IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF DELAWARE

VEDANTI SYSTEMS LIMITED and MAX SOUND CORPORATION, Plaintiffs, v. GOOGLE, INC., YOUTUBE, LLC, and ON2 TECHNOLOGIES, INC., Defendants.	C.A. No._____ **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiffs Vedanti Systems Limited ("VSL") and Max Sound Corporation ("Max Sound") file this Complaint for patent infringement against Defendants Google, Inc. ("Google"), YouTube, LLC ("YouTube"), and On2 Technologies, Inc. ("On2") (collectively "Defendants") and allege as follows:

1. This case arises out of Defendants' willful infringement of United States Patent No. 7,974,339 and Defendants' incorporation of this patented technology into products made, used, sold, offered for sale, and/or imported, including, but not limited to, VP8, VP9, WebM, YouTube, Google Adsense, Google Play, Google TV, Chromebook, Google Drive, Google Chromecast, Google Play-per-view, Google Glasses, Google +, Google's Simplify, Google Maps and Google Earth. In short, Defendants' infringement pervades virtually every website and product offered by Google and its Defendant subsidiaries.

Google Inc.
GOOG 1009
IPR of US Pat. No. 7,974,339

2. Despite Google's well-publicized Code of Conduct — "Don't be Evil" — which it explains is "about doing the right thing," "following the law," and "acting honorably," Google, in fact, has an established pattern of conduct which is the exact opposite of its claimed piety.

3. Indeed, time and time again, Google has willfully infringed the patents and used the proprietary information of others without offering to compensate the owners of those patents and/or proprietary information. This case is yet another of the many occasions on which Google has unlawfully taken, rather than developed for itself and/or paid for, valuable and proprietary technology that is core to the functioning of its many businesses and products.

PARTIES

4. Plaintiff Vedanti Systems Limited is a British company having its principal place of business at 43 Overstone Road London W6 0AD.

5. Plaintiff Max Sound Corporation is a Delaware corporation having its principal place of business at 2902A Colorado Avenue, Santa Monica, California 90404.

6. Google is a corporation organized under the laws of the State of Delaware, and has a principal place of business at 1600 Amphitheatre Parkway, Mountain View, California 94043 and/or is conducting business through an affiliate located at this address. Google may be served through its registered agent for service of process, Corporation Trust Company, at Corporation Trust Center, 1209 Orange Street, Wilmington, Delaware 19801.

7. On information and belief, YouTube is a limited liability company organized under the laws of the State of Delaware, and headquartered in San Bruno, California. YouTube is a wholly-owned subsidiary of Google. YouTube is in the business of the sharing and display of user-generated and corporate media video. Available content on YouTube includes video clips, TV clips, music videos, and other content such as video blogging, short original videos,

and educational videos. YouTube may be served through its registered agent for service of process, Corporation Trust Company, at Corporation Trust Center, 1209 Orange Street, Wilmington, Delaware 19801.

8. On information and belief, On2 is a corporation organized under the laws of the State of Delaware, and has a principal place of business in Clifton Park, New York. On2 is wholly-owned subsidiary of Google. On2, formerly known as The Duck Corporation, engaged in the business of developing video compression technologies known as codecs. In February 2010, Google acquired On2 for an estimated $124.6 million. On2 claims the authorship of a number of video codecs, including video codecs known as VP8 and VP9. On2 may be served through its registered agent for service of process, Corporation Service Company, at 2711 Centerville Road, Suite 400, Wilmington, Delaware 19808.

JURISDICTION AND VENUE

9. This civil action for patent infringement arises under the Patent Laws of the United States, 35 U.S.C. §§ 1, *et seq.* This Court has jurisdiction over the claims presented herein pursuant to 28 U.S.C. §§ 1331 and 1338(a).

10. Defendants make, import, use, sell, and/or offer for sale the Accused Instrumentalities (as defined below) within the United States, including this District, that infringe one or more claims of United States Patent No. 7,974,339 entitled "Optimized Data Transmission System and Method" (the "'339 Patent"). The '339 Patent was duly and legally issued by the United States Patent and Trademark Office on July 5, 2011. A true and correct copy of the '339 Patent is attached hereto as Exhibit 1.

11. The '339 Patent is referred to herein as the "Asserted Patent."

12. VSL is the owner by assignment of all rights, title, and interests in the Asserted Patent, and is entitled to sue for past and future infringement thereof.

13. Max Sound and VSL have agreed that Max Sound shall have the right to enforce VSL's patent rights on VSL's behalf.

14. A "codec" is a device or computer program capable of encoding or decoding a digital data stream or signal.

15. Defendants are engaged in the business of developing, using, and selling a variety of video computer programs, including those commonly referred to as the VP8, VP9, H.264, and WebM video codecs (collectively the "Accused Codec Instrumentalities").

16. Defendants embed these Accused Codec Instrumentalities into products that Defendants make, use, and sell, including in this District, such as the Android operating system used in many mobile phones and tablet computers (collectively "the Accused Android Instrumentalities").

17. Defendants use these Accused Codec Instrumentalities to deliver video content from Defendants' websites and products such as VP8, VP9, WebM, YouTube.com, Google Adsense, Google Play, Google TV, Chromebook, Google Drive, Google Chromecast, Google Play-per-view, Google Glasses, Google +, Google's Simplify, Google Maps and Google Earth (collectively the "Accused Website and Product Instrumentalities").

18. Defendants distribute software such as the Chrome web browser that implements the Accused Codec Instrumentalities (collectively the "Accused Software Instrumentalities").

19. Collectively, the Accused Codec Instrumentalities, the Accused Android Instrumentalities, the Accused Website and Product Instrumentalities, and the Accused Software Instrumentalities comprise the "Accused Instrumentalities."

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20. On information and belief, Defendants directly and/or indirectly import, manufacture, use, offer for sale, and/or sell the Accused Instrumentalities within the United States, including this District, that infringe one or more claims of the Asserted Patent.

21. Venue is proper in this District pursuant to 28 U.S.C. § 1400(b).

GENERAL ALLEGATIONS

VSL and the '339 Patent

22. In 2001, Constance Nash, one of the two named inventors of the '339 Patent, had the goal of offering to the public an Internet subscription service to deliver digitized video of musical concerts via the Internet.

23. After reviewing and testing numerous video compression and decompression technologies for use with the subscription services, Ms. Nash concluded that none of the then-existing video compression technologies could provide the level of video quality necessary to launch the project.

24. The then-existing video standards resulted in jittery, low-quality video and sound for large-sized video files.

25. The available technologies relied solely on compression, *i.e.*, the encoding of digital information by reducing the number of bits in the representation, by identifying and deleting unnecessary bits ("lossy" compression).

26. Ms. Nash hired Alex Krichevsky to work for VSL. Together, Ms. Nash and Mr. Krichevsky developed the technology, specifically a video codec (the "VSL Codec"), and the inventions described in the '339 Patent.

27. The VSL Codec implemented a proprietary and unique system of optimizing data transmission using methods for key frame partitioning, slicing and analyzing pixel variation of

video content to significantly reduce the volume of digital video files, while minimizing any resulting loss of video quality.

28. Ms. Nash and Mr. Krichevsky filed United States and numerous other international patent applications that covered some of the methods and systems used in the VSL Codec.

29. Germane to this lawsuit, on January 16, 2002, Ms. Nash and Mr. Krichevsky filed the United States patent application that resulted in the issuance of the '339 patent.

Google, H.264, and VP8

30. During the mid- to late-2000s, video compression and streaming technology had become integral to Google products, including but not limited to the YouTube.com website, the Chrome web browser, and the Android mobile device operating system.

31. Google and Google products began supporting a video codec known as H.264.

32. The first version of the H.264 codec was completed in 2003 by a standardization committee called the Joint Video Team, which was formed by the Video Coding Experts Group and the Moving Pictures Experts Group.

33. Since that time, H.264 has developed into a widely used codec with substantial penetration in the optical disc, broadcast, and streaming video markets.

34. MPEG LA, LLC ("MPEG LA"), a Colorado-based firm, licenses patent pools that cover essential patents necessary for use in various video codec standards. MPEG LA is not related to the Moving Pictures Experts Group.

35. MPEG LA was initially founded in the late 1990s by several international companies that owned patents necessary to practice the MPEG-2 video standard in order to pool

those patents under a single entity for purposes of granting pooled licenses to those patents and to generate patent royalties.

36. Since that time, MPEG LA has asserted that multiple video standards, including H.264, require a license to its pooled patents, and hundreds of companies have obtained licenses from MPEG LA for the rights to the H.264 patent pool.

37. For many years Google refused to obtain a license from MPEG LA to cover its implementations of the H.264 standard, despite multiple notices from MPEG LA that Google required a license.

38. Rather than obtaining a license from MPEG LA for Google's implementations of H.264, Google decided instead to seek alternatives to H.264 that would not require paying royalties to MPEG LA.

39. VP8 is a video compression standard released by Defendant On2 in September 2008.

40. As of September 2008, MPEG LA had not established a patent pool that covered the VP8 codec.

41. In August 2009, Google targeted VP8 as a potential alternative to H.264 and initiated negotiations to acquire On2.

42. In February 2010, Google completed the acquisition of On2.

43. Through its acquisition of On2, Google obtained ownership of the VP8 codec and On2's patents and pending patent applications covering the VP8 codec and possessed a potential alternative to avoid paying licensing royalties to MPEG LA.

44. In May 2010, Google announced that its new WebM video file format would incorporate the VP8 codec.

45. YouTube now uses WebM/VP8 video and has committed to encode its entire portfolio of videos to WebM.

46. WebM was enabled in Google Android operating system in late 2010.

47. After the release of WebM/VP8 by Google, however, numerous reviews by the public concluded that the video quality of WebM/VP8 was significantly weaker than the quality produced using H.264.

Google's Discussions with VSL

48. In March 2010, with the understanding that WebM/VP8 was in desperate need of improvement, Alpesh Patel, VSL's CEO at that time, communicated with Google's Nikesh Arora to discuss licensing VSL's video technology and/or the possible acquisition of VSL and the '339 Patent by Google.

49. In April 2010, Mr. Patel and Megan Smith, Google's Vice President of New Business Development, executed a non-disclosure agreement ("NDA") for the purpose of engaging in negotiations regarding VSL's technology.

50. During those negotiations, Laura Majerus, one of Google's in-house counsel advised that if VSL's patent portfolio read on the H.264 video codec, then Google would seek to buy the technology or to acquire VSL.

51. During the course of the negotiations and pursuant to the NDA, VSL provided a working VSL codec to Google for testing and analysis, and further provided copies of VSL's patents, patent applications (including the patent application that led to the '339 Patent), and claim charts comparing the inventions claimed in the '339 Patent to the H.264 standard.

52. The parties continued to meet over the course of the next eight months. During the course of those meetings, Google requested, and VSL provided, technical guidance to Google

regarding the implementation of VSL's technology, the VSL Codec, and the inventions claimed in the '339 Patent.

53. By December 2010, negotiations between the parties stalled, and the parties terminated discussions.

54. On December 16, 2010, Ms. Majerus shipped back to VSL materials that VSL had provided to Google pursuant to the NDA. Ms. Majerus included a cover letter that provided an itemized list of documents and other things being returned to VSL pursuant to the NDA, with the only apparent missing components being the claim charts comparing the inventions claimed in the '339 Patent to the H.264 standard.

55. Included with the materials was a collection of Post-It notes, which appear to have been authored by Google personnel.

56. The Post-It notes included statements that suggest that Google intended to infringe VSL's patents and that Google's infringement was knowing and willful.

57. Examples of such statements in the Post-It notes include the following:

a. Google engineers should be discouraged from "digging deep" and should "close eyes to existing IP," and from talking further to Qualcomm IP engineer Seyfullah Oguz who had agreed to assist VSL in providing understanding to Google ;

b. Google was concerned that its infringement could be considered "recklessness" (the standard applicable to willful infringement);

c. Google had concerns that products in development should be carefully monitored because of potential infringement;

d. Google personnel should "try" to destroy incriminating emails;

e. Google needed to obtain a non-infringement opinion from outside counsel;

f. Google should evaluate the risk of getting sued for infringement if Google's infringing products were "money making"; and

g. Google should consider a "design around" because it was facing a "risk of litigation."

58. On information and belief, Google began to incorporate VSL's patented technology into WebM/VP8 soon after it initiated negotiations with VSL and received from VSL confidential information regarding VSL's patent portfolio.

59. Indeed, subsequent to meeting with VSL, Google and On2 either amended a number of their pending patent applications to incorporate various claims of the '339 Patent or filed for new patents which incorporated various claims of the '339 Patent, without disclosing to the United States Patent and Trademark Office the '339 Patent or its underlying application as prior art or Ms. Nash or Mr. Krichevsky as prior inventors. Nonetheless, Defendants' incorporation of claims of the '339 Patent into their patent applications and patents constitute tacit admissions of Defendants' infringement of the '339 Patent.

CLAIM FOR RELIEF
(Infringement of the '339 Patent)

60. VSL incorporates paragraphs 1 through 59 as though fully set forth herein.

61. Upon information and belief, Defendants have been and now are directly infringing one or more claims of the '339 Patent by making, importing, using (including use for testing purposes), offering for sale, and/or selling the patented inventions, including but not limited to the Accused Instrumentalities.

62. In addition and/or in the alternative, Defendants have been and/or now are indirectly infringing one or more claims of the Asserted Patent by inducing customers,

consumers, and end users to use the Accused Instrumentalities to directly infringe one or more claims of the Asserted Patent in violation of 35 U.S.C. § 271(b).

63. Google was informed in 2010 of the pending application that became the '339 Patent and had actual knowledge of the applicability of the inventions claimed therein to video codecs such as those used in the Accused Instrumentalities.

64. Furthermore, Google has been provided actual notice of the existence of the '339 Patent.

65. The Post-It notes are unequivocal evidence of Google's knowledge of the '339 Patent and infringement by Defendants.

66. In spite of having received such notice, Google and its Defendant subsidiaries have intended, and continue to intend, to induce patent infringement by customers and end users, and have had knowledge that the inducing acts would cause infringement or, alternatively, have been willfully blind to the possibility that its inducing acts would cause infringement.

67. The Accused Instrumentalities comprise the systems claimed in one or more claims of the '339 Patent, and, when used as described in Defendants' technical publications, perform the method(s) described and claimed in the Asserted Patent.

68. Defendants have engaged in indirect infringement by providing their customers and end users with the infringing Accused Instrumentalities, and/or by providing the Accused Instrumentalities and providing instructions to enable those customers and end users to use the Accused Instrumentalities, each of which constitute the system claimed in one or more claims of the '339 Patent, and/or to utilize the Accused Instrumentalities so as to practice the method claimed in one or more claims of the '339 Patent.

69. By way of example, and not as a limitation, Defendants induce such infringement by at least making its Internet websites available to customers and end users and providing links and/or other directions on its websites and/or the Internet to instruct and teach users to use the Accused Instrumentalities in an infringing manner.

70. Defendants engaged – and continue to engage – in such activities knowingly, and, as early as 2010, have done so with the knowledge that such activities induce customers and end users to directly infringe the Asserted Patent.

71. In addition, or, in the alternative, Defendants engaged – and continue to engage – in such activities knowingly, and, as early as 2010, have sold or distributed the Accused Instrumentalities knowing that such Accused Instrumentalities are especially made or adapted for use by their customers and end users in an infringing use of one or more claims of the Accused Instrumentalities.

72. On information and belief, Defendants' customers and end users configure the Accused Instrumentalities to encode and/or decode digital video as described and claimed in the Asserted Patent. Thus, Defendants' customers and end users, by using the Accused Instrumentalities, directly infringe the claimed method(s) of the Asserted Patent.

73. VSL has been damaged by Defendants' infringing activities and will be irreparably harmed unless those infringing activities are preliminarily and permanently enjoined by this Court.

74. Google and its Defendant subsidiaries either had actual knowledge of the '339 Patent or recklessly disregarded the existence of the '339 Patent, so VSL is entitled to damages against Google for indirect infringement for the period prior to the filing of this Complaint through the date of trial.

75. Defendants' infringement of the '339 Patent is and has been willful.

76. Defendants' past and continued infringement of the '339 Patent has caused VSL damage and will continue to cause irreparable damage to VSL unless Google is enjoined by this Court.

77. VSL does not have an adequate remedy at law.

REQUEST FOR RELIEF

WHEREFORE, Plaintiffs VSL and Max Sound request the following relief:

(a) A judgment in favor of VSL and Max Sound that Defendants have directly infringed, and/or have indirectly infringed by way of inducement, one or more claims of the Asserted Patent and that such infringement has been willful;

(b) A judgment that VSL and Max Sound have been irreparably harmed by the Defendants' infringing activities and are likely to continue to be irreparably harmed by Google's continued infringement;

(c) Imposition of preliminary and permanent injunctions prohibiting Defendants and their officers, agents, servants, employees, and those persons in active concert or participation with any of them, as well as all successors or assignees of the interests or assets related to the Accused Instrumentalities, from further infringement, direct and indirect, of the Asserted Patent;

(d) A judgment and order requiring Defendants to pay VSL and Max Sound damages adequate to compensate for infringement under 35 U.S.C. § 284, which damages may include lost profits but in no event shall be less than a reasonable royalty for the use made of the inventions of the Asserted Patent, including pre- and post-judgment interest and costs, including expenses and disbursements;

(e) A judgment awarding treble damages to VSL and Max Sound pursuant to 35 U.S.C. § 284, in view of the willful and deliberate nature of the infringement, with interest;

(f) A judgment declaring this to be an exceptional case under 35 U.S.C. § 285 and awarding VSL and Max Sound their attorneys' fees;

(g) Pre- and post-judgment interest as permitted by law; and

(h) Any and all such further necessary or proper relief as this Court may deem just.

DEMAND FOR JURY TRIAL

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, VSL and Max Sound hereby demand a trial by jury of all issues so triable.

Dated: August 9, 2014

GRANT & EISENHOFER P.A.

By: /s/ Geoffrey C. Jarvis
Geoffrey C. Jarvis

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CIVIL COVER SHEET

The JS 44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. *(SEE INSTRUCTIONS ON NEXT PAGE OF THIS FORM.)*

I. (a) PLAINTIFFS

VEDANTI SYSTEMS LIMITED and MAX SOUND CORPOATION,

(b) County of Residence of First Listed Plaintiff London, UK
(EXCEPT IN U.S. PLAINTIFF CASES)

(c) Attorneys *(Firm Name, Address, and Telephone Number)*
Geoffrey C. Jarvis, Grant & Eisenhofer P.A., 123 Justison Street, Wilmington, DE 19801, (302) 622-7000.

DEFENDANTS

GOOGLE, INC., YOUTUBE, LLC, and On2 Technologies, Inc.

County of Residence of First Listed Defendant Santa Clara County, CA
(IN U.S. PLAINTIFF CASES ONLY)

NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE TRACT OF LAND INVOLVED.

Attorneys *(If Known)*

II. BASIS OF JURISDICTION *(Place an "X" in One Box Only)*

- ❒ 1 U.S. Government Plaintiff
- ☒ 3 Federal Question *(U.S. Government Not a Party)*
- ❒ 2 U.S. Government Defendant
- ❒ 4 Diversity *(Indicate Citizenship of Parties in Item III)*

III. CITIZENSHIP OF PRINCIPAL PARTIES *(Place an "X" in One Box for Plaintiff and One Box for Defendant)*
(For Diversity Cases Only)

	PTF	DEF		PTF	DEF
Citizen of This State	❒ 1	❒ 1	Incorporated *or* Principal Place of Business In This State	❒ 4	❒ 4
Citizen of Another State	❒ 2	❒ 2	Incorporated *and* Principal Place of Business In Another State	❒ 5	❒ 5
Citizen or Subject of a Foreign Country	❒ 3	❒ 3	Foreign Nation	❒ 6	❒ 6

IV. NATURE OF SUIT *(Place an "X" in One Box Only)*

CONTRACT
- ❒ 110 Insurance
- ❒ 120 Marine
- ❒ 130 Miller Act
- ❒ 140 Negotiable Instrument
- ❒ 150 Recovery of Overpayment & Enforcement of Judgment
- ❒ 151 Medicare Act
- ❒ 152 Recovery of Defaulted Student Loans (Excludes Veterans)
- ❒ 153 Recovery of Overpayment of Veteran's Benefits
- ❒ 160 Stockholders' Suits
- ❒ 190 Other Contract
- ❒ 195 Contract Product Liability
- ❒ 196 Franchise

REAL PROPERTY
- ❒ 210 Land Condemnation
- ❒ 220 Foreclosure
- ❒ 230 Rent Lease & Ejectment
- ❒ 240 Torts to Land
- ❒ 245 Tort Product Liability
- ❒ 290 All Other Real Property

TORTS

PERSONAL INJURY
- ❒ 310 Airplane
- ❒ 315 Airplane Product Liability
- ❒ 320 Assault, Libel & Slander
- ❒ 330 Federal Employers' Liability
- ❒ 340 Marine
- ❒ 345 Marine Product Liability
- ❒ 350 Motor Vehicle
- ❒ 355 Motor Vehicle Product Liability
- ❒ 360 Other Personal Injury
- ❒ 362 Personal Injury - Medical Malpractice

PERSONAL INJURY
- ❒ 365 Personal Injury - Product Liability
- ❒ 367 Health Care/ Pharmaceutical Personal Injury Product Liability
- ❒ 368 Asbestos Personal Injury Product Liability

PERSONAL PROPERTY
- ❒ 370 Other Fraud
- ❒ 371 Truth in Lending
- ❒ 380 Other Personal Property Damage
- ❒ 385 Property Damage Product Liability

CIVIL RIGHTS
- ❒ 440 Other Civil Rights
- ❒ 441 Voting
- ❒ 442 Employment
- ❒ 443 Housing/ Accommodations
- ❒ 445 Amer. w/Disabilities - Employment
- ❒ 446 Amer. w/Disabilities - Other
- ❒ 448 Education

PRISONER PETITIONS

Habeas Corpus:
- ❒ 463 Alien Detainee
- ❒ 510 Motions to Vacate Sentence
- ❒ 530 General
- ❒ 535 Death Penalty

Other:
- ❒ 540 Mandamus & Other
- ❒ 550 Civil Rights
- ❒ 555 Prison Condition
- ❒ 560 Civil Detainee - Conditions of Confinement

FORFEITURE/PENALTY
- ❒ 625 Drug Related Seizure of Property 21 USC 881
- ❒ 690 Other

LABOR
- ❒ 710 Fair Labor Standards Act
- ❒ 720 Labor/Management Relations
- ❒ 740 Railway Labor Act
- ❒ 751 Family and Medical Leave Act
- ❒ 790 Other Labor Litigation
- ❒ 791 Employee Retirement Income Security Act

IMMIGRATION
- ❒ 462 Naturalization Application
- ❒ 465 Other Immigration Actions

BANKRUPTCY
- ❒ 422 Appeal 28 USC 158
- ❒ 423 Withdrawal 28 USC 157

PROPERTY RIGHTS
- ❒ 820 Copyrights
- ☒ 830 Patent
- ❒ 840 Trademark

SOCIAL SECURITY
- ❒ 861 HIA (1395ff)
- ❒ 862 Black Lung (923)
- ❒ 863 DIWC/DIWW (405(g))
- ❒ 864 SSID Title XVI
- ❒ 865 RSI (405(g))

FEDERAL TAX SUITS
- ❒ 870 Taxes (U.S. Plaintiff or Defendant)
- ❒ 871 IRS—Third Party 26 USC 7609

OTHER STATUTES
- ❒ 375 False Claims Act
- ❒ 400 State Reapportionment
- ❒ 410 Antitrust
- ❒ 430 Banks and Banking
- ❒ 450 Commerce
- ❒ 460 Deportation
- ❒ 470 Racketeer Influenced and Corrupt Organizations
- ❒ 480 Consumer Credit
- ❒ 490 Cable/Sat TV
- ❒ 850 Securities/Commodities/ Exchange
- ❒ 890 Other Statutory Actions
- ❒ 891 Agricultural Acts
- ❒ 893 Environmental Matters
- ❒ 895 Freedom of Information Act
- ❒ 896 Arbitration
- ❒ 899 Administrative Procedure Act/Review or Appeal of Agency Decision
- ❒ 950 Constitutionality of State Statutes

V. ORIGIN *(Place an "X" in One Box Only)*

☒ 1 Original Proceeding ❒ 2 Removed from State Court ❒ 3 Remanded from Appellate Court ❒ 4 Reinstated or Reopened ❒ 5 Transferred from Another District *(specify)* ❒ 6 Multidistrict Litigation

VI. CAUSE OF ACTION

Cite the U.S. Civil Statute under which you are filing ***(Do not cite jurisdictional statutes unless diversity)***:
28 U.S.C. §§ 1331 and 1338(a)

Brief description of cause:
Patent Infringement

VII. REQUESTED IN COMPLAINT:

❒ CHECK IF THIS IS A **CLASS ACTION** UNDER RULE 23, F.R.Cv.P.

DEMAND $

CHECK YES only if demanded in complaint:
JURY DEMAND: ◉ Yes ○ No

VIII. RELATED CASE(S) IF ANY

(See instructions): JUDGE _____ DOCKET NUMBER _____

DATE
08/09/2014

SIGNATURE OF ATTORNEY OF RECORD
/s/ Geoffrey C. Jarvis

FOR OFFICE USE ONLY

RECEIPT # _____ AMOUNT _____ APPLYING IFP _____ JUDGE _____ MAG. JUDGE _____

INSTRUCTIONS FOR ATTORNEYS COMPLETING CIVIL COVER SHEET FORM JS 44

Authority For Civil Cover Sheet

The JS 44 civil cover sheet and the information contained herein neither replaces nor supplements the filings and service of pleading or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. Consequently, a civil cover sheet is submitted to the Clerk of Court for each civil complaint filed. The attorney filing a case should complete the form as follows:

I.(a) **Plaintiffs-Defendants.** Enter names (last, first, middle initial) of plaintiff and defendant. If the plaintiff or defendant is a government agency, use only the full name or standard abbreviations. If the plaintiff or defendant is an official within a government agency, identify first the agency and then the official, giving both name and title.

(b) **County of Residence.** For each civil case filed, except U.S. plaintiff cases, enter the name of the county where the first listed plaintiff resides at the time of filing. In U.S. plaintiff cases, enter the name of the county in which the first listed defendant resides at the time of filing. (NOTE: In land condemnation cases, the county of residence of the "defendant" is the location of the tract of land involved.)

(c) **Attorneys.** Enter the firm name, address, telephone number, and attorney of record. If there are several attorneys, list them on an attachment, noting in this section "(see attachment)".

II. **Jurisdiction.** The basis of jurisdiction is set forth under Rule 8(a), F.R.Cv.P., which requires that jurisdictions be shown in pleadings. Place an "X" in one of the boxes. If there is more than one basis of jurisdiction, precedence is given in the order shown below.
United States plaintiff. (1) Jurisdiction based on 28 U.S.C. 1345 and 1348. Suits by agencies and officers of the United States are included here.
United States defendant. (2) When the plaintiff is suing the United States, its officers or agencies, place an "X" in this box.
Federal question. (3) This refers to suits under 28 U.S.C. 1331, where jurisdiction arises under the Constitution of the United States, an amendment to the Constitution, an act of Congress or a treaty of the United States. In cases where the U.S. is a party, the U.S. plaintiff or defendant code takes precedence, and box 1 or 2 should be marked.
Diversity of citizenship. (4) This refers to suits under 28 U.S.C. 1332, where parties are citizens of different states. When Box 4 is checked, the citizenship of the different parties must be checked. (See Section III below; **NOTE: federal question actions take precedence over diversity cases.**)

III. **Residence (citizenship) of Principal Parties.** This section of the JS 44 is to be completed if diversity of citizenship was indicated above. Mark this section for each principal party.

IV. **Nature of Suit.** Place an "X" in the appropriate box. If the nature of suit cannot be determined, be sure the cause of action, in Section VI below, is sufficient to enable the deputy clerk or the statistical clerk(s) in the Administrative Office to determine the nature of suit. If the cause fits more than one nature of suit, select the most definitive.

V. **Origin.** Place an "X" in one of the six boxes.
Original Proceedings. (1) Cases which originate in the United States district courts.
Removed from State Court. (2) Proceedings initiated in state courts may be removed to the district courts under Title 28 U.S.C., Section 1441. When the petition for removal is granted, check this box.
Remanded from Appellate Court. (3) Check this box for cases remanded to the district court for further action. Use the date of remand as the filing date.
Reinstated or Reopened. (4) Check this box for cases reinstated or reopened in the district court. Use the reopening date as the filing date.
Transferred from Another District. (5) For cases transferred under Title 28 U.S.C. Section 1404(a). Do not use this for within district transfers or multidistrict litigation transfers.
Multidistrict Litigation. (6) Check this box when a multidistrict case is transferred into the district under authority of Title 28 U.S.C. Section 1407. When this box is checked, do not check (5) above.

VI. **Cause of Action.** Report the civil statute directly related to the cause of action and give a brief description of the cause. **Do not cite jurisdictional statutes unless diversity.** Example: U.S. Civil Statute: 47 USC 553 Brief Description: Unauthorized reception of cable service

VII. **Requested in Complaint.** Class Action. Place an "X" in this box if you are filing a class action under Rule 23, F.R.Cv.P.
Demand. In this space enter the actual dollar amount being demanded or indicate other demand, such as a preliminary injunction.
Jury Demand. Check the appropriate box to indicate whether or not a jury is being demanded.

VIII. **Related Cases.** This section of the JS 44 is used to reference related pending cases, if any. If there are related pending cases, insert the docket numbers and the corresponding judge names for such cases.

Date and Attorney Signature. Date and sign the civil cover sheet.

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Delaware on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	8/9/2014	Delaware

PLAINTIFF	DEFENDANT
VEDANTI SYSTEMS LIMITED and MAX SOUND CORPORATION	GOOGLE, INC., YOUTUBE, LLC, and ON2 TECHNOLOGIES, INC.7,974,339

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	7,974,339	7/5/2011	Vedanti Systems Limited
2			
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

EXHIBIT 1

US007974339B2

(12) **United States Patent**
Krichevsky et al.

(10) **Patent No.: US 7,974,339 B2**
(45) **Date of Patent: Jul. 5, 2011**

(54) **OPTIMIZED DATA TRANSMISSION SYSTEM AND METHOD**

(76) Inventors: **Alex Krichevsky**, Laguna Beach, CA (US); **Constance Nash**, Laguna Beach, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1401 days.

(21) Appl. No.: **10/892,690**

(22) Filed: **Jul. 16, 2004**

(65) **Prior Publication Data**

US 2004/0258150 A1 Dec. 23, 2004

Related U.S. Application Data

(63) Continuation of application No. PCT/US02/00503, filed on Jan. 16, 2002.

(51) **Int. Cl.**
H04N 7/12 (2006.01)

(52) **U.S. Cl.** **375/240.01**

(58) **Field of Classification Search** 375/240.01, 375/240.15, 240.23; 380/54; 382/239, 236; 348/699

See application file for complete search history.

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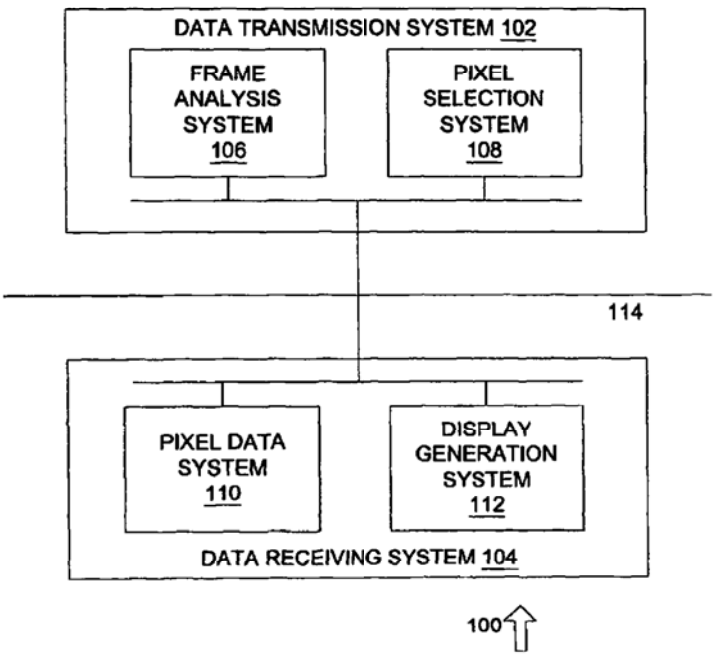
Primary Examiner — Tung Vo

(57) **ABSTRACT**

A system for transmitting data is provided. The system includes a frame analysis system receiving frame data, such as a frame of video data, and generating region data, such as a uniform matrix size that is used to divide the frame into a predetermined set of matrices. A pixel selection system receives the region data and generates one set of pixel data for each region, such as by selecting one of the pixels contained within each of the original matrices that comprise the frame.

13 Claims, 4 Drawing Sheets



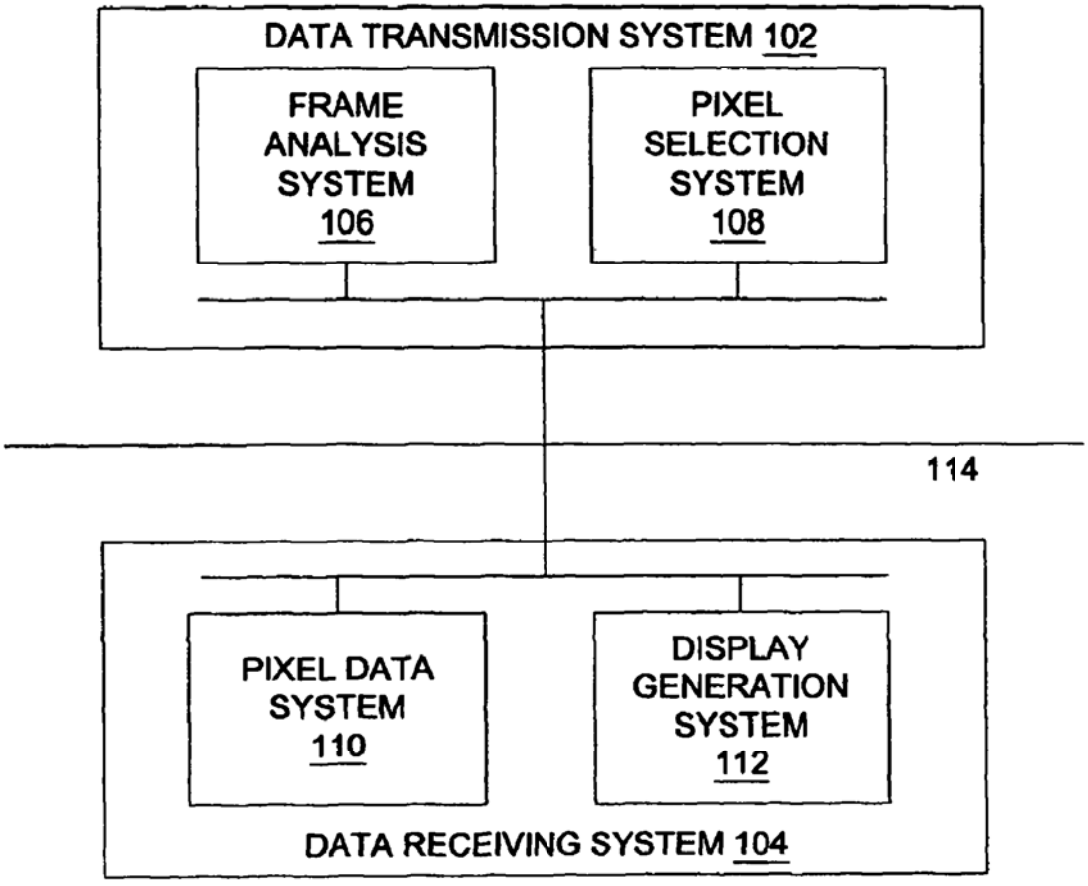


FIGURE 1 100

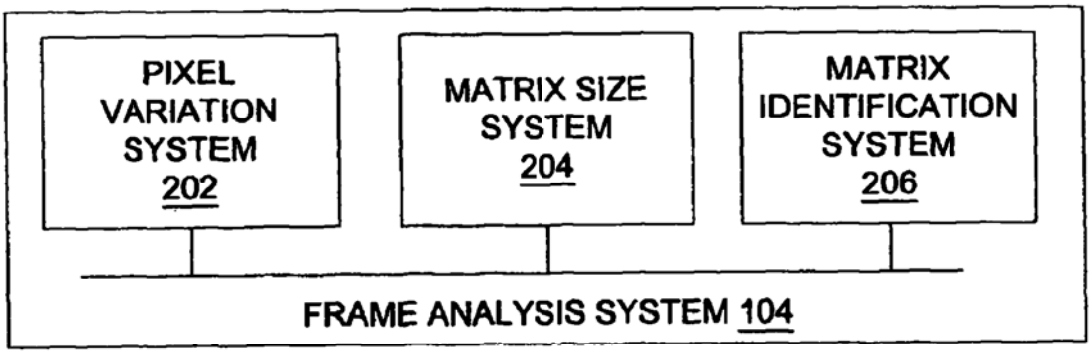


FIGURE 2 200

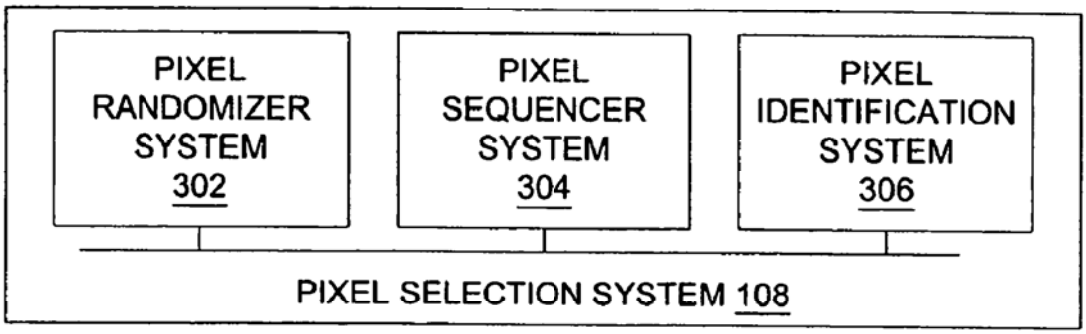


FIGURE 3 300

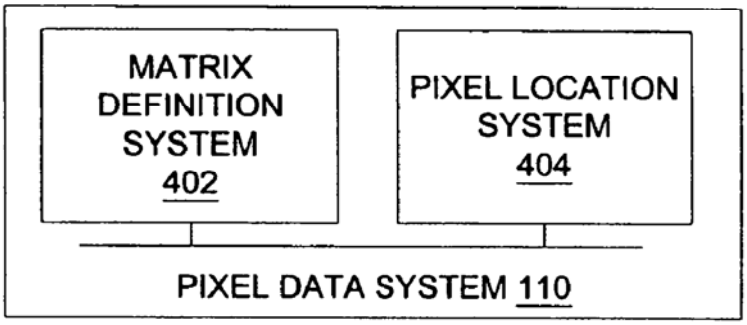


FIGURE 4 400

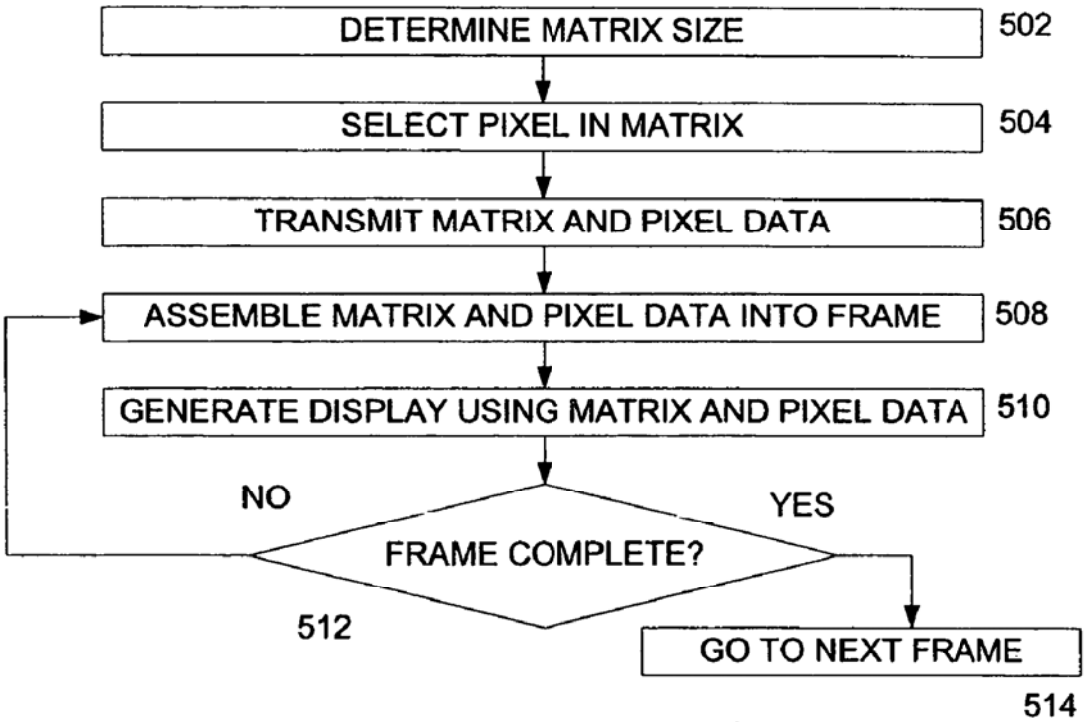
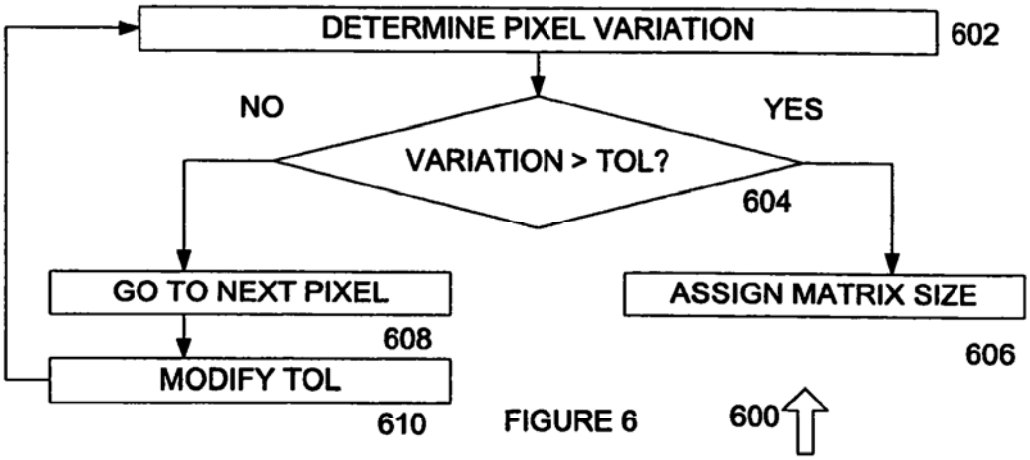


FIGURE 5 500



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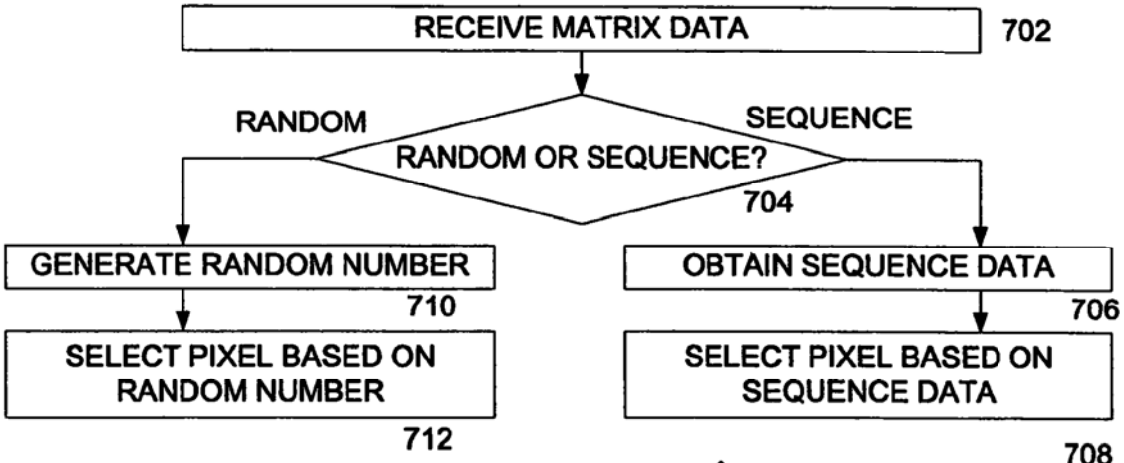
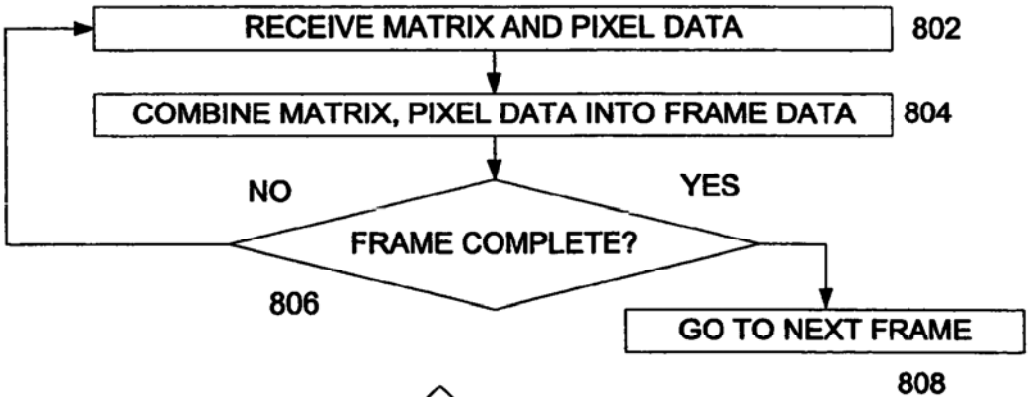


FIGURE 7 700



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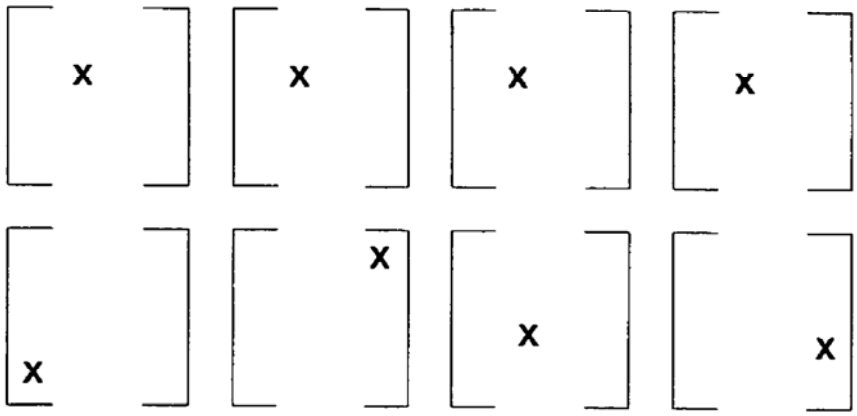

FIGURE 9 900

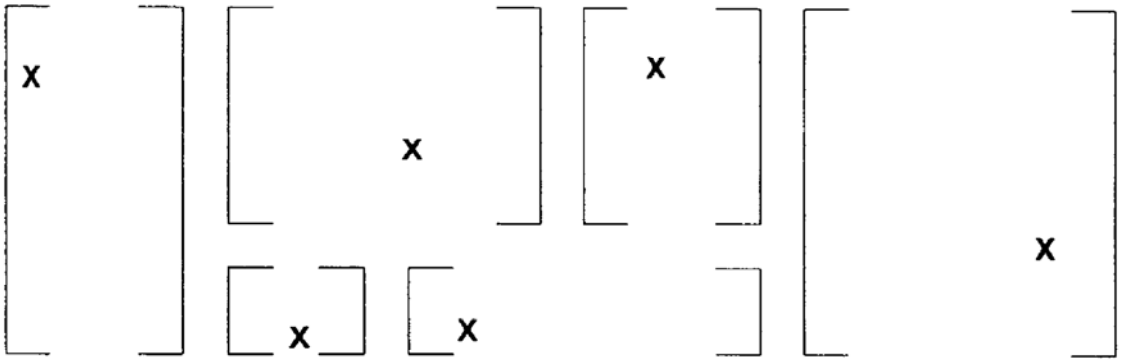

FIGURE 10 1000

OPTIMIZED DATA TRANSMISSION SYSTEM AND METHOD

FIELD OF THE INVENTION

The present invention pertains to the field of data transmission, and more particularly to a system and method for optimizing data transmission that decreases bandwidth requirements for data transmission.

BACKGROUND OF THE INVENTION

Data transmission systems are known in the art. Such data transmission systems often use compression to decrease bandwidth requirements. For example, compression techniques have been characterized as "lossless" when no reduction in data occurs, or "lossy" when a loss of data occurs that does not adversely affect the intended use.

One drawback with such data transmission systems is that the compressed data must be "decompressed" on the receiving end. Thus, for lossless data compression systems, the exact configuration of the data must be achieved when the data is decompressed. Likewise, even for lossy data compression systems, the data is decompressed and the lost data is then approximated. The need for such decompression contributes to the overall difficulty in implementing data transmission in conjunction with compression.

SUMMARY OF THE INVENTION

In accordance with the present invention, a system and method for transmitting data are provided that overcome known problems with data transmission systems and methods.

In particular, a system and method for data transmission are provided that use data optimization instead of compression, so as to provide a mixed lossless and lossy data transmission technique.

In accordance with an exemplary embodiment of the present invention, a system for transmitting data is provided. The system includes a frame analysis system receiving frame data, such as a frame of video data, audio data, graphical data, text data, or other suitable data, and generating region data, such as a uniform matrix size that is used to divide the frame into a predetermined set of matrices. A pixel selection system receives the region data and generates one set of pixel data for each region, such as by selecting one of the pixels contained within each of the original matrices that comprise the frame. For data that is used for purposes other than the generation of a display, the pixel data can instead be audio data, text data, or other suitable data.

The present invention provides many important technical advantages. One important technical advantage of the present invention is a system and method for transmitting data that do not require the data to be compressed at the sending end and decompressed at the receiving end. The present invention uses data optimization to transmit only the data that is necessary for the application, such that decompression of the data on the receiving end is not required. In this manner, the present invention incorporates features of both lossless and lossy compression without requiring the data to be decompressed on the receiving end.

Those skilled in the art will further appreciate the advantages and superior features of the invention together with other important aspects thereof on reading the detailed description that follows in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagram of a system for transmitting data in accordance with an exemplary embodiment of the present invention;

FIG. **2** is a diagram of a system for performing frame analysis in accordance with an exemplary embodiment of the present invention;

FIG. **3** is a diagram of a system for selecting optimized pixel data for transmission in accordance with an exemplary embodiment of the present invention;

FIG. **4** is a diagram of a system for generating a frame in accordance with an exemplary embodiment of the present invention;

FIG. **5** is a flow chart of a method for optimizing data transmission in accordance with an exemplary embodiment of the present invention;

FIG. **6** is a flowchart of a method for determining or assigning matrix or region size based on an exemplary embodiment of the present invention;

FIG. **7** is a flowchart of a method for selecting a pixel within a region in accordance with an exemplary embodiment of the present invention;

FIG. **8** is a flowchart for method for generating optimized frame data in accordance with an exemplary embodiment of the present invention;

FIG. **9** is a diagram **900** showing an exemplary uniform matrix segmentation of an array of pixel data; and

FIG. **10** is a diagram **1000** showing an exemplary non-uniform matrix segmentation of an array of pixel data.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In the description that follows, like parts are marked throughout the specification and drawings with the same reference numerals, respectively. The drawing figures might not be to scale, and certain components can be shown in generalized or schematic form and identified by commercial designations in the interest of clarity and conciseness.

FIG. **1** is a diagram of a system **100** for transmitting data in accordance with an exemplary embodiment of the present invention. System **100** allows data such as video data to be transmitted in a manner that does not require the data to be compressed, and which results in significant decreases in bandwidth requirements for data transmission.

System **100** includes data transmission system **102**, which is coupled to data receiving system **104** over a suitable communications medium **114**. As used herein, the term "couple" and its cognate terms, such as "couples" and "coupled," can include a physical connection (such as a copper conductor), a virtual connection (such as through randomly assigned memory locations of a data memory device), a logical connection (such as through logical gates of a semiconducting device), other suitable connections, or a suitable combination of such connections. In one exemplary embodiment, systems and components are coupled to other systems and components through intervening systems and components, such as through an operating system of a general purpose computing platform. Communications medium **114** can be the Internet, the public switched telephone network, a wireless network, a local area network, an optical network, other suitable communications media, or a suitable combination of such communications media.

Data transmission system **102** includes frame analysis system **106** and pixel selection system **108**, each of which can be implemented in hardware, software, or a suitable combina-

tion of hardware and software, and which can be one or more software systems operating on a general purpose processing platform. As used herein, a software system can include one or more objects, agents, threads, lines of code, subroutines, separate software applications, user-readable (source) code, machine-readable (object) code, two or more lines of code in two or more corresponding software applications, databases, or other suitable software architectures. In one exemplary embodiment, a software system can include one or more lines of code in a general purpose software application, such as an operating system, and one or more lines of software in a specific purpose software application.

Data transmission system **102** reduces data transmission requirements by eliminating data that is not required for the application of the data on the receiving end. In one exemplary embodiment, data transmission system **102** can receive frames of video data, and can select pixels of data for transmission that are needed in order to allow the frames of video data to be viewed by the human eye. In this exemplary embodiment, a video display having a quiescent state of pixels in either the "on" or "off" states can be used to generate video data by selecting a subset of pixels within the frame to display image data. In this exemplary embodiment, if a frame of video data has low detail, it may only be necessary to provide a data value for one of every twenty-five pixels or less in order to create the image to be viewed by the human eye. Likewise, if the frame of video data has a large amount of detail, it may be necessary to transmit each pixel in order to generate a suitable image. When a frame of video data includes regions of high detail and low detail, it may likewise be desirable to transmit only the necessary number of pixels in each region that are required to generate the image. In this exemplary embodiment, the number of pixels to transmit can be decided on a region-by-region basis within the frame.

Data receiving system **104** includes pixel data system **110** and display generation system **112**, each of which can be implemented in hardware, software, or a suitable combination of hardware and software, and which can be one or more software systems operating on a general purpose processor platform. Data receiving system **104** receives the data from data transmission system **102**, and generates a display for a user that utilizes the optimized data set transmitted by data transmission system **102**. In one exemplary embodiment, data receiving system **104** can generate a video display, such as by illuminating predetermined pixels within a frame based on the determination of the level of detail required for the frame, and by leaving the remaining pixels in a quiescent state of either "off" or "on." Likewise, data receiving system **104** can generate frames of video data that have variable levels of detail, to accommodate the image data being transmitted.

Frame analysis system **106** receives frame data including pixel data and generates matrix size data based upon the pixel data. In one exemplary embodiment, frame analysis system **106** can analyze adjacent pixel data values in the frame, and can apply one or more predetermined variation tolerances to select a matrix size for a data optimization region. In this exemplary embodiment, the matrix size for each data optimization region of a frame can be uniform, such that each data optimization matrix has the same dimensions. Thus, if a 640×480 pixel frame is being transmitted, then the 640×480 pixel frame can be split up into a 64×48 frame of matrices, where each matrix is a 10×10 matrix. Likewise, frame analysis system **106** can assign a different matrix size on a frame by frame basis, such as where a first frame is transmitted using 10×10 matrices for a 64×48 matrix frame, and a subsequent frame could then be transmitted using 5×5 data matrices, for a 128×96 matrix frame. In another exemplary embodiment, the size of matrices within the frame can be varied, such that a given frame is made up of matrices varying in size, such as from a 1×1 matrix to a 5×5 matrix or greater. In yet another exemplary embodiment, the size of the matrices can be non-symmetrical, such that an N×M matrix can be used where N and M are integer values that are not equivalent. Likewise, other suitable data optimization regions can be selected, such as ones that are not based on a matrix structure, but which may be circular, elliptical, amorphous, or based on other suitable structures.

Pixel selection system **108** selects one or more pixel within a predefined matrix or other region for transmission in an optimized data transmission system. In one exemplary embodiment, pixel selection system **108** can randomly select a pixel from a location within a matrix or other region, can use a sequence selection scheme such that the pixel is selected in accordance with a predetermined sequence, or other suitable selection criteria can be used. Pixel selection system **108** can further generate pixel location data within the matrix, such that the pixel can be regenerated at a predetermined location, at a random location, or in other suitable manners. For example, if a predetermined location is used, the predetermined location can be the same for each matrix or other region, such as by assigning a quadrant or other location (e.g., the first row and column position in the matrix). Likewise, if randomization is used, control data can be generated that will cause data receiving system **104** to randomize the location of each pixel in each matrix or other region without requiring individual control data for each matrix or other region. Likewise, other suitable pixel selection data can be generated.

Pixel data system **110** receives matrix data and pixel data and assembles frame data based on the matrix data and pixel data. In one exemplary embodiment, pixel data system **110** receives a matrix size identifier for an entire frame, such that it can be determined that a uniform matrix size is used for each frame. Likewise, pixel data system **110** can receive matrix map data, such that a sequence of matrices and the size of each matrix can be determined. Likewise, pixel data system **110** can receive pixel data for each matrix, such as pixel data with each matrix identifier, pixel data in a predetermined order based on the order of matrix data transmitted, or other suitable data.

Display generation system **112** receives frames of data from pixel data system **110** and generates video data, audio data, graphical data, textual data, or other suitable data for use by a user. In one exemplary embodiment, display generation system **112** receives an entire frame of data after it has been reconstructed by pixel data system **110**. In another exemplary embodiment, display generation system **112** can receive frame data as it is generated by pixel data system **110** prior to the generation of the entire frame. Other suitable configurations can be used.

In operation, system **100** allows data transmission to be optimized so as to decrease bandwidth requirements. System **100** determines the optimal data for transmission based on the end use of the data. For example, system **100** can reduce the data transmitted for video display generation, such as by determining the level of detail required, and then transmitting data based on the level of detail required. Likewise, similar optimization processes can be used for audio data, graphical data, textual data, or other suitable data. Thus, system **100** is a lossy data transmission system, but can also be a lossless data transmission system depending on the data fields within a set of data for which lossy or lossless data transmission is desired. In this exemplary embodiment, system **100** allows data sets to be processed in a manner that allows data trans-

mission to be both lossless and lossy based on application criteria for the data on the receiving end.

System **100** can also be used in conjunction with a compression system, a frame elimination system, or with other suitable systems or processes to achieve further savings in bandwidth requirements. For example, after data optimization has been achieved, the optimized data can then be compressed using a lossy or lossless compression technique. Likewise, frame elimination can be used where such techniques do not result in an unacceptable decrease in the quality of the data at the receiving end.

FIG. **2** is a diagram of a system **200** for performing frame analysis in accordance with an exemplary embodiment of the present invention. System **200** includes frame analysis system **106** and pixel variation system **202**, matrix size system **204**, and matrix identification system **206**, each of which can be implemented in hardware, software, or a suitable combination of hardware and software, and which can be one or more software systems operating on a general purpose processing platform.

Pixel variation system **202** determines the level of detail required based on variations in pixel data. In one exemplary embodiment, pixel variation system **202** can receive pixel data values, such as (x/y/z) in a suitable pixel color pixel system (e.g., 16-bit values for R/G/B, Y/Cb/Cr, Y/U/V, or other suitable color data formats). Pixel variation system **202** can then compare two adjacent pixels to determine whether the amount of variation between those two adjacent pixels exceeds a predetermined tolerance, such that the amount of pixel data required to transmit image data or other suitable data for perception by a human eye or other suitable applications can be determined. In this exemplary embodiment, pixel variation system **202** can have a number of tolerance settings, so that a matrix size, region, or other data optimization set can be determined. For example, consider the following pixel set:

P1(121/34/187) P2(119/39/198) P3(117/42/202)

In this example, the variation between P1 and P2 may be lower than a first tolerance for the purposes of selecting a first data set, such as a 2×2 matrix, but the variation between P1 and P3 may be greater than a second tolerance for the purpose of selecting a second data set, such as a 3×3 matrix. In this manner, increasing groups of pixels can be analyzed so as to insure that desired levels of detail are not inadvertently omitted. For example, if video data includes an image of an essentially uniform object, such as the ocean or a grassy field, and where that essentially uniform object has details that are nonetheless of interest to the viewer, such as wave whitecaps or wildflowers, pixel variation system **202** can include tolerance settings such that variations between pixels that identify such details would be identified, but where such variations between two adjacent pixels within the field would be ignored. Likewise, other suitable pixel variation detection functionality can be provided.

Matrix size system **204** generates matrix size data based on pixel variation data. In one exemplary embodiment, matrix size system **204** can receive pixel variation data based on an analysis of an entire frame of data, such that a uniform matrix size can be assigned. Likewise, matrix size system **204** can receive pixel variation data from pixel variation system **202**, and can generate nonsymmetrical matrix dimensional data, such as N×M dimensions where "N" and "M" are integers that are not equivalent, circular region data, elliptical region data, amorphous region data, or other suitable region identification data. Matrix size system **204** can also generate matrix size control data, such as where a non-uniform matrix or region size is used within a frame. In this exemplary embodiment, matrix size system **204** can identify a sequence for matrices, coordinate data for matrices, size data for matrices, or other suitable data that can be used to assemble or sequence pixel data within matrices.

Matrix identification system **206** receives matrix size data and generates matrix identification data. In one exemplary embodiment, matrix identification system **206** can receive matrix sequence data, and can assemble the matrix sequence data for use with pixel data generated by pixel selection system **108**. In this exemplary embodiment, matrix identification system **206** can identify whether a uniform matrix size is being generated, the number of matrices within a frame, sequence data for the matrices when a non-uniform matrix or region is being used, or other suitable data. Matrix identification system **206** generates matrix identification data for use by data receiving system **104**, so as to allow data receiving system **104** to generate the optimized data display.

In operation, system **200** allows frames to be analyzed so as to determine the optimal data to be transmitted, based on the intended use of the frame. In one exemplary embodiment, pixel variation system **202** or other suitable systems can be used to identify lossy and lossless regions within the frame. Likewise, uniform lossy regions can be identified, such as matrices having predetermined dimensions of greater than 1×1 or other suitable data.

FIG. **3** is a diagram of a system **300** for selecting optimized pixel data for transmission in accordance with an exemplary embodiment of the present invention. System **300** includes pixel selection system **108** and pixel randomizer system **302**, pixel sequencer system **304**, and pixel identification system **306**, each of which can be implemented in hardware, software, or a suitable combination of hardware and software, and which can be one or more software systems operating on a general purpose processor platform.

Pixel randomizer system **302** selects a random pixel within a matrix or other region. In one exemplary embodiment, pixel randomizer system **302** can generate a random number and can select a pixel based upon a pixel sequence and the relationship of the generated random number to that pixel sequence. In this exemplary embodiment, pixel randomizer system **302** can generate a random number between 0 and 1, and can multiply that random number times the number of pixels within a region, and can then select the pixel based upon a pixel sequence from a predetermined location. Likewise, other suitable random pixel selection processes can be used. Pixel randomizer system **302** generates random pixel location data and random pixel value data.

Pixel sequencer system **304** generates pixel selection data based on pixel sequence data. In one exemplary embodiment, such as when a uniform frame matrix size is being used, pixel sequencer system **304** can select pixels in a predetermined order, such that if a 3×3 matrix is used uniformly across the frame, the pixel at location (1,1) is transmitted in the first frame, the pixel at location (1,2) is transmitted in the second frame, the pixel at location (1,3) is transmitted in the third frame, and so forth, until the pixel at location (3,3) has been transmitted, after which the pixel at location (1,1) will be transmitted. Pixel sequencer system **304** can likewise send other suitable sequences, such as skipping every other pixel, skipping pixels based on predetermined display generation characteristics, or other suitable sequences.

Pixel identification system **306** generates pixel identification data, such as may be required by a data receiving system to illuminate the pixel in a display. In one exemplary embodiment, pixel identification system **306** can identify the coordinates of a pixel where generation of the pixel by the data receiving system at the exact location is desired. Likewise, pixel identification system **306** can identify a uniform pixel

location within each matrix or other region, such as location (1,1) for all matrices, such as randomizer control data that will randomly place a pixel within a matrix or region, or other suitable pixel identification data.

In operation, system **300** allows a pixel within a matrix or other suitable region to be selected based on data optimization. System **300** allows random, sequenced, or other suitable processes to be used to select and locate pixels within optimized regions.

FIG. **4** is a diagram of a system **400** for generating a frame in accordance with an exemplary embodiment of the present invention. System **400** includes pixel data system **110**, matrix definition system **402** and pixel location system **404**, each of which can be implemented in hardware, software, or a suitable combination of hardware and software, and which can be one or more software systems operating on a general purpose processor platform.

Matrix definition system **402** receives matrix definition data for use in generating frame data. In one exemplary embodiment, matrix definition data can include data that identifies a uniform matrix size throughout the frame. In another exemplary embodiment, matrix definition data can include data that identifies matrix dimensions and sequences, so that a sequence of non-similar matrices can be assembled into a frame. Likewise, matrix definition system **402** can include region definition data, such as for ellipses, circles, amorphous shapes, or other suitable definition data.

Pixel location system **404** receives pixel location data for locating a pixel within a matrix or other region. In one exemplary embodiment, pixel location system **404** can receive data that locates pixels for each matrix within a frame on a uniform basis, such that each pixel received will be generated in a predetermined location (e.g. (1,1) in a 3×3 matrix). Likewise, pixel location system **404** can receive randomization data, such that the location of a pixel within a matrix or other region is randomly assigned. In yet another exemplary embodiment, pixel location system **404** can receive exact coordinates for placement of pixels. Other suitable processes can be implemented by pixel location system **404**.

In operation, system **400** is used to locate pixels of data within a matrix or other region in an optimized data transmission system. System **400** thus allows optimized data, such as video data, audio data, or other suitable data, to be used to generate a display, an audio stream, graphic images, textual data, and other suitable data on a frame by frame basis.

FIG. **5** is a flow chart of a method **500** for optimizing data transmission in accordance with an exemplary embodiment of the present invention. Method **500** begins at **502** where a matrix size is determined. In one exemplary embodiment, the matrix size can be uniformly assigned across the frame, a matrix size can assigned based upon regions within the frame, a region other than a matrix can be used, or other suitable matrix sizes or region sizes can be determined. The method then proceeds to **504**.

At **504** a pixel within the matrix is selected. In one exemplary embodiment, the pixel can be selected based on a predetermined location within the matrix, such as when uniform matrix sizes are used within a frame, or in other suitable manners. In another exemplary embodiment, pixel selection can be performed based on random selection, based upon predetermined rules regarding selection of pixels, or in other suitable manners. The method then proceeds to **506**.

At **506** the matrix and pixel data is transmitted. In one exemplary embodiment, the matrix and pixel data can be transmitted in pairs, such that each set of matrix definition data or location data is paired with corresponding pixel brightness data. Likewise, matrix data and pixel data can be transmitted in sequence, such that the sequence of matrix data is received first, and the sequence of pixel data for each corresponding matrix is then received. Other suitable transmission sequences can likewise be used. The method then proceeds to **508**.

At **508** the matrix and pixel data is assembled into a frame. In one exemplary embodiment, the frame assembly can be performed on a line-by-line basis, such that each line of data can be generated as it is created. In another exemplary embodiment, an entire frame of data can be generated prior to utilization of the frame of data. The method then proceeds to **510**.

At **510** a display is generated using the matrix and pixel data. As previously described, the display can be generated from an entire frame data set after it has been completed. Likewise, the display can be generated on a line-by-line basis, audio streams or graphical displays can be generated, or other suitable displays can be generated. The method then proceeds to **512**.

At **512** it is determined whether a frame is completed. If the frame is not completed the method returns to **508**. Otherwise the frame is complete, the method proceeds to **514** and the method proceeds to the next frame.

FIG. **6** is a flowchart of a method **600** for determining or assigning matrix or region size based on an exemplary embodiment of the present invention. Method **600** begins at **602** where a pixel variation is determined. In one exemplary embodiment, the pixel data values for two adjacent pixels can be compared, and it can be determined whether the variations between the two adjacent pixel data values exceed predetermined allowable variations. The suitable variation techniques can be implemented. The method then proceeds to **604**.

At **604** it is determined whether the variation is greater than a predetermined tolerance. If it is determined at **604** that the variation is greater than the tolerance the method proceeds to **606** where the matrix size is assigned based on the number of pixels under consideration. In one exemplary embodiment, if a first and second pixel have been compared and it is determined that the variation between pixels exceeds the tolerance, then a matrix size of 1×1 (i.e., an individual pixel), can be transmitted such that data transmission is lossless. If it is determined that the variation is not greater than the tolerance, the method proceeds to **608**.

At **608**, the next pixel is selected. In one exemplary embodiment, the next pixel can be selected based upon an N×N matrix size, an N×M matrix size, a circular region size, an elliptical region size, an amorphous region size, or other suitable regions. The method then proceeds to **610**.

At **610** the tolerance is modified. In one exemplary embodiment, the tolerance can be modified with each increasing region size, such that smaller tolerances are imposed for larger regions. Likewise, a maximum region size can be imposed such that the tolerance is set to zero. Likewise, if it is determined at **604** that the maximum region size has been reached, the method can proceed directly to **606**. After the tolerance is modified at **610**, the method returns to **602**.

In operation, method **600** allows a matrix or other suitable region size to be determined based upon pixel variations. In one exemplary embodiment, pixel variation can be determined at **602** on a frame basis, such that a first tolerance is set for having uniform matrices of 2×2 size, a second tolerance is set for having uniform matrices of a 3×3 size, and other suitable tolerances can be used. Likewise, tolerances can be set and regions can be determined based on a region-by-region basis, such that in areas having low information consent, the matrix size is increased whereas in areas having high information content the matrix size is decreased. In one

exemplary embodiment, the matrix size can be decreased to 1×1, such that in areas having high information content, the data transmission can be lossless, but in areas having low information content, the data transmission can be lossy.

FIG. **7** is a flowchart of a method **700** for selecting a pixel within a region in accordance with an exemplary embodiment of the present invention. Method **700** begins at **702** where matrix or other region data is received. In one exemplary embodiment, the matrix data can include a matrix size, a region size, a region boundary for amorphous regions, or other suitable data. The method then proceeds to **704**.

At **704**, it is determined whether random or sequencing selection is being used for selecting the pixel data. If it is determined that sequencing data is used, the method proceeds to **706** where the sequence data is obtained. In one exemplary embodiment, such as where a uniform matrix size is used within the frame, a sequence of pixels can be used such that the pixels are "swept" across the matrix. Likewise, other suitable sequence data can be used. After the sequence is obtained at **706** the method proceeds to **708** where a pixel is selected based on the sequence data. The pixel data for the matrix is then stored.

Likewise, if it is determined at **704** that a random pixel selection is being used, the method proceeds to **710** where a random number is generated. The method then proceeds to **712**.

At **712** a pixel is selected based on a random number. In one exemplary embodiment, a random number generated between 0 and 1 can be multiplied by the number of pixels within the matrix or region, and a predetermined sequence can be used to select the pixel. Likewise, the pixel data values can be randomly identified or other suitable random selection processes can be used.

In operation, method **700** allows pixel data within a matrix or other region to be selected, which are based on sequencing, random selection, or in other suitable manners. Method **700** allows pixel data for optimized data applications to be used, such as where video data having low information content and regions of high information content are being transmitted or in other suitable applications.

FIG. **8** is a flowchart of a method **800** for generating optimized frame data in accordance with an exemplary embodiment of the present invention. Method **800** begins at **802** where matrix and pixel data are received. In one exemplary embodiment, the matrix and pixel data can include a standard or uniform matrix size and a sequence of pixels for the frame. In another exemplary embodiment, the matrix and pixel data can include a sequence of matrix sizes that define a frame and a sequence of pixels for generation within each matrix. In yet another exemplary embodiment, the matrix and pixel data can be region and pixel data, such as where the region data defines one or more regions within a frame and the pixel data includes points that go within that region. Other suitable data can also be used, such as audio data, graphical data, text data, or other suitable data. The method then proceeds to **802**.

At **802** the matrix and pixel data are combined into a frame. In one exemplary embodiment, the frame can be generated on a line-by-line basis, such that the matrices are assembled in rows and that the pixel for each matrix are assigned after a row is complete. In this exemplary embodiment, such as where matrix sizes exceed 2×2, then assembling a row of matrices can result in the assembly or two or more lines of data, such as where video data is generated by scanning lines from the top of a display to the bottom of a display. In this exemplary embodiment, the frame can be generated as each line is completed. The method then proceeds to **804**.

At **804** it is determined whether the frame has been completed. In one exemplary embodiment, an entire frame of data can be constituted prior to generation of the frame. Likewise, in another exemplary embodiment, the data can be generated on a line-by-line basis, so that the data does not need to be buffered until a complete frame is generated. Other suitable processes can also be used. If it is determined at **804** that the frame is not complete, the method returns to **800**. Otherwise, the method proceeds to **804** and advances to the next frame.

In operation, method **800** allows frames of data, such as video data, audio data, graphical data, textual data, or other suitable data, to be generated in an optimized manner, such that lossy, lossless, or a combination of lossy and lossless data transmission is used based upon the end use of the data. In this exemplary embodiment, uniform or non-uniform matrices or regions can be used, such that only one of two or more points of data within a data set for each region needs to be transmitted.

FIG. **9** is a diagram **900** showing an exemplary uniform matrix segmentation of an array of pixel data. Each matrix of the array is of uniform size, such as 4×4. Thus, the matrix size data for the entire frame can be represented by a single data set.

In the first row of matrices, the location "X" of a single pixel of data is identical (e.g. (2,2)), such as where the location of the pixel in each matrix is based on sequential data. In the second row, the location of the pixel in each matrix is different, such as where the location of the pixel in each matrix is random. In this exemplary embodiment, the matrix data can include the single uniform size (e.g. 4×4), the pixel location data can include the location of the pixel in each matrix (e.g. (2,2), "random," or the coordinates of each pixel starting with the first matrix and sweeping across from left to right until the last matrix in the last row is reached (e.g. (4,1) (1,4), (3,2), (3,4)) and the pixel data for each matrix can include the (X/Y/Z) data, such as where the pixel is a color pixel. Likewise, other suitable data can be used.

FIG. **10** is a diagram **1000** showing an exemplary non-uniform matrix segmentation of an array of pixel data. Each matrix of the array can be of different size, but the matrices must form the array when combined. In each matrix, the location of the pixel in each matrix is different, such as where the location of the pixel in each matrix is random. In this exemplary embodiment, the matrix data can include the size of each matrix in series, starting from the first matrix and sweeping across from left to right until the last matrix is reached (e.g. (7×3), (5×6), (5×4), (7×7), (2×3), (2×7)), the pixel location data can include the location of the pixel in each matrix (e.g. (2,2), "random," or the coordinates of each pixel starting with the first matrix and sweeping across from left to right until the last matrix in the last row is reached (e.g. (2,1), (4,4), (2,2), (5,6), (2,2), (2,2)), and the pixel data for each matrix can include the (X/Y/Z) data, such as where the pixel is a color pixel. Likewise, other suitable data can be used.

Although exemplary embodiments of a system and method of the present invention have been described in detail herein, those skilled in the art will also recognize that various substitutions and modifications can be made to the systems and methods without departing from the scope and spirit of the appended claims.

What is claimed is:

1. A system for transmitting data transmission comprising:

a analysis system receiving frame data and generating region data comprised of high detail and or low detail;

a pixel selection system receiving the region data and generating one set of pixel data for each region forming a new set of data for transmission;

a data receiving system receiving the region data and the pixel data for each region and generating a display;

wherein the data receiving system comprises a pixel data system receiving matrix definition data and pixel data and generating pixel location data;

wherein the data receiving system comprises a display generation system receiving pixel location data and generating display data that includes the pixel data placed according to the location data.

2. The system of claim **1** wherein the frame analysis system comprises a matrix size system receiving pixel variation data and generating matrix size data.

3. The system of claim **1** wherein the frame analysis system comprises a matrix identification system receiving matrix size data and generating matrix identification data.

4. The system of claim **1** wherein the pixel selection system comprises a pixel Randomizer system receiving two or more sets of pixel data for each region and randomly selecting one of the two or more sets of pixel data.

5. The system of claim **1** wherein the pixel selection system comprises a pixel sequencer system receiving two or more sets of pixel data for each region and selecting one of the two or more sets of pixel data based on sequence data.

6. The system of claim **1** wherein the pixel selection system comprises a pixel identification system generating pixel location data based on a location of the set of pixel data associated with each of the regions.

7. A method for transmitting data comprising:

receiving frame data;

generating optimized matrix data from the frame data;

selecting one of two or more sets of pixel data based on the optimized matrix data;

wherein receiving frame data comprises receiving an array of pixel data;

wherein generating the optimized matrix data from the frame data comprises setting a matrix size based on pixel selection data;

and transmitting the selection pixel data and the optimized matrix data by assembling the optimized matrix data and the selection pixel data into a generated display frame.

8. The method of claim **7** wherein selecting one of two or more sets of pixel data comprises selecting the pixel from a matrix of sets of pixel data.

9. The method of claim **7** wherein transmitting the pixel data and the matrix data comprises transmitting an array of pixel data and uniform matrix size data.

10. A method for transmitting data comprising:

dividing an array of pixel data into two or more regions;

selecting a set of pixel data from each region;

wherein dividing the array of pixel data comprises dividing the array of pixel data into two or more matrices having a uniform size;

wherein dividing the array of pixel data comprises dividing the array of pixel data into two or more matrices having two or more different sizes;

and transmitting the region data and the selection pixel data for each region by assembling the region data and the selection pixel data into a generated display frame.

11. The method of claim **10** wherein selecting the set of pixel data from each region comprises selecting a random set of pixel data.

12. The method of claim **10** wherein transmitting the region data and the pixel data for each region comprises transmitting matrix data and the pixel data for each matrix.

13. The system of claim **1** wherein the frame analysis system comprises a pixel variation system receiving two or more sets of pixel data and generating the region data based on pixel variation data from the two or more sets of pixel data.

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