NO. 16-_____

In the Supreme Court of the United States

BLUE SPIKE, LLC,

Petitioner,

–v–

GOOGLE INC.,

Respondent.

On Petition for Writ of Certiorari to the United States Court of Appeals for the Federal Circuit

PETITION FOR WRIT OF CERTIORARI

RANDALL T. GARTEISER
CHRISTOPHER A. HONEA
KIRK J. ANDERSON
GARTEISER HONEA
119 W FERGUSON ST.
TYLER, TX 75702
(415) 568-0553

ERNEST A. YOUNG
COUNSEL OF RECORD
3208 FOX TERRACE DR.
APEX, NC 27502
(919) 360-7718
YOUNG@LAW.DUKE.EDU

APRIL 6, 2017 *COUNSEL FOR PETITIONER*

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QUESTIONS PRESENTED

This Court has fashioned a two-part test for determining whether the subject matter of a patent is ineligible, under 35 U.S.C. § 101, because it claims a law of nature, natural phenomenon, or abstract idea. "First, we determine whether the claims at issue are directed to one of those patent-ineligible concepts." *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S.Ct. 2347, 2355 (2014). If so, a court must nonetheless ask whether the patent involves an "'inventive concept'—*i.e.*, an element or combination of elements that is 'sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself.'" *Id.* (quoting *Mayo Collaborative Svcs. v. Prometheus Laboratories, Inc.*, 132 S.Ct. 1289, 1294 (2012)). This case raises three questions under that framework:

1. May patentable subject matter under § 101 properly be assessed by over-generalizing patent claims to a "gist"?

2. May a district court properly assess patentability under § 101 prior to authoritatively construing the patent's claims?

3. May a district court adjudicating a motion for judgment on the pleadings on § 101 patentability grounds properly consider questions of patent enablement under 35 U.S.C. § 112?

RULE 29.6 CORPORATE DISCLOSURE STATEMENT

Blue Spike, LLC is not a publicly traded company, issues no stock, and has no parent company. There is no publicly held company with more than 10% ownership stake in Blue Spike, LLC.

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PETITION FOR WRIT OF CERTIORARI

Blue Spike, LLC petitions for a writ of certiorari to review the judgment of the United States Court of Appeals for the Federal Circuit.

OPINIONS BELOW

The Federal Circuit's Rule 36 judgment without opinion affirming the Northern District of California's decision is unreported, but it is available at 2016 WL 5956746. (App.1a) The Northern District of California's judgment on the pleadings is unreported, but it is available at 2015 WL 5260506. (App.4a)

JURISDICTION

The Federal Circuit denied Blue Spike's combined petition for an *en banc* hearing and panel rehearing on January 6, 2017. This Court's jurisdiction is timely invoked under 28 U.S.C. § 1254(1).

STATUTORY PROVISIONS

- **35 U.S.C. § 101**

  Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

- **35 U.S.C. § 112**

  (a) In general. The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

STATEMENT OF THE CASE

A. Introduction

This case goes to the heart of one of the most central, but also most confusing, questions in patent law: the scope of patentable subject matter under § 101 of the Patent Act. Section 101 of the Patent Act provides that "[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." 35 U.S.C. § 101. However, this Court has "long held that this provision contains an important implicit exception: Laws of nature, natural phenomena, and abstract ideas are not patentable." *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S.Ct. 2347, 2354 (2014) (internal marks omitted). The Court has fashioned a two-step process in determining Section 101 eligibility: "First, we determine whether the claims at issue are directed to one of those patent-ineligible concepts." *Id.* at 2355 (citing *Mayo Collaborative Svcs. v. Prometheus Laboratories, Inc.*, 132 S.Ct. 1289, 1296-97 (2012)). If they are, then the second stage of the inquiry asks whether the patent contains an "inventive concept," such that the invention "amounts to significantly more than a patent upon the ineligible concept itself." *Id.* at 2355.

The lower courts—not to mention scholars and practicing lawyers—have struggled to interpret the *Alice/Mayo* test and apply it in specific cases. This case features three important issues common to many patentability disputes under § 101. The first is the level of generality at which a patent's claims should be assessed. Specifically, many trial courts have adopted the practice of reducing patent claims to a highly general "gist," then assessing that gist to determine whether it is so abstract as to be unpatentable. Because distillation to a "gist" inherently abstracts from a patent's specific claims, this approach builds in a bias towards invalidity.

Second, some district courts—including the trial court here—have attempted to rule on eligibility of a patent's subject matter without first authoritatively construing the patent's claims. The Federal Circuit has counseled against this practice, but it has also muddied the waters by affirming decisions in which the trial court has ignored that advice. Deciding eligibility before claim construction exacerbates the tendency noted above to ignore a patent's specific claims and over-generalize its "gist."

Third, patent eligibility determinations have become a procedural surrogate for a quite distinct set of concerns about whether a patent sufficiently enables the invention. In the present case, for example, Respondent argued strongly that Petitioner had not actually invented anything because the patent did not sufficiently specify the underlying technology. This is an argument about enablement, which falls under § 112 of the Patent Act, not § 101. This Court has recognized the importance of keeping these two statutory requirements distinct, *see Diehr*, 450 U.S. 190. The Court has never directly addressed whether § 101 eligibility determinations are appropriate for resolution on the pleadings, but in any event, fact-intensive questions of specification and enablement should not be resolved without factual development by importing those questions into a determination of eligibility.

B. Background

Blue Spike, LLC is a small company specializing in digital watermarking technology and other means of identifying digital signals. This sort of technology has important applications, including protecting copyrighted digital content from piracy. At the time the patents at issue in this case were filed, digital signal recognition focused primarily on inserting data into a digital signal (a "digital watermark"). Blue Spike's patents introduced a novel alternative to digital watermarking; rather than inserting data into a digital signal, Blue Spike's technology creates a digital signal abstract—a smaller digital representtation of the digital signal—that can be used for identification purposes. The central question in the appeal below was whether Blue Spike's digital abstracting technology is patentable subject matter under § 101 of the Patent Act.

1. The Patents in Suit

The Patents-in-Suit teach a "novel basis" for signal recognition and identification.[1] This "enhanced identification" is carried out by (1) monitoring and analyzing a digital signal;[2] (2) creating a smaller digital representation known as a signal "abstract" of that digital signal;[3] and (3) utilizing the signal abstract to make comparisons and perform other useful operations.[4] In one sample embodiment, the comparison using signal abstracts teaches how copyrighted songs

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[1] '175 Patent 2:4-7, 6:63-66.

[2] '175 Patent, 3:11-12, 22-23, 32-33, 48-49.

[3] '175 Patent, 3:13-21, 23-24, 33-35; 51-52.

[4] *See, e.g.*, '472 Patent, Claim 11 (creating an index-of-relatedness); '700 Patent, Claim 12 (embedding uniquely identifiable data into a digital signal); '700 Patent, Claim 40 (identifying related digital signals); and '175 Patent, Claim 5 (changing selected criteria to effect different results in creating).

may be identified, including an artist singing a cover of a copyrighted song.[5]

The key to the process is the signal abstract. It is a data-reduced representation of a digital signal allowing complex comparisons at lower bandwidth than comparisons of the raw digital signal.[6] This signal abstract is "created using data reduction techniques to determine the smallest amount of data, at least a single bit, which can represent and differentiate two digitized signal representations."[7] A typical embodiment, for instance, creates an abstract by analyzing the characteristics of each signal in a group of variations of the same signal, then selecting those characteristics which remain relatively constant.[8] For example, one might analyze five versions of the same song, with the same lyrics and music, but which are sung by different artists. This process of creating a signal abstract attempts to "reduce the digital signal in such a manner as to retain a 'perceptual relationship' between the original signal and its data reduced version."[9] The resulting signal abstract is non-invertible, meaning that that it cannot be used to recreate the original digital signal.[10] Once signal

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5 '175 Patent, 13:39-14:35.

6 *See, e.g.*, '175 Patent, 6:54-7:9; 9:59-10:6; 10:10-19; 12:42-51.

7 '175 Patent, 10:10-19.

8 '175 Patent, 4:7-17.

9 '175 Patent, 3:65-4:1.

10 '175 Patent, 13:55-60.

abstracts are created, they may be compared to digital signals or to each other.[11]

Comparing digital signals to each other without the use of a signal abstract can be a computationally expensive way to identify a signal.[12] At the time of the invention, the prevailing solution for this problem of computer-based "identification of digitally-sampled information" relied largely upon adding "a separate and additional signal," such as a digital watermark, to the original signal.[13] The Patents-in-Suit provide a salient example: "One traditional, text-based additive signal is title and author information. The title and author, for example, is information about a book, but it is in addition to the text of the book."[14] One of the "many shortcomings" of the additive signal approach is the difficulty of creating an additive signal that could not be removed surreptitiously.[15]

Blue Spike's patents addressed these deficiencies.[16] The solution was the signal abstract: a representation of a digital signal that "massively compress[ed] a signal to its essence" while not compressing so much that the resulting abstract "fails to

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[11] '175 Patent, 7:42-49.

[12] '175 Patent, 7:4-10.

[13] '175 Patent, 4:51-55.

[14] '175 Patent, 4:58-61.

[15] '175 Patent, 5:1-12.

[16] '175 Patent, 4:2-4 ("The purpose is to afford a more consistent means for classifying signals than proprietary, related text-based approaches.").

maintain the ability to distinguish" signals.[17] "The present invention eliminates the need of any additive monitoring signal because the present invention utilizes the underlying content signal as the identifier itself."[18] The Patent and Trademark Office rigorously assessed these advantages in comparing the Patents-in-Suit to literally hundreds of prior art patents and publications. Hence, the '472 Patent cites more than 100 references; the '700 Patent cites more than 350 references; the '494 and '175 Patents each cite almost 600 references; and the '728 Patent cites more than 700 references.

The Patents-in-Suit draw from "the highly effective ability of humans to identify and recognize a signal."[19] If a signal abstract can be "compressed to retain what is 'humanly-perceptible'" and "successfully mimics human perception, data space may be saved when the compressed file is compared to the uncompressed original file."[20] But the signal abstracts yet teach improvements of human-based comparisons and identification.

One such improvement includes a faster and more accurate form of identification.[21] The '175 Patent's first sample embodiment thus teaches the identification of copyrighted songs.[22] Other applications exist outside

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[17] '175 Patent, 7:10-34.

[18] '175 Patent, 5:26-28.

[19] '175 Patent, 4:44-46.

[20] '175 Patent, 7:43-46.

[21] '175 Patent, 7:4-10.

[22] '175 Patent, 13:39-14:35.

of media rights. For instance, the same patent's second sample embodiment describes "identification of photographs of potential suspects whose identity matches the sketch of a police artist."[23]

The Patents-in-Suit provide a 5-step prose algorithm spanning multiple columns of the specification.[24] The algorithm provides five elements: (1) a reference database, (2) an object locator, (3) a feature selector, (4) a comparing device, and (5) a recorder.[25] Additionally, the patents point to various other algorithms that could be utilized in the creation of the abstract.[26]

2. Proceedings Below

On August 22, 2012, Blue Spike filed its original complaint against Google in the Eastern District of Texas, alleging infringement of the '472, '700, '494, and '175 Patents.[27] On March 13, 2014, the Court granted Google's motion for transfer to the Northern

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[23] '175 Patent, 14:62-65.

[24] '175 Patent, 8:3-9:40; Case No. 6:12-cv-499, Dkt. No. 1832, at 14 (referring to the Blue Spike Patents-in-Suit and noting "the specification provides an exemplary algorithm in prose."); *contra* App.9a ("The Court further notes that the specification does not teach the specifics of the implementation—it includes no source code, detailed algorithm or formulas, or the like.") (emphasis added).

[25] '175 Patent, 8:3-9:40.

[26] '175 Patent, 4:18-32; 10:56-12:11 (referring to algorithms such as linear predictive coding (LPC), z-transform analysis, root mean square (rms), frequency weighted RMS, signal to peak, and spectral transforms).

[27] Case No. 6:12-cv-558, Dkt. No. 1.

District of California.[28] Blue Spike filed its First Amended Complaint (adding the '728 Patent)[29] and Google Answered.[30] The parties then filed a joint stipulation to extend case deadlines by roughly four months in order to facilitate transfer and relation of other cases from the Eastern District of Texas.[31] The District Court granted the stay.[32]

Meanwhile, other cases involving the same patents-in-suit proceeded through claim construction and summary judgment rulings in the Eastern District of Texas. On October 16, 2014, that court, with the assistance of a court-appointed technical advisor, issued a 69-page *Markman* opinion construing more than 30 terms and phrases in the Patents-in-Suit.[33] On that same date, Magistrate Judge Craven issued a 19-page Report and Recommendation recommending that a motion for summary judgment of indefiniteness be denied.[34] In an 11-page Memorandum Order on January 6, 2015, Judge Schneider adopted the Magistrate Judge's findings, affirming the denial of summary judgment of indefiniteness.[35]

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28 Case No. 6:12-cv-558, Dkt. No. 1.

29 Case No. 4:14-cv-1650, Dkt. No. 47.

30 Case No. 4:14-cv-1650, Dkt. No. 48.

31 Case No. 4:14-cv-1650, Dkt. No. 56.

32 Case No. 4:14-cv-1650, Dkt. No. 57.

33 Case No. 6:12-cv-499, Dkt. No. 1831.

34 Case No. 6:12-cv-499, Dkt. No. 1832.

35 Case No. 6:12-cv-499, Dkt. No. 1892.

On May 12, 2015, Google filed a Rule 12(c) Motion for Judgment on the Pleadings seeking adjudication that the Patents-in-Suit are invalid under 35 U.S.C. § 101.[36] On October 1, 2015, the Northern District of California entered judgment against Blue Spike, finding the asserted claims of the Patents-in-Suit invalid pursuant to § 101.[37] Blue Spike appealed to the Court of Appeals for the Federal Circuit.[38]

On October 4, 2016, the Federal Circuit heard oral argument. On October 14, 2016, the Federal Circuit filed a Rule 36 judgment without opinion, affirming the District Court's invalidity ruling.[39] Blue Spike filed a motion for reconsideration *en banc* and a rehearing by the panel, which was denied on January 6, 2017.[40]

REASONS TO GRANT THE PETITION

This appeal does not simply seek to correct an erroneous application of the § 101 standard. Rather, the district court made at least two discrete errors of law that promoted an overbroad construction of the patent. The district court's errors, moreover, were not isolated; rather, they reflect relatively widespread

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36 Case No. 6:12-cv-558, Dkt. No. 59.

37 App.4a.

38 App.110a.

39 App.1a.

40 App.31a.

tendencies that the Federal Circuit has failed to correct.

First, the district judge followed Northern District of California precedent directing it to distill the patent's claims to a "gist"—explicitly defined at a high level of generality—for purposes of determining whether the patent's subject matter was patentable. Second, the court decided patentability under § 101 without first conducting a hearing and resolving disputed questions about claim construction. These points are of continuing importance in cases involving other patents. They should be explicitly analyzed and rejected by this Court.

Equally important, this case involves critical slippage between the patentable subject matter determination under § 101 of the Patent Act and the requirement that patents sufficiently enable the invention under § 112. In the district court, Google repeatedly alleged that Petitioner's patents did not sufficiently enable the invention, suggesting in effect that Blue Spike hadn't really invented anything. The district court's opinion indicates that these enablement concerns, despite not being properly before the court, were a substantial factor motivating its decision. And although the circuit panel did not issue an opinion, its comments at oral argument strongly suggest that it affirmed the district court's judgment based on enablement concerns.

This Court should explicitly reject this conflation of §§ 101 and 112, because those two provisions are both conceptually distinct and operate in different procedural contexts. In particular, enablement raises fact-intensive questions concerning what would be necessary for one of ordinary skill in the art to produce the invention. Hence, this Court has insisted on keeping patentability and enablement separate. *See Diamond v. Diehr*, 450 U.S. 175, 190 (1981); *See also Ultramercial, LLC v. Hulu, LLC*, 657 F.3d 1323, 1329 (Fed. Cir. 2011), vacated on other grounds, 132 S.Ct. 2431 (2012). This Court should grant *certiorari* to make clear that district courts may not import § 112 concerns into the § 101 analysis.

This Court should not forego review simply because the Federal Circuit did not issue an opinion in this case. It is, of course, the Federal Circuit's responsibility in the first instance to resolve conflicting approaches among the district courts in patent cases. But the Federal Circuit has increasingly abdicated that responsibility in § 101 cases by affirming district court results without opinion or explanation under Fed. R. App. Proc. 36. The Federal Circuit should not be permitted to make itself non-reviewable simply by refusing to explain its rulings, and this Court should grant *certiorari* to clarify the legal standard under § 101 that the Federal Circuit has been unwilling to illumine.

I. THIS COURT SHOULD GRANT REVIEW TO RESOLVE CONFLICTING APPROACHES TO PATENT ELIGIBILITY DETERMINATIONS UNDER 35 U.S.C. § 101.

Every patent involves abstract principles, just as every scientific advance ultimately rests on unpatentable laws of nature. Hence, Justice Breyer recognized in *Mayo* that "too broad an interpretation of this exclusionary principle [for abstract principles and laws of nature] could eviscerate patent law. For all inventions at some level embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas." 132 S.Ct. at 1293. Likewise, the Federal Circuit has "long-recognized that any claim can be stripped down, simplified, generalized, or paraphrased to remove all of its concrete limitations, until at its core, something that could be characterized as an abstract idea is revealed." *Ultramercial, Inc. v. Hulu, LLC*, 722 F.3d 1335, 1344 (Fed. Cir. 2013), *cert. granted, judgment vacated sub nom. WildTangent, Inc. v. Ultramercial, LLC*, 134 S.Ct. 2870 (2014). If every patent were construed at the highest level of generality, then nothing would be patentable. And short of that extreme, broad constructions of patent claims risk undermining Congress's intent to provide generous protection for inventors as well as the general statutory presumption of patent validity.[41] That is why the Federal Circuit has cautioned that "[a] court cannot go hunting for abstractions by ignoring the concrete, palpable, tangible limitations of the invention the patentee actually claims." *Id.*

Unfortunately, neither the district courts nor the Federal Circuit have developed a consistent and predictable approach to eligibility determinations under § 101. One scholar recently concluded that "there is now less clarity on the basic question of patent-eligibility than at almost any other time in American patent law." Jeffrey A. Lefstin, *The Three Faces of Prometheus: A Post-Alice Jurisprudence of Abstrac-*

[41] *See* 35 U.S.C. § 282 (patents presumed valid once granted); *Bilski v. Kappos*, 561 U.S. 593, 602 (2010) ("This Court has more than once cautioned that courts should not read into the patent laws limitations and conditions which the legislature has not expressed.") (internal marks and citations omitted).

tions, 16 N.C. J. L. & Tech. 647, 649 (2015). Under these circumstances, it is not surprising that district courts have adopted diverse approaches to defining the boundaries of § 101. The Federal Circuit has proven unwilling to reconcile these approaches. That situation makes guidance from this Court all the more imperative.

This case features two recurring errors under § 101 that have divided and confused federal trial courts. The first is a rule adopted by some—but hardly all—district courts that patent claims must first be reduced to a highly-general "gist" before considering whether those claims speak to patentable subject matter. The second is a procedural error—attempting to rule on patent eligibility before authoritatively construing the patent's claim—that tends to reinforce the trend toward over-generalization. Both errors critically undermine Congress's intent by rendering patent protection unpredictable and overly narrow.

A. The Lower Courts Are in Disarray Concerning the Proper Level of Generality at Which to Assess the Eligibility of a Patent's Claims.

Local precedent in the Northern District of California requires distilling a claim to its "gist" in assessing its patentability under § 101. *See Open Text S.A. v. Box, Inc.*, 78 F.Supp.3d 1043, 1046 (N.D. Cal. 2015) ("In evaluating the first prong of the *Mayo/Alice* test, which looks to see if the claim in question is directed at an abstract idea, the Court distills the gist of the claim.").[42] This notion of a

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[42] *See also GT Nexus, Inc. v. Inttra, Inc.*, 2015 WL 6747142, at *4 (N.D. Cal. Nov. 5, 2015); *IPLearn-Focus, LLC v. Microsoft*

"gist" inherently presses courts toward a higher level of generality and thus inappropriately raises the bar for patentability under the Act. *See, e.g.*, *Open Text*, 78 F.Supp.3d at 1047 ("Courts should recite a claim's purpose at a reasonably high level of generality."). The district court in the present case explicitly invoked this "gist" approach. *See* App.11a (stating that "the Court must 'distill[] the gist of the claim[s]'") (quoting *Open Text*, 78 F.Supp.3d at 1046)). The court accordingly framed the patents in suit at the highest possible level of generality, finding that Appellant's patents were "generally directed to the abstract concept of comparing one thing to another." App.15a.

The Federal Circuit has, in some cases, rejected overbroad distillations of patents. In *Enfish*, that court rejected the Central District of California's over-generalized "gist" of the asserted claims. *See Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1346 (Fed. Cir. 2016) (finding "the district court oversimplified the self-referential component of the claims and downplayed the invention's benefits"). The court of appeals thus reversed a holding that a patent was invalid pursuant to § 101. *See id.* ("[D]escribing the claims at such a high level of abstraction and untethered from the language of the claims all but ensures that the exceptions to § 101 swallow the rule."). But the Federal Circuit has failed to address as a general matter the practice of many district courts of reducing patent claims to a "gist." This case presents an optimal vehicle to correct this erroneous line of district court precedent.

Corp., 14-CV-00151-JD, 2015 WL 4192092, at *1 (N.D. Cal. July 10, 2015).

That the generalizing "gist" approach conflicts with Federal Circuit precedent is clear from cases like *Ultramercial*. There, the court of appeals addressed the "abstract idea" inquiry by (1) noting that claim 1 of the '545 patent "includes eleven steps for displaying an advertisement in exchange for access to copyright media"; (2) summarizing the 11 claims "[w]ithout purporting to construe" them; and finally (3) noting that the "ordered combination of steps recites an abstraction—an idea, having no particular concrete or tangible form." *Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 714-15 (Fed. Cir. 2014). Although the court of appeals agreed with the lower court's summary, that summary was not the starting point but rather the end point of the appellate court's careful analysis of the patent's claims. Unlike *Ultramercial*, where no inventive steps were discarded in the summary, the District Court here ignored the innovative process of creating a data-reduced, non-invertible, perceptually-based representation of a digital signal.

The problems in the district court's patentability approach are thus not isolated to this case. They will persist as long as the Northern District (and other district courts) continue to employ this flawed methodology.

B. The Lower Courts Are Also in Disarray Concerning Whether a Patent's Claims Should Be Construed Before Evaluating Patentability of Its Subject Matter.

The District Court decided Google's § 101 Motion on the Pleadings without the benefit of claim construction. Although the Federal Circuit has stated that claim construction is "not an inviolable prerequisite," it has strongly suggested that it "will ordinarily be desirable—and often necessary—to resolve claim construction disputes prior to a § 101 analysis, for the determination of patent eligibility requires a full understanding of the basic character of the claimed subject matter." *Bancorp Servs., LLC v. Sun Life Assur. Co. of Canada (U.S.)*, 687 F.3d 1266, 1273-74 (Fed. Cir. 2012). Here, the trial judge found the patents invalid under § 101 based on an informal interpretation—reached without any briefing or hearing on construction—that read the patent's claims exceptionally broadly.

This case presents a particularly good vehicle to examine the importance of claim construction to an invalidity analysis, because separate courts made conflicting findings on the same patents. Although the Eastern District of Texas did not assess § 101 directly, it did arrive at conclusions, post-*Markman*, that differ from the Northern District of California's pre-*Markman* ruling. In particular, the Eastern District of Texas found that the patents-in-suit contain an exemplary algorithm in prose (*see* Case No. 6:12-cv-499, Dkt. No. 1832, at 14), while the Northern District of California court dismissed them as containing no algorithm (App.9a). These disparate conclusions highlight the importance of delaying § 101 decisions until after claim construction.[43]

Distilling a series of specific patent claims down to a "gist" is, for all practical purposes, a matter of claim construction. But it is a particularly inadequate

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[43] *Cf. DDR Holdings*, 773 F.3d at 1257 (in which the court of appeals benefited from a full record and reversed a § 101 holding of ineligibility for the first time).

substitute for actual claim construction, because it involves a largely impressionistic and indeterminate judgment conducted without the procedural safeguards that a prior hearing on claim construction would have afforded. This Court should grant *certiorari* and hold that where interpretation of the patent claims is central to § 101 analysis, informal claim construction is insufficient.

II. THIS COURT SHOULD GRANT REVIEW TO PREVENT CONFLATION OF PATENTABILITY AND ENABLEMENT.

This case illustrates a disturbing tendency for trial courts to use patentable subject matter analysis under § 101 of the Patent Act as a vehicle for concerns that a patentholder may have claimed rights in an invention that he has not actually invented. These concerns relate to the enablement requirement in § 112 of the Act, not to patentability of the subject matter.[44] Under § 112, a patent must teach a person having ordinary skill in the art how to make and use the invention. This not only ensures that the public will have access to the invention after the patent term expires, but also prevents the inventor from claiming a broader invention than he actually possesses.[45]

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[44] *See, e.g.*, *Streck, Inc. v. Research & Diagnostic Systems, Inc.*, 665 F.3d 1269, 1288 (Fed. Cir. 2012) ("Enablement 'is a legal determination of whether a patent enables one skilled in the art to make and use the claimed invention.'") (quoting *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384 (Fed. Cir. 1986)).

[45] *See, e.g.*, Timothy R. Holbrook, *Possession in Patent Law*, 59 SMU L. Rev. 123, 157 (2006) ("Enablement doctrine performs this role of confining the scope of the claims to what the inventor actually possessed.").

Enablement requires analysis of several frequently fact-intensive factors concerning whether "one skilled in the art, having read the specification, could practice the invention without 'undue experimentation.'"[46] Moreover, the threshold for proving insufficient enablement in a patent is very high. *See Streck*, 665 F.3d at 1288 ("Because patents are presumed valid, lack of enablement must be shown by clear and convincing evidence."). Hence, it is not surprising that litigants and trial courts might try to avoid these hurdles by importing doubts about enablement into the § 101 analysis.

That occurred here. The District Court repeatedly expressed doubt concerning whether the Patents-in-Suit adequately specified and enabled the actual invention.[47] Google did not move for judgment on these grounds, however—nor could it have, as these issues are fact-intensive and disputed, and thus could

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[46] *Streck*, 665 F.3d at 1288 (quoting *In re Wands*, 858 F.2d 731, 736-37 (Fed. Cir. 1988)). These factors are "(1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims." *Id.* (quoting *Wands*, 858 F.2d at 737).

[47] *See* App.75a, Transcript at 19:8-12 ("I'm asking you to explain the patent. Does it do anything other than tell the reader to identify something that a human perceives and compare it to something else through the use of a computer? Does it do anything other than that?"); App.92a, 36:21-22 ("This patent doesn't disclose or teach those compression techniques."); App.92a, 37:4-10 ("[W]hy would I have an entire case be litigated where on the face of the patent, there's nothing there?").

not be resolved in a motion for judgment on the pleadings. Instead, Google's claim that Blue Spike had not actually invented anything infected the District Court's analysis of patent eligibility under § 101.

Similar concerns about enablement may have driven the panel's decision on appeal. Although the Federal Circuit did not issue an opinion, statements at argument suggested that it did not accept the District Court's overbroad characterization of Petitioner's patents.[48] The court of appeals' questions to Blue Spike's counsel were largely, if not entirely, focused on issues of enablement. And one judge reasoned that the specification does not sufficiently describe how to create a signal abstract and use it to compare. *See* Oral Argument Recording at 26' 00" ("And the non-conventional, technological advance would be to say, "This is how you do it. That's what I was trying to say to your opposing counsel isn't there.").

Conflating enablement and patentability was both conceptual and procedural error. Title 35 sets the § 112 written description and enablement requirements for patentability "wholly apart from whether the invention falls into a category of statutory subject matter." *Diehr*, 450 U.S. at 190. As Judge Rader has noted, "the 'coarse eligibility filter' of § 101 should not be used to invalidate patents based on concerns

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48 *See* Oral Argument at 17' 40" to 18' 02" ("This isn't a case where you're taking something a human can do and just stick it on a computer. This is a case with algorithms—precise and different and varied algorithms on how to extrapolate from a digital file characteristics that a human would perceive.") (Judge Moore), available at http://oralarguments.cafc.uscourts.gov/default.aspx?fl=2016-1054.mp3.

about vagueness, indefinite disclosure, or lack of enablement, as these infirmities are expressly addressed by § 112." *Ultramercial*, 657 F.3d at 1329.

Importing enablement concerns into the patentable subject matter analysis was particularly inappropriate in the context of a motion for judgment on the pleadings. By making factual judgments relating to the § 112 issues as part of its § 101 analysis, the District Court violated the narrow parameters of Rule 12(c). As the Federal Circuit has noted, "[e]nablement is a question of law with factual underpinnings." *CFMT Inc. v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1337-40 (Fed. Cir. 2003). And the District Court simply did not have a sufficient factual record to make this determination.[49]

Petitioner maintains that the Patents-in-Suit are sufficiently described and enabled and would welcome the opportunity to prove that in a proper proceeding. But the district court's (and the Federal Circuit's) decision to import enablement into patentability deprived Petitioner of that opportunity. This is a problem of continuing significance. Patentability is a difficult and somewhat amorphous inquiry, and courts will often be tempted to short-circuit that analysis by relying on more practical concerns, such as enablement. If both issues are resolved at a procedural stage where the underlying facts can be properly explored, there may be little harm done. But this Court should make clear that at

[49] The Eastern District of Texas, on the other hand, had the advantage of a more developed factual record and consequently denied a § 112 motion on indefiniteness. *See*, Case No. 6:12-cv-499, Dkt. No. 1832.

the pleading stage, enablement concerns under § 112 simply cannot be allowed to infect the patentability analysis under § 101.

III. THE FEDERAL CIRCUIT'S DECISION NOT TO ISSUE AN OPINION IN THIS CASE SHOULD NOT PREVENT REVIEW.

Petitioners acknowledge that decisions by a court of appeals issued without opinion are ordinarily not good candidates for *certiorari*. Two aspects of the present case, however, should overcome that presumption here. The first consideration stems from the unique role of the Federal Circuit in patent cases. Because that court already provides centralized review in patent cases, this Court's decision to grant *certiorari* cannot turn upon whether there is a split among the circuit courts of appeal. Rather, the relevant question is whether there is conflict and disorder in the patent law that the Federal Circuit has failed to resolve. As demonstrated, federal trial courts have applied this Court's patentability analysis set forth in *Alice* and *Mayo* in ways that are in tension both with one another and with the Federal Circuit's pronouncements. This case provides a ready vehicle for resolving significant aspects of this confusion.

Second, the Federal Circuit appears unwilling to shoulder the responsibility for clarifying the *Alice/Mayo* analysis. That court's use of summary Rule 36 affirmances seems to be both commonplace and increasing.[50] This is particularly true in cases

[50] *See, e.g.*, Gene Quinn & Peter Harter, *Does the Federal Circuit's use of Rule 36 call into question integrity of the judicial process?* IP Watchdog, Feb. 14, 2017, at http://www.

concerning patentable subject matter under § 101. One recent report identified a dozen Federal Circuit appeals raising this issue decided by Rule 36 affirmances in 2016 alone.[51]

This trend is particularly unfortunate given the unsettled nature of the law under § 101 and the Federal Circuit's statements that this uncertainty is to be resolved through "the classic common law methodology." *Amdocs Israel Ltd. v. Openet Telecom, Inc.*, 841 F.3d 1288, 1294 (Fed. Cir. 2016). That method cannot proceed without judicial opinions stating the grounds and reasoning for the results in litigated cases. Federal Circuit Rule 36 states that summary affirmance should occur only if "an opinion would have no precedential value." Because the Federal Circuit has elaborated the § 101 analysis largely by example rather than by articulating more precise rules, however, most such decisions do serve as important precedents. The Patent and Trademark Office has acknowledged as much in its guidance to patent examiners:

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ipwatchdog.com/2017/02/14/federal-circuit-rule-36-integrity-judicial-process/id=78261/ ("[T]he Federal Circuit is using Rule 36 in an increasing plurality of cases that will soon become a clear majority of cases."); Jason Rantanen, *Data on Federal Circuit Appeals and Decisions*, PatentlyO, June 2, 2016, at https://patentlyo.com/patent/2016/06/circuit-appeals-decisions.html (demonstrating the increasing proportion of Rule 36 affirmances as a percentage of all dispositions in recent years).

51 *See* Peter Harter & Gene Quinn, *Unprecedented Abuse at the Federal Circuit*, IPWatchdog, Jan. 12, 2017, at http://www.ipwatchdog.com/2017/01/12/rule-36-abuse-federal-circuit/id=76971/.

> Because the courts have declined to define abstract ideas, other than by example, the 2014 [Interim Guidance on Subject Matter Eligibility] instructs examiners to refer to the body of case law precedent in order to identify abstract ideas by way of comparison to concepts already found to be abstract.[52]

As this statement suggests, precedential opinions in § 101 cases are important not just for trial courts reviewing issued patents, but also for the PTO's examiners who must determine whether to issue patents in the first place. When the Federal Circuit fails to write a written opinion, it fails to provide the USPTO with necessary examples to use in granting patent applications.

As one Federal Circuit practitioner recently noted, "[a] Rule 36 affirmance is nearly impossible to obtain rehearing or rehearing en banc, or seek U.S. Supreme Court certiorari, because there is no appellate decision to challenge."[53] This may be good for a victorious appellee who cares primarily about the result, but it is hardly good for the law. That is especially true in an area like patentable subject matter under § 101, in which the governing law is notoriously unclear and unpredictable. To be sure, the docket pressures facing the Federal Circuit are

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[52] U.S. Patent & Trademark Office, *July 2015 Update: Subject Matter Eligibility* at 3, available at https://www.uspto.gov/sites/default/files/documents/ieg-july-2015-update.pdf.

[53] Rachel Hughey, *How to Get to Federal Circuit Rule 36*, Law360, July 29, 2015, at https://www.law360.com/articles/684264/how-to-get-to-federal-circuit-rule-36.

significant and increasing. But uncertainty about the scope and existence of patent rights will only breed further litigation. The best relief for docket pressures would be to clarify the rules and reduce parties' incentives to go to court.

CONCLUSION

For these reasons, the petition for writ of certiorari should be granted.

Respectfully submitted,

ERNEST A. YOUNG
COUNSEL OF RECORD
3208 FOX TERRACE DR.
APEX, NC 27502
(919) 360-7718
YOUNG@LAW.DUKE.EDU

RANDALL T. GARTEISER
CHRISTOPHER A. HONEA
KIRK J. ANDERSON
GARTEISER HONEA
119 W FERGUSON ST
TYLER, TX 75702
(415) 568-0553

COUNSEL FOR PETITIONER

APRIL 6, 2017

APPENDIX TABLE OF CONTENTS

JUDGMENT OF THE FEDERAL CIRCUIT (OCTOBER 14, 2016)

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

BLUE SPIKE, LLC,

Plaintiff–Appellant,

v.

GOOGLE INC.,

Defendant–Appellee.

2016-1054

Appeal from the United States District Court for the Northern District of California in No. 4:14-cv-01650-YGR, Judge Yvonne Gonzalez Rogers.

Before: MOORE, WALLACH, and TARANTO, Circuit Judges

THIS CAUSE having been heard and considered, it is ORDERED and ADJUDGED:

AFFIRMED. *See* Fed. Cir. R. 36.

Entered by Order of the Court

/s/ Peter R. Marksteiner
Clerk of Court

Date: October 14, 2016

ORDER RE: REMAINING PATENT CLAIM (SEPTEMBER 18, 2015)

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA

BLUE SPIKE, LLC,

Plaintiff,

v.

GOOGLE INC.,

Defendant.

Case No. 14-cv-01650-YGR
Re: Dkt. No. 77

Before: Yvonne Gonzalez ROGERS
United States District Court Judge

On September 8, 2015, the Court issued an order granting defendant's motion for judgment on the pleadings, finding all patent claims at issue in the motion to be invalid (Dkt. No. 75), and issued an order to show cause as to why the sole remaining patent claim at issue in this case, but not raised in the motion, should not be held invalid on the same grounds (Dkt. No. 76). The parties "do not dispute that Claim 30 of U.S. Patent No. 8,712,728 would be held invalid under the Court's reasoning as to the other asserted claims in its Order Granting Motion for Judgment on the Pleadings." (Dkt. No. 77 at 1-2.)

Thus, in the absence of any objection, the Court finds that claim invalid for the same reasons discussed in the September 8, 2015 Order at Docket Number 75. As all asserted claims have been held invalid, the Court directs defendant to file a proposed form of judgment, approved as to form by plaintiff, by no later than September 23, 2015.

IT IS SO ORDERED.

/s/ Yvonne Gonzalez Rogers
United States District Court Judge

Dated: September 18, 2015

ORDER GRANTING MOTION FOR JUDGMENT ON THE PLEADINGS (SEPTEMBER 8, 2015)

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA

BLUE SPIKE, LLC,

Plaintiff,

v.

GOOGLE INC.,

Defendant.

Case No. 14-cv-01650-YGR
Re: Dkt. No. 59

Before: Yvonne Gonzalez ROGERS
United States District Court Judge

Defendant Google Inc. ("Google") moves for judgment on the pleadings, arguing the asserted claims of the patents-in-suit—which broadly cover computer-based content comparisons—are invalid as embodying an unpatentable "abstract idea" under Section 101 of the Patent Act. (Dkt. No. 59 ("Mot.").) Plaintiff Blue Spike, LLC ("Blue Spike") opposes the motion. (Dkt. No. 63 ("Oppo.").) Having carefully considered the papers submitted, the patents-in-suit, the record in this case, and the arguments of counsel at the June 30, 2015 hearing, and good cause shown, the Court GRANTS the motion.

I. Background

The plaintiff asserts five patents in this lawsuit: U.S. Patent Nos. 7,346,472 (the "'472 Patent"), 7,660, 700 (the "'700 Patent"), 7,949,494 (the "'494 Patent"), 8,214,175 (the "'175 Patent"), and 8,712,728 (the "'728 Patent").[1] Other than the first, each is a continuation of the preceding application. All five are entitled "Method and Device for Monitoring and Analyzing Signals" and share the same specification. The patents include both method and system claims. Generally, the patents address the creation of "abstracts" (essentially digital fingerprints, hashes, or the like) from various "signals" (electronic versions of human-perceptible works in formats such as audio, visual, audiovisual, or text) based on perceptible qualities inherent to those signals.[2] The abstracts of

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[1] The plaintiff filed copies of each patent as attachments to its initial complaint. (Dkt. No. 1.) The defendant filed additional copies, with the asserted claims highlighted, as exhibits to the instant motion. (Dkt. No. 60.) The asserted claims are as follows: 1-4, 8, and 11 of the '472 Patent; 1, 10-12, 18, 21, 27, 40, and 51 of the '700 Patent; 11, 15, 17, and 29 of the '494 Patent; 1, 8, 11, 12, 16, and 17 of the '175 Patent; and 1, 4, 5, 16, 25, and 26 of the '728 Patent. (*See* Mot. at 4; Oppo. at 3 n.2.) The parties dispute whether claim 30 of the '728 Patent remains at issue. However, as the motion was not directed to that claim, neither is this Order. (*See* Oppo. at 3 n.2; Dkt. No. 64 ("Reply") at 15 n.9.)

[2] The specification contrasts this approach of relying on perceptual qualities inherent in the signal with what it calls the "traditional" or prior art approach of employing an "additive signal" (*e.g.*, adding something to the signal, such as a title or watermark, to facilitate future identification and comparison). *See* '728 Patent at 4:53-55, 4:66-5:4, 5:15-25.

"reference signals" are added to a reference database. Thereafter, new signals ("query signals") can be similarly processed, the resulting abstract checked against the database to determine whether the new signal matches any earlier analyzed signal. At a high level, the patents contemplate determining whether one piece of content—*e.g.*, a picture, a song, or a video—matches another, or the extent to which they are similar. The plaintiff accuses Google's "products, systems and/or services," including ContentID and YouTube, of infringement. (Dkt. No. 47 ("FAC") ¶ 28.) The plaintiff also contends the patents cover a wide array of comparison technologies, including biometric systems such as iris scanners. (*See* Oppo. at 20.)

The Court finds that claim 1 of the '472 Patent is generally representative of all asserted claims for purposes of this motion.[3] It reads as follows:

> A method for monitoring and analyzing at least one signal comprising:
>
> > receiving at least one reference signal to be monitored;

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[3] Plaintiff did not stipulate to the use of this or any other representative claim(s) for purposes of this motion. Therefore, the Court must consider every claim at issue. Nevertheless, because 31 claims spanning five patents are asserted, and in light of the fact that each is "substantially similar and linked to the same abstract idea," the Court finds the following approach to resolving this motion justified: addressing first, in detail, a single, broadly representative claim (claim 1 of the '472 Patent), and then explaining briefly why any material distinctions or additional limitations in each of the other claims are irrelevant to the ultimate conclusion of invalidity. *See Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat. Ass'n*, 776 F.3d 1343, 1348 (Fed. Cir. 2014); *see also Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 709 (Fed. Cir. 2014).

creating an abstract of said at least one reference signal wherein the step of creating an abstract of said at least one reference signal comprises:

inputting the reference signal to a processor;

creating an abstract of the reference signal using perceptual qualities of the reference signal such that the abstract retains a perceptual relationship to the reference signal from which it is derived;

storing the abstract of said at least one reference signal in a reference database;

receiving at least one query signal to be analyzed;

creating an abstract of said at least one query signal wherein the step of creating an abstract of said at least one query signal comprises:

inputting the at least one query signal to the processor;

creating an abstract of the at least one query signal using perceptual qualities of the at least one query signal such that the abstract retains a perceptual relationship to the at least one query signal from which it is derived; and

comparing the abstract of said at least one query signal to the abstract of said at least one reference signal to determine if the abstract of said at least one query signal matches the abstract of said at feast [*sic*][4] one reference signal.

'472 Patent at 15:33-60.

In its opposition brief, Blue Spike argued claim construction was needed prior to resolution of Google's motion, suggesting the claim constructions previously issued by the Eastern District of Texas involving four of the five patents at issue should be adopted. *See Blue Spike, LLC v. Texas Instruments, Inc.*, No. 6:12-CV-499-MHS-CMC, 2014 WL 5299320, at *4 (E.D. Tex. Oct. 16, 2014) ("Prior Construction"). At the hearing, Google stipulated to the adoption of those constructions solely for purposes of resolving its motion for judgment on the pleadings.[5] Most

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[4] This is an obvious typographical error. While the parties have not raised the issue of whether this is an error, the Court assumes for purposes of ruling on this this motion that the '472 Patent should read "least" instead of "feast." The Court may only correct an obvious typographical error when, from the perspective of a person of ordinary skill in the art, "(1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims." *Ultimax Cement Mfg. Corp. v. CTS Cement Mfg. Corp.*, 587 F.3d 1339, 1352-53 (Fed. Cir. 2009) (citing *Novo Industries, L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003)). The Court therefore corrects this obvious typographical error for purposes of this motion, substituting "least" for "feast." *See Ultimax*, 587 F.3d at 1353 (reversing district court's finding of claim indefiniteness where the district court should have instead inserted a missing comma into a chemical formula in a claim because a person of ordinary skill would have recognized and fixed the error).

[5] The parties have not argued that different constructions should apply to the most recent continuation patent. The Court sees no reason to depart from the Prior Construction in the case

critically in terms of the plaintiff's argument, the Texas court construed "abstract" as "a data-reduced representation of a signal that retains a perceptual relationship with the signal and differentiates the data-reduced representation from other data-reduced representations." (*Id.* at *14.)

The Court further notes that the specification does not teach the specifics of implementation—it includes no source code, detailed algorithms or formulas, or the like.

II. Legal Standard

Under Federal Rule of Civil Procedure 12(c), judgment on the pleadings may be granted when, accepting as true all material allegations contained in the nonmoving party's pleadings, the moving party is entitled to judgment as a matter of law. *Chavez v. United States*, 683 F.3d 1102, 1108 (9th Cir. 2012). The applicable standard is essentially identical to the standard for a motion to dismiss under Rule 12(b)(6). *United States ex rel. Cafasso v. Gen. Dynamics C4 Sys., Inc.*, 637 F.3d 1047, 1054 n.4 (9th Cir. 2011). Thus, although the Court must accept well-pleaded facts as true, it is not required to accept mere conclusory allegations or conclusions of law. *See Ashcroft v. Iqbal*, 556 U.S. 662, 678-79 (2009).

In ruling on a motion for judgment on the pleadings, the Court "need not . . . accept as true allegations that contradict matters properly subject to judicial notice or by exhibit" attached to the complaint. *Sprewell v. Golden State Warriors*, 266

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of the '728 Patent in light of the similarity of all five patents at issue, which, as noted above, share the same specification.

F.3d 979, 988 (9th Cir. 2001) (citation omitted). A challenge under Section 101 of the Patent Act may be brought as a motion for judgment on the pleadings. *See Open Text S.A. v. Box, Inc.*, No. 13-CV-04910-JD, 2015 WL 269036, at *2 (N.D. Cal. Jan. 20, 2015) (citing *buySAFE, Inc. v. Google, Inc.*, 765 F.3d 1350, 1352 (Fed. Cir. 2014)). A court may decide such a motion prior to claim construction. *See Bancorp Servs., L.L.C. v. Sun Life Assur. Co. of Canada (U.S.)*, 687 F.3d 1266, 1273-74 (Fed. Cir. 2012) ("[C]laim construction is not an inviolable prerequisite to a validity determination under § 101. We note, however, that it will ordinarily be desirable—and often necessary—to resolve claim construction disputes prior to a § 101 analysis, for the determination of patent eligibility requires a full understanding of the basic character of the claimed subject matter.").

III. Discussion

A. Legal Framework

The scope of subject matter eligible for patent protection is defined in Section 101 of the Patent Act: "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." 35 U.S.C. § 101. The Supreme Court has "long held that this provision contains an important implicit exception: Laws of nature, natural phenomena, and abstract ideas are not patentable." *Alice Corp. Pty. v. CLS Bank Int'l*, 134 S.Ct. 2347, 2354 (2014) ("*Alice*") (quoting *Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 133 S.Ct. 2107, 2116 (2013)). In applying this exception, courts "must distinguish between patents that claim the building blocks of human ingenuity and those that integrate the building blocks into something more." *Alice*, 134 S.Ct. at 2354 (internal quotations and alterations omitted); *see also Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S.Ct. 1289, 1301 (2012).

Thus, in determining whether claims are patent-ineligible, a court must first determine whether they are directed to a patent-ineligible concept, such as an abstract idea. *See Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980). "A principle, in the abstract, is a fundamental truth . . . [which] cannot be patented." *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972) (internal citations and quotations omitted). "Phenomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work." *Id.*; *see also CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1371 (Fed. Cir. 2011) ("[M]ental processes are not patent-eligible subject matter because the 'application of [only] human intelligence to the solution of practical problems is no more than a claim to a fundamental principle.'"). To determine whether patent claims are directed to an abstract idea, the Court must "distill[] the gist of the claim[s]." *Open Text S.A*, 2015 WL 269036, at *2 (citing *Bilski v. Kappos*, 561 U.S. 593, 611-12 (2010)).

If the claims are directed to an abstract idea, a court must then consider whether they nevertheless involve an "inventive concept" such that "the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself." *Alice*, 134 S.Ct. at 2355 (quoting *Mayo*, 132 S.Ct. at 1294); *see also*

DDR Holdings, LLC v. Hotels.com, L.P., 773 F.3d 1245, 1255 (Fed. Cir. 2014) ("Distinguishing between claims that recite a patent-eligible invention and claims that add too little to a patent-ineligible abstract concept can be difficult, as the line separating the two is not always clear."). "For the role of a computer in a computer-implemented invention to be deemed meaningful in the context of this analysis, it must involve more than performance of 'well-understood, routine, [and] conventional activities previously known to the industry.'" *Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat. Ass'n*, 776 F.3d 1343, 1347-48 (Fed. Cir. 2014) (alteration in original); *see also buySAFE, Inc. v. Google, Inc.*, 765 F.3d 1350, 1354 (Fed. Cir. 2014) ("The Court in *Alice* made clear that a claim directed to an abstract idea does not move into section 101 eligibility territory by 'merely requir[ing] generic computer implementation.'") (alteration in original).

The burden of establishing invalidity rests on the movant. *See Microsoft Corp. v. i4i Ltd. P'ship*, 131 S.Ct. 2238, 2245 (2011) (citing 35 U.S.C.A. § 282). However, on a motion for judgment on the pleadings for invalidity, where no extrinsic evidence is considered, the "clear and convincing" standard for weighing evidence in determining a patent's validity is inapplicable. *See Shortridge v. Found. Constr. Payroll Serv., LLC*, No. 14-CV-04850-JCS, 2015 WL 1739256, at *7 (N.D. Cal. Apr. 14, 2015) (citing *Modern Telecom Sys. LLC v. Earthlink, Inc.*, No. 14-CV-0347-DOC, 2015 WL 1239992, at *8 (C.D. Cal. Mar. 17, 2015)).

After *Alice*, the Federal Circuit has held a number of patent claims directed to abstract ideas to be invalid. A sampling follows:

- "[D]igital image processing" claims were directed to "an abstract idea because [they described] a process of organizing information through mathematical correlations and [were] not tied to a specific structure or machine." *Digitech Image Technologies, LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344, 1347, 1350 (Fed. Cir. 2014).
- Claims covering "methods and machine-readable media encoded to perform steps for guaranteeing a party's performance of its online transaction" were merely "directed to creating familiar commercial arrangements by use of computers and networks." *buySAFE, Inc. v. Google, Inc.*, 765 F.3d 1350, 1351 (Fed. Cir. 2014).
- Patent "directed to a method for distributing copyrighted media products over the Internet where the consumer receives a copyrighted media product at no cost in exchange for viewing an advertisement" was directed to an abstract idea, and "routine additional steps such as updating an activity log, requiring a request from the consumer to view the ad, restrictions on public access, and use of the Internet [did] not transform [the] otherwise abstract idea into patent-eligible subject matter." *Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 709, 716 (Fed. Cir. 2014).
- Patents covering a method for optical character recognition in connection with scanning hard copy documents were directed to an abstract idea and, even if limited "to a particular

technological environment," were invalid because "[s]uch a limitation has been held insufficient to save a claim in this context." *Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat. Ass'n*, 776 F.3d 1343, 1348 (Fed. Cir. 2014).

- Patent relating to a "method of price optimization in an e-commerce environment . . . claims no more than an abstract idea coupled with routine data-gathering steps and conventional computer activity . . . ." *OIP Technologies, Inc. v. Amazon.com, Inc.*, 788 F.3d 1359, 1360 (Fed. Cir. 2015).

- Claims directed to "tracking financial transactions to determine whether they exceed a pre-set spending limit (*i.e.*, budgeting)" covered "an abstract idea and [did] not otherwise claim an inventive concept." *Intellectual Ventures I LLC v. Capital One Bank (USA)*, 792 F.3d 1363, 1367, 1370 (Fed. Cir. 2015).

Notably, however, in *DDR Holdings, LLC v. Hotels.com, L.P.*, the Federal Circuit upheld a finding of validity as to a patent with claims "directed to systems and methods of generating a composite web page that combines certain visual elements of a 'host' website with content of a third-party merchant." 773 F.3d 1245, 1248 (Fed. Cir. 2014) ("For example, the generated composite web page may combine the logo, background color, and fonts of the host website with product information from the merchant."). The Federal Circuit found the patent "address[es] a business challenge (retaining website visitors) . . . particular to the Internet," but cautioned "that not all claims purporting to address Internet-centric challenges are eligible for patent." *Id.* at 1257-59.

B. Analysis

1. Abstract Idea

As a threshold matter, the Court must determine whether the asserted claims are directed to an abstract idea. The Court finds that the claims at issue are generally directed to the abstract concept of comparing one thing to another.

The patents seek to "model," on a computer, "the highly effective ability of humans to identify and recognize a signal." (*See* '728 Patent at 4:47-48.) By their own terms, therefore, the patents simply seek to cover a general purpose computer implementation of an abstract idea long undertaken within the human mind. *See Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat. Ass'n*, 776 F.3d 1343, 1347 (Fed. Cir. 2014) ("The concept of data collection, recognition, and storage is undisputedly well-known. Indeed, humans have always performed these functions."). Despite the opinion of plaintiff's expert, on their face the patents do not purport to recognize aspects of the compared works that only a computer—but not a human—could reasonably detect. The specification itself emphasizes the goal of modeling human capacity. Nothing in the claim language suggests the patents were not intended to encompass computerized content comparisons based on human-perceptible characteristics. To the contrary, the Prior Construction of "abstract" (a key term at issue in every asserted claim) states that the abstract has a "perceptual relationship" to the signal, and the Prior

Construction for related terms reveals the patents are generally directed to human-observable aspects of signals.[6]

The method by which the claims contemplate enabling these comparisons mirrors the manner in which the human mind undertakes the same task. Perceptible characteristics of an item (*e.g.*, a photograph) are used as a heuristic to compare that item to others. For instance, to borrow an example from the specification, one might compare paintings of sunsets by focusing on "perceptual characteristics related to the sun," *e.g.*, its color or position. '728 Patent at 14:52-60; *see also id.* ("The present invention . . . involves the scanning of an image involving a sun, compressing the data to its essential characteristics (*i.e.*, those perceptual characteristics related to the sun) and then finding matches in a database of other visual images (stored as compressed or even uncompressed data). By studying the work of other artists using such techniques, a novice, for example, could learn much by comparing the presentations of a common theme by different artists."). One might also identify a criminal by comparing a police artist sketch to various suspect photographs. *Id.* at 14:61-64. True, certain asserted claims involve only a subset of the mental process—*e.g.*, creating the "abstract," but not necessarily using it for anything. That these claims cover only a part of the broader abstract idea

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6 For instance, pursuant to the stipulation of the parties in that case, including plaintiff Blue Spike, the order construed "perceptual quality" as being a "quality <u>perceived by a person</u>" and "recognizable characteristic" as a "characteristic visually or aurally <u>perceived by a person</u>." *See* Prior Construction at *30 (emphasis supplied).

does not rescue them from falling within the realm of the abstract.

Blue Spike argues, with the support of an expert declaration, that its claims cover an invention that can accomplish comparisons beyond a human's capabilities. (*See* Papakonstantinou Decl., Dkt. No. 63-11, at ¶¶ 13-17 (opining that the creation of an abstract as contemplated in the patents-in-suit "requires use of a computing device configured to utilize data-reduction techniques" which a human "would not be capable" of mentally performing, particularly where "accuracy (down to even a single bit) . . . is essential").) Even if credited, this premise is legally false; the claims may be abstract even if they contemplate use of "a computer that processe[s] streams of bits." *See Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat. Ass'n*, 776 F.3d 1343, 1347 (Fed. Cir. 2014) (citing *Alice*, 134 S.Ct. at 2358).

Blue Spike further disputes Google's contention that a patent that seeks to mirror human perception and analysis on a computer is abstract with a "slippery slope" argument, contending such a finding would also render future breakthroughs in artificial intelligence technology un-patentable. To the extent artificial intelligence inventions—or the present "invention"—involve an inventive concept, they could be patentable even if they have, at their core, an abstract concept. The Court thus turns to the question of whether the asserted claims include an inventive concept.

2. Inventive Concept

As noted, the patents are directed to an abstract idea—the idea of comparing one thing to another. Blue Spike contends the claims would cover a nearly limitless scope of signals for comparison—ranging from irises to songs. However, the claims do not involve any "inventive concept." *See Alice*, 134 S.Ct. at 2355. Instead, they merely discuss using routine computer components and methods (*e.g.*, general purpose computers, compression, and databases) to accomplish this task with, in certain circumstances, greater efficiency than a human mind could achieve. *See Kroy IP Holdings, LLC v. Safeway, Inc.*, No. 2:12-CV-800-WCB, 2015 WL 3452469, at *13 (E.D. Tex. May 29, 2015) ("The greater efficiency with which the computer can perform tasks that a human could perform does not render the inventions patentable."); *Bancorp Services, L.L.C. v. Sun Life Assur. Co. of Canada (U.S.)*, 687 F.3d 1266, 1278 (Fed. Cir. 2012) ("[T]he use of a computer in an otherwise patent-ineligible process for no more than its most basic function—making calculations or computations—fails to circumvent the prohibition against patenting abstract ideas and mental processes."). Merely adding limitations involving the use of general purpose computer components to an otherwise abstract concept does not constitute an inventive concept sufficient to save a claim from invalidity. *See Planet Bingo, LLC v. VKGS LLC*, 576 F. App'x 1005, 1008 (Fed. Cir. 2014) (finding claims lacked an "inventive concept," despite being limited to computer-aided methods and systems, where the steps at issue could be "carried out in existing computers long in use" and "done mentally") (quoting *Gottschalk v. Benson*, 409 U.S.

63, 67 (1972)). The mere fact that the claims may cover a computer implementation that surpasses in scope or complexity what a human mind is capable of accomplishing is irrelevant where the claims are not limited to such complex activities, but also encompass more basic approaches. *Id.* Here, to the extent the asserted claims do encompass comparisons that a human is not readily capable of undertaking—an argument belied by the specification—they nevertheless also cover and preempt a wide range of comparisons that humans can and, indeed, have undertaken from time immemorial. Accordingly, given the patents claim an abstract idea but lack any inventive concept, they fail to meet the legal standard for patentability.

3. Additional Claims

The foregoing two-step analysis, largely focused on claim 1 of the '472 Patent, applies with equal force to all claims at issue. The only material distinctions, *e.g.*, inclusion of generic computer components, do not save those claims from invalidity. *See, e.g.*, *Cogent Med., Inc. v. Elsevier Inc.*, 70 F.Supp.3d 1058, 1066 (N.D. Cal. 2014) (finding certain "system and computer component claims rise and fall with the method claims" where they merely involve "generic computer components configured to implement the [abstract] idea"). The Court addresses each of the remaining claims in turn:

a. '472 Patent

- Claim 2 is a dependent claim, taking the method of claim 1 (the representative claim) but generating abstracts of only portions of signals, instead of signals in their entirety. The claim still encompasses the abstract idea discussed above and this limitation does not constitute an inventive concept.

- Claim 3 covers largely the same ground as the representative claim, but includes incremental counting steps—namely, a method for tracking the number of matches detected by the comparison process. This basic computer-based counting fails to rescue the claim from the realm of the abstract. *See Ultramercial, Inc.*, 772 F.3d at 712, 715 (characterizing a step of "recording [a] transaction event to [an] activity log, . . . including updating the total number of times" the event has occurred, as "routine, conventional activity").

- Claim 4 is dependent on claim 3 and merely adds routine steps for recording each match and generating a report identifying the matched signals. *See Alice*, 134 S.Ct. at 2359 (mere "use of a computer to create electronic records, track multiple transactions, and issue simultaneous instructions" does not constitute an inventive concept).

- Claim 8 mirrors, in substance, the representative claim, with the further limitation—immaterial to this analysis—that more than one reference signal is used, and also including an incremental counter for matches.

- Claim 11 is a system claim, involving generic computer components and routines ("a computerized system," "a processor," "a reference database," and "input[s]") to accomplish the basic method of the representative claim. Unlike the earlier discussed claims, this claim is not limited to detecting an exact "match," but instead compares the two abstracts to generate "an index of relatedness." The abstract idea discussed above is "comparison"—whether to find exact matches, or to determine the extent of similarity. Further, as noted, a system claim that merely incorporates generic computer components to implement the abstract idea of the method claim fails along with the method claim. Finally, the limitation of selecting certain criteria to consider in comparing things falls squarely within the heuristic approach the human mind takes to solving the same problem. It therefore does not rescue the claim from abstraction, nor does it constitute an inventive concept.

b. '700 Patent

- Claim 1 covers "[a]n electronic system," similar to claim 11 of the '472 patent, but limited to matching instead of broader comparisons. It similarly fails.
- Claim 10 depends on claim 1, but includes the limitation that "a cryptographic protocol" is applied to one or more of the abstracts at issue. The claims do not discuss a novel cryptographic method, but merely contemplate "'well-understood, routine, conventional activity.'" *See Intellectual Ventures II LLC v. JP Morgan Chase & Co.*, No. 13-CV-3777 AKH, 2015 WL 1941331, at *14 (S.D.N.Y. Apr. 28, 2015) (citing *Mayo*, 132 S.Ct. at 1298). Thus, the inclusion

of this limitation does not constitute an inventive concept.

- Claim 11 depends on claim 10, but is further limited to the use of a cryptographic protocol that has "at least a hash or digital signature," and the storage of the encrypted abstract. The patents do not explain a novel method for generating hashes or digital signatures—they merely call for the use of these conventional cryptographic methods.

- Claim 12 depends on claim 1, but adds "an embedder to embed uniquely identifiable data into at least one" of the signals. As the specification itself notes, however, such watermarking (or use of "additive signals") was in the prior art, and its inclusion here does not constitute an inventive concept. *See, e.g.*, '700 Patent at 4:44-53, 13:37-40 ("Traditionally, monitoring is accomplished by embedding some identifier into the signal, or affixing the identifier to the signal, for later analysis and determination of royalty payments.") (emphasis supplied).

- Claim 18 is a method claim, apparently for a digital rights management ("DRM") or other routine data transmission system. The claim notes the match determination is undertaken "to enable authorized transmission or use of the query signal." As to the data transmission issue, the claim does no more than present this basic recitation of purpose, but does not present an inventive method to facilitate data transmission. The claim is otherwise similar to the representative claim, but is further limited to generation of abstracts based on "signal characteristic parameters configured to differentiate between a plurality of versions of the data signal." This is not a unique approach; indeed, as noted above, humans also focus on discrete characteristics to facilitate comparisons between two similar things, *e.g.*, paintings of sunsets. These additional limitations do not save the claim.

- Claim 21 is dependent on claim 18, but limited to abstracts "derived from one of a cognitive feature or a perceptible characteristic" of the signals. This broad "limitation" (covering use of any aspect of a signal that a human could perceive) is not meaningful for purposes of the preceding analysis.

- Claim 27 is dependent on claim 18, but involves comparison instead of matching. As noted above, this is a distinction without a difference in regards to the claim's validity.

- Claim 40 covers a process similar to the representative claim, but again is focused on certain parameters and directed to similarity comparison instead of direct matching.

- Claim 51 is dependent on claim 40, but includes an additional step: "distributing at least one signal based on the comparison step." This is, again, apparently directed to the purpose of DRM or access control—but its inclusion does not constitute an inventive step sufficient to save the claim.

c. ’494 Patent

- <u>Claim 11</u> is a system claim similar to claim 11 of the ’472 Patent, but using “perceptible characteristics representative of parameters to differentiate between versions of the reference signal” to generate abstracts (instead of “selectable criteria”). This limitation is not materially distinct from the similar limitation discussed above regarding claim 18 of the ’700 Patent.

- <u>Claim 15</u> is dependent on claim 11, but includes the further limitation that “the stored abstracts comprise a self-similar representation of at least one reference signal.” In light of the specification, this limitation simply appears to contemplate generating a hash or compression of the signal to serve as the abstract. *See* ’494 Patent at 7:49-54. As noted above, the addition of this well understood, routine activity does not save the claim.

- <u>Claim 17</u> depends on claim 11, and includes the limitation that “at least one abstract comprises data describing a portion of the characteristics of its associated reference signal.” As with claim 2 of the ’472 Patent, generating an abstract based on only a portion of the characteristics of the signal, instead of the signal in its entirety, still falls squarely within the realm of the abstract concept discussed above.

- <u>Claim 29</u> covers a system materially similar to that of claim 11, but focuses on matching instead of comparisons and requires the use of more than one reference signal. Again, none of these minor variations saves the claim.

d. ’175 Patent

- Claim 1 covers a system similar to many of the preceding claims, contemplating the use of generic computer components, such as “non transitory memory,” “processor[s],” and “database[s].” As with some of the preceding claims, for instance claim 15 of the ’494 Patent, the abstract must be “similar” to the signal from which it is derived, but reduced in size (*e.g.*, a hash). The key distinction is that this claim contemplates the creation of two databases of distinct abstracts for the reference signals, and does not include a comparison step. This claim is therefore directed to accomplishing a subset of the abstract idea discussed above, but twice for each signal and in a different manner each time. The former aspect broadens, rather than limits, the claim’s scope. Neither constitutes an inventive concept sufficient to save the claim.

- Claim 8 is structured similarly to claim 1, but involves only a single database and focuses on facilitating possible comparisons “of different versions of a visual work and a multimedia work” by generating abstracts based on “signal characteristic parameters that differentiate between” different versions of the works. Limiting its scope to broad categories of possible signals—visual and multimedia works—does not save the claim. As noted above as to claim 18 of the ’700 Patent, neither does the use of "signal characteristic parameters."

- Claim 11 is similar to claim 8, but does not require the use of signal characteristic parameters and includes a comparison step with a query signal, as do many of the earlier addressed claims.

- Claim 12 depends on claim 11, with the additional limitation that the compare process indicates the absence of a match between the query signal abstract and the reference signal abstracts stored in a database. This additional routine limitation does not save the claim.

- Claim 16 is dependent on claim 12, but includes the further limitation that the processor generating and storing the abstracts "is programmed or structured to use an algorithm to generate" the abstracts. This generic reference to the use of an unspecified "algorithm" hardly limits the scope of claim 12, if at all, and certainly does not save the claim from invalidity. *See Digitech Image Technologies, LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344, 1351 (Fed. Cir. 2014) ("Without additional limitations, a process that employs mathematical algorithms to manipulate existing information to generate additional information is not patent eligible.").

- Claim 17 is similar to claim 11, but the comparison component is absent and the claim instead includes a requirement that the system be "programmed or structured to apply at least one of psycho-acoustic model and psycho-visual model to generate" the reference abstracts. The specification notes that psycho-acoustic/psycho-visual-focused compression is in the prior art and explains the approach is intended to "mimic[] human perception." *See, e.g.*, '175 Patent at 7:40-49; *see also id.* at 14:41-44 ("Similar to the goals of a psychoacoustic model, a psychovisual model attempts to represent a visual image with less data, and yet preserve those perceptual qualities that permit a human to recognize the original visual image."); *id.* at 7:42-43 ("Most compression is either lossy or lossless and is designed with psychoacoustic or psychovisual parameters. That is to say, the signal is compressed to retain what is 'humanly-perceptible.'"); *id.* at 4:18-21 (referencing prior art data reduction techniques based on "perceptual models" such as AAC, MP3, JPEG, GIF, or MPEG encoding). This approach falls squarely within the prior art and/or the abstract concept discussed above, and introduces no inventive concept.

e. '728 Patent

- Claim 1 describes a method for using an "electronic system" to create "data reduced,"[7]

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[7] This language appears redundant in light of the Prior Construction of the term "abstract," which describes the abstract as "data-reduced." Admittedly, "[i]t is settled law that when a patent claim does not contain a certain limitation and another claim does, that limitation cannot be read into the former claim in determining either validity or infringement." *VMWare, Inc. v. Connectix Corp.*, No. C 02-3705 CW, 2005 WL 6220090, at *12 (N.D. Cal. Mar. 25, 2005) (quoting *SRI Int'l v. Matsushita Elec. Corp. of Am.*, 775 F.2d 1107, 1122 (Fed. Cir.

"self-similar" abstracts of one reference signal, doing the same for one query signal, and comparing the two to determine whether the abstracts match. This claim's scope is similar to that of the representative claim; the additional limits of creating a hash-based (or similar) abstract, and of using an "electronic system," do not save the claim for the reasons previously explained.

- Claim 4 depends on claim 1, but also involves the creation of a second abstract, from a second reference signal. This does nothing to save the claim.
- Claim 5 depends on claim 4, but discusses "changing selected criteria" for generating the reference signal abstracts. The limitation of enabling the abstract generation to be based upon selectable criteria does not save the claim for the reasons discussed above.
- Claim 16 depends on claim 1, but includes a match counter. For the reasons discussed above, including as to claim 3 of the '472 Patent, this limitation does not save the claim.
- Claim 25 essentially describes a system for implementing claim 1, with a recitation of generic components (*e.g.*, a "receiver" and a "processor"). This claim therefore falls along with the method claim.

1985)). Nevertheless, the Court adopts the Prior Construction for purposes of this motion despite this apparent redundancy in light of the plaintiff's reliance thereon and defendant's stipulation thereto.

- Finally, claim 26 depends on claim 25, with the additional limitation that the "system is configured to apply at least one spectral transform" to the reference signal during the abstract-generation process. As with the unspecific reference to use of "algorithms" discussed above, the reference to use of "spectral transforms"—acknowledged by the specification to be a mathematical method to process signals, maintaining "some cognitive or perceptual relationship with the original analog waveform"—falls within the realm of the abstract. *See* '728 Patent at 11:25-31. The specification suggests "spectral transforms" refer to prior art; certainly, the patent does nothing to teach a person having ordinary skill in the art how to perform a spectral transform, taking for granted that such a process would be well understood at the time the patent was filed. *See id.* at 4:20-26. Moreover, the Federal Circuit has held that system claims directed to describing mathematical transformations undertaken in connection with digital image processing were not directed to patent-eligible subject matter where they did not "require any physical embodiment." *See Digitech Image Technologies, LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344, 1350 (Fed. Cir. 2014). This claim, similarly, appears directed to application of a mathematical model to data in a digital environment with no resulting physical embodiment.

Thus, all claims at issue are not patent-eligible.

IV. Conclusion

For the foregoing reasons, the Court GRANTS the defendant's motion for judgment on the pleadings, finding the asserted claims listed in the motion to be invalid. In light of the rulings herein, the plaintiff's request for leave to amend is denied as futile. *See Foman v. Davis*, 371 U.S. 178, 182 (1962).

This Order terminates Docket Number 59.

IT IS SO ORDERED.

/s/ Yvonne Gonzalez Rogers
United States District Court Judge

Dated: September 8, 2015

ORDER OF THE FEDERAL CIRCUIT DENYING PETITION FOR REHEARING (JANUARY 6, 2017)

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

BLUE SPIKE, LLC,

Plaintiff–Appellant,

v.

GOOGLE INC.,

Defendant–Appellee.

2016-1054

Appeal from the United States District Court for the Northern District of California in No. 4:14-cv-01650-YGR, Judge Yvonne Gonzalez Rogers.

Before: PROST, Chief Judge, NEWMAN, LOURIE, DYK, MOORE, O'MALLEY, REYNA, WALLACH, TARANTO, CHEN, HUGHES, and STOLL, Circuit Judges

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Appellant Blue Spike, LLC filed a combined petition for panel rehearing and rehearing en banc. A response to the petition was invited by the court and filed by the appellee. The petition for rehearing was referred to the panel that heard the appeal, and thereafter was referred to the circuit judges who are in regular active service.

Upon consideration thereof,

IT IS ORDERED THAT:

The petition for panel rehearing is denied.

The petition for rehearing en banc is denied.

The mandate of the court will issue on January 13, 2017.

For the Court

/s/ Peter R. Marksteiner
Clerk of Court

Date: January 6, 2017

AMENDED COMPLAINT FOR PATENT INFRINGEMENT (SEPTEMBER 15, 2014)

IN THE UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF CALIFORNIA OAKLAND DIVISION

BLUE SPIKE, LLC,

Plaintiff,

v.

GOOGLE INC.,

Defendant.

Case No. 14-1650

Jury Trial Demanded

Plaintiff Blue Spike, LLC files this Amended Complaint against Defendant Google Inc. and alleges infringement of U.S. Patent Nos. 7,346,472 (the ’472 Patent), 7,660,700 (the ’700 Patent), 7,949,494 (the ’494 Patent), 8,214,175 (the ’175 Patent), and 8,712,728 (the ’728 Patent, together with the ’472, ’700, ’494, and ’175 Patents, the Patents-in-Suit) as follows:

NATURE OF THE SUIT

1. This is a claim for patent infringement arising under the patent laws of the United States, Title 35 of the United States Code.

2. This lawsuit was originally filed in the Eastern District of Texas, Tyler Division (Civil Action No. 12-CV-499-MMS). On [Date], Defendant moved to transfer the case to this District, and on [Date] the Texas court granted the motion. [Elaborate?]

PARTIES

3. Plaintiff Blue Spike, LLC is a Texas limited liability company and has its headquarters and principal place of business at 1820 Shiloh Road, Suite 1201-C, Tyler, Texas 75703. Blue Spike, LLC is the assignee of the Patents-in-Suit from Blue Spike, Inc. (a Florida corporation), which was the assignee of the Patents-in-Suit from Scott Moskowitz and Michael Berry. Blue Spike, LLC and Blue Spike, Inc. are collectively referred to as “Blue Spike.” Blue Spike CEO Scott Moskowitz is an inventor of more than 66 U.S. Patents related to managing, monitoring, and monetizing digital content and informational assets. Blue Spike has practiced and has continued business plans to practice Moskowitz’s patented inventions. Many of Blue Spike’s patents are foundational to today’s robust markets for content, which grew into their present form only after using Blue Spike’s technology to catalogue, manage, monitor, and monetize that content.

4. On information and belief, Google Inc. (“Google” or “Defendant”) is a Delaware corporation

having its principal place of business at 600 Amphitheatre Parkway, Mountain View, California 94043. Defendant can be served with process through its registered agent, The Corporation Trust Company, located at 1209 Orange Street, Wilmington, Delaware 19801. Defendant does business in the State of Texas and in the Eastern District of Texas.

JURISDICTION AND VENUE

5. This lawsuit is a civil action for patent infringement arising under the patent laws of the United States, 35 U.S.C. § 101 *et seq*. The Court has subject-matter jurisdiction pursuant to 28 U.S.C. §§ 1331, 1332, 1338(a), and 1367.

6. The Court has personal jurisdiction over Defendant for at least five reasons: (1) Defendant has committed acts of patent infringement and contributed to and induced acts of patent infringement by others in this District and elsewhere in Texas; (2) Defendant regularly does business or solicits business in the District and in Texas; (3) Defendant engages in other persistent courses of conduct and derives substantial revenue from products and/or services provided to individuals in the District and in Texas; and (4) Defendant has purposefully established substantial, systematic, and continuous contacts with the District and should reasonably expect to be haled into court here. Thus, the Court's exercise of jurisdiction over Defendant will not offend traditional notions of fair play and substantial justice.

7. Venue is proper in this judicial district under 28 U.S.C. §§ 1391(b)–(c) and 1400(b) because Defendant does business in the State of Texas, Defendant has committed acts of infringement in Texas and in the

District, a substantial part of the events or omissions giving rise to Blue Spike's claims happened in the District, and Defendant is subject to personal jurisdiction in the District.

FACTUAL BACKGROUND

A. Moskowitz's History

8. The owners of art, music, films, and other creations who want to sell and license their work in digital form over the Internet need an efficient way to manage, monitor, and monetize it. Blue Spike founder Scott Moskowitz pioneered—and continues to invent—technology that makes such management possible, and which has parlayed with equal importance into other industries.

9. Moskowitz, who earned two degrees *cum laude* from the Wharton School of Finance and Commerce at the University of Pennsylvania, is an inventor of more than 87 U.S. Patents, including each of the Patents-in-Suit.

10. In 1992, Moskowitz entered the entertainment industry by doing agency work in Japan for a large U.S. wholesaler of music-related products.

11. In 1993, Moskowitz filed his first U.S. digital-content-management patent application. That year, he also founded the software start-up The Dice Company, which would become widely recognized as a leader in digital watermarking. Since that first patent, Moskowitz has continued to create patented inventions in the field of information management and security at a prodigious pace. His goal from the outset has been to commercialize his patented inventions.

12. Moskowitz founded Blue Spike, Inc. in November 1997. Just over two years later, he filed his first patent application related to signal recognition technology, which issued as the '472 Patent. In describing this pioneering technology, Moskowitz coined the term "signal abstracting," which enhanced the ability to catalogue, archive, identify, authorize, transact, and monitor the use and/or application of signals, such as images (for example, photographs, paintings, and scanned fingerprints), audio (for example, songs, jingles, commercials, movies soundtracks, and their versions), video (for example, videos, television shows, commercials, and movies), and multimedia works. This revolutionary technology greatly improves the efficiency and speed of monitoring, analyzing, and identifying signals as perceived, as well as enabling the optimal compression of the signals and their associated signal abstracts for memory accommodation.

13. Moskowitz's status as a pioneer in this new field between cryptography and signal analysis is evident from the United States Patent and Trademark Office's categorization of his patent applications. The USPTO was initially puzzled about how to classify his early inventions, as the then-existing patent categories in cryptography and signal analysis were, by themselves, inadequate. The USPTO therefore created a new classification for his groundbreaking inventions: classification 713, subclass 176, called "Authentication by digital signature representation or digital watermark."

14. The National Security Agency (NSA) even took interest in his work after he filed one of his early patent applications. The NSA made the

application classified under a "secrecy order" while it investigated his pioneering innovations and their impact on national security.

15. As an industry trailblazer, Moskowitz has been an active author and public figure on digital-watermarking and signal-recognition technologies since their emergence. A 1995 New York Times article—entitled "TECHNOLOGY: DIGITAL COMMERCE; 2 plans for watermarks, which can bind proof of authorship to electronic works"— recognized Moskowitz's The Dice Company as one of two leading software start-ups in this newly created field. Forbes also interviewed Moskowitz as an expert for "Cops Versus Robbers in Cyberspace," a September 9, 1996 article about the emergence of digital watermarking and rights-management technology. He has also testified before the Library of Congress regarding the Digital Millennium Copyright Act.

16. He has spoken to the RSA Data Security Conference, the International Financial Cryptography Association, Digital Distribution of the Music Industry, and many other organizations about the business opportunities that digital watermarking creates. Moskowitz also authored *So This Is Convergence?*, the first book of its kind about secure digital-content management. This book has been downloaded over a million times online and has sold thousands of copies in Japan, where Shogakukan published it under the name *Denshi Skashi*, literally "electronic watermark." Moskowitz was asked to author the introduction to *Multimedia Security Technologies for Digital Rights Management*, a 2006 book explaining digital-rights management. Moskowitz authored a paper for the 2002 International Symposium on Information Technology,

titled “What is Acceptable Quality in the Application of Digital Watermarking: Trade-offs of Security, Robustness and Quality.” He also wrote an invited 2003 article titled “Bandwidth as Currency” for the IEEE Journal, among other publications.

17. Moskowitz is a senior member of the Institute of Electrical and Electronics Engineers (IEEE), a member of the Association for Computing Machinery, and the International Society for Optics and Photonics (SPIE). As a senior member of the IEEE, Moskowitz has peer-reviewed numerous conference papers and has submitted his own publications.

18. Moskowitz has been at the forefront of industry-based tests—such as the MUSE Embedded Signaling Tests, Secure Digital Music Initiative (“SDMI”), and various tests by performance-rights organizations including ASCAP and BMI, as well as Japan’s Nomura Research Institute.

19. Moskowitz has negotiated projects to incorporate his technologies with leaders in a gamut of industries. For example, Moskowitz worked with EMI, Warner Brothers, and Universal Music Group on music-release tracking systems; with AIG on insurance and financial services; with IBM on watermarking its software and managing movie scripts; and with Juniper Networks on measuring and provisioning the bandwidth used on its routers. Blue Spike is also registered with the Federal Government’s Central Contractor Registry (managed under the System for Award Management, “SAM”) and participated in the Department of Defense Small Business Innovative Research (SBIR) program.

20. Moskowitz and his companies have always practiced or had business plans to practice his patented inventions. He has worked extensively to ensure that his technology's powerful and patented Giovanni® suite of media security technologies can be licensed to all. Before the industry understood where digital management of content was heading, Moskowitz believed that copyright management was an invaluable element for dramatically expanding the business of music, emphasizing that security must not be shrouded in secrecy and that his patented techniques were the strongest to do so.

21. Moskowitz and Blue Spike continued to produce new versions of its popular digital-watermarking tools. Under Moskowitz's control, Blue Spike also developed its unique Scrambling technologies, which continue to gain currency. Moskowitz and Blue Spike rolled out its "end-to-end" solution for music security. Music encoded with Blue Spike's watermark had both security and CD-quality sound, even when integrated with text, image, and video content. To this day, Moskowitz and Blue Spike are working with artists to help them manage and secure their valuable artistic contributions from its office in Tyler, Texas.

B. Patents-in-Suit

22. As content becomes increasingly profitable and prevalent in the U.S. and around the globe, pirates will continue to proliferate and use increasingly sophisticated technologies to steal and illegally copy others' work, especially those works that are digitally formatted or stored. The Patents-in-Suit comprise, in part, what Moskowitz has coined "signal

abstracting," which encompasses techniques, among others, also known as "signal fingerprinting," "acoustic fingerprinting," or "robust hash functions." These are among the most effective techniques available for combating piracy, which are completely undetectable to the thief, yet still enable content owners to easily search through large amounts of data to identify unauthorized copies of their works.

23. Broadly speaking, "signal abstracting" identifies digital information and material—including video, audio, graphics, multimedia, and text—based solely on the perceptual characteristics of the material itself. If desired, however, the abstract need not be static, and other information or heuristics can be used to augment the perceptual characteristics, resulting in a more robust abstract. In contrast, other technologies (such as digital watermarking) embed additional information or messages into the original source material to enable traceability of the subsequently watermarked content, much like an audit trail or the serial number on a dollar bill. When a pirate attempts to remove embedded information or messages, ideally the quality of the content may be degraded, making the tampered copies unusable or of such poor quality that they have little commercial value. Signal abstracting avoids watermarking's vulnerabilities by leaving the source signal unchanged and catalogues the signal's identifying features or perceptual characteristics in a database.

24. Content owners can also then monitor and analyze distribution channels, such as the Internet, radio broadcasts, television broadcasts, and other media sources, to determine whether any content from those sources has the same abstract as their catalogued

works. Unauthorized versions of copies of content may then be successfully identified. With the unauthorized copies identified, the content owner can then restrict access, compel payment for authorized use, and develop better intelligence about content markets and those consumers with a willingness to pay. In some cases, new versions of the content can be observed and analyzed, creating more robust abstracts or new abstracts entirely, informing owners and content aggregators about new channels or new opportunities for consumption of their content.

25. Similarly, content recognition applications running on mobile devices, smartphones, and tablets can use abstracts to identify content for users who would like to know what it is they are listening to (such as applications that just identify content) or would like to know more about that content (such as applications that are now popularly known as "second screen applications," which allow a television audience to identify and interact with the content they are consuming, whether it be, for example, TV shows, movies, music, or video games). Once identified by an abstract, songwriters, for example, can be given lyrics, or budding video producers can be provided related versions or background on a video identified. Thus, value add in markets can be adjusted to meet the specific needs and consumption patterns of users.

26. This idea of "signal abstracting" applies equally to biometric identification and today's security systems, such as fingerprint, facial, and optic systems that analyze, catalogue, monitor, and identify a person's biometric features. Once an image is created from the features of these biometric identifiers, signal abstracting can be used to optimally compress

the signal and its associated abstract, resulting in less memory usage and increased accuracy and speed of signal analysis and identification. Further, signal abstracts of the biometric information can be secured independently; this means that authentication and verification of the identifying abstract do not compromise the original information. This separation of the abstracts from the original source material enables more secure environments, such as those dealing with the security of a person's biometrics. Thus, fingerprint scanners are made more secure, as are systems requiring physical scans of a person's body. The recent evolution to smaller and cheaper processsors and memory storage has led to the proliferation of these biometric-identification systems, which rely on the inventions of the Patents-in-Suit to be implemented.

27. The four Patents-in-Suit are prime examples of Moskowitz's pioneering contributions to signal recognition technology.

C. The Accused Products and Services

28. Defendant designs and develops software, applications, websites, systems, and technology so users can find, store, share, manage, and monetize videos, images, music and other digital content. Defendant makes, uses, offers for sale and/or imports into the U.S. products, systems and/or services including, but not limited to, its ContentID and YouTube, applications, websites, systems, and technology ("Accused Products"), which infringe one or more claims of the Patents-in-Suit. The Accused Products have millions of users and Defendant generates millions of dollars in revenue from them.

29. Defendant has not sought or obtained a license for any of Blue Spike's patented technologies.

30. Yet Defendant is using methods, devices, and systems taught by Blue Spike's Patents-in-Suit.

31. Ironically, although Defendant does not have permission to use Blue Spike's Patents-in-Suit, it is using those very same technologies to prevent and track piracy committed by others. Furthermore, without the use of Blue Spike's patented technology, Defendant faces lawsuits seeking billions of dollars from content owners claiming copyright infringement alleging that Defendant has done too little to prevent the uploading of copyrighted content.

COUNT 1:
Infringement of U.S. Patent No. 8,214,175

32. Blue Spike incorporates by reference the allegations in paragraphs 1 through 30 of this complaint.

33. Blue Spike, LLC is assignee of the '175 Patent, titled "Method and Device for Monitoring and Analyzing Signals," and has ownership of all substantial rights in the '175 Patent, including the rights to grant sublicenses, to exclude others from using it, and to sue and obtain damages and other relief for past and future acts of patent infringement.

34. The '175 Patent is valid, is enforceable, and was duly and legally issued on July 3, 2012. A true and correct copy of the '175 Patent is attached as Exhibit A.

35. Without a license or permission from Blue Spike, Defendant has infringed and continues to

infringe on one or more claims of the '175 Patent—directly, contributorily, or by inducement—by importing, making, using, offering for sale, or selling products and devices that embody the patented invention, including, without limitation, one or more of the Accused Products, in violation of 35 U.S.C. § 271.

36. Defendant has been and now is indirectly infringing by way of inducing infringement by others and/or contributing to the infringement by others of the '175 Patent in the State of Texas, in this judicial district, and elsewhere in the United States, by, among other things, making, using, importing, offering for sale, and/or selling, without license or authority, products for use in systems that fall within the scope of one or more claims of the '175 Patent. Such products include, without limitation, one or more of the Accused Products. Such products have no substantial non-infringing uses and are for use in systems that infringe the '175 Patent. By making, using, importing offering for sale, and/or selling such products, Defendant injured Blue Spike and is thus liable to Blue Spike for infringement of the '175 Patent under 35 U.S.C. § 271. Those whom Defendant induces to infringe and/or to whose infringement Defendant contributes are the end users of the Accused Products. Defendant had knowledge of the '175 Patent at least as early as the service of this complaint and is thus liable for infringement of one or more claims of the '175 Patent by actively inducing infringement and/or is liable as contributory infringer of one or more claims of the '175 Patent under 35 U.S.C. § 271.

37. Defendant's acts of infringement of the '175 Patent have caused damage to Blue Spike, and Blue Spike is entitled to recover from Defendant the

damages sustained as a result of Defendant's wrongful acts in an amount subject to proof at trial pursuant to 35 U.S.C. § 271. Defendant's infringement of Blue Spike's exclusive rights under the '175 Patent will continue to damage Blue Spike, causing it irreparable harm, for which there is no adequate remedy at law, warranting an injunction from the Court.

38. On information and belief, Defendant has continued to infringe the '175 Patent since receiving notice of their infringement, at least by way of their receiving notice of this lawsuit. On information and belief, such continued infringement has been objectively reckless including because Defendant has (1) acted despite an objectively high likelihood that its actions constituted infringement of a valid patent and (2) knew or should have known of that objectively high risk. Accordingly, Blue Spike seeks a willfulness finding against Defendant relative to its infringement of the '175 Patent entitling Blue Spike to increased damages under 35 U.S.C. § 284 as well as attorneys' fees and costs under 35 U.S.C. § 285.

39. On information and belief, Defendant has at least had constructive notice of the '175 Patent by operation of law.

COUNT 2:
Infringement of U.S. Patent No. 7,949,494

40. Blue Spike incorporates by reference the allegations in paragraphs 1 through 38 of this complaint.

41. Blue Spike, LLC is assignee of the '494 Patent, titled "Method and Device for Monitoring and

Analyzing Signals," and has ownership of all substantial rights in the '494 Patent, including the rights to grant sublicenses, to exclude others from using it, and to sue and obtain damages and other relief for past and future acts of patent infringement.

42. The '494 Patent is valid, is enforceable, and was duly and legally issued on May 24, 2011. A true and correct copy of the '494 Patent is attached as Exhibit B.

43. Without a license or permission from Blue Spike, Defendant has infringed and continues to infringe on one or more claims of the '494 Patent—directly, contributorily, or by inducement—by importing, making, using, offering for sale, or selling products and devices that embody the patented invention, including, without limitation, one or more of the Accused Products, in violation of 35 U.S.C. § 271.

44. Defendant has been and now is indirectly infringing by way of inducing infringement by others and/or contributing to the infringement by others of the '494 Patent in the State of Texas, in this judicial district, and elsewhere in the United States, by, among other things, making, using, importing, offering for sale, and/or selling, without license or authority, products for use in systems that fall within the scope of one or more claims of the '494 Patent. Such products include, without limitation, one or more of the Accused Products. Such products have no substantial non-infringing uses and are for use in systems that infringe the '494 Patent. By making, using, importing offering for sale, and/or selling such products, Defendant injured Blue Spike and is thus liable to Blue Spike for infringement of the '494

Patent under 35 U.S.C. § 271. Those whom Defendant induces to infringe and/or to whose infringement Defendant contributes are the end users of the Accused Products. Defendant had knowledge of the '494 Patent at least as early as the service of this complaint and is thus liable for infringement of one or more claims of the '494 Patent by actively inducing infringement and/or is liable as contributory infringer of one or more claims of the '494 Patent under 35 U.S.C. § 271.

45. Defendant's acts of infringement of the '494 Patent have caused damage to Blue Spike, and Blue Spike is entitled to recover from Defendant the damages sustained as a result of Defendant's wrongful acts in an amount subject to proof at trial pursuant to 35 U.S.C. § 271. Defendant's infringement of Blue Spike's exclusive rights under the '494 Patent will continue to damage Blue Spike, causing it irreparable harm, for which there is no adequate remedy at law, warranting an injunction from the Court.

46. On information and belief, Defendant has continued to infringe the '494 Patent since receiving notice of their infringement, at least by way of their receiving notice of this lawsuit. On information and belief, such continued infringement has been objectively reckless including because Defendant has (1) acted despite an objectively high likelihood that its actions constituted infringement of a valid patent and (2) knew or should have known of that objectively high risk. Accordingly, Blue Spike seeks a willfulness finding against Defendant relative to its infringement of the '494 Patent entitling Blue Spike to increased damages under 35 U.S.C. § 284 as well as attorneys' fees and costs under 35 U.S.C. § 285.

47. On information and belief, Defendant has at least had constructive notice of the ’494 Patent by operation of law.

COUNT 3:
Infringement of U.S. Patent No. 7,660,700

48. Blue Spike incorporates by reference the allegations in paragraphs 1 through 46 of this complaint.

49. Blue Spike, LLC is assignee of the ’700 Patent, titled “Method and Device for Monitoring and Analyzing Signals,” and has ownership of all substantial rights in the ’700 Patent, including the rights to grant sublicenses, to exclude others from using it, and to sue and obtain damages and other relief for past and future acts of patent infringement.

50. The ’700 Patent is valid, is enforceable, and was duly and legally issued on February 9, 2010. A true and correct copy of the ’700 Patent is attached as Exhibit C.

51. Without a license or permission from Blue Spike, Defendant has infringed and continues to infringe on one or more claims of the ’700 Patent—directly, contributorily, or by inducement—by importing, making, using, offering for sale, or selling products and devices that embody the patented invention, including, without limitation, one or more of the Accused Products, in violation of 35 U.S.C. § 271.

52. Defendant has been and now is indirectly infringing by way of inducing infringement by others and/or contributing to the infringement by others of the ’700 Patent in the State of Texas, in this judicial

district, and elsewhere in the United States, by, among other things, making, using, importing, offering for sale, and/or selling, without license or authority, products for use in systems that fall within the scope of one or more claims of the ’700 Patent. Such products include, without limitation, one or more of the Accused Products. Such products have no substantial non-infringing uses and are for use in systems that infringe the ’700 Patent. By making, using, importing offering for sale, and/or selling such products, Defendant injured Blue Spike and is thus liable to Blue Spike for infringement of the ’700 Patent under 35 U.S.C. § 271. Those whom Defendant induces to infringe and/or to whose infringement Defendant contributes are the end users of the Accused Products. Defendant had knowledge of the ’700 Patent at least as early as the service of this complaint and is thus liable for infringement of one or more claims of the ’700 Patent by actively inducing infringement and/or is liable as contributory infringer of one or more claims of the ’700 Patent under 35 U.S.C. § 271.

53. Defendant’s acts of infringement of the ’700 Patent have caused damage to Blue Spike, and Blue Spike is entitled to recover from Defendant the damages sustained as a result of Defendant’s wrongful acts in an amount subject to proof at trial pursuant to 35 U.S.C. § 271. Defendant’s infringement of Blue Spike’s exclusive rights under the ’700 Patent will continue to damage Blue Spike, causing it irreparable harm, for which there is no adequate remedy at law, warranting an injunction from the Court.

54. On information and belief, Defendant has continued to infringe the ’700 Patent since receiving notice of their infringement, at least by way of their receiving notice of this lawsuit. On information and belief, such continued infringement has been objectively reckless including because Defendant has (1) acted despite an objectively high likelihood that its actions constituted infringement of a valid patent and (2) knew or should have known of that objectively high risk. Accordingly, Blue Spike seeks a willfulness finding against Defendant relative to its infringement of the ’700 Patent entitling Blue Spike to increased damages under 35 U.S.C. § 284 as well as attorneys’ fees and costs under 35 U.S.C. § 285.

55. On information and belief, Defendant has at least had constructive notice of the ’700 Patent by operation of law.

COUNT 4:
Infringement of U.S. Patent No. 7,346,472

56. Blue Spike incorporates by reference the allegations in paragraphs 1 through 54 of this complaint.

57. Blue Spike, LLC is assignee of the ’472 Patent, titled “Method and Device for Monitoring and Analyzing Signals,” and has ownership of all substantial rights in the ’472 Patent, including the rights to grant sublicenses, to exclude others from using it, and to sue and obtain damages and other relief for past and future acts of patent infringement.

58. The ’472 Patent is valid, is enforceable, and was duly and legally issued on March 18, 2008. A

true and correct copy of the ’472 Patent is attached as Exhibit D.

59. Without a license or permission from Blue Spike, Defendant has infringed and continues to infringe on one or more claims of the ’472 Patent—directly, contributorily, or by inducement—by importing, making, using, offering for sale, or selling products and devices that embody the patented invention, including, without limitation, one or more of the Accused Products, in violation of 35 U.S.C. § 271.

60. Defendant has been and now is indirectly infringing by way of inducing infringement by others and/or contributing to the infringement by others of the ’472 Patent in the State of Texas, in this judicial district, and elsewhere in the United States, by, among other things, making, using, importing, offering for sale, and/or selling, without license or authority, products for use in systems that fall within the scope of one or more claims of the ’472 Patent. Such products include, without limitation, one or more of the Accused Products. Such products have no substantial non-infringing uses and are for use in systems that infringe the ’472 Patent. By making, using, importing offering for sale, and/or selling such products, Defendant injured Blue Spike and is thus liable to Blue Spike for infringement of the ’472 Patent under 35 U.S.C. § 271. Those whom Defendant induces to infringe and/or whose infringement to which Defendant contributes are the end users of the Accused Products. Defendant had knowledge of the ’472 Patent at least as early as the service of this complaint and is thus liable for infringement of one or more claims of the ’472 Patent

by actively inducing infringement and/or is liable as contributory infringer of one or more claims of the ’472 Patent under 35 U.S.C. § 271.

61. Defendant’s acts of infringement of the ’472 Patent have caused damage to Blue Spike, and Blue Spike is entitled to recover from Defendant the damages sustained as a result of Defendant’s wrongful acts in an amount subject to proof at trial pursuant to 35 U.S.C. § 271. Defendant’s infringement of Blue Spike’s exclusive rights under the ’472 Patent will continue to damage Blue Spike, causing it irreparable harm, for which there is no adequate remedy at law, warranting an injunction from the Court.

62. On information and belief, Defendant has continued to infringe the ’472 Patent since receiving notice of their infringement, at least by way of their receiving notice of this lawsuit. On information and belief, such continued infringement has been objectively reckless including because Defendant has (1) acted despite an objectively high likelihood that its actions constituted infringement of a valid patent and (2) knew or should have known of that objectively high risk. Accordingly, Blue Spike seeks a willfulness finding against Defendant relative to its infringement of the ’472 Patent entitling Blue Spike to increased damages under 35 U.S.C. § 284 as well as attorneys’ fees and costs under 35 U.S.C. § 285.

63. On information and belief, Defendant has at least had constructive notice of the ’472 Patent by operation of law.

COUNT 5:
Infringement of U.S. Patent No. 8,712,728

64. Blue Spike incorporates by reference the allegations in paragraphs 1 through 63 of this complaint.

65. Blue Spike, LLC is assignee of the '728 Patent, titled "Method and Device for Monitoring and Analyzing Signals," and has ownership of all substantial rights in the '728 Patent, including the rights to grant sublicenses, to exclude others from using it, and to sue and obtain damages and other relief for past and future acts of patent infringement.

66. The '728 Patent is valid, is enforceable, and was duly and legally issued on April 29, 2014. A true and correct copy of the '728 Patent is attached as Exhibit E.

67. Without a license or permission from Blue Spike, Defendant has infringed and continues to infringe on one or more claims of the '728 Patent—directly, contributorily, or by inducement—by importing, making, using, offering for sale, or selling products and devices that embody the patented invention, including, without limitation, one or more of the Accused Products, in violation of 35 U.S.C. § 271.

68. Defendant has been and now is indirectly infringing by way of inducing infringement by others and/or contributing to the infringement by others of the '728 Patent in the State of Texas, in this judicial district, and elsewhere in the United States, by, among other things, making, using, importing, offering for sale, and/or selling, without license or authority, products for use in systems that fall

within the scope of one or more claims of the ’728 Patent. Such products include, without limitation, one or more of the Accused Products. Such products have no substantial non-infringing uses and are for use in systems that infringe the ’728 Patent. By making, using, importing offering for sale, and/or selling such products, Defendant injured Blue Spike and is thus liable to Blue Spike for infringement of the ’728 Patent under 35 U.S.C. § 271. Those whom Defendant induces to infringe and/or whose infringement to which Defendant contributes are the end users of the Accused Products. Defendant had knowledge of the ’728 Patent at least as early as the service of this complaint and is thus liable for infringement of one or more claims of the ’728 Patent by actively inducing infringement and/or is liable as contributory infringer of one or more claims of the ’728 Patent under 35 U.S.C. § 271.

69. Defendant’s acts of infringement of the ’728 Patent have caused damage to Blue Spike, and Blue Spike is entitled to recover from Defendant the damages sustained as a result of Defendant’s wrongful acts in an amount subject to proof at trial pursuant to 35 U.S.C. § 271. Defendant’s infringement of Blue Spike’s exclusive rights under the ’728 Patent will continue to damage Blue Spike, causing it irreparable harm, for which there is no adequate remedy at law, warranting an injunction from the Court.

70. On information and belief, Defendant has continued to infringe the ’728 Patent since receiving notice of their infringement, at least by way of their receiving notice of this lawsuit. On information and belief, such continued infringement has been object-

ively reckless including because Defendant has (1) acted despite an objectively high likelihood that its actions constituted infringement of a valid patent and (2) knew or should have known of that objectively high risk. Accordingly, Blue Spike seeks a willfulness finding against Defendant relative to its infringement of the '728 Patent entitling Blue Spike to increased damages under 35 U.S.C. § 284 as well as attorneys' fees and costs under 35 U.S.C. § 285.

71. On information and belief, Defendant has at least had constructive notice of the '728 Patent by operation of law.

REQUEST FOR RELIEF

Blue Spike incorporates each of the allegations in paragraphs 1 through 62 above and respectfully asks the Court to:

(a) enter a judgment that Defendant has directly infringed, contributorily infringed, and/or induced infringement of one or more claims of each of the Patents-in-Suit;

(b) enter a judgment awarding Blue Spike all damages adequate to compensate it for Defendant's infringement of, direct or contributory, or inducement to infringe, the Patents-in-Suit, including all pre-judgment and post-judgment interest at the maximum rate permitted by law;

(c) enter a judgment awarding treble damages pursuant to 35 U.S.C. § 284 for Defendant's willful infringement of one or more of the Patents-in-Suit;

(d) issue a preliminary injunction and thereafter a permanent injunction enjoining and restraining Defendant, its directors, officers, agents, servants, employees, and those acting in privity or in concert with them, and their subsidiaries, divisions, successors, and assigns, from further acts of infringement, contributory infringement, or inducement of infringement of the Patents-in-Suit;

(e) enter a judgment requiring Defendant to pay the costs of this action, including all disbursements, and attorneys' fees as provided by 35 U.S.C. § 285, together with prejudgment interest; and

(f) award Blue Spike all other relief that the Court may deem just and proper.

DEMAND FOR JURY TRIAL

Blue Spike demands a jury trial on all issues that may be determined by a jury.

Respectfully submitted,

/s/ Randall T. Garteiser
California Bar No. 231821
rgarteiser@ghiplaw.com

Christopher A. Honea
California Bar No. 232473
chonea@ghiplaw.com

Peter S. Brasher
California Bar No. 283992
pbrasher@ghiplaw.com

Ian Ramage
California Bar No. 224881
iramage@ghiplaw.com

Kirk J. Anderson
California Bar No. 289043
kanderson@ghiplaw.com

GARTEISER HONEA, P.C.
44 North San Pedro Rd
San Rafael, California 94903
Telephone: (415) 785-3762
Facsimile: (415) 785-3805

Counsel for Blue Spike LLC

REPORTER'S TRANSCRIPT OF PROCEEDINGS ON MOTION TO DISMISS (JUNE 30, 2015)

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA

BLUE SPIKE, LLC,

Plaintiff,

v.

GOOGLE INC.,

Defendant.

No. C 14- 01650-YGR

Before: The Hon. Yvonne Gonzalez ROGERS, Judge

[June 30, 2015 Transcript, p.2]

THE CLERK: Calling Civil Action 14-1650, Blue Spike Versus Google.

Counsel, please come forward and state your appearances.

MR. GARTEISER: Good morning, Your Honor. Randall Garteiser for plaintiff Blue Spike. With me today is Helen Dutton and Molly Jones.

Which is Ms. Dutton?

MS. DUTTON: (Indicating.)

THE COURT: Okay.

(off-the-record discussion.)

MR. BERTA: Your Honor, Mike Berta and—from Arnold and Porter on behalf of Google. with me is Nicholas Lee. And with us Are Molly—

THE COURT: I can't hear you when you turn—

MR. BERTA: Sorry. I'm sorry.

Molly Peck and Tremaine Kirkman from Google.

THE COURT: Okay.

MR. BERTA: Thank you.

THE COURT: All right. Welcome, everyone.

I have a number of questions, but I'll let you get started. It's your motion.

MR. BERTA: Thank you.

THE COURT: Who's arguing on the plaintiff's side?

MR. GARTEISER: Your Honor, Helen Dutton will be arguing for plaintiff.

THE COURT: Okay.

(Pause in the proceedings.)

THE COURT: You may proceed.

MR. BERTA: Thank you, Your Honor. I appreciate it.

We put together some materials that are essentially what we were talking about in the brief. And I don't want to repeat what we argued in the papers, but I do want to go through some of the things that we have talked about here in light of the opposition just to the extent the court has questions about particular issues that we could potentially cover through here.

As an initial matter, ten—sorry. I apologize.

(Off-the-record discussion.)

(Demonstrative published.)

MR. BERTA: The question of whether claims of a patent are valid or invalid under question 101 is a straightforward test, straightforward at least in what you're supposed to do under the test if not always what the exact parameters are on the outside of the test.

THE COURT: Well, I don't think that that's a controversial proposition. Is it Ms. Hutton (phonetic)?

MS. DUTTON: Your Honor, we don't contest—

THE COURT: Can you use the mic or come up forward.

MS. DUTTON: Thank you, Your Honor.

We don't contest the two steps. That's pretty well established. We would say that there's been a lot of complexity introduced by the landscape of the law and how that's applied.

THE COURT: Okay. so let's move through the—

MR. BERTA: Okay.

THE COURT: We—there's no—I don't know what she means by that, but go ahead.

MR. BERTA: So the way the test is laid out, the first question is to identify what the idea of the patent claims are. And then after that, determine whether that is or is not an abstract idea. I think with respect to that question as to what that step of that test is, there probably is no dispute.

Where I think there have been issues is what plaintiff contends should be relevant for the question of what the idea of the patent is. And so I do want to go through those issues.

So as courts have explained—and, obviously, some of these are sister courts and not binding on this court, but there's been a lot of courts that have spoken on the issue of what it means to identify the idea of the patent as a—as an idea for purposes of determining whether or not it's abstract.

one of those that's fairly interesting—is it goes through a long discussion this interest—this issue is the—the *Enfish* case in the Central District of California. And one—

(off-the-record discussion.)

MR. BERTA: One of the things that that case says is that you just have to look at what it is the claim is trying to accomplish. And so the issue of what is the idea and then the question of whether it's abstract is a question that's answered by looking at the claims in light of the specification for their essential purpose.

Now, what plaintiffs have done sometimes in some of the arguments that they've made is they say you need to look at step one in light of the prior art—

THE COURT: Plaintiffs—the plaintiff here? or plaintiffs generically?

MR. BERTA: Both. But the plaintiff—so this argument has been made before and rejected before.

So for example, the idea that looking at the prior art is a relevant question with respect to what the idea of the patent claims is and whether it is abstract has been argued before, is being argued here, has been rejected by other courts who look to *Mayo* who says that you need to look at the idea of the patent as what it is—

THE COURT: Again, I think that's a pretty basic proposition.

Is there authority to the contrary specifically? If so, what are the cases?

MS. DUTTON: Your Honor, we would not submit that—Blue Spike does not submit that there is any authority to the contrary. The issue that we would—we'd like to address further is the lens through which one characterizes the—the overall patent and whether one divorces one of the context in terms of technological environment in which its set forth or does one take it to the extreme and—and simply say this is—in this case, as Google has done in its opening brief, is they're simply comparing.

THE COURT: Well, clearly, the court needs to look at the claims asserted in the patent. The notion that the fact of prior—that the fact a prior art exists somehow impacts that analysis I find hard to fathom, which is why I asked if there was any authority for that proposition.

All right. You can be seated, and—and no worries, Ms. Hutton (sic), you will be given an opportunity not just to rebut as we go along but if this case proceeds beyond this stage, just know this is how I do claim construction. I like to take it issue by issue and hear from both of you pretty much at the same time, so that—and I've got your name wrong. Dutton.

MS. DUTTON: No problem, Your Honor.

THE COURT: So I—I don't wait until the end to get responses.

MS. DUTTON: Thank you.

THE COURT: All right.

MR. BERTA: With that in mind, then, when you look at—and I want to address, I think, what is the dispute here.

We have talked about an exemplary claim which is claim one of the '472 patent and just walked through it, both in the briefing and here and—

THE COURT: Let me—I'm going to interrupt you at this point.

MR. BERTA: Yes.

THE COURT: First of all, what is the burden of proof? That is, is it clear and convincing evidence?

Is there—is there a standard?

MR. BERTA: It's—it is a—it is a question of law, not a question of fact. And it is a question of law whether or not it is patentable subject matter. I do not—

THE COURT: So is it—

MR. BERTA:—Aware of the specific holding as to the burden of proof, but it is I believe—

THE COURT: So there are no—this isn't a question—a mixed question of law and fact.

MR. BERTA: Correct.

THE COURT: Under your view, there are no facts to be resolved.

MR. BERTA: Correct.

THE COURT: In terms of the representative claims, is there—is it, in fact, representative? Ms. Dutton?

MS. DUTTON: No, Your Honor, it is not. In particular, we identify specific limitations throughout the remaining claims under prong two of *Alice* that identify differences with respect to claim one of the '472.

THE COURT: All right. So I'm going to have you proceed, Ms. Berta—Mr. Berta, but that issue has to be resolved.

MR. BERTA: Yes.

THE COURT: Because the question is whether in part, Google's motion rises and falls with—with or without any ability to identify this as a representative claim.

MR. BERTA: And—and I agree with you, Your Honor. and what we have done in the papers and what we are prepared to do here is go through—and this was addressed in the federal circuit decision of—sorry. I apologize, Your Honor.

—The *Content Extraction* decision that the issue is to the extent that they raise particular limitations with respect to particular claims, you can go through those limitations on those claims and then you asked the question, does this add something patentable to the abstract idea.

And so when you go through the limitations that they've identified on the claims that they have identified and if the court were to determine that the things that they are adding are no more than conventional activities that are recognized as prior art, then they are not sufficient limitations on the abstract idea to convert it into a patentable invention, and that's because—and this is explained in many cases—that that—

And one those that's somewhat interesting is the *Cogent* decision out of this district that you can just have hundreds of claims, each with a different limitation that is otherwise what some people do and by that draftsman art, still take up an entire field of the use of the abstract idea.

So whatever the additional limitations are have to be something more than—in and of themselves more than what's in the prior art. Otherwise, you're just slicing off pieces of the abstract idea in particular fields for particular claims.

So we will go through the particular limitations that they've identified and show that they concede in the specification that these are just things that otherwise people do.

THE COURT: All right. Proceed.

MR. BERTA: Okay. So with respect to what the idea is, we have said, in essence, you—going through the claim of the exemplary claim language that what the claim calls for is just using a part of a—we'll say signal to compare with it other signals and that the rule is here the part of the signal has to be something that's based on human perception.

And I don't think that there is a true dispute that this is a abstract idea claim by claim, for example—sorry. I don't know—how do you go back?

(off-the-record discussion.)

MR. LEE: Right click "Previous."

MR. BERTA: I actually can't see that far.

Okay. if I sneak over to your side just for a sec. Sorry.

So when you go through exemplary claim, the issue is—

THE COURT: That can be pushed up. That is—

THE CLERK: There you go. You don't have to lean.

THE COURT: The mic—the neck—

MR. BERTA: Thank you.

THE COURT:—Is movable.

MR. BERTA: Thank you.

When you go through this claim for whatever claims that we agree that it's exemplary of, setting aside the individual limitations that they identify, all it says is you receive a signal, and then it has this discussion of what the abstract is. You create this abstract, and it expressly says that the abstract has to be based on perceptual qualities.

After that, there's nothing more to the claim besides storing the abstract, creating another abstract, and comparing the abstracts.

And there's no computer—specific computer implementations that are required to do this. They just say things like a processor, things like a reference database. So taking this claim as an example, it is all about the idea of creating something from a signal that's smaller than the signal using human perceptual qualities.

Now, there is a argument that was made in the brief that you would have to take into account claim construction generally and especially claim construction in Texas.

But that—whether we agree with that or not doesn't really matter because the claim construction to which they point is the claim construction of the term "abstract." And they say you've got to look at the term "abstract" for the idea of this patent in light of what the claim construction said about it.

But when you go to what the Texas Claim Construction is, it says essentially the exact same thing that we're saying, the specific language of the—

(Pause in the proceedings.)

MR. BERTA:—Construction is "a data reduced representation of a signal that retains a perceptual relationship with the signal." And goes on to say "differentiates one from another."

But the court in Texas construed "perceptual quality" as a quality perceived by a person. And the court in Texas construed "data reduced"—not "data reduced" exactly, but it construed the term by agreement "reduced in size" to be its plain-and-ordinary meaning.

So when you put those constructions into "abstract," it's a smaller representation of a signal that depends on human perceptibility. And so that is the idea here under the construction for which they are—on which they are relying.

And so then the question becomes is that abstract.

THE COURT: Okay. So just to be clear, then, is google conceding that that's the construction? To the extent—and I haven't completed the analysis. So to the extent I found that I might need to construe a term, are you conceding that's what it should be for purposes of this motion?

MR. BERTA: Not to be difficult, but what I believe our argument truly is is that even if you took their argument about this claim construction was true, it doesn't change the analysis.

THE COURT: If I need to construe a term—'cause one of the things we'll talk about in case you don't get here is whether this is appropriate for judgment on the pleadings or whether I have to convert it to a motion for summary judgment.

So I need to know whether or not for purposes of this motion, you would agree that the court could use a construction that is proffered by the plaintiffs, namely the one out of Texas.

MR. BERTA: Yes, we agree.

THE COURT: All right. Keep going.

MR. BERTA: So I do want to briefly cover this issue of 112 'cause this is why i'm—not being cautious but want to be careful. We did talk about 112 in our papers, and we said, well, you—112 is a mixed question of law and fact, and this is pleadings, and you can't determine 112 on the pleadings—

THE COURT: Before you go there—

MR. BERTA: Yeah.

THE COURT:—I want to go back.

Is there a difference and are you claiming there's a difference between the concept in the patent that is being proffered between matching and comparison?

Is that a distinction with a difference?

MR. BERTA: No, Your Honor. There is no distinction in that. It is—the—the issue of what the abstract idea is the—the idea of the patents that we contend to be abstract is that you are creating something from a signal using a smaller piece of signal that relies on what humans can otherwise perceive.

To whatever purpose. Because there are different purposes enumerated in there. Sometimes it's to compare. Sometimes it's to make similar. sometimes it's not. but all of that functionality of what you're using this abstract for is conventional computer activity. and they don't say otherwise because it just says put it on a database or use a processor.

THE COURT: Okay.

MR. BERTA: So the reason, and I—I—I—want to just briefly address the 112 issue and explain why we think it's relevant in a sense. We agree there's no question that that is not a 112 motion and the court does not need to decide one way or the other whether the patent meets the written description or any of the other—enablement or any of the other requirements of 112.

The reason—we think it doesn't meet those but set that aside. The reason the 112 discussion is here is because the patent is required to set forth how it does its invention.

And the issue that we have with the specification, which I think we talked about long time ago when we had our case statuses conferences, there is no particular disclosure of any particular abstract with any particular algorithm of any sort or any requirements on what the abstract can be.

Now, do I think that's a 112 problem? Sure. But it is also a problem here because the specification and the claims are completely unbounded as to what an abstract—i.e., the word "abstract" in the patent claims—can be. It can take any form that you want as long as it's smaller than the original and uses human perceptible qualities.

And the problem with that is that's exactly the issue of preemption, that there's no—they can't point to the idea of an abstract using an abstract and say that that is somehow constrained because they are trying to claim all ways of using an abstract because the patent specification never says anything about an abstract other than how useful it is in all sorts of different circumstances.

So it's really a question of is there anything in this specification that limits an abstract. And the answer is according to the Texas claim construction, nope. It just has to be smaller than the original and rely on human perception, so that unboundedness of the construction on which they are relying and that there are no limitations on it, that's what makes this an abstract idea.

Because by its very definition, the idea of looking at a signal, like a picture, and determining a piece of that, like the sun, and then comparing the two pieces that are smaller than the original using what is humanly perceptible is by definition something that humans do.

And all this claim does is—all these claims do is say do that on a computer.

THE COURT: Is there a difference between "perceptual relationship" and "perceptual quality"?

MR. BERTA: Not according to the construction on which they rely because all of that relies on what humans can perceive, and so it is a limitation that means whatever you're doing on the computer, it's got to be what humans could otherwise do.

And it's in the—we say this in the brief, but it—it's—it's in the specification. This is just one example where it's talking about these psycho-acoustic models and psycho-visual models, and it says that the point is preserve those perceptual qualities that permit a human to recognize the original visual image using the very same techniques described above in connection with the audio signal, signal monitoring of visual images can be implemented.

And then it goes on. This is the embodiment that is disclosed in the patent. And it says, for once its application for monitoring and analyzing visual images involves a desire to find works of other artists that related to a particular theme.

For example, finding paintings of sunrises—sunsets or sunrises. Then it goes on to say the present invention involves the scanning of an image involving a sun.

THE COURT: Can I stop you for a second while you're reading?

MR. BERTA: Yes.

THE COURT: Does my court reporter have a copy of this?

MR. BERTA: She does.

THE CLERK: Yeah.

MR. BERTA: Okay.

THE COURT: Just a note, a practice note, and many, many lawyers do it. When you read, you start talking very quickly. And as a consequence, my transcript's not as good as it needs to be.

MR. BERTA: Thank you.

THE COURT: Go ahead. So you were reading.

MR. BERTA: I was. But let me cut to the chase. The embodiment that is described here is essentially described in terms of what a human would do. It says you do what humans do. You say "sunsets," "sunrises," and then it says somehow do that by way of doing it on a computer. And that is the essence of an abstract idea moved to a computer environment.

And cases are legion that the fact that you do this on a computer alone doesn't mean anything. It doesn't confer patentability on what is otherwise an abstract idea. It's just a limitation on the forum in which you are doing that abstract idea.

THE COURT: Ms. Dutton, why don't you respond to that? That is a critical piece of this. What does this patent teach other than to outline exactly that?

MS. DUTTON: Your Honor, I think the first question that has to be answered before—and I'm not in the position that—Blue Spike is not in a position to answer that—is what is one of ordinary skill of the art. That is the lens through—

THE COURT: What do you mean Blue Spike is not in a position to answer that question. It's their patent.

MS. DUTTON: Correct, Your Honor. and in Texas we have said that—Blue Spike has argued that one of skill in the art would have a master's degree, with several years of experience in signal processing.

THE COURT: And they do not.

MS. DUTTON: In this case, the—the inventor—one of the inventors, as you've noted in the CMC hearing, is—has a bachelor in—bachelor's in economics. The other coinventor has a bachelor's in—is a software engineer. I don't know his exact—

THE COURT: Can you not explain this patent to me?

MS. DUTTON: Yes, Your Honor.

THE COURT: Is that yes, you can? Or that's a yes, I cannot?

MS. DUTTON: I can explain—Blue Spike can explain the patents. However, the lens through which the court and Blue Spike needs to analyze the—the legitimate questions that are answered are through—is from one of skill in the art.

THE COURT: So what? So answer the question. We do this all the time. That's our job.

MS. DUTTON: Yes, Your Honor. So under prong one of the—the *Alice* test, the correct construct of reviewing this is reviewing not just a comparison but—

THE COURT: I'm asking you to explain the patent. Does it do anything other than tell the reader to identify something that a human perceives and compare it to something else through the use of a computer?

Does it do anything other than that?

MS. DUTTON: Yes, Your Honor.

THE COURT: Then what does it do?

MS. DUTTON: It provides for computations that—part of the error here is in saying that perceptual characteristics equates to human activity. That's the—that's the initial problem that's—that's facing Blue Spike and the court today.

THE COURT: I'm not trying to put words in your mouth. I'm asking a very open-ended question for you to explain to—if this—this is being attacked as just outlining an abstract idea.

I am asking you to then tell me if it does not, what does it do?

MS. DUTTON: Your Honor, what it does with respect to the abstract—too many uses of the word "abstract"—is it's complex algorithms that have—that while taking into account what a human perception is, is not something that in turn a human can do.

These are complex mathematical algorithms that effect (sic) and model and mimic what human activity is, but the—the other direction is not true.

A human—

THE COURT:—Teach the algorithms. It doesn't do any of that; Is that right?

MS. DUTTON: No, Your Honor, it's not right. The test is—which has been fully briefed in Texas and is—

THE COURT: Well, we're not in Texas right now.

MS. DUTTON: Correct, Your Honor.

THE COURT: So tell me where it is that it teaches it. What claim—let's take a look at the '740, which is the first—or '728?

MS. DUTTON: '472, Your Honor?

(Simultaneous colloquy.)

MS. DUTTON:—'472.

THE COURT: So where are you saying it teaches this?

(Pause in the proceedings.)

MS. DUTTON: One moment, Your Honor.

(Pause in the proceedings.)

MS. DUTTON: Your Honor, at column 7, lines 46 through 60, which is directly on point with Google's counsel pointing out "Psycho-Acoustic" and "Psycho-Visual Compression."

In addition, Your Honor, at column 4, lines 24 through 32, specifically—and these are identified in the expert declaration submitted by—by Blue Spike.

THE COURT: So there's nothing in the claims itself.

MS. DUTTON: No, Your Honor.

THE COURT: Okay.

Anything else?

MS. DUTTON: Those are the two primary columns, Your Honor, that the expert has relied upon and—and is not—admittedly is not before this court because the—as we'll explain shortly, we believe this issue to be premature.

One of skill in the art is allowed to work with the—the knowledge of what has come before. The—in fact, the NPEP cites to numerous federal circuit opinions which identify that the patent—

THE COURT: Can you tell me—

MS. DUTTON: Sorry, Your Honor.

THE COURT: You said line 46? That doesn't start a sentence. Line—column 7—

(Pause in the proceedings.)

MR. GARTEISER: Just want to confirm we're looking at the same patent, '472.

MS. DUTTON: Right. No, Your Honor's correct. That is—that is not the right citation.

(Pause in the proceedings.)

THE COURT: Well, I'll let you get back to me on that one.

MS. DUTTON: Thank you, Your Honor.

THE COURT: The—the second one you cited was column four, at what line?

MS. DUTTON: Lines 24 through 32, Your Honor.

THE COURT: With—starting with word "for example"?

(Pause in the proceedings.)

MS. DUTTON: Your Honor, it appears that instead of the '472, this should have been cited to a different patent. Let me locate both of those sections so that we can be literally on the same page.

MR. GARTEISER: Probably the 7—

THE COURT: Okay. Why don't you go look at it. let's keep going.

MS. DUTTON: Thank you, Your Honor.

THE COURT: Mr. Berta.

MR. BERTA: Your Honor, thank you.

Briefly on this issue that was being discussed, the—the issue that we have with the expert's declaration is that what he says is that there are things that computers can do that people can't do. And that may be true.

And then he says that there are true particular comparisons that he thinks a computer can do of one abstract to another that people can't do based on particular single-bit differences between two different abstracts.

We will get to this later, but the issue is two fold. Number one, case law has said that's not true. actually, humans can go bit by bit through things, so that's not a correct statement of human capacity.

Two, here, obviously because these patents are expressly, even under their construction, drawn to mimicking what humans can otherwise perceive. It is nothing more than what humans can perceive on a computer, which is the paradigm of an abstract idea.

But three, the limitation—the ideas that he says that computers can do that people can't do, those aren't limitations of the claim. There may be a corner case somewhere of a claim that covers what he's saying, but unless the claim is limited to that, it doesn't matter. The claim is broader than the thing he's saying that a computer can do and that person can't do. And that's the issue here. That's why these are preemptive, because these patents are being asserted obviously against everything everywhere and don't have a limit to only an abstract that is one-bit difference between another abstract or only an abstract that a computer can tell the difference between but a human can't do.

I would submit you couldn't have that as a limitation of these claims 'cause that's directly contrary to the construction that they are saying. But regardless, unless it's a limitation of the claim, it has no bearing on the 101 analysis.

I want to, I think, just move to step 22, if appropriate, to talk about whether there are any limitations here that matter. And as a preface, what I would say is that cases are, I think, uniform in the idea that adding in conventional activity is not a meaningful limitation on an abstract idea.

I just want to briefly talk about why that has to be true. I think we talked about it a little earlier, that—and this is consistent with the reasoning of the *cogent* case, which is out of this district, that you can basically preempt everything by just adding in what other people do.

And in terms of these sets of patents and these sets of claims, there are hundreds of the claims. And that's essentially exactly what's happened here. they came up with—they say we came up with a revolutionary idea. Fine. Let's accept that as true. The revolutionary idea of taking a smaller piece of a signal and comparing it using human perception.

That's the abstract idea. And if they say, then, do it with a computer, that does—that only limits it to computer field.

If they say do it with compression, there's no contention here that they invented compression certainly and in the specification they admit that they don't, nor any particular form of compression. They just say—they, in fact, cite compression, which I think is one of the examples that we're probably going to get from the expert declaration as a thing that people otherwise do. And they say this thing that other people have invented is useful in combination with our abstract idea.

And that's exactly what isn't a limit on an abstract idea because it doesn't—you add compression here, you add encryption there, you are then slicing off pieces of the abstract idea and then preempting the entire abstract idea.

And so when they point to particular limitations of particular claims that have something that's acknowledged by the specification to be in the prior art, those are just slices of claiming the abstract idea in a particular field.

Obviously with the broader claims that have none of these limitations at all, just generic computer implementation, those are completely unlimited. But the fact you have a dependent claim that says do it in a field you're using compression, do it in field where you're using encryption, both of which are acknowledged to be things that other people have come up with according to the specification, that's just slicing up your preemption of the field.

The particular things to which they point—well, first, we have a—this is in the slides, and it's in the papers, but it's, I think, a little not clear. The claims that don't have the limitations that they are pointing to in the briefs are, on the '472 patent, claims 1, 2, 3, and 8; on the '700 patent, claims 1 and 21; on the '494 patent, claims 15 and 17. On the '175 patent, it's claims 1, 8, and 11; and on the '728 patent, it's claims 1, 4 and 25.

So those are the claims that don't have the limitations that they expressly were discussing in their papers, setting aside our dispute over whether an abstract itself takes it out of the realm of an abstract idea.

So I want to go through the particular limitations that are raised and show where those things either have been held to be or are admitted to be essentially well understood routine and conventional—*i.e.*, practiced by others and not invented by the patent—the inventors.

So just getting to it. Starting with certain claims that they point to in the '700 patent, claims 10 and 11, and then in the '175 patent, claim 16, these are examples of how those—what those claims look like.

Says "the system of claim 1, wherein the system applies a cryptographic protocol to the abstract." So that's what they've added. "Cryptographic protocol" in claim 11 is "one of at least a hash or digital signature." I believe there's no dispute here that the inventors here did not come up with cryptographic protocols, did not come up with hashes or digital signals. And, in fact, the specification admits as much, where it basically talks about a—in, for example, the '700 patent, columns—column 10, lines 39 to 48, that you can just add in cryptographic techniques. There's no description of what it means to be a cryptographic technique because it is a well-understood practice in the art.

And, in fact, that's what's been held by other courts when looking at this issue. Cryptography is known. You're not—first of all, identifying—inventing cryptography. Second, a particular form of cryptography—

THE COURT: The point's made. You're not going to have all morning.

MR. BERTA: Sorry.

Data transmission is the next limitation. Claims 18 and 27 of the '700 patent, and there's an additional limit at the bottom of that claim that says, "determining whether the query signal abstract matches any of the stored data signal abstracts in the at least one database." And here it gives the purpose, "to enable authorized transmission."

Again, patent expressly acknowledges that transmission of data is nothing new.

And it goes through multiple protocols including MPEG that are compression and transmission standards for digitized information. It's just another instance of adding what is already known to the abstract idea, which is not a valid step 2 limitation.

Similarly, they talk about a limitation called this use of psycho-acoustic and psycho-visual models. It's a mouthful. It shows up, for example, in '175 patent, claim 17.

However, what the specification explains is—and this is, I believe, in the same set of citations pointed to by plaintiff's counsel. It says, lossy and lossless—"lossless and lossy compression schemes are appropriate candidates for data reduction technologies, as are those subset of approaches that are based on perceptual models such as"—and it lists a whole slew of preexisting compression schemes.

And then it goes on to explain, most compression is either lossy or lossless and is designed with psycho-acoustic or psycho-visual parameters. That is to say the signal is compressed to retain what is humanly perceptible. That is a statement that they are referring to preexisting compression schemes that are doing the thing that they are claiming.

So they're just saying, use these existing compression schemes that have these attributes to practice our invention.

That is not a step 2 limitation—that is not a step 2 of *Alice* valid limitation.

Spectral transforms shows up in ’728 patent, claim 26, same issue. Same issue on both fronts. First—

THE COURT: If it’s the same issue, don’t repeat yourself.

MR. BERTA: Okay.

THE COURT: If you have something new to add, then you can add it.

MR. BERTA: I will add the particulars of where in the specification they concede that a spectral transform is nothing other than—they certainly don’t say that they’re inventing spectral transforms. They just describe them as something that exists as a mathematically determining a spectral transform. And a mathematical calculation is not a patentable idea. They admit it is. The spectral transform is a mathematical calculation.

The rest of the limitations are in their particulars different but substantively no different of the limitation that they point to of changing selected criteria which shows up in the ’728 patent, claim 5. The idea of—this is from the federal circuit data—collection and recognition is undisputably (phonetic) well known. The issue in *Content Extraction,* the particulars had to do with feeding a check into a optical recognition system and pulling out certain fields.

The court characterized there that the abstract idea was collecting the data, recognizing certain data within the collected data, and then storing the data. Court said that’s abstract. That’s not—

there's nothing about that that's anything other than what people would otherwise do.

Same here, it's basically selecting a portion of a signal to use as your abstract of the signal.

The—they go on, I think, with respect to the '728 patent claim 5 and say that somehow this limitation of selection raises the idea of the strengths of a computing device and the economic needs of a particular market. That's the argument that's made in their papers.

The issue is, though, of course those are not claim limitations, so what one would do with selecting and why it's great to select doesn't convert the idea of selecting into anything other than a common, conventional, well-understood practice done by others.

This—it is essentially the same argument with respect to the last issue here, which is where they point to an abstract comprises signal characteristic parameters configured to differentiate between a plurality of versions of the reference signal.

In actual words, that's nothing other than picking which characteristic parameters that you're going to make your abstract from, and that's in the rest of claims that they challenge.

And in particular here, it's interesting because a specification just confirms that we're—that we're right about this, because there's this whole discussion of how to practice the—the invention. And, again, they do this by way of example rather than a disclosure. And it says, "perceptual differences exist between a song and its reproduction from a CD, an A.M. radio, and an internet broadcast." So here we're talking about what kinds of signals the patent can potentially apply to.

And then it says, "to the extent that the creator or consumer of the signal can define a difference in any of the four criteria above, means can be derived (and programmed for selectability) to recognize and distinguish these differences."

THE COURT: So I take it that Google's entire argument essentially rests on the basic premise that the patent and/or the claims are really—I guess you're not attacking the patent as a whole, just very specific claims—that all of those are fundamentally based on the notion that a human needs to perceive something.

MR. BERTA: That—yes, Your Honor. That is—that is why we think it's abstract. And we think that these other limitations that are being thrown in either collapse to this exact same issue, that it's just something humans are otherwise doing and it's on a computer or they just add in conventional, otherwise well-known computer steps of something like selecting.

THE COURT: All right.

MR. BERTA: With that, without questions obviously if there's something to respond to, I can address that but that is our presentation.

THE COURT: Well, let's start there with the plaintiff again. Does it do anything other than that? and if so, what?

MS. DUTTON: Your Honor, may we reframe and take a look at the forest for the trees.

THE COURT: No, I'd like you to answer that question, and then you can reframe.

MS. DUTTON: Thank you, Your Honor.

Will you read the question back, please, to make sure I'm on the same page.

THE COURT: Let me do it.

(Pause in the proceedings.)

THE COURT: Mr. Berta finished by saying that Google thinks that these—well, when I asked the question about whether Google's argument rest on the premise that the claims asserted were based on a notion that a human needs to just perceive something.

His response was that yes, but that they think that these other limitations that are being thrown in either collapse to this exact same issue or it's just something that—

(Record read as follows: "—Humans are otherwise doing and it's on a computer.")

MS. DUTTON: Thank you, Your Honor.

So that really presents the two-prong approach. First of all, we do not agree that—that human perception abstract.

The problem with equating retaining perceptual relationships to human activity is that this would encompass artificial intelligence. Mimicking or modeling perceptual relationships based on what humans do, such as comparing, communicating, may go in one direction, but it doesn't necessarily mean that the humans can perform the functions that the computers do.

And we'd like to explore that later with some—with some examples, but let me get directly to your second question.

THE COURT: So are you saying that this patent covers artificial intelligence?

MS. DUTTON: No, Your Honor. But using the framework and the test that google sets forth in attacking our—the patent's modeling after human perception is one that would have grave consequences for AI; including, for example Google's own driverless car.

THE COURT: Okay.

MS. DUTTON: Second, with respect to the additional limitations, the error that google invites this court to create in looking at a point of novelty of individual claim limitations, this is contrary to supreme court law as well as federal circuit precedent—we cover this in our opposition at footnote 9—in which obviousness, the section 103 analysis, can be looked—is required to be looked at all—as all of the claim elements as a whole.

So the analysis, the lens through which Google is looking at and focusing on one limitation at a time is erroneous, your honor. It's problematic.

THE COURT: Are you saying that I'm not supposed to look at the patent and—that each claim of the patent independently?

MS. DUTTON: Your Honor, you're—the—the framework and the lens is one of looking both at the claim as a whole as well as looking at the limitations individually. But in terms of an obviousness analysis, as the supreme court recognized in—in *KSR*, "invention"—and I quote slowly, "inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what in some senses sense is already known."

Your Honor, this issue has been—and Google relies on a case in a sister court in Central District of California called *MCRO*. this case is currently pending on appeal for the very same issues that I raise here in that—and this is relevant—it's responding to Google's reply brief.

Excuse me. With the court's indulgence.

(Pause in the proceedings.)

MS. DUTTON: These issues have been teed up and will be argued later this year. In particular, the—this drew the attention of the software alliance including numerous entities that raise the very same issues that respectfully, your honor, we would like to address the fact that google does seek to create a super one—section 101 incorporating fact questions of—with factual underpinnings under both sections 112 and 103.

THE COURT: I'm listening.

MS. DUTTON: Thank you, Your Honor.

If I may go back to looking at the framework, your honor. In addition to creating a super section 101, the context that I referred to with respect to artificial intelligence—and here I rely on the Texas construction that Google has conceded will—will govern this particular argument. And that is a three-part construction.

However, what's critical here is the analysis of—and Google's equation that—that in effect retaining perceptual relationships as required under the abstracts that are claimed in each and every claim limitation is effectively equal to human activity.

And this is where we draw issue—if this is the test that is carried forward that would be applied to artificial intelligence, Your Honor, the problem is that in that context—

THE COURT: Well, in that context, haven't—haven't scientists actually generated the method by which the perceptions you're seeking to compare could actually be digitized, which you in this patent certainly do not do.

I mean, I don't—I don't understand how you can compare what this patent seeks to achieve with something as complicated as this given that all you're saying is take what everybody else has done and compare them.

MS. DUTTON: Your Honor, that's—that's not what the patents claim.

THE COURT: Okay. Well, then what does it claim? You still haven't clearly articulated it for me.

MS. DUTTON: Thank you, Your Honor, for allowing me to go back to—the corrected columns of the '472 are columns 4, lines 15 through 22, and column 7, lines 40 through 55, which contain the sections that identify compression techniques that would be understood by one of skill in the art.

THE COURT: Right, but you didn't—this patent doesn't disclose or teach those compression techniques.

MS. DUTTON: Your Honor, these are—

THE COURT: Not in the claims, right? So they take that invention, they take that patent, and then what do they do with it? That's—that's what Google has issues with in this case.

MS. DUTTON: And, Your Honor—

THE COURT:—Taken all of this technology, you've taken all these other inventions, and you say take that intellectual property, reduce it to an abstract, pop it into a computer, and correct it. That—that doesn't—that's the essence of what they're arguing. And I'm trying to see—I'm giving you an opportunity to convince me that they're wrong, that that's all—that there's something more here.

MS. DUTTON: Your Honor, these are legitimate questions. The crux of the matter here is that it's premature to be answering these questions—

THE COURT: Well, no, it's not.

MS. DUTTON:—101 context.

THE COURT: No, it's not. if I cannot—why would I have an entire case be litigated where on the face of the patent, there's nothing there?

MS. DUTTON: and that's where—

THE COURT: I mean, that's—that is—and perhaps there is something, but I can tell you, I have lot of patent cases, and I don't always get these motions. and I'm getting this one here because the argument's being made that there's nothing there there (sic).

MS. DUTTON: And, Your Honor, both—originally both blue spike and google contended that—that both fact and expert discovery are required to answer those questions.

If I may refer back to—and ask the court to take judicial notice—in January of this year, google served invalidity contentions upon blue spike in which it originally asked for both fact and expert discovery to explore these issues.

Google in effect is asking you, Your Honor, to act as a expert as the one of skill in the art to analyze and take a look at what's being taught. is it enabled? is there sufficiency? is it too broad? that's—with all due respect, your honor, that's not the court's role.

So one question blue spike is left with is between January and may of this year when google filed its motion, why did it change its mind? why is fact discovery and expert discovery no longer required? why is everything sufficient on just the face of the patent alone? these are the issues that—that blue spike would request the court's leave to present in a full capacity with further primarily expert disclosure that has been largely developed in the Texas case and be able to bring it here to the—to the northern district of

California so that your honor can consider these issues.

In short, the record is—is not fully developed in order to address these issues.

THE COURT: On this motion, there is no record other than the patent, so it is fully developed. I may deny the motion, but there is nothing else to be considered in this type of motion.

What else does one consider in this type of motion other than the patent?

MS. DUTTON: That is the crux of the issue, Your Honor.

Under a 101 standard, which is a more favorable standard of review, as you're aware, matter of the law, it would only require the pleadings, the patent. And that's the inherent problem here.

What's required to answer these questions is something more. Expert discovery is required, Your Honor. And that is why in incorporating the section 112 questions into section 101, that's, in essence, asking the court to combine the two without giving 112 full effect.

112, as we've pointed out in the opposition brief, are, for the most part, questions of law with factual underpinnings, as is claim construction, Your Honor. The—as is obviousness.

THE COURT: All right. So what's changed, Google, since January? If this was such a good motion, why didn't I see it six months ago?

MR. BERTA: In all honesty, I believe that we've gotten a lot more clarity on the law, like *Alice* came out last—sorry. *Alice* was issued last summer. I think that the law has been developed very more significantly in the past 12 months on the issue.

There is no—the—of course, we sought fact and expert discovery with respect to invalidity issues in general. No question about that, but that doesn't change that the analysis under this particular prong of invalidity is still an issue as a matter of law that depends on what's claimed and what's conceded in the specification in light of courts such as other courts here, other courts in other districts, and what the federal circuit and the supreme court have said on no more than conventional activity.

Those are all decisions that have been made as a matter of law, what conventional activity is. And it's in light of those precedents that this—these claims, the claims themselves, do not add anything—any limitations that are anything other than conventional activity.

The—this is an issue that—I don't know—I don't want to speak more than i have license to, but this was an issue that came up in *Planet Bingo*, which was decided at the federal circuit, which I have the cite for.

That was admittedly in a summary judgment context, but what the court said there was the—the plaintiff has raised this corner case of—it was a patent about organizing bingo games using computers.

And the plaintiff said, look, our—our computers that organize bingo games can organize millions of bingo games. And what the court pointed out at the federal circuit is maybe but the claims say "two or more bingo cards," so your claims aren't limited to the things that you're saying is special; therefore it's irrelevant to the 101 analysis.

It's exactly the same thing that happened in the *cogent* case in this court. but it was an expert declaration that was submitted. but if the expert declaration can't tie whatever they're saying to the particular claims at issue, it is not relevant because the claims have to be limited under a 101 analysis to something that is other than conventional activity, and that is our argument.

THE COURT: The plaintiff has asked for leave to amend if the motion is granted. I don't understand the question.

That is, again, I understand that you think the motion shouldn't be granted, and perhaps it should not, but how can an amendment change any of the analysis?

MS. DUTTON: your honor, it—what blue spike would seek to do is to include the—the declarations and more fully developed its expert testimony that would flesh out and answer the questions that this—that both google and this court is asking in order to complete that fact record.

It—would it achieve the same result? Is it a different form—procedural forum to—as converting to an MSJ? Absolutely, Your Honor, but we're—we're seeking every potential to—to have our day in court.

THE COURT: But you're not seeking to amend to change—I mean, the patent's the patent.

MS. DUTTON: Correct, Your Honor.

THE COURT: And you're not seeking to amend to change the patents asserted in this case or at issue in this case, are you?

MS. DUTTON: No, Your Honor.

THE COURT: I take it that none of these questions have been raised or litigated in Texas in terms of this kind of motion? Is that accurate?

MS. DUTTON: This procedural motion has not been raised. However, the very same underlying issues that Google and this court is asking are indeed in front of—in front of Texas and will be raised to the jury in November.

MR. BERTA: We're not familiar with the status of Texas, but you can't do a 101 in front of jury.

THE CLERK: You need to be in front of the mic.

MR. BERTA: I apologize. 101 is not for the jury.

THE COURT: No, I understand.

I agree the—the law in this area is developing more and has been developing more since *Alice*. I think that it's only been recently that a court in this district issued a Post-*Alice* ruling. And I think there have been a number that have come down, but it's been relatively recent.

What, if any, relevance anymore is there to the machine or transformation test that had been used in the past in terms of these kinds of issues?

We'll start with the plaintiff and then move to the defendants.

MS. DUTTON: Your Honor, the machine transformation tests that we've addressed in our opposition papers deals specifically with—it's an indicator. I don't have a particular—an—a direct answer with respect to how it's continued to develop. It is certainly a—it is still a factor.

THE COURT: All right. Any response?

MR. BERTA: Yeah. Yes, Your Honor.

The two recent cases out of the federal—it depends, I guess, on what it is. But what is clear here is that doing something on a computer is not sufficient to meet the transformation test.

And that is—can only be the outcome of cases such as *Alice* that says putting it on a computer, which is a machine, and does transformations of data does not save a claim that's otherwise abstract from patentability.

I would offer the *Digitech Image* case from the federal circuit, which cite is in our papers, and I apologize. I don't have it on my fingertips. But that case says without additional limitations, a process that employs mathematical algorithms to manipulate existing information to generate additional information is not patent eligible.

And so the transformation of information cannot make something—convert something to patent eligibility. We know that.

We know do doing it on a computer also cannot because that—those are the limitations that are at issue with respect to this patent. That test has no relevance here under a controlling precedent.

THE COURT: Let me refer you, Ms. Dutton, to page 4 of the defendant's moving papers. They list there the asserted claims which they are moving on. I just want to confirm that I understand the totality of the motion and that you agree that that's the list of asserted claims that Blue Spike has other than I understand there's a separate dispute with claim 30.

MS. DUTTON: Correct, Your Honor. With that exception, we're on the same page.

THE COURT: Okay.

All right. In terms of claim 30, we have very strict rules here in the northern district.

Responses on those issues? We'll begin with you, Ms. Dutton.

MS. DUTTON: Yes, Your Honor. It's—it's simply a matter of—forgive me. It's a matter of who bears the burden. Does Google—does Google bear the burden to move to strike but claim 30 was not properly—was not properly charted? Or is it Blue Spike's burden to—to move to amend?

It's Blue Spike's position that—that sufficient notice has been provided and, therefore, the burden should be shifted properly to google to move to strike, which it has not done.

THE COURT: Response.

MR. BERTA: If I understand it correctly, it's that the—I don't think that there's a dispute that it wasn't disclosed correctly under the local rules and that it's a question of whether we have or haven't moved to strike it yet.

I concede we have not. I don't—I don't think it's incorrect that one should move to strike things, but I don't think that changes the outcome here, that there's no question that it wasn't disclosed adequately in the initial infringement contentions and on that basis, it's not at issue.

The fact that we have it—I mean, not to be flip, and I don't mean that at all, but we have the factual predicate available to us here. They do not—they do not contest it. In fact, they didn't chart that claim, therefore, it shouldn't be there; therefore, the outcome is the same with respect to who moved and who didn't move.

THE COURT: Ms. Dutton.

MS. DUTTON: Your Honor, Google's positions here are at odds. It would have this court believe that one claim is representative and can rule them all. And yet in the flip side, it says it doesn't—sufficient charting has to be element by element. Which—which is it, Your Honor?

THE COURT: Well, do you concede that you didn't comply with the rules?

MS. DUTTON: Yes, Your Honor.

THE COURT: And if a motion to strike was brought, what would be the basis for opposing the motion?

MR. GARTEISER: One moment.

(Pause in the proceedings.)

MS. DUTTON: My understanding from lead counsel is that during meet-and-confers, the issue was not brought up. I was not a party to those—those meet-and-confers; however, that's my information.

But I would add, Your Honor, that—that in the opposition, I would frame up that it would surely elevate form over substance to not permit Blue Spike with the opportunity to chart the claim in full to comply with the intent of the rule.

THE COURT: Why wasn't it charted?

MS. DUTTON: I don't know, Your Honor.

THE COURT: Does lead counsel know?

MR. GARTEISER: Your Honor, Randall Garteiser for Blue Spike.

It's my understanding after we met and conferred several times with Google to avoid actually a motion to strike previously, we—we reduced or—we eliminated D.O.E. We eliminated indirect. We tried to—we agreed on a prior—I'm sorry—the earliest date of conception and reduction to practice.

So we—we had a real productive meet-and-confer. To the extent that that was not charted properly, it's—it's a responsibility that falls on me and is most likely just a—an oversight due to it being claim 30 of the—or last patent or last dependent claim asserted in a particular patent.

THE COURT: I'm just checking the docket in this case. Looks like I issued a scheduling order about ten months ago.

MR. GARTEISER: That's Correct Your Honor. There was a deadline to—the move to strike, and the four or five—of the four defendants that were—were consolidated—not consolidated but related, only adobe filed a motion to strike.

THE COURT: A motion to strike—a motion to strike claim 30?

MR. GARTEISER: No, Ma'am. A motion to strike infringement contentions. The claims were different for each defendant.

THE COURT: So has the—what's the status of the briefing on claim construction?

MR. GARTEISER: Your Honor, the parties—and correct me if I'm wrong, counsel for Google, but the parties were in the process of getting together on claim construction. And Blue Spike was trying to—try to limit the number of disputes 'cause we understand the court wants to limit the number of terms that the court construes.

And so we were asking for them to explain to us what constructions they did not agree with in E.D. Texas, and they didn't want to do that. And that order we thought was most efficient.

Then along—at the same time, a new defendant got transferred to N.D. Cal, Gracenote, and the parties met and conferred, and we agreed to kind of a wait—postpone the deadlines until we see whether the court agreed whether it was proper to relate the Gracenote case or not. And in that—so that's the status.

THE COURT: Well, the motion to relate Gracenote just came across my desk late last week. Is there an objection? I don't know that the five days has passed.

MR. GARTEISER: I don't think there is an objection from us. And Google—correct me if I'm wrong—didn't want to take a position one way or the other.

MR. BERTA: Yeah, we don't object. we just don't know that this meets the standards. And that's for the court to determine and—not that we're saying that we want to advocate responsibility for the issue, so it's just—

THE COURT: I don't want have to wait, so I want to—

MR. BERTA: We're definitely not filing an objection, if that's the question.

THE COURT: That's—that's the question.

MR. BERTA: Yeah.

THE COURT: So you're not—you're submitting on the issue.

MR. BERTA: Absolutely.

THE COURT: So I don't have to wait the five days.

MR. BERTA: Correct.

THE COURT: All right.

MR. BERTA: Sorry, Your Honor.

THE COURT: Under the current deadline, your claim construction and prehearing at the same time is due August 1st.

MR. BERTA: That's correct.

THE COURT: Are you suggesting that that would change if I grant that Motion to Relate?

MR. GARTEISER: It doesn't need to, Your Honor. It's up to the court.

We—we spoke with counsel for Gracenote. They had a change. Someone at their—that was taking lead for that case, David Lee Kasters, he went in-house apparently now at apple, and so there was a little bit of a—a delay there in talking to who was going to take it over.

Now that we've spoken with them, their position is that they—they want to rely on the licensing defense, and they don't think claim construction is—is relevant.

We disagree, and we think claim construction is relevant, and we've asked them if they'll stipulate for the purposes of—of, you know, this proceeding with the constructions in the former case, and they've declined to do so.

But they didn't want to slow down this case either, so they're—they're kind of—

THE COURT: So have there—has there been the exchange of claim constructions that were due last, I guess, the—February and March?

MR. GARTEISER: Your Honor, the parties did exchange terms. And in—it got a little confusing because in some cases, Google would have, like, one modifier added to a previous construction from the court.

THE COURT: Is that the Eastern District Court?

MR. GARTEISER: Correct, Your Honor. and that was very—we—it was a lot of work that went into that opinion at 69 pages. it had a special technical advisor that went and helped out with that. and it involved a lot of briefing. and then it was challenged because some of the terms were said to have been indefinite. And that was a whole MSJ that was brought there.

There were eight MSJ's brought in that case, and none of them have been granted, and none of them related to section 101.

But—so some of these underlying things about section 112, we've dealt with with our professor, Ahmed Tewfik, who is the head of the department of Computer Science and Electrical Engineering at University of Texas. He was gracious enough to give us his time to—to participate in the claim construction process by submitting a declaration.

And then also he was just deposed last week in preparation for trial on our infringement analysis for a different defendant audible magic.

So to answer your question, we tried to exchange the terms, and we're in the process of meeting and conferring on that because in some cases, it seems like—it would seem to Blue Spike like we were being redundant. And to Google's counsel, they wanted to meet and confer more, and that's why we decided to push back the dates. And we're not inclined—we're—we're inclined to agree to push it back more if we need to.

I believe now, we're—we may even have a conflict in October.

THE COURT: Well, I'm not inclined. I go into a three-month murder trial, extenuating circumstances and a violent RICO prison gang case in January, so I have no inclination to laden my calendar with things that need to be done this fall that was scheduled to be done this fall, in part because I know what I'm going into in 2016. that's why I'm asking the questions.

MR. GARTEISER: Your Honor, I think that the parties could get together with counsel for Gracenote and come up with, you know, the—a workable outline and present it to the court. We're supposed to have a CMC tomorrow in that case and—

THE COURT: In front of whom?

MR. GARTEISER: The—Denoto (phonetic). Judge Donato.

THE COURT: Well, I'll make sure to deal with it one way or the other before tomorrow, and I'll let him know.

Okay.

(Pause in the proceedings.)

THE COURT: All right. I think I have everything I need.

MS. DUTTON: Your Honor—

THE COURT: Yes, Ma'am.

MS. DUTTON: With the court's indulgence, I had earlier requested if we could re-frame (sic) to take a look briefly at the forest for the trees.

I only request leave to analyze prong one because the inferences I read from what the court's addressed today seems to focus solely on prong two. And if I may take one minute to—to address that.

THE COURT: Go ahead.

MS. DUTTON: Thank you, Your Honor.

Understanding that the—the court draws issue with the context of artificial intelligence, there still remains an issue—

THE COURT: I don't take issue with the concept of artificial intelligence. I do think that this patent is a far cry from that.

MS. DUTTON: Understand, Your Honor.

And that's not—we're not certainly trying to umbrella under that. However, the equating of retaining perceptual relationship to human activity would create huge policy implications for that technology. That can't be the test. If it's not the test there, it shouldn't be the test here.

One form would be automated phone technology, voice recognition.

THE COURT: You know, what you've just said concerns me. Because the point of a patent is to elucidate, to identify the bounds of an invention, to then move technology forward.

It is not the point of the patent laws to have someone expound without invention on a concept which impacts huge issues and areas of technology.

So just because there is a patent for one does not mean that there is—that—that that concept gets important—imported into every single patent. That's not the point.

The point is, is that every patent stands on its own. It must stand on its own.

So if you cannot defend this patent in this case at the time it was issued, well, then you can't.

But—but don't—don't seem to suggest that because there are patentable ideas in the form of—of artificial intelligence and others, that somehow, you—you get the benefit of that if you haven't done anything.

MS. DUTTON: Blue Spike recognizes the legitimacy of the questions that you have. We would contend, however, that the sufficiency of the patent is able to stand on the—on the patents of others.

The—the patent rules and the case law state that it does not encourage every patent to include every known prior art. It's—in fact, the law—

THE COURT: It doesn't. Of course, it doesn't. But you do have to define something.

MS. DUTTON: And Your Honor is actually making the argument that we want you to see. You're—we're seeing the two sides of the same coin. That is 112 argument, Your Honor. And that is for one of skill in the art to provide testimony for this court to consider.

THE COURT: Okay. Anything else?

MS. DUTTON: No, Your Honor.

On the basis of the—the papers and the arguments here today, blue spike requests that the court to deny this motion—the present motion.

THE COURT: I mean, as I understand this last argument, you are claiming that any time there is sophisticated technology, that a court could never issue an order under 112. That's what I hear you saying.

And that's—I don't think there's any law to support it. But—that's what I hear you saying.

MS. DUTTON: Your Honor, on the facts of this case, with the—the Google arguments that have been raised, this would conflate sections 101 and 112, and that's contrary to statutory interpretation.

THE COURT: Okay.

MS. DUTTON: Thank you, Your Honor.

THE COURT: Thank you. Submitted?

MR. BERTA: Yes, Your Honor. Thank you.

(Proceedings were concluded at 10:25 A.M.)

**BRIEF OF APPELLANT
(JANUARY 6, 2016)**

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

BLUE SPIKE, LLC,

Plaintiff–Appellant,

v.

GOOGLE INC.,

Defendant–Appellee.

2016-1054

Appeal from the United States District Court for the Northern District of California in Case No. 4:14-cv-1650-YGR, Judge Yvonne Gonzalez Rogers.

Randall T. Garteiser
Christopher A. Honea
GARTEISER HONEA, P.C.
119 West Ferguson Street
Tyler, Texas 75702
(415) 568-0553

Counsel for Appellant

{ TABLES AND APPENDICES OMITTED }

STATEMENT OF RELATED CASES

The following five (5) cases are stayed in the United States District Courts for the Eastern District of Texas and the Northern District of California pending the outcome of this appeal.

Case Name	Case No.	Court
Blue Spike, LLC v. Gracenote, Inc., et al.	15-cv-1494	N.D. Cal.
Blue Spike, LLC v. Miranda Tech., Inc, et al.	15-cv-0598	E.D. Tex.
Blue Spike, LLC v. Audible Magic Corp.	15-cv-584	E.D. Tex.
Blue Spike, LLC v. Facebook, LLC	15-cv-4185	N.D. Cal.
Blue Spike, LLC v. WiOffer, LLC, et al.	15-cv-585	E.D. Tex.
Blue Spike, LLC v. Adobe Systems, Inc.	16-1075 (appeal)	Fed. Cir.
	15-1803 (cross-appeal)	Fed. Cir.

JURISDICTIONAL STATEMENT

This appeal arises from a decision of the United States District Court for the Northern District of California. The District Court had jurisdiction under 28 U.S.C. §§ 1331 and 1338(a). The District Court granted Defendant's motion for judgment on the pleadings on September 8, 2015 and issued final judgment on October 1, 2015. Plaintiff timely filed a notice of appeal on October 5, 2015. This Court has jurisdiction under 28 U.S.C. § 1295(a)(1).

STATEMENT OF ISSUES

I. Section 101 Eligibility—Prong 1: Whether Blue Spike is entitled to a judgment of eligibility where the Patents-in-Suit are not directed to an abstract idea.

II. Section 101 Eligibility—Prong 2: Whether Blue Spike is entitled to a judgment of eligibility where the Patents-in-Suit, if directed to an abstract idea, add an inventive concept and are not preemptive.

III. Improper Section 112 Analysis—Whether the District Court's § 101 decision should be reversed and remanded for improperly addressing § 112 concerns.

STATEMENT OF THE CASE

Blue Spike, LLC ("Blue Spike") is a small company specializing in digital watermarking technology and other means of identifying digital signals. This sort of technology has important applications, including protecting copyrighted digital content from piracy. At the time the patents at issue in this case were filed, digital signal recognition focused primarily on inserting data into a digital signal (a "digital watermark"). Blue Spike's patents introduced a novel alternative to digital watermarking; rather than inserting data into a digital signal, Blue Spike's technology creates an abstract ("Signal Abstract")—a smaller digital representation of the digital signal—that can be used for identification purposes. The central question in this appeal is whether Blue Spike's digital abstracting technology is patentable subject matter under § 101 of the Patent Act.

A. Preliminary Statement

The District Court granted Google's motion for judgment on the pleadings, holding that Blue Spike's patents were "generally directed to the abstract concept of comparing one thing to another," and therefore ineligible for patent protection. (Appx0008.) But this interpretation of the patents issued without the benefit of claim construction proceedings—was breathtakingly broad. All inventions rely, at bottom, on fundamental

principles and natural laws, and all patents can thus be construed at such a high level of generality that they are stripped down to an underlying "abstract idea." The District Court erred by looking past the particular contributions described in Blue Spike's patents.

The District Court also held that Blue Spike's patent claims "do not involve any 'inventive concept.'" (Appx0010.) Those claims, the court said, "merely discuss using routine computer components and methods." *Id.* That holding ignored the patents' claims to describe a particular method of signal comparison that overcomes practical difficulties in the field of signal recognition.

The District Court's skepticism of Blue Spike's patents may derive from a belief that Blue Spike had not, in fact, actually discovered and implemented a practical method of signal abstracting. Any such belief would be incorrect. But more important for present purposes, these sorts of concerns are not appropriately addressed under § 101, but rather are the domain of § 112 of the Patent Act, which requires that the patent specification "enable" the invention. Google did not move for judgment under § 112, and any argument about inadequate enablement would certainly have implicated factual disputes inappropriate for resolution on a Rule 12(c) motion. It is no more appropriate, however, to import § 112 concerns into the § 101 analysis, thereby forgoing the opportunity for factual development that adjudicating such concerns requires.

B. Procedural History

On August 22, 2012, Blue Spike filed its original complaint against Google in the Eastern District of Texas, alleging infringement of the '472, '700, '494, and '175 Patents. (Appx0293.) On March 13, 2014, the Court granted Google's motion for transfer to the Northern District of California. (Appx0414.) Blue Spike filed its First Amended Complaint ("FAC") on September 15, 2015, alleging infringement of the same four patents asserted in its original complaint along with U.S. Patent No. 8,712,728 ("the '728 Patent") (collectively with the '472, '700, '494 and '175 Patents, "the Patents-in-Suit"). (Appx1488.) Google answered Blue Spike's FAC on October 2, 2015. (Appx0401.) The Court granted the parties' joint stipulation to extend case deadlines through claim construction by roughly four months in order to facilitate the completed transfer of other cases from the Eastern District of Texas as well as in anticipation of the likely relation of several transferred cases involving the same Patents-in-Suit. (Appx0112.)

The Eastern District of Texas has previously issued a number of substantive rulings in a related case relevant to Google's motion. On October 16, 2014, that court with the assistance of a court-appointed technical advisor issued a 69-page *Markman* opinion construing more than 30 terms and phrases in the Patents-in-Suit. (Appx1965.) On that same date, Magistrate Judge Craven issued a 19-page Report and Recommendation recommending that a motion for summary judgment based on indefiniteness be denied. (Appx2034.) In an 11-page Memorandum Order on January 6, 2015, Judge Schneider adopted the Magistrate Judge's findings, affirming the denial of summary judgment of indefiniteness. (Appx0284.)

On May 12, 2015, during what Blue Spike understood to be a stand-down period on motion practice, Google filed a Rule 12(c) Motion for Judgment on the Pleadings seeking adjudication that the Patents-in-Suit are invalid under 35 U.S.C. § 101 (the "§ 101 Motion"). (Appx2103.) Blue Spike opposed Google's Rule 12(c) Motion. (Appx2270.) On October 1, 2015, the Northern District of California ("District Court") entered judgment against Blue Spike, finding the asserted claims of the Patents-in-Suit invalid pursuant to Section 101. (Appx0001.) Four days later, Blue Spike appealed. (Appx0115.)

STATEMENT OF FACTS

A. The Patents-in-Suit

The Patents-in-Suit teach a "novel basis" for signal recognition and identification. (Appx0069, '175 Patent 2:4-7, 6:63-66). This "enhanced identification" is carried out by (1) monitoring and analyzing a digital signal (Appx0069, '175 Patent, 3:11-12, 22-23, 32-33, 48-49); (2) creating a smaller digital representation known as an "abstract" (a "Signal Abstract") of that digital signal (Appx0069, '175 Patent, 3:13-21, 23-24, 33-35; 51-52); and (3) utilizing the Signal Abstract to make comparisons and perform other useful operations (*e.g.* creating an index-of-relatedness (Appx0023, '472 Patent, Claim 11); embedding uniquely identifiable data into a digital signal (Appx0038, '700 Patent, Claim 12); identifying related digital signals (Appx 0038, '700 Patent, Claim 40); and changing selected criteria to effect different results in creating the Signal Abstract (Appx0069, '175 Patent, Claim 5)).

The key to the process is the Signal Abstract. It is a data-reduced representation of a digital signal allowing complex comparisons at lower bandwidth than comparisons of the raw digital signal. (*See, e.g.*, Appx0069, '175 Patent, 6:54-7:9; 9:59-10:6; 10:10-19; 12:42-51.) This Signal Abstract is "created using data reduction techniques to determine the smallest amount of data, at least a single bit, which can represent and differentiate two digitized signal representations." (Appx0069, '175 Patent, 10:10-19.) The Patents-in-Suit describe an embodiment in which an abstract is created by the following steps:

> 1) analyze the characteristics of each signal in a group of audible/perceptible

> variations for the same signal (*e.g.* analyze each of five versions of the same song—which versions may have the same lyrics and music but which are sung by different artists); and 2) select those characteristics which achieve or remain relatively constant . . . .

(Appx0069, '175 Patent, 4:7-17.) This process of creating a Signal Abstract attempts to "reduce the digital signal in such a manner as to retain a 'perceptual relationship' between the original signal and its data reduced version." (Appx0069, '175 Patent, 3:65-4:1.) The resulting Signal Abstract is non-invertible, meaning that that it cannot be used to recreate the original digital signal. (Appx0069, '175 Patent, 13:55-60.) Once Signal Abstracts are created, they may be compared to digital signals or to each other. (Appx0069, '175 Patent, 7:42-49.)

Comparing digital signals to each other without the use of a Signal Abstract can be a computationally expensive way to identify a signal. (Cf. Appx0069, '175 Patent, 7:4-10.) At the time of the invention, the prevailing solution for this problem of computer-based "identification of digitally-sampled information" relied largely upon adding "a separate and additional signal," such as a digital watermark, to the original signal. (Appx0069, '175 Patent, 4:51-55.) The Patents-in-Suit provide a salient example: "One traditional, text-based additive signal is title and author information. The title and author, for example, is information about a book, but it is in addition to the text of the book." (Appx0069, '175 Patent, 4:58-61.) One of the "many shortcomings" of the additive signal approach is the difficulty of creating an additive signal that could not be removed surreptitiously. (Appx0069, ’175 Patent, 5:1-12.)

Blue Spike’s patents addressed these deficiencies. (“The purpose is to afford a more consistent means for classifying signals than proprietary, related text-based approaches.” (Appx0069, ’175 Patent, 4:2-4); The solution was the Signal Abstract: a representation of a digital signal that “massively compress[ed] a signal to its essence” while not compressing so much that the resulting abstract “fails to maintain the ability to distinguish” signals. (Appx 0069, ’175 Patent, 7:10-34.) “The present invention eliminates the need of any additive monitoring signal because the present invention utilizes the underlying content signal as the identifier itself.” (Appx0069, ’175 Patent, 5:26-28).) The Patent and Trademark Office rigorously assessed these advantages in comparing the Patents-in-Suit to literally hundreds of prior art patents and publications. Hence, the ’472 Patent cites more than 100 references; the ’700 Patent cites more than 350 references; the ’494 and ’175 Patents each cite almost 600 references; and the ’728 Patent cites more than 700 references.

The Patents-in-Suit draw from “the highly effective ability of humans to identify and recognize a signal.” (Appx0069, ’175 Patent, 4:44-46). If a Signal Abstract can be “compressed to retain what is ‘humanly-perceptible’” and “successfully mimics human perception, data space may be saved when the compressed file is compared to the uncompressed original file.” (Appx0069, ’175 Patent, 7:43-46). But the signal abstracts yet teach improvements of human-based comparisons and identification.

One such improvement includes a faster and more accurate form of identification. (Appx0069, '175 Patent, 7:4-10.) The '175 Patent's first sample embodiment thus teaches the identification of copyrighted songs. (Appx0069, '175 Patent, 13:39-14:35.) Other applications exist outside of media rights. For instance, the same patent's second sample embodiment describes "identification of photographs of potential suspects whose identity matches the sketch of a police artist." (Appx0069, '175 Patent, 14:62-65.)

The claims also contain other improvements over human-based comparisons. For example, the Patents-in-Suit teach reconstructing abstracts based on selectable criteria upon matching collision (Appx0023, '472 Patent, Claim 9), creation of an index-of-relatedness (Appx0023, '472 Patent, Claim 11), a security controller granting access to a secured area (*e.g.* a biometric reader) (Appx0023, '472 Patent, Claim 12), differentiation between versions of a signal (Appx0052, '494 Patent, Claim 1), and authorizing transmission or use of a signal based on matching criteria (Appx0038, '700 Patent, Claim 18).

The Patents-in-Suit provide a 5-step prose algorithm spanning multiple columns of the specification. (Appx0069, '175 Patent, 8:3-9:40); Appx2034 (referring to the Blue Spike Patents-in-Suit and noting "the specification provides an exemplary algorithm in prose."); *contra* Appx001 ("The Court further notes that the specification does not teach the specifics of the implementation—it includes no source code, <u>detailed algorithm or formulas</u>, or the like.") (emphasis added). The algorithm provides five elements: (1) a reference database, (2) an object locator, (3) a feature selector, (4) a comparing device, and (5) a recorder. (Appx0069, '175 Patent, 8:3-9:40.) Additionally, the patents point to various other algorithms that could be utilized in the creation the abstract. (Appx0069, '175 Patent, 4:18-32; 10:56-12:11 (referring to algorithms such as linear predictive coding (LPC), z-transform analysis, root mean square (rms), frequency weighted RMS, signal to peak, and spectral transforms).) Despite the detailed specification, Google argued in its § 101 Motion that these specifications did not adequately enable the invention under § 112.[1]

B. Blue Spike and Scott Moskowitz

Scott Moskowitz is Blue Spike's founder and manager, as well as co-inventor on all of the Patents-in-Suit. (Appx0332-333, ¶ 2.) Mr. Moskowitz filed his first digital-content-management patent in 1993 and has continued to contribute to the field of digital signal processing and its application to technological problems. (Appx0334, ¶ 10.) One of his early patents in this technological space was innovative enough that the USPTO could not classify it under its existing labeling system, earning the patent an entirely new category: "classification 713, subclass 176, called 'Authentication by digital signature representation or digital watermark'." (Appx0335, ¶ 12.) And at least one of his patents garnered government interest when the NSA classified the patent under a secrecy order "while it investigated his pioneering innovations and their impact on national security." (Appx0335-336, ¶ 13.) Mr. Moskowitz has been cited by *The New York Times*, interviewed by *Forbe*s, and

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[1] On reply, Google averred it did not intend to raise § 112 arguments. (Appx2492, n.5.)

has testified before the Library of Congress regarding the Digital Millennium Copyright Act. (Appx0336, ¶ 15.) He is a senior member of the Institute of Electrical and Electronics Engineers (IEEE), a member of the Association for Computing Machinery, and the International Society for Optics and Photonics (SPIE) and has written books since translated into other languages, spoken at conferences, and peer-reviewed numerous conference papers. (Appx0337, ¶ 14-16.)

Mr. Moskowitz has applied his digital signal processing knowledge in a number of products, and he and Blue Spike continue "to produce new versions of its popular digital-watermarking tools" including "unique Scrambling technologies" and an "end-to-end solution for music security." (Appx0338, ¶ 21.) Mr. Moskowitz' technology has "been at the forefront" of industry-based tests such as the MUSE Embedded Signaling Tests and Secure Digital Music Initiative ("SDMI"). (Appx0337, ¶ 17.) "To this day, Mr. Moskowitz and Blue Spike are working with artists to help them manage and secure their valuable artistic contributions. . . . " (Appx0338, ¶ 21.)

SUMMARY OF ARGUMENT

Every valid patent builds on abstract principles and laws of nature. And every patent can be described at a sufficiently high level of generality to make it abstract, unoriginal, or banal. In this case, the District Court did just that: It characterized Blue Spike's patents, which claim a method of comparing digital signals based on a Signal Abstract of the original signal, as claiming the entire notion of "comparing one thing to another." This reduced the

Patents-in-Suit to an absurdity, and it rendered them ineligible for patent protection under § 101 of the Patent Act.

This was error. The District Court misapplied both parts of the *Alice/Mayo* test for patentability under § 101. First, it erroneously concluded that the Patents-in-Suit were directed to an abstract idea by construing those patents at an overly high level of generality. It would be absurd to try and patent "comparing one thing to another," and Blue Spike did not attempt to do so. Rather, it patented a particular approach to comparing digital signals that eschews both comparison of entire signals and inserting a digital signature or watermark, and instead employs data reduction techniques to create a Signal Abstract from the underlying signal. The District Court overlooked the particularity of Blue Spike's approach, however, because it focused on the problem addressed rather than the means employed, improperly sought to boil the patents down to their "gist," and attempted to resolve patent eligibility on a Rule 12(c) motion for judgment on the pleadings, prior to any resolution of disputes about construction of the patent claims.

Second, the District Court wrongly rejected Blue Spike's argument that, even if its patents were directed to an abstract concept, they nonetheless added a patentable "inventive concept." Blue Spike's reliance on the Signal Abstract overcomes recognized technical obstacles in the field, employs computers in a non-routine way, and satisfies the "machine or transformation" test. Moreover, the Patents-in-Suit's inventive concept is sufficiently narrow to avoid preempting a wide variety of other means of digital comparisons. In concluding otherwise, the District

Court improperly conflated the patentability of Blue Spike's invention with concerns about its novelty, even though novelty is both conceptually distinct and bound up with factual disputes that may not be resolved on a Rule 12(c) motion.

Finally, Google repeatedly suggested to the District Court that Blue Spike had not actually invented anything, and that its patents therefore did not and could not sufficiently enable the invention under § 112. Google could not hope to resolve this disputed factual issue on a Rule 12(c) motion, and it was ultimately forced to disavow its § 112 argument in its reply brief. But the record demonstrates that these concerns about § 112 enablement infiltrated the District Court's § 101 analysis. This left Blue Spike in the worst of all possible worlds, forced to rebut aspersions about enablement in a procedural context that foreclosed developing evidence necessary to do so. The District Court's venture beyond the pleadings thus provides an independent ground for reversal here.

Congress framed § 101 to provide broad and robust protection for innovation. The District Court's decision here, however, both construed § 101 in a way that encourages attacks on patent eligibility and expanded the scope of Rule 12(c) motions for judgment on the pleadings in a way that will make those attacks hard to rebut. The judgment invalidating Blue Spike's patents should be reversed.

STANDARDS OF REVIEW

Section 282 of the Patent Act provides that "[a] patent shall be presumed valid," 35 U.S.C. § 282; hence, the movant bears the burden of establishing invalidity. *See Microsoft Corp. v. i4i Ltd. Partn.*, 564 U.S. 91 (2011). The Federal Circuit reviews de novo a district court's determination of patent-eligibility under 35 U.S.C. § 101. *DDR Holdings, LLC, L.P.*, 773 F.3d 1245, 1255 (Fed. Cir. 2014). Similarly, the Federal Circuit reviews a grant of judgment on the pleadings de novo. *buySAFE, Inc. v. Google, Inc.*, 765 F.3d 1350, 1352 (Fed. Cir. 2014). In reviewing a district court's grant of a motion for judgment on the pleadings, the Federal Circuit applies the procedural law of the regional circuit. *Amgen Inc. v. Sandoz Inc.*, 794 F.3d 1347, 1354 (Fed. Cir. 2015).

ARGUMENT

Section 101 of the Patent Act provides that "[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." 35 U.S.C. § 101. However, the Supreme Court has "long held that this provision contains an important implicit exception: Laws of nature, natural phenomena, and abstract ideas are not patentable." *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S.Ct. 2347, 2354 (2014) (internal marks omitted). The Court has fashioned a two-step process in determining Section 101 eligibility: "First, we determine whether the claims at issue are directed to one of those patent-ineligible concepts." *Alice*, 134 S.Ct. at 2355 (citing *Mayo Collaborative Svcs. v. Prometheus Laboratories, Inc.*, 132 S.Ct. 1289, 1296-97 (2012)). If they are, then the second stage of the inquiry asks whether the patent contains an "inventive concept," such that the invention "amounts to significantly more than a patent upon the ineligible concept itself." *Id.* at 2355.

Blue Spike contends that the District Court erred at both stages of this *Mayo-Alice* test. The Patents-in-Suit are not directed to an abstract idea, and even if they were, those patents also add a significant inventive concept. Moreover, the District Court inappropriately conflated § 101's eligibility inquiry with the enablement requirement of § 112—an issue which, if confronted directly, would have required significant factual development in order to resolve.

I. THE PATENTS-IN-SUIT ARE NOT DIRECTED TO AN ABSTRACT IDEA

Section 101 eligibility begins with an inquiry into "whether the claims at issue are directed to a patent-ineligible concept." *Alice*, 134 S.Ct. at 2350. The District Court erred by construing the claims here as "generally directed to the abstract concept of comparing one thing to another." (Appx0008.) This overly general characterization is analogous to construing patents on telephony as directed toward the abstract concept of "person-to-person communication," or patents on electronic calculators as directed toward the abstract concept of "doing mathematics." In fact, the Patents-in-Suit teach a particular method of comparing audio signals, replacing the prior art of inserting a digital watermark into signals with creating a Signal Abstract of the signals themselves. This innovation is plainly patentable subject matter under § 101.

A. The District Court Characterized the Patents-in-Suit at an Overly High Level of Generality

Every patent involves abstract principles, just as every scientific advance ultimately rests on unpatentable laws of nature. Hence, Justice Breyer recognized in *Mayo* that "too broad an interpretation of this exclusionary principle [for abstract principles and laws of nature] could eviscerate patent law. For all inventions at some level embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas." 132 S.Ct. at 1293. Likewise, this court has "long-recognized that any claim can be stripped down, simplified, generalized, or paraphrased to remove all of its concrete limitations, until at its core, something that could be characterized as an abstract idea is revealed." *Ultramercial, Inc. v. Hulu, LLC*, 722 F.3d 1335, 1344 (Fed. Cir. 2013), cert. granted, judgment vacated. sub nom. *WildTangent, Inc. v. Ultramercial, LLC*, 134 S.Ct. 2870 (2014). If every patent were construed at the highest level of generality, then nothing would be patentable. And short of that extreme, broad constructions of patent claims risk undermining Congress's intent to provide generous protection for inventors as well as the general statutory presumption of patent validity.[2] That is why this court has cautioned that "[a] court cannot go hunting for abstractions by ignoring the concrete, palpable, tangible limitations of the invention the patentee actually claims." *Id.*

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2 *See* 35 U.S.C. § 282 (patents presumed valid once granted); *Bilski v. Kappos*, 561 U.S. 593, 602 (2010) ("This Court has more than once cautioned that courts should not read into the patent laws limitations and conditions which the legislature has not expressed.") (internal marks and citations omitted).

The District Court made this very mistake by over-generalizing the Patents-in-Suit. Assessing Claim 1 of the '472 as representative, the District Court held "that the claims at issue are generally directed to the abstract concept of comparing one thing to another." (Appx0008.) Not even Google proposed such a broad construction of the patents' claims; rather, it proposed that the "gist" of Blue Spikes' patents involved "comparing one signal to another using perceivable qualities of the signal." (Appx2119.)[3] In any event, both the District Court's and Google's generalizations overlooked key aspects of the patent claims. To begin, the Patents-in-Suit contain "concrete, palpable, tangible limitations" to the particular matter of digital signal comparisons. They address a particular engineering problem within that limited field—that is, the problem that comparing signals in their entirety is prohibitively inefficient, while inserting a digital watermark to identify signals provides inadequate security against illicit copying. The Patents-inSuit address this problem by relying on the Signal Abstract, which is a distilled version of the original signal and yet derived from that signal itself rather than a separate (and thus removable) added watermark. Hence, Claim 1 describes "creating an abstract of said at least one reference signal . . . using perceptual qualities of the at least one reference signal such that the abstract retains a perceptual relationship to the reference

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[3] Blue Spike argues that the Patents-in-Suit should be construed more specifically still, but it submits that even Google's characterization was not directed toward an abstract idea, and the District Court did not hold otherwise.

signal from which it is derived." (Appx0023, '472 Patent, 15:36-43.)[4]

Although the District Court recognized that the "abstract" is "a key term at issue in every asserted claim" (Appx0008-09), its characterization of the Patents-in-Suit as simply involving "comparing one thing to another" dismisses Blue Spike's abstract-based approach as irrelevant. If a patent's particular approach to signal comparison is irrelevant, then it is hard to know what advances in the field would be patentable.[5] All those advances would be characterizable as directed toward the abstract concept of "comparing one thing to another."

Once one rejects the conclusion that no innovation involving "comparing one thing to another" is patentable, then it is easy to see that the Patents-in-Suit are not directed toward an impermissibly abstract concept. This Court's cases rejecting patentability have generally involved patents that teach well-known, fundamental concepts.[6] But the Patents-in-Suit are

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[4] As described above, the specification provides a prose algorithm further detailing the creation of this Signal Abstract.

[5] This is why one might suspect that the District Court doubted that Blue Spike had in fact developed a new method of signal comparison. But that is an issue of whether the Patents-in-Suit adequately enabled the invention under § 112—not a question of whether such an invention would be patentable under § 101. *See infra* Part III.

[6] *See, e.g.*, buySAFE, Inc., 765 F.3d at 1355 (finding an abstract idea because the patents taught "long-familiar commercial transactions"); *Content Extraction and Transmission LLC v. Wells Fargo Bank, Nat. Ass'n*, 776 F.3d 1343, 1347 (Fed. Cir. 2014) (finding an abstract idea because the "concept of data collection, recognition, and storage is undisputedly well-

not directed toward any such concept. On the contrary, the Patents-in-Suit teach tangible improvements over the prior art methods for digital signal recognition. (*See, e.g.*, Appx0069, '175 Patent, 2:4-7, 6:63-66.) They teach the creation of a data-reduced representation of a digital signal (a Signal Abstract) that retains perceptual characteristics of that signal. (*See* Appx0069, '175 Patent, 3:65-4:1, 4:7-17, 10:10-19.) It was this inventive approach to digital signal processing and recognition that the USPTO deemed worthy of patent protection over hundreds of prior art references. Reducing a signal to an abstract for purposes of comparison is hardly comparable to hedging to reduce financial risk, *see Bilski*, 561 U.S. at 611 (2010), or the use of a financial intermediary to mitigate risk of nonperformance of an agreement, *see Alice*, 134 S.Ct. at 2356, that the Supreme Court held unpatentable in its leading cases.

Other cases have held patents invalid under § 101 where they merely purport to organize human activity.[7] Here, however, the Patents-in-Suit do not organize human activity, but rather teach a method

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known"); *OIP Technologies, Inc. v. Amazon.com, Inc.*, 788 F.3d 1359, 1364 (Fed. Cir. 2015) (finding an abstract idea because "the claims merely recite well-understood, routine, conventional data-gathering activities").

[7] *See Intell. Ventures I LLC v. Capital One Bank (USA)*, 792 F.3d 1363, 1367 (Fed. Cir. 2015) (finding an abstract idea because the patent was "not meaningfully different from the ideas found to be abstract in other cases before the Supreme Court and our court involving methods of organizing human activity"); *see also Content Extraction,* 776 F.3d at 1347 (indicating a specific area of potentially ineligible human activity as "claims directed to mere formation and manipulation of economic relations").

of creating a digital signal representation (the Signal Abstract) that facilitates complex digital signal comparisons. The Patents-in-Suit teach a 5-step prose algorithm, refer to a number of other algorithms, and provide a host of variations in the specification and claims for different needs (including greater matching accuracy through additive signals, encryption, and hashing). The Patents-inSuit apply a novel technology that improves the functioning of the computer itself by reducing the amount of data that needs to be analyzed (*e.g.* the reference Signal Abstracts) in order to perform the comparison, matching, and identification functions.[8]

This Court has provided guidance on claims "necessarily rooted in computer technology" such as those here. *See DDR Holdings*, 773 F.3d at 1257. Like *DDR Holdings*, Blue Spike's patents "do not merely recite the performance of some business practice known from the pre-Internet world along with the requirement to perform it on the internet." *Id.* Rather, in both *DDR Holdings* and the present case, "the claimed solution is necessarily rooted in computer technology in order to overcome a problem specifically arising in the realm of computer networks." *Id.* The asserted claims do not port business methods to a computer; they solve a real-world problem by generating a data-reduced Signal Abstract based on perceptual characteristics.

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8 *Compare Alice*, 134 S.Ct. at 2359 ("The method claims do not, for example, purport to improve the functioning of the computer itself or effect an improvement in any other technology or technical field.").

B. The District Court's Approach Inherently Tends Toward Over-Generalization of Patent Claims

Many legal tests require courts to select an appropriate level of generality at which to characterize phenomena, and that selection poses some of the most difficult problems in the law. No one asserts that the task *Alice* and *Mayo* set for the district courts is an easy one. But at least three aspects of the District Court's approach here tend to lead the inquiry astray. First, the District Court began with the wrong question: It asked whether the problem or task that the patent addressed was an abstract one, rather than whether the solution that the patents proposed was inherently abstract. Second, the District Court followed Northern District of California precedent directing courts to distill the "gist" of a patent in assessing its eligibility under § 101. This notion of a "gist" inherently presses courts toward a higher level of generality and thus inappropriately raises the bar for patentability under the Act. Finally, the District Court rendered its conclusions about the abstraction of the patents' claims without having conducted a hearing or considering evidence on claim construction. Given that the § 101 inquiry turned completely on the District Court's construction of the patents' claims, short-circuiting that process was bound to—and did—lead to error.

1. The Wrong Question

The Patents-in-Suit do not attempt to patent the concept of comparing one thing to another; rather, finding an efficient and practical means of comparing digital signals is the problem that the patents undertake to solve. The Patents-in-Suit claim one particular approach to that problem, employing a

Signal Abstract, and they point out the advantages of that approach over competing approaches (such as digital watermarking). The suitability of the claimed approach for patent protection must be the focus of the inquiry under § 101.[9] In *Bilski*, for example, the Court did not ask whether the problem of financial risk was impermissibly abstract; rather, it asked whether the generic hedging strategies claimed in the patent were an impermissibly abstract means of addressing that problem. *See* 561 U.S. at 611-12.

Problems will often be more general than the particular approaches to solving those problems. Hence, focusing on the problem rather than the patented solution biases the inquiry toward abstraction. But even if this were not true, it makes little sense to focus on problems rather than solutions. Blue Spike seeks patent protection for its digital abstracting technology, not for any alternative means by which one might undertake to compare digital signals. The question under § 101 is thus necessarily whether that abstracting approach is patentable subject matter.

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9 Blue Spike would further contend that, in any event, the District Court mischaracterized the problem that the Patents-in-Suit address. While that problem does involve comparison, the patent claims are specifically directed toward the engineering problem of finding an intermediate means of comparing audio signals between the less-satisfactory alternatives of comparing the entire signal or relying on an additional digital signature inserted in the signal (a watermark). That is hardly an abstract problem.

2. "The Gist."

The District Court's error may have been facilitated by Northern District of California precedent, which begins a Section 101 analysis by reducing a patent to its "gist." *See Open Text S.A. v. Box, Inc.*, 78 F.Supp.3d 1043, 1046 (N.D. Cal. 2015) ("In evaluating the first prong of the *Mayo/Alice* test, which looks to see if the claim in question is directed at an abstract idea, the Court distills the gist of the claim.").[10] In the present case, the District Court cited *Open Text S.A.* in concluding that "the Court must 'distill[] the gist of the claim[s].'" (Appx0006 (*quoting Open Text S.A.*, 78 F.Supp.3d at 1046).) The District Court has not provided guidance on how to derive this "gist," and in practice the instruction to boil patent claims down to a "gist" urges toward overgeneralization of patent claims.[11] Indeed, the *Open Text S.A.* opinion quoted with approval another district's conclusion that "[c]ourts should recite a claim's purpose at a reasonably high level of generality." 78 F.Supp.3d at 1047 (quoting *Enfish, LLC v.*

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[10] *See also GT Nexus, Inc. v. Inttra, Inc.*, 2015 WL 6747142, at *4 (N.D. Cal. Nov. 5, 2015); *IPLearn-Focus, LLC v. Microsoft Corp.*, 14-CV-00151-JD, 2015 WL 4192092, at *1 (N.D. Cal. July 10, 2015).

[11] In *Open Text S.A.*, the district court seems to have read the relevant precedents to direct courts to ignore limitations in the claims in order to distill a patent's "gist," specifically describing those limitations as irrelevant in its parenthetical descriptions of the cases. *See Open Text S.A.*, 78 F.Supp.3d at 1046.

Microsoft Corp., 56 F.Supp.3d 1167, 1173 (C.D. Cal. 2014)).[12]

The District Court was correct that this Court and the Supreme Court have described patents in general terms that by their very nature as summaries do not include all claim aspects. However, *Open Text S.A.* fails to note that each time this Court or the Supreme Court summarizes a patent, it glosses over additional limitations only if they (1) are not inventive, (2) are already described at a high level of generality, and/or (3) merely recite routine components. By seeking a general "gist" in <u>all</u> cases*, Open Text S.A.* inadvertently sanctioned the over-generalization of inventive steps such as, here, Blue Spike's Signal Abstract.

The District Court's over-simplification runs counter to this Court's approach in *Ultramercial*. In *Ultramercial*, this Court addressed the "abstract idea" inquiry by (1) noting that claim 1 of the '545 patent "includes eleven steps for displaying an advertisement in exchange for access to copyright media"; (2) summarizing the 11 claims "[w]ithout purporting to construe" them; and finally (3) noting that the "ordered combination of steps recites an abstraction—an idea, having no particular concrete or tangible form." *Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 714-15 (Fed. Cir. 2014). This Court then agreed with the lower court's summary. *See id.* at 714. Critically, however, that summary was not the <u>starting point</u> but rather the end point of this Court's careful analysis of the patent's specific claims.

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[12] Even the *Enfish* decision, however, did not endorse the District Court's approach here, which was to construe the patent claims at the <u>highest possible</u> level of generality.

Unlike *Ultramercial*, where no inventive steps were discarded in the summary, the District Court's holding here ignores the far-from-well-known process of creating a data-reduced, perceptually-based representation of a digital signal. It is imperative that courts refrain from summarizing a claim at a higher-level of generality that strips a claim of its inventive teachings.

3. Claim Construction

The District Court decided Google's § 101 Motion prior to holding any proceedings to resolve disputes about claim construction of the Patents-in-Suit. This Court has stated,

> claim construction is not an inviolable prerequisite to a validity determination under § 101. We note, however, that it will ordinarily be desirable—and often necessary—to resolve claim construction disputes prior to a § 101 analysis, for the determination of patent eligibility requires a full understanding of the basic character of the claimed subject matter.

Bancorp Servs., LLC v. Sun Life Assur. Co. of Canada (U.S.), 687 F.3d 1266, 1273-74 (Fed. Cir. 2012). This is one of those cases where claim construction was not only "desirable," but "necessary," prior to resolving the patents' eligibility under § 101. After all, the entire case came to turn on the District Court's extraordinarily broad interpretation of the patents' claims.[13]

[13] The necessity of a claim construction hearing in this case is illustrated by the District Court's confusion regarding the

Distilling a series of specific patent claims down to a "gist" is, for all practical purposes, a matter of claim construction. But it is a particularly inadequate substitute for actual claim construction, because it involves a largely impressionistic and indeterminate judgment conducted without the procedural safeguards that a prior hearing on claim construction would have afforded. A non-arbitrary process of distillation would require consideration not only of precisely what the patent does and does not claim, but also a comparison with prior art to determine what, if anything, is in fact new in the patent. Just as the "gist" of a precedential decision or an academic article is the new contribution that it makes to an evolving body of law or knowledge, the "gist" of a patent ought to be the new contribution that the patented innovation makes in its field. That determination would have required not only a hearing on claim construction, but possibly the development of arguments and evidence on novelty and enablement as well. In the absence of that sort of information, it is unsurprising that the District Court construed these patents at the highest possible level of generality.

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patents' teachings. (*See, e.g.*, Appx2765, Transcript at 27:7-9.) This confusion resulted in cursory findings such as determining the specification contained no algorithm. (Appx0004.) That finding is explicitly contradicted by the Eastern District of Texas court, which benefited from claim construction, expert evidence, and full briefing and held that "the specification provides an exemplary algorithm in prose." (Appx2034.) The Eastern District of Texas's rulings demonstrate that factual inquiries are often necessary to a § 101 analysis. Cf. DDR Holdings, 773 F.3d at 1257 (in which this Court benefited from a full record and reversed a § 101 holding of ineligibility for the first and only time.)

C. Patents Involving the Automation of Functions that May Be Performed by Humans Are Not Inherently Directed to Abstract Ideas

The District Court found the Patents-in-Suit invalid in large part because they "seek to 'model,' on a computer, 'the highly effective ability of humans to identify and recognize a signal.'" (*See* Appx0084, '728 Patent at 4:47-48.) By their own terms, therefore, the patents simply seek to cover a general purpose computer implementation of an abstract idea long undertaken within the human mind." (Appx0008.) There are at least two problems with this reasoning. First, if the patents' claimed method of improving signal identification by creating and employing a digital abstract is not itself impermissibly abstract (as argued above), then those claims would not be rendered abstract simply because they sought to replicate on a computer a process performed by humans. Second, the Patents-in-Suit do not simply replicate a process performed by humans.

The Supreme Court's "abstract idea" cases have frequently dealt with efforts to patent the implementation of human processes on a computer. As such, they have generated language suggesting that simply replicating ordinary human processes on a computer is not patentable subject matter. *See Alice*, 134 S.Ct. at 2357-58.[14] Generally, this issue has arisen at step two of the *Alice/Mayo* test. *See id.*; *Mayo*, 132 S.Ct. at 1301 (confirming that computer implementation of human processes is not inherently unpatentable at

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14 *See also Content Extraction,* 776 F.3d at 1347 (noting that an abstract idea is not made eligible merely because it is performed on a machine).

Step One). The District Court was thus wrong to suggest that the Patents-in-Suit were directed to an abstract idea because they "emphasiz[ed] the goal of modeling human capacity" on a computer (Appx0008) or because "[t]he method by which the claims contemplate enabling these comparisons mirrors the manner in which the human mind undertakes the same task. (Appx0009.) If Google patented a driverless car that replicated human driving skills, that patent would not be invalid under § 101 simply because it "mirrors the manner in which the human mind undertakes the same task."

Skepticism of patents claiming to computerize human processes in these cases has stemmed from the generic nature of the claims about computer implementation in the patents at issue. Hence, in *Alice*, the Court held that "the method claims, which merely require generic computer implementation, fail to transform that abstract idea [of intermediated settlement] into a patent-eligible invention." 134 S.Ct. at 2357. Likewise, this Court said in *Bancorp Services* that "[t]he use of a computer in an otherwise patent-ineligible process for no more than its most basic function—making calculations or computations—fails to circumvent the prohibition against patenting abstract ideas and mental processes." 687 F.3d at 1278. Both these cases suffered from two fatal defects: (1) the human process replicated was itself highly abstract, and (2) the claims regarding computer implementation were basic and generic. Neither is true in the present case.

The District Court was led astray by the Signal Abstract's ability to recognize human-perceptible characteristics. (*See* Appx0008 (noting the Patents-in-Suit are "intended to encompass computerized content comparisons based on human-perceptible characteristics.").) But the use of perceptual characteristics does not instantly classify an idea as abstract. If this were the case, Alexander Graham Bell's famous telephone patents—inventions that use a machine to recognize human-perceptible sounds—would not be considered eligible subject matter.[15] On the contrary, training a machine to perform human-like functions—when the computer is not innately organized to do so—is just the sort of concrete invention Section 101 was drafted to protect.

In any event, the Patents-in-Suit do not simply replicate human perception. Neither Google nor the District Court presented evidence that humans perform comparisons by reducing signals to data-reduced representations (nor is this factual dispute resolvable on a motion for judgment on the pleadings). And even if such evidence exists, the application of complex human ability on a machine is not "general purpose" or routine. *Compare Content Extraction,* 776 F.3d at 1347 (in which "general purpose" techniques include "data collection, recognition, and storage"). On the contrary, the Patents-in-Suit teach a concrete method of comparing digital signals by creating a data-reduced, perceptually-based, non-invertible representation (a Signal Abstract). Blue

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[15] *Cf. Bilski*, 561 U.S. at 620 n.2 (Stevens, J., concurring in the judgment) (citing for other purposes claim 5 of a telephone patent: "[t]he method of, and apparatus for, transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds . . . ." (citation omitted)).

Spike's expert demonstrated that the Patents-in-Suit improve upon prior art, which also relied on computer processing of signals. (Appx2306-7, Papakonstantinou Declaration at ¶ 17.) While the use of computer technology alone does not make an invention eligible, improving upon existing computer-based technology in data reduction and comparison does.[16]

II. THE PATENTS-IN-SUIT ADD INVENTIVE STEPS THAT PREVENT PREEMPTION OF ANY ABSTRACT CONCEPT

Even patent claims directed to an abstract concept can pass muster under § 101 if they add "an 'inventive concept'—*i.e.*, an element or combination of elements that is 'sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself.'" *Alice*, 134 S.Ct. at 2355 (quoting *Mayo*, 132 S.Ct. at 1294). Courts must "consider the elements of each claim both individually and 'as an ordered combination' to determine whether the additional elements 'transform the nature of the claim' into a patent-eligible application." *Id.* (quoting *Mayo*, 132 S.Ct. at 1298, 1297). The Supreme Court has made clear, however, that the ultimate question is "one of preemption"; by requiring that the patent add an inventive concept to the abstract idea, courts obtain "'practical assurance that the process is more than a drafting effort designed to monopolize the

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[16] It is worth noting that the process of expressing perceptual characteristics on a computer is by itself arguably <u>not</u> abstract because a computer is not innately capable of such representation without inventive programming. Expressing perceptual characteristics on a machine is not routine, compared to, for example, the data storage and retrieval in *Content Extraction.*

[abstract idea] itself.'" *Id.* at 2354, 2358 (quoting *Mayo*, 132 S.Ct. at 1297).

These concerns are more than satisfied here. The Patents-in-Suit obviously do not purport to preempt all technologies that involve "comparing one thing to another"—the abstract idea to which the District Court thought the patent claims were directed. Blue Spike has never asserted this degree of preemptive force, and even Google did not view the patents' claims so broadly.[17] Rather, the Patents-in-Suit claim only a particular method of comparison, involving creation of a signal abstract, and its applications within the field of digital signal comparison.

Several aspects of the Patents-in-Suit clarify the inventive concept that these patents embody. First, Blue Spike's patents overcome a particular technological obstacle in the field of digital signal comparison. Second, they do not provide for merely generic implementation on a computer but instead specify a particular and innovative task for the computer to perform. Third, the patents do not preempt a wide variety of other approaches to digital signal comparison, including advances and refinements to the dominant mode of comparison at the time the patents were filed involving digital watermarks. And fourth, the Patents-in-Suit satisfy the

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[17] Google contended that the "gist" of Blue Spikes' patents involved "comparing one signal to another using perceivable qualities of the signal." (Appx2119.) Although overbroad, this interpretation of the patents was limited to signal comparison and would not have preempted comparisons based on inserting imperceptible content, such as a digital watermark, in the original signal.

"machine or transformation" test, which, although not dispositive, remains a helpful indication of an inventive concept.

In assessing whether the Patents-in-Suit contained an inventive concept, the District Court seems to have equated the patentability of the subject matter with its novelty. This Court and the Supreme Court have made clear, however, that these issues are distinct; because Google moved for judgment solely under § 101, any novelty issues were not properly before the District Court. Moreover, novelty issues have a factual component which ought to have precluded their resolution at the pleading stage.

A. That Patents-in-Suit Overcome Technological Dilemmas

One clear instance of an inventive concept occurs where a patent applies an abstract principle in such a way as to overcome a recognized technological dilemma in its field. An example is *Diamond v. Diehr*, 450 U.S. 175 (1981), which upheld patent claims applying a well-known mathematical equation. As the Court explained in *Alice*, the *Diehr* patent used that equation "in a process designed to solve a technological problem in 'conventional industry practice.'" 134 S.Ct. at 2358 (quoting *Diehr*, 450 U.S. at 178).[18] Similarly, the Patents-in-Suit in the present case address known technological dilemmas in the digital signal processing field.

Prior to the Patents-in-Suit, digital signal identification relied heavily on modifying a digital

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18 *See also OIP Technologies*, 788 F.3d at 1364 (emphasizing this aspect of *Diehr*).

signal with a "separate and additional signal" such as a digital watermark. (*See, e.g.*, Appx0069, '175 Patent, 4:51-55.) These watermarks—themselves patentable inventions—had to be separately added to a signal before they could be used in identification, and comparison methods predicated on watermarks were useless for signals that did not contain them. Moreover, a digital watermark that is added to the signal can, in many circumstances, be removed without destroying the underlying signal—thereby facilitating illicit copying.

The Patents-in-Suit addressed these problems by introducing a method of "faster and more accurate auditing of signals." (Appx0069, '175 Patent, 7:4-10.) A Signal Abstract is derived from the underlying signal itself, and can thus be used to identify a signal without the aid of an additional signal, such as a watermark. Moreover, one cannot render the original signal undetectable by use of the Signal Abstract without damaging the signal itself; hence, the Signal Abstract provides more robust protection against illicit copying.

The Patents-in-Suit's ability to produce "faster and more accurate" results should not be confused with this Court's warning that "claiming the improved speed or efficiency inherent with applying the abstract idea on a computer" is not "a sufficient inventive concept." *Intell. Ventures I LLC v. Capital One Bank (USA)*, 792 F.3d 1363, 1367 (Fed. Cir. 2015). *Intellectual Ventures* states that claiming inherent improvement provided by a computer will not make an abstract idea patent-eligible. But Blue Spike's Patents-in-Suit are not claiming inherent improvements from computerizing the process of comparison; rather, they teach a new process of computerized comparison, based on the signal abstract, that solves problems with existing computerized comparisons based on digital watermarks. The signal abstract approach yields advantages not only in speed and efficiency but also accuracy,[19] and it works in contexts (like un-watermarked signals or signals from which the watermark has been removed) that existing technology cannot reach.

B. The Patents-in-Suit Utilize a Computer in a non-Routine Way

The *Alice/Mayo* line of cases has rightly rejected claims that generic computer implementation of an abstract concept is a sufficient inventive concept to sustain patentability under § 101. As we have already noted, *see supra* Part I.C, those cases involved patents that failed to limit their claims to a particular computerized approach.[20] The Patents-in-Suit here, however, teach the non-routine creation of a data-reduced representation of a digital signal (a Signal Abstract) that retains perceptual characteristics of that signal. Signal Abstracts are not merely "conventional computer activities or routine data-

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[19] The improved accuracy taught by the Patents-in-Suit is particularly important in some contexts such as biometric identification where false positives or negatives can have drastic consequences. (*See, e.g.*, Appx0052, '494 Patent 13:25-26; *see also* Appx0052, '494 Patent, Claims 6, 20 (not asserted in this litigation).)

[20] *See, e.g.*, *buySAFE*, 765 F.3d at 1352 (finding a patent ineligible because it "describe[d] a well-known, and widely understood concept" and the computer was "used merely for processing").

gathering steps." *See OIP Technologies, Inc.*, 788 F.3d at 1363 (citing *Alice*, 134 S.Ct. at 2359). Rather, the Patents-in-Suit teach complex representations of the original digital signal that are data reduced, non-invertible, and configured to retain perceptual relationships with the original signal.

This case would be analogous to the patents previously found ineligible if the Patents-in-Suit claimed the abstract concept of "comparing one thing to another" and then claimed simply to implement that comparison on a computer. But the Patents-in-Suit instead utilize a computer for complex calculations on a digital signal, the creation of a Signal Abstract, and the comparison of Signal Abstracts. These are not routine computer functions. They are different, moreover, from the leading approach at the time the patents were filed of using a computer to insert a digital watermark in an existing signal and then comparing signals based on the presence or absence of that additive watermark. Hence, the Patents-in-Suit "effect an improvement" in "other technology" and a "technical field" in a way that the patents in *buySAFE* did not. *See buySAFE*, 765 F.3d at 1354.

C. The Patents-in-Suit Do Not Preempt Invention

Even if the claims were directed to the abstract idea of "comparing one thing to another," (*see* Appx0008), it is hard to understand how the asserted claims of the Patents-in-Suit could be said to claim the "buildin[g] block[s] of human ingenuity," or otherwise "disproportionately [tie] up the use of the underlying ideas." *Alice*, 134 S.Ct. at 2354 (internal citations omitted). As discussed above, the asserted claims transform the abstract idea of comparing one thing to another to developing a specific system for automating comparison across digital platforms in order to facilitate further improvements over the art such as providing for an index of relatedness between two signals. Critically, the inventive concept of a Signal Abstract encompasses just one method for comparison of digital signals. The specification highlights other methods of comparison and identification of digital signals, including through the use of "text-based additive signals" and digital watermarking. (*See, e.g.*, Appx0023, '472 Patent, 4:50-56, 5:5-17.) In addition, the Patents-in-Suit cite hundreds of prior art patents and publications, which remain available to those in the art for the comparison of signals.

Moreover, there remain many more ways to compare digital signals. One approach would be a direct comparison, analyzing two binary files composed of 1s and 0s side-by-side on a bit-by-bit basis. One can imagine advances in computing power, for instance, that might render practical direct bit-by-bit comparison of large digital files, and the Patents-in-Suit would not preempt any such innovation. Rather, those patents offer a distinct, narrow approach of identifying perceptual characteristics and creating a data-reduced representation.

To the extent Google argues Blue Spike's Patents-in-Suit are preemptive because they are innovative or have applications to fields beyond digital signal identification, this is not an appropriate to the preemptive inquiry. Nothing in § 101 insists that inventions be of limited significance or have applications only within a narrow field. What is relevant is whether there are sufficient claim limitations to prevent the monopoly of an abstract idea. Even if the claimed approach based on digital signal abstracts could be used in another field, such as biometric identification, it would not preempt forms of comparison that did not rely on abstracting, such as comparison of the overall signal or insertion of a digital signature. Blue Spike's innovative Patents-in-Suit are sufficiently narrow and thus not preemptive.

Finally, the District Court rejected Blue Spike's argument that the Patents-in-Suit claim only a particular form of computer comparison by insisting that, "the claims are not limited to such complex activities, but also encompass more basic approaches." (Appx0011.) Hence, the court concluded that the claims "cover and preempt a wide range of comparisons that humans can and, indeed, have undertaken from time immemorial." *Id.* Blue Spike submits that to read the Patents-in-Suit as covering and preempting all forms of human comparison is to render them absurd. But the more basic point is that this sort of dispute, concerning the proper construction of Blue Spike's patent claims, should have been resolved through a hearing on claim construction. Such a proceeding would have permitted the patents to be read to have a reasonable scope, rather than destroying them by reading them to be absurdly broad.

D. The Patents-in-Suit Satisfy the Machine-or-Transformation Test

Another indicator that the Patents-in-Suit teach an inventive concept is that they satisfy the machine-or-transformation test. The Supreme Court recently held that "the machine-or-transformation test is not the sole test" for deciding patent eligibility because it might "deny[] patent protection for inventions in areas not contemplated by Congress." *Bilski*, 561 U.S. at 605 (citing *Diamond v. Chakrabarty*, 447 U.S. 303, 315 (1980)) (marks omitted). Nevertheless, the Court maintained that the "machine-or-transformation test is a useful and important clue, an investigative tool, for determining whether some claimed inventions are processes under § 101." *Id.* at 604. Blue Spike argued this test to the District Court (*see* A2293-94), but the District Court ignored it entirely. (Appx0001.)

One way for the machine-or-transformation test to be satisfied is if a claim is tied to a particular machine. *In re Bilski*, 545 F.3d 943, 961 (Fed. Cir. 2008) *aff'd but criticized sub nom. Bilski v. Kappos*, 130 S.Ct. 3218 (2010); *Gottschalk v. Benson*, 409 U.S. 63, 69-70 (1972). Many of the claims in the Patents-in-Suit satisfy this aspect. (*See, e.g.*, Appx0023, '472 Patent, Claim 11; Appx0038, '700 Patent, Claims 1, 10-12; Appx0052, '494 Patent, Claims 11, 15, 17, 29; Appx0069, '175 Patent, Claims 1, 8, 11, 12, 16, 17; Appx0084, '728 Patent, Claims 25, 26, 30.)

The machine-or-transformation test may also be satisfied if a claim "transforms a particular article into a different state or thing." *Ultramercial*, 772 F.3d at 716. The Signal Abstract—"a key term at issue in every asserted claim" (Appx0008-9)—satisfies this requirement. The Signal Abstract is created by transforming a digital signal into a different thing—a data-reduced representation that is non-invertible while retaining perceptual characteristics of the original signal. (*See, e.g.*, Appx0084, '728 Patent, 15:23-27.)

The machine-or-transformation test makes clear that the Patents-in-Suit claim more than simply the abstract concept of "comparing one thing to another." Blue Spike's patents teach a particular approach to a particular problem—a particular method of comparison based on reducing a digital signal to a particular form that facilitates efficient and accurate analysis. That is sufficient to satisfy § 101.

E. The District Court Inappropriately Conflated Whether the Claims Contain an Inventive Concept with Whether the Individual Claim Limitations Are Novel

In finding that the Patents-in-Suit lacked an inventive concept, the District Court reasoned that such a concept must necessarily represent a novel improvement over prior art, and the Patents-in-Suit lacked such a concept.[21] Any such conclusion would be incorrect, as the Patents-in-Suit extensively discuss how the patents improve on prior art. But the District Court's approach was also legal error for two distinct reasons. First, this Court and the Supreme

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21 (*see, e.g.*, Appx0012 ("The claims do not discuss a novel cryptographic method . . . . Thus, the inclusion of this limitation does not constitute an inventive concept."); Appx0013 ("watermarking . . . was in the prior art, and its inclusion here does not constitute an inventive step"); Appx0013 ("The patents do not explain a novel method for generating hashes or digital signatures—they merely call for the use of these conventional cryptographic methods."); Appx0016 ("This approach falls squarely within the prior art and/or the abstract concept discussed above, and introduces no inventive concept.").)

Court have repeatedly insisted that § 101's requirements for patentable subject matter and § 102's requirement of novelty are analytically distinct. Second, conflating the two is particularly inappropriate in the present context of a motion for judgment on the pleadings. That is because novelty under § 102 inevitably incorporates factual issues concerning the state of the prior art and what a person reasonably skilled in that art would conceive as an improvement. Those issues cannot be resolved on the pleadings alone. By importing its novelty concerns into the § 101 analysis, the District Court deprived Blue Spike of its right to present evidence on the novelty questions.

1. Patentable Subject Matter and Novelty Are Conceptually Distinct

Although the Supreme Court has recognized that "in evaluating the significance of additional steps, the § 101 patent eligibility inquiry, and say, the § 102 novelty inquiry might sometimes overlap," it has also clearly established "that need not always be so." *Mayo*, 132 S.Ct. at 1303-04. Logically, the two requirements are quite different. Patentability is a permanent aspect of an invention, while novelty is a function of the state of the art at a particular time. The claims in a patent granted a century ago surely would no longer be novel, but that would not mean that the patent did not involve patentable subject matter.

Every innovation entitled to patent protection since the beginning of the United States patent system has relied on the building blocks of the technologies that came before it. *See KSR Intern. Co.*

v. Teleflex Inc., 550 U.S. 398, 418 (2007) ("[I]nventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known."). Any claims directed toward patentable subject matter, of course, must also satisfy § 102's novelty requirement; however, it has never been the case that individual claim limitations must themselves meet the stringent requirements of § 102. Such a position runs counter to the requirement that claims must be analyzed as a whole rather than individually. *See Diehr*, 450 U.S. at 188. Thus, it was error for the District Court to conflate patent-eligibility under Section 101 with the more-stringent patentability requirements under Sections 102, 103, and 112. This conflation confused the applicable standard and turned an otherwise threshold inquiry of patentability into an unduly high hurdle. *See, e.g.*, *Diehr*, 450 U.S. at 190 ("The question therefore of whether a particular invention is novel is wholly apart from whether the invention falls into a category of statutory subject matter." (internal quotation omitted)).

2. Novelty Considerations Have a Factual Component and Are Not Properly Addressed on a Motion for Judgment on the Pleadings

Novelty is a function not simply of the patent claims, but of the relationship between those claims and the prior art existing at a particular point in time. As such, novelty cannot be determined strictly by looking at the terms of the patent; rather, the court must consider evidence concerning the state of the prior art and the contribution that the patent makes to that art. Thus, novelty cannot be evaluated in the context of a Rule 12(c) motion for judgment on the pleadings. By importing novelty considerations into its consideration of patentability under § 101, the District Court inappropriately resolved factual disputes about the prior art.

In support of its motion, Google invited the District Court to make determinations about what were well-understood activities in the prior art even though these determinations cannot have been made on the pleadings alone. (*See* Appx2765, Transcript at 27:7-9 ("There's no description of what it means to be a cryptographic technique because it is a well-understood practice in the art.").) Whether the cryptographic techniques involved in Blue Spike's patents were well-understood, routine, or conventional activities at the relevant time (the date of filing) is a fact-intensive and disputed question. Its resolution would require underlying determinations of at least (1) the level of skill of a person having ordinary skill in the art, (2) factual determinations about what techniques were not merely known but also "conventional," and (3) how a person having ordinary skill in the art at the time of filing would have understood the terms of the asserted claims.

Blue Spike submits that, even if it were permissible to look beyond the pleadings on a Rule 12(c) motion, the record did not contain sufficient facts to resolve the disputed novelty issues. Google bore the burden to establish that the claim limitations and technologies encompassed by the Patents-in-Suit were well-understood and conventional, and the District Court was obliged to resolve any factual ambiguities in Blue Spike's favor. Even if it had been appropriate to introduce issues of novelty into the

§ 101 determination, then, the District Court could not validly have resolved those issues in the way that it did.

For example, regarding the "cryptographic protocol" claim limitation of Claim 10 of the '700 Patent, the District Court opined without discussion or analysis that, "The claims do not discuss a novel cryptographic method, but merely contemplate '"well-understood, routine, conventional activity."' (Appx-00012.) Whether the cryptographic protocol contemplated by the claimed invention is novel and to what extent it would have been considered well-understood, routine, and conventional activity to a heretofore undefined person having ordinary skill in the art is a highly factual question. Thus, the District Court erred in finding that this claim limitation could not have supplied the inventive concept with respect to this asserted claim.

3. An inventive Concept Can Exist Even Though it Takes Into Account Methods and Techniques Known in the Prior Art

In rejecting all remaining claim limitations of the asserted claims, the District Court's analysis focused on the presence of conventional and routine computing methods. (*See, e.g.*, Appx0010 (discussing use of "general purpose computer components"); Appx0012 (reasoning use of a cryptographic protocol is "well-understood, routine, conventional activity).) However, the Court construed conventional and routine activity as methods and techniques known in the prior art, adopting Google's argument that because the patentee did not invent the individual claim limitations, they were ineligible to form the inventive concept of the asserted claims.[22] Further, in conflating the novelty requirements with the search for an inventive concept under step two of the *Alice/Mayo* inquiry, the District Court ignored the rule that non-novel claim limitations—individually and/or as an ordered combination—may nonetheless form the basis for an inventive concept.

In *Diehr*, the Supreme Court expressly rejected the "point of novelty" approach the District Court applied here. The Court stated that, in "determining the eligibility of [the patentees'] claimed process for patent protection under § 101, their claims must be considered as a whole." 450 U.S. at 188. "It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis." *Id.* The Court explained that "[t]he 'novelty' of any element or steps in a process . . . is of no relevance in determining whether the subject matter of a claim falls within the § 101 categories of possibly patentable subject matter." *Id.* at 188-89 (emphasis added). The District Court here did precisely what *Diehr* prohibits—it dissected the claims "into old and new elements" and focused solely

22 At the hearing on Google's § 101 Motion, Google argued that prior art methods—those not invented by the patentees—cannot serve as the basis for an inventive concept and invited the District Court to find that "well understood and conventional" is synonymous with prior art. (*See* Appx2764, Transcript at 26:14-18 ("So I want to go through the particular limitations that are raised and show where those things either have been held to be or are admitted to be essentially well understood routine and conventional—*i.e.*, practiced by others and not invented by the patent—the inventors."); Appx2767, Transcript at 29:9-12 ("They certainly don't say that they're inventing spectral transforms.").)

on the "point of novelty" in determining whether the claims' subject matter is patent-eligible in the first instance.

The District Court also fatally misconstrued the scope of the "conventional activity" exclusion. *Mayo* explains that "well-understood, routine, conventional activity" may not suffice to "transform an unpatentable law of nature into a patent-eligible application of such a law." 132 S.Ct. at 1298. The District Court, however, interpreted that to mean that <u>any step with a basis in the prior art</u> must be disregarded. (*See* Appx0011-18.) As one judge noted in criticizing another district court opinion containing similar reasoning, "neither *Mayo* nor any other precedent defines conventional elements to include <u>everything</u> found in prior art." *Cal. Institute of Tech. v. Hughes Communications Inc.*, 59 F.Supp.3d 974, 989 (C.D. Cal. 2014).

F. The District Court Erred by Failing to Assess the Claims as a Whole

In assessing the dependent claims of the Patents-in-Suit, the District Court failed to consider the dependent claim elements individually and "as an ordered combination." *Alice*, 134 S.Ct. at 2359. Unlike the Court's analysis in *Alice*, here, the District Court only conducted a cursory analysis of the individual claim limitations (which suffer from other defects as outlined above), failing to consider whether the claim limitations in concert reveal an inventive concept. In *Alice*, the Court opined that the generic computer components of the claimed method "ad[d] nothing . . . that is not already present when the steps are considered separately," and when viewed as a whole, the claimed method "amount to 'nothing significantly more' than an instruction to apply the abstract idea of intermediated settlement using some unspecified, generic computer." *Alice*, 134 S.Ct. at 2359-60 (citing *Mayo*, 132 S.Ct. at 1298). *Alice* makes clear that courts must view claim limitations together in search of an inventive concept.[23]

The District Court's analysis of the dependent claims was limited to assessing the claims in isolation, looking only to whether the dependent claims standing along contained an "inventive concept." This analysis was faulty because the District Court failed to consider whether the claim limitations as an ordered combination reveal an inventive concept. *See Digitech Image Techs, LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344, 1350 (Fed. Cir. 2014) (noting that "[i]n determining whether a process claim recites an abstract idea, we must examine the claim as a whole"). Claim 10 of the '700 Patent illustrates the importance of examining claims as a whole. The District Court considered Claim 10's reference to a digital signature or hash as routine, but it failed to consider whether a digital signature or hash in combination with a Signal Abstract might itself be inventive. Claim 10 combines the benefits of a Signal Abstract such as "massive data reduction" with "cryptographic techniques," such as a hash or digital signature "to further add accuracy and confidence in the system." (Appx0038, '700 Patent,

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[23] *See also Diehr*, 450 U.S. at 188 ("In determining the eligibility of respondents' claimed process for patent protection under § 101, their claims must be considered as a whole. It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis.").

10:39-49.) Even if the cryptographic method contemplated in Claim 10 were routine by itself, its combination with the Signal Abstract is an inventive concept. The District Court erred by failing to analyze the claims, including Claim 10, as a whole.

III. THE DISTRICT COURT IMPROPERLY IMPORTED CONCERNS ABOUT NOVELTY, NON-OBVIOUSNESS, AND DESCRIPTIVE ENABLEMENT INTO THE § 101 INQUIRY

The Supreme Court noted in *Bilski* that "[t]he § 101 patent-eligibility inquiry is only a threshold test"; even if that test is satisfied, "the claimed invention must also satisfy 'the conditions and requirements of this title,'" including "that the invention be novel, *see* § 102, nonobvious, *see* § 103, and fully and particularly described, *see* § 112." 561 U.S. at 602 (quoting 35 U.S.C. § 101). The District Court in this case plainly harbored doubts about not only the novelty of Blue Spike's technology, but also these additional requirements. In particular, it expressed doubt concerning whether the Patents-in-Suit adequately specified and enabled the actual invention. (*See* Appx2757, Transcript at 19:8-12 ("I'm asking you to explain the patent. Does it do anything other than tell the reader to identify something that a human perceives and compare it to something else through the use of a computer? Does it do anything other than that?"); Appx2774, 36:21-22 ("This patent doesn't disclose or teach those compression techniques."); Appx2775, 37:4-10 ("[W]hy would I have an entire case be litigated where on the face of the patent, there's nothing there?").) Google did not move for judgment on these grounds, however—nor could it have, as these issues, like novelty, are fact-intensive and disputed, and thus could not be resolved in a judgment on the pleadings. Instead, Google's claim that Blue Spike had not actually invented anything infected the District Court's analysis of patent eligibility under § 101.

This was error. As Justice Stevens noted in *Bilski*, "claim specification is covered by § 112, not § 101; and if a series of steps constituted an unpatentable idea merely because it was described without sufficient specificity, the Court could be calling into question some of our own prior decisions." 561 U.S. at 620 (Stevens, J., concurring in the judgment). By making factual judgments relating to the § 112 issues as part of its § 101 analysis, the District Court violated the narrow parameters of Rule 12(c).

The Supreme Court has not addressed the propriety of resolving a § 101 eligibility challenge at the pleading stage. *Alice* and *Mayo* were both summary judgment cases, *see Alice*, 134 S.Ct. at 2353; *Mayo*, 132 S.Ct. at 1296, and *Bilski* was an appeal from the USPTO's denial of a patent application, *see* 561 U.S. at 599-600. It is unclear how any district court can determine the boundary between non-inventive claim limitations and claim limitations, which confer patent-eligibility without reliance on extrinsic evidence. But this Court need not categorically resolve this issue in the present case. Whether or not courts may resolve eligibility issues on the pleadings in some cases, they plainly may not do so where eligibility does in fact turn on materials outside the pleadings or on disputed matters of fact. *See Chavez v. United States*, 683 F.3d 1102, 1108 (9th Cir. 2012) (observing that, on a motion for judgment on the pleadings, "[a] court generally cannot consider material outside of the complaint (*e.g.*, facts presented in briefs, affidavits or discovery materials)"). The District Court here was thus obligated either to confine its analysis to the pleadings or to deny Google's motion.

Nonetheless, the District Court here looked at practices, customs, and conventions outside of anything alleged in the complaint or the Patents-inSuit. The pleadings and Patents-in-Suit include insufficient facts to have determined, for example, that hashes and digital signatures are "conventional cryptographic methods." (Appx0013.) Google's motion extensively discussed § 112 issues, and these improperly raised concerns seem to have infiltrated the District Court's opinion of the asserted claims. During oral argument, the district judge repeatedly cast doubt on the merit of the claimed inventions, not through the lens of subject-matter eligibility but rather through the apparent lens of enablement. When discussing the parallels between the asserted claims and artificial intelligence, which seeks to model human behavior, the District Court judge stated, "Well, in that context, haven't . . . scientists actually generated the method by which the perceptions you're seeking to compare could actually be digitized, which you in this patent certainly do not do. . . . I mean, I don't . . . understand how you can compare what this patent seeks to achieve with something as complicated as this given that all you're saying is take what everybody else has done and compare them." (Appx2774, Transcript at 36:3-10.) Statements like this reflect a qualitative judgment about whether the asserted claims are sufficiently enabled and otherwise meet the requirements of § 112.

Ultimately, the District Court ignored a number of claim limitations containing an inventive concept because, in its estimation, they failed to meet the requirements of § 112. Regarding claim 26 of the '728 Patent, the court opined that "the patent does nothing to teach a person having ordinary skill in the art how to perform a spectral transform," and concluded that spectral transforms must "be well understood at the time the patent was filed." (*See* Appx0018.) This reasoning relies on a factual determination of who a person having ordinary skill in the art is and whether spectral transforms were well understood at the time the patents were filed.[24]

The requirements of § 112 should be and are irrelevant to the § 101 analysis. Title 35 sets the § 112 written description and enablement requirements for patentability "wholly apart from whether the invention falls into a category of statutory subject matter." *Diehr*, 450 U.S. at 190. As former Chief Judge Rader noted, "the 'coarse eligibility filter' of § 101 should not be used to invalidate patents based on concerns about vagueness, indefinite disclosure, or lack of enablement, as these infirmities are expressly addressed by § 112." *Ultramercial, LLC v. Hulu, LLC*, 657 F.3d 1323, 1329 (Fed. Cir. 2011), *cert. granted, judgment vacated sub nom. WildTangent, Inc. v.*

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[24] The District Court further ignored the possibility that technological solutions known in the prior art may nonetheless not qualify as routine, conventional, or even well-understood by a person having ordinary skill in the art at the date of filing.

Ultramercial, LLC, 132 S.Ct. 2431 (2012).[25] The proper course would have been to deny the Rule 12(c) motion on eligibility and litigate the § 112 issues on summary judgment or at trial. Because the District Court failed to do this, its decision should be reversed and remanded for further development and decision of these disputed factual matters.

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25 *See also Research Corp. Techs., Inc. v. Microsoft Corp.*, 627 F.3d 859, 869 (Fed. Cir. 2010) ("In section 112, the Patent Act provides powerful tools to weed out claims that may present a vague or indefinite disclosure of the invention.").

CONCLUSION

The District Court's judgment should be reversed.

Respectfully submitted,

/s/ Randall T. Garteiser

Randall T. Garteiser
Christopher A. Honea
GARTEISER HONEA, P.C.
119 West Ferguson Street
Tyler, Texas 75702
(415) 568-0553

Attorneys for Plaintiff-Appellant
Blue Spike, LLC

Date: January 6, 2016

BRIEF OF APPELLEE GOOGLE INC. (MARCH 28, 2016)

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

BLUE SPIKE, LLC,

Plaintiff–Appellant,

v.

GOOGLE INC.,

Defendant–Appellee.

No. 2016-1054

Appeal from the United States District Court for the Northern District of California in No. 4:14-cv-01650-YGR, Judge Yvonne Gonzalez Rogers.

Nicholas H. Lee
ARNOLD & PORTER LLP
777 S. Figueroa Street
44th Floor
Los Angeles, California 90017
Telephone: (213) 243-4000
Facsimile: (213) 243-4199
nicholas.lee@aporter.com

Michael A. Berta
Counsel of Record
ARNOLD & PORTER LLP
Three Embarcadero Center
10th Floor
San Francisco, California 94111
Telephone: (415) 471-3100
Facsimile: (415) 471-3400
michael.berta@aporter.com

Counsel for Appellee Google Inc.

{ TABLES AND APPENDICES OMITTED }

COUNTER-STATEMENT OF RELATED CASES

There has been no other appeal in or from the same civil action in this or any other appellate court. Google disagrees with the Statement of Related Cases provided by Blue Spike in the following respects.

Two cases in the *Northern District of California, Blue Spike, LLC v. Gracenote Inc. et al.*, Case No. 4:15-cv-01494 (N.D. Cal.) and *Blue Spike, LLC v. Facebook, Inc.*, Case No. 4:15-cv-04185 (N.D. Cal.), have been related to the Google action and are stayed pending resolution of this appeal.

Of the three actions identified by Blue Spike in the Eastern District of Texas, only one is stayed: *Blue Spike, LLC v. Miranda Tech., Inc. et al.*, Case No. 6:14- cv-00598 (E.D. Tex.) (stayed pending resolution of this appeal); *Blue Spike, LLC v. Audible Magic Corp. et al.*, Case No. 6:15-cv-00584 (E.D. Tex.) (not stayed); *Blue Spike, LLC v. WiOffer, LLC et al.*, Case No. 6:15-cv-00585 (E.D. Tex.) (not stayed).

These cases may be directly affected by this Court's decision.

JURISDICTIONAL STATEMENT

Google agrees with the jurisdictional statement of Blue Spike.

COUNTER-STATEMENT OF THE ISSUES

Whether the District Court correctly held that the Asserted Claims are patent-ineligible under 35 U.S.C. § 101 because they (i) are directed to an abstract idea and (ii) do not contain any inventive concept.

COUNTER-STATEMENT OF THE CASE

I. Introduction

It is fundamental to our patent laws that '[a]n idea of itself is not patentable.'" *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972) (quoting *Rubber-Tip Pencil Co. v. Howard*, 87 U.S. (20 Wall.) 498, 507 (1874)). This rule has no less force and application in today's digital age; taking a bare idea and moving it to a computer environment does not make it patentable. *See, e.g., Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S.Ct. 2347 (2014) ("*Alice*").

Here, the Asserted Claims seek to monopolize the idea of comparing works, such as songs or images or videos, by using the features of those works that humans would perceive and use to differentiate between them, such as subject matter or melody. The Asserted Claims say, in essence, 'do this, but on a computer'; they recite using an "abstract" of the content that is intended to digitally mimic how humans perform the same comparisons in the real world.

Given that this "abstract" is the alleged "key" to the invention (Br. at 6), one would expect the Patents to disclose technical details necessary to generate this "abstract" and use it for comparisons. They do not. The specification and Asserted Claims refer to the "abstract" in aspirational terms only—identifying what it should do (*e.g.*, an abstract should retain what is "humanly-perceptible" so that it "successfully mimics human perception") but not how to do it. Essentially, the Patents seek to claim for themselves any and all ways to perform the same comparison humans would do, but on a computer. In short, the "abstract" itself is nothing more than an abstract idea under *Alice* and under this Court's precedent.

This simply is not a case where a patent-ineligibility finding for these Asserted Claims threatens <u>every</u> patent—like those for self-driving cars—or increases the risk that <u>all</u> patents will be construed at such a high level of generality that they, too, will be found to be abstract ideas and invalidated. (*Contra* Br. at 2-3, 12, 31, 56.) After considering the briefing and giving Blue Spike every opportunity to answer "a very open-ended question" and explain what the Patents do (Appx2755:13-Appx2759:10), the District Court determined that the concept of the Asserted Claims is directed to an abstract idea, and the specification does not identify "the specifics of implementation—it includes no source code, detailed algorithms or formulas, or the like." (Appx0004.) The other claim limitations "merely discuss using routine computer components and methods" for an otherwise abstract concept. (Appx0010.) These Patents claim nothing more than a naked idea, executed on conventional computer components, and are invalid under § 101.

II. The Patents and Asserted Claims

A. The Patents Perform Basic Signal Comparisons Using Generic Computer Components

Blue Spike asserts five Patents against Google, each entitled "Method and Device for Monitoring and Analyzing Signals." (Appx0023.[1]) These Patents purport

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[1] Unless noted, Google cites to the '472 patent specification, the earliest of the Patents. (Appx0023.) The others are

to cover methods and apparatus for the same process that humans have been performing since the dawn of time—comparing two or more works based on the content of those works—but implemented using generic computer components. (Appx0027(1:56-59), Appx0028(4:42-43, 4:56-59).) Blue Spike contends that the "key" to the computerized comparisons is the claimed "abstract" (Br. at 6; Appx0335 ¶ 11), which is admittedly based solely on human-observable characteristics of the content itself. (Appx0338-39 ¶ 21; *see* Counter-Statement of the Case, Section II.B, *infra*.)

The Abstract and Summary of the Invention of the Patents recite (i) a reference signal, (ii) creating and storing an "abstract" for the reference signal, (iii) receiving a query signal, (iv) creating an "abstract" for the query signal, and (v) comparing the "abstract" of the query signal to the stored "abstract(s)" of the reference signal(s) to determine if they match. (Appx0023(Abstract), Appx00027-8(2:64-3:47).) Claim 1 of the '472 patent, which the District Court found to be representative for purposes of § 101 (Appx0002), recites the same:[2]

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continuations and share the same specification. (Appx0038, Appx0052, Appx0069, Appx0084.)

[2] In the proceedings below, Google submitted that the independent claims are not meaningfully distinguishable from one another for purposes of § 101. (Appx2195-97 & notes (providing citations to the limitations of other independent claims that correspond to those of '472 claim 1).) Blue Spike never identified any material differences in response, but contended at the hearing that "specific limitations" for a handful of Asserted Claims should be considered for part two of the *Alice/Mayo* framework. (Appx2746:3-8; Appx2277-78 & n.2, Appx2289.) Google addresses these alleged differences below,

A method for monitoring and analyzing at least one signal comprising:

receiving at least one reference signal to be monitored;

creating an abstract of said at least one reference signal wherein the step of creating an abstract of said at least one reference signal comprises:

inputting the reference signal to a processor;

creating an abstract of the reference signal using perceptual qualities of the reference signal such that the abstract retains a perceptual relationship to the reference signal from which it is derived;

storing the abstract of said at least one reference signal in a reference database; receiving at least one query signal to be analyzed;

creating an abstract of said at least one query signal wherein the step of creating an abstract of said at least one query signal comprises:

inputting the at least one query signal to the processor;

creating an abstract of the at least one query signal using perceptual qualities of the at least one query signal such

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but submits that '472 claim 1 is representative for at least part one of the test.

> that the abstract retains a perceptual relationship to the at least one query signal from which it is derived; and comparing the abstract of said at least one query signal to the abstract of said at least one reference signal to determine if the abstract of said at least one query signal matches the abstract of said at feast [sic] one reference signal.

(Appx0034(claim 1).) Method claim 1 recites nothing more than the generic idea of comparing one signal to another signal for virtually any purpose or application, and the aspirational idea of creating some unspecified type of "abstract" by an unidentified mechanism that uses any humanly-observable "perceptual qualities" of the signal. It says to do all of this using only generic computer components. The independent system claims fare no better, reciting additional generic computer components (*e.g.*, processor, input, receiver, database, comparing device, counter) to practice the same idea of comparing. (*See, e.g.*, Appx0049(claim 1).)

The dependent claims are directed generally to creating the "abstract" (Appx0034('472 claim 2); Appx0049('700 claim 21); Appx0066('494 claims 15, 17); Appx0083('175 claim 16); Appx0099('728 claims 5, 26)); creating a second "abstract" for the signal (Appx0099('728 claim 4)); further processing the "abstract" using techniques in the prior art (Appx0049 ('700 claims 10, 11)); "comparing" and "matching" (Appx0034('472 claim 4); Appx0083('175 claim 12); Appx0099('728 claim 16)); embedding information into the signal itself (Appx0049('700 claim 12)); or other activity that is common in computer environments such as authorizing or distributing (Appx0049('700 claims 27, 51)). none of these limitations adds anything inventive. (*See* Argument, Section II.B.2, *infra*.)

B. The Patents Describe an Aspirational "Abstract" To Mimic Everyday Human Activity

The District Court held, and Blue Spike admits, that the Patents attempt "to model the processes of the highly effective ability of humans to identify and recognize a signal" (Appx0008; Br. at 9; Appx0028(4:32-41)) by creating an "abstract" for the signal. The specification explains, in theory, that the "abstract" should capture qualities of the signal's content that humans perceive and utilize to differentiate one work from another:

- Signal should be compressed "to its essence" but "preserve some underlying 'aesthetic quality'" (Appx0030 (7:3-7));
- "Abstract" should "retain what is 'humanly-perceptible'" so that it "successfully mimics human perception" (*id.* (7:34-40));
- "Abstract" should identify perceptual differences to distinguish between different artists' recordings of the same song (*id.* (7:14-20); *id.* (8:24-27) (also has "obvious application" to visual works like images, trademarks, photos and video));
- Database should be recalibrated if it fails to recognize different versions of a song, *e.g.*, an artist's performances that are similar but not identical (Appx0032 (11:13-23));

- Invention should capture "humanly-perceptible observation" and "experience based criteria," *e.g.*, to differentiate between a "complete song" and "short 3 second segment" used for commercials (*id.* (11:31-45));
- Invention should recognize and distinguish "perceptual differences" such as those that "exist between a song and its reproduction from a CD, an AM radio, and an Internet broadcast" if listeners would recognize a difference (Appx0033 (13:13-22)); and
- Invention must "preserve those perceptual qualities that permit a human to recognize the original visual image" (*id.* (14:58-61)).

(*See also* Appx1495 ¶ 23 ("signal abstracting" is based "solely on the perceptual characteristics of the material itself").)

The specification states that because the "abstract" retains humanly-perceptible qualities of the original signal, comparing one "abstract" to another will replicate activities "performed by actual persons." (Appx0033 (13:54-14:2).) In one embodiment, the invention is explained by analogy to finding paintings of sunsets or sunrises. (Appx0033-34 (14:56-15:11).) A person could look at a painting, observe its subject (*e.g.*, sunsets) and characteristics (*e.g.*, color, position of the sun, artistic technique) and then use this information to locate similar paintings in physical archives or digital repositories. Or, another approach "might involve a textual search [of] a database wherein the [paintings] have been described in writing." (*Id.*) The specification explains that the invention contemplates (without explaining exactly how) scanning an image "involving the sun," compressing the data to "those perceptual characteristics related to the sun" and finding matches in a database. (*Id.*) Similarly, the specification states that the invention could be used to identify songs or the number of times they are played on a radio station or Internet streaming site. (Appx0033(13:31-38, 13:54-14:2).) The specification does not provide any specific mechanism by which to accomplish this goal; instead, it generically refers to the concepts of "compression" and "data-reduction" and analogizes the invention to the human task it is supposed to mimic: "traditional analysis is performed by actual persons who use play lists . . . " or by simply listening to the radio or Internet stream. (*Id.* ("through manual (*i.e.*, by persons) monitoring").)

Apart from these aspirational goals of what the "abstract" should do and how it might be used, the specification contains no technical detail or instruction of how to go about creating such an "abstract." There is no drawing, no figure, no schematic and no algorithm. (*See* Appx00023 *et seq.*) The specification describes the "abstract" only in terms of its hoped-for function, as illustrated by the following passage:

> The ability to <u>massively compress a signal to its essence</u>—which is not strictly equivalent to "lossy" or "lossless" compression schemes or perceptual coding techniques, but designed to <u>preserve some underlying "aesthetic quality</u>" of the signal —represents a useful means for signal analysis in a wide variety of applications. The signal analysis, however, <u>must maintain the ability</u>

> <u>to distinguish the perceptual quality of the signals being compared</u>.

(Appx0030 (7:3-11).) The specification suggests that existing technology may be relevant to achieving these stated goals, but never quite explains exactly how the "abstract" is created. (Appx0028(4:8-22), Appx0029 (7:3-7) (prior art compression schemes are not "strictly equivalent" to invention); Appx0030 (7:40-43) (existing compressive techniques may have "some relevance . . . [but] additional data reduction or massive compression is anticipated" and dependent on application); Appx0031(10:50-55) (after "abstract" is created, additional hash, signature or cryptographic technique may be used); *see also* Br. at 21, 33 (Blue Spike contends that the Patents teach tangible improvements over the prior art, but only points to statements in the specification that make the assertion as its support for the assertion).)

Fundamentally, the specification's description of an "abstract" (*i.e.*, a reduced version of the signal that retains humanly-perceptible qualities of the underlying signal) is nothing more than a broad, open-ended theoretical concept, waiting for future innovation and for someone else to figure out how to implement it.[3]

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[3] Blue Spike attempts to capitalize upon these conceptual recitations of the "abstract" by interpreting the Patents broadly to cover and preempt virtually every conceivable application for which "comparing" one thing to another might be useful (*e.g.*, piracy, biometric identification, security, authorization systems, market/consumer intelligence). Blue Spike has asserted these Patents against defendants whose businesses concern wide-ranging content (*e.g.*, songs, videos, photos, TV shows, video games, human fingerprints, optics, facial features) and platforms

III. The Proceedings Below

A. Blue Spike's Assertion of the Patents

Blue Spike began a litigation campaign against Google and others in the Eastern District of Texas in August 2012, just days after it obtained ownership of the Patents from a related entity, Blue Spike Inc. (Appx0117 at Dkt. 1; Appx2130 ¶ 4; Appx2136.) It filed a complaint against Google on August 22, 2012 in Case No. 6:12-cv-00558, asserting that Google infringed the '472, '700, '494 and '175 patents. (Appx0106.) The court consolidated the Google action with more than eighty-five other cases into Case No. 6:12-cv-00499 (Appx0118-19, Appx0162-63), and Blue Spike later filed more cases in the same district. Several remain pending in Texas and California, but as of May 2015, Blue Spike had voluntarily dismissed or settled at least eighty. (Counter-Statement of Related Cases, *supra*; Appx2130 ¶ 2.)

The Texas court severed the *Google* action from the others on March 13, 2014 when it granted Google's motion to transfer venue. (Appx0174, Appx0235.) This case transferred to the Northern District of California on April 10, 2014 (Appx0108), well prior to claim construction or summary judgment in Texas. (Br. at 4-5.) Google took no part in those proceedings.

Following transfer of the *Google* action and several others to California, the District Court related the cases (Appx0109), then held a scheduling conference on July 28, 2014. (Appx0110.) At the

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(*e.g.*, radio, television, Internet, mobile devices, smartphones, tablets). (Appx1494 ¶ 22; Appx1495-96 ¶¶ 24-26.)

hearing, counsel for Google and Adobe informed the Court of their clients' assertions that the Patents were invalid under § 101 and indicated that early disposition may be appropriate. (Appx0608, 0609, 0623, 0626.)

On September 15, 2014, Blue Spike amended its complaint to assert the '728 patent along with the four patents identified in its original complaint. (Appx1488.) Google filed its answer and counter-claims on October 2, 2014 and Blue Spike answered the counterclaims on October 20, 2014. (Appx0111.) Between October 2014 and February 2015, the parties exchanged contentions and claim charts required under the Patent Local Rules and began conferring on claim construction. Discussions and filings related to claim construction were delayed on several occasions at Blue Spike's request as it negotiated settlements with other defendants in the related California cases (*see, e.g.*, Appx2802-10, Appx2811-23, Appx 2824-39) and awaited decisions from the Texas court on several motions to transfer venue. (Br. at 4.)

Ultimately, Blue Spike asserted thirty-two claims (*see* Abbreviations, *supra*) against Google. Google and Blue Spike filed a Joint Claim Construction Statement in early August 2015. (Appx2635.) They agreed to adopt constructions from the Texas court for certain claim terms, including those implicated in the present appeal: "abstract," "perceptible characteristic" and "perceptual characteristics."

(Appx2636; *see also* Appx2750:12-Appx2751:6 (stipulating to constructions for purposes of the § 101 motion).)

B. Google's Motion for Judgment on the Pleadings

On May 12, 2015, Google moved for judgment on the pleadings pursuant to Federal Rule of Civil Procedure 12(c) that the Asserted Claims were invalid under 35 U.S.C. § 101. (Appx2103-2127.) Blue Spike opposed the motion on June 9, 2015 and Google filed its reply brief on June 16, 2015. (Appx0113 at entry 63, 64.) The District Court heard argument on June 30, 2015 (Appx2739), granted the motion on September 9, 2015 (Appx0001), and entered judgment in Google's favor on October 1, 2015. [4] (Appx0021.)

In its opinion, the District Court noted, "[a]t a high level, the patents contemplate determining whether one piece of content—*e.g.*, a picture, a song, or a video – matches another, or the extent to which they are similar." (Appx0002.) It further noted, "the specification does not teach the specifics of implementation—it includes no source code, detailed algorithms or formulas, or the like." (Appx0004.) The District Court then discussed and applied the legal framework for patent eligibility, looking not only at the two-step test outlined in *Alice* and *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S.Ct. 1289 (2012) ("*Mayo*"), but also recent cases from this Court. (Appx0005-0008.)

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[4] In the proceedings below, Blue Spike agreed that it did not comply with its disclosure obligations for '728 claim 30. (Appx2130 ¶¶ 6-9; Appx2784.) Regardless, the District Court ordered the parties to show cause as to why claim 30 should not be invalidated on the same grounds as the other claims. (Appx0019.) Blue Spike did not oppose, and the District Court invalidated claim 30. (Appx0020.) Based on that order, Google includes claim 30 as an Asserted Claim.

Under part one of the *Alice/Mayo* framework, the District Court concluded that the Asserted Claims "are generally directed to the abstract concept of comparing one thing to another." (Appx 0008.) More specifically, the District Court stated that "[t]he patents seek to model on a computer a human's highly effective ability to identify and recognize a signal" (*id.* (internal quotation marks omitted)), and rejected Blue Spike's contention that the Patents require comparisons that humans cannot make. (*Id.*) The District Court relied on the specification, the plain language of the Asserted Claims and the constructions urged by Blue Spike:[5]

Abstract	a data-reduced representation of a signal that retains a <u>perceptual</u> relationship with the signal and differentiates the data-reduced representation from other data-reduced representations
Perceptual Quality	quality <u>perceived by a person</u>
Recognizable Characteristic	quality visually or aurally <u>perceived by a person</u>

(Appx0008-9.) The District Court concluded that this evidence confirmed that the Asserted Claims are

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[5] Blue Spike's repeated assertions that the District Court failed to consider claim construction are incorrect. (Br. at 2, 13, 24, 28-29.) In its analysis, the District Court expressly cited to and relied upon the prior constructions urged by Blue Spike. (Appx1996, Appx2230-31 (Texas claim constructions); Appx0003-4, Appx0008-9, Appx0017 n.7 (discussing same).)

directed to mimicking human-observable aspects of signals on a computer. (*Id.*)

The District Court then turned to part two of the *Alice/Mayo* framework and concluded that the Asserted Claims contained no inventive concept. It found that the Asserted Claims merely discuss using routine computer components and methods to perform comparisons (Appx0010-11) and "preempt a wide range of comparisons that humans can and, indeed, have, undertaken from time immemorial." (Appx0011.)

Finally, although it confirmed that its two-step analysis of representative claim 1 "applie[d] with equal force to all claims at issue" (Appx0011), the District Court looked at each of the other Asserted Claims in turn. It concluded that the recitation of generic computer components or routine processes did not save the Asserted Claims from invalidity. (Appx0011-18.)

SUMMARY OF ARGUMENT

Patent eligibility under 35 U.S.C. § 101 is a threshold issue, serving to ensure that "basic tools of scientific and technological work" and "building blocks of human ingenuity" remain "free to all men and [are] reserved exclusively to none." *Bilski v. Kappos*, 561 U.S. 593, 602 (2010); *Alice*, 134 S.Ct. at 2354; *Mayo*, 132 S.Ct. at 1293 (citations omitted). The Asserted Claims in this case run afoul of this important safeguard. They seek to claim the same real-world comparisons that humans make every day when identifying, comparing and locating content (*e.g.*, songs, images, videos, text) and preempt every possible use or application of these straight-forward comparisons on a computer. That the Asserted Claims purport to move this process to a computerized environment by reciting the use of an "abstract" to perform the comparisons is of no moment. The claim language, specification, and relevant claim constructions confirm that the "abstract" is merely a conceptual substitute for human behavior in that it is any result generated using inherent, perceptual qualities perceived by humans (*e.g.*, color, subject matter, melody). As the District Court correctly found under part one of the *Alice/Mayo* framework, the Asserted Claims are directed to an abstract idea.

Where the Asserted Claims are directed to an abstract idea, the other limitations of the Asserted Claims fail to convey an inventive concept to confer patentability under part two of the *Alice/Mayo* framework. They are generally directed to (i) claiming the generation of any "abstract" that mimics human perception; (ii) comparing or matching "abstracts" or determining how they are related, which is an activity that humans routinely perform; or (iii) routine, conventional activity using generic computer components, which this Court has repeatedly rejected as "inventive" in its pre- and post-*Alice* cases. Despite Blue Spike's assertions to the contrary, the Asserted Claims require nothing more than what humans can do (*e.g.*, they do not claim increased speed, efficiency or accuracy), they are preemptive, and they do not satisfy the machine-or-transformation test. And as the District Court correctly found under part two of the *Alice/Mayo* framework, there is no other limitation in the Asserted Claims that conveys an inventive concept or that is limiting enough to confer patent eligibility.

The District Court's judgment should be affirmed.

ARGUMENT

I. STANDARD OF REVIEW

In reviewing judgment on the pleadings, this Court applies the procedural law of the regional circuit, which in this case is *de novo*. *Amgen, Inc. v. Sandoz Inc.*, 794 F.3d 1347, 1354 (Fed. Cir. 2015) (citing *Peterson v. California*, 604 F.3d 1166, 1169 (9th Cir. 2010)). Patent eligibility under 35 U.S.C. § 101 is a question of law that this Court also reviews *de novo*. *OIP Techs., Inc. v. Amazon.com, Inc.*, 788 F.3d 1359, 1362 (Fed. Cir. 2015).

II. THE DISTRICT COURT CORRECTLY HELD THAT THE ASSERTED CLAIMS ARE INVALID UNDER § 101

Section 101 of the Patent Act defines patent-eligible subject matter as "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof." 35 U.S.C. § 101. The Supreme Court has "long held that this provision contains an important implicit exception: Laws of nature, natural phenomena, and <u>abstract ideas are not patentable</u>." *Alice*, 134 S.Ct. at 2354 (citation omitted). Under the now-familiar two-part test described in *Alice* and *Mayo*, courts must first determine whether the claims are directed to a patent-ineligible concept. If so, courts must next conduct "a search for an inventive concept" by considering the elements of the claims individually and as an ordered combination to determine if they "transform the nature of the claim" from an abstract idea into a patent-eligible application. *Id.* at 2355 (quotation marks and citation omitted); *Mayo*, 132 S.Ct. at 1294, 1297. The Asserted Claims are not patent-eligible under this test.

A. The Asserted Claims Are Directed to an Abstract Idea

The Supreme Court has instructed that, at part one, courts should consider the claims as a whole, looking to "their face" to decide what "concept" they are drawn to. *Alice*, 134 S.Ct. at 2356. Here, as found by the District Court, the real-world, everyday process of identifying and comparing works using their inherent, perceptual qualities is an abstract idea. *Parker v. Flook*, 437 U.S. 584, 586, 589 (1978) (citation omitted) ("abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work," and finding allegedly inventive algorithm was not patentable). Blue Spike takes issue with what it calls "over-generalization" by the District Court (Br. at 18-30), but this Court's precedent makes clear that the District Court's analysis and conclusions regarding the idea of the Asserted Claims is correct.

1. The District Court Correctly Applied Part One of the *Alice/Mayo* Framework

The District Court began its analysis by looking to the claim language to determine the concept to which the Asserted Claims were drawn (*i.e.*, their "character" or "gist"), then confirmed its understanding against the specification and Texas claim constructions urged by Blue Spike. (Appx0002-4, Appx0008-10; *see also* Appx2755-2759.) This is the exact approach used by this Court.[6] *See Internet Patents Corp. v. Active Network, Inc.*, 790 F.3d 1343, 1346, 1348 (Fed. Cir. 2015) (ascertaining basic character of claims and describing *Mayo* as having "distilled this ineligible concept from the claims as a whole"); *Intellectual Ventures I LLC v. Capital One Bank (USA)*, 792 F.3d 1363, 1369 (Fed. Cir. 2015) (for step one, "it is often useful to determine the breadth of the claims"); *Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 714 (Fed. Cir. 2014) (agreeing with lower court that the abstract idea "at the heart of" an eleven-step claim was using "[an] advertisement as an exchange or currency") (citation omitted); *Dealertrack, Inc. v. Huber*, 674 F.3d 1315, 1333-34 (Fed. Cir. 2012) (distilling claim limitations down to their "simplest form").

As discussed above, the Asserted Claims generally recite receiving a reference and query signal; creating an "abstract" for each using some undisclosed mechanism, but using inherent qualities that humans would perceive; and comparing the signals using the "abstracts." (Appx0034 (claim 1); Appx0027-28; Appx 0002 (describing claims).) The concept to which these Asserted Claims are drawn is "comparing one thing to another," just as the District Court held. That this comparing uses humanly-perceptible qualities and is a

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6 Blue Spike critiques California decisions that use phrases such as "gist of the claims" in their part one analysis. (Br. at 24, 26-28.) Even a cursory look at these cases establishes that they understand and are utilizing the correct framework as applied by the Supreme Court and this Court. *See Open Text S.A. v. Box, Inc.*, 78 F.Supp.3d 1043, 1046-47 (N.D. Cal. 2015) (citing relevant portions of *Bilski*, *Alice*, *buySAFE* and *Ultramercial*). Similarly here, the District Court correctly describes the holdings of seven different Federal Circuit cases in its application of the *Alice/Mayo* framework. (Appx0006-8.)

substitute for human comparison is understood from the claim language, specification and claim constructions. (Appx0010 (summarizing prior discussion, and stating "as noted, the patents are directed to an abstract idea—the idea of comparing one thing to another"); *see also* Appx0002 (at a high level, the patents contemplate determining if pictures, songs, or videos match).)

Recent cases from this Court confirm that the District Court correctly identified the idea of the Asserted Claims, and that it is abstract. For example, in Internet Patents, this Court began its own claim analysis "by ascertaining the basic character of the subject matter" to determine "whether their character as a whole is directed to excluded subject matter." 790 F.3d at 1346, 1348. Those claims concerned the use of a conventional web browser's Back and Forward navigation buttons without losing data ("maintaining the state"). *Id.* at 1344. Despite arguments that "maintaining the state" was the innovative, most important aspect of the invention and "a tangible and useful improvement" over the art (just as Blue Spike argues here for "abstract"), this Court affirmed that the "character of the claimed invention is an abstract idea: the idea of retaining information in the navigation of online forms." *Id.* at 1345, 1348. This Court did not import the way the invention allegedly retained information or "maintained the state" as part of the idea, *id.* (noting that mechanism for "maintaining the state" is not described), even though it is apparent that there must have been a computerized mechanism to "maintain the state."

This Court applied the same approach in *Vehicle Intelligence*. Those claims recited screening equipment operators for impairment, selectively testing the operators, and controlling equipment if impairment was detected. Despite arguments that the claimed "expert system modules," which performed the "screening [and] controlling," were inventive and allegedly improved over the prior art, this Court determined that the claims were drawn to the abstract idea of "testing for any impairment." *Vehicle Intelligence and Safety LLC v. Mercedes-Benz USA, LLC*, Case No. 2015-1411, 2015 WL 9461707, at *1-3 (Fed. Cir. Dec. 28, 2015). The Court did not import the mechanism for performing the idea into the idea itself, and, in fact, noted that "critically absent from the entire patent" are any details as to how "expert system modules" work. *Id.* at *3.

This case is no different. The Asserted Claims and specification assert ownership of the bare-bones idea of an "abstract," setting forth only its aspirational function of mimicking on a computer the way that humans compare content by using humanly-perceptible qualities of the content. That falls squarely into the realm of ideas that this Court has found to be abstract.

2. Blue Spike Mischaracterizes the Asserted Claims by Arguing That the Idea of the Patents is "Using an Abstract" to Compare

Blue Spike argues that, because the District Court did not recite the idea of using an "abstract" to compare two things as part of its statement of the idea of the patents, the District Court committed error. (Br. at 18-30.) Blue Spike is incorrect. Blue

Spike's argument is based upon three fundamentally flawed notions that build upon one another. First, that the idea to be articulated in part one of the *Alice/Mayo* framework must recite the "particular contributions" of the purported invention that implement or accomplish the idea of the Patents. (Br. at 3, 13, 17; *id.* at 13, 24, 25 (arguing that the idea must include the means employed and not just the task the claims cover); *id.* at 25 ("the question [is] whether that abstracting approach is patentable subject matter").) Second, that the idea of the Asserted Claims is not comparing one signal to another (Appx0010), but is comparing one signal to another using an "abstract." (Br. at 12-13; *see also id.* at 7, 23, 24-25, 25 (generally discussing using an "abstract" to compare signals).) Third, that because the idea is using the "abstract" and the "abstract" is digital, the Asserted Claims allegedly are rooted in computer technology and the idea of the Patents thus cannot be abstract. (*Id.* at 12, 24.) none of these arguments is correct, and none save the Asserted Claims from ineligibility under § 101.

First, Blue Spike's notion that the idea of a patent claim must restate every element that it contends is "inventive" (here, the "abstract" (Appx1491 ¶ 12)) is counter to this Court's precedent. For example, in *Vehicle Intelligence*, this Court determined that the idea was "testing for any impairment" not "testing for any impairment using expert system modules" even though the claimed "expert system modules" were the allegedly inventive limitation.[7] *Vehicle*

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[7] That the District Court may have shorthanded the abstract idea as "comparing one thing to another" (Appx0010) is not indicative of any error. The District Court necessarily

Intelligence, 2015 WL 9461707 at *2; *see also Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat'l Ass'n*, 776 F.3d 1343, 1344, 1348 (Fed. Cir. 2014) (considering how the patents "recogniz[ed] certain data" in second part of test); *Parker*, 437 U.S. at 593 (holding untenable respondent's position "that if a process application implements a principle in some specific fashion, it automatically falls within the patentable subject matter of § 101 and the substantive patentability . . . can then be determined by the conditions of §§ 102 and 103").

Second, even if Blue Spike was correct that the idea of the Asserted Claims is to compare signal content "using an abstract," the ultimate conclusion of patent-ineligibility under part one of the *Alice/Mayo* framework is the same. The District Court found that the Asserted Claims are directed to a process "long undertaken within the human mind." (Appx0008.) It looked to the claim language, specification and the Texas court's claim constructions advanced by Blue Spike, which all confirm that the "abstract" is a concept intended to reflect "human-observable aspects of signals." (Appx0010-11.) Thus, the idea of "comparing signals using an abstract" that Blue Spike urges

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considered the claimed "abstract" in step one—just as this Court considered the allegedly inventive "expert system modules" in *Vehicle Intelligence*—in determining the claims' concept, and in its analysis expressly addressed Blue Spike's arguments as to the nature of the "abstract" (*e.g.*, rejecting Blue Spike's claim that the "abstract" surpasses what the human mind can do because claim language itself is not so limited). (Appx0010-11.) Blue Spike over-simplifies and recasts the Order to "comparing one thing to another" in the hopes of inciting this Court's skepticism because none of its other arguments save the Asserted Claims.

here is still an abstract idea. The idea of comparing signals using human-observable characteristics of the signals is simply a longer way of saying: use an aspect of the content that humans would perceive and utilize to compare the content. This is nothing more than a restatement of the very abstract idea that the District Court found.

Third, importing the concept of a digital "abstract" into the idea for purposes of part one of the *Alice/Mayo* framework makes no difference. It does not transform these Asserted Claims into claims that necessarily are rooted in computer technology. If Blue Spike had its way, anytime a patentee injected the concept of something "digital" into its claims through either argument or clever draftsmanship, it would automatically make the claims commensurate with those in *DDR Holdings*. (*See* Br. at 23.) Those claims, however, on their face were directed to an issue that would only arise on the internet, *i.e.*, on-click Internet redirection to an automatically generated hybrid webpage that combined the look and feel of a host-site layout with product information from a third-party merchant. *DDR Holdings, LLC v. Hotels.com, L.P.*, 773 F.3d 1245, 1249, 1257 (Fed. Cir. 2014) (claims reciting, for example, a host web page, link and Internet communication).

The Asserted Claims here stand in stark contrast. As expressly confirmed in the specification, these Patents are directed to comparing actual works—songs on the radio, pictures of the sun—in the way humans would. (*See* Counter-Statement of the Case, Section II.B*, supra*.) Doing so digitally, rather than with analog eyeballs or ears, does not bring these Asserted Claims within the ambit of *DDR Holdings*. Rather, Blue

Spike's argument is like that in *Bancorp* and "boils down to the contention that because its claims are limited to being performed on a computer, they cannot claim only an abstract idea." This Court has found that argument "untenable." *See Bancorp Servs. L.L.C. v. Sun Life Assurance Co. of Canada (U.S.)*, 687 F.3d 1266, 1277 (2012) (rejecting argument because it "boils down to the contention that because its claims are limited to being performed on a computer, they cannot claim only an abstract idea"); *see also Alice*, 134 S.Ct. at 2358-59 (requiring that an abstract idea be done on a computer does not confer patent eligibility).

3. Blue Spike's Other Arguments Do Not Save the Asserted Claims

a) Nothing in the Asserted Claims Requires More Than What Humans Would Do

Blue Spike also argues that the Asserted Claims are not directed to replicating an ordinary human process on a computer like some of the patents discussed in this Court's recent cases. (Br. at 30-33.) As discussed above, however, the idea of an "abstract" is the idea of replicating human perceptions in a computer environment. So, Blue Spike is wrong. And, absent from Blue Spike's attempt to distinguish these Patents from other cases that "simply replicat[e] ordinary human processes" (*id.* at 31-32) is any reference to the Patents or Asserted Claims, or any discussion of the substantive patent claim analysis of the prior cases. Instead, Blue Spike just declares that these Patents are on a par with innovations like a self-driving car or the telephone. (*Id.* at 31-32 & 32 n.15.) With no substance, Blue Spike's arguments can be rejected.

Similarly, Blue Spike's assertion that there is no "evidence that humans perform comparisons by reducing signals to data-reduced representations" (*id.* at 33) is belied by the Patents themselves. Indeed, one of the two "embodiments" of the Patent is little more than an analogy between the purported invention and the human activity of looking at different pictures and comparing them by aspects of the pictures like the presence of a setting sun. (Appx0033-34 (14:65-15:8).) Where the Patents themselves resort to explaining the invention by analogy to human activities, Blue Spike's assertion that these Patents are not directed to replicating human activities is simply not true.

The District Court was also not "led astray" by the human aspects of the "abstract." (*Contra* Br. at 32.) It considered Blue Spike and its expert's attempts to distinguish comparisons that the claimed "abstract" could perform from those that humans are capable of performing, but concluded that "on their face the patents do not purport to recognize aspects of the compared work that only a computer—but not a human—could reasonably detect." (Appx0008.) This determination was consistent with this Court's decisions. *See Bancorp*, 687 F.3d at 1278 ("To salvage an otherwise patent-ineligible process, a computer must be integral to the claimed invention, facilitating the process in a way that a person making calculations or computations could not."); *Content Extraction,* 776 F.3d at 1347 (finding claims invalid under § 101 and rejecting argument that humans could not process and recognize streams of bits output by a conventional computer, *e.g.*, scanner) (citing *Alice*, 134 S.Ct. at 2358).

Had the Asserted Claims done something other than generically recite the use of humanly-perceptual qualities to do comparisons, and had the patentee truly invented and claimed an actual process by which to generate an "abstract . . . using perceptual qualities," this case may have been different. *Compare Research Corp.Techs., Inc. v. Microsoft Corp.*, 627 F.3d 859, 869 (Fed. Cir. 2010) (claimed methods relating to digital image half-toning that "incorporate algorithms and formulas that control the masks and halftoning" are patent-eligible) with *Digitech Image Technologies, LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344, 1350-51 (Fed. Cir. 2014) ("a process for generating a device profile" that requires "generating [ ] data" relating to "color information content of the image" and "spatial information content of the image" is patent-ineligible). But, no matter how much Blue Spike wishes differently, the Asserted Claims require no more than what human do, and are patent-ineligible.

b) Unclaimed, Speculative Benefits Are Not Relevant

Scattered throughout Blue Spike's part one analysis are assertions that the "abstract" provides improvements or benefits over "human-based" comparisons and identification. For example, Blue Spike contends that the "abstract" might be faster and more accurate than human-based comparison[8] (Br. at 9); might be used in a variety of applications such as

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[8] Except for one ('471 claim 11, discussed below), the claims that Blue Spike cites to illustrate "other improvements over human-based comparisons" are not asserted against Google and are not at issue on appeal. (Br. at 9-10.)

piracy detection, security measures, or police work (*id.* at 2, 9); or might facilitate various computer-related processes, such as permitting some unspecified "complex signal comparison" or reducing signal-comparison costs and volume.[9] (Br. at 6-7, 22-23.)

This argument also fails. Whether or not a comparison—if done on a computer—might be faster or more efficient than if done by a person is nothing more than saying that computers can be faster than humans in some contexts. Even if there was some potential increased efficiency or benefit, this Court has not found that to be sufficient to confer patent-eligibility. *Bancorp*, 687 F.3d at 1279 (finding that no "technical advance is evident in the present invention" but merely employ computers to "perform[] more efficiently what could otherwise be accomplished manually").

And here, where the claimed "abstract" of these Patents is described in aspirational terms only, the specification and the Asserted Claims are devoid of any teaching or limitation that would require or provide that implementing the claimed "abstract" on a computer actually provides any particular benefit or improvement over human activity. Indeed, the Asserted Claims point in the opposite direction, purporting to cover all ranges of comparisons at any level of complexity by expressly requiring only the minimal amount of comparison to fall within the

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[9] To the extent Blue Spike points to any particular Asserted Claim for a purported "application" or "useful operation" (Br. at 5-7), Google addresses them below at Section II.B.2. Blue Spike also points to un-asserted claims in its brief, including '472 claims 9 and 12, '494 claim 1 and '175 claim 5 (Br. at 6, 9-10), which are not relevant to this appeal.

claimed scope: "at least one" reference signal to "at least one" query signal, which the specification recognizes can be performed by a human. *See Planet Bingo, LLC v. VKGS LLC*, 576 F. App'x 1005, 1008 (Fed. Cir. 2014) (claims fall far short of capturing an invention that handles "thousands, if not millions" of transactions).

c) The Prior Art Is Not Relevant to Whether the Asserted Claims Are Directed to an Abstract Idea

Blue Spike argues at length that the Asserted Claims are not an abstract idea because using an "abstract" to compare signal content allegedly solves a problem in the prior art and provides an alternative to watermarking technology. (Br. at 2, 3, 7-8, 11-12, 17, 19-20, 21, 25, 29, 33.) Blue Spike's conclusion does not follow from its premise – identifying an idea and determining whether it is abstract is not dictated by the content of the prior art. Blue Spike's argument is merely an argument against the *Alice* test. But, *Alice* is the law, and Blue Spike's argument has been rejected by this Court multiple times, particularly in cases like this one where the patent lacks detail as to how the purported invention works. *See, e.g.*, *Vehicle Intelligence*, 2015 WL 9461707, at *3 (rejecting argument that "using expert system module" to make decisions or effectuate control improved over prior art); *Parker*, 437 U.S. at 594-95 (claims were patent-ineligible even though assumed to disclose a "better" or "improved" method over the prior art). Whether or not there is prior art to these Asserted Claims does not dictate whether or not they are directed to an abstract idea, as they are here.

B. The Asserted Claims Do Not Include an Inventive Concept

Under part two of the *Alice/Mayo* framework, the District Court correctly determined that there are no limitations of the Asserted Claims, considered individually or collectively, that contain an inventive step sufficient to transform the abstract idea of comparing content using human-perceptible aspects of that content into patent-eligible subject matter.

1. Implementing Human Behavior on Generic Computer Components Is Not an Inventive Concept

As the District Court determined, the Asserted Claims "merely discuss using routine computer components and methods (*e.g.*, general purpose computers, compression, and databases)" to make comparisons that humans can accomplish. (Appx0010; Appx0034 (claim 1).) Blue Spike challenges this conclusion, arguing that the idea of an "abstract" is inventive because the Patents: (1) permit faster and more accurate auditing of signals; and (2) utilize a computer in a non-routine manner to perform complex calculations on digital signals.[10] (Br. at 36-39.) Blue Spike is incorrect.

With respect to Blue Spike's first argument, it is well established that simply adding a computer to an

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[10] The only substantive citations Blue Spike provides are to a passage indicating that the invention might be used for voice-activated security (which is not in any of the Asserted Claims) and to '494 claims 6 and 20 related to security control (which are not asserted). (Br. at 36-39; *see also id.* at 9-10 (citing un-asserted '472 claims 9 and 12, and '494 claim 1).) These citations have no relevance to this appeal.

abstract idea, even to increase speed or efficiency, does not transform the abstract idea into patent-eligible subject matter. *Planet Bingo*, 576 F. App'x at 1007-1008 (citations omitted) (if patent's recitation of computer amounts to mere instruction to implement an abstract idea on a computer, that addition cannot impart patent eligibility); *Intellectual Ventures*, 792 F.3d at 1370 ("[O]ur precedent is clear that merely adding computer functionality to increase the speed or efficiency of the process does not confer patent eligibility on an otherwise abstract idea."); *Vehicle Intelligence*, 2015 WL 9461707, at *3-5 (rejecting argument that implementing an abstract idea using conventional and readily-available computer components to produce "faster, more accurate and reliable results" provide an inventive concept to confer patentability, especially given the absence of any relevant implementation details in the specification or claim requirement). Here, the Asserted Claims do not require any particular level of speed or performance—indeed, they purport to cover any comparison at all, even the most basic instance where <u>two</u> signals be compared, *i.*e., one reference signal to one query signal based on an "abstract" that can be formed in any way one desires and with whatever content one wishes, as long as it is at least human-perceptible. The District Court recognized that the Asserted Claims do not require any level of complexity, pointing out that "[t]he mere fact that the claims may cover a computer implementation that surpasses in scope or complexity what a human mind is capable of accomplishing is irrelevant where the claims are not limited to such complex activities, but also encompass more basic human approaches." (Appx0010-11.) This is exactly the analysis that is supposed to happen in part two of the *Alice/Mayo* framework—not asking what is possible while still within the scope of the Asserted Claims, but to ask whether any limitations of the Asserted Claims take them from the theoretical abstract to a concrete inventive concept.

With respect to Blue Spike's second argument, as the District Court also noted, the Asserted Claims, on their face, do not require any specialized equipment, but instead solely rely upon generic computer components (*e.g.*, processors, receivers, databases, comparing devices, devices configured to determine matches, and/or non-transitory memory) to perform conventional computer operations (*e.g.*, receiving, inputting, creating, generating, storing, counting, comparing, recording, and distributing). (Appx0010; *see also, e.g.*, Appx0034-35 ('472 claims 1, 8, 11); Appx0049-50 ('700 claims 1, 18, 40); Appx0066-67 ('494 claims 11, 29); Appx0082-83 ('175 claims 1, 8, 11, 17); Appx0099 ('728 claims 1, 25).) Routine operations performed on generic computer components do not adequately limit an abstract idea. *See Planet Bingo*, 576 F. App'x at 1007-1008 (computer components "long in use" could implement the computer-aided methods and systems); *Content Extraction,* 776 F.3d at 1347¬ 48 (data collection, scanning, recognizing and storing information insufficient for patent-ability); *Dealertrack*, 674 F.3d at 1333 ("the claims are silent as to how a computer aids the method, the extent to which a computer aids the method, or the significance of a computer to the performance of the method").

Moreover, the Supreme Court and this Court have made clear that using computers to perform calculations and computations, especially for a process that seeks to model human recognition and ability, does not render a claim patentable. *Alice*, 132 S.Ct. at 2355-56; *Bancorp*, 687 F.3d at 1278 (use of computer in otherwise patent-ineligible process for "its most basic function—making calculations or computations—fails to circumvent the prohibition against patenting abstract ideas and mental processses"); *Content Extraction,* 776 F.3d at 1347 (for a computer in a computer-implemented invention to be deemed meaningful "it must involve more than performance of 'well-understood, routine, [and] convention activities previously known to the industry'"). Blue Spike's characterizations of the Patents to "utilize a computer for complex calculations on a digital signal" and make comparisons through what admittedly relies upon human perceptibility (*i.e.*, the "abstract") (Br. at 39, 33) do nothing to disturb the District Court's finding that the Patents fail to provide an inventive step.

2. The Remaining Claim Limitations Do Not Provide an Inventive Concept to Limit the Abstract Idea

Beyond the recitation of generic computer components, routine computer functionality, and the claimed "abstract" that make up the sum total of representative claim 1, the remaining limitations of the Asserted Claims rely on routine computer functionality, well-known techniques, mathematical computations, human capacity and/or are minor variations over the representative claim. Considered even as an ordered combination, these limitations do not add anything that is not already present when considered separately. *See Mayo*, 132 S.Ct. at 1298. none of these confer patentability.

a) Limitations Directed to Generating the "Abstract" Lack an Inventive Concept

In representative claim 1 of the '472 patent, the data-reduced "abstract" of the signal mimics human perception because, by definition, it is generated using and retains qualities that are perceived by a person. The "abstract"-generating limitations of the other Asserted Claims add nothing more, and even Blue Spike refrains from arguing that these limitations add any inventive concept:

- Reciting use of "selectable criteria" (Appx0035 ('472 claim 11)) or "selected criteria" (Appx0099 ('728 claim 5));
- Reciting use of "signal characteristic parameters" or "perceptual characteristics" or "cognitive features" or "perceptible characteristics" that differentiate between versions of the signal (Appx0049 ('700 claims 1, 18, 21, 40); Appx0066-67 ('494 claims 11, 29); Appx 0082 ('175 claim 8));
- Reciting use of "characteristics" of each signal in a group of "audibly/perceptibly similar signals" (Appx0100 ('728 claim 30, and unasserted claim 29 from which it depends)); and
- Reciting that the "abstract" is "similar to" or a "self-similar representation of" the signal (Appx0066 ('494 claim 15); Appx0082-83 ('175 claims 1, 8, 11, 17); Appx0099 ('728 claims 1, 4, 25)).

These are all different ways of saying that the "abstract" is based on and representative of some humanly-recognizable quality of the content.[11] (*See, e.g.*, Appx2303 ("perceptible" as construed by Texas court means "perceived by a person"); Appx0028 (3:63-4:2) ("abstract" should model a person's ability to differentiate between songs that have "the same lyrics and music, but which are sung by different artists"); Appx0033 (13:7-12) (selectable criteria are based on human-defined differences: "[t]o the extent that the creator or consumer of the signal can define a difference in any of the four criteria above, means can be derived (and programmed for selectability) to recognize and distinguish these differences."); Appx0030 (7:36-48) (the only mention of "self-similar" in the specification pertains to prior art hashing or compression techniques, but then clarifies that an "abstract" is something else because it must "retain what is humanly perceptible," be "realistic," and "mimic human perception"); Appx0033-34 (14:65-15:11) (analogizing an "abstract" to human analysis of identifying and comparing sunset paintings by selecting "perceptual characteristics" relating to the sun as the criteria).) As confirmed by the patent specification, these limitations are merely restatements of the abstract idea of comparing based on what a human would perceive, and do not limit the abstract idea sufficiently to state a patentable, inventive concept. (*See* Argument, Sections II.A.1, II.B.1, *supra*.)

The other limitations likewise add nothing inventive. Several claims reiterate that the "abstract"

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[11] Claims 3 and 8 of the '472 patent require "creating an abstract" with no further limitations, and in that respect, are even broader and more abstract than representative claim 1.

be "reduced in size" or "data reduced"—just as the Texas court's claim construction and specification already require. (*See* Appx1996; Appx0082-83('175 claims 1, 8, 11, 17); Appx0099('728 claims 1, 4, 25); Appx0030(7:36-40).) In generating the data-reduced "abstract," '175 claim 16 refers to an unspecified "algorithm," '175 claim 17 uses a "psycho-acoustic" or "psycho-visual" model, and '728 claim 26 applies a "spectral transform" to the signal. (Appx0083('175 claims 16, 17); Appx0099('728 claim 26).) But, the Patents confirm that these limitations are not sufficiently limiting either.

With respect to claim 16 of the '175 patent, the specification fails to provide any algorithm to generate the "abstract" and, as noted by the District Court, claim 16 is not limited to any particular algorithm, thus providing no concrete limitation on the abstract idea sufficient to confer patentability (Appx0016). *See Vehicle Intelligence*, 2015 WL 9461707, at *3 (claims were patent-ineligible where the specification was devoid of any details on how the claimed system works). As also noted by the District Court, the psycho-acoustic or psycho-visual models recited in claim 17 are confirmed by the specification to be existing data manipulation tools that mimic human perception. (Appx0016.) Thus, these limitations simply restate the abstract idea itself in the context of using existing algorithms to manipulate the data, and do not provide a limiting inventive concept. *Content Extraction,* 776 F.3d at 1349 ("all of the additional limitations in the claims . . . recite well-known, routine, and conventional functions of scanners and computers. Thus, while these claims may have a narrower scope than the representative claims, no claim contains an 'inventive concept' that transforms the corresponding claim into a patent-eligible application of the otherwise ineligible abstract idea.").

The same is true for '728 claim 26, which claims using a "spectral transform" in the creation of the "abstract." Again, the specification confirms that a "spectral transform" is nothing more than a mathematical manipulation of data that "should maintain, for certain applications, some cognitive or perceptual relationship with the original analog waveform." (Appx0032 (11:28-31).) But, this is nothing other than a restatement of the abstract idea of the Patents, *i.e.*, use a mathematical equation to achieve the goal of the abstract idea. This too is not a limitation that provides an inventive concept. *See Digitech*, 758 F.3d at 1351 ("Without additional limitations, a process that employs mathematical algorithms to manipulate existing information to generate additional information is not patent eligible.").

Finally, two dependent claims require that the "abstracts" be generated using only a portion of the underlying signal (rather than the entire signal as in the independent claims from which they depend). In '472 claim 2, both the reference signal "abstract" and query signal "abstract" are based upon a portion of the reference and query signals, respectively. Claim 17 of the '494 patent is similar, except that it addresses only the reference signal "abstract." For the same reasons as already discussed for an "abstract" based on a whole signal, using some undefined "portion" of a signal is not an inventive concept or meaningful limitation on the abstract idea of creating and using an "abstract."

The District Court also analyzed these limitations, and correctly concluded that they do not include any inventive concepts. (*See, e.g.*, Appx0012-18.)

b) Limitations Directed to Comparing and Matching Lack an Inventive Concept

Just like representative claim 1, nearly every other Asserted Claim requires comparing the reference and query signal "abstracts" to determine if they match or are related.[12] The majority of Asserted Claims require nothing beyond this basic comparison. They recite no purpose, practical use or application, a fact that Blue Spike has exploited in more than one hundred separate lawsuits covering a vast array of technology fields and applications. (*See* n.3, *supra.*) The handful of Asserted Claims that do require that something happen as a result of the match recite only routine computerized processes that do not confer patent-eligibility.

Limitations that require comparing "abstracts" to determine if they match (Appx0034-35 ('472 claim 3, 8, 11); Appx0049 ('700 claims 1, 18); Appx0067 ('494 claim 29); Appx0099 ('728 claims 1, 4, 25)) or to generate a "compare result" (Appx0083 ('175 claims 11, 12)) are no different than the comparing and matching limitations of representative claim 1 of the '472 patent. These types of routine computerized comparisons are not an inventive concept. *See Planet*

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[12] The exceptions are claims 1, 8 and 17 of the '175 patent. They are even more generic than the other Asserted Claims in that they recite an "abstract" but no compare step. (Appx0082-83.)

Bingo, 576 F. App'x. at 1008-09 (finding patent's recitation of computer components, such as "a program . . . enabling" the steps of storing and comparing, referred to purely '"conventional activity'") (citations omitted); *Content Extraction,* 776 F.3d at 1345, 1348-49 (determining that digital data recognition was routine computer functionality).

Certain Asserted Claims compare "abstracts" to determine whether they are related (Appx0050 ('700 claim 40); Appx0066 ('494 claim 11)), and others require an index of relatedness after a match is determined (Appx0035 ('472 claim 11); Appx0049 ('700 claim 27)). The quality of relatedness is not directly addressed in the specification, but is conceptually referred to in discussions regarding "perceptual differences" in songs or the common theme of the sun in different paintings. (Appx0033-34 (13:16-22, 14:65-15:11).) This concept—determining how things are related based on human-perceptible characteristics—is no different than what humans (even children) do, for example, by looking at two paintings to determine how they are similar and how they are different. Claiming "relatedness"—particularly with no parameters for what level of "relatedness" would result in a match—does not save the claim under § 101. *See Alice*, 134 S.Ct. at 2355-56 (determining that generically applying a computer to an otherwise abstract idea fails to confer patentability); *Bancorp*, 687 F.3d at 1278 (noting that basic digital computation on a conventional computer to perform mental processes is not patentable).

For the few Asserted Claims that require additional activity as a result of any match, these activities are nothing more than routine processes like counting matches, recording match occurrences or generating a report to identify matches (Appx0034 ('472 claims 3, 4, 8); Appx0099 ('728 claim 16)); authorizing transmission of the signal (Appx0049 ('700 claim 18, 27)); or distributing the signal (Appx0050 ('700 claim 51)). These functions have been recognized as examples of "routine, conventional activity" that do not confer patentability. *See Ultramercial*, 772 F.3d at 715-16 (citations omitted) (steps such as updating an activity log are "conventional steps, specified at a high level of generality" that do not supply an inventive concept); *OIP Technologies*, 788 F.3d at 1363 (citations omitted) ("sending" digital data is well-understood, routine, conventional activity); *buySAFE, Inc. v. Google, Inc.*, 765 F.3d 1350, 1355 (Fed. Cir. 2014) ("That a computer receives and sends the information over a network—with no further specification—is not even arguably inventive.").

c) Limitations Directed to Routine, Conventional Activity on Generic Computer Components Lack an Inventive Concept

Blue Spike does not contend that there is anything special or inventive about any of the generic computer components recited in the Asserted Claims, *e.g.*, a processor, database used to store "abstracts," non-transitory memory, comparing device, receiver or electronic system. This Court has confirmed that recitation of such components do not provide an inventive concept to an abstract idea, particularly where no special structure or use is indicated. *Dealertrack*, 674 F.3d at 1333; *Planet Bingo*, 576 F. App'x at 1008.

The embedder recited in ’700 claim 12 is similarly generic. As described in the specification, it was used in the prior art to embed “additive signals” like digital watermarks into the signal. (Appx0028 (4:42-66) (traditional methods to identify and monitor signals rely on “a separate and additional signal” that is concatenated or embedded into the original signal); Appx0033(13:60-14:2) (identifier embedded into or affixed to signal is a traditional monitoring technique); Appx0029 (5:40- 6:17) (watermarking).) Adding known techniques and components to an otherwise abstract idea does not confer patent-eligibility. *See, e.g., Content Extraction,* 776 F.3d at 1345, 1348 (claim requiring “recognizing portions of said hard copy documents corresponding to a first data field” that uses existing technology to recognize and store data is not inventive); *Alice*, 132 S.Ct. at 2357 (finding that techniques “well known in the art” are insufficient to transform an abstract idea into patentability).

Other dependent claims in the ’700 patent also recite prior art techniques. After an “abstract” is generated, there is an additional step of applying a cryptographic protocol to the “abstract” (’700 claim 10) where the protocol is a hash or digital signature (’700 claim 11), and then storing the hashed or digitally signed “abstract” (’700 claim 11). (Appx0049.) none of these limitations limit the scope of the claimed “abstract” but instead add an admittedly known processing step only after the “abstract” is created. (*See, e.g.*, Appx0046(10:39-48); *see also* Appx2030 (construing “hash” as a “mathematical transform”).) Adding conventional computing functions to an abstract idea is not an inventive step. *See Digitech*

Image, 758 F.3d at 1451 (process that employs "mathematical algorithms" to manipulate data is not patent eligible); *Alice*, 134 S.Ct. at 2357-58 (mathematical principle that could be carried out in existing computers long in use is not patent eligible).

3. The Asserted Claims Are Preemptive

Blue Spike's anti-preemption arguments focus on unclaimed, aspirational aspects of the "abstract," rather than the actual claim language. For example, Blue Spike asserts that <u>something</u> about the Asserted Claims themselves "transform the abstract idea of comparing one thing to another [into an idea of] developing a specific system for automating comparison across digital platforms in order to facilitate further improvements over the art." (Br. at 40.) There are at least two significant problems with this argument. <u>First</u>, according to Blue Spike, the inventive concept is <u>using</u> the very construct (*i.e.*, the claimed "abstract") that it says is the idea of the Patents under part one of the *Mayo/Alice* framework. In other words, if the claimed "abstract" is the idea of the Patents—which Blue Spike says it is—then the Patents intrinsically claim the ineligible concept itself. *See Alice*, 134 S.Ct. at 2355 (citation omitted) (the second step of the test is to ensure that the asserted claims are "significantly more than a patent upon the [abstract idea] itself.").

Second, Blue Spike's own interpretation of the claimed "abstract" makes clear that the abstract idea in the Asserted Claims is not meaningfully limited. As mentioned above, Blue Spike urged Google and the District Court to adopt the earlier constructions entered in Texas (*see* Appx0003-04), which confirm that the claimed "abstract" is simply a portion of the original work that retains a human-perceptible relationship to the original. (Appx1996; Appx2030-32; Appx2636.) By definition, this is the equivalent of human processing, which proves that "abstract"-based comparisons are not meaningfully limited in its application and scope. *See CyberSource Corp. v. Retail Decisions, Inc.,* 654 F.3d 1366, 1372 (Fed. Cir. 2011) (finding claims unpatentable because they are of such a broad scope that they extend to methods that "can be performed in the human mind"); *Content Extraction,* 776 F.3d at 1347 (noting that the concepts of "data collection, recognition, and storage is indisputably well-known" and are functions that "humans have always performed"); *Dealertrack*, 674 F.3d at 1333-34 (explaining that "computer aided" mental process claims was unlimited in scope and preempted the abstract concept).

The sweeping breadth of the claimed "abstract" is further confirmed by the specification, which highlights the goal of modeling and mirroring human-observable signal recognition for performing claimed comparisons. (*See, e.g.*, Appx0028 (4:32-36) (recognizing that "it is usually costly and time consuming to model the processes of the highly effective ability of humans to identify and recognize signals"); Appx0033-34 (14:58-15:11) (invention models and preserves "perceptual qualities that permit a human to recognize the original visual image"); *id.* (describing how invention might be used to locate images of the sun by analogy to what a person would do); Appx0033 (15:12-15) (one application might be "identification of photographs of potential suspects which identity matches a sketch of a police artist").)

As broad as the Patents read, Blue Spike dismisses preemption issues by asserting that the Asserted Claims would not preempt what is in the prior art. (Br. at 40 (using an "abstract" is "just one method" for comparing signals; others like water-marking or additive signals are in the prior art and can be utilized).) This self-serving declaration of an axiomatic patent law principle cannot save Blue Spike. This Court has made clear that the "mere existence of a non-preempted use of an abstract idea does not prove that a claim is drawn to patent-eligible subject matter." To hold otherwise would allow a patentee to avoid a § 101 challenge by "identify[ing] a single prior art reference in the specification and state that its invention improves upon that reference." *See Vehicle Intelligence*, 2015 WL 9461707, at *3.

Blue Spike additionally argues that the Patents do not preempt because they do not cover "direct comparison, analyzing two binary files composed of 1s and 0s side-by-side on a bit-by-bit basis." (Br. at 40-41.) Said differently, Blue Spike is essentially arguing that everything other than an entire-work-to-entire-work comparison is covered by the Asserted Claims. This argument does not help Blue Spike; instead, it proves the point. By Blue Spike's own argument, any process that takes any human-perceptible part of a work and makes a comparison on that basis (using any prior art or yet-to-be-conceived mechanism), is within the scope of the alleged invention. This is preemption of the abstract idea. *See Internet Patents*, 790 F.3d at 1349 (finding claims invalid under § 101 and noting that computer aided mental process and abstract ideas linked to general purpose computer preempted all practical uses of the abstract concept).

4. The Asserted Claims Do Not Satisfy the Machine or Transformation Test

Regarding the machine-or-transformation test, the District Court did not "ignore" Blue Spike's arguments (*contra* Br. at 42-44), but asked at the hearing what relevance the machine-or-transformation test had to its § 101 analysis. The entirety of Blue Spike's response was to suggest that the test was "an indicator" or "factor" to consider, and to direct the District Court's attention to its opposition brief. (Appx2781:3-13.) That brief dedicated <u>one paragraph</u> to discussing—in the most cursory fashion possible—how the Asserted Claims purportedly satisfied the "transformation" portion of the test (*i.e.*, by claiming "a method for creating signal abstracts, which are manipulations of the data signal" to a data-reduced form). (Appx2994.) Blue Spike repeats this argument on appeal and again misses the mark. (Br. at 43.) The mere transformation of data does not satisfy the machine-or-transformation test.[13] *Cf. Bilski*, 561

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[13] Blue Spike newly contends on appeal that the "abstract" is "non-invertible." (Br. at 7.) Blue Spike is apparently arguing against the construction of "abstract" that it urged to the Court below. On that basis, its new argument can be rejected. Regardless, Blue Spike is wrong. As support, Blue Spike cites a passage of the '175 patent that corresponds to Appx0033(14:3-8), which does <u>not</u> discuss the "abstract." It describes creating a second database (storing data-reduced audio signals) from a first database (storing audio signals) where the data-reduced versions of the signals in the second database are "not likely to reflect the human perceptual quality of the signal" and thus, are "not <u>likely</u> to be played back and recognized as the original signal." (Emphasis added.) As discussed above, an "abstract" by

U.S. at 602; *Alice*, 134 S.Ct. at 2357-58 (noting, for example, that mathematical transforms carried out in computers long in use is not patentable).

With respect to whether these claims involve a "machine," Blue Spike, for the first time on appeal, apparently asserts that the presence of a computer satisfies the machine test. Again, Blue Spike is wrong. The Asserted Claims recite nothing more than generic computer components (*see* Counter-Statement of the Case, Section II.A, *supra*; Appx0011), which cannot save them from invalidity under this Court's precedent. *Ultramercial*, 772 F.3d at 716-7 (claims that "are not tied to any particular novel machine or apparatus, only a general purpose computer" do not satisfy "machine" prong); *Vehicle Intelligence*, 2015 WL 9461707, at *4 ("Merely stating that the methods at issue are performed on already existing vehicle equipment, without more, does not save the disputed claims from abstraction.").

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definition must retain human perceptual qualities of the underlying signal (Argument, Section II.A, *supr*a; Counter-Statement of the Case, Section II.B, *supra*.) and neither this section of the specification or any language in any of the Asserted Claims <u>requires</u> that any abstract be "non-invertible."

III. Blue Spike's Remaining Arguments Do Not Bear on the § 101 Analysis, Have No Merit and/or Were Not Raised Below

A. The District Court Did Not Err in Deciding Patent Eligibility in the Context of a Rule 12(c) Motion, and Did Not Enter Judgment Prematurely

Patent eligibility under § 101 is a threshold issue. *Bilski*, 561 U.S. at 602. Where claims are plainly directed to an abstract idea, this Court has "repeatedly sanctioned a district court's decision to dispose of them on the pleadings." *See OIP Technologies*, 788 F3d. at 1364-65 (J. Mayer, concurring) (rejecting argument that discovery and claim construction are necessary); *see also Content Extraction,* 776 F.3d at 1349 (rejecting argument that lower court erred by declaring claims patent-ineligible at the pleading stage without claim construction or expert discovery); *buySAFE*, 765 F.3d 1350 (affirming judgment on the pleadings). Here, there is no merit to Blue Spike's complaint that the District Court should have construed claim terms and considered expert opinion before ruling on Google's motion. (Br. at 2, 13, 15, 24, 28-30, 29 n.13.) Even though the District Court would have been well within its authority had it not done so, the District Court analyzed the Texas court's claim constructions urged by Blue Spike and considered the expert declaration submitted by Blue Spike. (Appx0003-4, Appx0008-9.) To the extent Blue Spike contends that the District Court misunderstood the Patents, it also gave Blue Spike every opportunity to explain them. (Appx0601-0609 (scheduling conference); Appx2270 (brief); Appx2739 (§ 101 hearing); Appx0019 (order to show cause).) On this record and for these Patents, the District Court did not err in entering judgment on the pleadings.

B. Google and the District Court Did Not Inject Other Invalidity Considerations into the § 101 Analysis

It is true that, whether or not the Asserted Claims are patent-eligible, they still would be invalid if they did not satisfy the other statutory requirements for patentability, including §§ 102, 103 and 112. *Bilski*, 561 U.S. at 602; 35 U.S.C. § 101. But, the question of what the Patents cover is as central to the § 101 analysis as it is to other statutory requirements for patentability. Here, Blue Spike argues that the District Court was reversibly confused by enablement issues under § 112 when the District Court found these Patents invalid under § 101, pointing to the District Court's occasional use of words like "teach" or "enable" at the hearing or in its Order (along with a footnote in Google's motion reserving its rights to move later on § 112 issues, *see* Appx2114). (Br. at 3-4, 10-11, 14-15, 17, 20 n.5, 53-54.)

While the Patents are critically deficient under § 112, neither Google nor the District Court imported those deficiencies into or conflated them with the § 101 discussion.[14] The question of what the Patents teach, and thus what they may cover, are critical questions with respect to certain aspects of a § 101

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[14] Google was not "ultimately forced to disavow its § 112 argument." (*Contra* Br. at 14.) Google's motion was limited to a single question, patentability under § 101. Its briefing and argument focused solely on that issue. Blue Spike cites nothing that would suggest otherwise.

analysis, including the scope of preemption and whether there is an inventive concept sufficient to limit a claimed abstract idea. Here, the District Court was correct in noting that these Patents do not actually teach any way to construct an "abstract," but instead merely claim the idea of using an "abstract." This is a § 112 problem. But, it is also relevant to the § 101 analysis. The District Court's questions and analysis focused on whether there is, indeed, any limit anywhere in the Asserted Claims or specifications as to what an "abstract" could be or how it could be generated, other than the abstract idea of being based on human perception. In this analysis, the District Court, Google, and Blue Spike all referred to and evaluated the Asserted Claims in light of the specification, which is consistent with how this Court analyzes § 101 issues. *Internet Patents Corp.*, 790 F.3d at 1348 (discussing specification's lack of disclosure as part of the patentability determination); *Vehicle Intelligence*, 2015 WL 9461707, at *3 ("neither the claims at issue nor the specification provide any details as to how this [claimed] system works or how it produces faster, more accurate and reliable results"); *see also Digitech Image*, 758 F.3d at 1350 (system claims directed to describing mathematical transformations for digital image processing were not patent-eligible where they did not "require any physical embodiment"). The fact that the Asserted Claims may not, for instance, be enabled does not undercut the conclusion, as confirmed by the District Court, that the Asserted Claims also do not place any patentable limits on the abstract idea of an "abstract."

C. The Invalidity of These Asserted Claims Is Not Affected by the Texas Court's Finding of a "Prose Algorithm"

Blue Spike asserts that the District Court's statement that the specification includes no "source code, detailed algorithms or formulas, or the like" (Appx0004) is contradicted by a Texas court decision that apparently found a "prose" algorithm in the specification. (Br. at 10, 20 n.4, 22, 29 n.13; Appx2034.) In context, the Texas court was not considering the question of patent eligibility under § 101, but instead addressed arguments as to whether certain phrases met the requirements of § 112 ¶¶ 2, 6. (Appx2045, Appx2048.)

Blue Spike's assertion of a conflict is overstated, at best. The District Court, in its analysis of the claimed "abstract," noted that "the specification does not teach the specifics of implementation—it includes no source code, detailed algorithms or formulas, or the like." (Appx0004.) As framed by Blue Spike, the Texas court's supposedly contradictory finding of a "prose algorithm" was related to "five elements: (1) a reference database, (2) an object locator, (3) a feature selector, (4) a comparing device, and (5) a recorder." (Br. at 10 (citing '175 Patent 8:3-9:40).) Whether or not the specification's discussion of these elements is a "prose" algorithm, it certainly is not a detailed algorithm teaching the specifics of how to create the claimed "abstract" that is alleged to be "key" to the Asserted Claims.[15] There is thus no substantive

[15] *See Augme Techs., Inc. v. Yahoo! Inc.*, 755 F.3d 1326, 1337-38 (Fed. Cir. 2014) (affirming indefiniteness ruling where specification merely restated the recited function to "assemble a second code module" but did not include any algorithm for how

tension between the District Court's observation and the Texas Court's finding.

Even if Blue Spike's assertion of a conflict was true, Blue Spike offers no authority for the proposition that one court's decision regarding one element of a claim in light of § 112 has any bearing on another court's detailed analysis under § 101. *See, e.g., J&J Sports Prods., Inc. v. Kim Hung Ho*, Case No. 5:11-cv-1163, 2012 WL 1910041, at *4 (N.D. Cal. May 24, 2012). Regardless, the District Court cannot be criticized for its finding that the specification contained no algorithm (*contra* Br. at 29 n.13) when Blue Spike never raised its "prose" algorithm argument below.[16] (*See* Appx2278, Appx2283, Appx2758-59.) At the hearing, Blue Spike admitted that the Asserted Claims do not include any algorithms and, in response to the District Court's request that it identify <u>where</u> the Patents teach the "complex mathematical algorithms" that it alleged were in the specification, Blue Spike identified only two passages.

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the second code module was actually assembled); *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 520-21 (Fed. Cir. 2012) (rejecting argument that specification included prose algorithm, noting that the "problem here is not the adequacy of the substance or form of the disclosure, but the absence of any disclosure at all"); *Ergo Licensing, LLC v. CareFusion 303, Inc.*, 673 F.3d 1361, 1365 (Fed. Cir. 2012) ("Even described 'in prose,' an algorithm is still 'a step-by-step procedure for accomplishing a given result.'") (citation omitted).

[16] Blue Spike cites the '175 patent at column 8:3-9:40 as evidence of "a 5-step prose algorithm." (Br. at 10; Appx0078-79.) This citation corresponds to column 7:65-9:39 of the '472 patent (Appx0030-31), and is not one of the two passages identified by Blue Spike at the hearing on Google's motion. (Appx2758-59 (identifying column 7:46-60 and column 4:24-32 (sic, 4:8-18).)

(Appx2758:1-Appx2759:9.) The first pertains to prior art psycho-acoustic and psycho-visual compression (Appx0030-31 (7:65¬ 9:39)) and the second pertains to prior art lossless and lossy compression and other data reduction techniques (Appx00028 (4:8-18).) The District Court did consider each argument that Blue Spike actually made below, but rejected them because it held that the approaches identified by Blue Spike "fall[] squarely within the prior art and/or the abstract concept." (Appx0016) (considering these arguments in connection with the Asserted Claims that actually recite these limitations).)

D. Blue Spike's Reliance on Purported Novelty, the USPTO's Issuance of the Patents and the Statutory Presumption of Validity Is Misplaced

Blue Spike's last assertion—that the USPTO's issuance of the Patents and "the general statutory presumption of patent validity" should trump the § 101 eligibility requirement—also has no merit. (Br. at 5-6, 8, 18-19, 19 n.2, 22.) If this were so, there would be no *Bilski*, no *Mayo*, no *Alice* and no role for the Court on this issue. *See Alice*, 134 S.Ct. at 2359 (finding claims patent-ineligible as they relied upon prior art and prior knowledge insofar as the claims recited "'well-understood, routine, conventional activit[ies]' previously known to the industry.") (citing *Mayo*, 132 S.Ct. at 1294); *Internet Patent*, 790 F.3d at 1348 (finding the specification described a claimed element as "conventional," well-known, and a product of prior art applications rending it patent-ineligible).

CONCLUSION

For the foregoing reasons, Google respectfully requests that the Court affirm the Order of the District Court granting judgment on the pleadings and finding that the Asserted Claims are invalid under 35 U.S.C. § 101.

Respectfully submitted,

/s/ Michael A. Berta
ARNOLD & PORTER LLP
Three Embarcadero Center,
7th Floor
San Francisco, CA 94111
Phone: (415) 471-3100
Fax: (415) 471-3400
michael.berta@aporter.com

Nicholas H. Lee
ARNOLD & PORTER LLP
777 S. Figueroa Street,
44th Floor
Los Angeles, CA 90017
Phone: (213) 243-4000
Fax: (213) 243-4199
nicholas.lee@aporter.com

Attorneys for Appellee Google Inc.

Date: March 28, 2016

CORRECTED REPLY BRIEF FOR PLAINTIFF-APPELLANT (MAY 5, 2016)

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

BLUE SPIKE, LLC,

Plaintiff–Appellant,

v.

GOOGLE INC.,

Defendant–Appellee.

No. 16-1054

Appeal from the United States District Court for the Northern District of California in Case No. 4:14-cv-1650, Judge Yvonne Gonzalez Rogers.

Ernest Young
Of Counsel
3208 Fox Terrace Dr.
Apex, NC 27502
(919) 360-7718

Randall T. Garteiser
Christopher A. Honea
Kirk J. Anderson
GARTEISER HONEA, P.C.
44 North San Pedro Rd
San Rafael, California 94903
(415) 785-3762

Counsel for Plaintiff-Appellant

{ TABLES AND APPENDICES OMITTED }

INTRODUCTION

Google's argument in this case is a claim about enablement and novelty masquerading as an argument about patentable subject matter. This is evident from Google's appellate brief, which repeatedly asserts that Blue Spike's patents attempt to monopolize a concept without explaining how the concept actually works. And the district court was plainly swayed by Google's allegations, using § 101's patentability analysis to conduct an informal analysis of concerns that belong under § 112. This was error, because Google's Rule 12(c) motion for judgment on the pleadings afforded Blue Spike no opportunity to present factual evidence concerning its invention necessary to resolving any issues under § 112.

The district court's concerns about enablement infected its entire analysis of patentability. The court's conviction that Blue Spike had not specified an actual invention led the court to characterize the claims of the patents in suit at the highest possible level of generality. Disregarding § 282 of the Patent Act's presumption of validity, the district court construed the patents to destroy them, not save them, concluding that they claimed all methods of "comparing one thing to another" and preempted even basic human comparisons "undertaken from time immemorial." (Appx0004.)

Likewise, the absence of an actual invention is critical to the district court's and Google's contention that Blue Spike's patents simply take an abstract idea—comparison—and implement it on a computer. Although both Google and the district court occasionally suggest that one simply cannot obtain a patent on automating a human process, the more precise point—which Blue Spike accepts—is that one cannot patent the idea of automating such processes. But one can patent an invention that actually implements that process on a machine—for example, a working driverless car. Google's argument that the patents-in-suit lack an inventive concept thus makes sense only in the context of the allegation—which belongs under § 112—that Blue Spike has not actually come up with a workable approach to digital comparisons using a signal abstract. That allegation is incorrect—as the Eastern District of Texas court determined when it denied a motion for summary judgment under § 112 on the same patents-in-suit (Appx2034)—and Blue Spike is entitled to a remand to establish that fact.

I. The District Court Failed to Construe Blue Spike's Patents in Such a Manner as to Preserve Their Validity

We begin with the last argument in Google's brief, which is to dismiss as irrelevant Section 282 of the Patent Act's command that "[a] patent shall be presumed valid" (35 U.S.C. § 282) because it does not "trump" § 101's requirement of patentable subject matter. (Google Br. at 59.) This argument flatly misunderstands the role of interpretive presumptions in the law. Section 282 must be applied consistently with the Patent Act's substantive requirements, but it guides interpretation of those requirements. The eligibility requirement of § 101 is hardly self-applying, and § 282 reflects Congress's intention that it be applied generously toward patent holders. Blue Spike's argument is not that § 282 overrides the

Alice/Mayo test, but rather that the pro-validity presumption should guide that test's application here.

This Court has interpreted § 282 to require the same generosity toward interpreting the patents themselves, holding that "[c]laims should be so construed, if possible, as to sustain their validity." *Rhine v. Casio, Inc.*, 183 F.3d 1342, 1345 (Fed. Cir. 1999). Neither the district court nor Google has heeded that command here. Rather, the district court interpreted Blue Spike's patents so broadly as to render them absurd, asserting that the patents claimed a monopoly on "comparing one thing to another." (Appx0004.) And Google's brief on appeal likewise not only endorses this reading but, at every turn, seeks to expand the sweep of the patents' claims so as to render them invalid and ridiculous.[1] The presumption of validity bars this approach, however. Patents are to be construed as reasonable and limited unless their language simply forecloses that interpretation. On the sympathetic reading that § 282 requires, Blue Spike's patents claim patentable subject matter.

Blue Spike's opening brief identified three particular ways in which the district court erred in determining that Blue Spike's patents were directed

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1 *See, e.g.*, Google Br. at 20 (asserting that Blue Spike's patents "seek to claim the same real-world comparisons that humans make every day when identifying, comparing and locating content (*e.g.*, songs, images, videos, text) and preempt every possible use or application of these straight-forward comparisons on a computer"); *id.* at 51 (asserting that Blue Spike's claims cover "everything other than an entire-work-to-entire-work comparison").

toward an abstract idea. First, it focused on the problem that the invention set out to solve (*e.g.*, comparing digital signals), not the approach claimed to address that problem (relying on a signal abstract). Google insists this Court's cases approach the characterization in the same way, but in those cases the patents did not claim a particular approach to the problem; rather, they simply claimed a generic solution. *See Internet Patents Corp. v. Active Network, Inc.*, 790 F.3d 1343, 1348 (Fed. Cir. 2015) (holding the patent's claim on "maintaining the state" was abstract because it was "dissociated from any method by which maintaining the state is accomplished"); *Vehicle Intelligence and Safety LLC v. Mercedes-Benz USA, LLC*, 2015-1411, 2015 WL 9461707, at *2 (Fed. Cir. Dec. 28, 2015) (finding the claims abstract because they fail to "explain how to perform either screening or testing for any impairment, specify how to program the 'expert system' to perform screening or testing, or explain the nature of control to be exercised on the vehicle in response to the test results"). That is not the case here, as Blue Spike's patents substitute a Signal Abstract for the approaches that dominate the prior art, such as comparing signals in their entirety or relying on digital watermarking.

The second problem was the Northern District of California's approach of narrowing patent claims to their "gist"—here, comparing one thing to another. Blue Spike submits that this approach contradicts this Court's precedents by generalizing away legitimate inventive concepts. (*See* Opening Br. at 24, n.6.) Google's only answer is to assert that the various Northern District cases cite the appropriate precedents, but that hardly means that these cases apply those precedents directly. In any event, the proof is in the pudding: Here, the district court's gist generalized Blue Spike's patents to the absurd claim of any method of comparing one thing to another.[2]

Finally, Blue Spike argued that the district court's patentability analysis was sufficiently dependent on debatable constructions of the patents' claims that it was inappropriate to resolve patentability prior to claim construction. Google answers that the district court had before it constructions of the claims from the Eastern District of Texas, but that is hardly the same thing as giving the parties to this case a hearing on claim construction.

II. Automating a Task Performable by Humans is not Inherently Unpatentable

Google presents two principal arguments in this appeal. The first is that Blue Spike's patents simply take something that humans do—compare one thing to another—and claim a monopoly on performing that task using a generic computer. (*E.g.* Google Br. at 29) (arguing that "comparing signals using human-observable characteristics of the signals" is inherently abstract because the machine is merely performing "a process 'long undertaken within the human mind'.") The problem with this argument is that, standing alone, it risks foreclosing any patent protection for innovation in automating human tasks.

[2] Google glosses over Blue Spike's "gist" argument, instead dismissing these cogent examples as having "no substance." (Google Br. at 31.)

Certainly one may not patent the very idea of automating a particular task. By the same token, however, patent protection for particular methods of automating particular tasks—*e.g.*, driving cars, reviewing legal documents, preparing the perfect café latte—is at the heart of contemporary innovation. Google's first argument thus makes little sense without its second claim, which is that Blue Spike has not actually invented a particular method for creating Signal Abstracts and employing them to compare digital signals. Google admits as much, recognizing that "had the patentee truly invented and claimed an actual process by which to generate an 'abstract . . . using perceptual qualities,' this case may have been different." (Google Br. at 32.)

Google's argument that Blue Spike's patents do not claim patentable subject matter thus depends on its further claim that the claims do not describe an actual invention. Google says that "[t]he specification and Asserted Claims refer to the 'abstract' in aspirational terms only—identifying <u>what it should do</u> . . . but <u>not how</u> to do it." (Google Br. at 6) (emphasis in original). No one disputes, for example, that while one could not patent the idea of a self-driving car, one certainly <u>could</u> patent a working apparatus for implementing that idea. This is critical, because it means that at bottom, Google's claims have to do not with patentability of the subject matter, but rather with the novelty and enablement of Blue Spike's invention. And those issues were not properly before the district court in this case.

A. The Key Distinction Is Between Patenting the Idea of Automating a Task *Per Se* and Patenting a Particular Approach to Automating that Task

This Court and the Supreme Court have been appropriately hesitant to uphold patents that simply claim the computerized application of familiar ideas and processes. For example, *DDR Holdings, LLC v. Hotels.com, LLP.*, 773 F.3d 1245 (Fed. Cir. 2014) referred to a number of cases in which patents were found ineligible because they merely claimed abstract ideas generically performed on a computer.[3] By contrast, the claims in *DDR Holdings* were not abstract because they disclosed an invention that incorporates, not merely mentions, digital technology. *Id.* Specifically, the claims in *DDR Holdings*

[3] For example, *Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 715–16 (Fed.Cir.2014) "merely recited the abstract idea of using advertising as a currency as applied to the particular technological environment of the Internet"; *buySAFE, Inc. v. Google, Inc.*, 765 F.3d 1350, 1355 (Fed.Cir.2014) "recited no more than using a computer to send and receive information over a network in order to implement the abstract idea of creating a 'transaction performance guaranty'; *Accenture Global Servs., GmbH v. Guidewire Software, Inc.*, 728 F.3d 1336, 1344–45 (Fed.Cir.2013), "merely recited 'generalized software components arranged to implement an abstract concept [of generating insurance-policy-related tasks based on rules to be completed upon the occurrence of an event] on a computer'"; and *Bancorp Servs., L.L.C. v. Sun Life Assur. Co. of Canada (U.S.)*, 687 F.3d 1266, 1278 (Fed.Cir.2012) "recited no more than the use of a computer 'employed only for its most basic function, the performance of repetitive calculations', to implement the abstract idea of managing a stable-value protected life insurance policy." *DDR Holdings, LLC v. Hotels.com, L.P.*, 773 F.3d at 1256.

disclose a technological improvement that "overrides the routine and conventional" computer technology—a website hyperlink. Similarly, the patents-in-suit do not take an abstract idea and generically say "do this on a computer" (*Contra* Google Br. at 30); rather, they describe how digital signals may be transformed into data-reduced, non-invertible representations that retain perceptual characteristics of that digital signal, and how those representations may be used to improve upon existing digital comparison techniques. The patents-in-suit do not seek to patent the mere idea of comparing digital signals; they disclose a particular method of accomplishing those comparisons.

This particular approach disclosed in the patents-in-suit adds to one of the most significant fields of contemporary innovation—the automation of functions traditionally performed by humans. If no invention that duplicated human behavior on a computer were patentable, then driverless cars, predictive coding processes that duplicate human lawyers' review of discovery documents, and a variety of other automated innovations would be left without protection. Blue Spike submits that the balance struck in the decisions of this Court and the Supreme Court is to forbid patenting the idea of automation *per se*, but to permit patenting particular approaches to automating human tasks. One cannot take out a patent that claims the concept of driving a car, as implemented on a generic computer. But one can patent particular systems for executing the idea of a driverless car. Judging from Google's driverless-car patent, Google must agree. (*See, e.g*. Google's U.S. Patent 8,7078,349.)

What cannot matter, however, is simply whether a patent claims a function that duplicates human behavior. Throughout its brief, Google emphasizes that the Signal Abstract is fashioned from human-perceptible characteristics of the signal.[4] As the driverless car and predictive coding examples demonstrate, inventions that simply duplicate what a human could also do may well be patentable, as long as they do not seek to patent the generic idea of automating that function. *See Research Corp. Techs., Inc. v. Microsoft Corp.*, 627 F.3d 859, 869 (Fed. Cir. 2010) (finding "inventions with specific applications or improvements to technologies in the marketplace are not likely to be so abstract that they override the statutory language and framework of the Patent Act"). As Blue Spike argued in its opening brief, computerized implementation of human capabilities may well yield power and efficiency advantages over human performance of the same task. (Opening Br. at 37-38.) But even this should not be necessary for patentability. Surely a driverless car would be a patentable invention, even if it drove no better than the average driver. And while robots that autonomously vacuum one's home almost surely do a poorer job than would a human,

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[4] This is not at all the same thing as saying that the process of abstracting and comparison claimed by Blue Spike duplicates the way human beings actually hear. That is an interesting question that would require evidence not available on a Rule 12(c) motion to actually evaluate. But in any event, it is unclear why that would render the invention unpatentable. Surely artificial organ implants that duplicate the functioning of human organs as nearly as possible are patentable. One could not patent that functioning, of course; but one could surely patent a particular method for getting an artificial construct to perform in that way.

the advantage is simply that the human does not have to do it. (*See* autonomous vacuum patents, *e.g.*, U.S. Patents 7,769,490; 6,883,201; 5,095,577; and 7,389,156.)

B. Prior Art Is Relevant and Helpful in Determining Where Unpatentable Abstract Concepts and Natural Laws End and Patentable Inventive Concepts Begin

A particularly relevant clue to whether a patent teaches a patentable approach to automating a function is whether it resolves an engineering problem in the prior art. Google argues that prior art is simply not relevant to patentability, (Google Br. at 35-36), but the Supreme Court acknowledged its relevance in *Alice*. Surveying its past precedents involving computer applications of well-known processes and mathematical equations, the Court distinguished between patents that simply take established principles and apply them in a generic computerized environment and those that "improved an existing technological process." *See Alice Corp. Pty. Ltd. v. CLS Bank Intern.*, 134 S.Ct. 2347, 2357-58 (2014) (comparing *Mayo* and *Flook* with *Diehr*).

The *Alice* Court's approach makes good sense. The central task here is to separate out the aspects of the invention that are appropriately viewed as common property—*e.g.*, abstract ideas and scientific concepts—from those aspects that represent innovation by the patentee. As discussed in Blue Spike's opening brief, the prior art generally relied either upon digital watermarking, which provided inadequate security against copying because the watermark could be removed, or comparing entire signals, which was prohibitively inefficient. The Signal Abstract represents a new approach that avoids these difficulties, therefore making an innovative contribution. Critically, the district court's highly-general characterization of Blue Spike's patents would cover all three of these approaches, thereby losing track of the distinct claims that motivate Blue Spike's invention.

C. Both the District Court and Google Are, at Base, Conflating Patentability with Novelty and Enablement

Google basically concedes the analysis above, acknowledging that "had the patentee truly invented and claimed an actual process by which to generate an 'abstract . . . using perceptual qualities,' this case may have been different." (Google Br. at 32.) Blue Spike submits that Google's real objection, which the district court seems to have accepted, was that Blue Spike has <u>not</u> "invented and claimed an actual process by which to generate an abstract." *Id.* That objection is groundless. But more importantly for present purposes, it has nothing to do with whether such an invention would be patentable. Both Google's argument and the district court's decision conflated patentability with novelty and enablement, and this was reversible error.

Even on appeal, Google's brief makes crystal clear that its real objection is that Blue Spike has no actual invention.[5] For example, Google argues "[t]he

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[5] *See also* Google Br. at 26 (asserting that "[t]he Asserted Claims and specification assert ownership of the bare-bones idea of an 'abstract,' setting forth only its aspirational function"); *id.* at 58 (asserting that the patents' "prose algorithm" "certainly is not a detailed algorithm teaching the

specification and Asserted Claims refer to the 'abstract' in aspirational terms only—identifying what it should do (*e.g.*, an abstract should retain what is 'humanly-perceptible' so that it 'successfully mimics human perception') but not how to do it." (Google Br. at 6.) Again, Google insists that "[a]part from these aspirational goals of what the 'abstract' should do and how it might be used, the specification contains no technical detail or instruction of how to go about creating such an 'abstract.' There is no drawing, no figure, no schematic and no algorithm. . . . The specification describes the "abstract" only in terms of its hoped-for function . . . " (*Id.* at 13.) "Fundamentally," Google concludes, "the specification's description of an "abstract" (*i.e.*, a reduced version of the signal that retains humanly-perceptible qualities of the underlying signal) is nothing more than a broad, open-ended theoretical concept, waiting for future innovation and for someone else to figure out how to implement it." (*Id.* at 14.)

These are serious charges, but they do not go to patentability. The articulated concerns go to whether Blue Spike's specification adequately enables the invention and, perhaps, whether the claims contribute anything novel to the prior art. They are properly assessed not under § 101 of the Patent Act, but under § 112. And as we consider in Section III, there are good reasons for keeping those two inquiries separate, especially at the current stage of the proceedings.

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specifics of <u>how</u> to create the claimed 'abstract'") (emphasis in original).

D. The Patents-in-Suit Provide a Detailed Algorithm That Instructs One of Ordinary Skill How to Implement the Inventions

As noted above, Blue Spike does not believe Google's § 112 arguments properly raised in the context of a § 101 inquiry. Moreover, the Eastern District of Texas already considered arguments that parallel Google's and denied a motion for summary judgment on § 112. (Appx2034) (finding that the patents-in-suit contain a prose algorithm). Even so, because the existence of an algorithm figures so prominently in Google's argument, Blue Spike will more fully highlight the algorithm and related instructions here.

Prior to the patents-in-suit, solutions for comparing and identifying digital signals were not optimal, often times requiring excessive computational overhead, storage capacity, prior access to and manipulation of digital signals, and so on. For example, digital watermarks have proved relatively effective in signal identification but require embedding a signal in each digital to be identified. This requirement is not optimal when digital signals under analysis have not yet been "tagged" with a digital watermark. Another example is a bit-by-bit comparison which is limited to exact identification and require significant computational resources.[6]

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[6] Google criticizes Blue Spike's mention of the bit-by-bit analysis as "essentially arguing that everything other than an entire-work-to-entire-work comparison <u>is</u> covered by the Asserted Claims." (Google Br. at 51) (emphasis original). This is grossly inaccurate. For one, Blue Spike provided this example as merely "[o]ne approach" to signal comparisons. (*See* Blue Spike Br. at 41.) Also, bit-by-bit analysis does not require analyzing

The patents-in-suit addressed these challenges in the digital world by teaching how signal abstracts—data-reduced, non-invertible representations of a digital signal—could be produced to improve matching and identification. They did not just speed up the process or reduce overhead. The patents-in-suit teach how identification and comparison can take place on a machine in a way that could not be achieved before. They "work" where prior art failed.

The patents-in-suit accomplish this feat by identifying perceptible qualities in a digital signal, generating representations that identify these perceptible signals without the excess overhead of an exact duplication. This means the representation is non-invertible—you can't use it to create the original. Because the signal is non-invertible, not all data is retained in the translation, but the Signal Abstract retains the key elements needed to perform identification and matching. How the invention does this is contained in the algorithm described below.

1. First Algorithm Component: A Reference Database Containing Information About Digital Signals That May Be Monitored

The patent specification describes five key components to the algorithm. The first component is a reference database containing information about digital signals that may be monitored. The database may contain the original works or pre-processed versions of those works, such as a digital abstract.

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an entire work. Discrete portions of a work can still be analyzed on a bit-by-bit basis.

Specifically, the algorithm's first component is described as follows:

> The first element is the reference database, which contains information about a plurality of potential signals that will be monitored. In one form, the reference database would contain digital copies of original works of art as they are recorded by the various artists, for example, contain digital copies of all songs that will be played by a particular radio station. In another form, the reference database would contain not perfect digital copies of original works of art, but digital copies of abstracted works of art, for example, contain digital copies of all songs that have been preprocessed such that the copies represent the perceptual characteristics of the original songs. In another form, the reference database would contain digital copies of processed data files, which files represent works of art that have been preprocessed in such a fashion as to identify those perceptual differences that can differentiate one version of a work of art from another version of the same work of art, such as two or more versions of the same song, but by different artists. These examples have obvious application to visually communicated works such as images, trademarks or photographs, and video as well.

'175 Patent, Col. 8:14-33.

2. Second Algorithm Component: An Object Locator Which Is Able to Segment a Portion of a Signal

The second component of the algorithm is the object locator "which is able to segment a portion of a signal being monitored for analysis." '175 Patent, Col. 8:34-35. The segments created by the object locator are referred to as "objects." These objects are then manipulated by other components of the algorithm. (Further description of how the object locator may be constructed is explained in subsection 6.)

> The second element is the object locator, which is able to segment a portion of a signal being monitored for analysis (*i.e.*, the "monitored signal"). The segmented portion is also referred to as an "object." As such, the signal being monitored may be thought of comprising a set of objects. A song recording, for example, can be thought of as having a multitude of objects. The objects need not be of uniform length, size, or content, but merely be a sample of the signal being monitored. Visually communicated informational signals have related objects; color and size are examples.

'175 Patent, Col. 8:34-43.

3. Third Algorithm Component: A Feature Selector Which Is Able to Identify Perceptual Features That Uniquely Describe an Object

The third element is a feature selector. This element is "able to analyze a selected object and identify perceptual features of the object that can be used to uniquely describe the selected object." '175 Patent, Col. 8:44-46. These perceptual qualities are helpful to describe the object as well as differentiate it from other objects. (Further description of how the feature selector may be constructed is explained in subsection 6.)

> The third element is the feature selector, which is able to analyze a selected object and identify perceptual features of the object that can be used to uniquely describe the selected object. Ideally, the feature selector can identify all, or nearly all, of the perceptual qualities of the object that differentiate it from a similarly selected object of other signals. Simply, a feature selector has a direct relationship with the perceptibility of features. commonly observed. Counterfeiting is an activity which specifically seeks out features to misrepresent the authenticity of any given object. Highly granular, and arguably successful, counterfeiting is typically sought for objects that are easily recognizable and valuable, for example, currency, stamps, and trademarked or copyrighted works and objects that have value to a body politic.

'175 Patent, Col. 8:44-58.

4. Fourth Algorithm Component: A Comparing Device Which Is Able to Identify Perceptual Features That Uniquely Describe an Object

The fourth component is a "comparing device which is able to compare the selected object using the features selected by the feature selector to the plurality of signals in the reference database to identify which of the signals matches the monitored signal." '175 Patent, Col. 8:58-62.

> The fourth element is the comparing device which is able to compare the selected object using the features selected by the feature selector to the plurality of signals in the reference database to identify which of the signals matches the monitored signal. Depending upon how the information of the plurality of signals is stored in the reference database and depending upon the available computational capacity (*e.g.*, speed and efficiency), the exact nature of the comparison will vary. For example, the comparing device may compare the selected object directly to the signal information stored in the database. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector and then compare the selected object to the processed signal information. Alternatively, the comparing device may need to process the selected object using input from the feature selector and then compare the processed selected object to the signal information. Alternatively, the comparing device may need to process

> the signal information stored in the database using input from the feature selector, process the selected object using input from the feature selector, and then compare the processed selected object to the processed signal information.

’175 Patent, Col. 8:58-9:12.

5. Fifth Algorithm Component: A Recorder Which Records Information

Finally, the fifth element “is the recorder which records information about the number of times a given signal is analyzed and detected.”

> The fifth element is the recorder which records information about the number of times a given signal is analyzed and detected. The recorder may comprise a database which keeps track of the number of times a song, image, or a movie has been played, or may generate a serial output which can be subsequently processed to determine the total number of times various signals have been detected.

’175 Patent, Col. 9:13-19.

6. Additional Information Supplementing the Prose Algorithm

The specification builds on the framework of the prose algorithm by providing detailed examples of technology that can be used to carry out portions of the algorithm, particularly components 2 through 4. Certainly the patents-in-suit contain more implementation specifics than are listed here.

First, using RMS (root mean square) can assist in selecting relevant features of a digital signal by "determining the distance between data based on mathematically determinable Euclidean distance between the beginning and end data points (bits)." '175 Patent, 10:60-62.

> 1) RMS (root mean square). For example, a RMS function may be used to assist in determining the distance between data based on mathematically determinable Euclidean distance between the beginning and end data points (bits) of a particular signal carrier.

'175 Patent, Col. 10:59-63.

Second, frequency weighted RMS can further assist in selecting relevant features.

> 2) Frequency weighted RMS. For example, different weights may be applied to different frequency components of the carrier signal before using RMS. This selective weighting can assist in further distinguishing the distance between beginning and end points of the signal carrier (at a given point in time, described as bandwidth, or the number of total bits that can be transmitted per second) and may be considered to be the mathematical equivalent of passing a carrier signal difference through a data filter and figuring the average power in the output carrier.

'175 Patent, 10:60-62.

Third, the NULL set can be utilized "where a collision of data occurs." '175 Patent, Col. 11:12. If two abstracts are identical but represent different digital signals, those abstracts will "collide" or inaccurately identify matches. The patent discusses the NULL set in detail and proposes recalibration of the abstract generation routines and recalibration of the database in such instances. *See, e.g.*, '175 Patent, Col. 11:20-22.

> 3) Absolute error criteria, including particularly the NULL set (described above) The NULL may be utilized in two significant cases: First, in instances where the recognized signal appears to be an identified object 10 which is inaccurately attributed or identified to an object not handled by the database of objects; and second, where a collision of data occurs. For instance, if an artist releases a second performance of a previously recorded song, and the two performances are so similar that their differences are almost imperceptible, then the previously selected criteria may not be able to differentiate the two recordings. Hence, the database must be "recalibrated" to be able to differentiate these two versions. Similarly, if the system identifies not one, but two or more, matches for a particular search, then the database may need "recalibration" to further differentiate the two objects stored in the database.

'175 Patent, Col. 11:7-22.

Fourth, the patent teaches how cognitive identification may be employed, such as a "spectral transform or its equivalent of the carrier signal." '175 Patent, Col. 11:25-27.

> 4) Cognitive Identification. For example, the present invention may use an experience-based analysis within a recognition engine. Once such analysis may involve mathematically determining a spectral transform or its equivalent of the carrier signal. A spectral transform enables signal processing and should maintain, for certain applications, some cognitive or perceptual relationship with the original analog waveform. As a novel feature to the present invention, additional classes may be subject to humanly-perceptible observation. For instance, an experience-based criteria which relates particularly to the envisioned or perceived accuracy of the data information object as it is used or applied in a particular market, product, or implementation. This may include a short 3 second segment of a commercially available and recognizable song which is used for commercials to enable recognition of the good or service being marketed. The complete song is marketed as a separately valued object from the use of a discrete segment of the song (that may be used for promotion or marketing-for the complete song or for an entirely different good or service). To the extent that an owner of the song in question is able to further enable value through the licensing or agreement for use of a segment of the original signal, cognitive identifica-

tion is a form of filtering to enable differentiations between different and intended uses of the same or subset of the same signal (object). The implementation relating specifically, as disclosed herein, to the predetermined identification or recognition means and/or any specified relationship with subsequent use of the identification means can be used to create a history as to how often a particular signal is misidentified, which history can then be used to optimize identification of that signal in the future. The difference between use of an excerpt of the song to promote a separate and distinct good or service and use of the excerpt to promote recognition of the song itself (for example, by the artist to sell copies of the song) relates informationally to a decision based on recognized and approved use of the song. Both the song and applications of the song in its entirety or as a subset are typically based on agreement by the creator 65 and the sender who seeks to utilize the work. Trust in the means for identification, which can be weighted in the present invention (for example, by adjusting bit-addressable information), is an important factor in adjusting the monitoring or recognition features of the object or carrier signal, and by using any misidentification information, (including any experience based or heuristic information), additional features of the monitored signal can be used to improve the performance of the monitoring system envisioned herein. The issue of

> central concern with cognitive identification is a greater understanding of the parameters by which any given object is to be analyzed. To the extent that a creator chooses varying and separate application of his object, those applications having a cognitive difference in a signal recognition sense (*e.g.*, the whole or an excerpt), the system contemplated herein includes rules for governing the application of bit-addressable information to increase the accuracy of the database.

'175 Patent, Col. 11:23-12:11

Finally, under certain circumstances it may be appropriate to catalogue specific transmission fidelity, such as differing bandwidths.

> 5) Finally, the predetermined parameters that are associated with a discrete case for any given object will have a significant impact upon the ability to accurately process and identify the signals. For example, if a song is transmitted over a FM carrier, then one skilled in the art will appreciate that the FM signal has a predetermined bandwidth which is different from the bandwidth of the original recording, and different even from song when played on an AM carrier, and different yet from a song played using an 8-bit Internet broadcast. Recognition of these differences, however, will permit the selection of an identification means which can be optimized for monitoring a FM broadcasted signal. In other words, the discreteness intended by the sender is limited and directed by the fidelity of the

> transmission means. Objects may be cataloged and assessing with the understanding that all monitoring will occur using a specific transmission fidelity. For example, a database may be optimized with the understanding that only AM broadcast signals will be monitored. For maximum efficiency, different data bases may be created for different transmission channels, *e.g.*, AM broadcasts, FM broadcasts, Internet broadcasts, etc.

'175 Patent, Col. 12:12-32.

Google and the district court glossed over or outright denied the existence of this detailed instruction. Conversely, the E.D. Texas court recognized the detailed prose algorithm contained in the specification of the patents-in-suit. (Appx2034.) To the extent this Court's determination rests on the presence of an algorithm, Blue Spike urges the Court to recognize the detailed algorithm and additional guidance contained in the patents-in-suit.

III. Conflating Patentability with Novelty and Enablement Is Particularly Inappropriate in the Context of a Rule 12(C) Motion for Judgment on the Pleadings

Blue Spike does not, of course, concede that it has no invention or that its patent specifications fail to enable that invention. A proper hearing on these issues would give Blue Spike an opportunity to rebut these allegations. But as argued in the opening brief, novelty and enablement are fact-intensive issues inappropriate for resolution on a Rule 12(c) motion for judgment on the pleadings. Google's only answer is to insist that inadequate enablement "is also relevant to the § 101 analysis." (Google Br. at 56.) The contention seems to be that an inadequate specification broadens the patent claims' preemptive scope because there is otherwise no limit on what a Signal Abstract may comprise. (*See id.*) If that were the argument, however, then much of Google's broad rhetoric about Blue Spike's lack of an invention would be beside the point. And as Blue Spike's opening argument demonstrates, concerns about the preemptive scope of these patents may be met based on the claims as they stand. (*See* Opening Brief at 40-42.)

Moreover, Google's argument is nonresponsive to the significant authority that insists on keeping these inquiries distinct. (*See* Opening Br. At 54-58.)[7] Google's argument is simply a cover for conducting an informal adjudication of enablement under the guise of § 101, without the full development of the facts and law that a proceeding under § 112 would have afforded. Google's aspersions about novelty, obviousness, and enablement raise important factual issues that simply cannot be resolved on a Rule 12(c) motion for judgment on the pleadings. The district court's analysis critically rested on such judgments, and that was reversible error.

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[7] Google's argument that Blue Spike's specification fails to narrow the preemptive scope of the patent also highlights the inappropriateness of resolving this dispute without a hearing on claim construction.

CONCLUSION

For the foregoing reasons, the district court erred by holding the patents-in-suit ineligible subject to § 101. Blue Spike respectfully asks the Court to reverse and remand.

Respectfully submitted,

/s/ Randall T. Garteiser

Randall T. Garteiser
Christopher A. Honea
Kirk J. Anderson
GARTEISER HONEA, P.C.
44 North San Pedro Rd
San Rafael, California 94903
(415) 785-3762

Ernest Young
Of Counsel
3208 Fox Terrace Dr.
Apex, NC 27502
(919) 360-7718

Attorneys for Plaintiff-Appellant
Blue Spike, LLC

Date: May 5, 2016

No. 16-________

IN THE

Supreme Court of the United States

BLUE SPIKE, LLC,

Petitioner,

-v-

GOOGLE INC.,

Defendant.

On Petition for Writ of Certiorari to the
Federal Circuit of the United States

Patent Appendix
To Petition for Writ of Certiorari

Blue Spike, LLC v. Google Inc.
PATENT APPENDIX TABLE OF CONTENTS

Patent 8,712,728 B2
(April 29, 2014)

US008712728B2

(12) United States Patent
Moskowitz et al.

(10) **Patent No.: US 8,712,728 B2**
(45) **Date of Patent: Apr. 29, 2014**

(54) **METHOD AND DEVICE FOR MONITORING AND ANALYZING SIGNALS**

(71) Applicant: **Blue Spike LLC**, Tyler, TX (US)

(72) Inventors: **Scott A. Moskowitz**, Sunny Isles Beach, FL (US); **Mike W. Berry**, Seattle, WA (US)

(73) Assignee: **Blue Spike LLC**, Tyler, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(58) **Field of Classification Search**
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See application file for complete search history.

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Primary Examiner — Carol S Tsai
(74) *Attorney, Agent, or Firm* — Neifeld IP Law, PC

(57) **ABSTRACT**

A method and system for monitoring and analyzing at least one signal are disclosed. An abstract of at least one reference signal is generated and stored in a reference database. An abstract of a query signal to be analyzed is then generated so that the abstract of the query signal can be compared to the abstracts stored in the reference database for a match. The method and system may optionally be used to record information about the query signals, the number of matches recorded, and other useful information about the query signals. Moreover, the method by which abstracts are generated can be programmable based upon selectable criteria. The system can also be programmed with error control software so as to avoid the re-occurrence of a query signal that matches more than one signal stored in the reference database.

31 Claims, No Drawings

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METHOD AND DEVICE FOR MONITORING AND ANALYZING SIGNALS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of application No. 13/487,119, filed Jun. 1, 2012, which is a continuation of application No. 13/035,964, filed Feb. 26, 2011, which is a continuation of application Ser. No. 12/655,357, filed Dec. 22, 2009, now U.S. Pat. No. 7,949,494, which is a continuation of application Ser. No. 12/005,229, filed Dec. 26, 2007, now U.S. Pat. No. 7,660,700, which is a continuation of application Ser. No. 09/657,181, filed Sep. 7, 2000, now U.S. Pat. No. 7,346,472. The previously identified patents and/or patent applications are hereby incorporated by reference, in their entireties, as if fully stated herein.

This application is related to U.S. patent application Ser. No. 08/999,766, filed Jul. 23, 1997, entitled "Steganographic Method and Device" (issued as U.S. Pat. No. 7,568,100); U.S. patent application Ser. No. 08/772,222, filed Dec. 20, 1996, entitled "Z-Transform Implementation of Digital Watermarks" (issued as U.S. Pat. No. 6,078,664); U.S. patent application Ser. No. 09/456,319, filed Dec. 8, 1999, entitled "Z-Transform Implementation of Digital Watermarks" (issued as U.S. Pat. No. 6,853,726); U.S. patent application. Ser. No. 08/674,726, filed Jul. 2, 1996, entitled "Exchange Mechanisms for Digital Information Packages with Bandwidth Securitization, Multichannel Digital Watermarks, and Key Management" (issued as U.S. Pat. No. 7,362,775); U.S. patent application Ser. No. 09/545,589, filed Apr. 7, 2000, entitled "Method and System for Digital Watermarking" (issued as U.S. Pat. No. 7,007,166); U.S. patent application Ser. No. 09/046,627, filed Mar. 24, 1998, entitled "Method for Combining Transfer Function with Predetermined Key Creation" (issued as U.S. Pat. No. 6,598,162); U.S. patent application Ser. No. 09/053,628, filed Apr. 2, 1998, entitled "Multiple Transform Utilization and Application for Secure Digital Watermarking" (issued as U.S. Pat. No. 6,205,249); pending U.S. patent application Ser. No. 09/281,279, filed Mar. 30, 1999, entitled "Optimization Methods for the Insertion, Protection, and Detection of Digital Watermarks in Digital Data (issued as U.S. Pat. No. 6,522,767)"; U.S. patent application Ser. No. 09,594,719, filed Jun. 16, 2000, entitled "Utilizing Data Reduction in Steganographic and Cryptographic Systems" (which is a continuation-in-part of PCT application No. PCT/US00/06522, filed Mar. 14, 2000, which PCT application claimed priority to U.S. Provisional Application No. 60/125,990, filed Mar. 24, 1999) (issued as U.S. Pat. No. 7,123,718); pending U.S. application Ser. No. 60/169,274, filed Dec. 7, 1999, entitled "Systems, Methods And Devices For Trusted Transactions" (issued as U.S. Pat. No. 7,159,116); and PCT Application No. PCT/US00/21189, filed Aug. 4, 2000 (which claims priority to U.S. patent application Ser. No. 60/147,134, filed Aug. 4, 1999, and to U.S. patent application Ser. No. 60/213,489, filed Jun. 23, 2000, both of which are entitled, "A Secure Personal Content Server") (issued as U.S. Pat. No. 7,475,246). The previously identified patents and/or patent applications are hereby incorporated by reference, in their entireties, as if fully stated herein.

In addition, this application hereby incorporates by reference, as if fully stated herein, the total disclosures of U.S. Pat. No. 5,613,004 "Steganographic Method and Device"; U.S. Pat. No. 5,745,569 "Method for Stega-Cipher Protection of Computer Code"; and U.S. Pat. No. 5,889,868 "Optimization Methods for the Insertion, Protection, and Detection of Digital Watermarks in Digitized Data."

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the monitoring and analysis of digital information. A method and device are described which relate to signal recognition to enhance identification and monitoring activities.

2. Description of the Related Art

Many methods and protocols are known for transmitting data in digital form for multimedia applications (including computer applications delivered over public networks such as the internet or World Wide Web ("WWW"). These methods may include protocols for the compression of data, such that it may more readily and quickly be delivered over limited bandwidth data lines. Among standard protocols for data compression of digital files may be mentioned the MPEG compression standards for audio and video digital compression, promulgated by the Moving Picture Experts Group. Numerous standard reference works and patents discuss such compression and transmission standards for digitized information.

Digital watermarks help to authenticate the content of digitized multimedia information, and can also discourage piracy. Because piracy is clearly a disincentive to the digital distribution of copyrighted content, establishment of responsibility for copies and derivative copies of such works is invaluable. In considering the various forms of multimedia content, whether "master," stereo, NTSC video, audio tape or compact disc, tolerance of quality will vary with individuals and affect the underlying commercial and aesthetic value of the content. It is desirable to tie copyrights, ownership rights, purchaser information or some combination of these and related data into the content in such a manner that the content must undergo damage, and therefore reduction of its value, with subsequent, unauthorized distribution, commercial or otherwise. Digital watermarks address many of these concerns. A general discussion of digital watermarking as it has been applied in the art may be found in U.S. Pat. No. 5,687,236 (whose specification is incorporated in whole herein by reference).

Further applications of basic digital watermarking functionality have also been developed. Examples of such applications are shown in U.S. Pat. No. 5,889,868 (whose specification is incorporated in whole herein by reference). Such applications have been drawn, for instance, to implementations of digital watermarks that were deemed most suited to particular transmissions, or particular distribution and storage mediums, given the nature of digitally sampled audio, video, and other multimedia works. There have also been developed techniques for adapting watermark application parameters to the individual characteristics of a given digital sample stream, and for implementation of digital watermarks that are feature-based—i.e., a system in which watermark information is not carried in individual samples, but is carried in the relationships between multiple samples, such as in a waveform shape. For instance, natural extensions may be added to digital watermarks that may also separate frequencies (color or audio), channels in 3D while utilizing discreteness in feature-based encoding only known to those with pseudo-random keys (i.e., cryptographic keys) or possibly tools to access such information, which may one day exist on a quantum level.

A matter of general weakness in digital watermark technology relates directly to the manner of implementation of the watermark. Many approaches to digital watermarking leave detection and decode control with the implementing party of the digital watermark, not the creator of the work to be protected. This weakness removes proper economic incentives for improvement of the technology. One specific form of exploitation mostly regards efforts to obscure subsequent watermark detection. Others regard successful over encoding using the same watermarking process at a subsequent time. Yet another way to perform secure digital watermark implementation is through "key-based" approaches.

SUMMARY OF THE INVENTION

A method for monitoring and analyzing at least one signal is disclosed, which method comprises the steps of: receiving at least one reference signal to be monitored; creating an abstract of the at least one reference signal; storing the abstract of the at least one reference signal in a reference database; receiving at least one query signal to be analyzed; creating an abstract of the at least one query signal; and comparing the abstract of the at least one query signal to the abstract of the at least one reference signal to determine if the abstract of the at least one query signal matches the abstract of the at least one reference signal.

A method for monitoring a plurality of reference signals is also disclosed, which method comprises the steps of: creating an abstract for each one of a plurality of reference signals; storing each of the abstracts in a reference database; receiving at least one query signal to be analyzed; creating an abstract of each at least one query signal; locating an abstract in the reference database that matches the abstract of each at least one query signal; and recording the identify of the reference signal whose abstract matched the abstract of each at least one query signal.

A computerized system for monitoring and analyzing at least one signal is also disclosed, which system comprises: a processor for creating an abstract of a signal using selectable criteria; a first input for receiving at least one reference signal to be monitored, the first input being coupled to the processor such that the processor may generate an abstract for each reference signal input to the processor; a reference database, coupled to the processor, for storing abstracts of each at least one reference signal; a second input for receiving at least one query signal to be analyzed, the second input being coupled to the processor such that the processor may generate an abstract for each query signal; and a comparing device, coupled to the reference database and to the second input, for comparing an abstract of the at least one query signal to the abstracts stored in the reference database to determine if the abstract of the at least one query signal matches any of the stored abstracts.

Further, an electronic system for monitoring and analyzing at least one signal is disclosed, which system comprises: a first input for receiving at least one reference signal to be monitored, a first processor for creating an abstract of each reference signal input to the first processor through the first input; a second input for receiving at least one query signal to be analyzed, a second processor for creating an abstract of each query signal; a reference database for storing abstracts of each at least one reference signal; and a comparing device for comparing an abstract of the at least one query signal to the abstracts stored in the reference database to determine if the abstract of the at least one query signal matches any of the stored abstracts.

DETAILED DESCRIPTION OF THE INVENTION

While there are many approaches to data reduction that can be utilized, a primary concern is the ability to reduce the digital signal in such a manner as to retain a "perceptual relationship" between the original signal and its data reduced version. This relationship may either be mathematically discernible or a result of market-dictated needs. The purpose is to afford a more consistent means for classifying signals than proprietary, related text-based approaches. A simple analogy is the way in which a forensic investigator uses a sketch artist to assist in determining the identity of a human.

In one embodiment of the invention, the abstract of a signal may be generated by the following steps: 1) analyze the characteristics of each signal in a group of audible/perceptible variations for the same signal (e.g., analyze each of five versions of the same song—which versions may have the same lyrics and music but which are sung by different artists); and 2) select those characteristics which achieve or remain relatively constant (or in other words, which have minimum variation) for each of the signals in the group. Optionally, the null case may be defined using those characteristics which are common to each member of the group of versions.

Lossless and lossy compression schemes are appropriate candidates for data reduction technologies, as are those subset of approaches that are based on perceptual models, such as AAC, MP3, TwinVQ, JPEG, GIF, MPEG, etc. Where spectral transforms fail to assist in greater data reduction of the signal, other signal characteristics can be identified as candidates for further data reduction. Linear predictive coding (LPC), z-transform analysis, root mean square (rms), signal to peak, may be appropriate tools to measure signal characteristics, but other approaches or combinations of signal characteristic analysis are contemplated. While such signal characteristics may assist in determining particular applications of the present invention, a generalized approach to signal recognition is necessary to optimize the deployment and use of the present invention.

Increasingly, valuable information is being created and stored in digital form. For example, music, photographs and motion pictures can all be stored and transmitted as a series of binary digits—1's and 0's. Digital techniques permit the original information to be duplicated repeatedly with perfect or near perfect accuracy, and each copy is perceived by viewers or listeners as indistinguishable from the original signal. Unfortunately, digital techniques also permit the information to be easily copied without the owner's permission. While digital representations of analog waveforms may be analyzed by perceptually-based or perceptually-limited analysis it is usually costly and time-consuming to model the processes of the highly effective ability of humans to identify and recognize a signal. In those applications where analog signals require analysis, the cost of digitizing the analog signal is minimal when compared to the benefits of increased accuracy and speed of signal analysis and monitoring when the processes contemplated by this invention are utilized.

The present invention relates to identification of digitally-sampled information, such as images, audio and video. Traditional methods of identification and monitoring of those signals do not rely on "perceptual quality," but rather upon a separate and additional signal. Within this application, such signals will be called "additive signals" as they provide information about the original images, audio or video, but such information is in addition to the original signal. One traditional, text-based additive signal is title and author information. The title and author, for example, is information about a book, but it is in addition to the text of the book. If a book is being duplicated digitally, the title and author could provide one means of monitoring the number of times the text is being duplicated, for example, through an Internet download. The present invention, however, is directed to the identification of a digital signal—whether text, audio, or video—using only the digital signal itself and then monitoring the number of times the signal is duplicated. Reliance on an additive signal has many shortcomings. For example, first, someone must incorporate the additive signal within the digital data being transmitted, for example, by concatenation or through an embedding process. Such an additive signal, however, can be easily identified and removed by one who wants to utilize the original signal without paying for its usage. If the original signal itself is used to identify the content, an unauthorized user could not avoid payment of a royalty simply by removing the additive signal—because there is no additive signal to remove. Hence, the present invention avoids a major disadvantage of the prior art.

One such additive signal that may be utilized is a digital watermark—which ideally cannot be removed without perceptually altering the original signal. A watermark may also be used as a monitoring signal (for example, by encoding an identifier that uniquely identifies the original digital signal into which the identifier is being embedded). A digital watermark used for monitoring is also an additive signal, and such a signal may make it difficult for the user who wants to duplicate a signal without paying a royalty—mainly by degrading the perceptual quality of the original signal if the watermark (and hence the additive monitoring signal) is removed. This is, however, is a different solution to the problem.

The present invention eliminates the need of any additive monitoring signal because the present invention utilizes the underlying content signal as the identifier itself. Nevertheless, the watermark may increase the value of monitoring techniques by increasing the integrity of the embedded data and by indicating tampering of either the original content signal or the monitoring signal. Moreover, the design of a watermarking embedding algorithm is closely related to the perceptibility of noise in any given signal and can represent an ideal subset of the original signal: the watermark bits are an inverse of the signal to the extent that lossy compression schemes, which can be used, for instance, to optimize a watermarking embedding scheme, can yield information about the extent to which a data signal can be compressed while holding steadfast to the design requirement that the compressed signal maintain its perceptual relationship with the original, uncompressed signal. By describing those bits that are candidates for imperceptible embedding of watermark bits, further data reduction may be applied on the candidate watermarks as an example of retaining a logical and perceptible relationship with the original uncompressed signal.

Of course, the present invention may be used in conjunction with watermarking technology (including the use of keys to accomplish secure digital watermarking), but watermarking is not necessary to practice the present invention. Keys for watermarking may have many forms, including: descriptions of the original carrier file formatting, mapping of embedded data (actually imperceptible changes made to the carrier signal and referenced to the predetermined key or key pairs), assisting in establishing the watermark message data integrity (by incorporation of special one way functions in the watermark message data or key), etc. Discussions of these systems in the patents and pending patent applications are incorporated by reference above. The "recognition" of a particular signal or an instance of its transmission, and its monitoring are operations that may be optimized through the use of digital watermark analysis.

A practical difference between the two approaches of using a separate, additive monitoring signal and using the original signal itself as the monitoring signal is control. If a separate signal is used for monitoring, then the originator of the text, audio or video signal being transmitted and the entity doing the monitoring have to agree as to the nature of the separate signal to be used for monitoring—otherwise, the entity doing the monitoring would not know where to look, for what to look, or how to interpret the monitoring signal once it was identified and detected. On the other hand, if the original signal is used itself as a monitoring signal, then no such agreement is necessary. Moreover, a more logical and self-sufficient relationship between the original and its data-reduced abstract enhances the transparency of any resulting monitoring efforts. The entity doing the monitoring is not looking for a separate, additive monitoring system, and further, need not have to interpret the content of the monitoring signal.

Monitoring implementations can be handled by robust watermark techniques (those techniques that are able to survive many signal manipulations but are not inherently "secure" for verification of a carrier signal absent a logically-related watermarking key) and forensic watermark techniques (which enable embedding of watermarks that are not able to survive perceptible alteration of the carrier signal and thus enable detection of tampering with the originally watermarked carrier signal). The techniques have obvious trade-offs between speed, performance and security of the embedded watermark data.

In other disclosures, we suggest improvements and implementations that relate to digital watermarks in particular and embedded signaling in general. A digital watermark may be used to "tag" content in a manner that is not humanly-perceptible, in order to ensure that the human perception of the signal quality is maintained. Watermarking, however, must inherently alter at least one data bit of the original signal to represent a minimal change from the original signal's "unwatermarked state." The changes may affect only a bit, at the very least, or be dependent on information hiding relating to signal characteristics, such as phase information, differences between digitized samples, root mean square (RMS) calculations, z-transform analysis, or similar signal characteristic category.

There are weaknesses in using digital watermark technology for monitoring purposes. One weakness relates directly to the way in which watermarks are implemented. Often, the persons responsible for encoding and decoding the digital watermark are not the creator of the valuable work to be protected. As such, the creator has no input on the placement of the monitoring signal within the valuable work being protected. Hence, if a user wishing to avoid payment of the royalty can find a way to decode or remove the watermark, or at least the monitoring signal embedded in the watermark, then the unauthorized user may successfully duplicate the signal with impunity. This could occur, for example, if either of the persons responsible for encoding or decoding were to have their security compromised such that the encoding or decoding algorithms were discovered by the unauthorized user.

With the present invention, no such disadvantages exist because the creator need not rely on anyone to insert a monitoring signal—as no such signal is necessary. Instead, the creator's work itself is used as the monitoring signal. Accordingly, the value in the signal will have a strong relationship with its recognizability.

By way of improving methods for efficient monitoring as well as effective confirmation of the identity of a digitally-sampled signal, the present invention describes useful methods for using digital signal processing for benchmarking a novel basis for differencing signals with binary data comparisons. These techniques may be complemented with perceptual techniques, but are intended to leverage the generally decreasing cost of bandwidth and signal processing power in an age of increasing availability and exchange of digitized binary data.

So long as there exist computationally inexpensive ways of identifying an entire signal with some fractional representation or relationship with the original signal, or its perceptually observable representation, we envision methods for faster and more accurate auditing of signals as they are played, distributed or otherwise shared amongst providers (transmitters) and consumers (receivers). The ability to massively compress a signal to its Essence—which is not strictly equivalent to "lossy" or "lossless" compression schemes or perceptual coding techniques, but designed to preserve some underlying "aesthetic quality" of the signal—represents a useful means for signal analysis in a wide variety of applications. The signal analysis, however, must maintain the ability to distinguish the perceptual quality of the signals being compared. For example, a method which analyzed a portion of a song by compressing it to a single line of lyrics fails to maintain the ability to distinguish the perceptual quality of the songs being compared. Specifically, for example, if the song "New York State of Mind" were compressed to the lyrics "I'm in a New York State of Mind," such a compression fails to maintain the ability to distinguish between the various recorded versions of the song, say, for example between Billy Joel's recording and Barbara Streisand's recording. Such a method is, therefore, incapable of providing accurate monitoring of the artist's recordings because it could not determine which of the two artists is deserving of a royalty—unless of course, there is a separate monitoring signal to provide the name of the artist or other information sufficient to distinguish the two versions. The present invention, however, aims to maintain some level of perceptual quality of the signals being compared and would deem such a compression to be excessive.

This analogy can be made clearer if it is understood that there are a large number of approaches to compressing a signal to, say, $\frac{1}{10{,}000}^{th}$ of its original size, not for maintaining its signal quality to ensure computational ease for commercial quality distribution, but to assist in identification, analysis or monitoring of the signal. Most compression is either lossy or lossless and is designed with psychoacoustic or psychovisual parameters. That is to say, the signal is compressed to retain what is "humanly-perceptible." As long as the compression successfully mimics human perception, data space may be saved when the compressed file is compared to the uncompressed or original file. While psychoacoustic and psychovisual compression has some relevance to the present invention, additional data reduction or massive compression is anticipated by the present invention. It is anticipated that the original signal may be compressed to create a realistic or self-similar representation of the original signal, so that the compressed signal can be referenced at a subsequent time as unique binary data that has computational relevance to the original signal. Depending on the application, general data reduction of the original signal can be as simple as massive compression or may relate to the watermark encoding envelope parameter (those bits which a watermarking encoding algorithm deem as candidate bits for mapping independent data or those bits deemed imperceptible to human senses but detectable to a watermark detection algorithm). In this manner, certain media which are commonly known by signal characteristics, a painting, a song, a TV commercial, a dialect, etc., may be analyzed more accurately, and perhaps, more efficiently than a text-based descriptor of the signal. So long as the sender and receiver agree that the data representation is accurate, even insofar as the data-reduction technique has logical relationships with the perceptibility of the original signal, as they must with commonly agreed to text descriptors, no independent cataloging is necessary.

The present invention generally contemplates a signal recognition system that has at least five elements. The actual number of elements may vary depending on the number of domains in which a signal resides (for example, audio is at least one domain while visual carriers are at least two dimensional). The present invention contemplates that the number of elements will be sufficient to effectively and efficiently meet the demands of various classes of signal recognition. The design of the signal recognition that may be used with data reduction is better understood in the context of the general requirements of a pattern or signal recognition system.

The first element is the reference database, which contains information about a plurality of potential signals that will be monitored. In one form, the reference database would contain digital copies of original works of art as they are recorded by the various artists, for example, contain digital copies of all songs that will be played by a particular radio station. In another form, the reference database would contain not perfect digital copies of original works of art, but digital copies of abstracted works of art, for example, contain digital copies of all songs that have been preprocessed such that the copies represent the perceptual characteristics of the original songs. In another form, the reference database would contain digital copies of processed data files, which files represent works of art that have been preprocessed in such a fashion as to identify those perceptual differences that can differentiate one version of a work of art from another version of the same work of art, such as two or more versions of the same song, but by different artists. These examples have obvious application to visually communicated works such as images, trademarks or photographs, and video as well.

The second element is the object locator, which is able to segment a portion of a signal being monitored for analysis (i.e., the "monitored signal"). The segmented portion is also referred to as an "object." As such, the signal being monitored may be thought of comprising a set of objects. A song recording, for example, can be thought of as having a multitude of objects. The objects need not be of uniform length, size, or content, but merely be a sample of the signal being monitored. Visually communicated informational signals have related objects; color and size are examples.

The third element is the feature selector, which is able to analyze a selected object and identify perceptual features of the object that can be used to uniquely describe the selected object. Ideally, the feature selector can identify all, or nearly all, of the perceptual qualities of the object that differentiate it from a similarly selected object of other signals. Simply, a feature selector has a direct relationship with the perceptibility of features commonly observed. Counterfeiting is an activity which specifically seeks out features to misrepresent the authenticity of any given object. Highly granular, and arguably successful, counterfeiting is typically sought for objects that are easily recognizable and valuable, for example, currency, stamps, and trademarked or copyrighted works and objects that have value to a body politic.

The fourth element is the comparing device which is able to compare the selected object using the features selected by the feature selector to the plurality of signals in the reference database to identify which of the signals matches the monitored signal. Depending upon how the information of the plurality of signals is stored in the reference database and depending upon the available computational capacity (e.g., speed and efficiency), the exact nature of the comparison will vary. For example, the comparing device may compare the selected object directly to the signal information stored in the database. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector and then compare the selected object to the processed signal information. Alternatively, the comparing device may need to process the selected object using input from the feature selector and then compare the processed selected object to the signal information. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector, process the selected object using input from the feature selector, and then compare the processed selected object to the processed signal information.

The fifth element is the recorder which records information about the number of times a given signal is analyzed and detected. The recorder may comprise a database which keeps track of the number of times a song, image, or a movie has been played, or may generate a serial output which can be subsequently processed to determine the total number of times various signals have been detected.

Other elements may be added to the system or incorporated into the five elements identified above. For example, an error handler may be incorporated into the comparing device. If the comparing device identifies multiple signals which appear to contain the object being sought for analysis or monitoring, the error handler may offer further processing in order to identify additional qualities or features in the selected object such that only one of the set of captured signals is found to contain the further analyzed selected object that actually conforms with the object thought to have been transmitted or distributed.

Moreover, one or more of the five identified elements may be implemented with software that runs on the same processor, or which uses multiple processors. In addition, the elements may incorporate dynamic approaches that utilize stochastic, heuristic, or experience-based adjustments to refine the signal analysis being conducted within the system, including, for example, the signal analyses being performed within the feature selector and the comparing device. This additional analyses may be viewed as filters that are designed to meet the expectations of accuracy or speed for any intended application.

Since maintenance of original signal quality is not required by the present invention, increased efficiencies in processing and identification of signals can be achieved. The present invention concerns itself with perceptible relationships only to the extent that efficiencies can be achieved both in accuracy and speed with enabling logical relationships between an original signal and its abstract.

The challenge is to maximize the ability to sufficiently compress a signal to both retain its relationship with the original signal while reducing the data overhead to enable more efficient analysis, archiving and monitoring of these signals. In some cases, data reduction alone will not suffice: the sender and receiver must agree to the accuracy of the recognition. In other cases, agreement will actually depend on a third party who authored or created the signal in question. A digitized signal may have parameters to assist in establishing more accurate identification, for example, a "signal abstract" which naturally, or by agreement with the creator, the copyright owner or other interested parties, can be used to describe the original signal. By utilizing less than the original signal, a computationally inexpensive means of identification can be used. As long as a realistic set of conditions can be arrived at governing the relationship between a signal and its data reduced abstract, increases in effective monitoring and transparency of information data flow across communications channels is likely to result. This feature is significant in that it represents an improvement over how a digitally-sampled signal can be cataloged and identified, though the use of a means that is specifically selected based upon the strengths of a general computing device and the economic needs of a particular market for the digitized information data being monitored. The additional benefit is a more open means to uniformly catalog, analyze, and monitor signals. As well, such benefits can exist for third parties, who have a significant interest in the signal but are not the sender or receiver of said information.

As a general improvement over the art, the present invention incorporates what could best be described as "computer-acoustic" and "computer-visual" modeling, where the signal abstracts are created using data reduction techniques to determine the smallest amount of data, at least a single bit, which can represent and differentiate two digitized signal representations for a given predefined signal set. Each of such representations must have at least a one bit difference with all other members of the database to differentiate each such representation from the others in the database. The predefined signal set is the object being analyzed. The signal identifier/detector should receive its parameters from a database engine. The engine will identify those characteristics (for example, the differences) that can be used to distinguish one digital signal from all other digital signals that are stored in its collection. For those digital signals or objects which are seemingly identical, except[ing] that the signal may have different performance or utilization in the newly created object, benefits over additive or text-based identifiers are achieved. Additionally, decisions regarding the success or failure of an accurate detection of any given object may be flexibly implemented or changed to reflect market-based demands of the engine. Appropriate examples are songs or works or art which have been sampled or reproduced by others who are not the original creator.

In some cases, the engine will also consider the NULL case for a generalized item not in its database, or perhaps in situations where data objects may have collisions. For some applications, the NULL case is not necessary, thus making the whole system faster. For instance, databases which have fewer repetitions of objects or those systems which are intended to recognize signals with time constraints or capture all data objects. Greater efficiency in processing a relational database can be obtained because the rules for comparison are selected for the maximum efficiency of the processing hardware and/or software, whether or not the processing is based on psychoacoustic or psychovisual models. The benefits of massive data reduction, flexibility in constructing appropriate signal recognition protocols and incorporation of cryptographic techniques to further add accuracy and confidence in the system are clearly improvements over the art. For example, where the data reduced abstract needs to have further uniqueness, a hash or signature may be required. And for objects which have further uniqueness requirements, two identical instances of the object could be made unique with cryptographic techniques.

Accuracy in processing and identification may be increased by using one or more of the following fidelity evaluation functions:

1) RMS (root mean square). For example, a RMS function may be used to assist in determining the distance between data based on mathematically determinable Euclidean distance between the beginning and end data points (bits) of a particular signal carrier.

2) Frequency weighted RMS. For example, different weights may be applied to different frequency components of

the carrier signal before using RMS. This selective weighting can assist in further distinguishing the distance between beginning and end points of the signal carrier (at a given point in time, described as bandwidth, or the number of total bits that can be transmitted per second) and may be considered to be the mathematical equivalent of passing a carrier signal difference through a data filter and figuring the average power in the output carrier.

3) Absolute error criteria, including particularly the NULL set (described above) The NULL may be utilized in two significant cases: First, in instances where the recognized, signal appears to be an identified object which is inaccurately attributed or identified to an object not handled by the database of objects; and second, where a collision of data occurs. For instance, if an artist releases a second performance of a previously recorded song, and the two performances are so similar that their differences are almost imperceptible, then the previously selected criteria may not be able to differentiate the two recordings. Hence, the database must be "recalibrated" to be able to differentiate these two versions. Similarly, if the system identifies not one, but two or more, matches for a particular search, then the database may need "recalibration" to further differentiate the two objects stored in the database.

4) Cognitive Identification. For example, the present invention may use an experience-based analysis within a recognition engine. Once such analysis may involve mathematically determining a spectral transform or its equivalent of the carrier signal. A spectral transform enables signal processing and should maintain, for certain applications, some cognitive or perceptual relationship with the original analog waveform. As a novel feature to the present invention, additional classes may be subject to humanly-perceptible observation. For instance, an experience-based criteria which relates particularly to the envisioned or perceived accuracy of the data information object as it is used or applied in a particular market, product, or implementation. This may include a short **3** second segment of a commercially available and recognizable song which is used for commercials to enable recognition of the good or service being marketed. The complete song is marketed as a separately valued object from the use of a discrete segment of the song (that may be used for promotion or marketing—for the complete song or for an entirely different good or service). To the extent that an owner of the song in question is able to further enable value through the licensing or agreement for use of a segment of the original signal, cognitive identification is a form of filtering to enable differentiations between different and intended uses of the same or subset of the same signal (object). The implementation relating specifically, as disclosed herein, to the predetermined identification or recognition means and/or any specified relationship with subsequent use of the identification means can be used to create a history as to how often a particular signal is misidentified, which history can then be used to optimize identification of that signal in the future. The difference between use of an excerpt of the song to promote a separate and distinct good or service and use of the excerpt to promote recognition of the song itself (for example, by the artist to sell copies of the song) relates informationally to a decision based on recognized and approved use of the song. Both the song and applications of the song in its entirety or as a subset are typically based on agreement by the creator and the sender who seeks to utilize the work. Trust in the means for identification, which can be weighted in the present invention (for example, by adjusting bit-addressable information), is an important factor in adjusting the monitoring or recognition features of the object or carrier signal, and by using any misidentification information, (including any experience-based or heuristic information), additional features of the monitored signal can be used to improve the performance of the monitoring system envisioned herein. The issue of central concern with cognitive identification is a greater understanding of the parameters by which any given object is to be analyzed. To the extent that a creator chooses varying and separate application of his object, those applications having a cognitive difference in a signal recognition sense (e.g., the whole or an excerpt), the system contemplated herein includes rules for governing the application of bit-addressable information to increase the accuracy of the database.

5) Finally, the predetermined parameters that are associated with a discrete case for any given object will have a significant impact upon the ability to accurately process and identify the signals. For example, if a song is transmitted over a FM carrier, then one skilled in the art will appreciate that the FM signal has a predetermined bandwidth which is different from the bandwidth of the original recording, and different even from song when played on an AM carrier, and different yet from a song played using an 8-bit Internet broadcast. Recognition of these differences, however, will permit the selection of an identification means which can be optimized for monitoring a FM broadcasted signal. In other words, the discreteness intended by the sender is limited and directed by the fidelity of the transmission means. Objects may be cataloged and assessing with the understanding that all monitoring will occur using a specific transmission fidelity. For example, a database may be optimized with the understanding that only AM broadcast signals will be monitored. For maximum efficiency, different data bases may be created for different transmission channels, e.g., AM broadcasts, FM broadcasts, Internet broadcasts, etc.

For more information on increasing efficiencies for information systems, see The Mathematical Theory of Communication (1948), by Shannon.

Because bandwidth (which in the digital domain is equated to the total number of bits that can be transmitted in a fixed period of time) is a limited resource which places limitations upon transmission capacity and information coding schemes, the importance of monitoring for information objects transmitted over any given channel must take into consideration the nature and utilization of a given channel. The supply and demand of bandwidth will have a dramatic impact on the transmission, and ultimately, upon the decision to monitor and recognize signals. A discussion of this is found in a co-pending application by the inventor under U.S. patent application Ser. No. 08/674,726 (which issued Apr. 22, 2008 as U.S. Pat. No. 7,362,775) "Exchange Mechanisms for Digital Information Packages with Bandwidth Securitization, Multichannel Digital Watermarks, and Key Management" (which application is incorporated herein by reference as if fully setforth herein).

If a filter is to be used in connection with the recognition or monitoring engine, it may be desirable for the filter to anticipate and take into consideration the following factors, which affect the economics of the transmission as they relate to triggers for payment and/or relate to events requiring audits of the objects which are being transmitted: 1) time of transmission (i.e., the point in time when the transmission occurred), including whether the transmission is of a live performance); 2) location of transmission (e.g., what channel was used for transmission, which usually determines the associated cost for usage of the transmission channel); 3) the point of origination of the transmission (which may be the same for a signal carrier over many distinct channels); and 4) pre-existence of the information carrier signal (pre-recorded or newly created information carrier signal, which may require differentiation in certain markets or instances).

In the case of predetermined carrier signals (those which have been recorded and stored for subsequent use), "positional information carrier signals" are contemplated by this invention, namely, perceptual differences between the seemingly "same" information carrier that can be recognized as consumers of information seek different versions or quality levels of the same carrier signal. Perceptual differences exist between a song and its reproduction from a CD, an AM radio, and an Internet broadcast. To the extent that the creator or consumer of the signal can define a difference in any of the four criteria above, means can be derived (and programmed for selectability) to recognize and distinguish these differences. It is, however, quite possible that the ability to monitor carrier signal transmission with these factors will increase the variety and richness of available carrier signals to existing communications channels. The differentiation between an absolute case for transmission of an object, which is a time dependent event, for instance a live or real time broadcast, versus the relative case, which is prerecorded or stored for transmission at a later point in time, creates recognizable differences for signal monitoring.

The monitoring and analysis contemplated by this invention may have a variety of purposes, including, for example, the following: to determine the number of times a song is broadcast on a particular radio broadcast or Internet site; to control security though a voice-activated security system; and to identify associations between a beginner's drawing and those of great artists (for example to draw comparisons between technique, compositions, or color schemes). None of these examples could be achieved with any significant degree of accuracy using a text-based analysis. Additionally, strictly text-based systems fail to fully capture the inherent value of the data recognition or monitoring information itself.

Sample Embodiments

Sample Embodiment 1

A database of audio signals (e.g., songs) is stored or maintained by a radio station or Internet streaming company, who may select a subset of the songs are stored so that the subset may be later broadcast to listeners. The subset, for example, may comprise a sufficient number of songs to fill 24 hours of music programming (between 300 or 500 songs). Traditionally, monitoring is accomplished by embedding some identifier into the signal, or affixing the identifier to the signal, for later analysis and determination of royalty payments. Most of the traditional analysis is performed by actual persons who use play lists and other statistical approximations of audio play, including for example, data obtained through the manual (i.e., by persons) monitoring of a statistically significant sample of stations and transmission times so that an extrapolation may be made to a larger number of comparable markets.

The present invention creates a second database from the first database, wherein each of the stored audio signals in the first database is data reduced in a manner that is not likely to reflect the human perceptual quality of the signal, meaning that a significantly data-reduced signal is not likely to be played back and recognized as the original signal. As a result of the data reduction, the size of the second database (as measured in digital terms) is much smaller than the size of the first database, and is determined by the rate of compression. If, for example, if 24 hours worth of audio signals are compressed at a 10,000:1 compression rate, the reduced data could occupy a little more than 1 megabyte of data. With such a large compression rate, the data to be compared and/or analyzed may become computationally small such that computational speed and efficiency are significantly improved.

With greater compression rates, it is anticipated that similarity may exist between the data compressed abstractions of different analog signals (e.g., recordings by two different artists of the same song). The present invention contemplates the use of bit-addressable differences to distinguish between such cases. In applications where the data to be analyzed has higher value in some predetermined sense, cryptographic protocols, such as a hash or digital signature, can be used to distinguish such close cases.

In a preferred embodiment, the present invention may utilize a centralized database where copies of new recordings may be deposited to ensure that copyright owners, who authorize transmission or use of their recordings by others, can independently verify that the object is correctly monitored. The rules for the creator himself to enter his work would differ from a universally recognized number assigned by an independent authority (say, ISRC, ISBN for recordings and books respectively). Those skilled in the art of algorithmic information theory (AIT) can recognize that it is now possible to describe optimized use of binary data for content and functionality. The differences between objects must relate to decisions made by the user of the data, introducing subjective or cognitive decisions to the design of the contemplated invention as described above. To the extent that objects can have an optimized data size when compared with other objects for any given set of objects, the algorithms for data reduction would have predetermined flexibility directly related to computational efficiency and the set of objects to be monitored. The flexibility in having transparent determination of unique signal abstracts, as opposed to independent third party assignment, is likely to increase confidence in the monitoring effort by the owners of the original signals themselves. The prior art allows for no such transparency to the copyright creators.

Sample Embodiment 2

Another embodiment of the invention relates to visual images, which of course, involve at least two dimensions.

Similar to the goals of a psychoacoustic model, a psychovisual model attempts to represent a visual image with less data, and yet preserve those perceptual qualities that permit a human to recognize the original visual image. Using the very same techniques described above in connection with an audio signal, signal monitoring of visual images may be implemented.

One such application for monitoring and analyzing visual images involves a desire to find works of other artists that relate to a particular theme. For example, finding paintings of sunsets or sunrises. A traditional approach might involve a textual search involving a database wherein the works of other artists have been described in writing. The present invention, however, involves the scanning of an image involving a sun, compressing the data to its essential characteristics (i.e., those perceptual characteristics related to the sun) and then finding matches in a database of other visual images (stored as compressed or even uncompressed data). By studying the work of other artists using such techniques, a novice, for example, could learn much by comparing the presentations of a common theme by different artists.

Another useful application involving this type of monitoring and analyzing is the identification of photographs of potential suspects whose identity matches the sketch of a police artist.

Note that combinations of the monitoring techniques discussed above can be used for audio-visual monitoring, such as video-transmission by a television station or cable station.

The techniques would have to compensate, for example, for a cable station that is broadcasting a audio channel unaccompanied by video.

Other embodiments and uses of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. The specification and examples should be considered exemplary only with the true scope and spirit of the invention indicated by the following claims. As will be easily understood by those of ordinary skill in the art, variations and modifications of each of the disclosed embodiments can be easily made within the scope of this invention as defined by the following claims.

The invention claimed is:

1. A method for monitoring and analyzing at least one signal comprising:

creating, using at least one processor of an electronic system, a reference signal abstract of a reference signal; wherein said reference signal abstract is a data reduced version of said reference signal that is a self-similar representation of said reference signal;

receiving, in said electronic system, at least one query signal to be analyzed;

creating, using said at least one processor of said electronic system, a query signal abstract of said at least one query signal, wherein said query signal abstract is a data reduced version of said query signal that is a self-similar representation of said query signal;

comparing, in said electronic system, said query signal abstract with said reference signal abstract thereby determining whether said query signal abstract matches said reference signal abstract.

2. The method of claim **1** wherein said at least one processor comprises a first processor used for creating said reference signal abstract and a second processor used for creating said query signal abstract.

3. The method of claim **1** wherein said creating said query signal abstract comprises said electronic system using at least one of a hash and a digital signature.

4. The method of claim **1** further comprising:

creating, using at least one processor of a electronic system, a second reference signal abstract of a second reference signal; wherein said second reference signal abstract is a data reduced version of said second reference signal that is a self-similar representation of said second reference signal;

comparing, in said electronic system, said query signal abstract with said second reference signal abstract, thereby determining whether said query signal abstract matches said second reference signal abstract.

5. The method of claim **4**, further comprising changing selected criteria for generating said reference signal abstract from said reference signal.

6. The method of claim **4**, wherein said changing is in response to said electronic system determining that a query signal abstract matches one of said reference signal abstract and said second reference signal abstract.

7. The method of claim **1** wherein said creating, using said at least one processor of said electronic system, said reference signal abstract, comprises applying at least one spectral transform to said reference signal.

8. The method of claim **1** wherein said creating, using said at least one processor of said electronic system, said reference signal abstract, comprises analyzing characteristics of each signal in a group of audibly/perceptibly similar signals.

9. The method of claim **8**, wherein said group of audibly/perceptibly similar signals are versions of a particular song sung by different artists.

10. The method of claim **8** wherein said reference signal abstract comprises at least some common characteristics of said group.

11. The method of claim **8** wherein said reference signal abstract comprises only at least some characteristics of said group that represent the null case.

12. The method of claim **1** wherein said reference signal is a digital signal representing at least one of an audio signal, a still image, and a video image.

13. The method of claim **1** wherein said reference signal is a digital signal representing an audio signal.

14. The method of claim **1** wherein said reference signal is a digital signal representing a video signal.

15. The method of claim **1** wherein said electronic system is a computerized system.

16. The method of claim **1** further comprising said electronic system counting a number of times a query signal abstract is determined to match said reference signal abstract.

17. The method of claim **16** further comprising said electronic system counting a number of times a query signal abstract that originated from a particular source is determined to match said reference signal abstract.

18. The method of claim **16** wherein said particular source is one of radio broadcast station and an Internet site.

19. The method of claim **1** wherein said creating, using said at least one processor of said electronic system, said reference signal abstract, comprises massive compression of said reference signal.

20. The method of claim **1** wherein said creating, using said at least one processor of said electronic system, said reference signal abstract, comprises compression of said reference signal by a factor of at least ten thousand.

21. The method of claim **1** wherein said creating, using said at least one processor of said electronic system, said reference signal abstract, comprises determining bits having values deemed imperceptible to human senses.

22. The method of claim **1**, wherein said creating, using said at least one processor of said electronic system, said reference signal abstract, comprises lossy compression.

23. The method of claim **1**, wherein said creating, using said at least one processor of said electronic system, said query signal abstract, comprises lossy compression.

24. The method of claim **8**, wherein said group of audibly/perceptibly similar signals are versions of a particular signal.

25. An electronic system for monitoring and analyzing at least one signal comprising:

at least one processor;

a receiver configured to receive at least one query signal to be analyzed;

wherein said system is configured to use said at least one processor to create a reference signal abstract of a reference signal; wherein said reference signal abstract is a data reduced version of said reference signal that is a self-similar representation of said reference signal;

wherein said system is configured to use said at least one processor to create a query signal abstract of said at least one query signal, wherein said query signal abstract is a data reduced version of said query signal that is a self-similar representation of said query signal;

wherein said system is programmed to use said at least one processor to electronically compare said query signal abstract with said reference signal abstract, thereby determining whether said query signal abstract matches said reference signal abstract.

26. The system of claim **25** wherein said system is configured to apply at least one spectral transform to said reference signal when creating said reference signal abstract.

27. The system of claim **25** wherein said system is configured to massively compress said reference signal when creating said reference signal abstract.

28. The system of claim **25** wherein said system is configured to use said least one processor and perform lossy compression when creating said reference signal abstract.

29. The system of claim **25** wherein said system is configured to analyze characteristics of each signal in a group of audibly/perceptibly similar signals when creating said reference signal abstract.

30. The system of claim **29**, wherein said group of audibly/perceptibly similar signals are versions of a particular signal.

31. The method of claim **8** wherein said analyzing comprises performing on said reference signal at least one of linear predictive coding; z-transform analysis; root mean square analysis; and signal to peak determination.

* * * * *

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(54) **METHOD AND DEVICE FOR MONITORING AND ANALYZING SIGNALS**

(75) Inventors: **Scott Moskowitz**, Sunny Isles Beach, FL (US); **Mike W. Berry**, Seattle, WA (US)

(73) Assignee: **Blue Spike, Inc.**, Sunny Isles Beach, FL (US)

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Primary Examiner — Carol Tsai
(74) *Attorney, Agent, or Firm* — Neifeld IP Law, PC

(57) **ABSTRACT**

A method and system for monitoring and analyzing at least one signal are disclosed. An abstract of at least one reference signal is generated and stored in a reference database. An abstract of a query signal to be analyzed is then generated so that the abstract of the query signal can be compared to the abstracts stored in the reference database for a match. The method and system may optionally be used to record information about the query signals, the number of matches recorded, and other useful information about the query signals. Moreover, the method by which abstracts are generated can be programmable based upon selectable criteria. The system can also be programmed with error control software so as to avoid the re-occurrence of a query signal that matches more than one signal stored in the reference database.

19 Claims, No Drawings

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METHOD AND DEVICE FOR MONITORING AND ANALYZING SIGNALS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of application Ser. No. 12/655,357, filed Dec. 22, 2009 now U.S. Pat. No. 7,949,494, which is a continuation of application Ser. No. 12/005,229, filed Dec. 26, 2007, now U.S. Pat. No. 7,660,700, which is a continuation of application Ser. No. 09/657,181, filed Sep. 7, 2000, now U.S. Pat. No. 7,346,472. The previously identified patents and/or patent applications are hereby incorporated by reference, in their entireties, as if fully stated herein.

This application is related to U.S. patent application Ser. No. 08/999,766, filed Jul. 23, 1997, entitled "Steganographic Method and Device" (issued as U.S. Pat. No. 7,568,100); U.S. patent application Ser. No. 08/772,222, filed Dec. 20, 1996, entitled "Z-Transform Implementation of Digital Watermarks" (issued as U.S. Pat. No. 6,078,664); U.S. patent application Ser. No. 09/456,319, filed Dec. 8, 1999, entitled "Z-Transform Implementation of Digital Watermarks" (issued as U.S. Pat. No. 6,853,726); U.S. patent application Ser. No. 08/674,726, filed Jul. 2, 1996, entitled "Exchange Mechanisms for Digital Information Packages with Bandwidth Securitization, Multichannel Digital Watermarks, and Key Management" (issued as U.S. Pat. No. 7,362,775); U.S. patent application Ser. No. 09/545,589, filed Apr. 7, 2000, entitled "Method and System for Digital Watermarking" (issued as U.S. Pat. No. 7,007,166); U.S. patent application Ser. No. 09/046,627, filed Mar. 24, 1998, entitled "Method for Combining Transfer Function with Predetermined Key Creation" (issued as U.S. Pat. No. 6,598,162); U.S. patent application Ser. No. 09/053,628, filed Apr. 2, 1998, entitled "Multiple Transform Utilization and Application for Secure Digital Watermarking" (issued as U.S. Pat. No. 6,205,249); U.S. patent application Ser. No. 09/281,279, filed Mar. 30, 1999, entitled "Optimization Methods for the Insertion, Protection, and Detection of Digital Watermarks in Digital Data (issued as U.S. Pat. No. 6,522,767)"; U.S. patent application Ser. No. 09,594,719, filed Jun. 16, 2000, entitled "Utilizing Data Reduction in Steganographic and Cryptographic Systems" (which is a continuation-in-part of PCT application No. PCT/US00/06522, filed Mar. 14, 2000, which PCT application claimed priority to U.S. Provisional Application No. 60/125,990, filed Mar. 24, 1999) (issued as U.S. Pat. No. 7,123,718); U.S. Application No. 60/169,274, filed Dec. 7, 1999, entitled "Systems, Methods And Devices For Trusted Transactions" (issued as U.S. Pat. No. 7,159,116); and PCT Application No. PCT/US00/21189, filed Aug. 4, 2000 (which claims priority to U.S. patent application Ser. No. 60/147,134, filed Aug. 4, 1999, and to U.S. patent application Ser. No. 60/213,489, filed Jun. 23, 2000, both of which are entitled, "A Secure Personal Content Server") (issued as U.S. Pat. No. 7,475,246). The previously identified patents and/or patent applications are hereby incorporated by reference, in their entireties, as if fully stated herein.

In addition, this application hereby incorporates by reference, as if fully stated herein, the total disclosures of U.S. Pat. No. 5,613,004 "Steganographic Method and Device"; U.S. Pat. No. 5,745,569 "Method for Stega-Cipher Protection of Computer Code"; and U.S. Pat. No. 5,889,868 "Optimization Methods for the Insertion, Protection, and Detection of Digital Watermarks in Digitized Data."

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the monitoring and analysis of digital information. A method and device are described which relate to signal recognition to enhance identification and monitoring activities.

2. Description of the Related Art

Many methods and protocols are known for transmitting data in digital form for multimedia applications (including computer applications delivered over public networks such as the internet or World Wide Web ("WWW"). These methods may include protocols for the compression of data, such that it may more readily and quickly be delivered over limited bandwidth data lines. Among standard protocols for data compression of digital files may be mentioned the MPEG compression standards for audio and video digital compression, promulgated by the Moving Picture Experts Group. Numerous standard reference works and patents discuss such compression and transmission standards for digitized information.

Digital watermarks help to authenticate the content of digitized multimedia information, and can also discourage piracy. Because piracy is clearly a disincentive to the digital distribution of copyrighted content, establishment of responsibility for copies and derivative copies of such works is invaluable. In considering the various forms of multimedia content, whether "master," stereo, NTSC video, audio tape or compact disc, tolerance of quality will vary with individuals and affect the underlying commercial and aesthetic value of the content. It is desirable to tie copyrights, ownership rights, purchaser information or some combination of these and related data into the content in such a manner that the content must undergo damage, and therefore reduction of its value, with subsequent, unauthorized distribution, commercial or otherwise. Digital watermarks address many of these concerns. A general discussion of digital watermarking as it has been applied in the art may be found in U.S. Pat. No. 5,687,236 (whose specification is incorporated in whole herein by reference).

Further applications of basic digital watermarking functionality have also been developed. Examples of such applications are shown in U.S. Pat. No. 5,889,868 (whose specification is incorporated in whole herein by reference). Such applications have been drawn, for instance, to implementations of digital watermarks that were deemed most suited to particular transmissions, or particular distribution and storage mediums, given the nature of digitally sampled audio, video, and other multimedia works. There have also been developed techniques for adapting watermark application parameters to the individual characteristics of a given digital sample stream, and for implementation of digital watermarks that are feature-based—i.e., a system in which watermark information is not carried in individual samples, but is carried in the relationships between multiple samples, such as in a waveform shape. For instance, natural extensions may be added to digital watermarks that may also separate frequencies (color or audio), channels in 3D while utilizing discreteness in feature-based encoding only known to those with pseudo-random keys (i.e., cryptographic keys) or possibly tools to access such information, which may one day exist on a quantum level.

A matter of general weakness in digital watermark technology relates directly to the manner of implementation of the watermark. Many approaches to digital watermarking leave detection and decode control with the implementing party of the digital watermark, not the creator of the work to be protected. This weakness removes proper economic incentives for improvement of the technology. One specific form of exploitation mostly regards efforts to obscure subsequent watermark detection. Others regard successful over encoding using the same watermarking process at a subsequent time. Yet another way to perform secure digital watermark implementation is through "key-based" approaches.

SUMMARY OF THE INVENTION

A method for monitoring and analyzing at least one signal is disclosed, which method comprises the steps of: receiving at least one reference signal to be monitored; creating an abstract of the at least one reference signal; storing the abstract of the at least one reference signal in a reference database; receiving at least one query signal to be analyzed; creating an abstract of the at least one query signal; and comparing the abstract of the at least one query signal to the abstract of the at least one reference signal to determine if the abstract of the at least one query signal matches the abstract of the at least one reference signal.

A method for monitoring a plurality of reference signals is also disclosed, which method comprises the steps of: creating an abstract for each one of a plurality of reference signals; storing each of the abstracts in a reference database; receiving at least one query signal to be analyzed; creating an abstract of each at least one query signal; locating an abstract in the reference database that matches the abstract of each at least one query signal; and recording the identify of the reference signal whose abstract matched the abstract of each at least one query signal.

A computerized system for monitoring and analyzing at least one signal is also disclosed, which system comprises: a processor for creating an abstract of a signal using selectable criteria; a first input for receiving at least one reference signal to be monitored, the first input being coupled to the processor such that the processor may generate an abstract for each reference signal input to the processor; a reference database, coupled to the processor, for storing abstracts of each at least one reference signal; a second input for receiving at least one query signal to be analyzed, the second input being coupled to the processor such that the processor may generate an abstract for each query signal; and a comparing device, coupled to the reference database and to the second input, for comparing an abstract of the at least one query signal to the abstracts stored in the reference database to determine if the abstract of the at least one query signal matches any of the stored abstracts.

Further, an electronic system for monitoring and analyzing at least one signal is disclosed, which system comprises: a first input for receiving at least one reference signal to be monitored, a first processor for creating an abstract of each reference signal input to the first processor through the first input; a second input for receiving at least one query signal to be analyzed, a second processor for creating an abstract of each query signal; a reference database for storing abstracts of each at least one reference signal; and a comparing device for comparing an abstract of the at least one query signal to the abstracts stored in the reference database to determine if the abstract of the at least one query signal matches any of the stored abstracts.

DETAILED DESCRIPTION OF THE INVENTION

While there are many approaches to data reduction that can be utilized, a primary concern is the ability to reduce the digital signal in such a manner as to retain a "perceptual relationship" between the original signal and its data reduced version. This relationship may either be mathematically discernible or a result of market-dictated needs. The purpose is to afford a more consistent means for classifying signals than proprietary, related text-based approaches. A simple analogy is the way in which a forensic investigator uses a sketch artist to assist in determining the identity of a human.

In one embodiment of the invention, the abstract of a signal may be generated by the following steps: 1) analyze the characteristics of each signal in a group of audible/perceptible variations for the same signal (e.g., analyze each of five versions of the same song—which versions may have the same lyrics and music but which are sung by different artists); and 2) select those characteristics which achieve or remain relatively constant (or in other words, which have minimum variation) for each of the signals in the group. Optionally, the null case may be defined using those characteristics which are common to each member of the group of versions.

Lossless and lossy compression schemes are appropriate candidates for data reduction technologies, as are those subset of approaches that are based on perceptual models, such as AAC, MP3, TwinVQ, JPEG, GIF, MPEG, etc. Where spectral transforms fail to assist in greater data reduction of the signal, other signal characteristics can be identified as candidates for further data reduction. Linear predictive coding (LPC), z-transform analysis, root mean square (rms), signal to peak, may be appropriate tools to measure signal characteristics, but other approaches or combinations of signal characteristic analysis are contemplated. While such signal characteristics may assist in determining particular applications of the present invention, a generalized approach to signal recognition is necessary to optimize the deployment and use of the present invention.

Increasingly, valuable information is being created and stored in digital form. For example, music, photographs and motion pictures can all be stored and transmitted as a series of binary digits—1's and 0's. Digital techniques permit the original information to be duplicated repeatedly with perfect or near perfect accuracy, and each copy is perceived by viewers or listeners as indistinguishable from the original signal. Unfortunately, digital techniques also permit the information to be easily copied without the owner's permission. While digital representations of analog waveforms may be analyzed by perceptually-based or perceptually-limited analysis it is usually costly and time-consuming to model the processes of the highly effective ability of humans to identify and recognize a signal. In those applications where analog signals require analysis, the cost of digitizing the analog signal is minimal when compared to the benefits of increased accuracy and speed of signal analysis and monitoring when the processes contemplated by this invention are utilized.

The present invention relates to identification of digitally-sampled information, such as images, audio and video. Traditional methods of identification and monitoring of those signals do not rely on "perceptual quality," but rather upon a separate and additional signal. Within this application, such signals will be called "additive signals" as they provide information about the original images, audio or video, but such information is in addition to the original signal. One traditional, text-based additive signal is title and author information. The title and author, for example, is information about a book, but it is in addition to the text of the book. If a book is being duplicated digitally, the title and author could provide one means of monitoring the number of times the text is being duplicated, for example, through an Internet download. The present invention, however, is directed to the identification of a digital signal—whether text, audio, or video—using only the digital signal itself and then monitoring the number of times the signal is duplicated. Reliance on an additive signal has many shortcomings. For example, first, someone must incorporate the additive signal within the digital data being transmitted, for example, by concatenation or through an embedding process. Such an additive signal, however, can be easily identified and removed by one who wants to utilize the original signal without paying for its usage. If the original signal itself is used to identify the content, an unauthorized user could not avoid payment of a royalty simply by removing the additive signal—because there is no additive signal to remove. Hence, the present invention avoids a major disadvantage of the prior art.

One such additive signal that may be utilized is a digital watermark—which ideally cannot be removed without perceptually altering the original signal. A watermark may also be used as a monitoring signal (for example, by encoding an identifier that uniquely identifies the original digital signal into which the identifier is being embedded). A digital watermark used for monitoring is also an additive signal, and such a signal may make it difficult for the user who wants to duplicate a signal without paying a royalty—mainly by degrading the perceptual quality of the original signal if the watermark (and hence the additive monitoring signal) is removed. This is, however, is a different solution to the problem.

The present invention eliminates the need of any additive monitoring signal because the present invention utilizes the underlying content signal as the identifier itself. Nevertheless, the watermark may increase the value of monitoring techniques by increasing the integrity of the embedded data and by indicating tampering of either the original content signal or the monitoring signal. Moreover, the design of a watermarking embedding algorithm is closely related to the perceptibility of noise in any given signal and can represent an ideal subset of the original signal: the watermark bits are an inverse of the signal to the extent that lossy compression schemes, which can be used, for instance, to optimize a watermarking embedding scheme, can yield information about the extent to which a data signal can be compressed while holding steadfast to the design requirement that the compressed signal maintain its perceptual relationship with the original, uncompressed signal. By describing those bits that are candidates for imperceptible embedding of watermark bits, further data reduction may be applied on the candidate watermarks as an example of retaining a logical and perceptible relationship with the original uncompressed signal.

Of course, the present invention may be used in conjunction with watermarking technology (including the use of keys to accomplish secure digital watermarking), but watermarking is not necessary to practice the present invention. Keys for watermarking may have many forms, including: descriptions of the original carrier file formatting, mapping of embedded data (actually imperceptible changes made to the carrier signal and referenced to the predetermined key or key pairs), assisting in establishing the watermark message data integrity (by incorporation of special one way functions in the watermark message data or key), etc. Discussions of these systems in the patents and pending patent applications are incorporated by reference above. The "recognition" of a particular signal or an instance of its transmission, and its monitoring are operations that may be optimized through the use of digital watermark analysis.

A practical difference between the two approaches of using a separate, additive monitoring signal and using the original signal itself as the monitoring signal is control. If a separate signal is used for monitoring, then the originator of the text, audio or video signal being transmitted and the entity doing the monitoring have to agree as to the nature of the separate signal to be used for monitoring—otherwise, the entity doing the monitoring would not know where to look, for what to look, or how to interpret the monitoring signal once it was identified and detected. On the other hand, if the original signal is used itself as a monitoring signal, then no such agreement is necessary. Moreover, a more logical and self-sufficient relationship between the original and its data-reduced abstract enhances the transparency of any resulting monitoring efforts. The entity doing the monitoring is not looking for a separate, additive monitoring system, and further, need not have to interpret the content of the monitoring signal.

Monitoring implementations can be handled by robust watermark techniques (those techniques that are able to survive many signal manipulations but are not inherently "secure" for verification of a carrier signal absent a logically-related watermarking key) and forensic watermark techniques (which enable embedding of watermarks that are not able to survive perceptible alteration of the carrier signal and thus enable detection of tampering with the originally watermarked carrier signal). The techniques have obvious trade-offs between speed, performance and security of the embedded watermark data.

In other disclosures, we suggest improvements and implementations that relate to digital watermarks in particular and embedded signaling in general. A digital watermark may be used to "tag" content in a manner that is not humanly-perceptible, in order to ensure that the human perception of the signal quality is maintained. Watermarking, however, must inherently alter at least one data bit of the original signal to represent a minimal change from the original signal's "unwatermarked state." The changes may affect only a bit, at the very least, or be dependent on information hiding relating to signal characteristics, such as phase information, differences between digitized samples, root mean square (RMS) calculations, z-transform analysis, or similar signal characteristic category.

There are weaknesses in using digital watermark technology for monitoring purposes. One weakness relates directly to the way in which watermarks are implemented. Often, the persons responsible for encoding and decoding the digital watermark are not the creator of the valuable work to be protected. As such, the creator has no input on the placement of the monitoring signal within the valuable work being protected. Hence, if a user wishing to avoid payment of the royalty can find a way to decode or remove the watermark, or at least the monitoring signal embedded in the watermark, then the unauthorized user may successfully duplicate the signal with impunity. This could occur, for example, if either of the persons responsible for encoding or decoding were to have their security compromised such that the encoding or decoding algorithms were discovered by the unauthorized user.

With the present invention, no such disadvantages exist because the creator need not rely on anyone to insert a monitoring signal—as no such signal is necessary. Instead, the creator's work itself is used as the monitoring signal. Accordingly, the value in the signal will have a strong relationship with its recognizability.

By way of improving methods for efficient monitoring as well as effective confirmation of the identity of a digitally-sampled signal, the present invention describes useful methods for using digital signal processing for benchmarking a novel basis for differencing signals with binary data comparisons. These techniques may be complemented with perceptual techniques, but are intended to leverage the generally decreasing cost of bandwidth and signal processing power in an age of increasing availability and exchange of digitized binary data.

So long as there exist computationally inexpensive ways of identifying an entire signal with some fractional representation or relationship with the original signal, or its perceptually observable representation, we envision methods for faster and more accurate auditing of signals as they are played, distributed or otherwise shared amongst providers (transmitters) and consumers (receivers). The ability to massively compress a signal to its essence—which is not strictly equivalent to "lossy" or "lossless" compression schemes or perceptual coding techniques, but designed to preserve some underlying "aesthetic quality" of the signal—represents a useful means for signal analysis in a wide variety of applications. The signal analysis, however, must maintain the ability to distinguish the perceptual quality of the signals being compared. For example, a method which analyzed a portion of a song by compressing it to a single line of lyrics fails to maintain the ability to distinguish the perceptual quality of the songs being compared. Specifically, for example, if the song "New York State of Mind" were compressed to the lyrics "I'm in a New York State of Mind," such a compression fails to maintain the ability to distinguish between the various recorded versions of the song, say, for example between Billy Joel's recording and Barbara Streisand's recording. Such a method is, therefore, incapable of providing accurate monitoring of the artist's recordings because it could not determine which of the two artists is deserving of a royalty—unless of course, there is a separate monitoring signal to provide the name of the artist or other information sufficient to distinguish the two versions. The present invention, however, aims to maintain some level of perceptual quality of the signals being compared and would deem such a compression to be excessive.

This analogy can be made clearer if it is understood that there are a large number of approaches to compressing a signal to, say, $1/10{,}000^{th}$ of its original size, not for maintaining its signal quality to ensure computational ease for commercial quality distribution, but to assist in identification, analysis or monitoring of the signal. Most compression is either lossy or lossless and is designed with psychoacoustic or psychovisual parameters. That is to say, the signal is compressed to retain what is "humanly-perceptible." As long as the compression successfully mimics human perception, data space may be saved when the compressed file is compared to the uncompressed or original file. While psychoacoustic and psychovisual compression has some relevance to the present invention, additional data reduction or massive compression is anticipated by the present invention. It is anticipated that the original signal may be compressed to create a realistic or self-similar representation of the original signal, so that the compressed signal can be referenced at a subsequent time as unique binary data that has computational relevance to the original signal. Depending on the application, general data reduction of the original signal can be as simple as massive compression or may relate to the watermark encoding envelope parameter (those bits which a watermarking encoding algorithm deem as candidate bits for mapping independent data or those bits deemed imperceptible to human senses but detectable to a watermark detection algorithm). In this manner, certain media which are commonly known by signal characteristics, a painting, a song, a TV commercial, a dialect, etc., may be analyzed more accurately, and perhaps, more efficiently than a text-based descriptor of the signal. So long as the sender and receiver agree that the data representation is accurate, even insofar as the data-reduction technique has logical relationships with the perceptibility of the original signal, as they must with commonly agreed to text descriptors, no independent cataloging is necessary.

The present invention generally contemplates a signal recognition system that has at least five elements. The actual number of elements may vary depending on the number of domains in which a signal resides (for example, audio is at least one domain while visual carriers are at least two dimensional). The present invention contemplates that the number of elements will be sufficient to effectively and efficiently meet the demands of various classes of signal recognition. The design of the signal recognition that may be used with data reduction is better understood in the context of the general requirements of a pattern or signal recognition system.

The first element is the reference database, which contains information about a plurality of potential signals that will be monitored. In one form, the reference database would contain digital copies of original works of art as they are recorded by the various artists, for example, contain digital copies of all songs that will be played by a particular radio station. In another form, the reference database would contain not perfect digital copies of original works of art, but digital copies of abstracted works of art, for example, contain digital copies of all songs that have been preprocessed such that the copies represent the perceptual characteristics of the original songs. In another form, the reference database would contain digital copies of processed data files, which files represent works of art that have been preprocessed in such a fashion as to identify those perceptual differences that can differentiate one version of a work of art from another version of the same work of art, such as two or more versions of the same song, but by different artists. These examples have obvious application to visually communicated works such as images, trademarks or photographs, and video as well.

The second element is the object locator, which is able to segment a portion of a signal being monitored for analysis (i.e., the "monitored signal"). The segmented portion is also referred to as an "object." As such, the signal being monitored may be thought of comprising a set of objects. A song recording, for example, can be thought of as having a multitude of objects. The objects need not be of uniform length, size, or content, but merely be a sample of the signal being monitored. Visually communicated informational signals have related objects; color and size are examples.

The third element is the feature selector, which is able to analyze a selected object and identify perceptual features of the object that can be used to uniquely describe the selected object. Ideally, the feature selector can identify all, or nearly all, of the perceptual qualities of the object that differentiate it from a similarly selected object of other signals. Simply, a feature selector has a direct relationship with the perceptibility of features commonly observed. Counterfeiting is an activity which specifically seeks out features to misrepresent the authenticity of any given object. Highly granular, and arguably successful, counterfeiting is typically sought for objects that are easily recognizable and valuable, for example, currency, stamps, and trademarked or copyrighted works and objects that have value to a body politic.

The fourth element is the comparing device which is able to compare the selected object using the features selected by the feature selector to the plurality of signals in the reference database to identify which of the signals matches the monitored signal. Depending upon how the information of the plurality of signals is stored in the reference database and depending upon the available computational capacity (e.g., speed and efficiency), the exact nature of the comparison will vary. For example, the comparing device may compare the selected object directly to the signal information stored in the database. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector and then compare the selected object to the processed signal information. Alternatively, the comparing device may need to process the selected object using input from the feature selector and then compare the processed selected object to the signal information. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector, process the selected object using input from the feature selector, and then compare the processed selected object to the processed signal information.

The fifth element is the recorder which records information about the number of times a given signal is analyzed and detected. The recorder may comprise a database which keeps track of the number of times a song, image, or a movie has been played, or may generate a serial output which can be subsequently processed to determine the total number of times various signals have been detected.

Other elements may be added to the system or incorporated into the five elements identified above. For example, an error handler may be incorporated into the comparing device. If the comparing device identifies multiple signals which appear to contain the object being sought for analysis or monitoring, the error handler may offer further processing in order to identify additional qualities or features in the selected object such that only one of the set of captured signals is found to contain the further analyzed selected object that actually conforms with the object thought to have been transmitted or distributed.

Moreover, one or more of the five identified elements may be implemented with software that runs on the same processor, or which uses multiple processors. In addition, the elements may incorporate dynamic approaches that utilize stochastic, heuristic, or experience-based adjustments to refine the signal analysis being conducted within the system, including, for example, the signal analyses being performed within the feature selector and the comparing device. This additional analyses may be viewed as filters that are designed to meet the expectations of accuracy or speed for any intended application.

Since maintenance of original signal quality is not required by the present invention, increased efficiencies in processing and identification of signals can be achieved. The present invention concerns itself with perceptible relationships only to the extent that efficiencies can be achieved both in accuracy and speed with enabling logical relationships between an original signal and its abstract.

The challenge is to maximize the ability to sufficiently compress a signal to both retain its relationship with the original signal while reducing the data overhead to enable more efficient analysis, archiving and monitoring of these signals. In some cases, data reduction alone will not suffice: the sender and receiver must agree to the accuracy of the recognition. In other cases, agreement will actually depend on a third party who authored or created the signal in question. A digitized signal may have parameters to assist in establishing more accurate identification, for example, a "signal abstract" which naturally, or by agreement with the creator, the copyright owner or other interested parties, can be used to describe the original signal. By utilizing less than the original signal, a computationally inexpensive means of identification can be used. As long as a realistic set of conditions can be arrived at governing the relationship between a signal and its data reduced abstract, increases in effective monitoring and transparency of information data flow across communications channels is likely to result. This feature is significant in that it represents an improvement over how a digitally-sampled signal can be cataloged and identified, though the use of a means that is specifically selected based upon the strengths of a general computing device and the economic needs of a particular market for the digitized information data being monitored. The additional benefit is a more open means to uniformly catalog, analyze, and monitor signals. As well, such benefits can exist for third parties, who have a significant interest in the signal but are not the sender or receiver of said information.

As a general improvement over the art, the present invention incorporates what could best be described as "computer-acoustic" and "computer-visual" modeling, where the signal abstracts are created using data reduction techniques to determine the smallest amount of data, at least a single bit, which can represent and differentiate two digitized signal representations for a given predefined signal set. Each of such representations must have at least a one bit difference with all other members of the database to differentiate each such representation from the others in the database. The predefined signal set is the object being analyzed. The signal identifier/detector should receive its parameters from a database engine. The engine will identify those characteristics (for example, the differences) that can be used to distinguish one digital signal from all other digital signals that are stored in its collection. For those digital signals or objects which are seemingly identical, except[ing] that the signal may have different performance or utilization in the newly created object, benefits over additive or text-based identifiers are achieved. Additionally, decisions regarding the success or failure of an accurate detection of any given object may be flexibly implemented or changed to reflect market-based demands of the engine. Appropriate examples are songs or works or art which have been sampled or reproduced by others who are not the original creator.

In some cases, the engine will also consider the NULL case for a generalized item not in its database, or perhaps in situations where data objects may have collisions. For some applications, the NULL case is not necessary, thus making the whole system faster. For instance, databases which have fewer repetitions of objects or those systems which are intended to recognize signals with time constraints or capture all data objects. Greater efficiency in processing a relational database can be obtained because the rules for comparison are selected for the maximum efficiency of the processing hardware and/or software, whether or not the processing is based on psychoacoustic or psychovisual models. The benefits of massive data reduction, flexibility in constructing appropriate signal recognition protocols and incorporation of cryptographic techniques to further add accuracy and confidence in the system are clearly improvements over the art. For example, where the data reduced abstract needs to have further uniqueness, a hash or signature may be required. And for objects which have further uniqueness requirements, two identical instances of the object could be made unique with cryptographic techniques.

Accuracy in processing and identification may be increased by using one or more of the following fidelity evaluation functions:

1) RMS (root mean square). For example, a RMS function may be used to assist in determining the distance between data based on mathematically determinable Euclidean distance between the beginning and end data points (bits) of a particular signal carrier.

2) Frequency weighted RMS. For example, different weights may be applied to different frequency components of the carrier signal before using RMS. This selective weighting can assist in further distinguishing the distance between

beginning and end points of the signal carrier (at a given point in time, described as bandwidth, or the number of total bits that can be transmitted per second) and may be considered to be the mathematical equivalent of passing a carrier signal difference through a data filter and figuring the average power in the output carrier.

3) Absolute error criteria, including particularly the NULL set (described above) The NULL may be utilized in two significant cases: First, in instances where the recognized, signal appears to be an identified object which is inaccurately attributed or identified to an object not handled by the database of objects; and second, where a collision of data occurs. For instance, if an artist releases a second performance of a previously recorded song, and the two performances are so similar that their differences are almost imperceptible, then the previously selected criteria may not be able to differentiate the two recordings. Hence, the database must be "recalibrated" to be able to differentiate these two versions. Similarly, if the system identifies not one, but two or more, matches for a particular search, then the database may need "recalibration" to further differentiate the two objects stored in the database.

4) Cognitive Identification. For example, the present invention may use an experience-based analysis within a recognition engine. Once such analysis may involve mathematically determining a spectral transform or its equivalent of the carrier signal. A spectral transform enables signal processing and should maintain, for certain applications, some cognitive or perceptual relationship with the original analog waveform. As a novel feature to the present invention, additional classes may be subject to humanly-perceptible observation. For instance, an experience-based criteria which relates particularly to the envisioned or perceived accuracy of the data information object as it is used or applied in a particular market, product, or implementation. This may include a short 3 second segment of a commercially available and recognizable song which is used for commercials to enable recognition of the good or service being marketed. The complete song is marketed as a separately valued object from the use of a discrete segment of the song (that may be used for promotion or marketing—for the complete song or for an entirely different good or service). To the extent that an owner of the song in question is able to further enable value through the licensing or agreement for use of a segment of the original signal, cognitive identification is a form of filtering to enable differentiations between different and intended uses of the same or subset of the same signal (object). The implementation relating specifically, as disclosed herein, to the predetermined identification or recognition means and/or any specified relationship with subsequent use of the identification means can be used to create a history as to how often a particular signal is misidentified, which history can then be used to optimize identification of that signal in the future. The difference between use of an excerpt of the song to promote a separate and distinct good or service and use of the excerpt to promote recognition of the song itself (for example, by the artist to sell copies of the song) relates informationally to a decision based on recognized and approved use of the song. Both the song and applications of the song in its entirety or as a subset are typically based on agreement by the creator and the sender who seeks to utilize the work. Trust in the means for identification, which can be weighted in the present invention (for example, by adjusting bit-addressable information), is an important factor in adjusting the monitoring or recognition features of the object or carrier signal, and by using any misidentification information, (including any experience-based or heuristic information), additional features of the monitored signal can be used to improve the performance of the monitoring system envisioned herein. The issue of central concern with cognitive identification is a greater understanding of the parameters by which any given object is to be analyzed. To the extent that a creator chooses varying and separate application of his object, those applications having a cognitive difference in a signal recognition sense (e.g., the whole or an excerpt), the system contemplated herein includes rules for governing the application of bit-addressable information to increase the accuracy of the database.

5) Finally, the predetermined parameters that are associated with a discrete case for any given object will have a significant impact upon the ability to accurately process and identify the signals. For example, if a song is transmitted over a FM carrier, then one skilled in the art will appreciate that the FM signal has a predetermined bandwidth which is different from the bandwidth of the original recording, and different even from song when played on an AM carrier, and different yet from a song played using an 8-bit Internet broadcast. Recognition of these differences, however, will permit the selection of an identification means which can be optimized for monitoring a FM broadcasted signal. In other words, the discreteness intended by the sender is limited and directed by the fidelity of the transmission means. Objects may be cataloged and assessing with the understanding that all monitoring will occur using a specific transmission fidelity. For example, a database may be optimized with the understanding that only AM broadcast signals will be monitored. For maximum efficiency, different data bases may be created for different transmission channels, e.g., AM broadcasts, FM broadcasts, Internet broadcasts, etc.

For more information on increasing efficiencies for information systems, see The Mathematical Theory of Communication (1948), by Shannon.

Because bandwidth (which in the digital domain is equated to the total number of bits that can be transmitted in a fixed period of time) is a limited resource which places limitations upon transmission capacity and information coding schemes, the importance of monitoring for information objects transmitted over any given channel must take into consideration the nature and utilization of a given channel. The supply and demand of bandwidth will have a dramatic impact on the transmission, and ultimately, upon the decision to monitor and recognize signals. A discussion of this is found in a application by the inventor under U.S. patent application Ser. No. 08/674,726 (which issued Apr. 22, 2008 as U.S. Pat. No. 7,362,775) "Exchange Mechanisms for Digital Information Packages with Bandwidth Securitization, Multichannel Digital Watermarks, and Key Management" (which application is incorporated herein by reference as if fully setforth herein).

If a filter is to be used in connection with the recognition or monitoring engine, it may be desirable for the filter to anticipate and take into consideration the following factors, which affect the economics of the transmission as they relate to triggers for payment and/or relate to events requiring audits of the objects which are being transmitted: 1) time of transmission (i.e., the point in time when the transmission occurred), including whether the transmission is of a live performance); 2) location of transmission (e.g., what channel was used for transmission, which usually determines the associated cost for usage of the transmission channel); 3) the point of origination of the transmission (which may be the same for a signal carrier over many distinct channels); and 4) pre-existence of the information carrier signal (pre-recorded or newly created information carrier signal, which may require differentiation in certain markets or instances).

In the case of predetermined carrier signals (those which have been recorded and stored for subsequent use), "positional information carrier signals" are contemplated by this invention, namely, perceptual differences between the seemingly "same" information carrier that can be recognized as consumers of information seek different versions or quality levels of the same carrier signal. Perceptual differences exist between a song and its reproduction from a CD, an AM radio, and an Internet broadcast. To the extent that the creator or consumer of the signal can define a difference in any of the four criteria above, means can be derived (and programmed for selectability) to recognize and distinguish these differences. It is, however, quite possible that the ability to monitor carrier signal transmission with these factors will increase the variety and richness of available carrier signals to existing communications channels. The differentiation between an absolute case for transmission of an object, which is a time dependent event, for instance a live or real time broadcast, versus the relative case, which is prerecorded or stored for transmission at a later point in time, creates recognizable differences for signal monitoring.

The monitoring and analysis contemplated by this invention may have a variety of purposes, including, for example, the following: to determine the number of times a song is broadcast on a particular radio broadcast or Internet site; to control security though a voice-activated security system; and to identify associations between a beginner's drawing and those of great artists (for example to draw comparisons between technique, compositions, or color schemes). None of these examples could be achieved with any significant degree of accuracy using a text-based analysis. Additionally, strictly text-based systems fail to fully capture the inherent value of the data recognition or monitoring information itself.

SAMPLE EMBODIMENTS

Sample Embodiment 1

A database of audio signals (e.g., songs) is stored or maintained by a radio station or

Internet streaming company, who may select a subset of the songs are stored so that the subset may be later broadcast to listeners. The subset, for example, may comprise a sufficient number of songs to fill 24 hours of music programming (between 300 or 500 songs). Traditionally, monitoring is accomplished by embedding some identifier into the signal, or affixing the identifier to the signal, for later analysis and determination of royalty payments. Most of the traditional analysis is performed by actual persons who use play lists and other statistical approximations of audio play, including for example, data obtained through the manual (i.e., by persons) monitoring of a statistically significant sample of stations and transmission times so that an extrapolation may be made to a larger number of comparable markets.

The present invention creates a second database from the first database, wherein each of the stored audio signals in the first database is data reduced in a manner that is not likely to reflect the human perceptual quality of the signal, meaning that a significantly data-reduced signal is not likely to be played back and recognized as the original signal. As a result of the data reduction, the size of the second database (as measured in digital terms) is much smaller than the size of the first database, and is determined by the rate of compression. If, for example, if 24 hours worth of audio signals are compressed at a 10,000:1 compression rate, the reduced data could occupy a little more than 1 megabyte of data. With such a large compression rate, the data to be compared and/or analyzed may become computationally small such that computational speed and efficiency are significantly improved.

With greater compression rates, it is anticipated that similarity may exist between the data compressed abstractions of different analog signals (e.g., recordings by two different artists of the same song). The present invention contemplates the use of bit-addressable differences to distinguish between such cases. In applications where the data to be analyzed has higher value in some predetermined sense, cryptographic protocols, such as a hash or digital signature, can be used to distinguish such close cases.

In a preferred embodiment, the present invention may utilize a centralized database where copies of new recordings may be deposited to ensure that copyright owners, who authorize transmission or use of their recordings by others, can independently verify that the object is correctly monitored. The rules for the creator himself to enter his work would differ from a universally recognized number assigned by an independent authority (say, ISRC, ISBN for recordings and books respectively). Those skilled in the art of algorithmic information theory (AIT) can recognize that it is now possible to describe optimized use of binary data for content and functionality. The differences between objects must relate to decisions made by the user of the data, introducing subjective or cognitive decisions to the design of the contemplated invention as described above. To the extent that objects can have an optimized data size when compared with other objects for any given set of objects, the algorithms for data reduction would have predetermined flexibility directly related to computational efficiency and the set of objects to be monitored. The flexibility in having transparent determination of unique signal abstracts, as opposed to independent third party assignment, is likely to increase confidence in the monitoring effort by the owners of the original signals themselves. The prior art allows for no such transparency to the copyright creators.

Sample Embodiment 2

Another embodiment of the invention relates to visual images, which of course, involve at least two dimensions.

Similar to the goals of a psychoacoustic model, a psychovisual model attempts to represent a visual image with less data, and yet preserve those perceptual qualities that permit a human to recognize the original visual image. Using the very same techniques described above in connection with an audio signal, signal monitoring of visual images may be implemented.

One such application for monitoring and analyzing visual images involves a desire to find works of other artists that relate to a particular theme. For example, finding paintings of sunsets or sunrises. A traditional approach might involve a textual search involving a database wherein the works of other artists have been described in writing. The present invention, however, involves the scanning of an image involving a sun, compressing the data to its essential characteristics (i.e., those perceptual characteristics related to the sun) and then finding matches in a database of other visual images (stored as compressed or even uncompressed data). By studying the work of other artists using such techniques, a novice, for example, could learn much by comparing the presentations of a common theme by different artists.

Another useful application involving this type of monitoring and analyzing is the identification of photographs of potential suspects whose identity matches the sketch of a police artist.

Note that combinations of the monitoring techniques discussed above can be used for audio-visual monitoring, such as video-transmission by a television station or cable station. The techniques would have to compensate, for example, for a cable station that is broadcasting a audio channel unaccompanied by video.

Other embodiments and uses of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. The specification and examples should be considered exemplary only with the true scope and spirit of the invention indicated by the following claims. As will be easily understood by those of ordinary skill in the art, variations and modifications of each of the disclosed embodiments can be easily made within the scope of this invention as defined by the following claims.

The invention claimed is:

1. A system, comprising:

non transitory memory comprising a database for storing a plurality of digital reference signal abstracts;

at least one processor;

wherein said at least one processor is programmed or structured to generate a digital reference signal abstract from a digital reference signal such that said digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal; and

wherein said at least one processor is programmed to store said digital reference signal abstract in said database as one of said plurality of digital reference signal abstracts;

wherein said non transitory memory further comprises a second database for storing a plurality of second database digital reference signal abstracts;

wherein said at least one processor is programmed or structured to generate a second database digital reference signal abstract from said digital reference signal such that said second database digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal, and wherein said second database digital reference signal abstract is distinct from said digital reference signal abstract; and

wherein said at least one processor is programmed to store said second database digital reference signal abstract in said second database as one of said plurality of second database digital reference signal abstracts.

2. The system of claim **1**, wherein said at least one processor is programmed or structured to generate said digital reference signal abstract from said digital reference signal by using perceptual qualities of said digital reference signal in generating said digital reference signal abstract such that the abstract retains a perceptual relationship to said digital reference signal.

3. The system of claim **1** wherein said at least one processor is programmed or structured to generate a digital reference signal abstract from a digital reference signal such that said digital reference signal abstract is self similar to said digital reference signal.

4. The system of claim **1**, wherein said at least one processor is programmed or structured to select criteria to use for generating said digital reference signal abstract from said digital reference signal.

5. The system of claim **1**, wherein said at least one processor is programmed or structured to generate said digital query signal abstract from a digital query signal such that said digital query signal abstract is similar to said digital query signal and reduced in size compared to said digital query signal.

6. The system of claim **1**, wherein said at least one processor is programmed to generate said digital reference signal abstract.

7. A system, comprising:

non transitory memory comprising a database for storing a plurality of digital reference signal abstracts;

at least one processor;

wherein said at least one processor is programmed or structured to generate a digital reference signal abstract from a digital reference signal such that said digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal; and

wherein said at least one processor is programmed to store said digital reference signal abstract in said database as one of said plurality of digital reference signal abstracts;

wherein said at least one processor is programmed or structured to generate said digital reference signal abstract from said digital reference signal and at least one of a hash and a signature, so that each one of said plurality of digital reference signal abstracts in said database is distinct from one another.

8. A system, comprising:

non transitory memory comprising a database for storing a plurality of digital reference signal abstracts;

at least one processor;

wherein said at least one processor is programmed or structured to generate a digital reference signal abstract from a digital reference signal such that said digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal; and

wherein said at least one processor is programmed to store said digital reference signal abstract in said database as one of said plurality of digital reference signal abstracts;

wherein said digital reference signal is a digital representation of one of a plurality of different versions of a visual work and a multimedia work, and wherein said at least one processor is programmed or structured to generate said digital reference signal abstract from said digital reference signal so that said digital reference signal comprises signal characteristic parameters that differentiate between said plurality of different versions of said visual work and said multimedia work.

9. A system, comprising:

non transitory memory comprising a database for storing a plurality of digital reference signal abstracts;

at least one processor;

wherein said at least one processor is programmed or structured to generate a digital reference signal abstract from a digital reference signal such that said digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal; and

wherein said at least one processor is programmed to store said digital reference signal abstract in said database as one of said plurality of digital reference signal abstracts;

wherein said at least one processor is programmed or structured to determine if said digital reference signal abstract matches one of said plurality of digital reference signal abstracts stored in said database; and

wherein said processor is programmed to recalibrate said database in response to a determination that said digital reference signal abstract matches one of said plurality of digital reference signal abstracts stored in said database.

10. A system, comprising:

non transitory memory comprising a database for storing a plurality of digital reference signal abstracts;

at least one processor;

wherein said at least one processor is programmed or structured to generate a digital reference signal abstract from a digital reference signal such that said digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal; and

wherein said at least one processor is programmed to store said digital reference signal abstract in said database as one of said plurality of digital reference signal abstracts;

wherein said processor is programmed or structured to change selected criteria to use for generating said digital reference signal abstract from said digital reference signal when said at least one processor determines that said digital reference signal abstract matches one of said plurality of digital reference signal abstracts stored in said database.

11. A system, comprising:

non transitory memory comprising a database for storing a plurality of digital reference signal abstracts;

at least one processor;

wherein said at least one processor is programmed or structured to generate a digital reference signal abstract from a digital reference signal such that said digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal; and

wherein said at least one processor is programmed to store said digital reference signal abstract in said database as one of said plurality of digital reference signal abstracts;

wherein said at least one processor is programmed or structured to compare a digital query signal abstract to said plurality of digital reference signal abstracts stored in said database to generate a compare result.

12. The system of claim **11**, wherein said compare result indicates no match between said digital query signal abstract to said plurality of digital reference signal abstracts stored in said database.

13. The system of claim **11**, wherein said compare result indicates a match between said digital query signal abstract and a first digital reference signal abstracts of said plurality of digital reference signal abstracts stored in said database.

14. The system of claim **11**, wherein said memory further defines a digital query signal abstract receipt recorder recording a number times said at least one processor receives said digital query signal abstract for comparison with said plurality of digital reference signal abstracts stored in said database.

15. The system of claim **11**, wherein said memory further defines a first digital reference signal abstract match recorder recording a number of times said at least one processor determines a match between a digital query signal abstract and first digital reference signal abstract of said plurality of digital reference signal abstracts stored in said database.

16. The system of claim **12**, wherein said at least one processor is programmed or structured to use an algorithm to generate said digital reference signal abstract from said digital reference signal; and wherein said at least one processor is programmed or structured to use said algorithm to generate said digital query signal abstract from said digital query signal.

17. A system, comprising:

non transitory memory comprising a database for storing a plurality of digital reference signal abstracts;

at least one processor;

wherein said at least one processor is programmed or structured to generate a digital reference signal abstract from a digital reference signal such that said digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal; and

wherein said at least one processor is programmed to store said digital reference signal abstract in said database as one of said plurality of digital reference signal abstracts;

wherein said wherein said at least one processor is programmed or structured to apply at least one of psycho-acoustic model and a psycho-visual model to generate said digital reference signal abstract from said digital reference signal.

18. A method, comprising:

storing in non transitory memory a database for storing a plurality of digital reference signal abstracts;

generating with at least one processor a digital reference signal abstract from a digital reference signal such that said digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal; and

storing with said at least one processor said digital reference signal abstract in said database as one of said plurality of digital reference signal abstracts;

wherein said non transitory memory further comprises a second database for storing a plurality of second database digital reference signal abstracts;

wherein said at least one processor is programmed or structured to generate a second database digital reference signal abstract from said digital reference signal such that said second database digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal, and wherein said second database digital reference signal abstract is distinct from said digital reference signal abstract; and

wherein said at least one processor is programmed to store said second database digital reference signal abstract in said second database as one of said plurality of second database digital reference signal abstracts.

19. A computer program product stored on non transitory memory media, which, when installed on a computer system having at least one processor and non transitory memory, causes said computer system to perform the steps comprising:

storing in said non transitory memory a database for storing a plurality of digital reference signal abstracts;

generating with said at least one processor a digital reference signal abstract from a digital reference signal such that said digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal; and

storing with said at least one processor said digital reference signal abstract in said database as one of said plurality of digital reference signal abstracts;

wherein said non transitory memory further comprises a second database for storing a plurality of second database digital reference signal abstracts;

wherein said at least one processor is programmed or structured to generate a second database digital reference signal abstract from said digital reference signal such that said second database digital reference signal abstract is similar to said digital reference signal and reduced in size compared to said digital reference signal, and wherein said second database digital reference signal abstract is distinct from said digital reference signal abstract; and

wherein said at least one processor is programmed to store said second database digital reference signal abstract in said second database as one of said plurality of second database digital reference signal abstracts.

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Patent 7,949,494 B2
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(54) **METHOD AND DEVICE FOR MONITORING AND ANALYZING SIGNALS**

(75) Inventors: **Scott A. Moskowitz**, Sunny Isles Beach, FL (US); **Mike W. Berry**, Seattle, WA (US)

(73) Assignee: **Blue Spike, Inc.**, Sunny Isles Beach, FL (US)

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See application file for complete search history.

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Primary Examiner — Carol S Tsai
(74) *Attorney, Agent, or Firm* — Neifeld IP Law, PC

(57) **ABSTRACT**

A method and system for monitoring and analyzing at least one signal are disclosed. An abstract of at least one reference signal is generated and stored in a reference database. An abstract of a query signal to be analyzed is then generated so that the abstract of the query signal can be compared to the abstracts stored in the reference database for a match. The method and system may optionally be used to record information about the query signals, the number of matches recorded, and other useful information about the query signals. Moreover, the method by which abstracts are generated can be programmable based upon selectable criteria. The system can also be programmed with error control software so as to avoid the re-occurrence of a query signal that matches more than one signal stored in the reference database.

29 Claims, No Drawings

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METHOD AND DEVICE FOR MONITORING AND ANALYZING SIGNALS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of pending U.S. application Ser. No. 12/005,229, which is a continuation of U.S. patent application Ser. No. 09/657,181, now U.S. Pat. No. 7,346,472. The previously identified patents and/or patent applications are hereby incorporated by reference, in their entireties, as if fully stated herein.

This application claims the benefit of pending U.S. patent application Ser. No. 08/999,766, filed Jul. 23, 1997, entitled "Steganographic Method and Device" (issued as U.S. Pat. No. 7,568,100); pending U.S. patent application Ser. No. 08/772,222, filed Dec. 20, 1996, entitled "Z-Transform Implementation of Digital Watermarks" (issued as U.S. Pat. No. 6,078,664); pending U.S. patent application Ser. No. 09/456,319, filed Dec. 8, 1999, entitled "Z-Transform Implementation of Digital Watermarks" (issued as U.S. Pat. No. 6,853,726); pending U.S. patent application. Ser. No. 08/674,726, filed Jul. 2, 1996, entitled "Exchange Mechanisms for Digital Information Packages with Bandwidth Securitization, Multichannel Digital Watermarks, and Key Management" (issued as U.S. Pat. No. 7,362,775); pending U.S. patent application Ser. No. 09/545,589, filed Apr. 7, 2000, entitled "Method and System for Digital. Watermarking" (issued as U.S. Pat. No. 7,007,166); pending U.S. patent application Ser. No. 09/046,627, filed Mar. 24, 1998, entitled "Method for Combining Transfer Function with Predetermined Key Creation" (issued as U.S. Pat. No. 6,598,162); pending U.S. patent application Ser. No. 09/053,628, filed Apr. 2, 1998, entitled "Multiple Transform Utilization and Application for Secure Digital Watermarking" (issued as U.S. Pat. No. 6,205,249); pending U.S. patent application Ser. No. 09/281,279, filed Mar. 30, 1999, entitled "Optimization Methods for the Insertion, Protection, and Detection of Digital Watermarks in Digital Data (issued as U.S. Pat. No. 6,522,767)"; U.S. patent application Ser. No. 09,594,719, filed Jun. 16, 2000, entitled "Utilizing Data Reduction in Steganographic and Cryptographic Systems" (which is a continuation-in-part of PCT application No. PCT/US00/06522, filed Mar. 14, 2000, which PCT application claimed priority to U.S. Provisional Application No. 60/125,990, filed Mar. 24, 1999) (issued as U.S. Pat. No. 7,123,718); pending U.S. Application No. 60/169,274, filed Dec. 7, 1999, entitled "Systems, Methods And Devices For Trusted Transactions" (issued as U.S. Pat. No. 7,159,116); and PCT Application No. PCT/US00/21189, filed Aug. 4, 2000 (which claims priority to U.S. patent application Ser. No. 60/147,134, filed Aug. 4, 1999, and to U.S. patent application No. 60/213,489, filed. Jun. 23, 2000, both of which are entitled, "A Secure Personal Content Server") (issued as U.S. Pat. No. 7,475,246). The previously identified patents and/or patent applications are hereby incorporated by reference, in their entireties, as if fully stated herein.

In addition, this application hereby incorporates by reference, as if fully stated herein, the total disclosures of U.S. Pat. No. 5,613,004 "Steganographic Method and Device"; U.S. Pat. No. 5,745,569 "Method for Stega-Cipher Protection of Computer Code"; and U.S. Pat. No. 5,889,868 "Optimization Methods for the Insertion, Protection, and Detection of Digital Watermarks in Digitized Data."

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the monitoring and analysis of digital information. A method and device are described which relate to signal recognition to enhance identification and monitoring activities.

2. Description of the Related Art

Many methods and protocols are known for transmitting data in digital form for multimedia applications (including computer applications delivered over public networks such as the internet or World Wide Web ("WWW"). These methods may include protocols for the compression of data, such that it may more readily and quickly be delivered over limited bandwidth data lines. Among standard protocols for data compression of digital files may be mentioned the MPEG compression standards for audio and video digital compression, promulgated by the Moving Picture Experts Group. Numerous standard reference works and patents discuss such compression and transmission standards for digitized information.

Digital watermarks help to authenticate the content of digitized multimedia information, and can also discourage piracy. Because piracy is clearly a disincentive to the digital distribution of copyrighted content, establishment of responsibility for copies and derivative copies of such works is invaluable. In considering the various forms of multimedia content, whether "master," stereo, NTSC video, audio tape or compact disc, tolerance of quality will vary with individuals and affect the underlying commercial and aesthetic value of the content. It is desirable to tie copyrights, ownership rights, purchaser information or some combination of these and related data into the content in such a manner that the content must undergo damage, and therefore reduction of its value, with subsequent, unauthorized distribution, commercial or otherwise. Digital watermarks address many of these concerns. A general discussion of digital watermarking as it has been applied in the art may be found in U.S. Pat. No. 5,687,236 (whose specification is incorporated in whole herein by reference).

Further applications of basic digital watermarking functionality have also been developed. Examples of such applications are shown in U.S. Pat. No. 5,889,868 (whose specification is incorporated in whole herein by reference). Such applications have been drawn, for instance, to implementations of digital watermarks that were deemed most suited to particular transmissions, or particular distribution and storage mediums, given the nature of digitally sampled audio, video, and other multimedia works. There have also been developed techniques for adapting watermark application parameters to the individual characteristics of a given digital sample stream, and for implementation of digital watermarks that are feature-based—i.e., a system in which watermark information is not carried in individual samples, but is carried in the relationships between multiple samples, such as in a waveform shape. For instance, natural extensions may be added to digital watermarks that may also separate frequencies (color or audio), channels in 3D while utilizing discreteness in feature-based encoding only known to those with pseudo-random keys (i.e., cryptographic keys) or possibly tools to access such information, which may one day exist on a quantum level.

A matter of general weakness in digital watermark technology relates directly to the manner of implementation of the watermark. Many approaches to digital watermarking leave detection and decode control with the implementing party of the digital watermark, not the creator of the work to be protected. This weakness removes proper economic incentives for improvement of the technology. One specific form of exploitation mostly regards efforts to obscure subsequent watermark detection. Others regard successful over encoding using the same watermarking process at a subsequent time. Yet another way to perform secure digital watermark implementation is through "key-based" approaches.

SUMMARY OF THE INVENTION

A method for monitoring and analyzing at least one signal is disclosed, which method comprises the steps of: receiving at least one reference signal to be monitored; creating an abstract of the at least one reference signal; storing the abstract of the at least one reference signal in a reference database; receiving at least one query signal to be analyzed; creating an abstract of the at least one query signal; and comparing the abstract of the at least one query signal to the abstract of the at least one reference signal to determine if the abstract of the at least one query signal matches the abstract of the at least one reference signal.

A method for monitoring a plurality of reference signals is also disclosed, which method comprises the steps of: creating an abstract for each one of a plurality of reference signals; storing each of the abstracts in a reference database; receiving at least one query signal to be analyzed; creating an abstract of each at least one query signal; locating an abstract in the reference database that matches the abstract of each at least one query signal; and recording the identify of the reference signal whose abstract matched the abstract of each at least one query signal.

A computerized system for monitoring and analyzing at least one signal is also disclosed, which system comprises: a processor for creating an abstract of a signal using selectable criteria; a first input for receiving at least one reference signal to be monitored, the first input being coupled to the processor such that the processor may generate an abstract for each reference signal input to the processor; a reference database, coupled to the processor, for storing abstracts of each at least one reference signal; a second input for receiving at least one query signal to be analyzed, the second input being coupled to the processor such that the processor may generate an abstract for each query signal; and a comparing device, coupled to the reference database and to the second input, for comparing an abstract of the at least one query signal to the abstracts stored in the reference database to determine if the abstract of the at least one query signal matches any of the stored abstracts.

Further, an electronic system for monitoring and analyzing at least one signal is disclosed, which system comprises: a first input for receiving at least one reference signal to be monitored, a first processor for creating an abstract of each reference signal input to the first processor through the first input; a second input for receiving at least one query signal to be analyzed, a second processor for creating an abstract of each query signal; a reference database for storing abstracts of each at least one reference signal; and a comparing device for comparing an abstract of the at least one query signal to the abstracts stored in the reference database to determine if the abstract of the at least one query signal matches any of the stored abstracts.

DETAILED DESCRIPTION OF THE INVENTION

While there are many approaches to data reduction that can be utilized, a primary concern is the ability to reduce the digital signal in such a manner as to retain a "perceptual relationship" between the original signal and its data reduced version. This relationship may either be mathematically discernible or a result of market-dictated needs. The purpose is to afford a more consistent means for classifying signals than proprietary, related text-based approaches. A simple analogy is the way in which a forensic investigator uses a sketch artist to assist in determining the identity of a human.

In one embodiment of the invention, the abstract of a signal may be generated by the following steps: 1) analyze the characteristics of each signal in a group of audible/perceptible variations for the same signal (e.g., analyze each of five versions of the same song—which versions may have the same lyrics and music but which are sung by different artists); and 2) select those characteristics which achieve or remain relatively constant (or in other words, which have minimum variation) for each of the signals in the group. Optionally, the null case may be defined using those characteristics which are common to each member of the group of versions.

Lossless and lossy compression schemes are appropriate candidates for data reduction technologies, as are those subset of approaches that are based on perceptual models, such as AAC, MP3, TwinVQ, JPEG, GIF, MPEG, etc. Where spectral transforms fail to assist in greater data reduction of the signal, other signal characteristics can be identified as candidates for further data reduction. Linear predictive coding (LPC), z-transform analysis, root mean square (rms), signal to peak, may be appropriate tools to measure signal characteristics, but other approaches or combinations of signal characteristic analysis are contemplated. While such signal characteristics may assist in determining particular applications of the present invention, a generalized approach to signal recognition is necessary to optimize the deployment and use of the present invention.

Increasingly, valuable information is being created and stored in digital form. For example, music, photographs and motion pictures can all be stored and transmitted as a series of binary digits—1's and 0's. Digital techniques permit the original information to be duplicated repeatedly with perfect or near perfect accuracy, and each copy is perceived by viewers or listeners as indistinguishable from the original signal. Unfortunately, digital techniques also permit the information to be easily copied without the owner's permission. While digital representations of analog waveforms may be analyzed by perceptually-based or perceptually-limited analysis it is usually costly and time-consuming to model the processes of the highly effective ability of humans to identify and recognize a signal. In those applications where analog signals require analysis, the cost of digitizing the analog signal is minimal when compared to the benefits of increased accuracy and speed of signal analysis and monitoring when the processes contemplated by this invention are utilized.

The present invention relates to identification of digitally-sampled information, such as images, audio and video. Traditional methods of identification and monitoring of those signals do not rely on "perceptual quality," but rather upon a separate and additional signal. Within this application, such signals will be called "additive signals" as they provide information about the original images, audio or video, but such information is in addition to the original signal. One traditional, text-based additive signal is title and author information. The title and author, for example, is information about a book, but it is in addition to the text of the book. If a book is being duplicated digitally, the title and author could provide one means of monitoring the number of times the text is being duplicated, for example, through an Internet download. The present invention, however, is directed to the identification of a digital signal—whether text, audio, or video—using only the digital signal itself and then monitoring the number of times the signal is duplicated. Reliance on an additive signal has many shortcomings. For example, first, someone must incorporate the additive signal within the digital data being transmitted, for example, by concatenation or through an embedding process. Such an additive signal, however, can be easily identified and removed by one who wants to utilize the original signal without paying for its usage. If the original signal itself is used to identify the content, an unauthorized user could not avoid payment of a royalty simply by removing the additive signal—because there is no additive signal to remove. Hence, the present invention avoids a major disadvantage of the prior art.

One such additive signal that may be utilized is a digital watermark—which ideally cannot be removed without perceptually altering the original signal. A watermark may also be used as a monitoring signal (for example, by encoding an identifier that uniquely identifies the original digital signal into which the identifier is being embedded). A digital watermark used for monitoring is also an additive signal, and such a signal may make it difficult for the user who wants to duplicate a signal without paying a royalty—mainly by degrading the perceptual quality of the original signal if the watermark (and hence the additive monitoring signal) is removed. This is, however, is a different solution to the problem.

The present invention eliminates the need of any additive monitoring signal because the present invention utilizes the underlying content signal as the identifier itself. Nevertheless, the watermark may increase the value of monitoring techniques by increasing the integrity of the embedded data and by indicating tampering of either the original content signal or the monitoring signal. Moreover, the design of a watermarking embedding algorithm is closely related to the perceptibility of noise in any given signal and can represent an ideal subset of the original signal: the watermark bits are an inverse of the signal to the extent that lossy compression schemes, which can be used, for instance, to optimize a watermarking embedding scheme, can yield information about the extent to which a data signal can be compressed while holding steadfast to the design requirement that the compressed signal maintain its perceptual relationship with the original, uncompressed signal. By describing those bits that are candidates for imperceptible embedding of watermark bits, further data reduction may be applied on the candidate watermarks as an example of retaining a logical and perceptible relationship with the original uncompressed signal.

Of course, the present invention may be used in conjunction with watermarking technology (including the use of keys to accomplish secure digital watermarking), but watermarking is not necessary to practice the present invention. Keys for watermarking may have many forms, including: descriptions of the original carrier file formatting, mapping of embedded data (actually imperceptible changes made to the carrier signal and referenced to the predetermined key or key pairs), assisting in establishing the watermark message data integrity (by incorporation of special one way functions in the watermark message data or key), etc. Discussions of these systems in the patents and pending patent applications are incorporated by reference above. The "recognition" of a particular signal or an instance of its transmission, and its monitoring are operations that may be optimized through the use of digital watermark analysis.

A practical difference between the two approaches of using a separate, additive monitoring signal and using the original signal itself as the monitoring signal is control. If a separate signal is used for monitoring, then the originator of the text, audio or video signal being transmitted and the entity doing

the monitoring have to agree as to the nature of the separate signal to be used for monitoring—otherwise, the entity doing the monitoring would not know where to look, for what to look, or how to interpret the monitoring signal once it was identified and detected. On the other hand, if the original signal is used itself as a monitoring signal, then no such agreement is necessary. Moreover, a more logical and self-sufficient relationship between the original and its data-reduced abstract enhances the transparency of any resulting monitoring efforts. The entity doing the monitoring is not looking for a separate, additive monitoring system, and further, need not have to interpret the content of the monitoring signal.

Monitoring implementations can be handled by robust watermark techniques (those techniques that are able to survive many signal manipulations but are not inherently "secure" for verification of a carrier signal absent a logically-related watermarking key) and forensic watermark techniques (which enable embedding of watermarks that are not able to survive perceptible alteration of the carrier signal and thus enable detection of tampering with the originally watermarked carrier signal). The techniques have obvious trade-offs between speed, performance and security of the embedded watermark data.

In other disclosures, we suggest improvements and implementations that relate to digital watermarks in particular and embedded signaling in general. A digital watermark may be used to "tag" content in a manner that is not humanly-perceptible, in order to ensure that the human perception of the signal quality is maintained. Watermarking, however, must inherently alter at least one data bit of the original signal to represent a minimal change from the original signal's "unwatermarked state." The changes may affect only a bit, at the very least, or be dependent on information hiding relating to signal characteristics, such as phase information, differences between digitized samples, root mean square (RMS) calculations, z-transform analysis, or similar signal characteristic category.

There are weaknesses in using digital watermark technology for monitoring purposes. One weakness relates directly to the way in which watermarks are implemented. Often, the persons responsible for encoding and decoding the digital watermark are not the creator of the valuable work to be protected. As such, the creator has no input on the placement of the monitoring signal within the valuable work being protected. Hence, if a user wishing to avoid payment of the royalty can find a way to decode or remove the watermark, or at least the monitoring signal embedded in the watermark, then the unauthorized user may successfully duplicate the signal with impunity. This could occur, for example, if either of the persons responsible for encoding or decoding were to have their security compromised such that the encoding or decoding algorithms were discovered by the unauthorized user.

With the present invention, no such disadvantages exist because the creator need not rely on anyone to insert a monitoring signal—as no such signal is necessary. Instead, the creator's work itself is used as the monitoring signal. Accordingly, the value in the signal will have a strong relationship with its recognizability.

By way of improving methods for efficient monitoring as well as effective confirmation of the identity of a digitally-sampled signal, the present invention describes useful methods for using digital signal processing for benchmarking a novel basis for differencing signals with binary data comparisons. These techniques may be complemented with perceptual techniques, but are intended to leverage the generally decreasing cost of bandwidth and signal processing power in an age of increasing availability and exchange of digitized binary data.

So long as there exist computationally inexpensive ways of identifying an entire signal with some fractional representation or relationship with the original signal, or its perceptually observable representation, we envision methods for faster and more accurate auditing of signals as they are played, distributed or otherwise shared amongst providers (transmitters) and consumers (receivers). The ability to massively compress a signal to its essence—which is not strictly equivalent to "lossy" or "lossless" compression schemes or perceptual coding techniques, but designed to preserve some underlying "aesthetic quality" of the signal—represents a useful means for signal analysis in a wide variety of applications. The signal analysis, however, must maintain the ability to distinguish the perceptual quality of the signals being compared. For example, a method which analyzed a portion of a song by compressing it to a single line of lyrics fails to maintain the ability to distinguish the perceptual quality of the songs being compared. Specifically, for example, if the song "New York State of Mind" were compressed to the lyrics "I'm in a New York State of Mind," such a compression fails to maintain the ability to distinguish between the various recorded versions of the song, say, for example between Billy Joel's recording and Barbara Streisand's recording. Such a method is, therefore, incapable of providing accurate monitoring of the artist's recordings because it could not determine which of the two artists is deserving of a royalty—unless of course, there is a separate monitoring signal to provide the name of the artist or other information sufficient to distinguish the two versions. The present invention, however, aims to maintain some level of perceptual quality of the signals being compared and would deem such a compression to be excessive.

This analogy can be made clearer if it is understood that there are a large number of approaches to compressing a signal to, say, $1/10{,}000^{th}$ of its original size, not for maintaining its signal quality to ensure computational ease for commercial quality distribution, but to assist in identification, analysis or monitoring of the signal. Most compression is either lossy or lossless and is designed with psychoacoustic or psychovisual parameters. That is to say, the signal is compressed to retain what is "humanly-perceptible." As long as the compression successfully mimics human perception, data space may be saved when the compressed file is compared to the uncompressed or original file. While psychoacoustic and psychovisual compression has some relevance to the present invention, additional data reduction or massive compression is anticipated by the present invention. It is anticipated that the original signal may be compressed to create a realistic or self-similar representation of the original signal, so that the compressed signal can be referenced at a subsequent time as unique binary data that has computational relevance to the original signal. Depending on the application, general data reduction of the original signal can be as simple as massive compression or may relate to the watermark encoding envelope parameter (those bits which a watermarking encoding algorithm deem as candidate bits for mapping independent data or those bits deemed imperceptible to human senses but detectable to a watermark detection algorithm). In this manner, certain media which are commonly known by signal characteristics, a painting, a song, a TV commercial, a dialect, etc., may be analyzed more accurately, and perhaps, more efficiently than a text-based descriptor of the signal. So long as the sender and receiver agree that the data representation is accurate, even insofar as the data-reduction technique has logical relationships with the perceptibility of the original signal, as they must with commonly agreed to text descriptors, no independent cataloging is necessary.

The present invention generally contemplates a signal recognition system that has at least five elements. The actual number of elements may vary depending on the number of domains in which a signal resides (for example, audio is at least one domain while visual carriers are at least two dimensional). The present invention contemplates that the number of elements will be sufficient to effectively and efficiently meet the demands of various classes of signal recognition. The design of the signal recognition that may be used with data reduction is better understood in the context of the general requirements of a pattern or signal recognition system.

The first element is the reference database, which contains information about a plurality of potential signals that will be monitored. In one form, the reference database would contain digital copies of original works of art as they are recorded by the various artists, for example, contain digital copies of all songs that will be played by a particular radio station. In another form, the reference database would contain not perfect digital copies of original works of art, but digital copies of abstracted works of art, for example, contain digital copies of all songs that have been preprocessed such that the copies represent the perceptual characteristics of the original songs. In another form, the reference database would contain digital copies of processed data files, which files represent works of art that have been preprocessed in such a fashion as to identify those perceptual differences that can differentiate one version of a work of art from another version of the same work of art, such as two or more versions of the same song, but by different artists. These examples have obvious application to visually communicated works such as images, trademarks or photographs, and video as well.

The second element is the object locator, which is able to segment a portion of a signal being monitored for analysis (i.e., the "monitored signal"). The segmented portion is also referred to as an "object." As such, the signal being monitored may be thought of comprising a set of objects. A song recording, for example, can be thought of as having a multitude of objects. The objects need not be of uniform length, size, or content, but merely be a sample of the signal being monitored. Visually communicated informational signals have related objects; color and size are examples.

The third element is the feature selector, which is able to analyze a selected object and identify perceptual features of the object that can be used to uniquely describe the selected object. Ideally, the feature selector can identify all, or nearly all, of the perceptual qualities of the object that differentiate it from a similarly selected object of other signals. Simply, a feature selector has a direct relationship with the perceptibility of features commonly observed. Counterfeiting is an activity which specifically seeks out features to misrepresent the authenticity of any given object. Highly granular, and arguably successful, counterfeiting is typically sought for objects that are easily recognizable and valuable, for example, currency, stamps, and trademarked or copyrighted works and objects that have value to a body politic.

The fourth element is the comparing device which is able to compare the selected object using the features selected by the feature selector to the plurality of signals in the reference database to identify which of the signals matches the monitored signal. Depending upon how the information of the plurality of signals is stored in the reference database and depending upon the available computational capacity (e.g., speed and efficiency), the exact nature of the comparison will vary. For example, the comparing device may compare the selected object directly to the signal information stored in the database. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector and then compare the selected object to the processed signal information. Alternatively, the comparing device may need to process the selected object using input from the feature selector and then compare the processed selected object to the signal information. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector, process the selected object using input from the feature selector, and then compare the processed selected object to the processed signal information.

The fifth element is the recorder which records information about the number of times a given signal is analyzed and detected. The recorder may comprise a database which keeps track of the number of times a song, image, or a movie has been played, or may generate a serial output which can be subsequently processed to determine the total number of times various signals have been detected.

Other elements may be added to the system or incorporated into the five elements identified above. For example, an error handler may be incorporated into the comparing device. If the comparing device identifies multiple signals which appear to contain the object being sought for analysis or monitoring, the error handler may offer further processing in order to identify additional qualities or features in the selected object such that only one of the set of captured signals is found to contain the further analyzed selected object that actually conforms with the object thought to have been transmitted or distributed.

Moreover, one or more of the five identified elements may be implemented with software that runs on the same processor, or which uses multiple processors. In addition, the elements may incorporate dynamic approaches that utilize stochastic, heuristic, or experience-based adjustments to refine the signal analysis being conducted within the system, including, for example, the signal analyses being performed within the feature selector and the comparing device. This additional analyses may be viewed as filters that are designed to meet the expectations of accuracy or speed for any intended application.

Since maintenance of original signal quality is not required by the present invention, increased efficiencies in processing and identification of signals can be achieved. The present invention concerns itself with perceptible relationships only to the extent that efficiencies can be achieved both in accuracy and speed with enabling logical relationships between an original signal and its abstract.

The challenge is to maximize the ability to sufficiently compress a signal to both retain its relationship with the original signal while reducing the data overhead to enable more efficient analysis, archiving and monitoring of these signals. In some cases, data reduction alone will not suffice: the sender and receiver must agree to the accuracy of the recognition. In other cases, agreement will actually depend on a third party who authored or created the signal in question. A digitized signal may have parameters to assist in establishing more accurate identification, for example, a "signal abstract" which naturally, or by agreement with the creator, the copyright owner or other interested parties, can be used to describe the original signal. By utilizing less than the original signal, a computationally inexpensive means of identification can be used. As long as a realistic set of conditions can be arrived at governing the relationship between a signal and its data reduced abstract, increases in effective monitoring and transparency of information data flow across communications channels is likely to result. This feature is significant in that it represents an improvement over how a digitally-sampled signal can be cataloged and identified, though the use of a means that is specifically selected based upon the strengths of a general computing device and the economic needs of a particular market for the digitized information data being monitored. The additional benefit is a more open means to uniformly catalog, analyze, and monitor signals. As well, such benefits can exist for third parties, who have a significant interest in the signal but are not the sender or receiver of said information.

As a general improvement over the art, the present invention incorporates what could best be described as "computer-acoustic" and "computer-visual" modeling, where the signal abstracts are created using data reduction techniques to determine the smallest amount of data, at least a single bit, which can represent and differentiate two digitized signal representations for a given predefined signal set. Each of such representations must have at least a one bit difference with all other members of the database to differentiate each such representation from the others in the database. The predefined signal set is the object being analyzed. The signal identifier/detector should receive its parameters from a database engine. The engine will identify those characteristics (for example, the differences) that can be used to distinguish one digital signal from all other digital signals that are stored in its collection. For those digital signals or objects which are seemingly identical, except[ing] that the signal may have different performance or utilization in the newly created object, benefits over additive or text-based identifiers are achieved. Additionally, decisions regarding the success or failure of an accurate detection of any given object may be flexibly implemented or changed to reflect market-based demands of the engine. Appropriate examples are songs or works or art which have been sampled or reproduced by others who are not the original creator.

In some cases, the engine will also consider the NULL case for a generalized item not in its database, or perhaps in situations where data objects may have collisions. For some applications, the NULL case is not necessary, thus making the whole system faster. For instance, databases which have fewer repetitions of objects or those systems which are intended to recognize signals with time constraints or capture all data objects. Greater efficiency in processing a relational database can be obtained because the rules for comparison are selected for the maximum efficiency of the processing hardware and/or software, whether or not the processing is based on psychoacoustic or psychovisual models. The benefits of massive data reduction, flexibility in constructing appropriate signal recognition protocols and incorporation of cryptographic techniques to further add accuracy and confidence in the system are clearly improvements over the art. For example, where the data reduced abstract needs to have further uniqueness, a hash or signature may be required. And for objects which have further uniqueness requirements, two identical instances of the object could be made unique with cryptographic techniques.

Accuracy in processing and identification may be increased by using one or more of the following fidelity evaluation functions:

1) RMS (root mean square). For example, a RMS function may be used to assist in determining the distance between data based on mathematically determinable Euclidean distance between the beginning and end data points (bits) of a particular signal carrier.

2) Frequency weighted RMS. For example, different weights may be applied to different frequency components of the carrier signal before using RMS. This selective weighting can assist in further distinguishing the distance between

beginning and end points of the signal carrier (at a given point in time, described as bandwidth, or the number of total bits that can be transmitted per second) and may be considered to be the mathematical equivalent of passing a carrier signal difference through a data filter and figuring the average power in the output carrier.

3) Absolute error criteria, including particularly the NULL set (described above) The NULL may be utilized in two significant cases: First, in instances where the recognized, signal appears to be an identified object which is inaccurately attributed or identified to an object not handled by the database of objects; and second, where a collision of data occurs. For instance, if an artist releases a second performance of a previously recorded song, and the two performances are so similar that their differences are almost imperceptible, then the previously selected criteria may not be able to differentiate the two recordings. Hence, the database must be "recalibrated" to be able to differentiate these two versions. Similarly, if the system identifies not one, but two or more, matches for a particular search, then the database may need "recalibration" to further differentiate the two objects stored in the database.

4) Cognitive Identification. For example, the present invention may use an experience-based analysis within a recognition engine. Once such analysis may involve mathematically determining a spectral transform or its equivalent of the carrier signal. A spectral transform enables signal processing and should maintain, for certain applications, some cognitive or perceptual relationship with the original analog waveform. As a novel feature to the present invention, additional classes may be subject to humanly-perceptible observation. For instance, an experience-based criteria which relates particularly to the envisioned or perceived accuracy of the data information object as it is used or applied in a particular market, product, or implementation. This may include a short 3 second segment of a commercially available and recognizable song which is used for commercials to enable recognition of the good or service being marketed. The complete song is marketed as a separately valued object from the use of a discrete segment of the song (that may be used for promotion or marketing—for the complete song or for an entirely different good or service). To the extent that an owner of the song in question is able to further enable value through the licensing or agreement for use of a segment of the original signal, cognitive identification is a form of filtering to enable differentiations between different and intended uses of the same or subset of the same signal (object). The implementation relating specifically, as disclosed herein, to the predetermined identification or recognition means and/or any specified relationship with subsequent use of the identification means can be used to create a history as to how often a particular signal is misidentified, which history can then be used to optimize identification of that signal in the future. The difference between use of an excerpt of the song to promote a separate and distinct good or service and use of the excerpt to promote recognition of the song itself (for example, by the artist to sell copies of the song) relates informationally to a decision based on recognized and approved use of the song. Both the song and applications of the song in its entirety or as a subset are typically based on agreement by the creator and the sender who seeks to utilize the work. Trust in the means for identification, which can be weighted in the present invention (for example, by adjusting bit-addressable information), is an important factor in adjusting the monitoring or recognition features of the object or carrier signal, and by using any misidentification information, (including any experience-based or heuristic information), additional features of the monitored signal can be used to improve the performance of the monitoring system envisioned herein. The issue of central concern with cognitive identification is a greater understanding of the parameters by which any given object is to be analyzed. To the extent that a creator chooses varying and separate application of his object, those applications having a cognitive difference in a signal recognition sense (e.g., the whole or an excerpt), the system contemplated herein includes rules for governing the application of bit-addressable information to increase the accuracy of the database.

5) Finally, the predetermined parameters that are associated with a discrete case for any given object will have a significant impact upon the ability to accurately process and identify the signals. For example, if a song is transmitted over a FM carrier, then one skilled in the art will appreciate that the FM signal has a predetermined bandwidth which is different from the bandwidth of the original recording, and different even from song when played on an AM carrier, and different yet from a song played using an 8-bit Internet broadcast. Recognition of these differences, however, will permit the selection of an identification means which can be optimized for monitoring a FM broadcasted signal. In other words, the discreteness intended by the sender is limited and directed by the fidelity of the transmission means. Objects may be cataloged and assessing with the understanding that all monitoring will occur using a specific transmission fidelity. For example, a database may be optimized with the understanding that only AM broadcast signals will be monitored. For maximum efficiency, different data bases may be created for different transmission channels, e.g., AM broadcasts, FM broadcasts, Internet broadcasts, etc.

For more information on increasing efficiencies for information systems, see *The Mathematical Theory of Communication* (1948), by Shannon.

Because bandwidth (which in the digital domain is equated to the total number of bits that can be transmitted in a fixed period of time) is a limited resource which places limitations upon transmission capacity and information coding schemes, the importance of monitoring for information objects transmitted over any given channel must take into consideration the nature and utilization of a given channel. The supply and demand of bandwidth will have a dramatic impact on the transmission, and ultimately, upon the decision to monitor and recognize signals. A discussion of this is found in an application by the inventor under U.S. patent application Ser. No. 08/674,726 (which issued Apr. 22, 2008 as U.S. Pat. No. 7,362,775) "Exchange Mechanisms for Digital Information Packages with Bandwidth Securitization, Multichannel Digital Watermarks, and Key Management" (which application is incorporated herein by reference as if fully setforth herein).

If a filter is to be used in connection with the recognition or monitoring engine, it may be desirable for the filter to anticipate and take into consideration the following factors, which affect the economics of the transmission as they relate to triggers for payment and/or relate to events requiring audits of the objects which are being transmitted: 1) time of transmission (i.e., the point in time when the transmission occurred), including whether the transmission is of a live performance); 2) location of transmission (e.g., what channel was used for transmission, which usually determines the associated cost for usage of the transmission channel); 3) the point of origination of the transmission (which may be the same for a signal carrier over many distinct channels); and 4) pre-existence of the information carrier signal (pre-recorded or newly created information carrier signal, which may require differentiation in certain markets or instances).

In the case of predetermined carrier signals (those which have been recorded and stored for subsequent use), "positional information carrier signals" are contemplated by this invention, namely, perceptual differences between the seemingly "same" information carrier that can be recognized as consumers of information seek different versions or quality levels of the same carrier signal. Perceptual differences exist between a song and its reproduction from a CD, an AM radio, and an Internet broadcast. To the extent that the creator or consumer of the signal can define a difference in any of the four criteria above, means can be derived (and programmed for selectability) to recognize and distinguish these differences. It is, however, quite possible that the ability to monitor carrier signal transmission with these factors will increase the variety and richness of available carrier signals to existing communications channels. The differentiation between an absolute case for transmission of an object, which is a time dependent event, for instance a live or real time broadcast, versus the relative case, which is prerecorded or stored for transmission at a later point in time, creates recognizable differences for signal monitoring.

The monitoring and analysis contemplated by this invention may have a variety of purposes, including, for example, the following: to determine the number of times a song is broadcast on a particular radio broadcast or Internet site; to control security though a voice-activated security system; and to identify associations between a beginner's drawing and those of great artists (for example to draw comparisons between technique, compositions, or color schemes). None of these examples could be achieved with any significant degree of accuracy using a text-based analysis. Additionally, strictly text-based systems fail to fully capture the inherent value of the data recognition or monitoring information itself.

SAMPLE EMBODIMENTS

Sample Embodiment 1

A database of audio signals (e.g., songs) is stored or maintained by a radio station or Internet streaming company, who may select a subset of the songs are stored so that the subset may be later broadcast to listeners. The subset, for example, may comprise a sufficient number of songs to fill 24 hours of music programming (between 300 or 500 songs). Traditionally, monitoring is accomplished by embedding some identifier into the signal, or affixing the identifier to the signal, for later analysis and determination of royalty payments. Most of the traditional analysis is performed by actual persons who use play lists and other statistical approximations of audio play, including for example, data obtained through the manual (i.e., by persons) monitoring of a statistically significant sample of stations and transmission times so that an extrapolation may be made to a larger number of comparable markets.

The present invention creates a second database from the first database, wherein each of the stored audio signals in the first database is data reduced in a manner that is not likely to reflect the human perceptual quality of the signal, meaning that a significantly data-reduced signal is not likely to be played back and recognized as the original signal. As a result of the data reduction, the size of the second database (as measured in digital terms) is much smaller than the size of the first database, and is determined by the rate of compression. If, for example, if 24 hours worth of audio signals are compressed at a 10,000:1 compression rate, the reduced data could occupy a little more than 1 megabyte of data. With such a large compression rate, the data to be compared and/or analyzed may become computationally small such that computational speed and efficiency are significantly improved.

With greater compression rates, it is anticipated that similarity may exist between the data compressed abstractions of different analog signals (e.g., recordings by two different artists of the same song). The present invention contemplates the use of bit-addressable differences to distinguish between such cases. In applications where the data to be analyzed has higher value in some predetermined sense, cryptographic protocols, such as a hash or digital signature, can be used to distinguish such close cases.

In a preferred embodiment, the present invention may utilize a centralized database where copies of new recordings may be deposited to ensure that copyright owners, who authorize transmission or use of their recordings by others, can independently verify that the object is correctly monitored. The rules for the creator himself to enter his work would differ from a universally recognized number assigned by an independent authority (say, ISRC, ISBN for recordings and books respectively). Those skilled in the art of algorithmic information theory (AIT) can recognize that it is now possible to describe optimized use of binary data for content and functionality. The differences between objects must relate to decisions made by the user of the data, introducing subjective or cognitive decisions to the design of the contemplated invention as described above. To the extent that objects can have an optimized data size when compared with other objects for any given set of objects, the algorithms for data reduction would have predetermined flexibility directly related to computational efficiency and the set of objects to be monitored. The flexibility in having transparent determination of unique signal abstracts, as opposed to independent third party assignment, is likely to increase confidence in the monitoring effort by the owners of the original signals themselves. The prior art allows for no such transparency to the copyright creators.

Sample Embodiment 2

Another embodiment of the invention relates to visual images, which of course, involve at least two dimensions.

Similar to the goals of a psychoacoustic model, a psychovisual model attempts to represent a visual image with less data, and yet preserve those perceptual qualities that permit a human to recognize the original visual image. Using the very same techniques described above in connection with an audio signal, signal monitoring of visual images may be implemented.

One such application for monitoring and analyzing visual images involves a desire to find works of other artists that relate to a particular theme. For example, finding paintings of sunsets or sunrises. A traditional approach might involve a textual search involving a database wherein the works of other artists have been described in writing. The present invention, however, involves the scanning of an image involving a sun, compressing the data to its essential characteristics (i.e., those perceptual characteristics related to the sun) and then finding matches in a database of other visual images (stored as compressed or even uncompressed data). By studying the work of other artists using such techniques, a novice, for example, could learn much by comparing the presentations of a common theme by different artists.

Another useful application involving this type of monitoring and analyzing is the identification of photographs of potential suspects whose identity matches the sketch of a police artist.

Note that combinations of the monitoring techniques discussed above can be used for audio-visual monitoring, such as video-transmission by a television station or cable station. The techniques would have to compensate, for example, for a cable station that is broadcasting a audio channel unaccompanied by video.

Other embodiments and uses of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. The specification and examples should be considered exemplary only with the true scope and spirit of the invention indicated by the following claims. As will be easily understood by those of ordinary skill in the art, variations and modifications of each of the disclosed embodiments can be easily made within the scope of this invention as defined by the following claims.

What is claimed:

1. A system for identifying at least one reference signal comprising:

a first input that receives at least one reference signal to be identified;

a first processor that creates an abstract of each reference signal input to said first processor through said first input wherein the abstract comprises signal characteristic parameters configured to differentiate between versions of said reference signal;

at least one reference database for storing at least one abstract;

a receiver that receives at least one query signal;

a second processor that creates an abstract of said query signal received by said receiver, based on the parameters; and

a comparing device that compares the created query signal abstract to the reference signal abstracts in the at least one database, each abstract in the at least one reference database corresponding to a version of a reference signal, to determine whether the query signal abstract matches any of the stored at least one abstract in the at least one reference database.

2. The system of claim **1**, further comprising: a controller that enables authorized transmission or use of the corresponding version of the reference signal based on whether a match was determined by the comparing device.

3. The system of claim **1**, wherein the reference database is created by at least one of a music company, a movie studio, an image archive, an owner of a general computing device, a user of the reference signal, an interne service provider, an information technology company, a body politic, a telecommunications company and combinations thereof.

4. The system of claim **1**, wherein the reference signals comprise at least one of images, audio, video, and combinations thereof.

5. The system of claim **1**, wherein the stored abstracts are derived from one of a cognitive feature or a perceptible characteristic of the associated reference signals.

6. The system of claim **1**, furthering comprising a security controller to apply a cryptographic protocol to at least one created abstract, at least one database abstract or both at least one created abstract and at least one database abstract.

7. The system of claim **1**, wherein each of the stored abstracts comprise information configured to differentiate variations of each referenced corresponding signal.

8. The system of claim **1**, further comprising a storage medium for storing information associated with the comparing device to store information to enable at least one of a re-calibration of the database and a heuristic-based adjustment of the database.

9. The system of claim **1**, further comprising a storage medium for storing information associated with the comparing device to store information to enable a computational efficiency adjustment of the database, an adjustment for database collisions and/or null cases, a change to the recognition or use parameters governing the database and combinations thereof.

10. The system of claim **1**, further comprising applying one of a relatedness index or measure of similarity to generate uniquely identifiable information to determine authorization by the comparing device.

11. A system for analyzing and identifying at least one reference signal, comprising: a first input for receiving at least one reference signal to be identified, a first processor for creating an abstract of each reference signal received based on perceptual characteristics representative of parameters to differentiate between versions of the reference signal; a reference database for storing abstracts of each reference signal received in a database; a second input for receiving at least one query signal to be identified, a second processor for creating an abstract of the received query signal based on the parameters; and a comparing device for comparing an abstract of said received query signal to the abstracts stored in the database to determine if the abstract of said received query signal is related to any of the stored abstracts.

12. The system of claim **11**, wherein said database is independently accessible.

13. The system of claim **11**, wherein said received query signal is independently stored.

14. The system of claim **11**, wherein the parameters used by the comparing device to compare a received query signal abstract with a stored reference signal abstract are adjustable.

15. The system of claim **11**, wherein the stored abstracts comprise a self-similar representation of at least one reference signal.

16. The system of claim **11**, wherein at least two of the stored abstracts comprise information corresponding to two versions of at least one reference signal.

17. The system of claim **11**, wherein at least one abstract comprises data describing a portion of the characteristics of its associated reference signal.

18. The system of claim **17**, wherein the characteristics of the reference signal being described comprise at least one of a perceptible characteristic, a cognitive characteristic, a subjective characteristic, a perceptual quality, a recognizable characteristic or combinations thereof.

19. The system of claim **11**, wherein a stored abstract comprises data unique to a variation of its corresponding reference signal.

20. The system of claim **11**, wherein the system further comprises a security controller for applying a cryptographic protocol to the abstract of said reference signal, said query signal, or both said reference signal and said query signal.

21. The system of claim **20**, wherein the cryptographic protocol is one of at least a hash or digital signature and further comprising storing the hashed abstract and/or digitally signed abstract in the reference database.

22. The system of claim **11**, further comprising a transmitter for distributing at least one signal based on the comparison step.

23. The system of claim **22**, further comprising a processor for applying a watermarking technique to the at least one signal to be distributed.

24. A system for identifying a plurality of reference signals comprising:

a first input that receives a plurality of reference signals to be identified;

a first processor that creates an abstract for each of the plurality of reference signals input to said first processor through said first input wherein the abstract comprises signal characteristic parameters configured to differentiate between versions of at least one reference signal; at least one reference database for storing the plurality of created abstracts; a receiver for receiving a query signal; a second processor that creates an abstract of said query signal received by said receiver, based on the parameters; and a comparing device that compares the created query signal abstract to the abstracts stored in the at least one database, to determine whether the query signal abstract matches any of the stored abstracts in the at least one reference database.

25. The system of claim **24**, wherein the first and second processors are the same processor.

26. The system of claim **24**, wherein the first and second processors are different processors.

27. A system for determining whether a query signal matches a reference signal, comprising:

a first processor configured to create a first version abstract of a first version of a reference signal input to said first processor;

wherein said first version abstract comprises signal characteristic parameters configured to differentiate said first version of said reference signal from a second version of said reference signal;

a reference database storing said first version abstract;

a device configured to determine whether said first version of said reference signal matches a query signal, by comparing a query signal abstract of said query signal to said first version abstract stored in said reference database.

28. A system for determining whether a query signal matches a reference signal, comprising:

a first processor configured to create a first version abstract of a first version of a reference signal input to said first processor, wherein said first processor is configured to create said first version abstract from said first version of

said reference signal based upon perceptual characteristics of said first version of said reference signal, such that said first version abstract retains a perceptual relationship to said first version of said reference signal;

a reference database storing said first version abstract;

a second processor configured to create a query signal abstract from a query signal, wherein said second processor is configured to generate said query signal abstract from said query signal based upon perceptual characteristics of said query signal, such that said query signal abstract retains a perceptual relationship to said query signal; and

a device configured to determine whether a query signal matches said first version of said reference signal, by comparing, a query signal abstract that was generated based upon perceptual characteristics of said query signal, with said first version abstract stored in said reference database.

29. A system for determining whether a query signal matches any of a plurality of reference signal, comprising:

a first processor configured to create a plurality of reference signal abstracts for each one of a plurality of reference signals, wherein each one of said plurality of reference signal abstracts comprises signal characteristic parameters configured to differentiate between other versions of that one of said plurality of reference signals;

a reference database storing said plurality of reference signal abstracts;

a device configured to determine if a query signal matches any one plurality of reference signals by comparing a query signal abstract of said query signal with at least one abstract of said plurality of reference signal abstracts stored in said reference database.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,949,494 B2
APPLICATION NO. : 12/655357
DATED : May 24, 2011
INVENTOR(S) : Moskowitz

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 1 line 14 reading:
This application claims the benefit of pending U.S. patent

should read:

This application is related to pending U.S. patent

Column 15 line 44 reading:

of the reference signal, an interne service provider, an infor-

should read:

of the reference signal, an internet service provider, an infor-

Signed and Sealed this
Thirtieth Day of August, 2011

David J. Kappos
Director of the United States Patent and Trademark Office

Patent 7,660,700 B2
(Feb. 9, 2010)

US007660700B2

(12) **United States Patent**
Moskowitz et al.

(10) **Patent No.: US 7,660,700 B2**
(45) **Date of Patent: *Feb. 9, 2010**

(54) **METHOD AND DEVICE FOR MONITORING AND ANALYZING SIGNALS**

(75) Inventors: **Scott A. Moskowitz**, Sunny Isles Beach, FL (US); **Michael Berry**, Virginia Beach, VA (US)

(73) Assignee: **Blue Spike, Inc.**, Sunny Isles Beach, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

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See application file for complete search history.

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Primary Examiner—Carol S Tsai

(57) **ABSTRACT**

A method and system for monitoring and analyzing at least one signal are disclosed. An abstract of at least one reference signal is generated and stored in a reference database. An abstract of a query signal to be analyzed is then generated so that the abstract of the query signal can be compared to the abstracts stored in the reference database for a match. The method and system may optionally be used to record information about the query signals, the number of matches recorded, and other useful information about the query signals. Moreover, the method by which abstracts are generated can be programmable based upon selectable criteria. The system can also be programmed with error control software so as to avoid the re-occurrence of a query signal that matches more than one signal stored in the reference database.

52 Claims, No Drawings

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METHOD AND DEVICE FOR MONITORING AND ANALYZING SIGNALS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 09/657,181, filed Sep. 7, 2000, entitled, "Method and Device for Monitoring and Analyzing Signals."

This application claims the benefit of pending U.S. patent application Ser. No. 08/999,766, filed Jul. 23, 1997, entitled "Steganographic Method and Device"; pending U.S. patent application Ser. No. 08/772,222, filed Dec. 20, 1996, entitled "Z-Transform Implementation of Digital Watermarks" (issued as U.S. Pat. No. 6,078,664); pending U.S. patent application Ser. No. 09/456,319, filed Dec. 8, 1999, entitled "Z-Transform Implementation of Digital Watermarks" (issued as U.S. Pat. No. 6,853,726); pending U.S. patent application. Ser. No. 08/674,726, filed Jul. 2, 1996, entitled "Exchange Mechanisms for Digital Information Packages with Bandwidth Securitization, Multichannel Digital Watermarks, and Key Management"; pending U.S. patent application Ser. No. 09/545,589, filed Apr. 7, 2000, entitled "Method and System for Digital. Watermarking" (issued as U.S. Pat. No. 7,007,166); pending U.S. patent application Ser. No. 09/046,627, filed Mar. 24, 1998, entitled "Method for Combining Transfer Function with Predetermined Key Creation" (issued as U.S. Pat. No. 6,598,162); pending U.S. patent application Ser. No. 09/053,628, filed Apr. 2, 1998, entitled "Multiple Transform Utilization and Application for Secure Digital Watermarking" (issued as U.S. Pat. No. 6,205,249); pending U.S. patent application Ser. No. 09/281,279, filed Mar. 30, 1999, entitled "Optimization Methods for the Insertion, Protection, and Detection of Digital Watermarks in Digital Data (issued as U.S. Pat. No. 6,522,767)"; U.S. patent application Ser. No. 09,594,719, filed Jun. 16, 2000, entitled "Utilizing Data Reduction in Steganographic and Cryptographic Systems" (which is a continuation-in-part of PCT application No. PCT/US00/06522, filed Mar. 14, 2000, which PCT application claimed priority to U.S. Provisional Application No. 60/125,990, filed Mar. 24, 1999) (issued as U.S. Pat. No. 7,123,718); pending U.S. Application No. 60/169,274, filed Dec. 7, 1999, entitled "Systems, Methods And Devices For Trusted Transactions" (issued as U.S. Pat. No. 7,159,116); and PCT Application No. PCT/US00/21189, filed Aug. 4, 2000 (which claims priority to U.S. Patent Application Ser. No. 60/147,134, filed Aug. 4, 1999, and to U.S. Patent Application No. 60/213,489, filed. Jun. 23, 2000, both of which are entitled, "A Secure Personal Content Server"). The previously identified patents and/or patent applications are hereby incorporated by reference, in their entireties, as if fully stated herein.

In addition, this application hereby incorporates by reference, as if fully stated herein, the total disclosures of U.S. Pat. No. 5,613,004 "Steganographic Method and Device"; U.S. Pat. No. 5,745,569 "Method for Stega-Cipher Protection of Computer Code"; and U.S. Pat. No. 5,889,868 "Optimization Methods for the Insertion, Protection, and Detection of Digital Watermarks in Digitized Data."

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the monitoring and analysis of digital information. A method and device are described which relate to signal recognition to enhance identification and monitoring activities.

2. Description of the Related Art

Many methods and protocols are known for transmitting data in digital form for multimedia applications (including computer applications delivered over public networks such as the internet or World Wide Web ("WWW"). These methods may include protocols for the compression of data, such that it may more readily and quickly be delivered over limited bandwidth data lines. Among standard protocols for data compression of digital files may be mentioned the MPEG compression standards for audio and video digital compression, promulgated by the Moving Picture Experts Group. Numerous standard reference works and patents discuss such compression and transmission standards for digitized information.

Digital watermarks help to authenticate the content of digitized multimedia information, and can also discourage piracy. Because piracy is clearly a disincentive to the digital distribution of copyrighted content, establishment of responsibility for copies and derivative copies of such works is invaluable. In considering the various forms of multimedia content, whether "master," stereo, NTSC video, audio tape or compact disc, tolerance of quality will vary with individuals and affect the underlying commercial and aesthetic value of the content. It is desirable to tie copyrights, ownership rights, purchaser information or some combination of these and related data into the content in such a manner that the content must undergo damage, and therefore reduction of its value, with subsequent, unauthorized distribution, commercial or otherwise. Digital watermarks address many of these concerns. A general discussion of digital watermarking as it has been applied in the art may be found in U.S. Pat. No. 5,687,236 (whose specification is incorporated in whole herein by reference).

Further applications of basic digital watermarking functionality have also been developed. Examples of such applications are shown in U.S. Pat. No. 5,889,868 (whose specification is incorporated in whole herein by reference). Such applications have been drawn, for instance, to implementations of digital watermarks that were deemed most suited to particular transmissions, or particular distribution and storage mediums, given the nature of digitally sampled audio, video, and other multimedia works. There have also been developed techniques for adapting watermark application parameters to the individual characteristics of a given digital sample stream, and for implementation of digital watermarks that are feature-based-i.e., a system in which watermark information is not carried in individual samples, but is carried in the relationships between multiple samples, such as in a waveform shape. For instance, natural extensions may be added to digital watermarks that may also separate frequencies (color or audio), channels in 3D while utilizing discreteness in feature-based encoding only known to those with pseudo-random keys (i.e., cryptographic keys) or possibly tools to access such information, which may one day exist on a quantum level.

A matter of general weakness in digital watermark technology relates directly to the manner of implementation of the watermark. Many approaches to digital watermarking leave detection and decode control with the implementing party of the digital watermark, not the creator of the work to be protected. This weakness removes proper economic incentives for improvement of the technology. One specific form of exploitation mostly regards efforts to obscure subsequent watermark detection. Others regard successful over encoding using the same watermarking process at a subsequent time. Yet another way to perform secure digital watermark implementation is through "key-based" approaches.

SUMMARY OF THE INVENTION

A method for monitoring and analyzing at least one signal is disclosed, which method comprises the steps of: receiving at least one reference signal to be monitored; creating an abstract of the at least one reference signal; storing the abstract of the at least one reference signal in a reference database; receiving at least one query signal to be analyzed; creating an abstract of the at least one query signal; and comparing the abstract of the at least one query signal to the abstract of the at least one reference signal to determine if the abstract of the at least one query signal matches the abstract of the at least one reference signal.

A method for monitoring a plurality of reference signals is also disclosed, which method comprises the steps of: creating an abstract for each one of a plurality of reference signals; storing each of the abstracts in a reference database; receiving at least one query signal to be analyzed; creating an abstract of each at least one query signal; locating an abstract in the reference database that matches the abstract of each at least one query signal; and recording the identify of the reference signal whose abstract matched the abstract of each at least one query signal.

A computerized system for monitoring and analyzing at least one signal is also disclosed, which system comprises: a processor for creating an abstract of a signal using selectable criteria; a first input for receiving at least one reference signal to be monitored, the first input being coupled to the processor such that the processor may generate an abstract for each reference signal input to the processor; a reference database, coupled to the processor, for storing abstracts of each at least one reference signal; a second input for receiving at least one query signal to be analyzed, the second input being coupled to the processor such that the processor may generate an abstract for each query signal; and a comparing device, coupled to the reference database and to the second input, for comparing an abstract of the at least one query signal to the abstracts stored in the reference database to determine if the abstract of the at least one query signal matches any of the stored abstracts.

Further, an electronic system for monitoring and analyzing at least one signal is disclosed which system comprises: a first input for receiving at least one reference signal to be monitored, a first processor for creating an abstract of each reference signal input to the first processor through the first input; a second input for receiving at least one query signal to be analyzed, a second processor for creating an abstract of each query signal; a reference database for storing abstracts of each at least one reference signal; and a comparing device for comparing an abstract of the at least one query signal to the abstracts stored in the reference database to determine if the abstract of the at least one query signal matches any of the stored abstracts.

DETAILED DESCRIPTION OF THE INVENTION

While there are many approaches to data reduction that can be utilized, a primary concern is the ability to reduce the digital signal in such a manner as to retain a "perceptual relationship" between the original signal and its data reduced version. This relationship may either be mathematically discernible or a result of market-dictated needs. The purpose is to afford a more consistent means for classifying signals than proprietary, related text-based approaches. A simple analogy is the way in which a forensic investigator uses a sketch artist to assist in determining the identity of a human.

In one embodiment of the invention, the abstract of a signal may be generated by the following steps: 1) analyze the characteristics of each signal in a group of audible/perceptible variations for the same signal (e.g., analyze each of five versions of the same song-which versions may have the same lyrics and music but which are sung by different artists); and 2) select those characteristics which achieve or remain relatively constant (or in other words, which have minimum variation) for each of the signals in the group. Optionally, the null case may be defined using those characteristics which are common to each member of the group of versions.

Lossless and lossy compression schemes are appropriate candidates for data reduction technologies, as are those subset of approaches that are based on perceptual models, such as AAC, MP3, TwinVQ, JPEG, GIF, MPEG, etc. Where spectral transforms fail to assist in greater data reduction of the signal, other signal characteristics can be identified as candidates for further data reduction. Linear predictive coding (LPC), z-transform analysis, root mean square (rms), signal to peak, may be appropriate tools to measure signal characteristics, but other approaches or combinations of signal characteristic analysis are contemplated. While such signal characteristics may assist in determining particular applications of the present invention, a generalized approach to signal recognition is necessary to optimize the deployment and use of the present invention.

Increasingly, valuable information is being created and stored in digital form. For example, music, photographs and motion pictures can all be stored and transmitted as a series of binary digits—1's and 0's. Digital techniques permit the original information to be duplicated repeatedly with perfect or near perfect accuracy, and each copy is perceived by viewers or listeners as indistinguishable from the original signal. Unfortunately, digital techniques also permit the information to be easily copied without the owner's permission. While digital representations of analog waveforms may be analyzed by perceptually-based or perceptually-limited analysis it is usually costly and time-consuming to model the processes of the highly effective ability of humans to identify and recognize a signal. In those applications where analog signals require analysis, the cost of digitizing the analog signal is minimal when compared to the benefits of increased accuracy and speed of signal analysis and monitoring when the processes contemplated by this invention are utilized.

The present invention relates to identification of digitally-sampled information, such as images, audio and video. Traditional methods of identification and monitoring of those signals do not rely on "perceptual quality," but rather upon a separate and additional signal. Within this application, such signals will be called "additive signals" as they provide information about the original images, audio or video, but such information is in addition to the original signal. One traditional, text-based additive signal is title and author information. The title and author, for example, is information about a book, but it is in addition to the text of the book. If a book is being duplicated digitally, the title and author could provide one means of monitoring the number of times the text is being duplicated, for example, through an Internet download. The present invention, however, is directed to the identification of a digital signal—whether text, audio, or video—using only the digital signal itself and then monitoring the number of times the signal is duplicated. Reliance on an additive signal has many shortcomings. For example, first, someone must incorporate the additive signal within the digital data being transmitted, for example, by concatenation or through an embedding process. Such an additive signal, however, can be easily identified and removed by one who wants to utilize the original signal without paying for its usage. If the original signal itself is used to identify the content, an unauthorized user could not avoid payment of a royalty simply by removing the additive signal—because there is no additive signal to remove. Hence, the present invention avoids a major disadvantage of the prior art.

One such additive signal that may be utilized is a digital watermark—which ideally cannot be removed without perceptually altering the original signal.A watermark may also be used as a monitoring signal (for example, by encoding an identifier that uniquely identifies the original digital signal into which the identifier is being embedded). A digital watermark used for monitoring is also an additive signal, and such a signal may make it difficult for the user who wants to duplicate a signal without paying a royalty—mainly by degrading the perceptual quality of the original signal if the watermark (and hence the additive monitoring signal) is removed. This is, however, is a different solution to the problem.

The present invention eliminates the need of any additive monitoring signal because the present invention utilizes the underlying content signal as the identifier itself. Nevertheless, the watermark may increase the value of monitoring techniques by increasing the integrity of the embedded data and by indicating tampering of either the original content signal or the monitoring signal. Moreover, the design of a watermarking embedding algorithm is closely related to the perceptibility of noise in any given signal and can represent an ideal subset of the original signal: the watermark bits are an inverse of the signal to the extent that lossy compression schemes, which can be used, for instance, to optimize a watermarking embedding scheme, can yield information about the extent to which a data signal can be compressed while holding steadfast to the design requirement that the compressed signal maintain its perceptual relationship with the original, uncompressed signal. By describing those bits that are candidates for imperceptible embedding of watermark bits, further data reduction may be applied on the candidate watermarks as an example of retaining a logical and perceptible relationship with the original uncompressed signal.

Of course, the present invention may be used in conjunction with watermarking technology (including the use of keys to accomplish secure digital watermarking), but watermarking is not necessary to practice the present invention. Keys for watermarking may have many forms, including: descriptions of the original carrier file formatting, mapping of embedded data (actually imperceptible changes made to the carrier signal and referenced to the predetermined key or key pairs), assisting in establishing the watermark message data integrity (by incorporation of special one way functions in the watermark message data or key), etc. Discussions of these systems in the patents and pending patent applications are incorporated by reference above. The "recognition" of a particular signal or an instance of its transmission, and its monitoring are operations that may be optimized through the use of digital watermark analysis.

A practical difference between the two approaches of using a separate, additive monitoring signal and using the original signal itself as the monitoring signal is control. If a separate signal is used for monitoring, then the originator of the text, audio or video signal being transmitted and the entity doing the monitoring have to agree as to the nature of the separate signal to be used for monitoring—otherwise, the entity doing the monitoring would not know where to look, for what to look, or how to interpret the monitoring signal once it was identified and detected. On the other hand, if the original signal is used itself as a monitoring signal, then no such agreement is necessary. Moreover, a more logical and self-sufficient relationship between the original and its data-reduced abstract enhances the transparency of any resulting monitoring efforts. The entity doing the monitoring is not looking for a separate, additive monitoring system, and further, need not have to interpret the content of the monitoring signal.

Monitoring implementations can be handled by robust watermark techniques (those techniques that are able to survive many signal manipulations but are not inherently "secure" for verification of a carrier signal absent a logically-related watermarking key) and forensic watermark techniques (which enable embedding of watermarks that are not able to survive perceptible alteration of the carrier signal and thus enable detection of tampering with the originally watermarked carrier signal). The techniques have obvious trade-offs between speed, performance and security of the embedded watermark data.

In other disclosures, we suggest improvements and implementations that relate to digital watermarks in particular and embedded signaling in general. A digital watermark may be used to "tag" content in a manner that is not humanly-perceptible, in order to ensure that the human perception of the signal quality is maintained. Watermarking, however, must inherently alter at least one data bit of the original signal to represent a minimal change from the original signal's "unwatermarked state." The changes may affect only a bit, at the very least, or be dependent on information hiding relating to signal characteristics, such as phase information, differences between digitized samples, root mean square (RMS) calculations, z-transform analysis, or similar signal characteristic category.

There are weaknesses in using digital watermark technology for monitoring purposes. One weakness relates directly to the way in which watermarks are implemented. Often, the persons responsible for encoding and decoding the digital watermark are not the creator of the valuable work to be protected. As such, the creator has no input on the placement of the monitoring signal within the valuable work being protected. Hence, if a user wishing to avoid payment of the royalty can find a way to decode or remove the watermark, or at least the monitoring signal embedded in the watermark, then the unauthorized user may successfully duplicate the signal with impunity. This could occur, for example, if either of the persons responsible for encoding or decoding were to have their security compromised such that the encoding or decoding algorithms were discovered by the unauthorized user.

With the present invention, no such disadvantages exist because the creator need not rely on anyone to insert a monitoring signal—as no such signal is necessary. Instead, the creator's work itself is used as the monitoring signal. Accordingly, the value in the signal will have a strong relationship with its recognizability.

By way of improving methods for efficient monitoring as well as effective confirmation of the identity of a digitally-sampled signal, the present invention describes useful methods for using digital signal processing for benchmarking a novel basis for differencing signals with binary data comparisons. These techniques may be complemented with perceptual techniques, but are intended to leverage the generally decreasing cost of bandwidth and signal processing power in an age of increasing availability and exchange of digitized binary data.

So long as there exist computationally inexpensive ways of identifying an entire signal with some fractional representation or relationship with the original signal, or its perceptually observable representation, we envision methods for faster and more accurate auditing of signals as they are played, distributed or otherwise shared amongst providers (transmitters) and consumers (receivers). The ability to massively compress a signal to its essence—which is not strictly equivalent to "lossy" or "lossless" compression schemes or perceptual coding techniques, but designed to preserve some underlying "aesthetic quality" of the signal—represents a useful means for signal analysis in a wide variety of applications. The signal analysis, however, must maintain the ability to distinguish the perceptual quality of the signals being compared. For example, a method which analyzed a portion of a song by compressing it to a single line of lyrics fails to maintain the ability to distinguish the perceptual quality of the songs being compared. Specifically, for example, if the song "New York State of Mind" were compressed to the lyrics "I'm in a New York State of Mind," such a compression fails to maintain the ability to distinguish between the various recorded versions of the song, say, for example between Billy Joel's recording and Barbara Streisand's recording. Such a method is, therefore, incapable of providing accurate monitoring of the artist's recordings because it could not determine which of the two artists is deserving of a royalty—unless of course, there is a separate monitoring signal to provide the name of the artist or other information sufficient to distinguish the two versions. The present invention, however, aims to maintain some level of perceptual quality of the signals being compared and would deem such a compression to be excessive.

This analogy can be made clearer if it is understood that there are a large number of approaches to compressing a signal to, say, $1/10{,}000^{th}$ of its original size, not for maintaining its signal quality to ensure computational ease for commercial quality distribution, but to assist in identification, analysis or monitoring of the signal. Most compression is either lossy or lossless and is designed with psychoacoustic or psychovisual parameters. That is to say, the signal is compressed to retain what is "humanly-perceptible." As long as the compression successfully mimics human perception, data space may be saved when the compressed file is compared to the uncompressed or original file. While psychoacoustic and psychovisual compression has some relevance to the present invention, additional data reduction or massive compression is anticipated by the present invention. It is anticipated that the original signal may be compressed to create a realistic or self-similar representation of the original signal, so that the compressed signal can be referenced at a subsequent time as unique binary data that has computational relevance to the original signal. Depending on the application, general data reduction of the original signal can be as simple as massive compression or may relate to the watermark encoding envelope parameter (those bits which a watermarking encoding algorithm deem as candidate bits for mapping independent data or those bits deemed imperceptible to human senses but detectable to a watermark detection algorithm). In this manner, certain media which are commonly known by signal characteristics, a painting, a song, a TV commercial, a dialect, etc., may be analyzed more accurately, and perhaps, more efficiently than a text-based descriptor of the signal. So long as the sender and receiver agree that the data representation is accurate, even insofar as the data-reduction technique has logical relationships with the perceptibility of the original signal, as they must with commonly agreed to text descriptors, no independent cataloging is necessary.

The present invention generally contemplates a signal recognition system that has at least five elements. The actual number of elements may vary depending on the number of domains in which a signal resides (for example, audio is at least one domain while visual carriers are at least two dimensional). The present invention contemplates that the number of elements will be sufficient to effectively and efficiently meet the demands of various classes of signal recognition. The design of the signal recognition that may be used with data reduction is better understood in the context of the general requirements of a pattern or signal recognition system.

The first element is the reference database, which contains information about a plurality of potential signals that will be monitored. In one form, the reference database would contain digital copies of original works of art as they are recorded by the various artists, for example, contain digital copies of all songs that will be played by a particular radio station. In another form, the reference database would contain not perfect digital copies of original works of art, but digital copies of abstracted works of art, for example, contain digital copies of all songs that have been preprocessed such that the copies represent the perceptual characteristics of the original songs. In another form, the reference database would contain digital copies of processed data files, which files represent works of art that have been preprocessed in such a fashion as to identify those perceptual differences that can differentiate one version of a work of art from another version of the same work of art, such as two or more versions of the same song, but by different artists. These examples have obvious application to visually communicated works such as images, trademarks or photographs, and video as well.

The second element is the object locator, which is able to segment a portion of a signal being monitored for analysis (i.e., the "monitored signal"). The segmented portion is also referred to as an "object." As such, the signal being monitored may be thought of comprising a set of objects. A song recording, for example, can be thought of as having a multitude of objects. The objects need not be of uniform length, size, or content, but merely be a sample of the signal being monitored. Visually communicated informational signals have related objects; color and size are examples.

The third element is the feature selector, which is able to analyze a selected object and identify perceptual features of the object that can be used to uniquely describe the selected object. Ideally, the feature selector can identify all, or nearly all, of the perceptual qualities of the object that differentiate it from a similarly selected object of other signals. Simply, a feature selector has a direct relationship with the perceptibility of features commonly observed. Counterfeiting is an activity which specifically seeks out features to misrepresent the authenticity of any given object. Highly granular, and arguably successful, counterfeiting is typically sought for objects that are easily recognizable and valuable, for example, currency, stamps, and trademarked or copyrighted works and objects that have value to a body politic.

The fourth element is the comparing device which is able to compare the selected object using the features selected by the feature selector to the plurality of signals in the reference database to identify which of the signals matches the monitored signal. Depending upon how the information of the plurality of signals is stored in the reference database and depending upon the available computational capacity (e.g., speed and efficiency), the exact nature of the comparison will vary. For example, the comparing device may compare the selected object directly to the signal information stored in the database. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector and then compare the selected object to the processed signal information. Alternatively, the comparing device may need to process the selected object using input from the feature selector and then compare the processed selected object to the signal information. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector, process the selected object using input from the feature selector, and then compare the processed selected object to the processed signal information.

The fifth element is the recorder which records information about the number of times a given signal is analyzed and detected. The recorder may comprise a database which keeps track of the number of times a song, image, or a movie has been played, or may generate a serial output which can be subsequently processed to determine the total number of times various signals have been detected.

Other elements may be added to the system or incorporated into the five elements identified above. For example, an error handler may be incorporated into the comparing device. If the comparing device identifies multiple signals which appear to contain the object being sought for analysis or monitoring, the error handler may offer further processing in order to identify additional qualities or features in the selected object such that only one of the set of captured signals is found to contain the further analyzed selected object that actually conforms with the object thought to have been transmitted or distributed.

Moreover, one or more of the five identified elements may be implemented with software that runs on the same processor, or which uses multiple processors. In addition, the elements may incorporate dynamic approaches that utilize stochastic, heuristic, or experience-based adjustments to refine the signal analysis being conducted within the system, including, for example, the signal analyses being performed within the feature selector and the comparing device. This additional analyses may be viewed as filters that are designed to meet the expectations of accuracy or speed for any intended application.

Since maintenance of original signal quality is not required by the present invention, increased efficiencies in processing and identification of signals can be achieved. The present invention concerns itself with perceptible relationships only to the extent that efficiencies can be achieved both in accuracy and speed with enabling logical relationships between an original signal and its abstract.

The challenge is to maximize the ability to sufficiently compress a signal to both retain its relationship with the original signal while reducing the data overhead to enable more efficient analysis, archiving and monitoring of these signals. In some cases, data reduction alone will not suffice: the sender and receiver must agree to the accuracy of the recognition. In other cases, agreement will actually depend on a third party who authored or created the signal in question. A digitized signal may have parameters to assist in establishing more accurate identification, for example, a "signal abstract" which naturally, or by agreement with the creator, the copyright owner or other interested parties, can be used to describe the original signal. By utilizing less than the original signal, a computationally inexpensive means of identification can be used. As long as a realistic set of conditions can be arrived at governing the relationship between a signal and its data reduced abstract, increases in effective monitoring and transparency of information data flow across communications channels is likely to result. This feature is significant in that it represents an improvement over how a digitally-sampled signal can be cataloged and identified, though the use of a means that is specifically selected based upon the strengths of a general computing device and the economic needs of a particular market for the digitized information data being monitored. The additional benefit is a more open means to uniformly catalog, analyze, and monitor signals. As well, such benefits can exist for third parties, who have a significant interest in the signal but are not the sender or receiver of said information.

As a general improvement over the art, the present invention incorporates what could best be described as "computer-acoustic" and "computer-visual" modeling, where the signal abstracts are created using data reduction techniques to determine the smallest amount of data, at least a single bit, which can represent and differentiate two digitized signal representations for a given predefined signal set. Each of such representations must have at least a one bit difference with all other members of the database to differentiate each such representation from the others in the database. The predefined signal set is the object being analyzed. The signal identifier/detector should receive its parameters from a database engine. The engine will identify those characteristics (for example, the differences) that can be used to distinguish one digital signal from all other digital signals that are stored in its collection. For those digital signals or objects which are seemingly identical, except that the signal may have different performance or utilization in the newly created object, benefits over additive or text-based identifiers are achieved. Additionally, decisions regarding the success or failure of an accurate detection of any given object may be flexibly implemented or changed to reflect market-based demands of the engine. Appropriate examples are songs or works or art which have been sampled or re-produced by others who are not the original creator.

In some cases, the engine will also consider the NULL case for a generalized item not in its database, or perhaps in situations where data objects may have collisions. For some applications, the NULL case is not necessary, thus making the whole system faster. For instance, databases which have fewer repetitions of objects or those systems which are intended to recognize signals with time constraints or capture all data objects. Greater efficiency in processing a relational database can be obtained because the rules for comparison are selected for the maximum efficiency of the processing hardware and/or software, whether or not the processing is based on psychoacoustic or psychovisual models. The benefits of massive data reduction, flexibility in constructing appropriate signal recognition protocols and incorporation of cryptographic techniques to further add accuracy and confidence in the system are clearly improvements over the art. For example, where the data reduced abstract needs to have further uniqueness, a hash or signature may be required. And for objects which have further uniqueness requirements, two identical instances of the object could be made unique with cryptographic techniques.

Accuracy in processing and identification may be increased by using one or more of the following fidelity evaluation functions:

1) RMS (root mean square). For example, a RMS function may be used to assist in determining the distance between data based on mathematically determinable Euclidean distance between the beginning and end data points (bits) of a particular signal carrier.

2) Frequency weighted RMS. For example, different weights may be applied to different frequency components of the carrier signal before using RMS. This selective weighting can assist in further distinguishing the distance between beginning and end points of the signal carrier (at a given point in time, described as bandwidth, or the number of total bits that can be transmitted per second) and may be considered to be the mathematical equivalent of passing a carrier signal difference through a data filter and figuring the average power in the output carrier.

3) Absolute error criteria, including particularly the NULL set (described above) The NULL may be utilized in two significant cases: First, in instances where the recognized signal appears to be an identified object which is inaccurately attributed or identified to an object not handled by the database of objects; and second, where a collision of data occurs. For instance, if an artist releases a second performance of a previously recorded song, and the two performances are so similar that their differences are almost imperceptible, then the previously selected criteria may not be able to differentiate the two recordings. Hence, the database must be "recalibrated" to be able to differentiate these two versions. Similarly, if the system identifies not one, but two or more, matches for a particular search, then the database may need "recalibration" to further differentiate the two objects stored in the database.

4) Cognitive Identification. For example, the present invention may use an experience-based analysis within a recognition engine. Once such analysis may involve mathematically determining a spectral transform or its equivalent of the carrier signal. A spectral transform enables signal processing and should maintain, for certain applications, some cognitive or perceptual relationship with the original analog waveform. As a novel feature to the present invention, additional classes may be subject to humanly-perceptible observation. For instance, an experience-based criteria which relates particularly to the envisioned or perceived accuracy of the data information object as it is used or applied in a particular market, product, or implementation. This may include a short 3 second segment of a commercially available and recognizable song which is used for commercials to enable recognition of the good or service being marketed. The complete song is marketed as a separately valued object from the use of a discrete segment of the song (that may be used for promotion or marketing-for the complete song or for an entirely different good or service). To the extent that an owner of the song in question is able to further enable value through the licensing or agreement for use of a segment of the original signal, cognitive identification is a form of filtering to enable differentiations between different and intended uses of the same or subset of the same signal (object). The implementation relating specifically, as disclosed herein, to the predetermined identification or recognition means and/or any specified relationship with subsequent use of the identification means can be used to create a history as to how often a particular signal is misidentified, which history can then be used to optimize identification of that signal in the future. The difference between use of an excerpt of the song to promote a separate and distinct good or service and use of the excerpt to promote recognition of the song itself (for example, by the artist to sell copies of the song) relates informationally to a decision based on recognized and approved use of the song. Both the song and applications of the song in its entirety or as a subset are typically based on agreement by the creator and the sender who seeks to utilize the work. Trust in the means for identification, which can be weighted in the present invention (for example, by adjusting bit-addressable information), is an important factor in adjusting the monitoring or recognition features of the object or carrier signal, and by using any misidentification information, (including any experience-based or heuristic information), additional features of the monitored signal can be used to improve the performance of the monitoring system envisioned herein. The issue of central concern with cognitive identification is a greater understanding of the parameters by which any given object is to be analyzed. To the extent that a creator chooses varying and separate application of his object, those applications having a cognitive difference in a signal recognition sense (e.g., the whole or an excerpt), the system contemplated herein includes rules for governing the application of bit-addressable information to increase the accuracy of the database.

5) Finally, the predetermined parameters that are associated with a discrete case for any given object will have a significant impact upon the ability to accurately process and identify the signals. For example, if a song is transmitted over a FM carrier, then one skilled in the art will appreciate that the FM signal has a predetermined bandwidth which is different from the bandwidth of the original recording, and different even from song when played on an AM carrier, and different yet from a song played using an 8-bit Internet broadcast. Recognition of these differences, however, will permit the selection of an identification means which can be optimized for monitoring a FM broadcasted signal. In other words, the discreteness intended by the sender is limited and directed by the fidelity of the transmission means. Objects may be cataloged and assessing with the understanding that all monitoring will occur using a specific transmission fidelity. For example, a database may be optimized with the understanding that only AM broadcast signals will be monitored. For maximum efficiency, different data bases may be created for different transmission channels, e.g., AM broadcasts, FM broadcasts, Internet broadcasts, etc.

For more information on increasing efficiencies for information systems, see *The Mathematical Theory of Communication* (1948), by Shannon.

Because bandwidth (which in the digital domain is equated to the total number of bits that can be transmitted in a fixed period of time) is a limited resource which places limitations upon transmission capacity and information coding schemes, the importance of monitoring for information objects transmitted over any given channel must take into consideration the nature and utilization of a given channel. The supply and demand of bandwidth will have a dramatic impact on the transmission, and ultimately, upon the decision to monitor and recognize signals. A discussion of this is found in a co-pending application by the inventor under U.S. patent application Ser. No. 08/674,726 "Exchange Mechanisms for Digital Information Packages with Bandwidth Securitization, Multichannel Digital Watermarks, and Key Management" (which application is incorporated herein by reference as if fully setforth herein).

If a filter is to be used in connection with the recognition or monitoring engine, it may be desirable for the filter to anticipate and take into consideration the following factors, which affect the economics of the transmission as they relate to triggers for payment and/or relate to events requiring audits of the objects which are being transmitted: 1) time of transmission (i.e., the point in time when the transmission occurred), including whether the transmission is of a live performance); 2) location of transmission (e.g., what channel was used for transmission, which usually determines the associated cost for usage of the transmission channel); 3) the point of origination of the transmission (which may be the same for a signal carrier over many distinct channels); and 4) pre-existence of the information carrier signal (pre-recorded or newly created information carrier signal, which may require differentiation in certain markets or instances).

In the case of predetermined carrier signals (those which have been recorded and stored for subsequent use), "positional information carrier signals" are contemplated by this invention, namely, perceptual differences between the seemingly "same" information carrier that can be recognized as consumers of information seek different versions or quality levels of the same carrier signal. Perceptual differences exist between a song and its reproduction from a CD, an AM radio, and an Internet broadcast. To the extent that the creator or consumer of the signal can define a difference in any of the four criteria above, means can be derived (and programmed for selectability) to recognize and distinguish these differences. It is, however, quite possible that the ability to monitor carrier signal transmission with these factors will increase the variety and richness of available carrier signals to existing communications channels. The differentiation between an absolute case for transmission of an object, which is a time dependent event, for instance a live or real time broadcast, versus the relative case, which is prerecorded or stored for transmission at a later point in time, creates recognizable differences for signal monitoring.

The monitoring and analysis contemplated by this invention may have a variety of purposes, including, for example, the following: to determine the number of times a song is broadcast on a particular radio broadcast or Internet site; to control security though a voice-activated security system; and to identify associations between a beginner's drawing and those of great artists (for example to draw comparisons between technique, compositions, or color schemes). None of these examples could be achieved with any significant degree of accuracy using a text-based analysis. Additionally, strictly text-based systems fail to fully capture the inherent value of the data recognition or monitoring information itself.

SAMPLE EMBODIMENTS

Sample Embodiment 1

A database of audio signals (e.g., songs) is stored or maintained by a radio station or Internet streaming company, who may select a subset of the songs are stored so that the subset may be later broadcast to listeners. The subset, for example, may comprise a sufficient number of songs to fill 24 hours of music programming (between 300 or 500 songs). Traditionally, monitoring is accomplished by embedding some identifier into the signal, or affixing the identifier to the signal, for later analysis and determination of royalty payments. Most of the traditional analysis is performed by actual persons who use play lists and other statistical approximations of audio play, including for example, data obtained through the manual (i.e., by persons) monitoring of a statistically significant sample of stations and transmission times so that an extrapolation may be made to a larger number of comparable markets.

The present invention creates a second database from the first database, wherein each of the stored audio signals in the first database is data reduced in a manner that is not likely to reflect the human perceptual quality of the signal, meaning that a significantly data-reduced signal is not likely to be played back and recognized as the original signal. As a result of the data reduction, the size of the second database (as measured in digital terms) is much smaller than the size of the first database, and is determined by the rate of compression. If, for example, if 24 hours worth of audio signals are compressed at a 10,000:1 compression rate, the reduced data could occupy a little more than 1 megabyte of data. With such a large compression rate, the data to be compared and/or analyzed may become computationally small such that computational speed and efficiency are significantly improved.

With greater compression rates, it is anticipated that similarity may exist between the data compressed abstractions of different analog signals (e.g., recordings by two different artists of the same song). The present invention contemplates the use of bit-addressable differences to distinguish between such cases. In applications where the data to be analyzed has higher value in some predetermined sense, cryptographic protocols, such as a hash or digital signature, can be used to distinguish such close cases.

In a preferred embodiment, the present invention may utilize a centralized database where copies of new recordings may be deposited to ensure that copyright owners, who authorize transmission or use of their recordings by others, can independently verify that the object is correctly monitored. The rules for the creator himself to enter his work would differ from a universally recognized number assigned by an independent authority (say, ISRC, ISBN for recordings and books respectively). Those skilled in the art of algorithmic information theory (AIT) can recognize that it is now possible to describe optimized use of binary data for content and functionality. The differences between objects must relate to decisions made by the user of the data, introducing subjective or cognitive decisions to the design of the contemplated invention as described above. To the extent that objects can have an optimized data size when compared with other objects for any given set of objects, the algorithms for data reduction would have predetermined flexibility directly related to computational efficiency and the set of objects to be monitored. The flexibility in having transparent determination of unique signal abstracts, as opposed to independent third party assignment, is likely to increase confidence in the monitoring effort by the owners of the original signals themselves. The prior art allows for no such transparency to the copyright creators.

Sample Embodiment 2

Another embodiment of the invention relates to visual images, which of course, involve at least two dimensions.

Similar to the goals of a psychoacoustic model, a psychovisual model attempts to represent a visual image with less data, and yet preserve those perceptual qualities that permit a human to recognize the original visual image. Using the very same techniques described above in connection with an audio signal, signal monitoring of visual images may be implemented.

One such application for monitoring and analyzing visual images involves a desire to find works of other artists that relate to a particular theme. For example, finding paintings of sunsets or sunrises. A traditional approach might involve a textual search involving a database wherein the works of other artists have been described in writing. The present invention, however, involves the scanning of an image involving a sun, compressing the data to its essential characteristics (i.e., those perceptual characteristics related to the sun) and then finding matches in a database of other visual images (stored as compressed or even uncompressed data). By studying the work of other artists using such techniques, a novice, for example, could learn much by comparing the presentations of a common theme by different artists.

Another useful application involving this type of monitoring and analyzing is the identification of photographs of potential suspects whose identity matches the sketch of a police artist.

Note that combinations of the monitoring techniques discussed above can be used for audio-visual monitoring, such as video-transmission by a television station or cable station. The techniques would have to compensate, for example, for a cable station that is broadcasting a audio channel unaccompanied by video.

Other embodiments and uses of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. The specification and examples should be considered exemplary only with the true scope and spirit of the invention indicated by the following claims. As will be easily understood by those of ordinary skill in the art, variations and modifications of each of the disclosed embodiments can be easily made within the scope of this invention as defined by the following claims.

What is claimed:

1. An electronic system for monitoring and analyzing at least one signal, comprising:

a first input that receives at least one reference signal to be monitored,

a first processor that creates an abstract of each reference signal input to said first processor through said first input wherein the abstract comprises signal characteristic parameters configured to differentiate between a plurality of versions of the reference signal;

a second input that receives at least one query signal to be analyzed,

a second processor that creates an abstract of each query signal wherein the abstract comprises signal characteristic parameters of the query signal;

a reference database that stores abstracts of each at least one reference signal;

a comparing device that compares an abstract of said at least one query signal to the abstracts stored in the reference database to determine if the abstract of said at least one query signal matches any of the stored abstracts wherein a match indicates the query signal is a version of at least one of the reference signals.

2. The system of claim **1**, wherein said second input is remotely coupled to the system.

3. The system of claim **1**, wherein said second processor is remotely coupled to the system.

4. The system of claim **1**, wherein the system transmits the parameters that are being used by the first processor to the second processor.

5. The system of claim **1**, wherein the stored abstracts comprise a self-similar representation of at least one reference signal.

6. The system of claim **1**, wherein at least two of the stored abstracts comprise information corresponding to two versions of at least one reference signal.

7. The system of claim **1**, wherein the stored abstracts comprise data describing a portion of the characteristics of its associated reference signal.

8. The system of claim **7**, wherein the characteristics of the reference signal being described comprise at least one of a perceptible characteristic, a cognitive characteristic, a subjective characteristic, a perceptual quality, a recognizable characteristic or combinations thereof.

9. The system of claim **1**, wherein each stored abstract comprises data unique to each variation of its corresponding reference signal.

10. The system of claim **1**, wherein the system applies a cryptographic protocol to the abstract of said reference signal, said query signal, or both said reference signal and said query signal.

11. The system of claim **10**, wherein the cryptographic protocol is one of at least a hash or digital signature and further comprising storing the hashed abstract and/or digitally signed abstract.

12. The system of claim **1**, further comprising an embedder to embed uniquely identifiable data into at least one of the received reference signal, the received query signal or both the received reference signal and the received query signal.

13. The system of claim **1**, wherein the match indicates that the abstract of the query signal comprises the same perceptual characteristics as the abstract of the matched one of the reference signals.

14. The system of claim **1**, wherein the parameters comprise commonly perceptible features.

15. The system of claim **14**, wherein the commonly perceptible features are selected.

16. The system of claim **1**, wherein said first and said second processors are the same processor.

17. The system of claim **1**, wherein the first processor and the second processor are different processors.

18. A method for monitoring the distribution of data signals, comprising:

creating an abstract for a data signal wherein the data signal abstract comprises signal characteristic parameters configured to differentiate between a plurality of versions of the data signal;

storing the data signal abstract in at least one reference database;

receiving a query signal;

creating an abstract for the query signal based on the parameters;

comparing the created query signal abstract to the at least one database of data signal abstracts, each abstract in the at least one database corresponding to a version of the data signal; and

determining whether the query signal abstract matches any of the stored data signal abstracts in the at least one database to enable authorized transmission or use of the query signal for the query signal abstract based on whether a match was determined.

19. The method of claim **18**, wherein the database is created by at least one of a music company, a movie studio, an image archive, an owner of a general computing device, a user of the data signal, an internet service provider, an information technology company, a body politic, a telecommunications company and combinations thereof.

20. The method of claim **18**, wherein the data signals comprise at least one of images, audio, video, and combinations thereof.

21. The method of claim **18**, wherein the stored data signal abstracts are derived from one of a cognitive feature or a perceptible characteristic of the associated data signals.

22. The method of claim **18**, furthering comprising applying a cryptographic protocol to at least one created signal abstract, at least one database signal abstract or both at least one created signal abstract and at least one database signal abstract.

23. The method of claim **22**, wherein the cryptographic protocol comprises one of a hash or digital signature.

24. The method of claim **18**, wherein the stored signal abstracts comprise data to differentiate versions of the corresponding data signals.

25. The method of claim **18**, wherein each of the stored data signal abstracts comprise information configured to differentiate variations of each referenced corresponding data signal.

26. The method of claim **18**, further comprising storing information associated with the comparison step to enable at least one of a re-calibration of the database, a heuristic-based adjustment of the database, a computational efficiency adjustment of the database, an adjustment for database collisions and/or null cases, changes to the recognition or use parameters governing the database and combinations thereof.

27. The method of claim **18**, further comprising applying one of a relatedness index or measure of similarity to generate uniquely identifiable information to determine authorization.

28. The method of claim **18**, further comprising encoding information into the data signal with a watermarking technique.

29. The process of claim **18**, wherein the data signal is received by one of a creator or owner of said data signal.

30. A system for identifying and distributing signals, comprising:
- a first input that receives a query abstract of a signal to identify;
- a database containing a plurality of signal abstracts, the plurality of signal abstracts each associated with a corresponding signal wherein each of the plurality of the signal abstracts retains a perceptual relationship with the corresponding signal;
- a comparing device that compares the query abstract to the plurality of abstracts stored in the reference database to identify a matching signal abstract; and
- a device for retrieving the signal corresponding to the matching signal abstract; and
- a device for conducting a transaction, the transaction selected from the group consisting of a download and a subscription.

31. The system of claim **30**, wherein each signal abstract comprises a link to its corresponding signal.

32. The system of claim **30**, wherein the comparing device determines if the signal abstracts stored in the database are authorized.

33. The system of claim **30**, wherein the comparing device determines if the link is an authorized link.

34. The system of claim **30**, wherein the reference database is governed by heuristics or experience-based parameters.

35. The system of claim **30**, wherein the plurality of abstracts stored in the reference database are derived from one of data reduced versions of said corresponding signals, compressed variations of said corresponding signals, bit-addressable relationships between said corresponding signals, and a least amount of data required to uniquely identify each corresponding signal, and combinations thereof.

36. The system of claim **30**, wherein the device for conducting transactions or the device for retrieving the signal is remotely coupled to the system.

37. The system of claim **30**, wherein the device for conducting transactions or the device for retrieving the signal is controlled by the database.

38. The system of claim **30**, wherein the device for retrieving the signal and the device for conducting transactions comprise the same device.

39. The system of claim **30**, further comprising an embedder to watermark signals with uniquely identifiable information.

40. A process for analyzing and identifying at least one signal, comprising:

- receiving at least one reference signal to be identified,
- creating an abstract of each reference signal received based on perceptual characteristics representative of parameters to differentiate between versions of the reference signal;
- storing abstracts of each reference signal received in a database;
- receiving at least one query signal to be identified,
- creating an abstract of the received query signal based on the parameters; and
- comparing an abstract of said received query signal to the abstracts stored in the database to determine if the abstract of said received query signal is related to any of the stored abstracts.

41. The process of claim **40**, wherein said database is independently accessible.

42. The process of claim **40**, wherein said received query signal is independently stored.

43. The process of claim **40**, wherein the criteria used to compare a received query signal abstract with a stored reference signal abstract are adjustable.

44. The process of claim **40**, wherein the stored abstracts comprise a self-similar representation of at least one reference signal.

45. The process of claim **40**, wherein at least two of the stored abstracts comprise information corresponding to two versions of at least one reference signal.

46. The process of claim **40**, wherein at least one abstract comprises data describing a portion of the characteristics of its associated reference signal.

47. The process of claim **46**, wherein the characteristics of the reference signal being described comprise at least one of a perceptible characteristic, a cognitive characteristic, a subjective characteristic, a perceptual quality, a recognizable characteristic or combinations thereof.

48. The process of claim **40**, wherein a stored abstract comprises data unique to a variation of its corresponding reference signal.

49. The process of claim **40**, wherein the process further comprises applying a cryptographic protocol to the abstract of said reference signal, said query signal, or both said reference signal and said query signal.

50. The process of claim **49**, wherein the cryptographic protocol is one of at least a hash or digital signature and further comprising storing the hashed abstract and/or digitally signed abstract.

51. The process of claim **40**, further comprising distributing at least one signal based on the comparison step.

52. The process of claim **51**, further comprising watermarking the at least one signal to be distributed.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,660,700 B2
APPLICATION NO. : 12/005229
DATED : February 9, 2010
INVENTOR(S) : Scott Moskowitz

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 1 line 10 reading:
-- This application claims the benefit of pending U.S. patent --

should read:

-- This application is related to pending U.S. patent --

Signed and Sealed this
Thirteenth Day of September, 2011

David J. Kappos

David J. Kappos
Director of the United States Patent and Trademark Office

Patent 7,346,472 B1
(Mar 18, 2008)

US007346472B1

(12) **United States Patent**
Moskowitz et al.

(10) **Patent No.: US 7,346,472 B1**
(45) **Date of Patent: Mar. 18, 2008**

(54) **METHOD AND DEVICE FOR MONITORING AND ANALYZING SIGNALS**

(75) Inventors: **Scott A. Moskowitz**, Miami, FL (US); **Michael W. Berry**, Albuquerque, NM (US)

(73) Assignee: **Blue Spike, Inc.**, Sunny Isles Beach, FL (US)

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See application file for complete search history.

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Primary Examiner—Carol S. W. Tsai

(57) **ABSTRACT**

A method and system for monitoring and analyzing at least one signal are disclosed. An abstract of at least one reference signal is generated and stored in a reference database. An abstract of a query signal to be analyzed is then generated so that the abstract of the query signal can be compared to the abstracts stored in the reference database for a match. The method and system may optionally be used to record information about the query signals, the number of matches recorded, and other useful information about the query signals. Moreover, the method by which abstracts are generated can be programmable based upon selectable criteria. The system can also be programmed with error control software so as to avoid the re-occurrence of a query signal that matches more than one signal stored in the reference database.

14 Claims, No Drawings

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METHOD AND DEVICE FOR MONITORING AND ANALYZING SIGNALS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of pending U.S. patent application Ser. No. 08/999,766, filed Jul. 23, 1997, entitled "Steganographic Method and Device"; pending U.S. patent application Ser. No. 08/772,222, filed Dec. 20, 1996, entitled "Z-Transform Implementation of Digital Watermarks"; pending U.S. patent application Ser. No. 09/456,319, filed Dec. 8, 1999, entitled "Transform Implementation of Digital Watermarks"; pending U.S. patent application Ser. No. 08/674,726, filed Jul. 2, 1996, entitled "Exchange Mechanisms for Digital Information Packages with Bandwidth Securitization, Multichannel Digital Watermarks, and Key Management"; pending U.S. patent application Ser. No. 09/545,589, filed Apr. 7, 2000, entitled "Method and System for Digital Watermarking"; pending U.S. patent application Ser. No. 09/046,627, filed Mar. 24, 1998, entitled "Method for Combining Transfer Function with Predetermined Key Creation"; pending U.S. patent application Ser. No. 09/053, 628, filed Apr. 2, 1998, entitled "Multiple Transform Utilization and Application for Secure Digital Watermarking"; pending U.S. patent application Ser. No. 09/281,279, filed Mar. 30, 1999, entitled "Optimization Methods for the Insertion, Protection, and Detection . . . "; U.S. patent application Ser. No. 09/594,719, filed Jun. 16, 2000, entitled "Utilizing Data Reduction in Steganographic and Cryptographic Systems" (which is a continuation-in-part of PCT application No. PCT/US00/06522, filed Mar. 14, 2000, which PCT application claimed priority to U.S. Provisional Application No. 60/125,990, filed Mar. 24, 1999); now abandoned U.S. Application No. 60/169,274, filed Dec. 7, 1999, entitled "Systems, Methods And Devices For Trusted Transactions"; and PCT Application No. PCT/US00/21189, filed Aug. 4, 2000 (which claims priority to U.S. Patent Application Ser. No. 60/147,134, filed Aug. 4, 1999, and to U.S. Patent Application No. 60/213,489, filed Jun. 23, 2000, both of which are entitled, "A Secure Personal Content Server"). The previously identified patents and/or patent applications are hereby incorporated by reference, in their entireties.

In addition, this application hereby incorporates by reference, as if fully stated herein, the total disclosures of U.S. Pat. No. 5,613,004 "Steganographic Method and Device"; U.S. Pat. No. 5,745,569 "Method for Stega-Cipher Protection of Computer Code"; and U.S. Pat. No. 5,889,868 "Optimization Methods for the Insertion, Protection, and Detection of Digital Watermarks in Digitized Data."

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the monitoring and analysis of digital information. A method and device are described which relate to signal recognition to enhance identification and monitoring activities.

2. Description of the Related Art

Many methods and protocols are known for transmitting data in digital form for multimedia applications (including computer applications delivered over public networks such as the internet or World Wide Web ("WWW"). These methods may include protocols for the compression of data, such that it may more readily and quickly be delivered over limited bandwidth data lines. Among standard protocols for

data compression of digital files may be mentioned the MPEG compression standards for audio and video digital compression, promulgated by the Moving Picture Experts Group. Numerous standard reference works and patents discuss such compression and transmission standards for digitized information.

Digital watermarks help to authenticate the content of digitized multimedia information, and can also discourage piracy. Because piracy is clearly a disincentive to the digital distribution of copyrighted content, establishment of responsibility for copies and derivative copies of such works is invaluable. In considering the various forms of multimedia content, whether "master," stereo, NTSC video, audio tape or compact disc, tolerance of quality will vary with individuals and affect the underlying commercial and aesthetic value of the content. It is desirable to tie copyrights, ownership rights, purchaser information or some combination of these and related data into the content in such a manner that the content must undergo damage, and therefore reduction of its value, with subsequent, unauthorized distribution, commercial or otherwise. Digital watermarks address many of these concerns. A general discussion of digital watermarking as it has been applied in the art may be found in U.S. Pat. No. 5,687,236 (whose specification is incorporated in whole herein by reference).

Further applications of basic digital watermarking functionality have also been developed. Examples of such applications are shown in U.S. Pat. No. 5,889,868 (whose specification is incorporated in whole herein by reference). Such applications have been drawn, for instance, to implementations of digital watermarks that were deemed most suited to particular transmissions, or particular distribution and storage mediums, given the nature of digitally sampled audio, video, and other multimedia works. There have also been developed techniques for adapting watermark application parameters to the individual characteristics of a given digital sample stream, and for implementation of digital watermarks that are feature-based—i.e., a system in which watermark information is not carried in individual samples, but is carried in the relationships between multiple samples, such as in a waveform shape. For instance, natural extensions may be added to digital watermarks that may also separate frequencies (color or audio), channels in 3D while utilizing discreteness in feature-based encoding only known to those with pseudo-random keys (i.e., cryptographic keys) or possibly tools to access such information, which may one day exist on a quantum level.

A matter of general weakness in digital watermark technology relates directly to the manner of implementation of the watermark. Many approaches to digital watermarking leave detection and decode control with the implementing party of the digital watermark, not the creator of the work to be protected. This weakness removes proper economic incentives for improvement of the technology. One specific form of exploitation mostly regards efforts to obscure subsequent watermark detection. Others regard successful over encoding using the same watermarking process at a subsequent time. Yet another way to perform secure digital watermark implementation is through "key-based" approaches.

SUMMARY OF THE INVENTION

A method for monitoring and analyzing at least one signal is disclosed, which method comprises the steps of: receiving at least one reference signal to be monitored; creating an abstract of the at least one reference signal; storing the abstract of the at least one reference signal in a reference database; receiving at least one query signal to be analyzed; creating an abstract of the at least one query signal; and comparing the abstract of the at least one query signal to the abstract of the at least one reference signal to determine if the abstract of the at least one query signal matches the abstract of the at least one reference signal.

A method for monitoring a plurality of reference signals is also disclosed, which method comprises the steps of: creating an abstract for each one of a plurality of reference signals; storing each of the abstracts in a reference database; receiving at least one query signal to be analyzed; creating an abstract of each at least one query signal; locating an abstract in the reference database that matches the abstract of each at least one query signal; and recording the identify of the reference signal whose abstract matched the abstract of each at least one query signal.

A computerized system for monitoring and analyzing at least one signal is also disclosed, which system comprises: a processor for creating an abstract of a signal using selectable criteria; a first input for receiving at least one reference signal to be monitored, the first input being coupled to the processor such that the processor may generate an abstract for each reference signal input to the processor; a reference database, coupled to the processor, for storing abstracts of each at least one reference signal; a second input for receiving at least one query signal to be analyzed, the second input being coupled to the processor such that the processor may generate an abstract for each query signal; and a comparing device, coupled to the reference database and to the second input, for comparing an abstract of the at least one query signal to the abstracts stored in the reference database to determine if the abstract of the at least one query signal matches any of the stored abstracts.

Further, an electronic system for monitoring and analyzing at least one signal is disclosed, which system comprises: a first input for receiving at least one reference signal to be monitored, a first processor for creating an abstract of each reference signal input to the first processor through the first input; a second input for receiving at least one query signal to be analyzed, a second processor for creating an abstract of each query signal; a reference database for storing abstracts of each at least one reference signal; and a comparing device for comparing an abstract of the at least one query signal to the abstracts stored in the reference database to determine if the abstract of the at least one query signal matches any of the stored abstracts.

DETAILED DESCRIPTION OF THE INVENTION

While there are many approaches to data reduction that can be utilized, a primary concern is the ability to reduce the digital signal in such a manner as to retain a "perceptual relationship" between the original signal and its data reduced version. This relationship may either be mathematically discernible or a result of market-dictated needs. The purpose is to afford a more consistent means for classifying signals than proprietary, related text-based approaches. A simple analogy is the way in which a forensic investigator uses a sketch artist to assist in determining the identity of a human.

In one embodiment of the invention, the abstract of a signal may be generated by the following steps: 1) analyze the characteristics of each signal in a group of audible/perceptible variations for the same signal (e.g., analyze each of five versions of the same song—which versions may have the same lyrics and music but which are sung by different artists); and 2) select those characteristics which achieve remain relatively constant (or in other words, which have minimum variation) for each of the signals in the group. Optionally, the null case may be defined using those characteristics which are common to each member of the group of versions.

Lossless and lossy compression schemes are appropriate candidates for data reduction technologies, as are those subset of approaches that are based on perceptual models, such as AAC, MP3, TwinVQ, JPEG, GIF, MPEG, etc. Where spectral transforms fail to assist in greater data reduction of the signal, other signal characteristics can be identified as candidates for further data reduction. Linear predictive coding (LPC), z-transform analysis, root mean square (rms), signal to peak, may be appropriate tools to measure signal characteristics, but other approaches or combinations of signal characteristic analysis are contemplated. While such signal characteristics may assist in determining particular applications of the present invention, a generalized approach to signal recognition is necessary to optimize the deployment and use of the present invention.

Increasingly, valuable information is being created and stored in digital form. For example, music, photographs and motion pictures can all be stored and transmitted as a series of binary digits—1's and 0's. Digital techniques permit the original information to be duplicated repeatedly with perfect or near perfect accuracy, and each copy is perceived by viewers or listeners as indistinguishable from the original signal. Unfortunately, digital techniques also permit the information to be easily copied without the owner's permission. While digital representations of analog waveforms may be analyzed by perceptually-based or perceptually-limited analysis it is usually costly and time-consuming to model the processes of the highly effective ability of humans to identify and recognize a signal. In those applications where analog signals require analysis, the cost of digitizing the analog signal is minimal when compared to the benefits of increased accuracy and speed of signal analysis and monitoring when the processes contemplated by this invention are utilized.

The present invention relates to identification of digitally-sampled information, such as images, audio and video. Traditional methods of identification and monitoring of those signals do not rely on "perceptual quality," but rather upon a separate and additional signal. Within this application, such signals will be called "additive signals" as they provide information about the original images, audio or video, but such information is in addition to the original signal. One traditional, text-based additive signal is title and author information. The title and author, for example, is information about a book, but it is in addition to the text of the book. If a book is being duplicated digitally, the title and author could provide one means of monitoring the number of times the text is being duplicated, for example, through an Internet download. The present invention, however, is directed to the identification of a digital signal—whether text, audio, or video—using only the digital signal itself and then monitoring the number of times the signal is duplicated. Reliance on an additive signal has many shortcomings. For example, first, someone must incorporate the additive signal within the digital data being transmitted, for example, by concatenation or through an embedding process. Such an additive signal, however, can be easily identified and removed by one who wants to utilize the original signal without paying for its usage. If the original signal itself is used to identify the content, an unauthorized user could not avoid payment of a royalty simply by removing the additive signal—because there is no additive signal to remove. Hence, the present invention avoids a major disadvantage of the prior art.

One such additive signal that may be utilized is a digital watermark—which ideally cannot be removed without perceptually altering the original signal. A watermark may also be used as a monitoring signal (for example, by encoding an identifier that uniquely identifies the original digital signal into which the identifier is being embedded). A digital watermark used for monitoring is also an additive signal, and such a signal may make it difficult for the user who wants to duplicate a signal without paying a royalty—mainly by degrading the perceptual quality of the original signal if the watermark (and hence the additive monitoring signal) is removed. This is, however, is a different solution to the problem.

The present invention eliminates the need of any additive monitoring signal because the present invention utilizes the underlying content signal as the identifier itself. Nevertheless, the watermark may increase the value of monitoring techniques by increasing the integrity of the embedded data and by indicating tampering of either the original content signal or the monitoring signal. Moreover, the design of a watermarking embedding algorithm is closely related to the perceptibility of noise in any given signal and can represent an ideal subset of the original signal: the watermark bits are an inverse of the signal to the extent that lossy compression schemes, which can be used, for instance, to optimize a watermarking embedding scheme, can yield information about the extent to which a data signal can be compressed while holding steadfast to the design requirement that the compressed signal maintain its perceptual relationship with the original, uncompressed signal. By describing those bits that are candidates for imperceptible embedding of watermark bits, further data reduction may be applied on the candidate watermarks as an example of retaining a logical and perceptible relationship with the original uncompressed signal.

Of course, the present invention may be used in conjunction with watermarking technology (including the use of keys to accomplish secure digital watermarking), but watermarking is not necessary to practice the present invention. Keys for watermarking may have many forms, including: descriptions of the original carrier file formatting, mapping of embedded data (actually imperceptible changes made to the carrier signal and referenced to the predetermined key or key pairs), assisting in establishing the watermark message data integrity (by incorporation of special one way functions in the watermark message data or key), etc. Discussions of these systems in the patents and pending patent applications are incorporated by reference above. The “recognition” of a particular signal or an instance of its transmission, and its monitoring are operations that may be optimized through the use of digital watermark analysis.

A practical difference between the two approaches of using a separate, additive monitoring signal and using the original signal itself as the monitoring signal is control. If a separate signal is used for monitoring, then the originator of the text, audio or video signal being transmitted and the entity doing the monitoring have to agree as to the nature of the separate signal to be used for monitoring—otherwise, the entity doing the monitoring would not know where to look, for what to look, or how to interpret the monitoring signal once it was identified and detected. On the other hand, if the original signal is used itself as a monitoring signal, then no such agreement is necessary. Moreover, a more logical and self-sufficient relationship between the original and its data-reduced abstract enhances the transparency of any resulting monitoring efforts. The entity doing the monitoring is not looking for a separate, additive monitoring system, and further, need not have to interpret the content of the monitoring signal.

Monitoring implementations can be handled by robust watermark techniques (those techniques that are able to survive many signal manipulations but are not inherently “secure” for verification of a carrier signal absent a logically-related watermarking key) and forensic watermark techniques (which enable embedding of watermarks that are not able to survive perceptible alteration of the carrier signal and thus enable detection of tampering with the originally watermarked carrier signal). The techniques have obvious trade-offs between speed, performance and security of the embedded watermark data.

In other disclosures, we suggest improvements and implementations that relate to digital watermarks in particular and embedded signaling in general. A digital watermark may be used to “tag” content in a manner that is not humanly-perceptible, in order to ensure that the human perception of the signal quality is maintained. Watermarking, however, must inherently alter at least one data bit of the original signal to represent a minimal change from the original signal’s “unwatermarked state.” The changes may affect only a bit, at the very least, or be dependent on information hiding relating to signal characteristics, such as phase information, differences between digitized samples, root mean square (RMS) calculations, z-transform analysis, or similar signal characteristic category.

There are weaknesses in using digital watermark technology for monitoring purposes. One weakness relates directly to the way in which watermarks are implemented. Often, the persons responsible for encoding and decoding the digital watermark are not the creator of the valuable work to be protected. As such, the creator has no input on the placement of the monitoring signal within the valuable work being protected. Hence, if a user wishing to avoid payment of the royalty can find a way to decode or remove the watermark, or at least the monitoring signal embedded in the watermark, then the unauthorized user may successfully duplicate the signal with impunity. This could occur, for example, if either of the persons responsible for encoding or decoding were to have their security compromised such that the encoding or decoding algorithms were discovered by the unauthorized user.

With the present invention, no such disadvantages exist because the creator need not rely on anyone to insert a monitoring signal—as no such signal is necessary. Instead, the creator’s work itself is used as the monitoring signal. Accordingly, the value in the signal will have a strong relationship with its recognizability.

By way of improving methods for efficient monitoring as well as effective confirmation of the identity of a digitally-sampled signal, the present invention describes useful methods for using digital signal processing for benchmarking a novel basis for differencing signals with binary data comparisons. These techniques may be complemented with perceptual techniques, but are intended to leverage the generally decreasing cost of bandwidth and signal processing power in an age of increasing availability and exchange of digitized binary data.

So long as there exist computationally inexpensive ways of identifying an entire signal with some fractional representation or relationship with the original signal, or its perceptually observable representation, we envision methods for faster and more accurate auditing of signals as they are played, distributed or otherwise shared amongst providers (transmitters) and consumers (receivers). The ability to massively compress a signal to its essence—which is not strictly equivalent to "lossy" or "lossless" compression schemes or perceptual coding techniques, but designed to preserve some underlying "aesthetic quality" of the signal—represents a useful means for signal analysis in a wide variety of applications. The signal analysis, however, must maintain the ability to distinguish the perceptual quality of the signals being compared. For example, a method which analyzed a portion of a song by compressing it to a single line of lyrics fails to maintain the ability to distinguish the perceptual quality of the songs being compared. Specifically, for example, if the song "New York State of Mind" were compressed to the lyrics "I'm in a New York State of Mind," such a compression fails to maintain the ability to distinguish between the various recorded versions of the song, say, for example between Billy Joel's recording and Barbara Streisand's recording. Such a method is, therefore, incapable of providing accurate monitoring of the artist's recordings because it could not determine which of the two artists is deserving of a royalty—unless of course, there is a separate monitoring signal to provide the name of the artist or other information sufficient to distinguish the two versions. The present invention, however, aims to maintain some level of perceptual quality of the signals being compared and would deem such a compression to be excessive.

This analogy can be made clearer if it is understood that there are a large number of approaches to compressing a signal to, say, $1/10{,}000^{th}$ of its original size, not for maintaining its signal quality to ensure computational ease for commercial quality distribution, but to assist in identification, analysis or monitoring of the signal. Most compression is either lossy or lossless and is designed with psychoacoustic or psychovisual parameters. That is to say, the signal is compressed to retain what is "humanly-perceptible." As long as the compression successfully mimics human perception, data space may be saved when the compressed file is compared to the uncompressed or original file. While psychoacoustic and psychovisual compression has some relevance to the present invention, additional data reduction or massive compression is anticipated by the present invention. It is anticipated that the original signal may be compressed to create a realistic or self-similar representation of the original signal, so that the compressed signal can be referenced at a subsequent time as unique binary data that has computational relevance to the original signal. Depending on the application, general data reduction of the original signal can be as simple as massive compression or may relate to the watermark encoding envelope parameter (those bits which a watermarking encoding algorithm deem as candidate bits for mapping independent data or those bits deemed imperceptible to human senses but detectable to a watermark detection algorithm). In this manner, certain media which are commonly known by signal characteristics, a painting, a song, a TV commercial, a dialect, etc., may be analyzed more accurately, and perhaps, more efficiently than a text-based descriptor of the signal. So long as the sender and receiver agree that the data representation is accurate, even insofar as the data-reduction technique has logical relationships with the perceptibility of the original signal, as they must with commonly agreed to text descriptors, no independent cataloging is necessary.

The present invention generally contemplates a signal recognition system that has at least five elements. The actual number of elements may vary depending on the number of

domains in which a signal resides (for example, audio is at least one domain while visual carriers are at least two dimensional). The present invention contemplates that the number of elements will be sufficient to effectively and efficiently meet the demands of various classes of signal recognition. The design of the signal recognition that may be used with data reduction is better understood in the context of the general requirements of a pattern or signal recognition system.

The first element is the reference database, which contains information about a plurality of potential signals that will be monitored. In one form, the reference database would contain digital copies of original works of art as they are recorded by the various artists, for example, contain digital copies of all songs that will be played by a particular radio station. In another form, the reference database would contain not perfect digital copies of original works of art, but digital copies of abstracted works of art, for example, contain digital copies of all songs that have been preprocessed such that the copies represent the perceptual characteristics of the original songs. In another form, the reference database would contain digital copies of processed data files, which files represent works of art that have been preprocessed in such a fashion as to identify those perceptual differences that can differentiate one version of a work of art from another version of the same work of art, such as two or more versions of the same song, but by different artists. These examples have obvious application to visually communicated works such as images, trademarks or photographs, and video as well.

The second element is the object locator, which is able to segment a portion of a signal being monitored for analysis (i.e., the "monitored signal"). The segmented portion is also referred to as an "object." As such, the signal being monitored may be thought of comprising a set of objects. A song recording, for example, can be thought of as having a multitude of objects. The objects need not be of uniform length, size, or content, but merely be a sample of the signal being monitored. Visually communicated informational signals have related objects; color and size are examples.

The third element is the feature selector, which is able to analyze a selected object and identify perceptual features of the object that can be used to uniquely describe the selected object. Ideally, the feature selector can identify all, or nearly all, of the perceptual qualities of the object that differentiate it from a similarly selected object of other signals. Simply, a feature selector has a direct relationship with the perceptibility of features commonly observed. Counterfeiting is an activity which specifically seeks out features to misrepresent the authenticity of any given object. Highly granular, and arguably successful, counterfeiting is typically sought for objects that are easily recognizable and valuable, for example, currency, stamps, and trademarked or copyrighted works and objects that have value to a body politic.

The fourth element is the comparing device which is able to compare the selected object using the features selected by the feature selector to the plurality of signals in the reference database to identify which of the signals matches the monitored signal. Depending upon how the information of the plurality of signals is stored in the reference database and depending upon the available computational capacity (e.g., speed and efficiency), the exact nature of the comparison will vary. For example, the comparing device may compare the selected object directly to the signal information stored in the database. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector and then compare the selected object to the processed signal information. Alternatively, the comparing device may need to process the selected object using input from the feature selector and then compare the processed selected object to the signal information. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector, process the selected object using input from the feature selector, and then compare the processed selected object to the processed signal information.

The fifth element is the recorder which records information about the number of times a given signal is analyzed and detected. The recorder may comprise a database which keeps track of the number of times a song, image, or a movie has been played, or may generate a serial output which can be subsequently processed to determine the total number of times various signals have been detected.

Other elements may be added to the system or incorporated into the five elements identified above. For example, an error handler may be incorporated into the comparing device. If the comparing device identifies multiple signals which appear to contain the object being sought for analysis or monitoring, the error handler may offer further processing in order to identify additional qualities or features in the selected object such that only one of the set of captured signals is found to contain the further analyzed selected object that actually conforms with the object thought to have been transmitted or distributed.

Moreover, one or more of the five identified elements may be implemented with software that runs on the same processor, or which uses multiple processors. In addition, the elements may incorporate dynamic approaches that utilize stochastic, heuristic, or experience-based adjustments to refine the signal analysis being conducted within the system, including, for example, the signal analyses being performed within the feature selector and the comparing device. This additional analyses may be viewed as filters that are designed to meet the expectations of accuracy or speed for any intended application.

Since maintenance of original signal quality is not required by the present invention, increased efficiencies in processing and identification of signals can be achieved. The present invention concerns itself with perceptible relationships only to the extent that efficiencies can be achieved both in accuracy and speed with enabling logical relationships between an original signal and its abstract.

The challenge is to maximize the ability to sufficiently compress a signal to both retain its relationship with the original signal while reducing the data overhead to enable more efficient analysis, archiving and monitoring of these signals. In some cases, data reduction alone will not suffice: the sender and receiver must agree to the accuracy of the recognition. In other cases, agreement will actually depend on a third party who authored or created the signal in question. A digitized signal may have parameters to assist in establishing more accurate identification, for example, a "signal abstract" which naturally, or by agreement with the creator, the copyright owner or other interested parties, can be used to describe the original signal. By utilizing less than the original signal, a computationally inexpensive means of identification can be used. As long as a realistic set of conditions can be arrived at governing the relationship between a signal and its data reduced abstract, increases in effective monitoring and transparency of information data flow across communications channels is likely to result. This feature is significant in that it represents an improvement over how a digitally-sampled signal can be cataloged and identified, though the use of a means that is specifically selected based upon the strengths of a general computing device and the economic needs of a particular market for the digitized information data being monitored. The additional benefit is a more open means to uniformly catalog, analyze, and monitor signals. As well, such benefits can exist for third parties, who have a significant interest in the signal but are not the sender or receiver of said information.

As a general improvement over the art, the present invention incorporates what could best be described as "computer-acoustic" and "computer-visual" modeling, where the signal abstracts are created using data reduction techniques to determine the smallest amount of data, at least a single bit, which can represent and differentiate two digitized signal representations for a given predefined signal set. Each of such representations must have at least a one bit difference with all other members of the database to differentiate each such representation from the others in the database. The predefined signal set is the object being analyzed. The signal identifier/detector should receive its parameters from a database engine. The engine will identify those characteristics (for example, the differences) that can be used to distinguish one digital signal from all other digital signals that are stored in its collection. For those digital signals or objects which are seemingly identical, excepting that the signal may have different performance or utilization in the newly created object, benefits over additive or text-based identifiers are achieved. Additionally, decisions regarding the success or failure of an accurate detection of any given object may be flexibly implemented or changed to reflect market-based demands of the engine. Appropriate examples are songs or works or art which have been sampled or re-produced by others who are not the original creator.

In some cases, the engine will also consider the NULL case for a generalized item not in its database, or perhaps in situations where data objects may have collisions. For some applications, the NULL case is not necessary, thus making the whole system faster. For instance, databases which have fewer repetitions of objects or those systems which are intended to recognize signals with time constraints or capture all data objects. Greater efficiency in processing a relational database can be obtained because the rules for comparison are selected for the maximum efficiency of the processing hardware and/or software, whether or not the processing is based on psychoacoustic or psychovisual models. The benefits of massive data reduction, flexibility in constructing appropriate signal recognition protocols and incorporation of cryptographic techniques to further add accuracy and confidence in the system are clearly improvements over the art. For example, where the data reduced abstract needs to have further uniqueness, a hash or signature may be required. And for objects which have further uniqueness requirements, two identical instances of the object could be made unique with cryptographic techniques.

Accuracy in processing and identification may be increased by using one or more of the following fidelity evaluation functions:

1) RMS (root mean square). For example, a RMS function may be used to assist in determining the distance between data based on mathematically determinable Euclidean distance between the beginning and end data points (bits) of a particular signal carrier.
2) Frequency weighted RMS. For example, different weights may be applied to different frequency components of the carrier signal before using RMS. This selective weighting can assist in further distinguishing the distance between beginning and end points of the

signal carrier (at a given point in time, described as bandwidth, or the number of total bits that can be transmitted per second) and may be considered to be the mathematical equivalent of passing a carrier signal difference through a data filter and figuring the average power in the output carrier.

3) Absolute error criteria, including particularly the NULL set (described above) The NULL may be utilized in two significant cases: First, in instances where the recognized signal appears to be an identified object which is inaccurately attributed or identified to an object not handled by the database of objects; and second, where a collision of data occurs. For instance, if an artist releases a second performance of a previously recorded song, and the two performances are so similar that their differences are almost imperceptible, then the previously selected criteria may not be able to differentiate the two recordings. Hence, the database must be "recalibrated" to be able to differentiate these two versions. Similarly, if the system identifies not one, but two or more, matches for a particular search, then the database may need "recalibration" to further differentiate the two objects stored in the database.

4) Cognitive Identification. For example, the present invention may use an experience-based analysis within a recognition engine. Once such analysis may involve mathematically determining a spectral transform or its equivalent of the carrier signal. A spectral transform enables signal processing and should maintain, for certain applications, some cognitive or perceptual relationship with the original analog waveform. As a novel feature to the present invention, additional classes may be subject to humanly-perceptible observation. For instance, an experience-based criteria which relates particularly to the envisioned or perceived accuracy of the data information object as it is used or applied in a particular market, product, or implementation. This may include a short 3 second segment of a commercially available and recognizable song which is used for commercials to enable recognition of the good or service being marketed. The complete song is marketed as a separately valued object from the use of a discrete segment of the song (that may be used for promotion or marketing—for the complete song or for an entirely different good or service). To the extent that an owner of the song in question is able to further enable value through the licensing or agreement for use of a segment of the original signal, cognitive identification is a form of filtering to enable differentiations between different and intended uses of the same or subset of the same signal (object). The implementation relating specifically, as disclosed herein, to the predetermined identification or recognition means and/or any specified relationship with subsequent use of the identification means can be used to create a history as to how often a particular signal is misidentified, which history can then be used to optimize identification of that signal in the future. The difference between use of an excerpt of the song to promote a separate and distinct good or service and use of the excerpt to promote recognition of the song itself (for example, by the artist to sell copies of the song) relates informationally to a decision based on recognized and approved use of the song. Both the song and applications of the song in its entirety or as a subset are typically based on agreement by the creator and the sender who seeks to utilize the work. Trust in the means for identification, which can be weighted in the present invention (for example, by adjusting bit-addressable information), is an important factor in adjusting the monitoring or recognition features of the object or carrier signal, and by using any misidentification information, (including any experience-based or heuristic information), additional features of the monitored signal can be used to improve the performance of the monitoring system envisioned herein. The issue of central concern with cognitive identification is a greater understanding of the parameters by which any given object is to be analyzed. To the extent that a creator chooses varying and separate application of his object, those applications having a cognitive difference in a signal recognition sense (e.g., the whole or an excerpt), the system contemplated herein includes rules for governing the application of bit-addressable information to increase the accuracy of the database.

5) Finally, the predetermined parameters that are associated with a discrete case for any given object will have a significant impact upon the ability to accurately process and identify the signals. For example, if a song is transmitted over a FM carrier, then one skilled in the art will appreciate that the FM signal has a predetermined bandwidth which is different from the bandwidth of the original recording, and different even from song when played on an AM carrier, and different yet from a song played using an 8-bit Internet broadcast. Recognition of these differences, however, will permit the selection of an identification means which can be optimized for monitoring a FM broadcasted signal. In other words, the discreteness intended by the sender is limited and directed by the fidelity of the transmission means. Objects may be cataloged and assessing with the understanding that all monitoring will occur using a specific transmission fidelity. For example, a database may be optimized with the understanding that only AM broadcast signals will be monitored. For maximum efficiency, different data bases may be created for different transmission channels, e.g., AM broadcasts, FM broadcasts, Internet broadcasts, etc.

For more information on increasing efficiencies for information systems, see *The Mathematical Theory of Communication* (1948), by Shannon.

Because bandwidth (which in the digital domain is equated to the total number of bits that can be transmitted in a fixed period of time) is a limited resource which places limitations upon transmission capacity and information coding schemes, the importance of monitoring for information objects transmitted over any given channel must take into consideration the nature and utilization of a given channel. The supply and demand of bandwidth will have a dramatic impact on the transmission, and ultimately, upon the decision to monitor and recognize signals. A discussion of this is found in a co-pending application by the inventor under U.S. patent application Ser. No. 08/674,726 "Exchange Mechanisms for Digital Information Packages with Bandwidth Securitization, Multichannel Digital Watermarks, and Key Management" (which application is incorporated herein by reference as if fully setforth herein).

If a filter is to be used in connection with the recognition or monitoring engine, it may be desirable for the filter to anticipate and take into consideration the following factors, which affect the economics of the transmission as they relate to triggers for payment and/or relate to events requiring audits of the objects which are being transmitted: 1) time of transmission (i.e., the point in time when the transmission occurred), including whether the transmission is of a live performance); 2) location of transmission (e.g., what channel was used for transmission, which usually determines the associated cost for usage of the transmission channel); 3) the point of origination of the transmission (which may be the same for a signal carrier over many distinct channels); and 4) pre-existence of the information carrier signal (prerecorded or newly created information carrier signal, which may require differentiation in certain markets or instances).

In the case of predetermined carrier signals (those which have been recorded and stored for subsequent use), "positional information carrier signals" are contemplated by this invention, namely, perceptual differences between the seemingly "same" information carrier that can be recognized as consumers of information seek different versions or quality levels of the same carrier signal. Perceptual differences exist between a song and its reproduction from a CD, an AM radio, and an Internet broadcast. To the extent that the creator or consumer of the signal can define a difference in any of the four criteria above, means can be derived (and programmed for selectability) to recognize and distinguish these differences. It is, however, quite possible that the ability to monitor carrier signal transmission with these factors will increase the variety and richness of available carrier signals to existing communications channels. The differentiation between an absolute case for transmission of an object, which is a time dependent event, for instance a live or real time broadcast, versus the relative case, which is prerecorded or stored for transmission at a later point in time, creates recognizable differences for signal monitoring.

The monitoring and analysis contemplated by this invention may have a variety of purposes, including, for example, the following: to determine the number of times a song is broadcast on a particular radio broadcast or Internet site; to control security though a voice-activated security system; and to identify associations between a beginner's drawing and those of great artists (for example to draw comparisons between technique, compositions, or color schemes). None of these examples could be achieved with any significant degree of accuracy using a text-based analysis. Additionally, strictly text-based systems fail to fully capture the inherent value of the data recognition or monitoring information itself.

SAMPLE EMBODIMENTS

In order to better appreciate and understand the present invention, the following sample embodiments are provided. These sample embodiments are provided for exemplary purposes only, and in no way limit the present invention.

Sample Embodiment 1

A database of audio signals (e.g., songs) is stored or maintained by a radio station or Internet streaming company, who may select a subset of the songs are stored so that the subset may be later broadcast to listeners. The subset, for example, may comprise a sufficient number of songs to fill 24 hours of music programming (between 300 or 500 songs). Traditionally, monitoring is accomplished by embedding some identifier into the signal, or affixing the identifier to the signal, for later analysis and determination of royalty payments. Most of the traditional analysis is performed by actual persons who use play lists and other statistical approximations of audio play, including for example, data obtained through the manual (i.e., by persons) monitoring of a statistically significant sample of stations and transmission times so that an extrapolation may be made to a larger number of comparable markets.

The present invention creates a second database from the first database, wherein each of the stored audio signals in the first database is data reduced in a manner that is not likely to reflect the human perceptual quality of the signal, meaning that a significantly data-reduced signal is not likely to be played back and recognized as the original signal. As a result of the data reduction, the size of the second database (as measured in digital terms) is much smaller than the size of the first database, and is determined by the rate of compression. If, for example, if 24 hours worth of audio signals are compressed at a 10,000:1 compression rate, the reduced data could occupy a little more than 1 megabyte of data. With such a large compression rate, the data to be compared and/or analyzed may become computationally small such that computational speed and efficiency are significantly improved.

With greater compression rates, it is anticipated that similarity may exist between the data compressed abstractions of different analog signals (e.g., recordings by two different artists of the same song). The present invention contemplates the use of bit-addressable differences to distinguish between such cases. In applications where the data to be analyzed has higher value in some predetermined sense, cryptographic protocols, such as a hash or digital signature, can be used to distinguish such close cases.

In a preferred embodiment, the present invention may utilize a centralized database where copies of new recordings may be deposited to ensure that copyright owners, who authorize transmission or use of their recordings by others, can independently verify that the object is correctly monitored. The rules for the creator himself to enter his work would differ from a universally recognized number assigned by an independent authority (say, ISRC, ISBN for recordings and books respectively). Those skilled in the art of algorithmic information theory (AIT) can recognize that it is now possible to describe optimized use of binary data for content and functionality. The differences between objects must relate to decisions made by the user of the data, introducing subjective or cognitive decisions to the design of the contemplated invention as described above. To the extent that objects can have an optimized data size when compared with other objects for any given set of objects, the algorithms for data reduction would have predetermined flexibility directly related to computational efficiency and the set of objects to be monitored. The flexibility in having transparent determination of unique signal abstracts, as opposed to independent third party assignment, is likely to increase confidence in the monitoring effort by the owners of the original signals themselves. The prior art allows for no such transparency to the copyright creators.

Sample Embodiment 2

Another embodiment of the invention relates to visual images, which of course, involve at least two dimensions.

Similar to the goals of a psychoacoustic model, a psychovisual model attempts to represent a visual image with less data, and yet preserve those perceptual qualities that permit a human to recognize the original visual image. Using the very same techniques described above in connection with an audio signal, signal monitoring of visual images may be implemented.

One such application for monitoring and analyzing visual images involves a desire to find works of other artists that relate to a particular theme. For example, finding paintings of sunsets or sunrises. A traditional approach might involve a textual search involving a database wherein the works of other artists have been described in writing. The present invention, however, involves the scanning of an image involving a sun, compressing the data to its essential characteristics (i.e., those perceptual characteristics related to the sun) and then finding matches in a database of other visual images (stored as compressed or even uncompressed data). By studying the work of other artists using such techniques, a novice, for example, could learn much by comparing the presentations of a common theme by different artists.

Another useful application involving this type of monitoring and analyzing is the identification of photographs of potential suspects whose identity matches the sketch of a police artist.

Note that combinations of the monitoring techniques discussed above can be used for audio-visual monitoring, such as video-transmission by a television station or cable station. The techniques would have to compensate, for example, for a cable station that is broadcasting a audio channel unaccompanied by video.

Other embodiments and uses of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. The specification and examples should be considered exemplary only with the true scope and spirit of the invention indicated by the following claims. As will be easily understood by those of ordinary skill in the art, variations and modifications of each of the disclosed embodiments can be easily made within the scope of this invention as defined by the following claims.

What is claimed is:

1. A method for monitoring and analyzing at least one signal comprising:

receiving at least one reference signal to be monitored;

creating an abstract of said at least one reference signal wherein the step of creating an abstract of said at least one reference signal comprises:

inputting the reference signal to a processor;

creating an abstract of the reference signal using perceptual qualities of the reference signal such that the abstract retains a perceptual relationship to the reference signal from which it is derived;

storing the abstract of said at least one reference signal in a reference database;

receiving at least one query signal to be analyzed;

creating an abstract of said at least one query signal wherein the step of creating an abstract of said at least one query signal comprises:

inputting the at least one query signal to the processor;

creating an abstract of the at least one query signal using perceptual qualities of the at least one query signal such that the abstract retains a perceptual relationship to the at least one query signal from which it is derived; and

comparing the abstract of said at least one query signal to the abstract of said at least one reference signal to determine if the abstract of said at least one query signal matches the abstract of said at feast one reference signal.

2. The method of claim **1**, wherein the step of creating an abstract of said at least one reference signal comprises:

using a portion of said at least one reference signal to create an abstract of said at least one reference signal; and

the step of creating an abstract of said at least one query signal comprises:

using a portion of said at least one query signal to create an abstract of said at least one query signal.

3. A method for monitoring and analyzing at least one signal comprising:

receiving at least one reference signal to be monitored;

creating an abstract of said at least one reference signal;

storing the abstract of said at least one reference signal in a reference database;

receiving at least one query signal to be analyzed;

creating an abstract of said at least one query signal;

comparing the abstract of said at least one query signal to the abstract of said at least one reference signal to determine if the abstract of said at least one query signal matches the abstract of said at least one reference signal;

creating at least one counter corresponding to one of said at least one reference signals, said at least one counter being representative of the number of times a match is found between the abstract of said at least one query signal and the abstract of said at least one reference signal; and

incrementing the counter corresponding to a particular reference signal when a match is found between an abstract of said at least one query signal and the abstract of the particular reference signal.

4. The method of claim **3** further comprising:

recording an occurrence of a match between the abstract of said at least one query signal and the abstract of said at least one reference signal; and

generating a report that identifies the reference signal whose abstract matched the abstract of said at least one query signal.

5. The method of claim **4**, further comprising:

recording an occurrence of a match between the abstract of said at least one query signal and the abstract of said at least one reference signal.

6. A method for monitoring a plurality of reference signals, comprising:

creating an abstract for each of the plurality of reference signals wherein the step of creating an abstract for each of a plurality of reference signals comprises:

inputting each of the plurality of reference signals to a processor;

creating an abstract of each one of the plurality of reference signals using perceptual qualities of each one of a plurality of reference signals such that the abstract retains a perceptual relationship to the reference signal from which it is derived;

storing each of said abstracts in a reference database;

receiving at least one query signal to be analyzed;

creating an abstract of each of the at least one query signals wherein the step of creating an abstract of each of the at least one query signals comprises:

inputting each of the at least one query signals to a processor;

creating an abstract of each one of a plurality of reference signals using perceptual qualities of each one of a plurality of reference signals such that the abstract retains a perceptual relationship to the reference signal from which it is derived;

locating an abstract in the reference database that matches the abstract of each at least one query signal; and

recording the identify of the reference signal whose abstract matched the abstract of each at least one query signal.

7. The method of claim 6, wherein

the step of creating an abstract of said at least one reference signal comprises:

using a portion of said at least one reference signal to create an abstract of said at least one reference signal;

and the step of creating an abstract of said at least one query signal comprises:

using a portion of said at least one query signal to create an abstract of said at least one query signal.

8. A method for monitoring a plurality of reference signals, comprising:

creating an abstract for each of the plurality of reference signals;

storing each of said abstracts in a reference database;

receiving at least one query signal to be analyzed;

creating an abstract of each of the at least one query signals;

locating an abstract in the reference database that matches the abstract of each at least one query signal;

recording the identify of the reference signal whose abstract matched the abstract of each at least one query signal;

creating at least one counter corresponding to one of said plurality of reference signals, said at least one counter being representative of the number of times a match is found between the abstract of said at least one query signal and an abstract of one of said plurality of reference signals; and

incrementing the counter corresponding to a particular reference signal when a match is found between an abstract of said at least one query signal and the abstract of the particular reference signal.

9. A computerized system for monitoring and analyzing at least one signal:

a processor that creates an abstract of a signal using selectable criteria;

a first input that receives at least one reference signal to be monitored, said first input being coupled to said processor such that said processor may generate an abstract for each reference signal input to said processor;

a reference database, coupled to said processor, that stores abstracts of each at least one reference signal;

a second input that receives at least one query signal to be analyzed, said second input being coupled to said processor such that said processor may generate an abstract for each query signal;

a comparing device, coupled to said reference database and to said second input, that compares an abstract of said at least one query signal to the abstracts stored in the reference database to determine if the abstract of said at least one query signal matches any of the stored abstracts;

a storage medium coupled to said first input, that stores each of said at least one reference signals to be monitored; and

a controller coupled to the first input, the processor, the comparing device, the reference database and the storage medium, said controller causing an abstract for each reference signal being input for the first time to be compared to all previously stored abstracts in the reference database, such that in the event that the comparing device determines that it cannot distinguish between the abstract of a reference signal being input for the first time from a previously stored abstract in the reference database, the controller adjusts the criteria being used by the processor and re-generates the reference database, by re-processing each reference signal stored on the storage medium to create new abstracts and storing said new abstracts in the reference database.

10. The system of claim 9, wherein the controller includes a means to adjust compression rates at which the processor processes a signal to create an abstract.

11. A computerized system for monitoring and analyzing at least one signal:

a processor that creates an abstract of a signal using selectable criteria;

a first input that receives at least one reference signal to be monitored, said first input being coupled to said processor such that said processor may generate an abstract for each reference signal input to said processor;

a reference database, coupled to said processor, that stores abstracts of each at least one reference signal;

a second input that receives at least one query signal to be analyzed, said second input being coupled to said processor such that said processor may generate an abstract for each query signal;

a comparing device, coupled to said reference database and to said second input, that compares an abstract of said at least one query signal to the abstracts stored in the reference database to determine if the abstract of said at least one query signal matches any of the stored abstracts, wherein the comparing device identifies at least two abstracts in the reference database that match the abstract of said at least one query signal and an index of relatedness to said at least one query signal for each of said at least two matching abstracts.

12. The system of claim 11, further comprising:

a security controller that controls access to a secured area, such that access is granted only if the comparing device confirms that an abstract of said at least one query signal matches an abstract of said at least one reference signal.

13. The system of claim 11, further comprising:

a recorder that records the identify of the reference signal whose abstract matched the abstract of said at least one query signal; and

a report generator that generates a report that identifies the reference signals whose abstracts matched the abstract of said at least one query signal.

14. A electronic system for monitoring and analyzing at least one signal, comprising:

a first input that receives at least one reference signal to be monitored,

a first processor that creates an abstract of each reference signal input to said first processor through said first input;

a second input that receives at least one query signal to be analyzed,

a second processor that creates an abstract of each query signal;

a reference database that stores abstracts of each at least one reference signal;

a comparing device that compares an abstract of said at least one query signal to the abstracts stored in the reference database to determine if the abstract of said at least one query signal matches any of the stored abstracts;

a storage medium coupled to said first input, that stores each of said at least one reference signals to be monitored; and a controller that compares an abstract for each reference signal being input for the first time to be compared to all previously stored abstracts in the reference database, such that in the event that the comparing device determines that it cannot distinguish between the abstract of a reference signal being input for the first time from a previously stored abstract in the reference database, the

controller adjusts the criteria being used by the processor and re-generates the reference database, by re-processing each reference signal stored on the storage medium to create new abstracts and storing said new abstracts in the reference database.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,346,472 B1
APPLICATION NO. : 09/657181
DATED : March 18, 2008
INVENTOR(S) : Scott Moskowitz

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 1 line 7 reading:
-- This application claims the benefit of pending U.S. patent --

should read:

-- This application is related to pending U.S. patent --

Signed and Sealed this
Thirteenth Day of September, 2011

David J. Kappos
Director of the United States Patent and Trademark Office