UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NEARMAP US, INC.,
Petitioner

v.

EAGLE VIEW TECHNOLOGIES, INC.,
Patent Owner

Case IPR2024-00716
Patent 10,671,648

EXPERT DECLARATION OF CYRUS SHAHABI PHD IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 10,671,648

TABLE OF CONTENTS

I. INTRODUCTION 2
II. BACKGROUND AND QUALIFICATIONS 3
III. PRIORITY DATE AND ONE OF ORDINARY SKILL 5
IV. MATERIALS RELIED UPON 7
V. BACKGROUND ON THE STATE OF THE ART 7
VI. THE '648 PATENT 20
A. Overview of the '648 Patent 20
B. Overview of the '648 Patent Prosecution History 26
C. Claim Construction of the '648 Patent Claims 27
VII. THE CHALLENGED CLAIMS ARE INVALID 29
A. Legal standards 29
B. Ground 1: Harris anticipates Claims 1, 2, 4, 5, 6, 9, 12, 13, and 15; Ground 2: Harris renders obvious Claims 1, 2, 4, 5, 6, 9, 12, 13, and 15; Ground 3: Harris in view of Florance renders obvious Claims 9-10, 12, 13, and 15; Ground 4: Harris in view of Florance and Salvagio renders obvious Claim 11 34
1. Overview of "Geo-Temporal Indexing and Searching"—U.S. Patent No. 9,501,507 B1 ("Harris") 35
2. Overview of "System and Method for Associating Aerial Images, Map Features, and Information"—U.S. Patent Application Publication No. 2009/0132316 A1 ("Florance") 40
3. Overview of "Insurance Claim Processing"—U.S. Patent No. 8,401,877 B2 ("Salvagio") 40
4. Harris, Florance, and Salvagio Are Analogous Art 42
C. Claim 12 Is Anticipated by or Rendered Obvious Over Harris or Rendered Obvious Over Harris in View of Florance. 46
1. Element 12.pre (the preamble of claim 12) 49
2. Element 12.a 55
3. Element 12.b 85
4. Element 12.c 93

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00002

5. Element 12.d 115
6. Element 12.e....126
D. Claim 13 is Anticipated or Rendered Obvious Over Harris, or Alternatively, is Rendered Obvious Over Harris in View of Florance 135
E. Claim 15 is Anticipated by or Rendered Obvious Over Harris, or Alternatively, is Rendered Obvious Over Harris in View of Florance 138
F. Claim 1 Is Anticipated by or Rendered Obvious Over Harris 147
1. Element 1.pre (the preamble of claim 1) 147
2. Element 1.a....151
3. Element 1.b 153
4. Element 1.c....153
5. Element 1.d 154
G. Claim 2 Is Anticipated by or Rendered Obvious Over Harris 155
H. Claim 4 Is Anticipated by or Rendered Obvious Over Harris 156
I. Claim 5 Is Anticipated by or Rendered Obvious Over Harris 161
J. Claim 6 Is Anticipated by or Rendered Obvious Over Harris 164
K. Claim 9 Is Anticipated by or Rendered Obvious Over Harris, or Alternatively, Is Rendered Obvious Over Harris in view of Florance 170
1. Element 9.pre (the preamble of claim 9) 170
2. Element 9.a....171
3. Element 9.b 171
4. Element 9.c....174
5. Element 9.d 175
6. Element 9.e....178
7. Element 9.f....179
8. Element 9.g 181
L. Claim 10 Is Rendered Obvious Over Harris in View of Florance 182
1. Element 10.pre (the preamble of claim 10) 182

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00003

2. Element 10.a....183
3. Element 10.b....188
4. Element 10.c....195
M. Claim 11 Is Rendered Obvious Over Harris in view of Florance and Salvagio....197
1. Element 11.pre (the preamble of claim 11)....197
2. Element 11.a....198
3. Element 11.b....204
4. Element 11.c....213
VIII. SECONDARY CONSIDERATIONS....215
IX. CONCLUSION....216

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00004

I, Cyrus Shahabi, Ph.D., hereby declare under penalty of perjury:

I. INTRODUCTION

1. I have been retained by Groombridge, Wu, Baughman & Stone LLP, on behalf of Nearmap US, Inc. ("Nearmap") to provide assistance regarding U.S. Patent No. 10,671,648 ("the '648 patent"). Specifically, I have been asked to consider the validity of claims 1-2, 4-6, 9-13, and 15 of the '648 patent (the "Challenged Claims"). Except as otherwise indicated, I have personal knowledge of the facts and opinions set forth in this declaration, and believe them to be true. If called upon to do so, I would testify competently thereto.

2. I am being compensated for my time at a rate of $600 per hour. I will be reimbursed for the expenses that I incur in the course of this work. My compensation is not contingent upon the results of my study, the substance of my opinions, or the outcome of any proceeding involving the Challenged Claims. I have no financial interest in the outcome of this matter or in the pending litigations involving Eagle View Technologies, Inc. and Pictometry International, Corp. (together, "EagleView" or "Patent Owner") or Nearmap US, Inc., Nearmap Australia Pty Ltd, and Nearmap Pty Ltd.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00005

II. BACKGROUND AND QUALIFICATIONS

3. I offer statements and opinions on behalf of Nearmap, generally regarding the validity, novelty, prior art, obviousness considerations, and understanding of a person of ordinary skill in the art as it relates to the '648 patent.

4. Much of my educational training as well as my decades of contributions to the field of geospatial information management and teaching computer science—specifically geospatial information management and spatial and temporal databases, and various database management subjects—are relevant to the subjects of this declaration.

5. In 1989, I earned a Bachelor of Science degree in Computer Engineering from the Sharif University of Technology. In 1993, I earned a Master of Science degree in Computer Science from the University of Southern California. And in 1996, I earned a Doctor of Philosophy in Computer Science from the University of South California.

6. Since earning my doctorate, I have taught at the University of Southern California, where I am a Professor of Computer Science, Electrical and Computer Engineering, and Spatial Sciences. I have taught various database management courses since 1997. For example, I teach and have taught since 2007 geospatial information management. From 2000-2002, I taught a spatial and temporal database course.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00006

7. At the University of Southern California, I have been Director of the Information Laboratory of the Thomas Lord Department of Computer Science since 1997; Director of the Integrated Media Systems Center since 2010; and Helen N. and Emmett H. Jones Professor of Engineering since 2019. And from 2014 to 2018, I also served the university as Director of the Data Science (Informatics) Program and, from 2017 to 2022, Chair of the Thomas Lord Department of Computer Science.

8. I have received numerous awards throughout my career. In 2003, I was awarded the Presidential Early Career Award for Scientists and Engineers by President George W. Bush. I am also a recipient of the ACM Distinguished Scientist Award in 2009, the NSF CAREER award in 2002, and the 2001 Okawa Foundation Research Award. I also received the US Vietnam Education Foundation (VEF) faculty fellowship award in 2011 and 2012, and organized the 2011 National Academy of Engineering "Japan-America Frontiers of Engineering" program. I was invited as speaker in the 2010 National Research Council (of the National Academies) Committee on New Research Directions for the National Geospatial-Intelligence Agency, and a participant in the 2005 National Academy of Engineering "Frontiers of Engineering" program.

9. I am a fellow of both the Institute of Electrical and Electronics Engineers and the National Academy of Inventors. I have authored two books and

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00007

more than 300 research papers in databases, GIS, and multimedia and am a named inventor on 14 U.S. patents.

10. Additionally, I was the co-founder of Geosemble, a company that designed databases and applications that utilize geo-temporal information, including storage and querying of such information. I have also been employed as an advisor and consultant for various companies advising on geo-temporal database technology, including Google, Tilofy, and Terrago, among others.

11. Attached hereto as **Appendix A** is a true and correct copy of my Curriculum Vitae describing my background and experience and includes a list of my publications and presentations.

III. PRIORITY DATE AND ONE OF ORDINARY SKILL

12. I understand that a person of ordinary skill in the art ("POSITA") is a hypothetical person who is presumed to have known the relevant art at the time of the invention. I understand that POSITA is also a person of ordinary creativity, who in many cases will be able to fit the teachings of multiple patents or printed publications together. I further understand that the factors that may be considered in determining the level of ordinary skill in a particular field of art include (1) the level of education and experience of those working in the field, (2) the types of problems encountered in the field, and (3) the sophistication of the technology at the time of the invention, which I understand EagleView asserts to be at least as early

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00008

as February 22, 2016. I understand that not every factor may be present in every case. I understand that POSITA is not a specific real person, but rather is a hypothetical person having the qualities reflected by the above-discussed factors. I further understand that POSITA would have knowledge from the teachings of the prior art, including the art cited herein.

13. In my opinion, on or before February 22, 2016, POSITA relating to the technology of the '648 patent would at minimum have a bachelor's degree or higher in computer science, computer engineering, or an equivalent educational background, or at least five years of industry experience in software development.

14. I base this opinion (1) on the level of training I believe is required to practice the concepts stated in the Challenged Claims, and which are described in the prior art; (2) on my decades of experience teaching and contributing to geospatial information management and spatial and temporal databases; and (3) on acting as an advisor and consultant (including to persons of ordinary skill) in that work.

15. Well before February 22, 2016, my level of skill in the art was at least that of POSITA. I am qualified to provide opinions concerning what such POSITA would have known or understood as of that time. Unless otherwise stated, my analysis and conclusions provided herein are from the perspective of POSITA as of that date.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00009

IV. MATERIALS RELIED UPON

16. In reaching the conclusions described in this declaration, I have relied on the documents and materials cited in this Declaration and those identified in **Appendix B**. These materials are patents, related documents, and printed publications. Each of these is a type of document that experts in my field would reasonably rely upon when forming their opinions.

17. My opinions are also based on my education, training, knowledge, and personal and professional experience.

V. BACKGROUND ON THE STATE OF THE ART

18. In my opinion, prior to February 22, 2016, the prior art disclosed aggregating data that is associated with a geographic location identifier and a time identifier, receiving a query regarding a geographic location and including time information, retrieving data items matching the query, and outputting those retrieved data items.

19. As discussed below (*infra* ¶¶20-25), in my opinion, ***aggregating data associated with a geographic location identifier and time identifier and associated with all geographic points on the earth, where the information is captured from distributed data sources and integrated into a centralized database that may be queried*** were well known prior to February 22, 2016.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00010

20. For example, U.S. Patent No. 9,501,507 ("**Harris**"), filed December 27, 2012, entitled "Geo-Temporal Indexing and Searching," discloses systems and methods for "facilitating low latency searches of ***large and dynamic data sets that include geo-temporal data***." *E.g.*, EX1004 (**Harris**), 2:1-3.[1] Harris's disclosed "geo-temporal data" includes both a geo-spatial component (including, *e.g.*, longitude and latitude) and a temporal component, disclosing that "'geotemporal data' refers to any input data that includes one or more ***values representing a geospatial component and one or more values representing a temporal component***," including, *e.g.*, "numerical values specifying a ***longitude and latitude*** *or any other representation of a* ***geographical location***," and "***one or more points in time***," including, *e.g.*, "years, months, days, hours, etc." *E.g.*, EX1004 (**Harris**), 5:62-6:3, 7:60-62.

21. In my opinion, Harris thus discloses aggregating data associated with a geographic location identifier and time identifier: "a data analysis system for analyzing data ***object collections*** that include ***geo-temporal data***," which (1) "may be obtained from... ***multiple disparate data sources***" like "network traffic logs, bank transaction records, phone call records, crime data, or ***any other data that includes both a geospatial and temporal component***" and includes, for example, data such

[1] All emphases and annotations herein added unless otherwise noted.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00011

as "values representing longitude and latitude" and "one or more values indicating a point in time or range of time"; and (2) "is ***received and indexed in a data repository***." *E.g.*, EX1004 (**Harris**), Abstract, 1:21-37, 2:50-67, 3:1-11, Figs.1 ("Data Repository" storing "input data 102" obtained from "Data Source(s)," including "geo-temporal data"; "Adaptor(s)" "configured to ingest geo-temporal data" and "Importer" to produce "key-value pairs 110"), 3:

FIG. 1

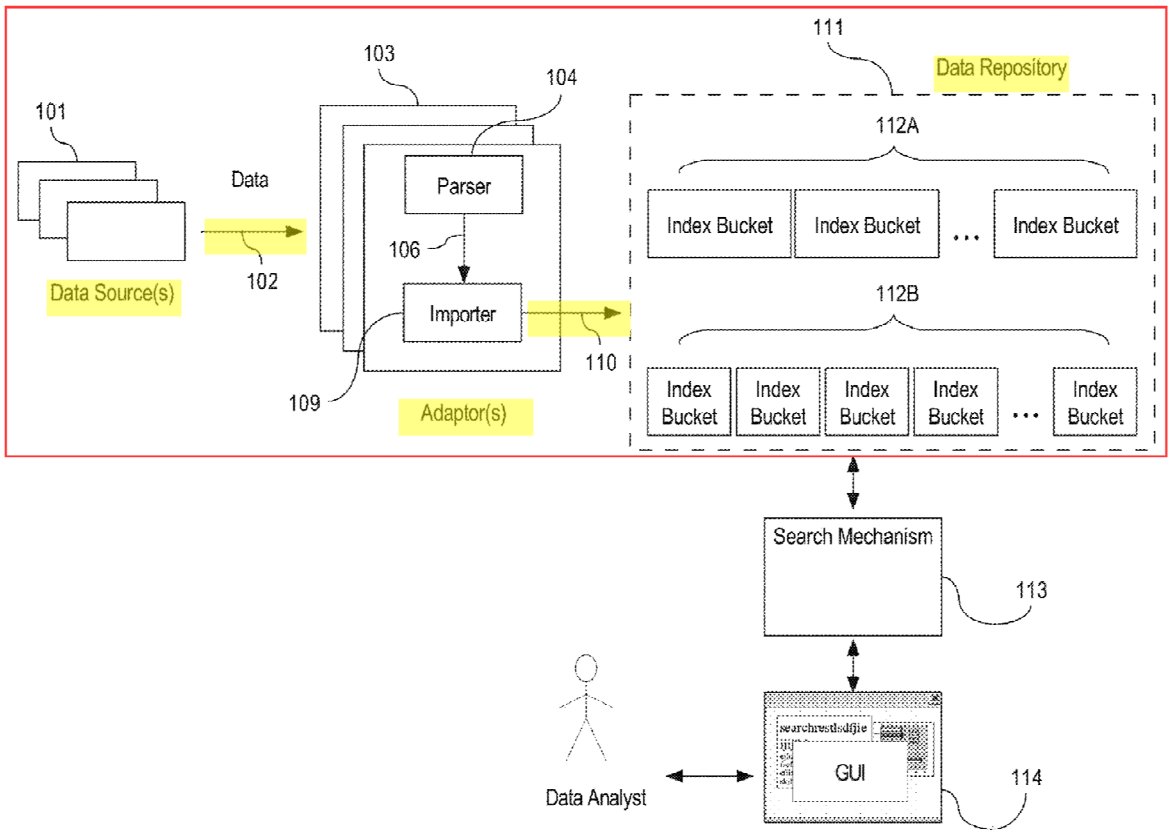
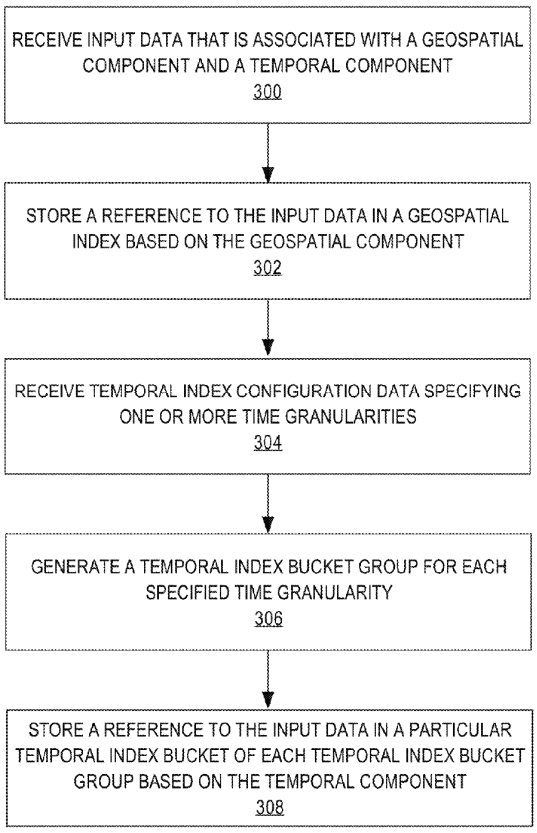


FIG. 3



22. U.S. Patent Application 2009/0132316 ("**Florance**"), published May 21, 2009, is entitled "System and Method for Associating Aerial Images, Map Features, and Information," and discloses a system that aggregates geo-spatial and temporal data, including "a ***comprehensive database of information***… relevant to commercial real estate transactions" "***obtained and assimilated [from] over 50 proprietary databases***." *E.g.*, EX1005 (**Florance**), ¶¶55, 101, 102. Florance discloses, *e.g.*, storing information about a particular "property" such as "latitudes and longitudes associated with the property," "the block/lot of the property, and the

parcel number," as well as providing a "history" of the property. *E.g.*, EX1005 (**Florance**), ¶¶93, 304 ("data mining applications… ensure that core data warehouse… contains up-to-date information"), 397, 602 ("assessor parcel number, legal description, address"), 611, Fig.1 (showing "Data Sources" and "Core Data Warehouse" (*i.e.*, database of aggregating geospatial and temporal information)):

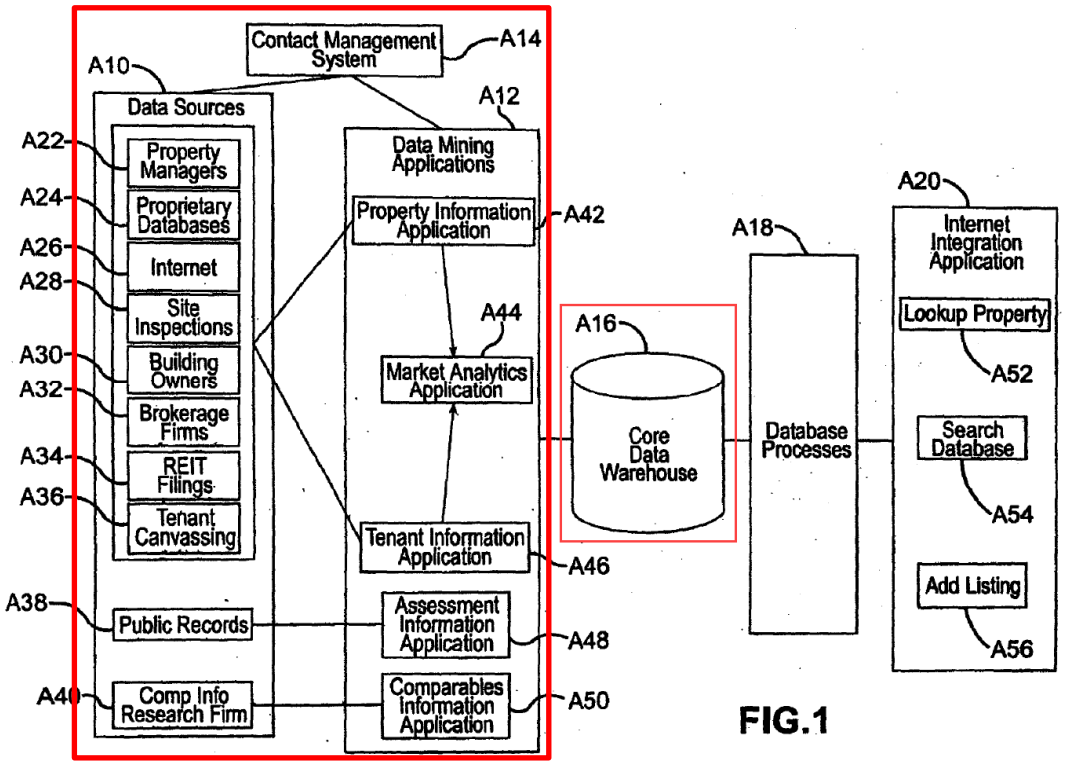


FIG.1

23. U.S. Patent 8,260,775 ("**Salvagio**"), issued March 19, 2013, and entitled "Insurance Claim Processing," discloses aggregating data associated with a geographic location identifier, including a method and system for "access[ing] information about one or more properties," including a "property database" searchable by geographic location identifiers like "street address, city, state, ZIP code." *E.g.*, EX1006 (**Salvagio**), Abstract, 10:48-55.

24. U.S. Patent No. 8,260,775 ("**Ahn**"), which issued September 4, 2012, is entitled "Geotemporal Search," and disclosed a system for aggregating data associated with a geographic location identifier and time identifier including "***upload[ing content]***" from "a ***content provider***" to a "***search database***," and "search results… ***includ[ing] associated metadata indicating a relationship with a location and time***…." EX1007 (**Ahn**), 2:29-31, 4:58-5:4, Fig.3:

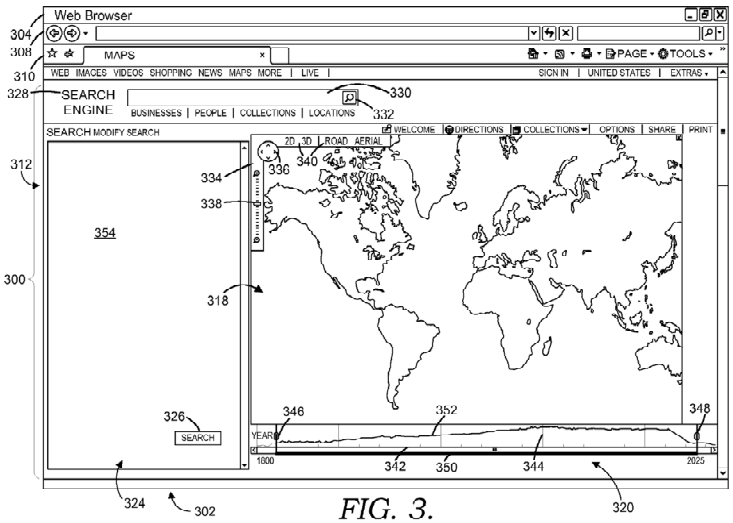


FIG. 3.

25. Thus, prior to February 22, 2016, aggregating information associated with a geographic location identifier and a time identifier was widely known.

26. As I discuss immediately below with respect to claim 12, for example, the '648 patent's other claimed steps were well-known long before its priority date, and the claims as a whole were anticipated or would have been obvious.

27. ***Receiving a query regarding a geographic location and/or including time information***, ***retrieving data items matching the query, and outputting the retrieved data items*** were also well known prior to February 22, 2016.

28. For example, Harris discloses querying geographic location and time information, retrieving matching data items, and outputting the retrieved data items. Harris state that its "system allows a data analyst to ***specify… geo-temporal queries that include both [a] geospatial component and a temporal component***… and ***retrieve[s] data items*** based on temporal index bucket groups" and "provides as output a set of search results." *E.g.*, EX1004 (**Harris**), Abstract, 4:44-59 ("***geo-temporal queries that specify one or more geospatial search parameters*** [*e.g.*, "latitude and longitude values that define a geographical area," *E.g.*, EX1004 (**Harris**), 6:67-7:1] corresponding to geographical areas of interest ***and one or more temporal search parameters*** corresponding to points in time or time ranges of interest"), 9:38-46, 10:24-48 ("results returned from each of the temporal index buckets are those ***results that satisfy the geospatial component of the query***"), 10:59-11:9 ("***retrieving any data objects*** from either or both of the two index buckets ***that satisfy any geospatial component of the query***") Fig.1 (double arrow indicating data retrieval), Fig.4:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00016

FIG. 1

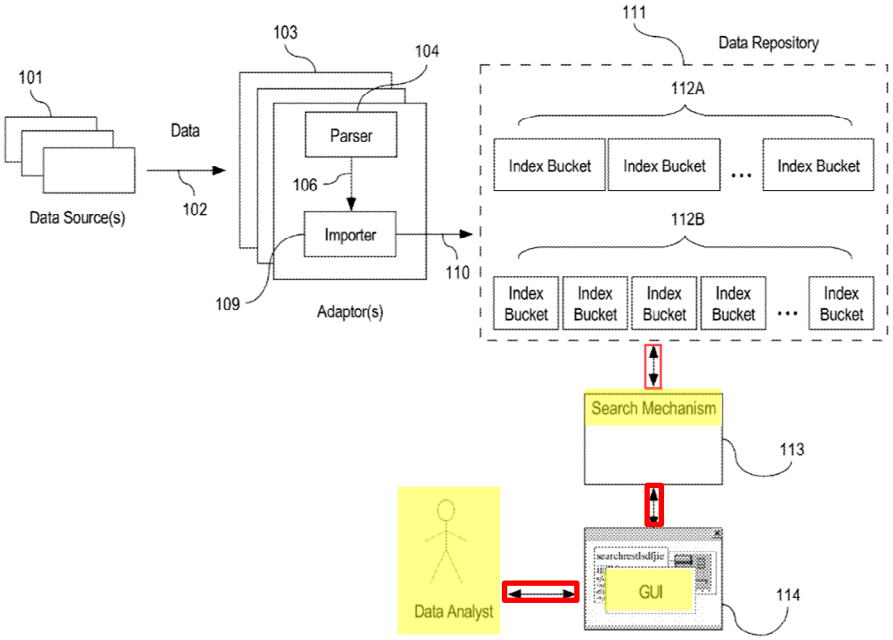
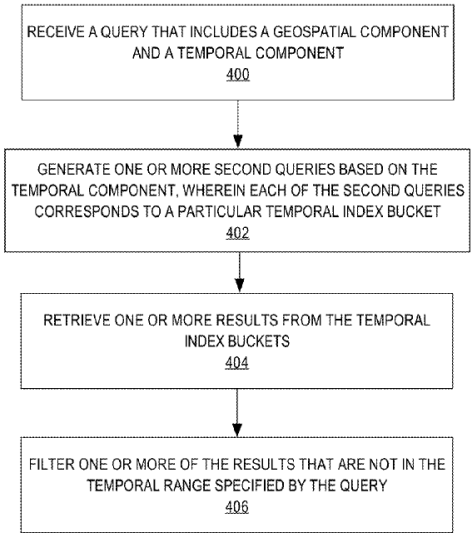


FIG. 4



29. Additionally, Florance disclosed searching by geographic location and time and retrieving/outputting matching items: a "database searchable by…

parameters such as ***location***" and "***geographically pertinent information***" (*E.g.*, EX1005 (**Florance**), ¶¶61, 80, 85 ("based on market criteria (e.g., *geographic region*) and information type"), 264 ("user selects… search area by *drawing... on a map*")), including ***time*** (*id*., ¶533 (search results showing "graph plotting three-year vacancy rates for the properties meeting the search criteria," including drop down menu for selecting temporal parameters (*e.g.*, range of years), thus disclosing a query including time information because Florance's disclosed drop down menu for selecting temporal parameters (*e.g.*, a range of years, such as "3 Years") because the drop down menu allows users to select a time period of interest for displaying data items stored in Florance's database, in response to which Florance displays only those data items having time information matching the user-selected drop down menu time period), Fig.104 (selectable dropdown menu showing "3 Years" time period)) and ***outputting the results***:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00018

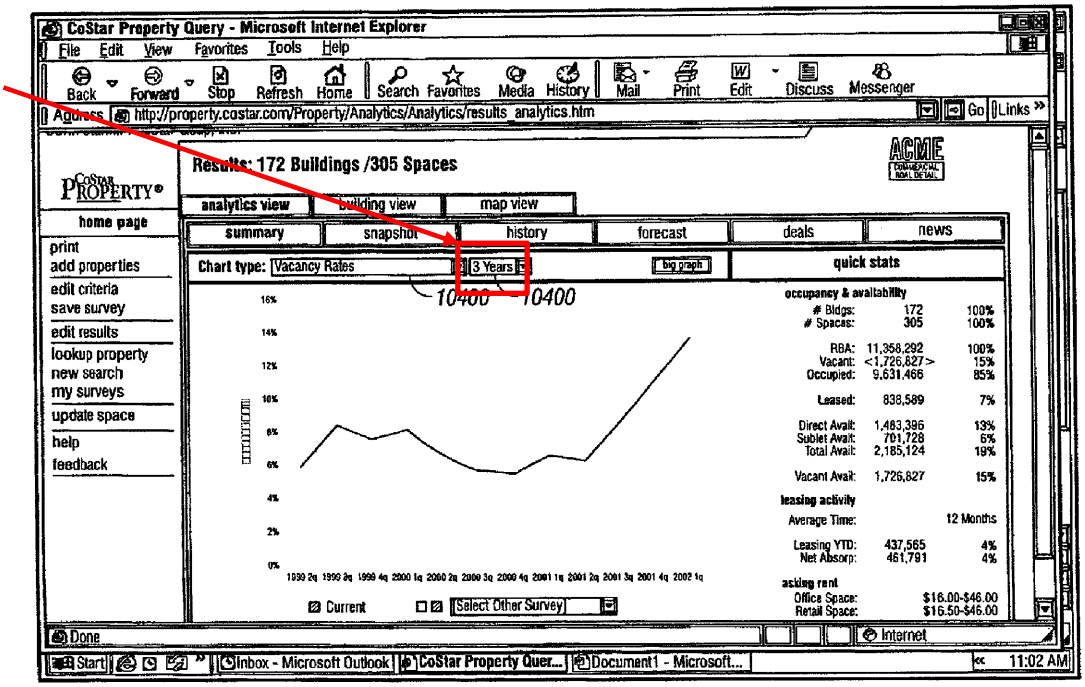


FIG. 104

30. Additionally, Salvagio disclosed, *e.g.*, searching by geographic location and retrieving/outputting matching results: "one or more ***databases… searched based on the user input***"—*e.g.*, "***user input identifying one or more properties***," including, *e.g.*, "a street address, city, state, zip code" (*E.g.*, EX1006 (**Salvagio**), 10:48-54, Fig.14), and "***display[ing]***" "***information corresponding to each of the one or more properties found in the search…***, enabling the user to access and ***view the results*** of the searching step." *E.g.*, EX1006 (**Salvagio**), 10:48-57, 11:19-21 ("searching a database based on the user input, locating and ***retrieving records about the property***"), Figs.12a, 14 (showing user interface for searching and viewing property records):

FIG. 14

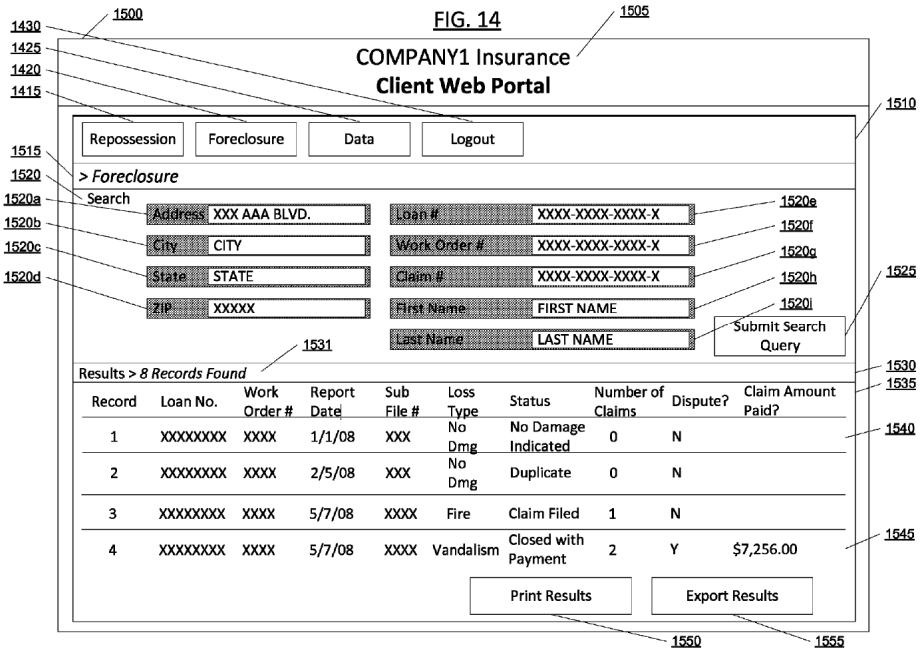
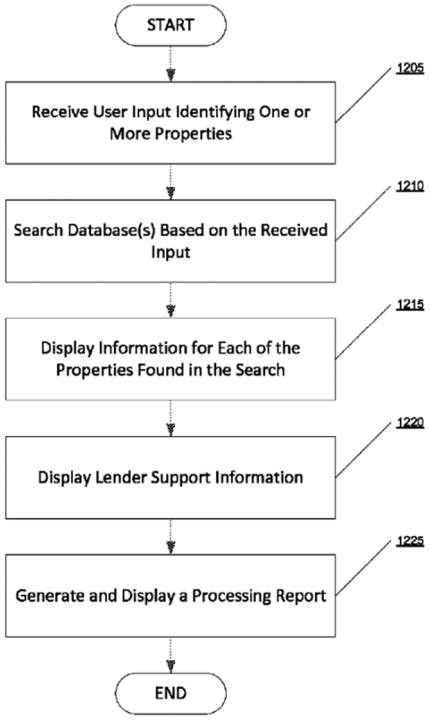
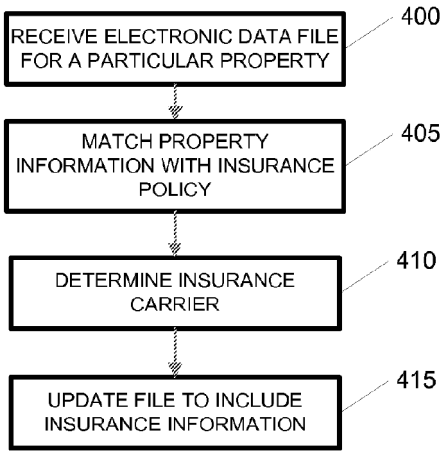


FIG. 12a



31. Salvagio further disclosed storing "property-specific information" such as "the current location of the property," and "insurance carrier, insurance policy number, the effective date of insurance, the maximum amount of coverage under the policy, the person who procured the insurance, [and] the expiration date of the policy." *E.g.*, EX1006 (**Salvagio**), 6:5-19, 11:11-32, Fig.4 (showing "insurance policy" and "insurance information" related to "a particular property"):

FIG. 4



32. And Ahn disclosed searching by geographic location and time and retrieving/outputting results: a "***geotemporal search***" "employ[ing] a ***selection of a geographic location along with*** a ***temporal window***, e.g., ***a period of time***" (*E.g.*, EX1007 (**Ahn**), Abstract, 1:23-26, 4:18-32 ("***query input device***"), 5:63-6:3 ("***search interface*** 300 includes a ***location portion 318*** and a ***timeline portion 320***"), Figs.2-5, 8), and "***candidate search results that are relevant or associated with the***

selected location and time are ***identified*** and ***presented to a user***." *E.g.*, EX1007 (**Ahn**), 2:10-16; *see also, e.g.*, EX1007 (**Ahn**), Abstract ("geotemporal search is executed based on the selected geographic area and temporal window to ***identify search results having*** associated metadata indicating a relationship to ***the selected geographic area and temporal window***"):

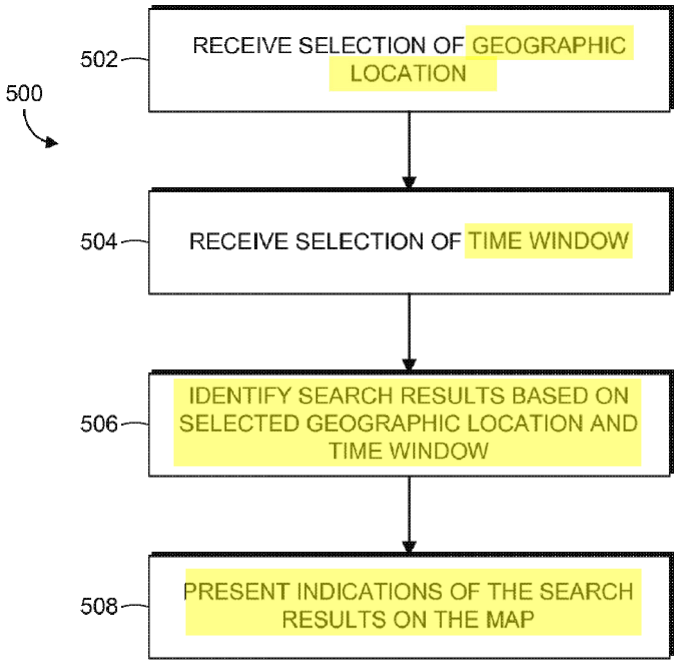


FIG. 5.

33. In sum, before February 22, 2016, each of the steps of the Challenged Claims, including aggregating data that is associated with a geographic location identifier and a time identifier, receiving a query regarding a geographic location and including time information, retrieving data items matching the query, and outputting those retrieved information, were well known.

VI. THE '648 PATENT

34. I have been advised that EagleView asserts that the Challenged Claims of the '648 patent are entitled to a priority date of at least as early as February 22, 2016. I assume a February 22, 2016 priority date for the purposes of my opinions herein and reserve the right to supplement my opinions should EagleView assert an earlier priority date.

A. Overview of the '648 Patent

35. The '648 patent relates to gathering and arranging information by location and time: "aggregating information associated with all geographic points on the earth, where the information is captured from distributed data sources and integrated into a centralized database that may be queried." EX1001 (**'648**), 1:8-11, cls.1, 9, 12, Fig.1:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00023

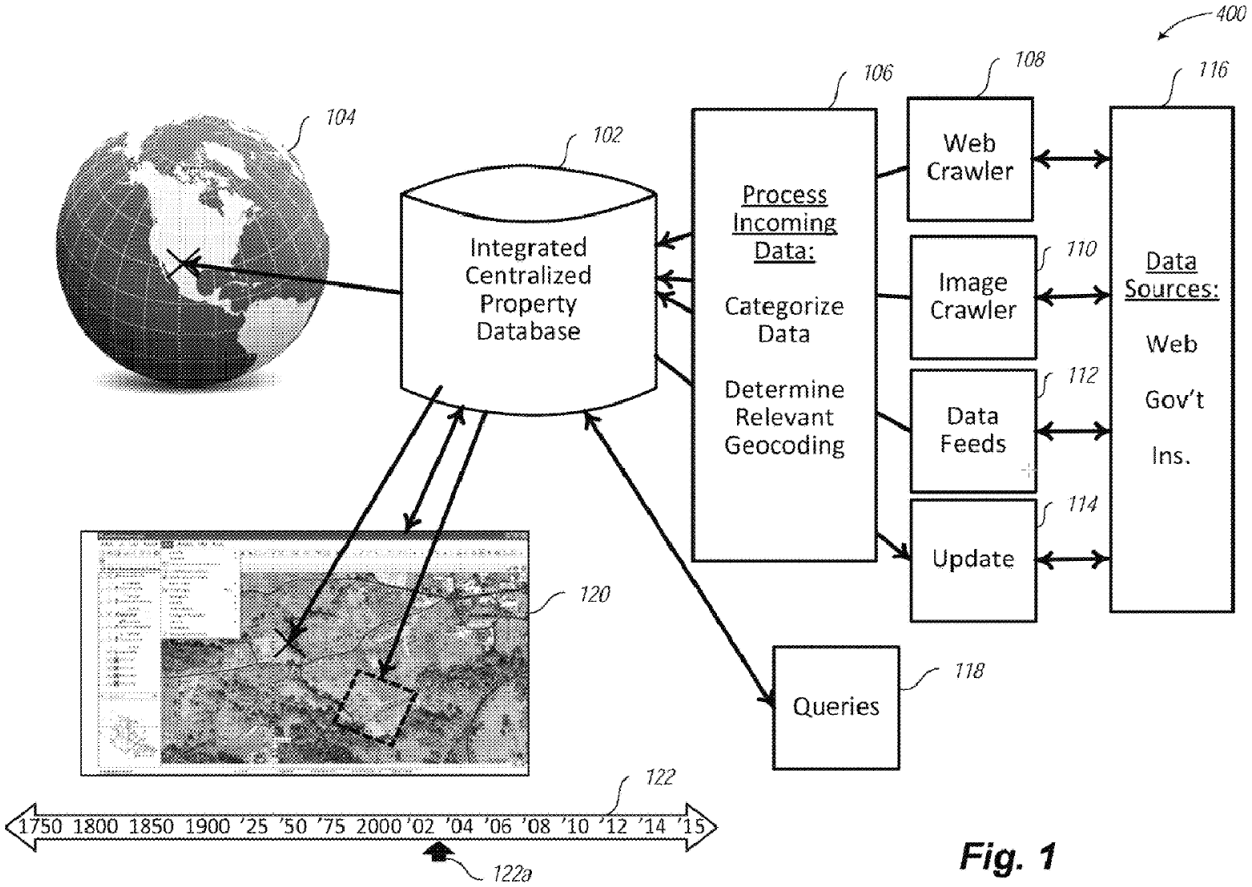


Fig. 1

36. The '648 patent's claims generally require storing information in a data aggregation system, where the stored data is associated with a ***geographic location identifier*** of a particular geographic point on earth—*e.g.*, latitude and longitude, "property street address, a parcel identifier, a ZIP code, a city, county, or state designation" or a "region identifier such as a climate zone, a marketing area, or a bounded area of a particular event such as a hailstorm or fire," EX1001 (**'648**), 1:51-53, 9:42-50—and a ***time identifier***—*e.g.*, ""Date/Time" or "Range of Dates/Times," EX1001 (**'648**), Fig.2—including one or more time or time periods indicative of a time history regarding the associated geographic point on earth, receiving a query

regarding a geographic location and time information, retrieving from the system data matching the query, and outputting the retrieved data items. EX1001 (**'648**), 3:52-65, cls.1, 9, 12.

37. I have considered the Challenged Claims (claims 1-2, 4-6, 9-13, and 15) of the '648 patent, which read as follows:

Claim 1

[1.pre] A method, comprising:

[1.a] storing a plurality of data items in a data aggregation system, each of the plurality of data items being associated with one or more geographic location identifiers of a particular geographic point on earth, wherein at least a portion of the plurality of data items stored in the data aggregation system are further associated with one or more time identifiers including one or more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth;

[1.b] receiving, by at least one processor, a query regarding a geographic location and including time information;

[1.c] retrieving, from the data aggregation system, data items having associated geographic location identifiers matching the received geographic location and having associated time identifiers matching the received time information; and

[1.d] outputting the retrieved data items.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00025

Claim 2

[2] The method of claim 1, wherein the one or more geographic location identifiers include latitude and longitude coordinates of a surface of the earth.

Claim 4

[4] The method of claim 1, wherein the received geographic location includes a region on the earth.

Claim 5

[5] The method of claim 4, wherein the region on the earth is identified by multiple geocoded locations, the multiple geocoded locations described in at least latitude and longitude coordinates.

Claim 6

[6] The method of claim 1, wherein the time information of the query includes one or more time periods.

Claim 9

[9.pre] A system, comprising:

[9.a] a computer processor;

[9.b] a memory coupled to the processor; and

[9.c] an integrated centralized property database, the processor being configured to:

[9.d] receive from a user computer a query including a geographic location identifier, the geographic location identifier including one of a

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00026

geocoded location and multiple geocoded locations identifying a polygon,

[9.e] receive from the user computer a time period identifier including one or more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth,

[9.f] retrieve from the integrated centralized property database location data, the location data including data associated with the geographic location identifier of a geographic location on the earth, and associated with the received time period identifier, and

[9.g] provide the retrieved location data to the user computer via a graphical user interface.

Claim 10

[10.pre] The system of claim 9, the processor further configured to:

[10.a] retrieve parcel information from the integrated centralized property database;

[10.b] compare the retrieved parcel information with the location data to determine parcels associated with the geographic location identifier; and

[10.c] output the parcels associated with the geographic location identifier.

Claim 11

[11.pre] The system of claim 10, the processor further configured to:

[11.a] retrieve insurance policy information from the integrated centralized property database;

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00027

[11.b] compare the retrieved insurance policy information with the parcels associated with the geographic location identifier to determine the insurance policies associated with the geographic location identifier; and

[11.c]: output the insurance policies associated with the geographic location identifier.

Claim 12

[12.pre] A system, comprising:

[12.a] an integrated centralized property database[ ] stored on computer-readable storage media, the integrated centralized property database including a plurality of data items, each of the plurality of data items being associated with one or more geographic location identifiers indicating a particular geographic point on earth, and at least a portion of the plurality of data items further being associated with one or more time identifiers including one or more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth;

[12.b] at least one computer processor communicatively coupled with the integrated centralized property database, the at least one computer processor configured to:

[12.c] receive, from a user computer system, a query of a geographic location and time information indicative of the time history of an associated data item regarding the geographic point on earth;

[12.d] retrieve, from the integrated centralized property database, data items having associated geographic location identifiers matching the

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00028

received geographic location and having associated time identifiers matching the time information, and

[12.e] provide the retrieved data items to the user computer system via a graphical user interface.

Claim 13

[13]: The system of claim 12, wherein the one or more geographic location identifiers include latitude and longitude coordinates.

Claim 15

[15]: The system of claim 12, wherein the time identifier includes one or more time periods.

B. Overview of the '648 Patent Prosecution History

38. The application leading to the '648 patent was filed on February 22, 2016. EX1002 (**'648 Prosecution History**), 1. EagleView overcame an initial anticipation rejection based on Tolman (EX1009) by amending the then-pending independent claims to add requirements relating to stored "time identifiers" and queried "time information." EX1002 (**'648 Prosecution History**), 138-140. EagleView then overcame an obviousness rejection based on Tolman in view of Steimle (EX1010) by further amending the claims to require that the stored data items are associated with a "geographic" location identifier and "includ[e] one or more time or time periods, indicative of a time history of an associated data item

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00029

regarding the associated geographic point on earth." EX1002 (**'648 Prosecution History**), 194.

39. The Examiner's final rejection before allowance was directed to obviousness based on Tolman in view of Iwamura (EX1011). EagleView overcame that rejection by arguing that Tolman does not disclose "geographic location identifiers" or a query regarding a "geographic location" and that Iwamura does not fill that gap because it does not disclose "a time history of an associated data item *regarding the associated geographic point on earth*"—according to EagleView, rather than disclosing geographic location identifiers and queries regarding a "geographic location," Iwamura instead discloses a history of building configurations (such as a building name or tenant). EX1002 (**'648 Prosecution History**), 230-233 (italics original). EagleView further argued that modifying Tolman with Iwamura would make Tolman unsatisfactory for its intended purpose and change Tolman's principle of operation. EX1002 (**'648 Prosecution History**), 233. The Examiner then allowed the claims based on these arguments and the shortcomings EagleView existed in the prior art. EX1002 (**'648 Prosecution History**), 244-251.

C. Claim Construction of the '648 Patent Claims

40. I understand that patent claims terms are generally given their plain and ordinary meaning in light of the specification. I also have been advised that the plain

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00030

and ordinary meaning may not apply where a patentee acts as his own lexicographer, meaning that the patentee sets out his own definition for the term or where the patentee disavows the full scope of the claim term either in the specification or during prosecution.

41. I understand that, in the context of the '648 patent, "data aggregation system" as used in each of the Challenged Claims means a "system that aggregates data from multiple distributed external data sources into a centralized database." I have applied this definition in my analysis below. I also understand, however, that EagleView asserts in a litigation that "data aggregation system" includes any generic storage system. As I explain below, regardless of whether EagleView's construction (*i.e.*, any generic storage system) or the construction set forth above (*i.e.*, a system that aggregates data from multiple distributed external sources into a centralized database) applies, the prior art references described in the grounds herein anticipate or at minimum render obvious each of the Challenged Claims.

42. For all other terms, I have been asked to assume that they have their plain and ordinary meaning as they would have been understood by POSITA in light of the specification, and for each term I have applied that meaning in my analysis.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00031

VII. THE CHALLENGED CLAIMS ARE INVALID

A. Legal standards

43. I understand that a claim may be invalid as anticipated under 35 U.S.C. § 102(a) if every limitation recited in a claim is found in an item of prior art, either expressly or inherently, and arranged in the item of prior art in the same way as it is claimed, so that the disclosure effectively puts the public in possession of the invention. I further understand where a prior art reference discloses multiple embodiments, each disclosed embodiment can be the basis for an invalidating disclosure.

44. I have been advised that an anticipatory reference is determined from the perspective of POSITA. Therefore, a reference discloses a claimed invention if POSITA could take its teachings in combination with their knowledge of the particular art and be in possession of the invention.

45. I understand that a claim may be invalid under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the claimed invention, as a whole, would have been obvious to a hypothetical person of ordinary skill in the art in view of a prior art reference or a combination of references at the time the claimed invention was made.

46. I have been advised that obviousness is determined from the perspective of POSITA and that the claims of the patent should be read from the

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00032

point of view of such a person at the time the claimed invention was made. Additionally, I understand that a person of ordinary skill in the art is assumed to know and to have read all relevant prior art in the field of endeavor covered by the patent in suit or reasonably pertinent to the particular problem that the inventor faced.

47. I understand that prior art used in an obviousness analysis must be analogous to the '648 patent. To determine whether prior art is analogous, I understand that two criteria are used: (1) whether the art is from the same field of endeavor as the invention, regardless of the problem addressed, and (2) if the reference is not within the same field of endeavor as the invention, whether the reference is still reasonably pertinent to the particular problem the inventor faced.

48. I understand that an analysis of whether a claimed invention would have been obvious should consider the following: (1) the scope and content of the prior art; (2) the differences (if any) between the prior art and the claimed invention; (3) the level of ordinary skill in the pertinent art involved; and (4) secondary considerations of non-obvious. I also understand that a prior art reference should be viewed as a whole.

49. In considering whether an invention would have been obvious, I understand that one may consider whether there are apparent reasons to combine known elements in the prior art in the manner claimed in view of interrelated

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00033

teachings of multiple prior art references, the effects of demands known to the design community or present in the marketplace, and/or the background knowledge possessed by POSITA. I further understand that other principles may be relied on to determine whether a claimed invention would have been obvious, including:

- Combining elements in the prior art according to known methods is likely to be obvious when it does no more than yield predictable results;
- When a device or technology is available in one field of endeavor, design incentives and other market forces can prompt variations of such device or technology, either in the same field or in a different one, so that if a person of ordinary skill can implement a predictable variation, it is likely obvious;
- If it would be recognized by POSITA that applying a known technique, which has been used to improve one device, method, or product, would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond the skill of POSITA;
- An explicit or implicit teaching, suggestion, or motivation to combine two prior art references to form the claimed combination may demonstrate obviousness, but proof of obviousness does not depend on or require showing such a teaching, suggestion, or motivation to combine;
- Market demand, rather than scientific literature, can drive design trends and may show obviousness;

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00034

- In determining whether the subject matter of a patent claim would have been obvious, neither the particular motivation nor the avowed purpose of the named inventor controls;
- One of the ways in which a patent's subject matter can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims;
- Any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed;
- Common sense teaches that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle;
- A person of ordinary skill in the art is also a person of ordinary creativity, and is not an automaton;
- A patent claim can be proved obvious by showing that the claimed combination of elements was "obvious to try," particularly when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions such that a person of ordinary

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00035

skill in the art would have had good reason to pursue the known options within his or her technical grasp; and

- One should be cautious of using hindsight in evaluating whether a claimed invention would have been obvious.

50. I further understand that when determining whether or not the claimed invention would have been obvious to POSITA, one may consider whether certain objective factors are present. These objective factors, known as "secondary considerations or non-obviousness" or "objective indicia of non-obviousness," include commercial success, long-felt but unmet need, teaching away, unexpected results, copying, and praise by others. I further understand that there must be a causal relationship (called a "nexus") between the claim and the purported evidence of non-obviousness, and that this nexus must be based on a novel element of the claim rather than something in the prior art. I further understand that even if secondary considerations of non-obviousness are present, secondary considerations are not sufficient to overcome primary evidence of obviousness that is sufficiently strong.

51. I understand that for a claim to be obvious, POSITA must have had, in addition to a motivation to combine, a reasonable expectation of success in practicing the claimed invention based on the prior art. Whether POSITA would have had a reasonable expectation of success in practicing the claims is determined

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00036

based on the degree of unpredictability in the art as well as the guidance provided by the art.

52. I understand that for *inter partes* review, invalidity (also called unpatentability) must be shown under a preponderance of the evidence standard, which I understand means it must be proven to be more likely true than not true.

53. I have concluded that claims 1-2, 4-6, 9, 12, 13, and 15 are anticipated by Harris and that each of the Challenged Claims is invalid (and unpatentable) for obviousness based on the references described below and as outlined in the claim charts attached hereto as **Appendix C**.

B. Ground 1: Harris anticipates Claims 1, 2, 4, 5, 6, 9, 12, 13, and 15; Ground 2: Harris renders obvious Claims 1, 2, 4, 5, 6, 9, 12, 13, and 15; Ground 3: Harris in view of Florance renders obvious Claims 9-10, 12, 13, and 15; Ground 4: Harris in view of Florance and Salvagio renders obvious Claim 11.

54. In my opinion, for the reasons described herein and in Appendix C (which forms part of my analysis), POSITA would have recognized that each and every limitation of claims 1, 2, 4, 5, 6, 9, 12, 13, and 15 is disclosed by Harris and that those claims are thus anticipated by Harris, and that each and every limitation of the Challenged Claims, combined as claimed, is disclosed and suggested by the prior art such that each of the Challenged Claims would have been obvious to POSITA. Specifically, it is my opinion that the Challenged Claims are invalid as anticipated or obvious as follows:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00037

Ground	Claims Challenged	References/Basis
1	1, 2, 4, 5, 6, 9, 12, 13, and 15	Anticipated by Harris
2	1, 2, 4, 5, 6, 9, 12, 13, and 15	Rendered obvious over Harris
3	9-10, 12, 13, and 15	Rendered obvious over Harris in view of Florance
4	11	Rendered obvious over Harris in view of Florance and Salvagio.

1. Overview of "Geo-Temporal Indexing and Searching"—U.S. Patent No. 9,501,507 B1 ("Harris")

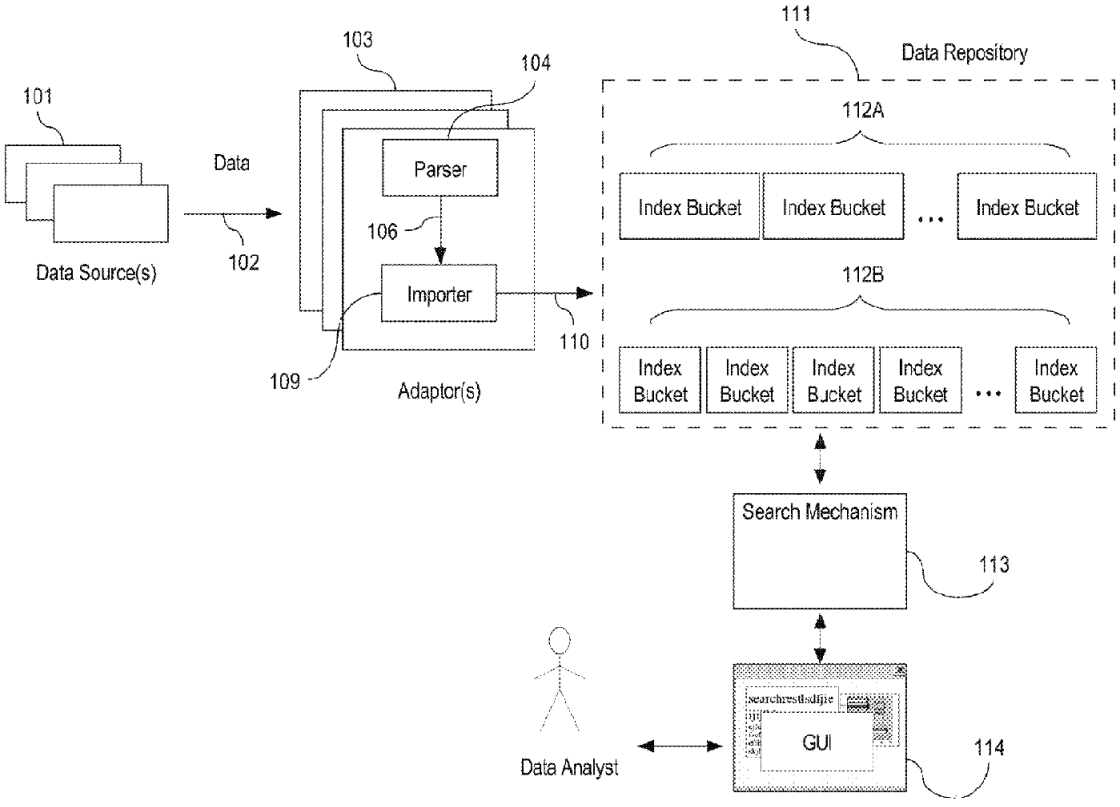
55. Harris (EX1004) is a U.S. Patent filed December 27, 2012. I understand that Harris is prior art to the '648 patent. Harris is entitled "Geo-Temporal Indexing and Searching" and describes, among other things, "facilitating low latency searches of large and dynamic data sets that include geo-temporal data," including geo-temporal data indicating a particular point on the earth and indicating a point in time or range of time. *E.g.*, EX1004 (**Harris**), 2:1-3, 2:54-58, 5:65-6:2 ("one or more numerical values specifying a longitude and latitude").

56. Harris further discloses that its geo-temporal data includes, *inter alia*, property information, disclosing storing, for example, "stored data objects pertaining to a particular geographic area around ***the user's home***," EX1004 (**Harris**), 9:56-61, and to information about the use of a "key card to gain access to a ***building***," EX1004 (**Harris**), 4:21-25.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00038

57. Additionally, Harris discloses aggregating data having a geo-spatial component (including a geographic location identifier) and temporal component for querying, including, *e.g.*, "computer systems and methods for ***indexing and searching geo-temporal data*** stored in a data repository," *e.g.*, EX1004 (**Harris**), 2:50-53, and expressly discloses aggregating such data from multiple sources because its "geo-temporal data may be obtained from potentially ***multiple disparate data sources***," *e.g.*, EX1004 (**Harris**), 3:1-11, Figs.1, 3:

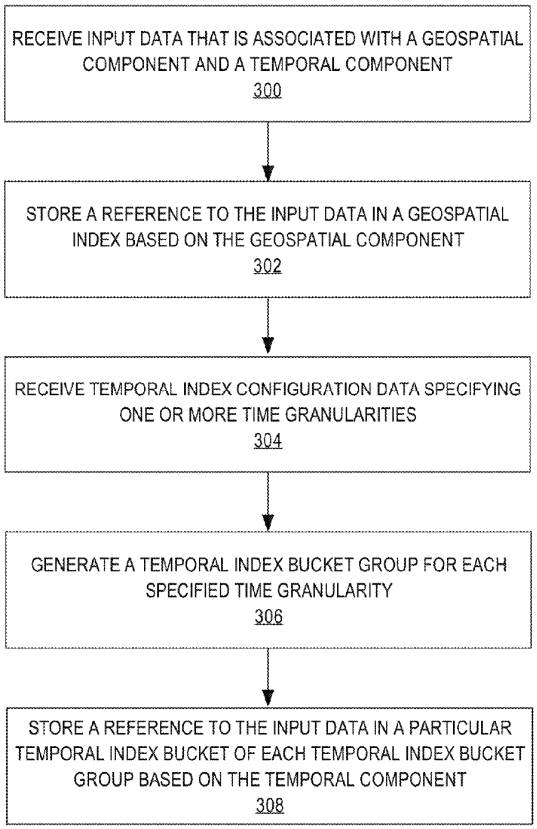
FIG. 1



58. Harris expressly makes clear that its data includes both a geographic location identifier (including, *e.g.*, longitude and latitude) and a temporal

component, disclosing that "'geotemporal data' refers to any input data that includes one or more ***values representing a geospatial component and one or more values representing a temporal component***," including, *e.g.*, "numerical values specifying a ***longitude and latitude*** *or any other representation of a* ***geographical location***," and "***one or more points in time***," including, *e.g.*, "years, months, days, hours, etc." *E.g.*, EX1004 (**Harris**), 5:62-6:3, 7:60-62, Fig.3:

FIG. 3



59. Harris further discloses that its users, through the use of their user computer systems, query Harris's aggregated, indexed data associated with one or

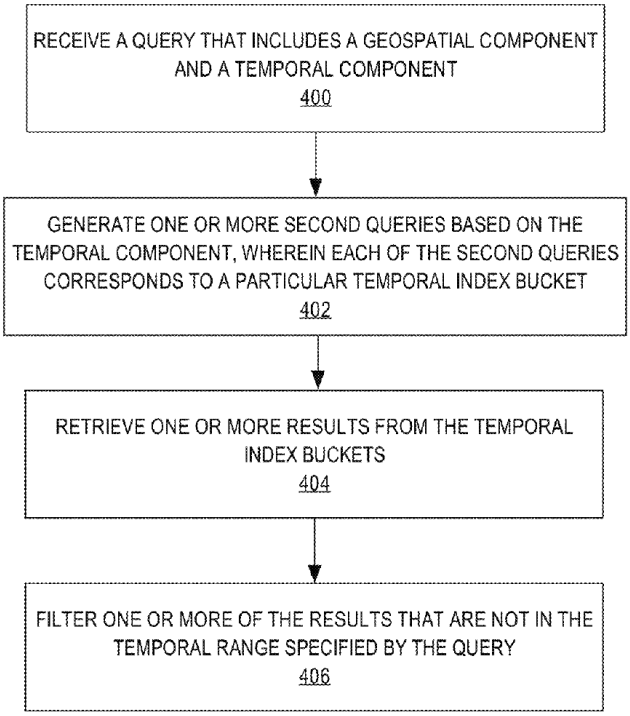
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00040

more geographic location identifiers and time periods, explaining its system "allows a data analyst to specify geo-temporal queries that include both [a] geospatial component and a temporal component" and its system retrieves "data objects from… [temporal] index buckets that satisfy any geospatial component of the query." *E.g.*, EX1004 (**Harris**), Abstract, 11:12-14.

60. Harris also expressly discloses that its "***geo-temporal queries… specify one or more geospatial search parameters*** [*e.g.*, "latitude and longitude values that define a geographical area," *e.g.*, EX1004 (**Harris**), 6:67-7:1] corresponding to geographical areas of interest ***and one or more temporal search parameters*** corresponding to points in time or time ranges of interest," *e.g.*, EX1004 (**Harris**), 4:44-59, Fig.4:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00041

FIG. 4



61. Harris also expressly discloses receiving geo-temporal search parameters, retrieving data stored in Harris's data repository in response to receiving those parameters, and outputting results matching those parameters. For example: "search mechanism 113 receives as input a set of geo-temporal search parameters and ***provides as output a set of search results***." *E.g.*, EX1004 (**Harris**), 9:38-46.

62. For each claim challenged in Grounds 1-4, as discussed below, I rely on Harris for its teachings concerning systems and methods for aggregating, querying, retrieving, and outputting data items associated with geographic and time identifiers.

2. Overview of "System and Method for Associating Aerial Images, Map Features, and Information"—U.S. Patent Application Publication No. 2009/0132316 A1 ("Florance")

63. Florance (EX1005) is a U.S. Patent Application Publication that was published on May 21, 2009. I understand that Florance is prior art to the '648 patent. Florance is entitled "System and Method for Associating Aerial Images, Map Features, and Information," and describes, among other things, aggregating data associated with a geographic location identifier and time identifier in "a comprehensive database of information that is relevant to commercial real estate transactions" that has "obtained and assimilated over 50 proprietary databases," *e.g.*, EX1005 (**Florance**), ¶55, including "property" information such as "latitudes and longitudes associated with the property," "the block/lot of the property, and the parcel number" and "assessor parcel number, legal description, address," *e.g.*, EX1005 (**Florance**), ¶¶304, 602.

64. For each claim challenged in Grounds 3-4, as discussed below, I rely on Florance for its teachings concerning property information, parcel information, and/or parcels stored in a database and associated with a geographic location identifier.

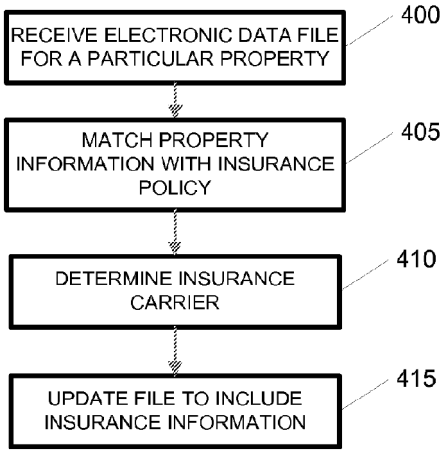
3. Overview of "Insurance Claim Processing"—U.S. Patent No. 8,401,877 B2 ("Salvagio")

65. Salvagio (EX1006) is a U.S. Patent that issued on March 19, 2013. I understand Salvagio is prior art to the '648 patent. Salvagio is entitled "Insurance

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00043

Claim Processing" and describes, among other things, aggregating data (including, *e.g.*, insurance information and insurance policies) in a "property database" searchable by "street address, city, state, ZIP code." *E.g.*, EX1006 (**Salvagio**), Abstract, 10:48-55. Salvagio further discloses the claimed "insurance information" and "insurance policies" "associated with a geographic location identifier" and stored in a database—including storing "property-specific information" such as "the current location of the property," and 'insurance carrier, insurance policy number, the effective date of insurance, the maximum amount of coverage under the policy, the person who procured the insurance, [and] the expiration date of the policy." *E.g.*, EX1006 (**Salvagio**), 6:5-19, 11:11-32, Fig.4 (showing "insurance policy" and "insurance information" related to "a particular property"):

FIG. 4



66. For claim 11 challenged in Ground 4, as discussed below, I rely on Salvagio for its teachings concerning insurance policy information and insurance policies stored in a database and associated with a geographic location identifier.

4. Harris, Florance, and Salvagio Are Analogous Art

67. In my opinion, each of Harris, Florance, and Salvagio is analogous art to the '648 patent (and to each other). *See* ¶¶68-78.

68. As I discuss above (*supra* ¶¶35-36), the '648 patent relates to aggregating data having geographic location identifiers and time identifiers in a database, receiving a query regarding that data, and outputting data matching the query. EX1001 (**'648**), cls.1, 9, 12.

69. The '648 patent states that it "is in the field of aggregating information associated with all geographic points on the earth, where the information is captured from distributed data sources and integrated into a centralized database that may be queried." EX1001 (**'648**), 1:8-12.

70. Harris, Florance, and Salvagio are directed to the same field of art as the '648 patent. Like the '648 patent, Harris, Florance, and Salvagio are directed to aggregating data having geographic and/or time identifiers in a centralized database and provide for the querying and outputting of such data. *E.g.*, EX1004 (**Harris**), 1:6-8, 2:50-52 ("computer systems and methods for indexing and searching geo-temporal data stored in a data repository); EX1005 (**Florance**), ¶¶61 ("database

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00045

searchable by such parameters as location, property type," etc.), 611 (stored "information can also include… the latitudes and longitudes associated with the property"); EX1006 (**Salvagio**), Abstract ("property database"), 10:48-55 (method and system "by which a user may access information about one or more properties," including by searching geographic location identifiers such as "street address, city, state, ZIP code").

71. Additionally, Harris discloses it is directed to "facilitating low latency searches of large dynamic data sets that include geo-temporal data," *e.g.*, EX1004 (**Harris**), 2:1-3, and Florance is directed to "a comprehensive database of information that is relevant to commercial real estate transactions," that has "obtained and assimilated over 50 proprietary databases," *e.g.*, EX1005 (**Florance**), ¶55.

72. Thus, Harris, Florance, and Salvagio are analogous art to the '648 patent (and each other)—and none were before the Examiner during prosecution.

73. Additionally, Harris, Florance, and Salvagio are analogous to the '648 patent because each is reasonably pertinent to the problem faced by the '648 patent's named inventors. The '648 patent described this problem as stemming from the concern that "data is tracked based on identifiers" that "may have changed over time," and "[i]t may be nearly impossible to identify and locate all available

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00046

information that may relate to [a] parcel… because many events are stored in different places and different databases." EX1001 (**'648**), 1:29-44.

74. Likewise, Harris discloses that "[d]ata analysts… often interact with and request data from computer-based databases containing large collections of data objects" that "may be generated and collected by various corporations, business, governmental agencies, and other organizations and often represent huge amounts of data," and "indexing and searching for geo-temporal data presents a number of challenges that are not resolved by" existing "indexing techniques," *e.g.*, EX1004 (**Harris**), 1:13-67, and that "geo-temporal data may be obtained from potentially multiple disparate data sources," *e.g.*, EX1004 (**Harris**), 3:1-6.

75. Similarly, Florance addresses the need for aggregated, up-to-date information, disclosing that "[t]he real estate industry is so large and fragmented that, historically, there has been no meaningful national research," and "[f]rom market to market, different data was kept by the administrative assistant for a couple of local brokers…. Ten years ago, this was out of date; by today's standards, it is completely useless," *e.g.*, EX1005 (**Florance**), ¶9, and "[t]o facilitate transactions, industry participants must have extensive, accurate, and current information," *e.g.*, EX1005 (**Florance**), ¶¶13, 18 ("there remains a need for a system and method for creating a unified commercial real estate data model through collection, distribution

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00047

and use of information in connection with commercial real estate" that would "preferably include the ability to search all commercial real estate data").

76. Additionally, Salvagio addresses the problem of aggregation and currency, disclosing that "each party involved in the [insurance] claims process maintains their own database or files corresponding to their portion of the claims process. Accordingly, when a party… requires information not found in their database, the party must spend resources contacting another party… to obtain the information, which leads to the wasting of more time and resources," *e.g.*, EX1006 (**Salvagio**), 1:56-62, and storing information regarding "the ***current*** location of the property," *e.g.*, Ex1006 (**Salvagio**), 6:8-12.

77. Harris, Florance, and Salvagio are thus each reasonably pertinent to the problem faced by the '648 patent's named inventors.

78. Thus, for these additional reasons, as well, it is my opinion that these references are all analogous to the '648 patent and to one another.

* * *

79. For ease of presentation, in the following section, I discuss each of the Challenged Claims, beginning first with claim 12, followed by claims 13 and 15 (which depends from claim 12), 1, 2, 4, 5, 6, 9, 10, and 11, in that order. I note that the arguments and evidence provided for Claim 12 include certain of the arguments

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00048

and evidence establishing that claims 13, 15, 1, 2, 4, 5, 6, 9, 10, and 11 are also unpatentable as obvious.

C. Claim 12 Is Anticipated by or Rendered Obvious Over Harris or Rendered Obvious Over Harris in View of Florance.

80. **In my opinion, claim 12 is anticipated by or rendered obvious over Harris (Grounds 1-2), or alternatively, is rendered obvious over Harris in view of Florance (Ground 3).**[2] *See infra*, Appendix C, Claim 12.

81. As an initial matter, I note that while Harris sometimes refers to "an embodiment" or "embodiments" in cataloging features of its disclosed system, in my opinion POSITA would have understood Harris to disclose a single system or method with multiple optional features.

82. Indeed, Harris's disclosures are arranged in groupings of core categories of features present in every implementation: "Data Sources," "Data Repository," "Geo-temporal Data Importation," "Indexing Geospatial Data," "Indexing Geo-temporal Data," "Geo-temporal Search Operations," and hardware and software for carrying out these functions. *E.g.*, EX1004 (**Harris**), 2:38-46.

[2] As I discuss below, as to claims 9 and 12, Ground 3 relies on Florance to address potential arguments regarding the scope of "integrated centralized property data-base." *See* EX1001 (**'648**), cl.9.a, cl.12.a.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00049

POSITA would thus have at once envisaged Harris's disclosures as a single embodiment. *See also, e.g.*, EX1004 (**Harris**), 13:37-41 ("specific details… may vary from implementation to implementation"). As explained herein, Harris's disclosures of these core features anticipate or at minimum render obvious the features of the challenged claims.

83. Moreover, none of the aspects of Harris I rely on herein are described by Harris as mutually exclusive alternatives—that is, none of them are described by Harris as not existing or happening together in the same embodiment—and are thus (and would have been understood by POSITA as) part of a single system expressly disclosed by Harris.

84. To the extent it is argued by EagleView that Harris somehow discloses multiple distinct embodiments, combining them as discussed in my limitation-by-limitation analysis below would certainly have been obvious, advantageous, and straightforward to POSITA, including because Harris expressly states that "[t]he present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository," *e.g.*, EX1004 (**Harris**), 2:50–52, and that its various disclosures (including these recitations of core feature categories, *e.g.*, EX1004 (**Harris**), 2:38-46) are directed to "facilitating low latency searches of large and dynamic data sets that include geo-temporal data." *E.g.*, EX1004 (**Harris**), 2:1–3. POSITA would have understood each of Harris's

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00050

disclosed features to be in furtherance of this express goal, and thus, to the extent any of those expressly disclosed features were not present in a single embodiment but instead only in multiple, distinct embodiments, in my opinion POSITA certainly would have found it obvious, advantageous, and straightforward to implement them together as features of a single, combined system.

85. This and other combinations that I discuss in this declaration are implemented in well-understood, wholly predictable technology— *e.g.*, computing hardware and software—further underscoring POSITA's reasonable expectation of success for each combination. In fact, as the '648 patent itself acknowledges, hardware capable of implementing the '648 patent's claims was already known to POSITA. *E.g.*, EX1001 (**'648**), 14:46-15:5 (stating its "data aggregation system 614 may be implemented in software, hardware, firmware, or in any combination thereof" with no further limitation or explanation of these generic terms). *See also, e.g.*, EX1006, 4:16-5:64 (described system can be implemented on, *e.g.*, "a generic computing device 101"), Figs.1-2; EX1004 (**Harris**), 11:47-48 (described system can be implemented on, *e.g.*, computer using "general purpose microprocessor").

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00051

1. Element 12.pre (the preamble of claim 12)[3]

86. Claim 12.pre recites "**A system, comprising.**" **In my opinion, Harris discloses this limitation (Grounds 1-3).**

87. In my opinion, **Harris discloses a system** (*e.g.*, "data analysis system for analyzing data object collections that include geo-temporal data"; "computer systems… for indexing and searching geo-temporal data stored in a data repository")**.**

88. Harris expressly discloses that it relates to a system: "**[t]he present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository**. Geo-temporal data generally refers to data that includes both a geospatial component and a temporal component. The geospatial component may comprise one or more stored data values indicating a geographic location and the temporal component may comprise one or more values indicating a point in time or range of time. In general terms, in order to more efficiently process requests for geo-temporal data stored in a key-value data repository, a geo-temporal indexing structure is generated and managed in computer memory; for example, indexes may be stored on disk and cached in memory on demand. In an embodiment, the geo-temporal indexing structure is based in part on

[3] To the extent deemed limiting, the preamble is disclosed.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00052

user input specifying one or more time sets or granularities that are likely to correspond to time ranges specified in user requests for the stored and indexed geo-temporal data." *E.g.*, EX1004 (**Harris**), 2:50–67.

89. In addition, Harris discloses a system in Figure 1: "**FIG. 1 illustrates an example computer system for indexing and searching geo-temporal data.** In an embodiment, an organization or entity may manage one or more data sources **101** that generate data, perhaps continuously or on an ongoing or periodic basis. Any sizeable organization will typically manage multiple data sources **101** that generate a large amount of data. Example data sources **101** include databases, log files, transaction logs, call data records, access logs, netflows, authentication logs, authorization logs, e-mail message spools, and any other container for data." *E.g.*, EX1004 (**Harris**), 4:7-17.

90. Harris further expressly and repeatedly discusses its "system," disclosing, for example, "[an]… apparatus for ***a data analysis system*** for analyzing data object collections that include geo-temporal data is provided. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are generated based on the specified time granularities. Geo-temporal input data is indexed based on the generated temporal

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00053

index bucket groups. ***The system*** allows a data analyst to specify geo-temporal queries that include both geospatial component and a temporal component. ***The system*** transforms geo-temporal queries into one or more second queries that retrieve data items based on the temporal index bucket groups." *E.g.*, EX1004 (**Harris**), Abstract.

91. Harris further discloses that its system "facilitate[es] low latency searches of large and dynamic data that include geo-temporal data." *E.g.*, EX1004 (**Harris**), 2:1–3.

92. Harris also states that its data processing system is for aggregating and stored data obtained from multiple external sources and allows for geo-temporal queries of its stored data: "[d]ata sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data. Organizations would appreciate a way to efficiently analyze these collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest**. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, for example, a request for all activities

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00054

within a single city block within the past five years to all activities within an entire city within the past five hours. One approach for processing a geo-temporal query is to first perform a geographically-focused search for all data objects reflecting activities in the specified geographical area and subsequently filtering the returned geographical results based on the specified temporal range. However, processing queries in this manner often may result in filtering of the majority of the geographically-focused search results because the vast majority of the results may fall outside of the temporal range specified in a query. For example, if a large volume of crime report data is recorded for a particular geographic area over a period of many years and a user subsequently submits a query for crime reports in the particular geographic area for the past day, the majority of data returned by a geographically-focused search will be filtered out in order to refine the results to the specified temporal range. **Referring again to FIG. 1, in an embodiment a data processing system comprises a data repository 111, one or more adaptors 103, and a search mechanism 113 with an interface 114.** The data repository 111, the adaptors(s) 103, the search mechanism 113, and the interface 114 may be interconnected to one another using any suitable data communication mechanism such as, for example, one or more data networks. The one or more data networks may include one or more local area networks (LANs), one or more wide area networks (WANs), or internetworks such as the public Internet. **The components of**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00055

the system may be distributed across one or more computer systems such as the computer system 500 of FIG. 5, which is further described herein. When distributed across multiple computer systems, components may additionally be distributed geographically, for example, across one or more data centers." *E.g.*, EX1004 (**Harris**), 4:44-5:24.

93. Harris also explains that its system receives search queries including both geospatial and temporal components: "FIG. 4 illustrates a flow diagram of a process for carrying out a geo-temporal query in accordance with one or more of embodiments described herein. In an embodiment, **a search query is received (block 400) that includes both a geospatial component and a temporal component**. In response to receiving a query, one or more second queries are generated (block 402), with each of the second queries corresponding to a particular temporal index bucket of a temporal index bucket group. In an embodiment, the temporal index buckets are selected to correspond to the temporal component of the query. For example, assume that particular geo-temporal data has been indexed into a first temporal index bucket group based on a time granularity of years and a second temporal index bucket group based on a time granularity of days. If a geo-temporal query is received that specifies a temporal range of Jan. 1, 2011 to Jan. 2, 2012, the system may transform the geo-temporal query into a second query against the bucket corresponding to the data year 2011 and two additional second queries

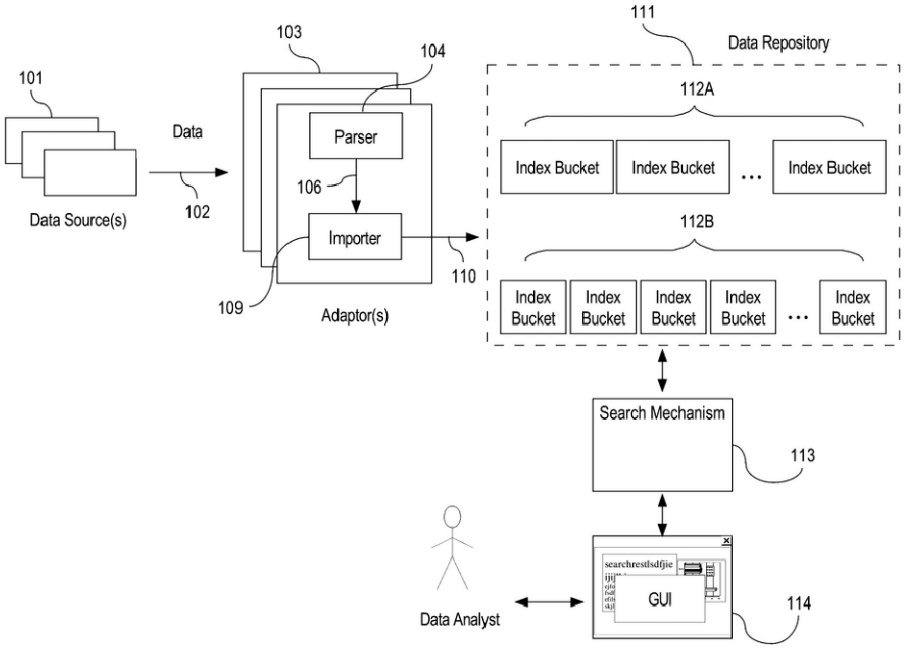
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00056

corresponding to the days of Jan. 1, 2012 and Jan. 2, 2012. In response to each of the second queries, zero or more results are returned from each of the particular temporal index buckets (block 404). **The results returned from each of the temporal index buckets are those results that satisfy the geospatial component of the query**." *E.g.*, EX1004 (**Harris**), 10:24-48.

94. Harris further discloses that the functions of its system are carried out by "one or more processors" using instructions stored on computer-readable storage media, explaining that "[a] **non-transitory computer-readable medium storing one or more sequences of instructions, which when executed by one or more processors, cause the one or more processors to carry out the steps of:**…." *E.g.*, EX1004 (**Harris**), cl.8; *see also, e.g.*, EX1004 (**Harris**), Fig. 1 (showing "system comprising a set of interconnected functional modules for indexing and searching geo-temporal data" (EX1004 (**Harris**), 2:15-17)):

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00057

FIG. 1



* * *

95. Thus, in my opinion, Harris discloses this limitation.

2. Element 12.a

96. Claim 12.a recites "**an integrated centralized property database stored on computer-readable storage media, the integrated centralized property database including a plurality of data items, each of the plurality of data items being associated with one or more geographic location identifiers indicating a particular geographic point on earth, and at least a portion of the plurality of data items further being associated with one or more time identifiers including one or more time or time periods, indicative of a time**

history of an associated data item regarding the associated geographic point on earth." **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-2), or alternatively, Harris in view of Florance renders obvious this limitation (Ground 3).**

97. In my opinion, **Harris discloses an integrated centralized property database** (*e.g.*, "geo-temporal data may be obtained from potentially multiple disparate data sources and… is received and indexed in a data repository"; "data repository 111 may operate on one or more computing nodes of a cluster of computing nodes"; "a data processing system comprises a data repository 111"; "database" that "store[s]" "geo-temporal data"; "data stored in data repository… may be stored as key-value pairs") **stored on computer-readable storage media** (*e.g.*, "indexes may be stored on disk and cached in memory on demand"; "storage media… that store data"; Fig.5 ("computer system" upon which system "implemented," including storage media including, *e.g.*, "Main Memory" 506, "Storage Device" 510))**, the integrated centralized property database including a plurality of data items** (*e.g.*, multiple items of geo-temporal data "associated with a geospatial component and a temporal component" (such as "crime reports received within a particular city," "cell phone call records," or "data objects pertaining to a particular geographical area around the user's home") are received, "stored in a data repository," and "indexed"; system "facilitat[es]… searches of large and dynamic

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00059

data sets that include geo-temporal data," "receiving" or "retrieving input data… from a source" and "consum[ing that] input data… and stor[ing] the data in the data repository"; Fig.1 (data from "Data Source(s)" 101 stored in "Data Repository" 111))**, each of the plurality of data items being associated with one or more geographic location identifiers indicating a particular geographic point on earth** (*e.g.*, "cell phone call records… each associated with data values reflecting a particular geographic location"; "numeric values representing a longitude and latitude corresponding to a geographic location"; the "geo-temporal data… includes… a geospatial component"; "data that includes one or more values representing a geospatial component"; "geo-temporal input data is received that is associated with a geospatial component," such as "crime reports received within a particular city… includ[ing] values representing a longitude and latitude corresponding to the geographical location of the incident")**, and at least a portion of the plurality of data items further being associated with one or more time identifiers including one or more time or time periods indicative of a time history of an associated data item regarding the associated geographic point on earth** (*e.g.*, the "geo-temporal data… includes both a geospatial component and a temporal component"; "data that includes one or more values representing a geospatial component and one or more values representing a temporal component"; "geo-temporal input data is received that is associated with a geospatial component

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00060

and a temporal component" such as "a time value indicating an approximate time the incident in the crime reported occurred"; "geospatial component may comprise one or more stored data values indicating a geographic location and the temporal component may comprise one or more values indicating a point in time or range of time"; "data objects associated with particular geographic regions and that are associated with temporal components with particular year time spans and/or particular hour time spans"; "all activities within a single city block within the past five years to all activities within an entire city within the past five hours")**.**

98. For ease of presentation, I first discuss the **integrated centralized property database stored on computer-readable storage media** limitations, followed by the remaining limitations of cl.12.a.

99. As discussed above, in my opinion, **Harris discloses an integrated centralized property database** (*e.g.*, "geo-temporal data may be obtained from potentially multiple disparate data sources and… is received and indexed in a data repository"; "data repository 111 may operate on one or more computing nodes of a cluster of computing nodes"; "a data processing system comprises a data repository 111"; "database" that "store[s]" "geo-temporal data"; "data stored in data repository… may be stored as key-value pairs") **stored on computer-readable storage media** (*e.g.*, "indexes may be stored on disk and cached in memory on

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00061

demand"; "storage media… that store data"; Fig.1 ("Data Repository" 111); Fig.5 (storage media including, *e.g.*, "Main Memory" 506, "Storage Device" 510))**.**

100. As an initial matter, I note that the '648 patent confirms that "an integrated centralized property database" includes, *e.g.*, "a full time history associated with ***any given point on earth***. In ***some embodiments***, this point ***may be identified by latitude and longitude coordinates***" (EX1001 (**'648**), 1:48-53), and "the integrated centralized property database may store a variety of information of all types ***which is related to one or more geographic points on the earth***." EX1001 (**'648**), 2:6-8, 2:57-60 ("stored data may include at least one of… building code data… [and] crime data"). The '648 patent also contrasts the "drawbacks" of collecting data based on, *e.g.*, "parcels, lots, townships, cities, ZIP Codes," etc., explaining "[t]hese identifiers may have changed over time such that they represent different points on the earth at different time." EX1001 (**'648**), 1:29-34. Moreover, the '648 patent's claims do not require the storage of any particular type of data, instead specifying only "data items associated with one or more geographic location identifiers ***indicating a particular geographic point on earth***." EX1001 (**'648**), cl.12. The '648 patent's "integrated centralized ***property*** database" thus does not require storage of "property" information and does not require its stored information to be linked to a particular "property," instead simply requiring that stored data be linked to, *e.g.*, a "a particular geographic point on earth."

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00062

101. As discussed herein, Harris expressly discloses an "integrated centralized property database," because Harris discloses, *inter alia*, storing in its data repository geographic location identifiers indicating a particular point on earth (*e.g.*, "one or more numerical values specifying a longitude and latitude," *e.g.*, EX1004 (**Harris**), 5:65-6:2). Harris thus expressly discloses this limitation. Additionally, to the extent it is argued that storage of "property" information or information linked to a specific "property" is required, Harris expressly discloses this limitation because it discloses storing, *e.g.*, "stored data objects pertaining to a particular geographic area around ***the user's home***," *e.g.*, EX1004 (**Harris**), 9:56-61, and data indicating "using a key card to gain access to a ***building***," *e.g.*, EX1004 (**Harris**), 4:21-25; *see* EX1001 (**'648**), 3:57-61 ("aggregated information may be related to parcels and ***buildings associated with that [geographic] point***… [and] ***buildings on that point***"), and Harris expressly discloses that such data would have been associated with a particular geographic point on earth. *E.g.*, EX1004 (**Harris**), 4:27-30 (identifying such data as "[g]eo-temporal data… that may reflect activities… that include both a geospatial component and a temporal component."). In addition, as discussed herein, Florance expressly discloses the use of "property information," and thus Harris in view of Florance also renders obvious this limitation.

102. As an example of the various data stored in Harris's data repository, Harris discloses that its system retrieves and indexes data from multiple disparate

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00063

data sources (many of which POSITA would have understood to be external data sources (*see* §VI.C regarding the construction of "data aggregation system") and stores it in a "data repository," which is an integrated centralized property database because it stores data from these multiple external data sources: "The geo-temporal data may be obtained from potentially multiple disparate data sources and examples of geo-temporal data include, but are not limited to, network traffic logs, bank transaction records, phone call records, crime data, or any other data that includes both a geospatial and temporal component. In an embodiment, the geo-temporal data is received and indexed in a data repository based on a geospatial component of the data. In an embodiment, the indexing of the geo-temporal data based on the geospatial component may be based on Z-order curves, Hilbert curves, or any other geospatial indexing technique." *E.g.*, EX1004 (**Harris**), 3:1-11.

103. Harris explains, *e.g.*, that these data, indexed and stored in in its data repository (the integrated centralized property database of Claim 12), come from "multiple data sources" (many of which POSITA would have understood to be external data sources) that "generate a large amount of data": "FIG. 1 illustrates an example computer system for indexing and searching geo-temporal data. **In an embodiment, an organization or entity may manage one or more data sources 101 that generate data, perhaps continuously or on an ongoing or periodic basis. Any sizeable organization will typically manage multiple data sources 101 that**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00064

generate a large amount of data. Example data sources 101 include databases, log files, transaction logs, call data records, access logs, netflows, authentication logs, authorization logs, e-mail message spools, and any other container for data." *E.g.*, EX1004 (**Harris**), 4:7-17.

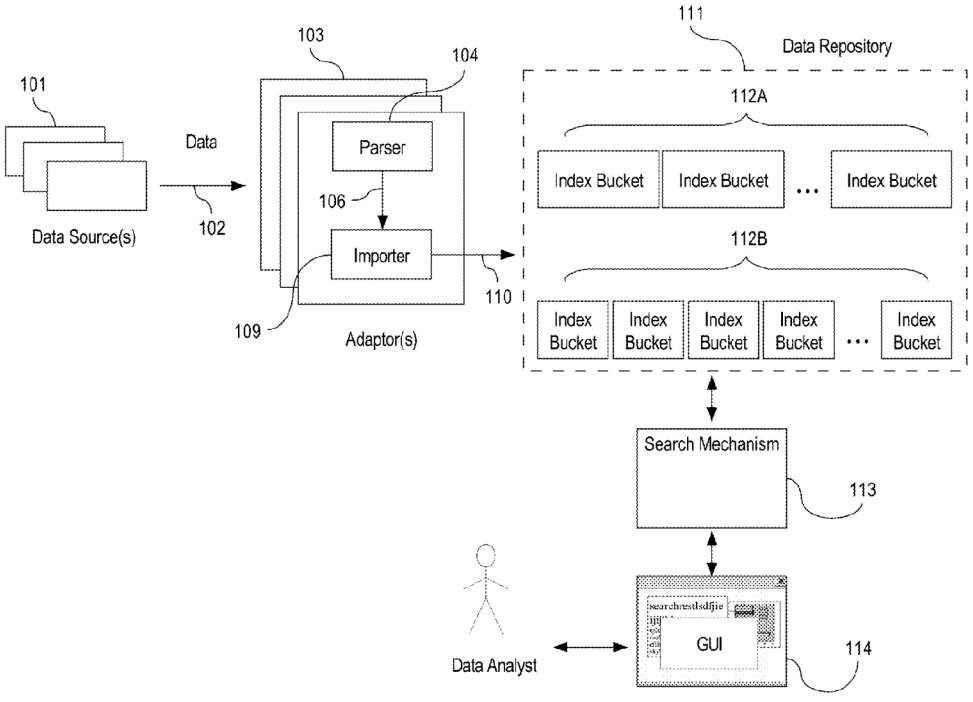
104. Harris further discloses that such sources of data indexed and stored in its data repository (which is an integrated centralized property database) include "various corporations, businesses, governmental agencies, and other organizations": "[d]ata analysts and other computer users often interact with and request data from computer-based databases containing large collections of data objects. The data object collections may be generated and collected by various corporations, businesses, governmental agencies, and other organizations and often represent huge amounts of data. For example, the data may include DNS traffic logs, transaction logs of banks, call data records, or any other potentially high-volume data." *E.g.*, EX1004 (**Harris**), 1:13-20.

105. As further examples of data from external sources stored in Harris's data repository, Harris describes importing and aggregating data from these multiple external data "Data Source(s)" 101, using, *e.g.*, "Adaptor(s)," "Importer" 109, and storing and indexing such data in Harris's "Data Repository" 111, confirming that Harris's database is a centralized repository for these data. *E.g.*, EX1004 (**Harris**), 6:7-10 ("An adaptor 103 may obtain input data 102 through any number of means

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00065

including receiving input data 102 from a data source or **retrieving input data 102 from a data source 101**."), 5:51-58 ("**The adaptor(s) 103 are configured to consume input data 102 and store the data in the data repository 111**. There may be an adaptor 103 for each type of data source 101. For example, there may be an adaptor for ingesting input data 102 produced by a database system data source 101 and another adaptor 103 for a web access log data source 101. In an embodiment, at least one adaptor 103 is configured to ingest geo-temporal data from a data source 101."), Fig.1:

FIG. 1



106. Harris further discloses that its input data (generated by external data sources and stored in Harris's data repository) may be in various formats, including

formats used for storage in a database such as Harris's "Data Repository": "data generated by data sources 101 adheres to some sort of data structure or data format. For example, data stored in a database may adhere to a relational database structure or related schema. As another example, data in a log file, including geo-temporal data, may be formatted in eXtensible Markup Language (XML), Keyhole Markup Language (KML), or in plain-text (e.g., ASCII) with whitespace characters (e.g., tab, space, and newline characters) providing structure, or generally any other machine-parseable character based format." *E.g.*, EX1004 (**Harris**), 4:34-43.

107. Harris further discloses that its retrieved and aggregated data (stored in Harris's "Data Repository," which is the claimed "integrated centralized property database" of Claim 12) includes "input data" that includes the claimed data items associated with one or more geographic location identifier indicating a particular geographic point on earth and one or more time identifiers including time periods: "In this context, the term 'input data' refers to data that is presented as input to the system. That is, data that is obtained by an adaptor 103 from a data source 101 for processing and possible input into the data repository 111. **The term 'geo-temporal data' refers to any input data that includes one or more values representing a geospatial component and one or more values representing a temporal component. For example, values representing a geospatial component may include one or more numerical values specifying a longitude and latitude or any**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00067

other representation of a geographical location. A temporal component includes one or more values specifying one or more points in time and may be specified, for example, by a character string or numerical value representing a midnight Coordinated Universal Time (UTC) value or any other representation of time values." *E.g.*, EX1004 (**Harris**), 5:59-6:6.

108. As just one example of retrieving and aggregating data from external sources, Harris discloses the aggregating of "crime report data" from an external source: "One approach for processing a geo-temporal query is to first perform a geographically-focused search for all data objects reflecting activities in the specified geographical area and subsequently filtering the returned geographical results based on the specified temporal range. However, processing queries in this manner often may result in filtering of the majority of the geographically-focused search results because the vast majority of the results may fall outside of the temporal range specified in a query. **For example, if a large volume of crime report data is recorded for a particular geographic area over a period of many years and a user subsequently submits a query for crime reports in the particular geographic area for the past day**, the majority of data returned by a geographically-focused search will be filtered out in order to refine the results to the specified temporal range." *E.g.*, EX1004 (**Harris**), 4:60-5:8.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00068

109. Harris also expressly discloses that its data repository is stored on **computer-readable storage media**, explaining that its "indexes" (which are "indexes" of geo-temporal data, which are stored in Harris's data repository), "may be stored on disk and cached in memory on demand." *E.g.*, EX1004, (**Harris**), 2:61-62.

110. Harris makes clear that its "disk" is an example of a type of "storage media" that can be employed and that its "storage media" is computer-readable: "[t]he term 'storage media' as used herein refers to any non-transitory media that store data and/or instructions that cause a machine to operate in a specific fashion. Such storage media may comprise non-volatile media and/or volatile media. Non-volatile media includes, for example, optical disks, magnetic disks, or solid-state drives, such as storage device 510. Volatile media includes dynamic memory, such as main memory 506. Common forms of storage media include, for example, a floppy disk, a flexible disk, hard disk, solid-state drive, magnetic tape, or any other magnetic data storage medium, a CD-ROM, any other optical data storage medium, any physical medium with patterns of holes, a RAM, a PROM, and EPROM, a FLASH-EPROM, NVRAM, any other memory chip or cartridge." *E.g.*, EX1004 (**Harris**), 12:28-41.

111. Further confirming that Harris's data repository is stored on computer-readable storage media, Harris explains that its data repository operates on

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00069

computing nodes, which POSITA would have understood store information on computer-readable storage media: "**[t]he data repository 111 may operate on one or more computing nodes of a cluster of computing nodes.** The computing nodes may be interconnected via a communication bus such as one or more local area data networks, one or more wide area data networks, the Internet, or other suitable data network or communication mechanism. In an embodiment, data stored in data repository 111 may be stored as key-value pairs. In an embodiment, in order to handle large data sets, the stored key-value pairs may be distributed across the computing nodes of the cluster." *E.g.*, EX1004 (**Harris**), 5:26-35.

112. As further confirmation that its data repository is stored on computer-readable storage media, Harris explains its disclosed techniques (including implementation of its data repository) are implemented by computer systems in response to execution of computer instructions by processors, and that such instructions are also on computer-readable storage media: "Computer system 500 may implement the techniques described herein using customized hard-wired logic, one or more ASICs or FPGAs, firmware and/or program logic which in combination with the computer system causes or programs computer system 500 to be a special-purpose machine. **According to one embodiment, the techniques herein are performed by computer system 500 in response to processor 504 executing one or more sequences of one or more instructions contained in main memory 506.**

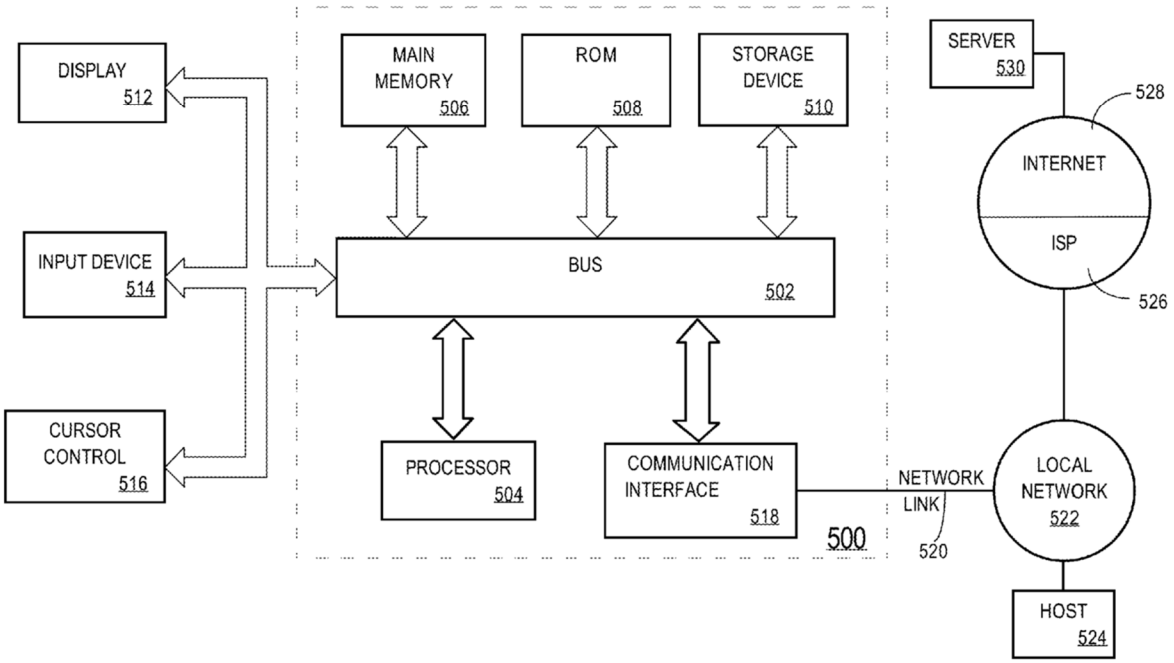
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00070

Such instructions may be read into main memory 506 from another storage medium, such as storage device 510. Execution of the sequences of instructions contained in main memory 506 causes processor 504 to perform the process steps described herein. In alternative embodiments, hard-wired circuitry may be used in place of or in combination with software instructions." *E.g.*, EX1004 (**Harris**), 12:12-27.

113. Harris Figure 5 additionally describes a "computer system upon which" its system (which includes its data repository) "may be implemented," and expressly shows that this system includes storage media such as a "Main Memory" 506 and "Storage Device" 510. *E.g.*, EX1004 (**Harris**), Fig. 5:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00071

FIG. 5



114. As also discussed above, **Harris further discloses that its integrated centralized property database includes a plurality of data items** (*e.g.*, multiple items of geo-temporal data "associated with a geospatial component and a temporal component" (such as "crime reports received within a particular city" or "data objects pertaining to a particular geographical area around the user's home") are received, "stored in a data repository," and "indexed"; system "facilitat[es]… searches of large and dynamic data sets that include geo-temporal data," "receiving" or "retrieving input data… from a source" and "consum[ing that] input data… and stor[ing] the data in the data repository"; Fig.1 (data from "Data Source(s)" 101

stored in "Data Repository" 111))**, each of the plurality of data items being associated with one or more geographic location identifiers indicating a particular geographic point on earth** (*e.g.*, "cell phone call records… each associated with data values reflecting a particular geographic location"; "numeric values representing a longitude and latitude corresponding to a geographic location"; the "geo-temporal data… includes… a geospatial component"; "data that includes one or more values representing a geospatial component"; "geo-temporal input data is received that is associated with a geospatial component," such as "crime reports received within a particular city… includ[ing] values representing a longitude and latitude corresponding to the geographical location of the incident")**, and at least a portion of the plurality of data items further being associated with one or more time identifiers including one or more time or time periods indicative of a time history of an associated data item regarding the associated geographic point on earth** (*e.g.*, the "geo-temporal data… includes both a geospatial component and a temporal component"; "data that includes one or more values representing a geospatial component and one or more values representing a temporal component"; "geo-temporal input data is received that is associated with a geospatial component and a temporal component" such as "a time value indicating an approximate time the incident in the crime reported occurred"; "geospatial component may comprise one or more stored data values indicating a geographic location and the temporal

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00073

component may comprise one or more values indicating a point in time or range of time"; "data objects associated with particular geographic regions and that are associated with temporal components with particular year time spans and/or particular hour time spans"; "all activities within a single city block within the past five years to all activities within an entire city within the past five hours")**.**

115. For example, Harris discloses that data stored in its data repository is associated with one or more geographic location identifiers and one or more time identifiers, explaining that its data has both a geospatial component and a temporal component: "[t]he present disclosure generally relates to computer based analysis of **geospatial data that includes a temporal component**." *E.g.*, EX1004 (**Harris**), 1:6-8; *see also, e.g.*, EX1004 (**Harris**), 2:1-3 ("[t]he present disclosure attempts to address these problems and others, facilitating low latency searches of **large and dynamic data sets that include geo-temporal data**."), Abstract ("A method and apparatus for a data analysis system for **analyzing data object collections that include geo-temporal data** is provided. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are generated based on the specified time granularities. **Geo-temporal input data is indexed based on the generated temporal index bucket groups. The**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00074

system allows a data analyst to specify geo-temporal queries that include both geospatial component and a temporal component. The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the temporal index bucket groups.")

116. Harris discloses that the data stored in its data repository is associated with geographic location identifiers, explaining that its stored data includes "a longitude and latitude corresponding to the geographical location" of the data item:

117. "One particular type of data that such organizations may often collect and analyze is **geospatial data**. Geospatial data generally represents any data that includes a geographical component and that associates the data with particular geographic locations or areas. For example, a crime enforcement agency may track data that corresponds to crime reports received within a particular city. One item of information stored in association with each crime report may include a geographical component indicating a location of the incident specified by the crime report. **An example data object representing each crime report may include values representing a longitude and latitude corresponding to the geographical location of the incident.** A data analyst with access to such data may then specify geospatial search requests such as, for example, a search request for crime reports associated with incidents within a specified geographical radius or within a four block perimeter."). EX1004 (**Harris**), 1:21-37; *see also, e.g.*, EX1004 (**Harris**),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00075

7:32-36 ("The one-dimensional representation may be a single numeric value and the multidimensional data representation may be **numeric values representing a longitude and latitude corresponding to a geographic location**.").

118. Harris further expressly states that its geo-temporal data include a geographic location identifier and a time identifier including a time range, explaining that the data stored in its data repository include both a geospatial component and a temporal component: "The present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository. **Geo-temporal data generally refers to data that includes both a geospatial component and a temporal component. The geospatial component may comprise one or more stored data values indicating a geographic location and the temporal component may comprise one or more values indicating a point in time or range of time.** In general terms, in order to more efficiently process requests for geo-temporal data stored in a key-value data repository, a geo-temporal indexing structure is generated and managed in computer memory; for example, indexes may be stored on disk and cached in memory on demand. In an embodiment, the geo-temporal indexing structure is based in part on user input specifying one or more time sets or granularities that are likely to correspond to time ranges specified in user requests for the stored and indexed geo-temporal data." *E.g.*, EX1004 (**Harris**), 2:50-67.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00076

119. Likewise, Harris again explains that its stored data include data associated with geographic location identifiers and time identifiers including time ranges, disclosing that "**[d]ata sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data**. Organizations would appreciate a way to efficiently analyze these collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest**. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, **for example, a request for all activities within a single city block within the past five years to all activities within an entire city within the past five hours**." *E.g.*, EX1004 (**Harris**), 4:44-59.

120. Again as to temporal data, Harris further discloses, *inter alia*, that "**[o]rganizations also frequently collect data that includes a temporal component**. A temporal component generally refers to one or more data values that indicate a particular point in time, such as a date and/or time of day, or a range of time. **For example, in reference to the example crime report information, a crime enforcement agency may store in association with each crime report a**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00077

time value indicating an approximate time the incident in the crime report occurred. **In the example, by storing the temporal information, data analysts may specify requests for data objects associated with a particular time range of interest, for example, all crime reports associated with an incident that occurred within the past three months**." *E.g.*, EX1004 (**Harris**), 1:38-50.

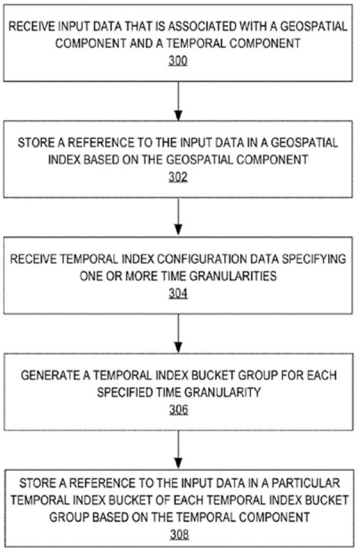
121. Harris further discloses various types of geo-temporal data it retrieves and aggregates from external data sources: "Data generated by data sources 101 includes, but is not limited to, any data that reflects an activity of an individual person or organization. The activity may be an online activity, such as, for example, accessing a website, sending or receiving an e-mail, or making an online payment with a credit card or an offline activity such as, for example, using a key card to gain access to a building. **Data generated by data sources 101 also includes, but is not limited to, geo-temporal data. Geo-temporal data is data that may reflect activities such as those identified above and other activities that include both a geospatial component and a temporal component**. **For example, geo-temporal data may reflect cell phone call records that are each associated with data values reflecting a particular geographic location of the cell phone and a particular time that the call was made or received**." *E.g.*, EX1004 (**Harris**), 4:19-33.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00078

122. Harris further explains that geo-temporal data received from external data sources is indexed (*i.e.*, organized based on its geo-spatial and temporal components) and stored in Harris's data repository: "Similar to the specification of particular input data 102 as geospatially searchable, in an embodiment, input data 102 may include geo-temporal data that is specified as geo-temporally searchable. FIG. 3 is a flow diagram of a process for indexing geo-temporal data in accordance with one or more embodiments described herein. **Initially, geo-temporal input data is received that is associated with a geospatial component and a temporal component (block 300).** The geo-temporal input data is indexed in a geospatial index based on the geospatial component (block 302). For example, the geo-temporal data may be indexed in data repository 111 according to a geospatial indexing technique such as the techniques described above." *E.g.*, EX1004 (**Harris**), 7:47-59, Fig. 3 (showing receipt and storage of Harris's geo-temporal data):

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00079

FIG. 3



123. Harris goes on to explain how its system indexes temporal aspects of its geo-temporal data in Harris's data repository (which discloses the claimed "integrated centralized property database" of Claim 12): "In an embodiment, temporal index configuration data is received specifying one or more time granularities (e.g., years, months, days, hours, etc.) (block 304). **In an embodiment, the temporal index configuration data may be specified by a user involved in the importation of input data 102 by using, for example, interface 114. In other embodiments, the particular time granularities may be specified as part of a data import configuration file or other user input mechanisms. In an embodiment, the particular time granularities may be specified before, during, or after the input data 102 is imported into data repository 111. For example, geo-temporal data that has previously been geospatially indexed may be re-**

indexed based on a temporal component, or geo-temporal data of input data 102 may be contemporaneously geospatially and temporally indexed at the time of data importation." *E.g.*, EX1004 (**Harris**), 7:60-8:8; *see also, e.g.*, EX1004 (**Harris**), 8:9-35 ("based on the received temporal index configuration data, an index bucket group is generated for each time granularity specified in the temporal index configuration data (block 306). In an embodiment, the generation of a temporal index bucket group includes storing a copy of the geospatial index data in one or more temporal index buckets. Each particular temporal index bucket in a temporal index bucket group represents a particular range of time spanning an amount of time equal to the time granularity of the temporal index bucket group. In an embodiment, each temporal index bucket group stores a copy of the geospatial index data, with each index entry of the geospatial index stored in a particular temporal index bucket. The particular temporal index bucket storing each geospatial index entry is the temporal index bucket that is associated with a time range that includes the value specified by the temporal component of the data object referenced by the geospatial index entry. For example, if a temporal index bucket group is generated for a time granularity of years, and a particular data object of input data 102 includes a temporal component specifying a time value that falls within the year 2010, the geospatial index entry for that data object may be stored in a temporal index bucket representing the year 2010 in the year granularity temporal index

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00081

bucket group. In an embodiment, each temporal index bucket is stored in data repository 111 and represented by a row key in the distributed key-value data repository."), 8:58-9:4 ("based on the temporal component of the input data, an indexed reference to the input data is stored in a particular temporal index bucket of each generated temporal index bucket group (block 308). In an embodiment, if a temporal index bucket in a particular temporal index bucket group does not yet exist for the temporal value specified by the input data, a new temporal index bucket is generated for the temporal index bucket group. In reference to the example temporal index bucket groups 112A and 11B, if input data is received specifying a temporal component value corresponding to the date Jan. 10, 2009 and no temporal bucket exists in day granularity temporal index bucket group 112B corresponding to January 10, a new temporal index bucket is generated.").

124. Harris provides additional detail as to the indexing of its geo-temporal data: "In general, the user-specified time granularities correspond to time granularities that are expected by the user or others to be specified in geo-temporal queries against the data as stored in data repository 111. For example, an analyst involved in the importation of geo-temporal data may be aware that users often desire to search for data objects associated with particular geographic regions and that are associated with temporal components within particular year time spans and/or particular hour time spans. In the example, an analyst involved in the

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00082

importation of data may specify temporal index configuration data indicating two time granularities for the geo-temporal input data: a year time granularity and an hour time granularity. For example, temporal index bucket group 112A in FIG. 1 may correspond to the index bucket group for the year time granularity and temporal index bucket group 112B may correspond to the index bucket group for the hour granularity. In the example, generated temporal index buckets of temporal index bucket group 112A may represent particular year timespans (e.g., 1978, 2002, 2009, 2012) and generated temporal index buckets of temporal index bucket group 112B may represent particular day timespans (e.g., Mar. 15, 1978; Jan. 10, 2009)." *E.g.*, EX1004 (**Harris**), 8:36-57.

125. Thus, in my opinion, Harris discloses or at minimum renders obvious this limitation.

126. **In my opinion, Harris in view of Florance also renders obvious this limitation based on the same Harris disclosures above in addition to the Florance disclosures below, including, in particular, storing "property information" in a database.**

127. In my opinion, **Florance discloses storing property information** (*e.g.*, "property information," "property within a geographical area, "properties for which the database has information") in a "central real estate database." I rely on Florance's disclosure of storing property information for this combination. The fact

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00083

that Florance stores that information in a database further supports my conclusion that there would be a reasonable expectation of success of using Florance's teachings of storing property information in implementing Harris's database.

128. For example, Florance expressly discloses storing property information: "[t]he system of the present invention also provides a unique method for ***searching for property within a geographical area using a map linked to a database that stores geographically pertinent information***. As an example, the map includes icons showing the locations of ***properties for which the database has information***. As a user drags a mouse pointer over an icon, a window pops-up displaying the geographically pertinent information from the database. For example, the information in the window could include a photograph of the property along with its sales price." *E.g.*, EX1005 (**Florance**), ¶85.

129. Florance specifically discloses its stored data includes "property information": "The data stored in the databases of the present invention is from various sources. For example, ***property information*** can be obtained by researching information sold and information available. Tenant information can be obtained through personal inspection of properties and from brokers. Market analytics are obtained through an historical analysis. In addition, tax assessment information provides yet another source of information." *E.g.*, EX1005 (**Florance**), ¶101.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00084

130. Florance additionally explains that its data include "property information" and that it includes a "property information database" storing such information: "In an aspect of this embodiment of the present invention, the ***real estate data includes property information and tenant information, and the unified group of correlated databases includes a property information database*** and a tenant information database. Optionally, the real estate data further includes ***comparable property information***, assessment information, and market analytics information, and the unified group of correlated databases further includes a comparable property information database, an assessment information database, and a market analytics information database." *E.g.*, EX1005 (**Florance**), ¶150; *see also, e.g.*, EX1005 (**Florance**), ¶165 ("In another aspect of this embodiment of the present invention, data mining applications include at least one of a ***property information database***, a tenant information database, an assessment information database, a comparable property information database, and a market analytics information database.").

131. Florance further discloses, *e.g.*, advantageously using a "fully integrated database" that includes information relating to commercial real estate (*i.e.*, particular properties): "The coordinated research of this embodiment demonstrates the value of having a ***fully integrated database***, which, in this instance, relates to commercial real estate. Another advantage afforded by a ***comprehensive***

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00085

integrated commercial real estate database is the ability to link comparable sales records to current lists of tenants in ***particular buildings***." *E.g.*, EX1005 (**Florance**), ¶103.

132. In my opinion, **POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's integrated centralized database—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial and temporal components (*e.g.*, EX1004 (Harris), 4:7-33, Fig.1)—using, as one data source, Florance's teachings of property information** (which Florance also stores in a database). POSITA would have recognized that using Florance's disclosed property information as one of the sources of information to be stored in Harris's database (which stores multiple types of information) would have advantageously added another useful type of data to Harris's existing integrated centralized database, thus increasing its usefulness to users performing geo-temporal searches as Harris expressly discloses—including to associate information regarding a particular point or points on earth with particular properties in the centralized database. Indeed, as Harris expressly discloses, "[o]rganizations would appreciate a way to efficiently analyze collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry." *E.g.*, EX1004 (**Harris**), 4:46-49. And, for example, Florance itself teaches "the value of having a ***fully integrated database***,

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00086

which… relates to commercial real estate," *e.g.*, EX1005 (**Florance**), ¶103, and a database user who "***search[es] for property within a geographical area using a map linked to a database that stores geographically pertinent information***," *e.g.*, EX1005 (**Florance**), ¶85. For POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosures that its system uses multiple different types of geo-temporal data, *e.g.*, EX1004 (**Harris**), 5:50-65, and Florance's express disclosures that its property information is stored in a database with both geo-spatial and temporal components and accessible based on, *e.g.*, location data, *e.g.*, EX1005 (**Florance**), ¶¶85, 103, 150) POSITA would have recognized it was clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.

133. As I mentioned above, this and other combinations proposed in the Grounds are implemented in well-understood, wholly predictable technology (*e.g.*, hardware and software), further underscoring POSITA's reasonable expectation of success for each combination. As the '648 patent itself acknowledges, hardware capable of implementing the '648 patent's claims was already known to POSITA. EX1001 (**'648**), 14:46-15:5 (stating its "data aggregation system 614 may be implemented in software, hardware, firmware, or in any combination thereof" with no further limitation or explanation of these generic terms). *See also*, *e.g.*, EX1006 (**Salvagio**), 4:16-5:64 (described system can be implemented on, *e.g.*, "a generic

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00087

computing device 101"), Figs.1-2; EX1004 (**Harris**), 11:47-48 (described system can be implemented on, *e.g.*, computer using "general purpose microprocessor").

* * *

134. Thus, in my opinion, Harris discloses or at minimum renders obvious this limitation (*see* ¶¶84-85) and Harris in view of Florance renders obvious this limitation.

3. Element 12.b

135. Claim 12.b recites "**at least one computer processor communicatively coupled with the integrated centralized property database, the at least one computer processor configured to.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-3). I discuss Harris's disclosure of the computer processor being configured to perform processes claimed in steps cl.12.c-12.e in sections VII.C.4-VII.C.6 below.**

136. In my opinion, **Harris discloses at least one computer processor** (*e.g.*, "techniques herein are performed by computer system 500 in response to processor 504 executing one or more sequences of one or more instructions contained in main memory 506"; "processor… perform[s] the process steps"; "processor"; "hardware processor… coupled with bus… for processing information"; "techniques described herein are implemented by one or more special-

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00088

purpose computing devices" including "one or more general purpose hardware processors programmed to perform the techniques pursuant to program instructions"; "data repository… may operate on one or more computing nodes"; "components of the system" including "data repository" (*e.g.* Fig. 1), "may be distributed across one or more computer systems such as the computer system 500 of Fig. 5" which "includes a bus… or other communication mechanism for communicating information, and a hardware processor… coupled with [the] bus… for processing information," and "main memory… or other dynamic storage device, coupled to [the] bus… for storing information and instructions to be executed by [the] processor"; Fig.5 (including "PROCESSOR" 504 communicating with storage media (*e.g.*, "Main Memory" 506, "Storage Device" 510) via "Bus" 502); "processors… carry out the steps") **communicatively coupled with the integrated centralized property database** (*see* cl.12.a)**.**

137. For example, Harris expressly discloses at least one computer processor and explains that its processors are communicatively coupled to its data repository (the claimed integrated centralized property database) through, *e.g.*, a "bus" and perform the functions of Harris's disclosed system: *e.g.,* "**According to one embodiment, the techniques described herein are implemented by one or more special-purpose computing devices**. The special-purpose computing devices may be hard-wired to perform the techniques, or may include digital electronic devices

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00089

such as one or more application-specific integrated circuits (ASICs) or field programmable gate arrays (FPGAs) that are persistently programmed to perform the techniques, or may include one or more **general purpose hardware processors programmed to perform the techniques pursuant to program instructions in firmware, memory, other storage, or a combination**. Such special-purpose computing devices may also combine custom hard-wired logic, ASICs, or FPGAs with custom programming to accomplish the techniques. The special-purpose computing devices may be desktop computer systems, portable computer systems, handheld devices, networking devices or any other device that incorporates hard-wired and/or program logic to implement the techniques. For example, FIG. 5 is a block diagram that illustrates a computer system 500 upon which an embodiment may be implemented. **Computer system 500 includes a bus 502 or other communication mechanism for communicating information, and a hardware processor 504 coupled with bus 502 for processing information. Hardware processor 504 may be, for example, a general purpose microprocessor. Computer system 500 also includes a main memory 506, such as a random access memory (RAM) or other dynamic storage device, coupled to bus 502 for storing information and instructions to be executed by processor 504. Main memory 506 also may be used for storing temporary variables or other intermediate information during execution of instructions to be executed by**

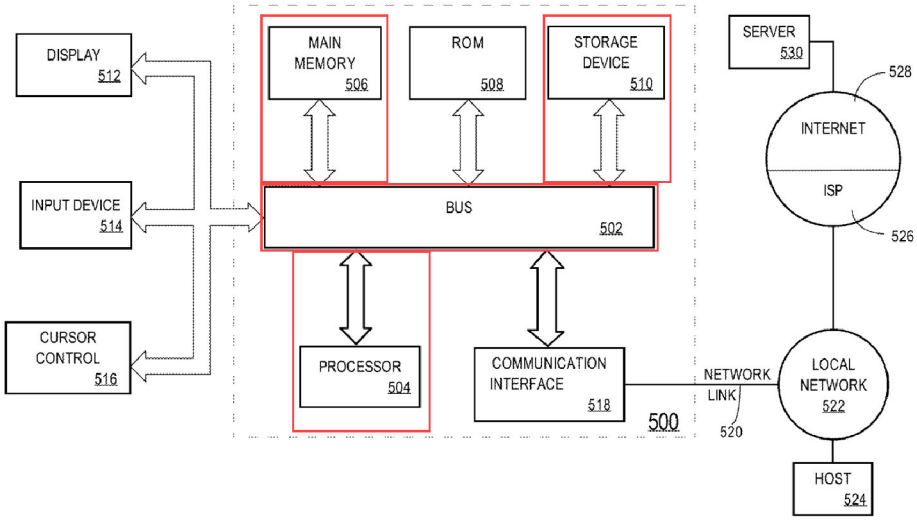
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00090

processor 504. Such instructions, when stored in non-transitory storage media accessible to processor 504, render computer system 500 into a special-purpose machine that is customized to perform the operations specified in the instructions. Computer system 500 further includes a read only memory (ROM) 508 or other static storage device coupled to bus 502 for storing static information and instructions for processor 504. A storage device 510, such as a magnetic disk, optical disk, or solid-state drive is provided and coupled to bus 502 for storing information and instructions." *E.g.*, EX1004 (**Harris**), 11:24-48.

138. Indeed, Figure 5 of Harris shows that, *e.g.*, its "processor 504" is communicatively coupled to Harris's other system components (*e.g.*, "Main Memory" and "Storage Device" storing Harris's data repository, *e.g.*, EX1004 (**Harris**), 2:61-62) via a "bus" and Harris also confirms that its "processors carry out the steps." *E.g.*, EX1004 (**Harris**), cl.8, Fig.5:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00091

FIG. 5



139. Harris goes on to expressly disclose that its processor executes instructions stored in Harris's memory, thus performing Harris's disclosed process steps described herein: "Computer system 500 may implement the techniques described herein using customized hard-wired logic, one or more ASICs or FPGAs, firmware and/or program logic which in combination with the computer system causes or programs computer system 500 to be a special-purpose machine. **According to one embodiment, the techniques herein are performed by computer system 500 in response to processor 504 executing one or more sequences of one or more instructions contained in main memory 506. Such instructions may be read into main memory 506 from another storage medium, such as storage device 510. Execution of the sequences of instructions contained in main memory 506 causes processor 504 to perform the process steps**

described herein. In alternative embodiments, hard-wired circuitry may be used in place of or in combination with software instructions." *E.g.*, EX1004 (**Harris**), 12:12-27.

140. Harris again further discloses that its processor performs Harris's disclosed functions, explaining that instructions are sent to the processor to be executed: "**Various forms of media may be involved in carrying one or more sequences of one or more instructions to processor 504 for execution.** For example, the instructions may initially be carried on a magnetic disk or solid-state drive of a remote computer. The remote computer can load the instructions into its dynamic memory and send the instructions over a telephone line using a modem. A modem local to computer system 500 can receive the data on the telephone line and use an infra-red transmitter to convert the data to an infra-red signal. An infra-red detector can receive the data carried in the infra-red signal and appropriate circuitry can place the data on bus 502. **Bus 502 carries the data to main memory 506, from which processor 504 retrieves and executes the instructions. The instructions received by main memory 506 may optionally be stored on storage device 510 either before or after execution by processor 504.**" *E.g.*, EX1004 (**Harris**), 12:50-65.

141. Harris also explains that its data repository operates on its disclosed computing nodes, which are interconnected via a "bus," further confirming that

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00093

Harris's processor is communicatively coupled to its integrated centralized property database (data repository) and is configured to perform the disclosed functions: "**The data repository 111 may operate on one or more computing nodes of a cluster of computing nodes. The computing nodes may be interconnected via a communication bus such as one or more local area data networks, one or more wide area data networks, the Internet, or other suitable data network or communication mechanism.** In an embodiment, data stored in data repository 111 may be stored as key-value pairs. In an embodiment, in order to handle large data sets, the stored key-value pairs may be distributed across the computing nodes of the cluster." *E.g.*, EX1004 (**Harris**), 5:26-35.

142. Harris further discloses, "[r]eferring again to FIG. 1, in an embodiment a data processing system comprises a data repository 111, one or more adaptors 103, and a search mechanism 113 with an interface 114. **The data repository 111, the adaptors(s) 103, the search mechanism 113, and the interface 114 may be interconnected to one another using any suitable data communication mechanism such as, for example, one or more data networks. The one or more data networks may include one or more local area networks (LANs), one or more wide area networks (WANs), or internetworks such as the public Internet.** The components of the system may be distributed across one or more computer systems such as the computer system 500 of FIG. 5, which is further described

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00094

herein. When distributed across multiple computer systems, components may additionally be distributed geographically, for example, across one or more data centers." *E.g.*, EX1004 (**Harris**), 5:9-24.

143. Harris further discloses that its data repository is implemented on well-known database management software, and thus POSITA would have understood Harris's data repository to be linked to Harris's computer processors: "In some embodiments, the data repository 111 is implemented using the Apache Cassandra distributed database management system. Apache Cassandra is an open source software project maintained by the Apache Software Foundation and currently available online at the Internet domain cassandra.apache.org. In other embodiments, the data repository 111 is implemented using the Apache HBase distributed database management system. Apache HBase is open source software maintained by the Apache Software Foundation and currently available online at the Internet domain hbase.apache.org. However, other distributed key-value data store systems may be used for the data repository 111 and the present embodiments are not limited to only the Apache Cassandra or the Apache HBase system." *E.g.*, EX1004 (**Harris**), 5:36-49.

144. Harris further discloses that its processor performs Harris's disclosed functions, explaining that code, "including program code" is "executed by" Harris's processor: "**Computer system 500 can send messages and receive data, including**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00095

program code, through the network(s), network link 520 and communication interface 518. In the Internet example, a server 530 might transmit a requested code for an application program through Internet 528, ISP 526, local network 522 and communication interface 518. The received code may be executed by processor 504 as it is received, and/or stored in storage device 510, or other non-volatile storage for later execution." *E.g.*, EX1004 (**Harris**), 13:28-36. POSITA would have understood that these operations would have been carried out by Harris's one or more computer processors.

* * *

145. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

4. Element 12.c

146. Claim 12.c recites "**receive, from a user computer system, a query of a geographic location and time information indicative of the time history of an associated data item regarding the geographic point on earth.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-3).**

147. In my opinion, **Harris discloses the processor** (*see* cl.12.b) **receiving, from a user computer system** (*e.g.*, "processors" "receiv[e]… search query" from "interface"; "search mechanism" and "data repository" "receiv[e] a query" from

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00096

"interface"; "a search query is received"; "user interface… represents one way to receive input from a user to specify a geo-temporal query"; "graphical user interface… that enables a user to specify a set of search parameters"; "interface components that enable a user to specify a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters"; Fig.1 (including "Data Analyst" using "GUI" 114 to query "Data Repository" 111 via "Search Mechanism" 113); "search mechanism 113, and the interface 114… may be distributed across one or more computer systems such as the computer system 500 of FIG. 5"; Fig.5 (including, *e.g.*, "BUS" 502 connecting, *e.g.*, "PROCESSOR" 504, "COMMUNICATION INTERFACE" 518, "INPUT DEVICE" 514, etc.))**, a query of a geographic location and time information indicative of the time history of an associated data item regarding the geographic point on earth** (*e.g.*, "data analyst… specif[ies] geo-temporal queries that include both [a] geospatial component and a temporal component"; "a query that includes a geospatial component and a temporal component"; "Graphical user interface 200 includes interface components that allow a user to specify both a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters, respectively"; "Information… may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00097

in time or time ranges of interest" such as "a request for all activities within a single city block within the past five years [or] all activities within an entire city within the past five hours"; "search for data objects associated with particular geographic regions"; "geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest")**.**

148. As an initial matter, I note that the '648 patent confirms that "a query of a geographic location" includes not only a discrete geographic point, but also an area or region on the earth. For example, claim 1 of the '648 patent requires "a query regarding a geographic location" and dependent claims 4 and 5 further require the query include "a region on the earth" (claim 4) "identified by multiple geocoded locations" (claim 5), thus making clear that "a geographic location" includes not only discrete points but also multiple points or areas on the earth. Harris's disclosure of queries including "a geospatial bounding area," *e.g.*, EX1004 (**Harris**), 9:38-46, is thus an express disclosure of this limitation. Moreover, even if the '648 patent required a query to include a single, discrete geographic point, in my opinion Harris expressly discloses this limitation because (1) POSITA would have understood that Harris's "geospatial bounding area" or "search parameters" including "a search string" (*e.g.*, EX1004 (**Harris**), 10:10-14) include a single geographic point (*e.g.*, a bounding area drawn by a user to include a single point or a search string specifying only one longitude/latitude value); (2) Harris's queries include "***one*** or more

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00098

geographical search parameters," *e.g.*, EX1004 (**Harris**), 6:64-7:1, which POSITA would have understood to include, *e.g.*, a query with ***one*** geographical search parameter (*e.g.*, a single latitude/longitude value) corresponding to a single point on the earth; and (3) to perform a query for data objects "within a four block perimeter" of a "geographical location of [an] incident," EX1004, 1:33-37 (*i.e.*, a distance-based search around a single point), POSITA would have understood that the single point would have been included in the query. To the extent it is argued further disclosure of this is required, POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's disclosed queries of a geographic location (including, *e.g.*, a geographic area) to include a single, discrete geographic point. This would have advantageously allowed Harris's users to submit a query regarding a single point on earth (*e.g.*, a single latitude/longitude value), thereby providing a more focused query that, *e.g.*, results in fewer and more pertinent search results when that single point is of interest, reducing processing time and making results easier to parse by, *e.g.*, reducing irrelevant results related to locations other than the specific point of interest. For POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosures its "example graphical user interface merely represents one way to receive input from a user to specify a geo-temporal query," *e.g.*, EX1004 (**Harris**),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00099

9:31-33, clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.

149. I also note that this limitation's (cl.12.c) reference to "the geographic point on earth" refers to stored data items (cl.12.a) rather than the contents of or syntax of the query required by this limitation. As discussed above (*see* cl.12.a), in my opinion Harris expressly discloses its stored data items are associated with one or more geographic location identifiers indicating a particular geographic point on earth (*e.g.*, "longitude and latitude corresponding to a geographic location," *e.g.*, EX1004 (**Harris**), 7:32-36), and thus Harris's disclosed queries of its stored data items are queries "regarding the geographic point on earth," even if this reference to "the geographic point on earth" refers to the contents of or syntax of the query of cl.12.c. To the extent it is argued that Harris's query must include a "geographic point on the earth," Harris discloses or renders obvious this limitation as explained above. *See* ¶148.

150. I also note that '648 independent claim 1 requires "a query regarding a geographic location" and independent claim 9 requires "a query including a geographic location identifier" both of which are included in the scope of cl.12.c.'s "query of a geographic location" as mapped and thus as shown herein, Harris expressly discloses these limitations. *See also* ¶148.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00100

151. Harris expressly discloses that its system allows users to query Harris's stored geo-temporal data using both location and time criteria for such queries: "A method and apparatus for a data analysis system for analyzing data object collections that include geo-temporal data is provided. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are generated based on the specified time granularities. Geo-temporal input data is indexed based on the generated temporal index bucket groups. **The system allows a data analyst to specify geo-temporal queries that include both geospatial component and a temporal component**. The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the temporal index bucket groups." *E.g.*, EX1004 (**Harris**), Abstract; *see also, e.g.*, EX1004 (**Harris**), 2:50-67 ("**The present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository**. Geo-temporal data generally refers to data that includes both a geospatial component and a temporal component. The geospatial component may comprise one or more stored data values indicating a geographic location and the temporal component may comprise one or more values indicating a point in time or range of time. In general terms, in order to more efficiently process requests for geo-

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00101

temporal data stored in a key-value data repository, a geo-temporal indexing structure is generated and managed in computer memory; for example, indexes may be stored on disk and cached in memory on demand. In an embodiment, the geo-temporal indexing structure is based in part on user input specifying one or more time sets or granularities that are likely to correspond to time ranges specified in user requests for the stored and indexed geo-temporal data.").

152. Harris further discloses, *inter alia*, that its system allows for searching (*i.e.*, querying) of its geo-temporal data: "**FIG. 1 illustrates an example computer system for indexing and *searching* geo-temporal data**. In an embodiment, an organization or entity may manage one or more data sources 101 that generate data, perhaps continuously or on an ongoing or periodic basis. Any sizeable organization will typically manage multiple data sources 101 that generate a large amount of data. Example data sources 101 include databases, log files, transaction logs, call data records, access logs, netflows, authentication logs, authorization logs, e-mail message spools, and any other container for data." *E.g.*, EX1004 (**Harris**), 4:7-17.

153. As one example, Harris explains that users may query particular data (*e.g.*, crime report data) using "a four block perimeter," explaining that "[o]ne particular type of data that such organizations may often collect and analyze is geospatial data. Geospatial data generally represents any data that includes a geographical component and that associates the data with particular geographic

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00102

locations or areas. For example, a crime enforcement agency may track data that corresponds to crime reports received within a particular city. One item of information stored in association with each crime report may include a geographical component indicating a location of the incident specified by the crime report. An example data object representing each crime report may include values representing a longitude and latitude corresponding to the geographical location of the incident. **A data analyst with access to such data may then specify geospatial search requests such as, for example, a search request for crime reports associated with incidents within a specified geographical radius or within a four block perimeter**." *E.g.*, EX1004 (**Harris**), 1:21-37.

154. Harris further discloses that users can query particular data (again, as one example, crime report data) based on temporal criteria, such as incidents occurring with the prior three months: "Organizations also frequently collect data that includes a temporal component. A temporal component generally refers to one or more data values that indicate a particular point in time, such as a date and/or time of day, or a range of time. For example, in reference to the example crime report information, a crime enforcement agency may store in association with each crime report a time value indicating an approximate time the incident in the crime report occurred. In the example, by storing the temporal information, **data analysts may specify requests for data objects associated with a particular time range of**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00103

interest, for example, all crime reports associated with an incident that occurred within the past three months." *E.g.*, EX1004 (**Harris**), 1:38-50.

155. Harris also explains, *inter alia*, that its queries include parameters relating to both geographical areas of interest and time points or ranges of interest: "Data sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data. Organizations would appreciate a way to efficiently analyze these collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, for example, a request for all activities within a single city block within the past five years to all activities within an entire city within the past five hours**." *E.g.*, EX1004 (**Harris**), 4:44-59.

156. Harris additionally details components of its system, including those related to user queries: "Referring again to FIG. 1, in an embodiment a data processing system comprises a data repository 111, one or more adaptors 103, and **a search mechanism 113 with an interface 114**. **The data repository 111, the**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00104

adaptors(s) 103, the search mechanism 113, and the interface 114 may be interconnected to one another using any suitable data communication mechanism such as, for example, one or more data networks. The one or more data networks may include one or more local area networks (LANs), one or more wide area networks (WANs), or internetworks such as the public Internet. The components of the system may be distributed across one or more computer systems such as the computer system 500 of FIG. 5, which is further described herein. When distributed across multiple computer systems, components may additionally be distributed geographically, for example, across one or more data centers." *E.g.*, EX1004 (**Harris**), 5:9-24.

157. Harris also states that its "input data" is searchable using, for example, latitude and longitude ***values*** that define a geographical area: "In an embodiment, input data 102 that includes a geospatial component may be specified as geospatially searchable. **For example, a user may configure parser 104 and/or importer 109 to identify particular data items of input data 102 as geospatially searchable data**. In other embodiments, data items of input data 102 may be specified as geospatially searchable by default and without user input. In general, **geospatially searchable data may be searched using queries that specify one or more geographical search parameters such as, for example, latitude and longitude values that define a geographical area**. In an embodiment, input data 102 that

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00105

includes a geospatial component and that is specified to be geospatially searchable is geospatially indexed in the data repository 111, as further described below." *E.g.*, EX1004 (**Harris**), 6:58-7:4.

158. As to searching by time points or time periods, Harris explains, *inter alia*, "**[i]n general, the user-specified time granularities correspond to time granularities that are expected by the user or others to be specified in geo-temporal queries against the data as stored in data repository 111**. **For example, an analyst involved in the importation of geo-temporal data may be aware that users often desire to search for data objects associated with particular geographic regions and that are associated with temporal components within particular year time spans and/or particular hour time spans.** In the example, an analyst involved in the importation of data may specify temporal index configuration data indicating two time granularities for the geo-temporal input data: a year time granularity and an hour time granularity. For example, temporal index bucket group 112A in FIG. 1 may correspond to the index bucket group for the year time granularity and temporal index bucket group 112B may correspond to the index bucket group for the hour granularity. In the example, generated temporal index buckets of temporal index bucket group 112A may represent particular year timespans (e.g., 1978, 2002, 2009, 2012) and generated temporal index buckets of

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00106

temporal index bucket group 112B may represent particular day timespans (e.g., Mar. 15, 1978; Jan. 10, 2009)." *E.g.*, EX1004 (**Harris**), 8:36-57.

159. Harris further discloses an interface for receiving user queries: "[i]n general, a search mechanism 113 receives as input a set of geo-temporal search parameters and provides as output a set of search results. **FIG. 2 illustrates an example graphical user interface 200 that enables a user to specify a set of search parameters for a geo-temporal query**. **Graphical user interface 200 includes interface components that enable a user to specify both a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters, respectively**." *E.g.*, EX1004 (**Harris**), 9:38-46.

160. Harris further discloses enabling users to provide the system with a geo-temporal query through various methods, including a graphical user interface, explaining that, *e.g.*, "[f]urther, no particular graphical user interface is required and the disclosure is intended to encompass the geo-temporal query processing approaches that are described independent of any graphical user interface, and it is not intended to be limited to any particular graphical user interface or other form of display. For example, the example **graphical user interface merely represents one way to receive input from a user to specify a geo-temporal query**; in other embodiments, programmatic methods may be used to obtain the same query specification information and other forms of data output may be used such as

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00107

logging, reporting, storing in database tables, storing in spreadsheets, etc." *E.g.*, EX1004 (**Harris**), 9:26-37.

161. Harris further discloses that its interface allows users to specify "geospatial bounding areas" to be used in queries: "Interface component 204 illustrates a representation of a geographical map that may be used to **specify one or more desired geospatial bounding areas**. For example, bounding area 206 represents an example bounding area that a user may specify on the map using an input mechanism such as, for example, a mouse pointer to draw the bounding area on the map. In an embodiment, a specified bounding area such as **bounding area 206 defines a geographical area of interest to the user that will be specified as a geospatial search parameter in a resulting geo-temporal query**. For example, if a user was interested in stored data objects pertaining to a particular geographical area around the user's home, the user may specify a bounding area that includes both the geographical location of the user's home and any surrounding area of interest using interface component 204. In an embodiment, a bounding area may be defined using a number of shapes including, but not limited to, a radial or polygonal bounding area." *E.g.*, EX1004 (**Harris**), 9:47-64.

162. Harris further discloses that in addition to geospatial bounding areas, its user interface allows users to specify temporal ranges to be used in user queries, explaining that "**a user may additionally specify a temporal range of interest**

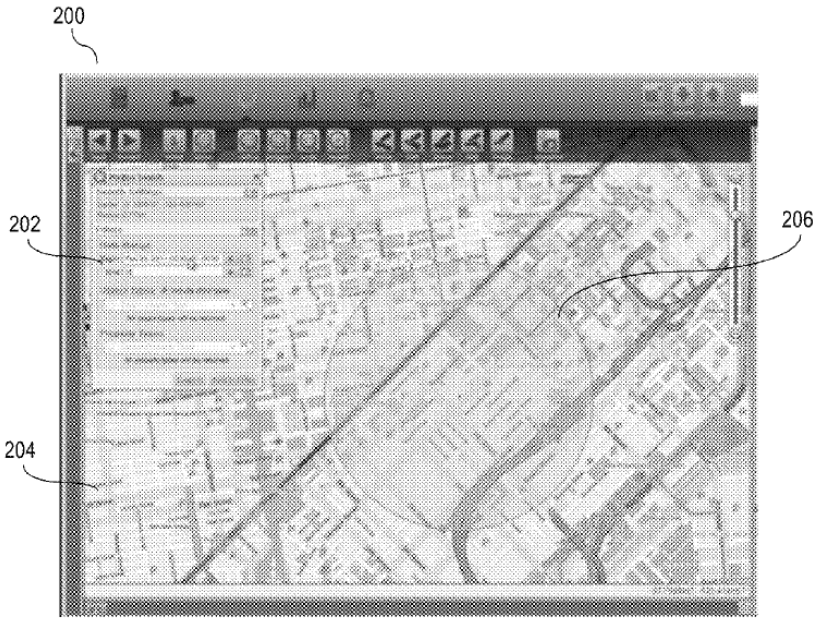
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00108

using graphical user interface 200. In an embodiment, a specified temporal range for a geo temporal query may include one or more of a start date and/or time value and an end date and/or time value. **Graphical interface component 202 illustrates an example interface component enabling a user to specify a temporal range as a search parameter.** An interface component such as interface component 202 may include, among other input elements, one or more input elements for entering date and time values. **For example, a user may enter one or more dates using text boxes, a calendar, or any other interface component for entering dates and/or time values**. In addition to specifying a temporal range, interface component 202 may include one or more additional input parameters enabling the specification of one or more other search parameters, for example, a search string, a sort order, etc. **In an embodiment, a geo-temporal query may be generated based on the input received at graphical user interface 200. For example, search mechanism may transform the user input received at graphical user interface 200 into a textual representation of a geo-temporal query that includes search parameters corresponding to the user input received at graphical user interface 200. After the geo-temporal query is generated, the geo-temporal query may be processed by search mechanism 113.**" *E.g.*, EX1004 (**Harris**), 9:65-10:23.

163. An example of this is illustrated in Harris's Figure 2:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00109

FIG. 2

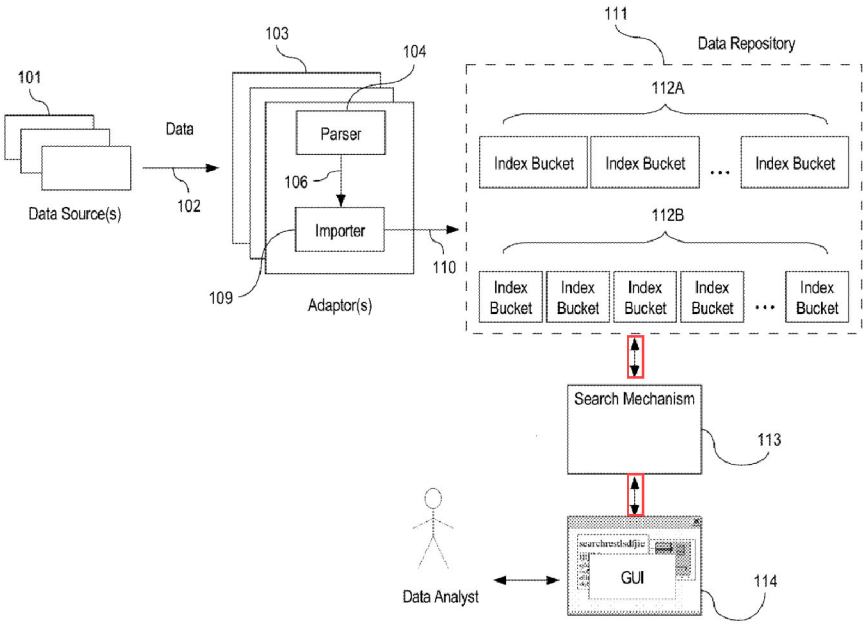


164. Harris explains that users interact with its graphical user interface (GUI), using, *e.g.*, a user computer and input devices such as a mouse and keyboard, explaining that "[c]omputer system 500 may be coupled via bus 502 to a display 512, such as a cathode ray tube (CRT), for displaying information to a computer user. **An input device 514, including alphanumeric and other keys, is coupled to bus 502 for communicating information and command selections to processor 504. Another type of user input device is cursor control 516, such as a mouse, a trackball, or cursor direction keys for communicating direction information and command selections to processor 504 and for controlling cursor movement on display 512.** This input device typically has two degrees of freedom in two axes,

a first axis (e.g., x) and a second axis (e.g., y), that allows the device to specify positions in a plane." *E.g.*, EX1004 (**Harris**), 11:66-12:11.

165. Harris expressly discloses that user queries created using Harris's GUI (*e.g.*, 114) are received (as shown by the double arrows) by Harris's search mechanism (*e.g.*, 113) and data repository (*e.g.*, 111). *E.g.*, EX1004 (**Harris**), Fig.1:

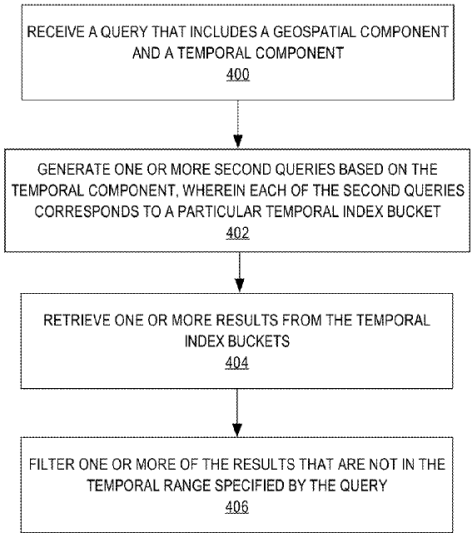
FIG. 1



166. Harris explains that user search queries include both geospatial and temporal components, explaining, *e.g.*, that "FIG. 4 illustrates a flow diagram of a process for carrying out a geo-temporal query in accordance with one or more of embodiments described herein. **In an embodiment, a search query is received (block 400) that includes both a geospatial component and a temporal**

component. In response to receiving a query, one or more second queries are generated (block 402), with each of the second queries corresponding to a particular temporal index bucket of a temporal index bucket group. In an embodiment, the temporal index buckets are selected to correspond to the temporal component of the query. For example, assume that particular geo-temporal data has been indexed into a first temporal index bucket group based on a time granularity of years and a second temporal index bucket group based on a time granularity of days. If a geo-temporal query is received that specifies a temporal range of Jan. 1, 2011 to Jan. 2, 2012, the system may transform the geo-temporal query into a second query against the bucket corresponding to the data year 2011 and two additional second queries corresponding to the days of Jan. 1, 2012 and Jan. 2, 2012." *E.g.*, EX1004 (**Harris**), 10:24-43, Fig.4:

FIG. 4



Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00112

167. As just one example, Harris provides a geo-temporal query that includes time parameters specifying a specific "time range" and a "particular day": "In an embodiment, processing a geo-temporal query may include one more steps of post-filtering. As a result of the particular partitioning of the temporal index buckets, the result set returned by the one or more second queries may include one or more data items that are not within the exact temporal range specified by the geo-temporal query. In an embodiment, the search mechanism 113 may filter (block 406) the one or more results that are not within the specified temporal range. For example, assume that a geo-temporal index is created using a specified time granularity of an hour, resulting in a temporal index bucket group with one or more temporal index buckets of hour time ranges (e.g., 1:00 pm-2:00 pm, 2:00 pm-3:00 pm, 3:00 pm-4:00 pm, etc.). **An example geo-temporal query may then include a temporal search parameter specifying a time range on a particular day between 2:15 pm and 3:15 pm**. In response to receiving the example geo-temporal query, the search mechanism 113 may transform the query into two queries that query the temporal index buckets that index data objects associated with a temporal value between the time ranges of 2:00 pm-3:00 pm and 3:00 pm-4:00 pm, respectively. After retrieving any data objects from either or both of the two index buckets that satisfy any geospatial component of the query, search mechanism 113 may post-filter the data object results in order to filter any data objects that are associated with a temporal

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00113

value outside of the range specified in the query, i.e., those data objects in the temporal ranges of 2:00 pm-2:14 pm and 3:16 pm-4:00 pm." *E.g.*, EX1004 (**Harris**), 10:59-11:19.

168. Harris further discloses that its search process is carried out by one or more computer processors: "According to one embodiment, the techniques described herein are implemented by one or more special-purpose computing devices. The special-purpose computing devices may be hard-wired to perform the techniques, or may include digital electronic devices such as one or more application-specific integrated circuits (ASICs) or field programmable gate arrays (FPGAs) that are persistently programmed to perform the techniques, or may include one or more **general purpose hardware processors programmed to perform the techniques pursuant to program instructions** in firmware, memory, other storage, or a combination. Such special-purpose computing devices may also combine custom hard-wired logic, ASICs, or FPGAs with custom programming to accomplish the techniques. The special-purpose computing devices may be desktop computer systems, portable computer systems, handheld devices, networking devices or any other device that incorporates hard-wired and/or program logic to implement the techniques. For example, FIG. 5 is a block diagram that illustrates a computer system 500 upon which an embodiment may be implemented. Computer system 500 includes a bus 502 or other communication mechanism for

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00114

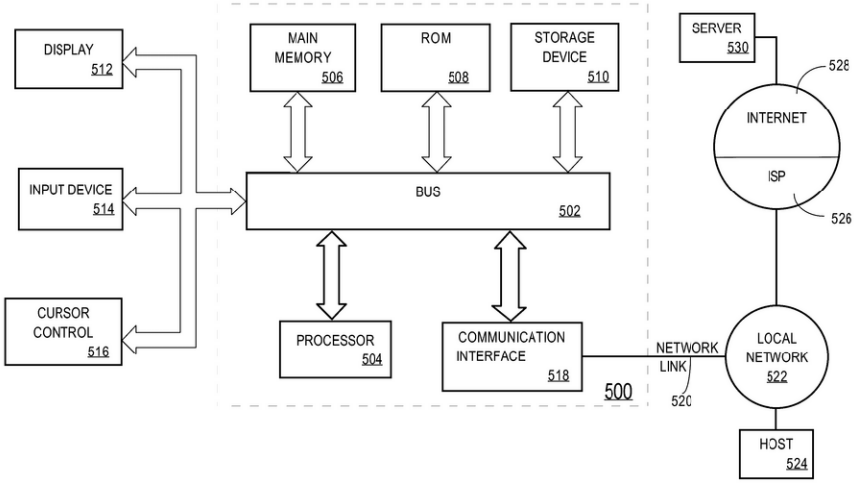
communicating information, and a **hardware processor 504 coupled with bus 502 for processing information. Hardware processor 504 may be, for example, a general purpose microprocessor.** Computer system 500 also includes a main memory 506, such as a random access memory (RAM) or other dynamic storage device, coupled to bus 502 for storing information and **instructions to be executed by processor 504**. Main memory 506 also may be used for storing temporary variables or other intermediate information during execution of instructions to be executed by processor 504. Such instructions, when stored in non-transitory storage media accessible to processor 504, render computer system 500 into a special-purpose machine that is customized to perform the operations specified in the instructions. Computer system 500 further includes a read only memory (ROM) 508 or other static storage device coupled to bus 502 for **storing static information and instructions for processor 504**. A storage device 510, such as a magnetic disk, optical disk, or solid-state drive is provided and coupled to bus 502 for storing information and instructions." *E.g.*, EX1004 (**Harris**), 11:24-48; *see also, e.g.*, EX1004 (**Harris**), 12:66-13:13 ("**Computer system 500 also includes a communication interface 518 coupled to bus 502. Communication interface 518 provides a two-way data communication coupling** to a network link 520 that is connected to a local network 522. For example, communication interface 518 may be an integrated services digital network

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00115

(ISDN) card, cable modem, satellite modem, or a modem to provide a data communication connection to a corresponding type of telephone line. As another example, communication interface 518 may be a local area network (LAN) card to provide a data communication connection to a compatible LAN. Wireless links may also be implemented. In any such implementation, communication interface 518 sends and receives electrical, electromagnetic or optical signals that carry digital data streams representing various types of information."), 13:28-36 ("**Computer system 500 can send messages and receive data, including program code, through the network(s), network link 520 and communication interface 518. In the Internet example, a server 530 might transmit a requested code for an application program through Internet 528, ISP 526, local network 522 and communication interface 518. The received code may be executed by processor 504 as it is received, and/or stored in storage device 510, or other non-volatile storage for later execution.**"), cl.8 ("the one or more processors carry out the steps of… receiving a search query"), Fig.5 (showing "processor 504"):

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00116

FIG. 5



169. Harris additionally discloses that its system includes a "communication interface" that allows communication through networks to other data devices: "**Network link 520 typically provides data communication through one or more networks to other data devices**. For example, network link 520 may provide a connection through local network 522 to a host computer 524 or to data equipment operated by an Internet Service Provider (ISP) 526. ISP 526 in turn provides data communication services through the world wide packet data communication network now commonly referred to as the "Internet" 528. Local network 522 and Internet 528 both use electrical, electromagnetic or optical signals that carry digital data streams. The signals through the various networks and the signals on network link 520 and through **communication interface 518**, which carry the digital data to

and from computer system 500, are example forms of transmission media." *E.g.*, EX1004 (**Harris**), 13:14-27.

* * *

170. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

5. Element 12.d

171. Claim 12.d recites "**retrieve, from the integrated centralized property database, data items having associated geographic location identifiers matching the received geographic location and having associated time identifiers matching the time information.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-3).**

172. In my opinion, **Harris discloses the processor (*see* cl.12.b) retrieving, from the integrated centralized property database** (*see* cl.12a)**, data items having associated geographic location identifiers** (*see* cl.12.a) **matching the received geographic location**[4] (*see* cl.12.c) **and having associated time identifiers** (*see* cl.12.a) **matching the time information** (*e.g.*, "retrieve one or more results from the temporal index buckets" stored in "data repository"; "geo-temporal

[4] For the combined Harris-Florance system (Ground 3), retrieved data includes Florance's property information (*see* cl.12.a).

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00118

queries… include both [a] geospatial component and a temporal component. The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the index"; "In response to receiving the… geo-temporal query, the search mechanism" retrieves indexed "data objects associated with a temporal value" from "data repository" satisfying the query and "satisfy[ing] any geospatial component of the query"; "data returned by a geographically-focused search will be filtered…to refine the results to the specified temporal range"; "[t]he results returned from each of the temporal index buckets are those results that satisfy the geospatial component of the query," *e.g.*, "crime report" and "geographical location of the incident," including "values representing a latitude and longitude"; *see* cl.12.c)**.**

173. For example, Harris expressly discloses that its system retrieves data items from Harris's temporal index buckets (which are stored in Harris's data repository, *e.g.*, EX1004 (**Harris**), Fig.1) matching the geographic location identifiers and time identifiers specified in the received query: "A method and apparatus for a data analysis system for analyzing data object collections that include geo-temporal data is provided. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00119

generated based on the specified time granularities. Geo-temporal input data is indexed based on the generated temporal index bucket groups. **The system allows a data analyst to specify geo-temporal queries that include both geospatial component and a temporal component. The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the temporal index bucket groups.**" *E.g.*, EX1004 (**Harris**), Abstract; *see also, e.g.*, EX1004 (**Harris**), 1:38–50 ("Organizations also frequently collect data that includes a temporal component. A temporal component generally refers to one or more data values that indicate a particular point in time, such as a date and/or time of day, or a range of time. For example, in reference to the example crime report information, a crime enforcement agency may store in association with each crime report a time value indicating an approximate time the incident in the crime report occurred. In the example, by storing the temporal information, **data analysts may specify requests for data objects associated with a particular time range of interest, for example, all crime reports associated with an incident that occurred within the past three months**."), 4:49-59 ("**Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest**. The geo-temporal information reflecting activities of interest may be as

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00120

varied along the geospatial and temporal dimensions as, for example, a request for all activities within a single city block within the past five years to all activities within an entire city within the past five hours.").

174. Harris further discloses that its system receives search queries through Harris's GUI and that a search mechanism processes such queries to retrieve data items from Harris's index buckets, which Harris expressly discloses are stored in Harris's data repository (*e.g.*, EX1004, (**Harris**), Fig.1): "In an embodiment, a user may additionally specify a temporal range of interest using graphical user interface 200. In an embodiment, a specified temporal range for a geo temporal query may include one or more of a start date and/or time value and an end date and/or time value. Graphical interface component 202 illustrates an example interface component enabling a user to specify a temporal range as a search parameter. An interface component such as interface component 202 may include, among other input elements, one or more input elements for entering date and time values. For example, a user may enter one or more dates using text boxes, a calendar, or any other interface component for entering dates and/or time values. In addition to specifying a temporal range, interface component 202 may include one or more additional input parameters enabling the specification of one or more other search parameters, for example, a search string, a sort order, etc. **In an embodiment, a geo-temporal query may be generated based on the input received at graphical user**

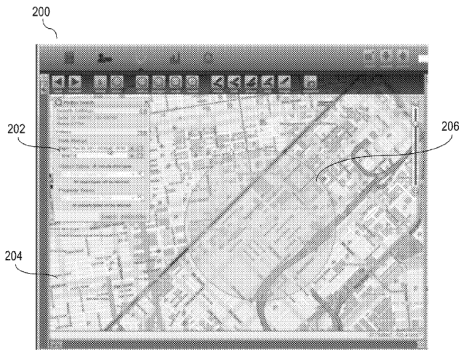
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00121

interface 200. For example, search mechanism may transform the user input received at graphical user interface 200 into a textual representation of a geo-temporal query that includes search parameters corresponding to the user input received at graphical user interface 200. After the geo-temporal query is generated, the geo-temporal query may be processed by search mechanism 113." *E.g.*, EX1004 (**Harris**), 9:65-10:23.

175. Harris describes, for example, its search mechanism receiving a user query through, *e.g.*, Harris's GUI and retrieving the items to provide them "as output": "In general, a search mechanism 113 receives as input a set of geo-temporal search parameters **and provides as output a set of search results**. FIG. 2 illustrates an example graphical user interface 200 that enables a user to specify a set of search parameters for a geo-temporal query. Graphical user interface 200 includes interface components that enable a user to specify both a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters, respectively." *E.g.*, EX1004 (**Harris**), 9:38-46, Fig.2:

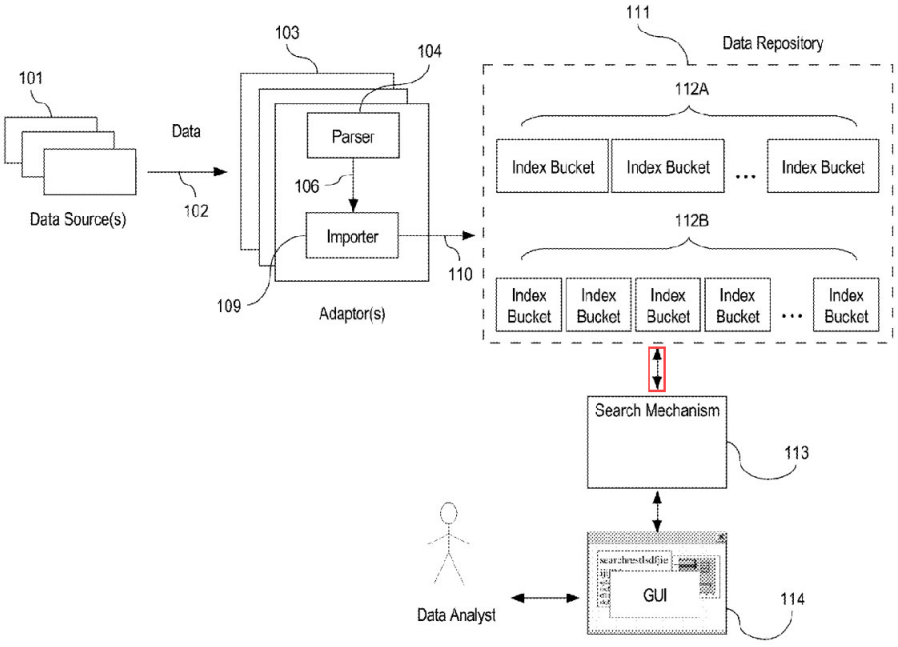
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00122

FIG. 2



176. Harris then describes retrieval of data from its "Data Repository" by its "Search Mechanism," which is indicated by the double arrow in Figure 1, denoting two-way communication (*i.e.*, queries sent by the search mechanism to Harris's data repository and data, such as data items satisfying the query, are retrieved by the search mechanism from the data repository). *E.g.*, EX1004 (**Harris**), Fig.1, Fig.2, Fig.4:

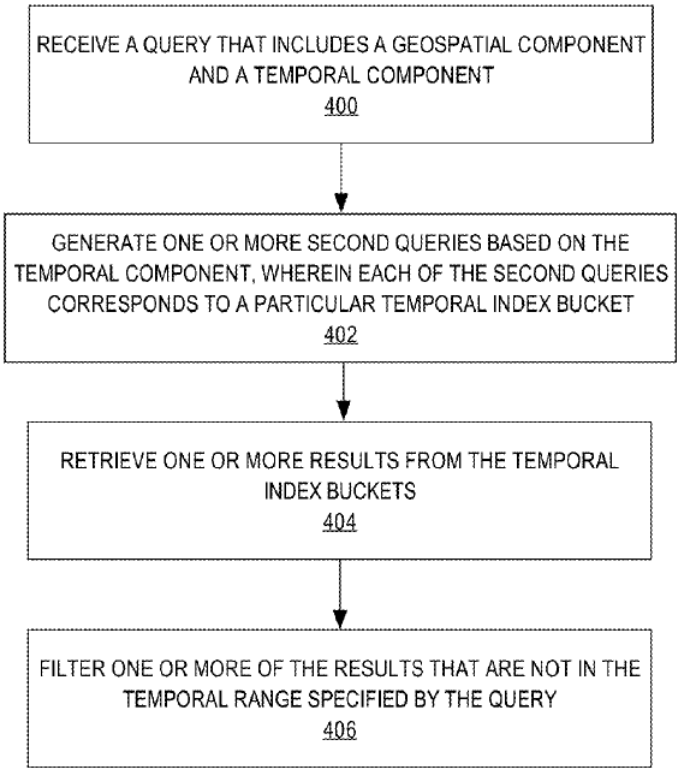
FIG. 1



177. Harris provides an exemplary search process in Figure 4, expressly disclosing that after receiving a query, Harris's system "retrieve[s] one or more results from the temporal index buckets," which are stored in the data repository, explaining that "FIG. 4 illustrates a flow diagram of a process for carrying out a geo-temporal query in accordance with one or more of embodiments described herein. In an embodiment, a search query is received (block 400) that includes both a geospatial component and a temporal component. In response to receiving a query, one or more second queries are generated (block 402), with each of the second queries corresponding to a particular temporal index bucket of a temporal index bucket group. **In an embodiment, the temporal index buckets are selected to**

correspond to the temporal component of the query. For example, assume that particular geo-temporal data has been indexed into a first temporal index bucket group based on a time granularity of years and a second temporal index bucket group based on a time granularity of days. If a geo-temporal query is received that specifies a temporal range of Jan. 1, 2011 to Jan. 2, 2012, the system may transform the geo-temporal query into a second query against the bucket corresponding to the data year 2011 and two additional second queries corresponding to the days of Jan. 1, 2012 and Jan. 2, 2012." *E.g.*, EX1004 (**Harris**), 10:24-48, Fig.4:

FIG. 4



Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00125

178. Harris further discloses, "[i]n response to each of the second queries, zero or more results are returned from each of the particular temporal index buckets (block 404). **The results returned from each of the temporal index buckets are those results that satisfy the geospatial component of the query**. Thus, in an embodiment, processing each of the second queries includes processing the geospatial component of the geo-temporal query on the data stored in each of the buckets. For example, if the data in data repository 111 is geospatially indexed using Z-order curve values, the geospatial component of the query may be transformed into one or more Z-order values and the values may be used to return corresponding results from each of the temporal index buckets. In an embodiment, the zero or more results returned from each of the one or more temporal index buckets are aggregated to form an initial result set." *E.g.*, EX1004 (**Harris**), 10:44-58.

179. As one of its examples, Harris discloses that a user may perform a geo-temporal query including as one parameter time ranges, and that the system receives the query and retrieves data objects that satisfy the geo-spatial component of the query as well as data objects satisfying the temporal component of the query: "In an embodiment, processing a geo-temporal query may include one more steps of post-filtering. As a result of the particular partitioning of the temporal index buckets, the result set returned by the one or more second queries may include one or more data items that are not within the exact temporal range specified by the geo-temporal

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00126

query. In an embodiment, the search mechanism 113 may filter (block 406) the one or more results that are not within the specified temporal range. For example, assume that a geo-temporal index is created using a specified time granularity of an hour, resulting in a temporal index bucket group with one or more temporal index buckets of hour time ranges (e.g., 1:00 pm-2:00 pm, 2:00 pm-3:00 pm, 3:00 pm-4:00 pm, etc.). An example geo-temporal query may then include a temporal search parameter specifying a time range on a particular day between 2:15 pm and 3:15 pm. In response to receiving the example geo-temporal query, the search mechanism 113 may transform the query into two queries that query the temporal index buckets that index data objects associated with a temporal value between the time ranges of 2:00 pm-3:00 pm and 3:00 pm-4:00 pm, respectively. **After retrieving any data objects from either or both of the two index buckets that satisfy any geospatial component of the query, search mechanism 113 may post-filter the data object results in order to filter any data objects that are associated with a temporal value outside of the range specified in the query, i.e., those data objects in the temporal ranges of 2:00 pm-2:14 pm and 3:16 pm-4:00 pm**." *E.g.*, EX1004 (**Harris**), 10:59-11:19; *see also, e.g.*, EX1004 (**Harris**), 8:36-57 ("In general, the user-specified time granularities correspond to time granularities that are expected by the user or others to be specified in geo-temporal queries against the data as stored in data repository 111. For example, an analyst involved in the importation of geo-

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00127

temporal data may be aware that users often desire to search for data objects associated with particular geographic regions and that are associated with temporal components within particular year time spans and/or particular hour time spans. In the example, an analyst involved in the importation of data may specify temporal index configuration data indicating two time granularities for the geo-temporal input data: a year time granularity and an hour time granularity. For example, temporal index bucket group 112A in FIG. 1 may correspond to the index bucket group for the year time granularity and temporal index bucket group 112B may correspond to the index bucket group for the hour granularity. In the example, generated temporal index buckets of temporal index bucket group 112A may represent particular year timespans (e.g., 1978, 2002, 2009, 2012) and generated temporal index buckets of temporal index bucket group 112B may represent particular day timespans (e.g., Mar. 15, 1978; Jan. 10, 2009).").

180. As another example, Harris explains that its users may query (and thus its system retrieves) "crime reports," which include "values representing a longitude and latitude corresponding to the geographical location of the incident": "One particular type of data that such organizations may often collect and analyze is geospatial data. Geospatial data generally represents any data that includes a geographical component and that associates the data with particular geographic locations or areas. For example, a crime enforcement agency may track data that

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00128

corresponds to crime reports received within a particular city. One item of information stored in association with each crime report may include a geographical component indicating a location of the incident specified by the crime report. An example data object representing each crime report may include values representing a longitude and latitude corresponding to the geographical location of the incident. A data analyst with access to such data may then specify geospatial search requests such as, for example, a search request for crime reports associated with incidents within a specified geographical radius or within a four block perimeter." *E.g.*, EX1004 (**Harris**), 1:21-37.

* * *

181. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

6. Element 12.e

182. Claim 12.e recites "**provide the retrieved data items to the user computer system via a graphical user interface.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-3).**

183. In my opinion, **Harris discloses providing the retrieved data items to the user computer system via a graphical user interface** (*e.g.*, "search mechanism 113… provides as output a set of search results" on, *e.g.*, Fig.2's "graphical user interface," including, *e.g.*, "crime report" and "geographical location

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00129

of the incident," including "values representing a latitude and longitude"; outputting the retrieved data items to Fig.1's "Data Analyst" having two-way interactions to query and receive results through "GUI" 114 which, in turn, has two-way interaction with "Data Repository" 111 via "Search Mechanism" 113; "displaying information to a computer user" (*e.g.*, "data objects" "satisfy[ing]… the query") including on Fig.5's "display 512, such as a cathode ray tube (CRT)")**.**

184. For example, Harris expressly discloses that data analysts perform geo-temporal queries for information: "Organizations also frequently collect data that includes a temporal component. A temporal component generally refers to one or more data values that indicate a particular point in time, such as a date and/or time of day, or a range of time. For example, in reference to the example crime report information, a crime enforcement agency may store in association with each crime report a time value indicating an approximate time the incident in the crime report occurred. In the example, by storing the temporal information, **data analysts may specify requests for data objects associated with a particular time range of interest, for example, all crime reports associated with an incident that occurred within the past three months**." *E.g.*, EX1004 (**Harris**), 1:38-50.

185. And Harris discloses its system receiving geo-temporal queries through a user interface that is a graphical user interface ("GUI"), and that the queries are processed by Harris's search mechanism, and results returned: "[A] user may

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00130

additionally specify a temporal range of interest using graphical user interface 200. In an embodiment, a specified temporal range for a geo temporal query may include one or more of a start date and/or time value and an end date and/or time value. Graphical interface component 202 illustrates an example interface component enabling a user to specify a temporal range as a search parameter. An interface component such as interface component 202 may include, among other input elements, one or more input elements for entering date and time values. For example, a user may enter one or more dates using text boxes, a calendar, or any other interface component for entering dates and/or time values. In addition to specifying a temporal range, interface component 202 may include one or more additional input parameters enabling the specification of one or more other search parameters, for example, a search string, a sort order, etc. **In an embodiment, a geo-temporal query may be generated based on the input received at graphical user interface 200. For example, search mechanism may transform the user input received at graphical user interface 200 into a textual representation of a geo-temporal query that includes search parameters corresponding to the user input received at graphical user interface 200. After the geo-temporal query is generated, the geo-temporal query may be processed by search mechanism 113.**" *E.g.*, EX1004 (**Harris**), 9:65-10:23; *see also, e.g.*, EX1004 (**Harris**), 5:9-24 ("Referring again to FIG. 1, in an embodiment a data processing system comprises a data repository 111,

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00131

one or more adaptors 103, and **a search mechanism 113 with an interface 114**. **The data repository 111, the adaptors(s) 103, the search mechanism 113, and the interface 114 may be interconnected to one another using any suitable data communication mechanism such as, for example, one or more data networks.** The one or more data networks may include one or more local area networks (LANs), one or more wide area networks (WANs), or internetworks such as the public Internet. The components of the system may be distributed across one or more computer systems such as the computer system 500 of FIG. 5, which is further described herein. When distributed across multiple computer systems, components may additionally be distributed geographically, for example, across one or more data centers.").

186. Harris further expressly discloses that after data items matching the geo-temporal parameters of the user query are retrieved, they are "output" and displayed to a user on Harris's GUI: "In general, a search mechanism 113 receives as input a set of geo-temporal search parameters and **provides as output a set of search results**. FIG. 2 illustrates an example **graphical user interface 200** that enables a user to specify a set of search parameters for a geo-temporal query. Graphical user interface 200 includes interface components that enable a user to specify both a geospatial bounding area and a time value or range of time values as

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00132

geospatial and temporal search parameters, respectively." *E.g.*, EX1004 (**Harris**), 9:38-46.

187. Harris confirms that its system includes a display, such as a computer monitor, for displaying information (*e.g.*, search results on Harris's GUI) to its users: "Computer system 500 may be coupled via bus 502 to a display 512, such as a cathode ray tube (CRT), for displaying information to a computer user. An input device 514, including alphanumeric and other keys, is coupled to bus 502 for communicating information and command selections to processor 504. Another type of user input device is cursor control 516, such as a mouse, a trackball, or cursor direction keys for communicating direction information and command selections to processor 504 and for controlling cursor movement on display 512. This input device typically has two degrees of freedom in two axes, a first axis (e.g., x) and a second axis (e.g., y), that allows the device to specify positions in a plane." *E.g.*, EX1004 (**Harris**), 11:66-12:11.

188. Likewise, Harris Figure 2 shows search results being output from Harris's "Data Repository" to a "Search Mechanism," from the "Search Mechanism" to a "GUI," and from the "GUI" to a "Data Analyst" (each indicated by double arrows, showing, *e.g.*, two-way communication, including the data analyst receiving information from the GUI (displayed on interface 114), including search results). *E.g.*, EX1004 (**Harris**), Figs.1 2 (showing GUI), 4 (showing Harris's

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00133

processing of a geo-temporal query), 5 (showing computer system upon which the Harris system is implemented, including "DISPLAY"):

FIG. 1

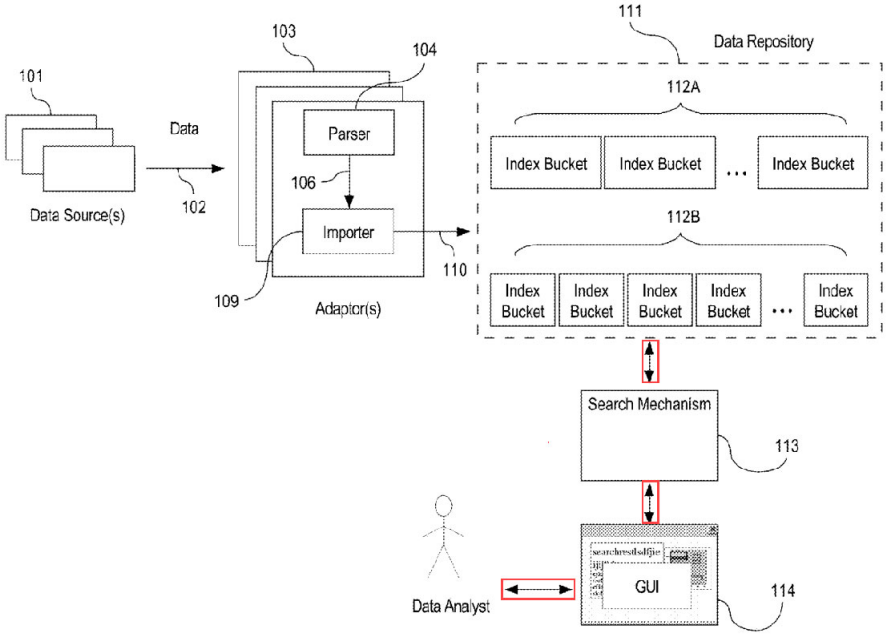


FIG. 2

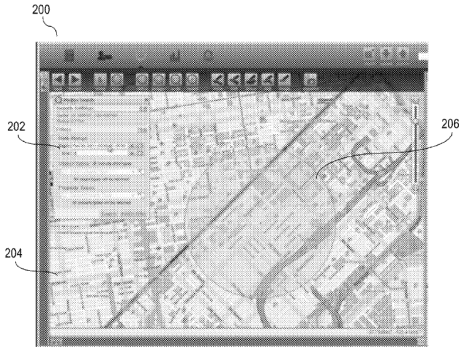


FIG. 4

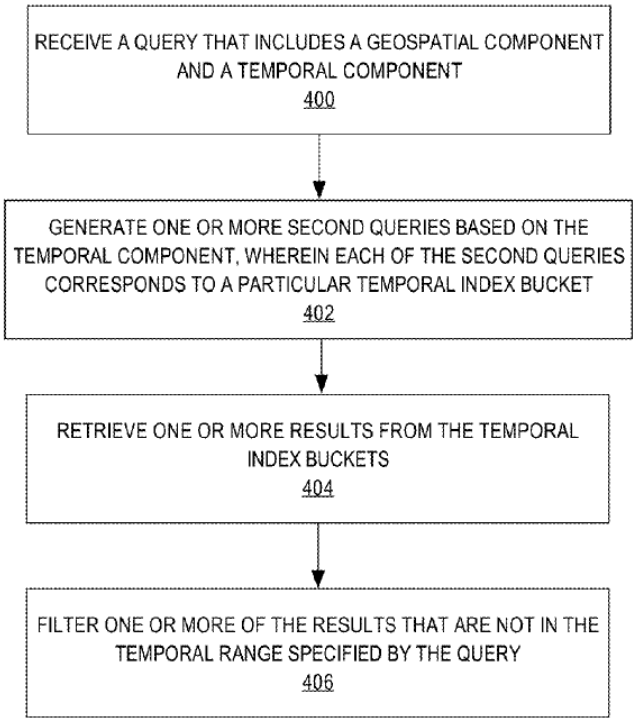
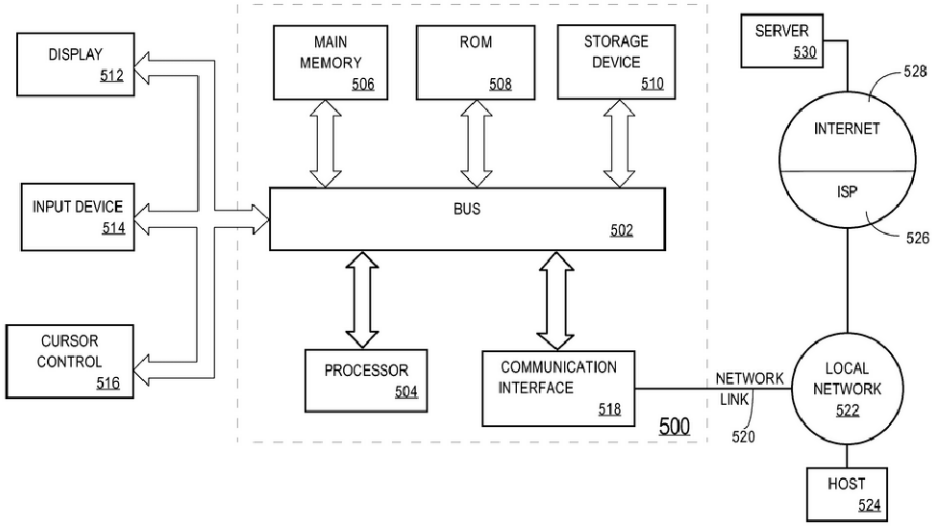

RECEIVE A QUERY THAT INCLUDES A GEOSPATIAL COMPONENT AND A TEMPORAL COMPONENT
400
GENERATE ONE OR MORE SECOND QUERIES BASED ON THE TEMPORAL COMPONENT, WHEREIN EACH OF THE SECOND QUERIES CORRESPONDS TO A PARTICULAR TEMPORAL INDEX BUCKET
402
RETRIEVE ONE OR MORE RESULTS FROM THE TEMPORAL INDEX BUCKETS
404
FILTER ONE OR MORE OF THE RESULTS THAT ARE NOT IN THE TEMPORAL RANGE SPECIFIED BY THE QUERY
406

FIG. 5


DISPLAY
512
INPUT DEVICE
514
CURSOR CONTROL
516
MAIN MEMORY
506
ROM
508
STORAGE DEVICE
510
BUS
502
PROCESSOR
504
COMMUNICATION INTERFACE
518
500
NETWORK LINK
520
SERVER
530
528
INTERNET
ISP
526
LOCAL NETWORK
522
HOST
524

189. Harris provides additional detail regarding the output of its search results to a user, making clear that results satisfying the user's query are provided (output) to a user: "In an embodiment, processing a geo-temporal query may include one more steps of post-filtering. As a result of the particular partitioning of the temporal index buckets, the result set returned by the one or more second queries may include one or more data items that are not within the exact temporal range specified by the geo-temporal query. In an embodiment, the search mechanism 113 may filter (block 406) the one or more results that are not within the specified temporal range. For example, assume that a geo-temporal index is created using a specified time granularity of an hour, resulting in a temporal index bucket group with one or more temporal index buckets of hour time ranges (e.g., 1:00 pm-2:00 pm, 2:00 pm-3:00 pm, 3:00 pm-4:00 pm, etc.). An example geo-temporal query may then include a temporal search parameter specifying a time range on a particular day between 2:15 pm and 3:15 pm. In response to receiving the example geo-temporal query, the search mechanism 113 may transform the query into two queries that query the temporal index buckets that index data objects associated with a temporal value between the time ranges of 2:00 pm-3:00 pm and 3:00 pm-4:00 pm, respectively. **After retrieving any data objects from either or both of the two index buckets that satisfy any geospatial component of the query, search mechanism 113 may post-filter the data object results in order to filter any data**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00136

objects that are associated with a temporal value outside of the range specified in the query, i.e., those data objects in the temporal ranges of 2:00 pm-2:14 pm and 3:16 pm-4:00 pm." *E.g.*, EX1004 (**Harris**), 10:59-11:19; *see also, e.g.*, EX1004 (**Harris**), Abstract ("A method and apparatus for a data analysis system for analyzing data object collections that include geo-temporal data is provided. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are generated based on the specified time granularities. Geo-temporal input data is indexed based on the generated temporal index bucket groups. The system allows a data analyst to specify geo-temporal queries that include both geospatial component and a temporal component. **The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the temporal index bucket groups**.").

* * *

190. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

191. Accordingly, in my opinion, claim 12 is anticipated by or rendered obvious over Harris, or alternatively, is rendered obvious over Harris in view of Florance.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00137

D. Claim 13 is Anticipated or Rendered Obvious Over Harris, or Alternatively, is Rendered Obvious Over Harris in View of Florance

192. **In my opinion, claim 13 is anticipated by or rendered obvious over Harris (Grounds 1-2), or alternatively, rendered obvious over Harris in view of Florance (Ground 3).** *See infra*, Appendix C, Claim 13.

193. Claim 13 recites "**The system of claim 12, wherein the one or more geographic location identifiers include latitude and longitude coordinates.**" **In my opinion, Harris discloses or renders obvious this claim (Grounds 1-2), or alternatively, Harris in view of Florance renders obvious this claim (Ground 3).**

194. In my opinion, **Harris discloses or renders obvious, or Harris in view of Florance renders obvious the system of claim 12** (*see* cl.12)**, and Harris discloses wherein the one or more geographic location identifiers include latitude and longitude coordinates** (*e.g.*, "values representing a geospatial component may include one or more numerical values specifying a longitude and latitude"; "values representing" or "specifying a latitude and longitude"; *see* cl.12.a)**.**

195. Harris expressly discloses that its stored data is associated with, *e.g.*, "longitude and latitude": "In this context, the term 'input data' refers to data that is presented as input to the system. That is, data that is obtained by an adaptor 103 from a data source 101 for processing and possible input into the data repository 111. **The term 'geo-temporal data' refers to any input data that includes one or more**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00138

values representing a geospatial component and one or more values representing a temporal component. For example, values representing a geospatial component may include one or more numerical values specifying a longitude and latitude or any other representation of a geographical location. A temporal component includes one or more values specifying one or more points in time and may be specified, for example, by a character string or numerical value representing a midnight Coordinated Universal Time (UTC) value or any other representation of time values." *E.g.*, EX1004 (**Harris**), 5:59-6:6; *see also, e.g.*, EX1004 (**Harris**), 1:21-37 ("One particular type of data that such organizations may often collect and analyze is geospatial data. Geospatial data generally represents any data that includes a geographical component and that associates the data with particular geographic locations or areas. For example, a crime enforcement agency may track data that corresponds to crime reports received within a particular city. One item of information stored in association with each crime report may include a geographical component indicating a location of the incident specified by the crime report. **An example data object representing each crime report may include values representing a longitude and latitude corresponding to the geographical location of the incident.** A data analyst with access to such data may then specify geospatial search requests such as, for example, a search request for crime reports

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00139

associated with incidents within a specified geographical radius or within a four block perimeter.").

196. Harris also expressly discloses that its data may be searched using longitude and latitude, explaining that user queries may include latitude and longitude parameters, explaining that "input data 102 that includes a geospatial component may be specified as geospatially searchable. For example, a user may configure parser 104 and/or importer 109 to identify particular data items of input data 102 as geospatially searchable data. In other embodiments, data items of input data 102 may be specified as geospatially searchable by default and without user input. **In general, geospatially searchable data may be searched using queries that specify one or more geographical search parameters such as, for example, latitude and longitude values that define a geographical area**. In an embodiment, input data 102 that includes a geospatial component and that is specified to be geospatially searchable is geospatially indexed in the data repository 111, as further described below."). *E.g.*, EX1004 (**Harris**), 6:58-7:4; *see also, e.g.*, EX1004 (**Harris**), 7:32-36 ("The one-dimensional representation may be a single numeric value and the multidimensional data representation may be numeric values representing a longitude and latitude corresponding to a geographic location.").

* * *

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00140

197. Accordingly, in my opinion, claim 13 is anticipated by or rendered obvious over Harris, or alternatively, is rendered obvious over Harris in view of Florance.

E. Claim 15 is Anticipated by or Rendered Obvious Over Harris, or Alternatively, is Rendered Obvious Over Harris in View of Florance

198. **In my opinion, claim 15 is anticipated by or rendered obvious over Harris (Grounds 1-2), or alternatively, rendered obvious over Harris in view of Florance (Ground 3).** *See infra*, Appendix C, Claim 15.

199. Claim 15 recites "**The system of claim 12, wherein the time identifier includes one or more time periods.**" **In my opinion, Harris discloses or renders obvious this claim (Grounds 1-2), or alternatively, Harris in view of Florance renders obvious this claim (Ground 3).**

200. In my opinion, **Harris discloses or renders obvious, or Harris in view of Florance renders obvious the system of claim 12** (*see* cl.12)**, and Harris discloses the additional limitation of claim 15, requiring the time identifier includes one or more time periods** (*e.g.*, "particular range of time associated with the particular temporal index bucket"; "particular geo-temporal data includes data with temporal components associated with time values falling within each of the years 2000-2010"; "temporal component may comprise one or more values indicating a… range of time")**.**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00141

201. For example, Harris discloses, *inter alia*, that its data are "associated with a temporal value that falls within the particular ***range of time*** associated with the particular temporal index bucket" and are thus associated with one or more time periods: "in addition to geospatially indexing the geo-temporal data, the data is further indexed in the data repository based on a temporal component of the data and based on received user input specifying one or more time granularities that a user may, for example, anticipate to be **time granularities that are likely to correspond to user requests against the indexed data. Examples of various time granularities that may be used in embodiments, or together in one embodiment, include years, months, days, and any other useful measure of time**. In an embodiment, a "temporal index bucket" group comprising one or more temporal index buckets is created in the data repository for each of the user-specified time granularities. In an embodiment, each temporal index bucket of a temporal index bucket group corresponds to a particular range of time equal to the corresponding time granularity for that bucket group. Each particular temporal index bucket includes one or more references to geospatially indexed data objects that are associated with a temporal value that falls within the particular range of time associated with the particular temporal index bucket." *E.g.*, EX1004 (**Harris**), 3:12-32.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00142

202. For example, an index bucket of Harris may include a time period of one year, and Harris indexes in that bucket, and thereby associates any data with a time identifier during that year with that particular time period (*i.e.*, a particular year): "[R]equests for geo-temporal data indexed in a data repository are processed using one or more of the generated index bucket groups. For example, a geo-temporal request may be a query specifying one or more geospatial search parameters and one or more temporal search parameters. In an embodiment, a geo-temporal request for geo-temporal data indexed according to the methods described herein is transformed into one or more second requests against one or more temporal index buckets based on the temporal component specified in the request. For example, assume particular geo-temporal data includes data with temporal components associated with time values falling within each of the years 2000-2010 and is indexed according to a time granularity of years. The temporal index bucket group may then include a temporal index bucket for each of the years 2000, 2001, 2002, and so forth. **If a geo-temporal query is received specifying a particular geospatial and a temporal range spanning the years 2008 and 2009, the geo-temporal query may be transformed into separate queries against the 2008 and 2009 temporal index buckets**." *E.g.*, EX1004 (**Harris**), 3:50-4:3.

203. Harris also expressly discloses that the time identifier in its indexed data includes the claimed one or more time periods, as its indexed data in the data

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00143

repository (the claimed integrated centralized property database) is associated with "one or more… time ***ranges***": "The present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository. Geo-temporal data generally refers to data that includes both a geospatial component and a temporal component. The geospatial component may comprise one or more stored data values indicating a geographic location and **the temporal component may comprise one or more values indicating a point in time or range of time**. In general terms, in order to more efficiently process requests for geo-temporal data stored in a key-value data repository, a geo-temporal indexing structure is generated and managed in computer memory; for example, indexes may be stored on disk and cached in memory on demand. **In an embodiment, the geo-temporal indexing structure is based in part on user input specifying one or more time sets or granularities that are likely to correspond to time ranges specified in user requests for the stored and indexed geo-temporal data**." *E.g.*, EX1004 (**Harris**), 2:50-67.

204. Harris also expressly explains that users may specify particular time granularities, including time periods (such as year or hour time spans), with which Harris's stored data is associated: "In general, the user-specified time granularities correspond to time granularities that are expected by the user or others to be specified in geo-temporal queries against the data as stored in data repository 111. For

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00144

example, an analyst involved in the importation of geo-temporal data may be aware that users often desire to search for data objects associated with particular geographic regions and that are **associated with temporal components within particular year time spans and/or particular hour time spans**. In the example, ***an analyst*** involved in the importation of data ***may specify temporal index configuration data indicating two time granularities for the geo-temporal input data: a year time granularity and an hour time granularity***. For example, temporal index bucket group 112A in FIG. 1 may correspond to the index bucket group for the year time granularity and temporal index bucket group 112B may correspond to the index bucket group for the hour granularity. In the example, generated temporal index buckets of temporal index bucket group 112A may represent ***particular year timespans (e.g., 1978, 2002, 2009, 2012)*** and generated temporal index buckets of temporal index bucket group 112B may represent ***particular day timespans (e.g., Mar. 15, 1978; Jan. 10, 2009)***." *E.g.*, EX1004 (**Harris**), 8:36-57.

205. Harris further discloses that its users may search for data corresponding to "time ranges of interest" such as "the past five years" or the "past five hours," each of which is a time period: "Data sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data. Organizations would appreciate a way to efficiently analyze these collections of data including geo-temporal data to quickly identify information of interest or information pertinent to

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00145

a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest**. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, for example, a request for all activities within a single city block **within the past five years** to all activities within an entire city **within the past five hours**." *E.g.*, EX1004 (**Harris**), 4:44-59. Harris's ability to search these data further confirms that its indexed data are associated with these and other time periods.

206. Harris explains that its users can perform such searches through, *e.g.*, Harris's GUI, which allows users to specify a "time value or range of time values" corresponding to data associated with such time ranges: "In general, a search mechanism 113 receives as input a set of geo-temporal search parameters and provides as output a set of search results. FIG. 2 illustrates an example graphical user interface 200 that enables a user to specify a set of search parameters for a geo-temporal query. **Graphical user interface 200 includes interface components that enable a user to specify both a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters, respectively."** *E.g.*, EX1004 (**Harris**), 9:38-46.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00146

207. Harris further discloses that, "[i]n an embodiment, a user may additionally specify a temporal range of interest using graphical user interface 200. In an embodiment, a specified temporal range for a geo-temporal query may include one or more of a start date and/or time value and an end date and/or time value. Graphical interface component 202 illustrates an example interface component enabling a user to specify a temporal range as a search parameter. An interface component such as interface component 202 may include, among other input elements, one or more input elements for entering date and time values. For example, a user may enter one or more dates using text boxes, a calendar, or any other interface component for entering dates and/or time values. In addition to specifying a temporal range, interface component 202 may include one or more additional input parameters enabling the specification of one or more other search parameters, for example, a search string, a sort order, etc." *E.g.*, EX1004 (**Harris**), 9:65-10:14.

208. As just one example of its system's capabilities, Harris discloses a user search for data that is associated with particular days (which again, are time periods), explaining that "FIG. 4 illustrates a flow diagram of a process for carrying out a geo-temporal query in accordance with one or more of embodiments described herein. In an embodiment, a search query is received (block 400) that includes both a geospatial component and a temporal component. In response to receiving a query, one or more second queries are generated (block 402), with each of the second

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00147

queries corresponding to a particular temporal index bucket of a temporal index bucket group. In an embodiment, the temporal index buckets are selected to correspond to the temporal component of the query. For example, assume that particular geo-temporal data has been indexed into a first temporal index bucket group based on a time granularity of years and a second temporal index bucket group based on a time granularity of days. **If a geo-temporal query is received that specifies a temporal range of Jan. 1, 2011 to Jan. 2, 2012, the system may transform the geo-temporal query into a second query against the bucket corresponding to the data year 2011 and two additional second queries corresponding to the days of Jan. 1, 2012 and Jan. 2, 2012**." *E.g.*, EX1004 (**Harris**), 10:24-43.

209. As another example, Harris discloses data objects "associated with" specific temporal values falling into a given time period: "[P]rocessing a geo-temporal query may include one more steps of post-filtering. As a result of the particular partitioning of the temporal index buckets, the result set returned by the one or more second queries may include one or more data items that are not within the exact temporal range specified by the geo-temporal query. In an embodiment, the search mechanism 113 may filter (block 406) the one or more results that are not within the specified temporal range. For example, assume that a geo-temporal index is created using a specified time granularity of an hour, resulting in a temporal index

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00148

bucket group with one or more temporal index buckets of hour time ranges (e.g., 1:00 pm-2:00 pm, 2:00 pm-3:00 pm, 3:00 pm-4:00 pm, etc.). **An example geo-temporal query may then include a temporal search parameter specifying a time range on a particular day between 2:15 pm and 3:15 pm. In response to receiving the example geo-temporal query, the search mechanism 113 may transform the query into two queries that query the temporal index buckets that index data objects associated with a temporal value between the time ranges of 2:00 pm-3:00 pm and 3:00 pm-4:00 pm, respectively.** After retrieving any data objects from either or both of the two index buckets that satisfy any geospatial component of the query, search mechanism 113 may post-filter the data object results in order to filter any data objects that are associated with a temporal value outside of the range specified in the query, i.e., those data objects in the temporal ranges of 2:00 pm-2:14 pm and 3:16 pm-4:00 pm." *E.g.*, EX1004 (**Harris**), 10:59-11:19.

* * *

210. Accordingly, in my opinion, claim 15 is anticipated by or rendered obvious over Harris, or alternatively, is rendered obvious over Harris in view of Florance.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00149

F. Claim 1 Is Anticipated by or Rendered Obvious Over Harris

211. **In my opinion, Claim 1 is anticipated by or rendered obvious (*see* ¶¶84-85) over Harris (Grounds 1-2).** *See infra*, Appendix C, Claim 1.

1. Element 1.pre (the preamble of claim 1)[5]

212. Claim 1.pre recites "**A method, comprising.**" **In my opinion, Harris discloses this limitation (Grounds 1-2).**

213. In my opinion, **Harris discloses a method** (*e.g.*, "method and apparatus for a data analysis system for analyzing data object collections that include geo-temporal data"; "methods for indexing and searching geo-temporal data stored in a data repository"; "method of creating and processing geo-temporal queries")**.**

214. For example, Harris discloses "**A method and apparatus for a data analysis system for analyzing data object collections that include geo-temporal data is provided**. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are generated based on the specified time granularities. Geo-temporal input data is indexed based on the generated temporal index bucket groups. The system allows a data analyst to specify

[5] To the extent deemed limiting, the preamble is disclosed.

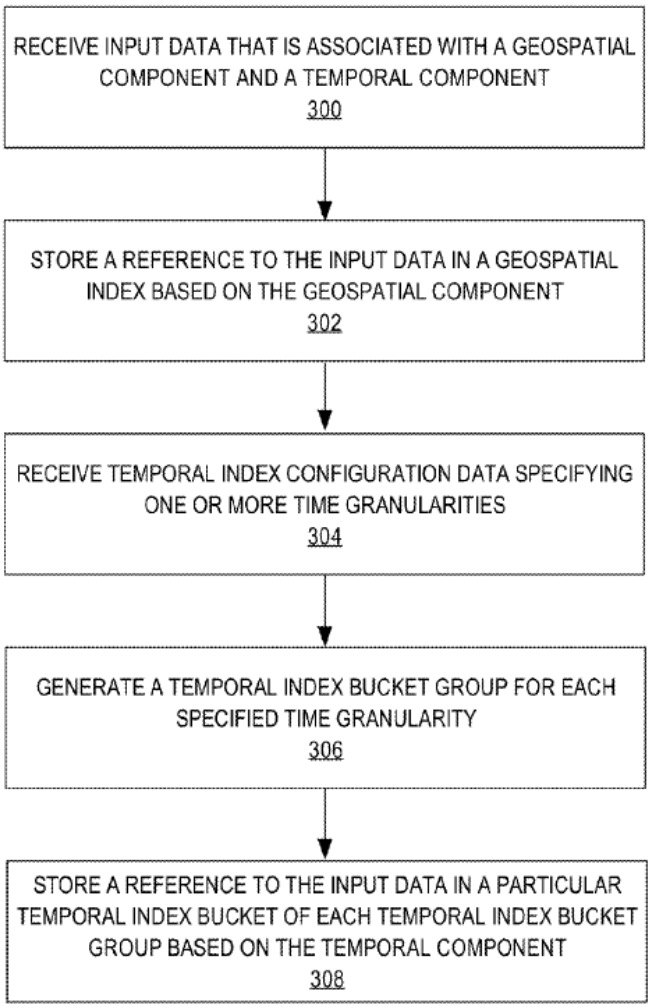
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00150

geo-temporal queries that include both geospatial component and a temporal component. The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the temporal index bucket groups." *E.g.*, EX1004 (**Harris**), Abstract.

215. Harris further discloses a "method," describing, *e.g.*,"**[a] computer-implemented method for indexing data items that are associated with a geospatial component and a temporal component, the computer implemented method comprising**…." *E.g.*, EX1004 (**Harris**), cl.1, Fig.3:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00151

FIG. 3



216. Harris further discloses that "[t]he present disclosure attempts to address these problems and others, facilitating low latency searches of large and dynamic data that include geo-temporal data." *E.g.*, EX1004 (**Harris**), 2:1-3; *see also, e.g.*, EX1004 (**Harris**), 2:50-67 ("**The present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository**. Geo-temporal data generally refers to data that includes

both a geospatial component and a temporal component. The geospatial component may comprise one or more stored data values indicating a geographic location and the temporal component may comprise one or more values indicating a point in time or range of time. In general terms, in order to more efficiently process requests for geo-temporal data stored in a key-value data repository, a geo-temporal indexing structure is generated and managed in computer memory; for example, indexes may be stored on disk and cached in memory on demand. In an embodiment, the geo-temporal indexing structure is based in part on user input specifying one or more time sets or granularities that are likely to correspond to time ranges specified in user requests for the stored and indexed geo-temporal data.").

217. Harris further explains that, "For the purposes of clearly illustrating how the functions described herein operate upon geo-temporal queries, the following sections describe an example graphical user interface display for specifying a geo-temporal query. However, the graphical user interface display described herein represents only a selected example of a visualization for the geo-temporal query operations that are described herein. **Thus, the disclosure broadly encompasses any method of creating and processing geo-temporal queries that are described herein**. In the following description, it will be assumed for the sake of illustration that the geo-temporal search functionality is provided by a combination of a search mechanism **113** and the data repository **111**. However, this is just one possible

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00153

implementation. Other implementations where the search functionality is provided entirely be the data repository **111** or a combination of the data repository **111**, a search mechanism **113**, and one or more other system component(s) are also possible." *E.g.*, EX1004 (**Harris**), 9:8-25.

* * *

218. Thus, in my opinion, Harris discloses this limitation.

2. Element 1.a

219. Claim 1.a recites "**storing a plurality of data items in a data aggregation system, each of the plurality of data items being associated with one or more geographic location identifiers of a particular geographic point on earth, wherein at least a portion of the plurality of data items stored in the data aggregation system are further associated with one or more time identifiers including one or more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-2).** *See* cl.12.a.

220. In my opinion, **Harris discloses storing a plurality of data items in a data aggregation system (***e.g.*, system including, *e.g.*, "data repository," "one or more adaptors"; ***see* cl.12.a (mapping for** storing data in an **"integrated centralized property database**,**)), each of the plurality of data items being associated with**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00154

one or more geographic location identifiers of a particular geographic point on earth (*see* cl.12.a.), wherein at least a portion of the plurality of data items stored in the data aggregation system are further associated with one or more time identifiers including one or more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth (*see*** cl.12.a**).** *See* discussion of cl.12.a.

221. As discussed (*see* § VI.C), I have been asked to assume that the claimed "data aggregation system" is a system that aggregates data from multiple distributed external data sources into a centralized database. EX1001 (**'648**), 1:48-62, 14:42-15:63, Fig. 6. In my opinion, Harris discloses this limitation under this construction. *See* cl.12.a. To the extent aggregating data is not required, the claims are broader and clearly met.

222. In addition, Harris discloses a system including "data repository 111" and "one or more adaptors 103," which, as discussed (*see* cl.12.a) aggregate data from multiple distributed sources and store the aggregated data. *E.g.*, EX1004 (**Harris**), 5:9-12.

* * *

223. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00155

3. Element 1.b

224. Claim 1.b recites "**receiving, by at least one processor, a query regarding a geographic location and including time information.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-2).** *See* cl.12.b, cl.12.c.

225. In my opinion, **Harris discloses receiving, by at least one processor** (*see* cl.12.b, cl.12.c)**, a query regarding a geographic location and including time information;** (*see* cl.12.c)**.** *See* discussion of cl.12.b, cl.12.c.

* * *

226. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

4. Element 1.c

227. Claim 1.c recites "**retrieving, from the data aggregation system, data items having associated geographic location identifiers matching the received geographic location and having associated time identifiers matching the received time information.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-2).** *See* cl.12.d.

228. In my opinion, **Harris discloses retrieving, from the data aggregation system** (*see* cl.12.d mapping "retrieve, from the integrated centralized property database"; the "integrated centralized property database" is part of a "data

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00156

aggregation system" (*see* cl.1.a)), **data items having associated geographic location identifiers matching the received geographic location and having associated time identifiers matching the received time information; and** (*see* cl.12.d)**.** *See* discussion of cl.12.d.

229. I note that Harris discloses retrieving data from its "data repository" (which is a component in Claim 1's "data aggregation system") and thus Harris discloses "retrieving[] from the data aggregation system." To the extent it is argued data must be retrieved by a user or user computer external to the data aggregation system, Harris expressly discloses a data analyst external to the data aggregation system retrieving data from its system (*see* EX1004, Fig.1 (stick figure "Data Analyst")), and also that its system "can send messages and receive data… through [] networks," EX1004, 13:28-30, and thus would have been accessible from a user computer system external to the data aggregation system.

* * *

230. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

5. Element 1.d

231. Claim 1.d recites "outputting the retrieved data items." **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-4).** *See* cl.12.e.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00157

232. In my opinion, **Harris discloses outputting the retrieved data items** (*see* cl.12.e)**.** *See* discussion of cl.12.e.

233. I note that, in my opinion, "outputting" includes providing the retrieved data items to a user via a graphical user interface, and thus Harris expressly discloses this limitation (*see* cl.12.e).

* * *

234. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

235. Accordingly, in my opinion, claim 1 is anticipated by or rendered obvious over Harris.

G. Claim 2 Is Anticipated by or Rendered Obvious Over Harris

236. **In my opinion, claim 2 is anticipated by or rendered obvious over Harris (Grounds 1-2).** *See infra*, Appendix C, Claim 2.

237. Claim 2 recites "**The method of claim 1, wherein the one or more geographic location identifiers include latitude and longitude coordinates of a surface of the earth.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-2).**

238. In my opinion, **Harris discloses the method of claim 1, wherein the one or more geographic location identifiers** (*see* cl.1) **include latitude and**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00158

longitude coordinates of a surface of the earth (*see* cl.12.a, cl.13)**.** *See* discussion of cl.1, cl.12, cl.13.

* * *

239. Accordingly, in my opinion, claim 2 is anticipated by or rendered obvious (*see* ¶¶84-85) over Harris.

H. Claim 4 Is Anticipated by or Rendered Obvious Over Harris

240. **In my opinion, claim 4 is anticipated by or rendered obvious over Harris (Grounds 1-2).** *See infra*, Appendix C, Claim 4.

241. Claim 4 recites "**The method of claim 1, wherein the received geographic location includes a region on the earth.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-2).**

242. In my opinion, **Harris discloses the method of claim 1** (*see* cl.1)**, wherein the received geographic location** (*see* cl.1. (citing cl.12.c)) **includes a region on the earth** (*e.g.*, "search for data objects associated with particular geographic regions"; "geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest")**.**

243. For example, Harris expressly discloses that the user queries include a region of the earth, such as "geographical areas of interest," including, *e.g.*, "a single city block" or "within an entire city": "Data sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00159

Organizations would appreciate a way to efficiently analyze these collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest**. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, for example, a request for all activities **within a single city block** within the past five years to all activities **within an entire city** within the past five hours." *E.g.*, EX1004 (**Harris**), 4:44-59; *see also, e.g.*, EX1004 (**Harris**), 1:21-37 ("One particular type of data that such organizations may often collect and analyze is geospatial data. Geospatial data generally represents any data that includes a geographical component and that associates the data with particular geographic locations or areas. For example, a crime enforcement agency may track data that corresponds to crime reports received within a particular city. One item of information stored in association with each crime report may include a geographical component indicating a location of the incident specified by the crime report. An example data object representing each crime report may include values representing a longitude and latitude corresponding to the geographical location of the incident. **A data analyst**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00160

with access to such data may then specify geospatial search requests such as, for example, a search request for crime reports associated with incidents within a specified geographical radius or within a four block perimeter.").

244. And Harris additionally discloses that its users search for data objects "associated with particular geographic regions": "In general, the user-specified time granularities correspond to time granularities that are expected by the user or others to be specified in geo-temporal queries against the data as stored in data repository 111. **For example, an analyst involved in the importation of geo-temporal data may be aware that users often desire to search for data objects associated with particular geographic regions and that are associated with temporal components within particular year time spans and/or particular hour time spans**. In the example, an analyst involved in the importation of data may specify temporal index configuration data indicating two time granularities for the geo-temporal input data: a year time granularity and an hour time granularity. For example, temporal index bucket group 112A in FIG. 1 may correspond to the index bucket group for the year time granularity and temporal index bucket group 112B may correspond to the index bucket group for the hour granularity. In the example, generated temporal index buckets of temporal index bucket group 112A may represent particular year timespans (e.g., 1978, 2002, 2009, 2012) and generated temporal index buckets of temporal index bucket group 112B may represent

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00161

particular day timespans (e.g., Mar. 15, 1978; Jan. 10, 2009)." *E.g.*, EX1004 (**Harris**), 8:36-57.

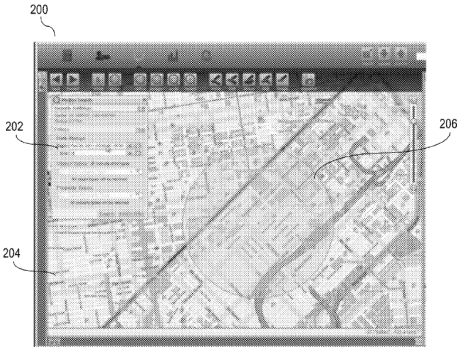
245. Harris further discloses that user queries can specify a geographic region on the earth through the use of latitude and longitude values that "define a geographical area": "In an embodiment, input data 102 that includes a geospatial component may be specified as geospatially searchable. For example, a user may configure parser 104 and/or importer 109 to identify particular data items of input data 102 as geospatially searchable data. In other embodiments, data items of input data 102 may be specified as geospatially searchable by default and without user input. **In general, geospatially searchable data may be searched using queries that specify one or more geographical search parameters such as, for example, latitude and longitude values that define a geographical area**. In an embodiment, input data 102 that includes a geospatial component and that is specified to be geospatially searchable is geospatially indexed in the data repository 111, as further described below." *E.g.*, EX1004 (**Harris**), 6:58-7:4.

246. Harris also expressly discloses user queries including geospatial bounding areas (representing a region on the earth) created using a geographical map: "Interface component 204 illustrates a representation of a **geographical map that may be used to specify one or more desired geospatial bounding areas**. For example, bounding area 206 represents an example bounding area that a user may

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00162

specify on the map using an input mechanism such as, for example, a mouse pointer to draw the bounding area on the map. In an embodiment, a specified bounding area such as **bounding area 206 defines a geographical area of interest to the user that will be specified as a geospatial search parameter in a resulting geo-temporal query**. For example, if a user was interested in stored data objects pertaining to a particular geographical area around the user's home, the user may specify a **bounding area that includes both the geographical location of the user's home and any surrounding area of interest** using interface component 204. In an embodiment, a bounding area may be defined using a number of shapes including, but not limited to, a radial or polygonal bounding area." *E.g.*, EX1004 (**Harris**), 9:47-64, Fig.2:

FIG. 2



247. Harris further discloses that its stored data includes multiple values representing longitudes and latitudes, thus denoting a region on the earth: "In this context, the term 'input data' refers to data that is presented as input to the system.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00163

That is, data that is obtained by an adaptor 103 from a data source 101 for processing and possible input into the data repository 111. **The term 'geo-temporal data' refers to any input data that includes one or more values representing a geospatial component and one or more values representing a temporal component. For example, values representing a geospatial component may include one or more numerical values specifying a longitude and latitude or any other representation of a geographical location**. A temporal component includes one or more values specifying one or more points in time and may be specified, for example, by a character string or numerical value representing a midnight Coordinated Universal Time (UTC) value or any other representation of time values." *E.g.*, EX1004 (**Harris**), 5:59-6:6.

* * *

248. Accordingly, in my opinion, claim 4 is anticipated by or rendered obvious (*see* ¶¶84-85) over Harris.

I. Claim 5 Is Anticipated by or Rendered Obvious Over Harris

249. **In my opinion, claim 5 is anticipated by or rendered obvious over Harris (Grounds 1-2).** *See infra*, Appendix C, Claim 5.

250. Claim 5 recites "**The method of claim 4, wherein the region on the earth** (*see* cl.4 (citing cl.1)) **is identified by multiple geocoded locations, the multiple geocoded locations described in at least latitude and longitude**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00164

coordinates." **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-2).**

251. As an initial matter, I note that the '648 patent confirms that geocoding information includes latitude, longitude, and/or Z-axis information. EX1001 (**'648**), 1:67-2:3 ("data items may be processed to determine or extract geocoding information, such as latitude, longitude and/or Z-axis information (i.e., height above or depth below the surface of the earth")).

252. In my opinion, **Harris discloses the method of claim 4** (*see* cl.4)**, wherein the region on the earth is identified by multiple geocoded locations** (*e.g.*, "geospatially searchable data may be searched using queries that specify one or more geographical search parameters")**, the multiple geocoded locations described in at least latitude and longitude coordinates** (*e.g.*, "latitude and longitude values that define a geographical area")**.**

253. For example, Harris discloses "input data 102 that includes a geospatial component may be specified as geospatially searchable. For example, a user may configure parser 104 and/or importer 109 to identify particular data items of input data 102 as geospatially searchable data. In other embodiments, data items of input data 102 may be specified as geospatially searchable by default and without user input. **In general, geospatially searchable data may be searched using queries that specify one <u>or more</u> geographical search parameters such as, for example,**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00165

latitude and longitude values that define a geographical area. In an embodiment, input data 102 that includes a geospatial component and that is specified to be geospatially searchable is geospatially indexed in the data repository 111, as further described below." *E.g.*, EX1004 (**Harris**), 6:58-7:4.

254. Harris further discloses "Interface component 204 illustrates a representation of a **geographical map that may be used to specify one or more desired geospatial bounding areas**. For example, bounding area 206 represents an example bounding area that a user may specify on the map using an input mechanism such as, for example, a mouse pointer to draw the bounding area on the map. In an embodiment, a specified bounding area such as bounding area 206 defines a geographical area of interest to the user that will be specified as a geospatial search parameter in a resulting geo-temporal query. For example, if a user was interested in stored data objects pertaining to a particular geographical area around the user's home, the user may specify a **bounding area that includes both the geographical location of the user's home and any surrounding area of interest** using interface component 204. In an embodiment, **a bounding area may be defined using a number of shapes** including, but not limited to, a radial or polygonal bounding area." *E.g.*, EX1004 (**Harris**), 9:47-64. POSITA would have understood Harris's disclosed bounding area would have been defined by latitude and longitude coordinates (*e.g.*, defining the four corners of a square bounding area) and thus as

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00166

including multiple geocoded locations defining a region on earth (*i.e.*, the area inside the square bounding area). Indeed, this is consistent with Florance's disclosure of "polygonal area drawn over a map by a user, divides the area into a plurality of pixels, determines latitude and longitude coordinates corresponding to the pixels, calculates a spatial index based on the coordinates, and retrieves data associated with the coordinates and the spatial index." *E.g.*, EX1005 (**Florance**), ¶547.

* * *

255. Accordingly, in my opinion, claim 5 is anticipated by or rendered obvious (*see* ¶¶84-85) over Harris.

J. Claim 6 Is Anticipated by or Rendered Obvious Over Harris

256. **In my opinion, claim 6 is anticipated by or rendered obvious over Harris (*see* ¶¶84-85) (Grounds 1-4).** *See infra*, Appendix C, Claim 6.

257. Claim 6 recites "**The method of claim 1, wherein the time information of the query includes one or more time periods.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-2).** *See* cl.15.

258. In my opinion, **Harris discloses the method of claim 1** (*see* cl.1)**, wherein the time information of the query includes one or more time periods** (*e.g.*, "temporal range of interest"; "specified temporal range"; "range of time values" specified by user as "temporal search parameters"; "query is received that

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00167

specifies a temporal range"; "temporal search parameters corresponding to… time ranges of interest"; "query is received specifying a particular geospatial and a temporal range spanning the years 2008 and 2009"; *see* cl.15)**.** *See* discussion of cl.15.

259. For example, Harris expressly discloses that user queries include "a temporal range of interest": "In an embodiment, a user may additionally specify a temporal range of interest using graphical user interface 200. In an embodiment, a specified temporal range for a geo-temporal query may include one or more of a start date and/or time value and an end date and/or time value. Graphical interface component 202 illustrates an example interface component enabling a user to specify a temporal range as a search parameter. An interface component such as interface component 202 may include, among other input elements, one or more input elements for entering date and time values. For example, a user may enter one or more dates using text boxes, a calendar, or any other interface component for entering dates and/or time values. In addition to specifying a temporal range, interface component 202 may include one or more additional input parameters enabling the specification of one or more other search parameters, for example, a search string, a sort order, etc." *E.g.*, EX1004 (**Harris**), col:9:65-col:10:14.

260. Harris explains that its users can perform such searches through, *e.g.*, Harris's GUI, which allows users to specify a "time value or range of time values"

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00168

corresponding to data associated with such time ranges: "In general, a search mechanism 113 receives as input a set of geo-temporal search parameters and provides as output a set of search results. FIG. 2 illustrates an example graphical user interface 200 that enables a user to specify a set of search parameters for a geo-temporal query. **Graphical user interface 200 includes interface components that enable a user to specify both a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters, respectively."** *E.g.*, EX1004 (**Harris**), 9:38-46.

261. Harris thus discloses, as just one example of its capabilities, a query including a time period of January 1, 2011 to January 2, 2012: "FIG. 4 illustrates a flow diagram of a process for carrying out a geo-temporal query in accordance with one or more of embodiments described herein. In an embodiment, a search query is received (block 400) that includes both a geospatial component and a temporal component. In response to receiving a query, one or more second queries are generated (block 402), with each of the second queries corresponding to a particular temporal index bucket of a temporal index bucket group. In an embodiment, the temporal index buckets are selected to correspond to the temporal component of the query. For example, assume that particular geo-temporal data has been indexed into a first temporal index bucket group based on a time granularity of years and a second temporal index bucket group based on a time granularity of days. **If a geo-temporal**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00169

query is received that specifies a temporal range of Jan. 1, 2011 to Jan. 2, 2012, the system may transform the geo-temporal query into a second query against the bucket corresponding to the data year 2011 and two additional second queries corresponding to the days of Jan. 1, 2012 and Jan. 2, 2012." *E.g.*, EX1004 (**Harris**), 10:24-43.

262. As another example, Harris further discloses that its users may search for data corresponding to "time ranges of interest" such as "the past five years" or the "past five hours," each of which is a time period: "Data sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data. Organizations would appreciate a way to efficiently analyze these collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest**. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, for example, a request for all activities within a single city block **within the past five years** to all activities within an entire city **within the past five hours**." *E.g.*,

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00170

EX1004 (**Harris**), 4:44-59. Harris's ability to search this data further confirms that its indexed data are associated with these and other time periods.

263. As yet another example, Harris discloses that the time information of a user query includes "a time range on a particular day between 2:15 pm and 3:15 pm": "[P]rocessing a geo-temporal query may include one more steps of post-filtering. As a result of the particular partitioning of the temporal index buckets, the result set returned by the one or more second queries may include one or more data items that are not within the exact temporal range specified by the geo-temporal query. In an embodiment, the search mechanism 113 may filter (block 406) the one or more results that are not within the specified temporal range. For example, assume that a geo-temporal index is created using a specified time granularity of an hour, resulting in a temporal index bucket group with one or more temporal index buckets of hour time ranges (e.g., 1:00 pm-2:00 pm, 2:00 pm-3:00 pm, 3:00 pm-4:00 pm, etc.). **An example geo-temporal query may then include a temporal search parameter specifying a time range on a particular day between 2:15 pm and 3:15 pm. In response to receiving the example geo-temporal query, the search mechanism 113 may transform the query into two queries that query the temporal index buckets that index data objects associated with a temporal value between the time ranges of 2:00 pm-3:00 pm and 3:00 pm-4:00 pm, respectively.** After retrieving any data objects from either or both of the two index buckets that

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00171

satisfy any geospatial component of the query, search mechanism 113 may post-filter the data object results in order to filter any data objects that are associated with a temporal value outside of the range specified in the query, i.e., those data objects in the temporal ranges of 2:00 pm-2:14 pm and 3:16 pm-4:00 pm." *E.g.*, EX1004 (**Harris**), 10:59-11:19; *see also, e.g.*, EX1004 (**Harris**), 3:50-4:3 ("[R]equests for geo-temporal data indexed in a data repository are processed using one or more of the generated index bucket groups. For example, a geo-temporal request may be a query specifying one or more geospatial search parameters and one or more temporal search parameters. In an embodiment, a geo-temporal request for geo-temporal data indexed according to the methods described herein is transformed into one or more second requests against one or more temporal index buckets based on the temporal component specified in the request. For example, assume particular geo-temporal data includes data with temporal components associated with time values falling within each of the years 2000-2010 and is indexed according to a time granularity of years. The temporal index bucket group may then include a temporal index bucket for each of the years 2000, 2001, 2002, and so forth. **If a geo-temporal query is received specifying a particular geospatial and a temporal range spanning the years 2008 and 2009, the geo-temporal query may be transformed into separate queries against the 2008 and 2009 temporal index buckets**." *E.g.*, EX1004 (**Harris**), 3:50-4:3.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00172

* * *

264. Accordingly, in my opinion, claim 6 is anticipated by or rendered obvious (*see* ¶¶84-85) over Harris.

K. Claim 9 Is Anticipated by or Rendered Obvious Over Harris, or Alternatively, Is Rendered Obvious Over Harris in view of Florance

265. **In my opinion, claim 9 is anticipated by or rendered obvious over Harris (*see* ¶¶84-85) (Grounds 1-2, 4), or alternatively, is rendered obvious over Harris in view of Florance (Ground 3).** *See infra*, Appendix C, Claim 9.

1. Element 9.pre (the preamble of claim 9)[6]

266. Claim 9.pre recites "**A system, comprising.**" **In my opinion, Harris discloses or renders obvious this limitation (*see* ¶¶84-85) (Grounds 1-4).** *See* cl.12.pre.

267. In my opinion, **Harris discloses a system** (*see* cl.12.pre)**.** *See* discussion of cl.12.pre.

* * *

268. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

[6] To the extent deemed limiting, the preamble is disclosed.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00173

2. Element 9.a

269. Claim 9.a recites "**a computer processor.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-4).** *See* cl.12.b.

270. In my opinion, **Harris discloses a computer processor** (*see* cl.12.b)**.** *See* discussion of cl.12.b.

* * *

271. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

3. Element 9.b

272. Claim 9.b recites "**a memory coupled to the processor.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-4).** *See* cl.12.a, cl.12.b.

273. In my opinion, **Harris discloses a memory coupled to the processor** (*e.g.*, "Bus 502 carries the data to main memory 506, from which processor 504 retrieves and executes the instructions"; "main memory… or other dynamic storage device, coupled to [the] bus… for storing information and instructions to be executed by [the] processor"; "Main Memory" coupled to "Processor" (*see* cl.12.b) via "Bus" (Fig.5); *see* cl.12.a)**.**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00174

274. For example, Harris discloses "main memory" that is "coupled to bus" in order to provide instructions to the "processor": "**According to one embodiment, the techniques described herein are implemented by one or more special-purpose computing devices**. The special-purpose computing devices may be hard-wired to perform the techniques, or may include digital electronic devices such as one or more application-specific integrated circuits (ASICs) or field programmable gate arrays (FPGAs) that are persistently programmed to perform the techniques, or may include one or more **general purpose hardware processors programmed to perform the techniques pursuant to program instructions in firmware, memory, other storage, or a combination**. Such special-purpose computing devices may also combine custom hard-wired logic, ASICs, or FPGAs with custom programming to accomplish the techniques. The special-purpose computing devices may be desktop computer systems, portable computer systems, handheld devices, networking devices or any other device that incorporates hard-wired and/or program logic to implement the techniques. For example, FIG. 5 is a block diagram that illustrates a computer system 500 upon which an embodiment may be implemented. **Computer system 500 includes a bus 502 or other communication mechanism for communicating information, and a hardware processor 504 coupled with bus 502 for processing information. Hardware processor 504 may be, for example, a general purpose microprocessor. Computer system 500 also**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00175

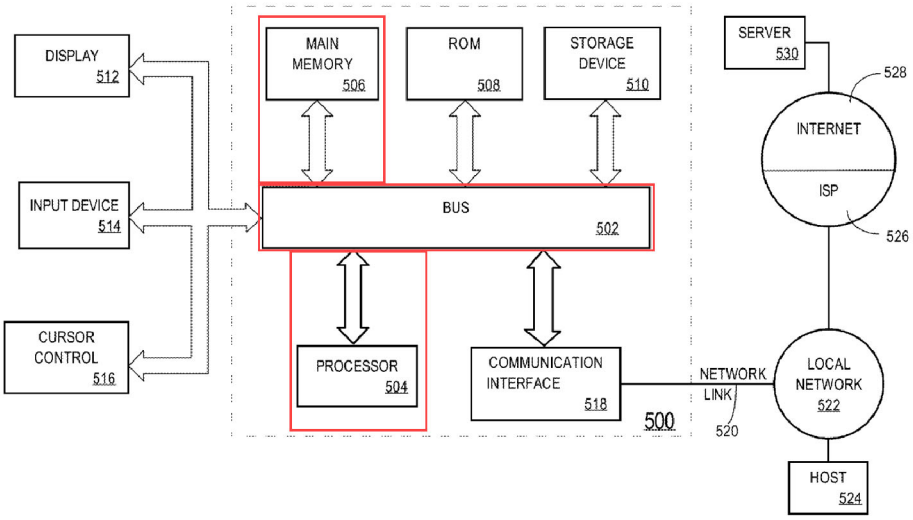
includes a main memory 506, such as a random access memory (RAM) or other dynamic storage device, coupled to bus 502 for storing information and instructions to be executed by processor 504. Main memory 506 also may be used for storing temporary variables or other intermediate information during execution of instructions to be executed by processor 504. Such instructions, when stored in non-transitory storage media accessible to processor 504, render computer system 500 into a special-purpose machine that is customized to perform the operations specified in the instructions. Computer system 500 further includes a read only memory (ROM) 508 or other static storage device coupled to bus 502 for storing static information and instructions for processor 504. A storage device 510, such as a magnetic disk, optical disk, or solid-state drive is provided and coupled to bus 502 for storing information and instructions." *E.g.*, EX1004 (**Harris**), 11:24-48.

275. Harris further discloses that its memory is coupled to the processor through the "bus": "Various forms of media may be involved in carrying one or more sequences of one or more instructions to processor 504 for execution. For example, the instructions may initially be carried on a magnetic disk or solid-state drive of a remote computer. The remote computer can load the instructions into its dynamic memory and send the instructions over a telephone line using a modem. A modem local to computer system 500 can receive the data on the telephone line and use an

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00176

infra-red transmitter to convert the data to an infra-red signal. An infra-red detector can receive the data carried in the infra-red signal and appropriate circuitry can place the data on bus 502. Bus 502 carries the data to main memory 506, from which processor 504 retrieves and executes the instructions. The instructions received by main memory 506 may optionally be stored on storage device 510 either before or after execution by processor 504." *E.g.*, EX1004 (**Harris**), 12:50-65, Fig.5:

FIG. 5



* * *

276. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

4. Element 9.c

277. Claim 9.c recites "**an integrated centralized property database, the processor being configured to.**" **In my opinion, Harris discloses or renders**

obvious (*see* ¶¶84-85) this limitation (Grounds 1-2, 4), or alternatively, Harris in view of Florance renders obvious this limitation (Ground 3). *See* cl.12.a, cl.12.b.

278. In my opinion, **Harris discloses an integrated centralized property database** (*see* cl.12.a), **the processor being configured to** (*see* cl.12.b)**.** *See* discussion of cl.12.a, cl.12.b.

279. **Florance discloses property information** (*see* cl.12.a) stored in a "central real estate database." *See* discussion of cl.12.a.

* * *

280. Thus, in my opinion, Harris discloses or at minimum renders obvious this limitation (*see* ¶¶84-85), and Harris in view of Florance renders obvious this limitation.

5. Element 9.d

281. Claim 9.d recites "[the processor configured to] **receive from a user computer a query including a geographic location identifier, the geographic location identifier including one of a geocoded location and multiple geocoded locations identifying a polygon.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-4).** *See* cl.12.c.

282. In my opinion, **Harris discloses the processor** (*see* cl.12.b-c) **receiving, from a user computer** (*see* cl.12.c)**, a query including a geographic**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00178

location identifier (*see* cl.12.a, cl.12.c, ¶148), **the geographic location identifier including one of a geocoded location and multiple geocoded locations identifying a polygon** (*e.g.*, "latitude and longitude values that define a geographical area"; "specify[ing] on the map" corners and/or edges forming "polygonal bounding area"; *see* cl.12.c)**.** *See* discussion of cl.12.c.

283. As an initial matter, I note that Harris discloses this limitation for the same reasons given in cl.12.c. To the extent claim 9's received "geographic location identifier" is narrower than claim 12's received "geographic location," as shown, this limitation is expressly disclosed by Harris's "latitude and longitude values that define a geographical area." *E.g.*, EX1004 (**Harris**), 6:58-7:4.

284. I also note that in my opinion, POSITA would have understood that by, for example, drawing a polygonal bounding area on a map, a user, through the user computer, specifies geocoded locations to "define a geographical area of interest" and that these geolocations would include, *e.g.*, the latitudes and longitudes or the corners or edges of the bounding area, which the system uses "as a geospatial search parameter in a resulting geo-temporal query." *E.g.*, EX1004 (**Harris**), 6:65-7:1 ("queries that specify one or more geographical search parameters such as… latitude and longitude values that define a geographical area"), 9:47-64, 10:17-21 ("search mechanism may transform the user input received at graphical user interface 200

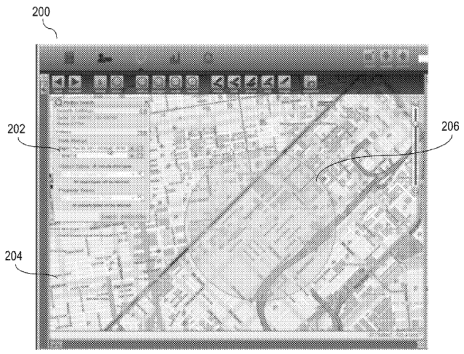
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00179

into a textual representation of the geo-temporal query that includes search parameters corresponding to the user input").

285. For example, Harris expressly discloses a "polygonal bounding area": "Interface component 204 illustrates a representation of a geographical map that may be used to **specify one or more desired geospatial bounding areas**. For example, bounding area 206 represents an example bounding area that a user may specify on the map using an input mechanism such as, for example, a mouse pointer to draw the bounding area on the map. In an embodiment, a specified bounding area such as ***bounding area 206 defines a geographical area of interest to the user that will be specified as a geospatial search parameter in a resulting geo-temporal query***. For example, if a user was interested in stored data objects pertaining to a particular geographical area around the user's home, the user may ***specify a bounding area*** that includes both the geographical location of the user's home and any surrounding area of interest using interface component 204. In an embodiment, ***a bounding area may be defined using a number of shapes including***, but not limited to, a radial or ***polygonal bounding area***." *E.g.*, EX1004 (**Harris**), 9:47-64, Fig.2:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00180

FIG. 2



* * *

286. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

6. Element 9.e

287. Claim 9.e recites "**[the processor configured to] receive from the user computer a time period identifier including one or more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-4).** *See* cl.12.c, cl.15.

288. In my opinion, **Harris discloses the processor** (*see* cl.12.b) **receiving from the user computer** (*see* cl.12.c) **a time period identifier including one or more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth** (*see* cl.12.c, cl.15)**.** *See* discussion of cl.12.c, cl.15.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00181

289. I note that cl.12.c explains its "time information" is "indicative of the time history of an associated data item" and cl.9.e states "a time period identifier" includes "one or more time periods ***indicative of a time history of an associated data item***." Thus, in my opinion, "time periods" "indicative of the time history of an associated data item," which Harris expressly discloses (*see* cl.12.c), also satisfy this limitation.

* * *

290. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

7. Element 9.f

291. Claim 9.f recites "**[the processor being configured to] retrieve from the integrated centralized property database location data, the location data including data associated with the geographic location identifier of a geographic location on the earth, and associated with the received time period identifier.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-4).** *See* cl.12.d.

292. In my opinion, **Harris discloses the processor (*see* cl.12.b) retrieving, from the integrated centralized property database, location data, the location data including data associated with the geographic location identifier of a geographic location on the earth** (*see* "having associated geographic location

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00182

identifiers" in cl.12.d))**, and associated with the received time period identifier** (*see* "having associated time identifiers matching the received time information" in cl.12.d)**.** *See* discussion of cl.12.d.

293. I note that '648 claim 9 expressly states "location data" includes "data associated with the geographic location identifier of a geographic location on the earth." As discussed (*see* cl.12.a, cl.12.d), Harris expressly discloses storing and retrieving such data. To the extent it is argued "location data" includes only a geographic location identifier of a geographic location on the earth (*e.g.*, latitude and longitude), Harris also expressly discloses this, disclosing a stored "data object representing each crime report may ***include values representing a longitude and latitude*** corresponding to the geographical location of the incident," that its users submit queries "for crime reports associated with incidents within a specified geographical radius," and that Harris's system retrieves and outputs these data (including location data) because Harris's system retrieves and outputs all results that "satisfy the geospatial [and temporal] component of the query." *E.g.*, EX1004 (**Harris**), 1:30-37, 4:30-3 ("cell phone call records that are each associated with data values reflecting a particular geographic location of the cell phone"), 10:46-48.

* * *

294. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00183

8. Element 9.g

295. Claim 9.g recites "**[the processor configured to] provide the retrieved location data to the user computer via a graphical user interface.**" **In my opinion, Harris discloses or renders obvious (*see* ¶¶84-85) this limitation (Grounds 1-4).** *See* cl.12.e.

296. In my opinion, **Harris discloses the processor** (*see* cl.12.b) **providing the retrieved location data to the user computer via a graphical user interface (*see* cl.12.e).** *See* discussion of cl.12.e.

297. As discussed, Harris's users search for crime reports that include latitude and longitude data, and Harris's system retrieves and outputs all retrieved data (including location data associated with crimes) matching the geospatial component of the query, and thus Harris's system retrieves and outputs the retrieved location data. *See* ¶293.

* * *

298. Thus, in my opinion, Harris discloses or at minimum renders obvious (*see* ¶¶84-85) this limitation.

299. Accordingly, in my opinion, claim 9 is anticipated by or rendered obvious over Harris, or alternatively, is rendered obvious over Harris in view of Florance.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00184

L. Claim 10 Is Rendered Obvious Over Harris in View of Florance

300. **In my opinion, claim 10 is rendered obvious over Harris in view of Florance.** *See infra*, Appendix C, Claim 10.

1. Element 10.pre (the preamble of claim 10)[7]

301. Claim 10.pre recites "**The system of claim 9, the processor further configured to.**" **In my opinion, Harris discloses or renders obvious this limitation (*see* ¶¶84-85) (Grounds 1-2, 4), or alternatively, Harris in view of Florance renders obvious this limitation (Ground 3).** *See* cl.9.

302. In my opinion, **Harris discloses or renders obvious, or Harris in view of Florance renders obvious the system of claim 9, the processor further configured to:** (*see* cl.9)**.** *See* discussion of cl.9.

* * *

303. Thus, in my opinion, Harris discloses or at minimum renders obvious this limitation (*see* ¶¶84-85), and Harris in view of Florance renders obvious this limitation.

[7] To the extent deemed limiting, the preamble is disclosed.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00185

2. Element 10.a

304. Claim 10.a recites "**retrieve parcel information from the integrated centralized property database.**" **In my opinion, Harris in view of Florance renders obvious this limitation (Ground 3).**

305. In my opinion, **Harris discloses or renders obvious, or Harris in view of Florance renders obvious the processor retrieving information from the integrated centralized property database** (*see* cl.9.c, cl.12.b)**.** *See* discussion of cl.9.

306. **Florance further discloses parcel information** (*e.g.*, "latitudes and longitudes associated with the property"; "who owns the parcels around where the user is standing, who the tenants are, what the rent is, and what the sale points are"; "a record associated with the property [in] the real estate database… [which] can include, for example,… land use, lot size, building square footage, percent improved, stories, zoning, and total assessed value") stored in a "central real estate database."

307. As an initial matter, I note that to the extent "property information" and "parcel information" (as required by cl.10.a) are different from one another in the '648 patent's Claims, Florance expressly discloses both. *See* cl.12.a.

308. Florance expressly discloses, for example, storing various types of parcel information in its database, including "latitudes and longitudes" associated

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00186

with a property: "The additional information can also include footprints of the property that indicate, for example, the latitudes and longitudes associated with the property and the property's offsets from the street." *E.g.*, EX1005 (**Florance**), ¶611.

309. Florance also discloses storing other types of parcel information in its database, including ownership information regarding parcels located near a user: "Linking position data to commercial information is also useful in contexts other than the mobile vehicle. The system could be used to transmit location sensitive real estate information to a user's PDA or laptop computer, for example. For example, PDA's such as those made by Palm™ will soon have both a OPS capability and a data transmission capacity. **Using the system of the present invention, information could be retrieved from the database of the present invention and displayed on the user's PDA or laptop computer based on the user's location**. The information can be stored locally with the user or transmitted to the user from a remote database. **For example, a user in Loudoun County investigating a property, looking at 5 or 6 adjoining parcels could have a Palm VII telling the user who owns the parcels around where the user is standing, who the tenants are, what the rent is, and what the sale points are**." *E.g.*, EX1005 (**Florance**), ¶330; *see also, e.g.*, EX1005 (**Florance**), ¶634 ("FIGS. 136-138 illustrate an exemplary dispatcher interface, according to an embodiment of the present invention. **The dispatcher interface displays information accessed from a**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00187

central real estate database and indicates the properties in the vicinity of the field researcher that have been researched and those that require further investigation. Optionally, the dispatcher interface also indicates the geographic position of the field researcher. The dispatcher interface provides significant quality control functions, including allowing the dispatcher to monitor whether the field researcher has missed updating relevant buildings.").

310. Florance further discloses storing additional information such as the parcel location: "Under the location subheading, the Overview page lists the property's metro market, county, submarket, and zip code. **This section also provides the map book and page on which to find the property, the block/lot of the property**, and the parcel number. This section also provides an area for narrative comments about the location." *E.g.*, EX1005 (**Florance**), ¶0397.

311. Florance discloses storing even further parcel information, including "land use, lot size, and "total assessed value": "In response to the selection, in step 1306, a **record associated with the property** is retrieved from the **real estate database**. The record is populated with information retrieved from a public record. For example, the public record can be a tax assessment record. As another example, the public record can be retrieved from a private database of business information. **The information retrieved from the public record can include, for example**, assessor parcel number, legal description, address, **land use, lot size, building**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00188

square footage, percent improved, stories, zoning, and total assessed value." *E.g.*, EX1005 (**Florance**), ¶602.

312. Florance further discloses its "FIG. 135 illustrates an exemplary method 1311 for geocoding a property, according to an embodiment of the present invention. The property would be associated with a geocode in a real estate database, for example. As shown, the method begins in step 1312 by electronically retrieving a public record of the property. This public record could be obtained by, for example, querying a public records database through a computer network (e.g. the Internet) or by downloading a group of public records from a public records database. The public records database could be provided by a government organization, such as those associated with construction permits, urban planning, zoning, or tax assessment. **The public record can contain property information such as address, owner, lessee(s), assessed value, purchase price**, and assessor parcel number (APN)." *E.g.*, EX1005 (**Florance**), ¶619.

313. In my opinion, **POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's disclosed retrieval of information from an integrated centralized property database (performed by Harris's processor, *see* cl.12.b)—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial and temporal components (*e.g.*, EX1004 (Harris), 4:7-33, Fig.1)–using, as one data source for**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00189

retrieval, Florance's teachings of *parcel information* (which Florance also stores in a database). POSITA would have recognized that doing so would have advantageously made available for retrieval another useful type of data to Harris's (or Harris-Florance's) existing integrated centralized property database for retrieval in response to queries, thus increasing its usefulness to users performing geo-temporal searches as Harris expressly discloses—including to determine and display (output) to the user parcels associated with a geographic location identifier in the centralized database. Indeed, as Harris expressly discloses, "[o]rganizations would appreciate a way to efficiently analyze collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry." *E.g.*, EX1004 (**Harris**), 4:46-49. For example, Florance itself teaches that a database user "investigating a property" in some location and "looking at 5 or 6 adjoining parcels could" advantageously use a database including parcel information to "tell[] the user who owns the parcels around where the user is standing, who the tenants are, what the rent is, and what the sale points are." *E.g.*, EX1005 (**Florance**), ¶330. For POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosures that its system uses multiple different types of geo-temporal data, *e.g.*, EX1004 (**Harris**), 5:50-65, and Florance's express disclosure that its parcel information is stored in a database with both geo-spatial and temporal components and accessible based on, *e.g.*, location data,

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00190

including to determine and display (output) to the user parcels associated with a geographic location identifier in the centralized database, *e.g.*, EX1005 (**Florance**), ¶¶330, 397, 602, 619, 634) clear this would work, predictably yielding the expected functionality with a reasonable expectation of success. *See* ¶133.

* * *

314. Thus, in my opinion, Harris in view of Florance renders obvious this limitation.

3. Element 10.b

315. Claim 10.b recites "**compare the retrieved parcel information with the location data to determine parcels associated with the geographic location identifier.**" **In my opinion, Harris in view of Florance renders obvious this limitation (Ground 3).**

316. In my opinion, **Harris renders obvious the processor comparing retrieved information with the location data to determine information associated with the geographic location identifier** (*see* cl.9.f, cl.12.b, cl.12.d). *See* discussion of cl.9.f.

317. In my opinion, **Florance discloses parcel information** (*see* cl.10.a) **and parcels** (*e.g.*, "assessor parcel number, legal description, address") **associated with a geographic location identifier** (*e.g.*, "[t]he property would be associated with a geocode in a real estate database")**.**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00191

318. For example, in addition to parcel information (discussed above), Florance expressly discloses identified parcels associated with a geographic location identifier, including "assessor parcel number, legal description, and address," each of which are associated with a geocoded location in Florance's database: "**FIG. 135 illustrates an exemplary method 1311 for geocoding a property, according to an embodiment of the present invention. The property would be associated with a geocode in a real estate database, for example**. As shown, the method begins in step 1312 by electronically retrieving a public record of the property. This public record could be obtained by, for example, querying a public records database through a computer network (e.g. the Internet) or by downloading a group of public records from a public records database. The public records database could be provided by a government organization, such as those associated with construction permits, urban planning, zoning, or tax assessment. **The public record can contain property information such as address, owner, lessee(s), assessed value, purchase price, and assessor parcel number (APN).**"). *E.g.*, EX1005 (**Florance**), ¶0619.

319. In my opinion, **POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's disclosed querying (performed by Harris's processor) of multiple different types of data from disparate sources stored in Harris's (or Harris-Florance's) integrated**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00192

centralized property database (including Florance's parcel information and parcels in the combined Harris-Florance system), and including multiple search parameters (*e.g.*, "*one or more other search parameters*, for example, a search string, a sort order, etc." *E.g.*, EX1004 (Harris), 10:13-14) to compare location data and parcel information retrieved in response to a query to determine parcels associated with the geographic location identifier of the query (*e.g.*, in response to a query requesting crimes that occurred at particular parcels within a geographic area, to output crimes and the parcels at which they occurred). Harris expressly discloses, *e.g.*, that "[d]ata analysts and other computer users often interact with and request data from computer-based databases containing large collections of data objects" from many organizations, for example, making "a search request for crime reports associated with incidents within a specified geographical radius" or many other types of data. *E.g.*, EX1004 (**Harris**), 1:13-17, 1:35-37, 3:1-6 ("bank transaction records, phone call records"), 4:24-25 ("using a key card to gain access to a building"), 4:30-32 ("cell phone call records… associated with data values reflecting a particular geographic location"). And Florance expressly discloses users beneficially searching for other types of information, including parcel information, such as "a user… investigating a property, looking at 5 or 6 adjoining parcels could" query, *e.g.*, "who owns the parcels around where the user are standing" and querying "the block/lot of the

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00193

property and the parcel number." *E.g.*, EX1005 (**Florance**), ¶¶330, 397. POSITA would thus have understood users beneficially query the Harris-Florance system across the various types of information it stores, and would have found it obvious to do so across the various types of information in the combined Harris-Florance system (containing parcel information as well as, for example, crime information). Harris also discloses that in response to queries, all data items satisfying the geospatial and temporal aspects of the query are retrieved. *E.g.*, EX1004 (**Harris**), 10:44-58. POSITA would have thus have understood that in response to a user query seeking, *e.g.*, information as to crimes within a certain geographic search area and the parcels at which they occurred, Harris-Florance would have retrieved from its data repository all data items "representing a longitude and latitude corresponding to the geographical location of… incident[s]" within that geographic search area and further retrieved parcel information (*e.g.*, based on "latitudes and longitudes associated with the property") within that geographic search area. To determine and output, from within this larger group of retrieved data, those parcels associated with the latitudes/longitudes of the incidents (as requested by the user query), POSITA would have found it obvious, advantageous, and straightforward to use well-known database operations to compare the retrieved parcel information with the location data concerning the incidents, such as "spatial join" (which would have been performed by Harris's processor)—which was a well-

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00194

known operation that compares different, disparate data sets each having spatial attributes (*e.g.*, longitude/latitude) stored in, *e.g.*, database tables (such as Harris's expressly disclosed database tables ("other forms of data output may be used such as… storing in database tables," *e.g.*, EX1004 (**Harris**), 9:35-37)) to determine whether there is any overlap in the spatial aspects of those data sets (such as latitude/longitude values) and determine whether any crimes occurred at longitudes/latitudes matching longitudes/latitudes associated with parcels stored in Harris's database**,** and output the requested results of that comparison, *i.e.*, parcel(s) associated with the location(s) at which any incidents occurred (*e.g.*, the assessor parcel number, legal description, and/or address). EX1008, 5 (explaining that the "spatial join query" is used to compare data having spatial attributes, such as "determin[ing] all pairs of overlapping rectangles").[8] For POSITA, this would have

[8] EX1008 is a compilation of scans that I made of pages of Samet, H., "Foundations of Multidimentional and Metric Data Structures," (published in 2006) which is a well-known textbook that I and others in my field were aware of and would have looked to for information about geo-spatial databases before the '648 patent's 2016 filing date. I received the textbook containing the scans in EX1008 on November 9, 2007, as shown by the author's handwritten note to me on the title page

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00195

been an obvious, routine implementation choice and (particularly given Harris's express disclosure of querying data with spatial attributes obtained from "disparate" sources, *e.g.*, EX1004 (**Harris**), 3:1-6, using multiple search parameters, *e.g.*, EX1004 (**Harris**), 10:13-14**,** storing results in database tables, *e.g.*, EX1004 (**Harris**), 9:35-37, and outputting the specific results requested by users and Florance's express disclosures of beneficially querying and identifying parcels associated with a particular location, *e.g.*, EX1005 (**Florance**), ¶330), clear this would work, predictably yielding the expected functionality with a reasonable expectation of success. *See* ¶133.

(EX1008, 2), and retrieved the textbook from my office at the University of Southern California in order to scan the pages that are EX1008. This textbook (which was published in 2006) and the information disclosed therein were known in the art well before '648's 2016 filing date. In fact, confirming the availability of this textbook and the fact that information therein was well-known to those in my field, this textbook was the assigned textbook for the Geospatial Information Management class (CSCI587) that I taught at the University of Southern California in Fall 2010. An exhibit label has been added to the first page of EX1008 and page numbers on all pages have been added to the bottom of EX1008 but no other alterations have been made.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00196

320. As discussed (*see* cl.10.a), in my opinion, **POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's disclosed retrieval of information from an integrated centralized property database—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial and temporal components (*e.g.*, EX1004 (Harris), 4:7-33, Fig.1)—using, as one data source, Florance's teachings of *parcel information* and further using parcels associated with a geographic location identifier (which Florance also stores in a database).** And as discussed (*see* cl.10.a), for POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosures that its system uses multiple different types of geo-temporal data, *e.g.*, EX1004 (**Harris**), 5:50-65 and Florance's express disclosures that its parcel information and parcels are stored in a database with both geo-spatial and temporal components and accessible based on, *e.g.*, location data, including to compare location data with parcel information to determine and display (output) to the user parcels associated with a geographic location identifier in the database, *e.g.*, EX1005 (**Florance**), ¶¶330, 397, 602, 619, 634) clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.

* * *

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00197

321. Thus, in my opinion, Harris in view of Florance renders obvious this limitation.

4. Element 10.c

322. Claim 10.c recites "**output the parcels associated with the geographic location identifier.**" **In my opinion, Harris in view of Florance renders obvious this limitation (Ground 3).**

323. In my opinion, **Harris the processor outputting information associated with the geographic location identifier** (*see* cl.9.g, cl.12.b)**.** *See* discussion of cl.9.g.

324. In my opinion, **Florance discloses parcels associated with a geographic location identifier** (*see* cl.10.b)**.** *See* discussion of cl.10.b.

325. For example, as discussed above, Florance discloses displaying parcels associated with a particular location: "Linking position data to commercial information is also useful in contexts other than the mobile vehicle. The system could be used to transmit location sensitive real estate information to a user's PDA or laptop computer, for example. For example, PDA's such as those made by Palm™ will soon have both a OPS capability and a data transmission capacity. **Using the system of the present invention, information could be retrieved from the database of the present invention and displayed on the user's PDA or laptop computer based on the user's location**. The information can be stored locally with

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00198

the user or transmitted to the user from a remote database. **For example, a user in Loudoun County investigating a property, looking at 5 or 6 adjoining parcels could have a Palm VII telling the user who owns the parcels around where the user is standing, who the tenants are, what the rent is, and what the sale points are**." *E.g.*, EX1005 (**Florance**), ¶0330.

326. Florance further discloses "Under the location subheading, the Overview page lists the property's metro market, county, submarket, and zip code. **This section also provides the map book and page on which to find the property, the block/lot of the property, and the parcel number**. This section also provides an area for narrative comments about the location." *E.g.*, EX1005 (**Florance**), ¶0397.

327. As discussed (*see* cl.10.a, cl.10.b), in my opinion, **POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's (or Harris-Florance's) disclosed retrieval of information from an integrated centralized property database using Florance's teachings of parcel information and parcels to determine and display (output) to the user parcels associated with a geographic location identifier in the database.** And as discussed (*see* cl.10.a, cl.10.b), for POSITA, this would have been an obvious, routine implementation choice and clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00199

* * *

328. Thus, in my opinion, Harris in view of Florance renders obvious this limitation.

329. Accordingly, in my opinion, claim 10 is rendered obvious over Harris in view of Florance.

M. Claim 11 Is Rendered Obvious Over Harris in view of Florance and Salvagio

330. **In my opinion, claim 11 is rendered obvious over Harris in view of Florance and Salvagio.** *See infra*, Appendix C, Claim 11.

1. Element 11.pre (the preamble of claim 11)[9]

331. Claim 11.pre recites "**The system of claim 10, the processor further configured to.**" **In my opinion, Harris in view of Florance renders obvious this limitation (Grounds 3-4).** *See* cl.10.

332. In my opinion, **Harris in view of Florance render obvious the system of claim 10, the processor further configured to:** (*see* cl.10)**.** *See* discussion of cl.10.

* * *

[9] To the extent deemed limiting, the preamble is disclosed.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00200

333. Thus, in my opinion, Harris in view of Florance renders obvious this limitation.

2. Element 11.a

334. Claim 11.a recites "**retrieve insurance policy information from the integrated centralized property database.**" **In my opinion, Harris in view of Florance and Salvagio renders obvious this limitation (Ground 4).**

335. In my opinion, **Harris discloses or renders obvious, or Harris in view of Florance renders obvious the processor retrieving information from the integrated centralized property database** (*see* cl.9.c, cl.9.f, cl.12.b)**.** *See* discussion of cl.9c, cl.9.f.

336. **Salvagio discloses insurance policy information** (*e.g.*, "insurance carrier,… the effective date of insurance, the maximum amount of coverage under the policy, the person who procured the insurance, the expiration date of the policy, and the like"; "insurance information") in a "property database."

337. For example, Salvagio discloses a "property database" including information about properties used by insurance providers: "A method, computer-readable medium, and apparatus by which a user may access **information about one or more properties** may be **used by an insurance provider or claims administrator** to provide an information portal to its clients. User input identifying one or more foreclosed properties may be received. Then, property data may be

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00201

retrieved from a **property database**, and the property data may include property damage information and insurance claim information for each of the identified properties. Then, based on the retrieved property data, it may be determined whether an identified property is damaged and whether an insurance claim was filed. Subsequently, information corresponding to the identified property may be displayed, and this information may include a damage indicator and an insurance claim status indicator." *E.g.*, EX1006 (**Salvagio**), Abstract; *see also, e.g.*, EX1006 (**Salvagio**), 11:63-64 ("database in which property information is stored."), cl.1 ("maintaining a **property database** at an information portal server, the property database containing property-specific information for one or more foreclosed properties"), cl.7 ("maintaining a property database, the property database containing property-specific information for one or more foreclosed properties").

338. Salvagio discloses that its stored information includes various types of insurance information, such as the "insurance carrier" and "maximum amount of coverage under the policy": "FIG. 3 illustrates a method of processing an insurance claim. At step 300, server 204 (as shown illustratively in FIG. 2) may receive property-specific information from a field service agency or company. The property-specific information, which may be part of an electronic data file, may include a description of the property, the current location of the property, notes entered by an inspector who has inspected the property, and the like. **At step 305, server 204 may**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00202

process the received file by adding insurance information which may cover the property. For instance, the server 204 may determine and add information such as the insurance carrier, insurance policy number, **the effective date of insurance, the maximum amount of coverage under the policy, the person who procured the insurance, the expiration date of the policy, and the like**." *E.g.*, EX1006 (**Salvagio**), 6:5-19; *see also, e.g.*, EX1006 (**Salvagio**), 8:8-18 ("FIG. 4 illustrates a method of preparing an insurance file. At step 400, the server, e.g., server 204, may receive an electronic data file for a particular property. The server may determine the corresponding insurance policy at step 405. For example, the server may match information provided in the data file and the insurance policy such as a property address, property owner, and the like. At step 410, the server may determine an insurance carrier based on the **insurance policy information**. At step 415, the server may update the electronic data file to include the insurance information including the insurance carrier and the like.").

339. Salvagio further discloses that its stored information includes location information such as property address, and that information (such as insurance information) is associated with property location information: "In step 1205, user input identifying one or more properties may be received. The **user input may include, for example, a street address, city, state, ZIP code**, a loan number, a work order number, a claim number, a borrower first name, and/or a borrower last

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00203

name. In step 1210, **one or more databases may be searched based on the user input** received in step 1205. In step 1215, **information corresponding to each of the one or more properties found in the search may be displayed**, enabling the user to access and view the results of the searching step 1210. The information displayed in step 1215 may include a record number, a loan number, an address, a borrower's name, a work order number, a report date, a sub-file number, a loss type indicator, a status indicator, a number of claims, a dispute indicator, and/or a claim amount paid. The information displayed in step 1215 may also include other information, as further described below." *E.g.*, EX1006 (**Salvagio**), 10:48-63; *see also, e.g.*, EX1006 (**Salvagio**), 11:17-25 ("Determining whether a property identified by the user input is damaged may include, for example, searching a database based on the user input, locating and retrieving **records about the property (and/or other properties)**, and determining, based on those records, whether property damage information indicates that the property is damaged. The searching of the database and retrieving of records may be based on a database query."), Figs.3, 4 (disclosing stored "Insurance Information):

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00204

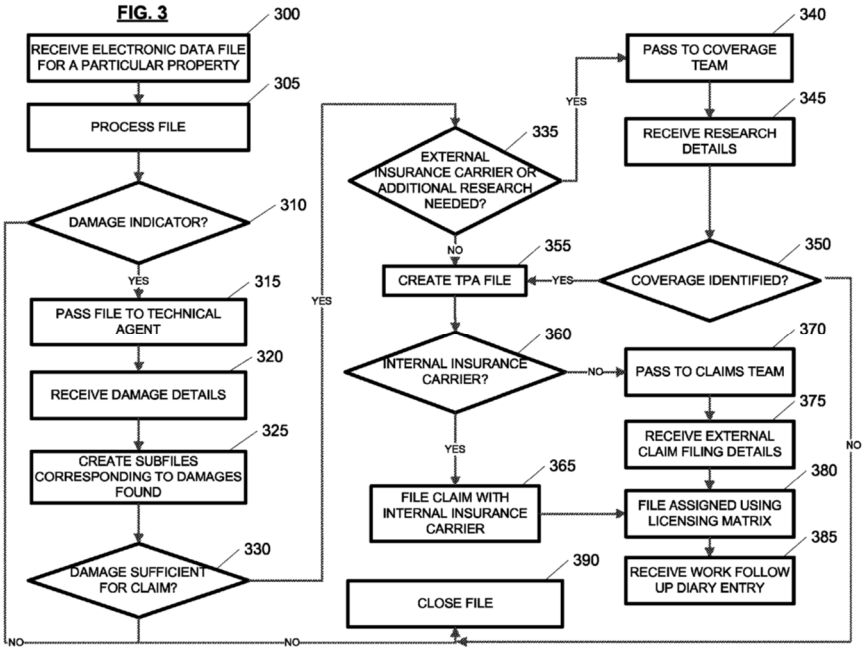
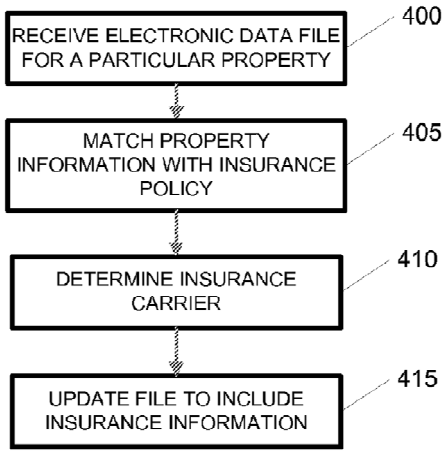


FIG. 4



340. As discussed (*see* cl.10.a), in my opinion, **POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's disclosed retrieval of information from an integrated**

centralized property database—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial and temporal components (*e.g.*, EX1004 (Harris), 4:7-33, Fig.1)—using, as one data source, Florance's teachings of *parcel information* (which Florance also stores in a database). POSITA would further have been motivated and found it obvious, straightforward, and advantageous to implement the resulting Harris-Florance combination's retrieval of information from Harris's (or Harris-Florance's) integrated centralized property database—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial and temporal components (*e.g.*, EX1004 (**Harris**), 4:7-33, Fig.1)—using, as one data source, Salvagio's teachings of ***insurance policy information*** (which Salvagio stores in a database). POSITA would have recognized that doing so would have advantageously added another useful type of data to Harris-Florance's existing integrated centralized property database, thus increasing its usefulness to users performing geo-temporal searches as Harris expressly discloses—including to determine and display (output) to the user insurance policies associated with a geographic location identifier in the centralized database. Indeed, as Harris expressly discloses, "[o]rganizations would appreciate a way to efficiently analyze collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry." *E.g.*, EX1004 (**Harris**), 4:46-49. For example, Salvagio itself discloses it is desirable to "avoid

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00206

wasting… time and resources" in retrieving insurance information as part of, *e.g.*, a claims process. *E.g.*, EX1006 (**Salvagio**), 1:56-62. For POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosures that its system uses multiple different types of geo-temporal data, *e.g.*, EX1004 (**Harris**), 5:50-65 and Salvagio's express disclosures that its data has geo-spatial components accessible based on, *e.g.*, location data, including to determine and display (output) to the user insurance policies associated with a geographic location identifier in the database, *e.g.*, EX1006 (**Florance**), Abstract, 6:5-19, 8:8-18, 10:48-63) clear this would work, predictably yielding the expected functionality with a reasonable expectation of success. *See* ¶133.

* * *

341. Thus, in my opinion, Harris in view of Florance and Salvagio renders obvious this limitation.

3. Element 11.b

342. Claim 11.b recites "**compare the retrieved insurance policy information with the parcels associated with the geographic location identifier to determine the insurance policies associated with the geographic location identifier.**" **In my opinion, Harris in view of Florance and Salvagio renders obvious this limitation (Ground 4).**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00207

343. In my opinion, **Harris renders obvious the processor comparing retrieved information with the geographic location identifier to determine information associated with the geographic location identifier** (*see* cl.9.f, cl.12.b)**.** *See* discussion of cl.9.f.

344. In my opinion, **Florance discloses parcels associated with a geographic location identifier** (*see* cl.10.b)**.** *See* discussion of cl.10.b.

345. In my opinion, **Salvagio discloses insurance policy information** (*see* cl.11.a) **and insurance policies** (*e.g.*, "insurance policy"; "policy number") **associated with a geographic location identifier** (*e.g.*, "particular property" identified by, *e.g.*, "street address…, city…, state…, [and] a ZIP code")**.**

346. For example, Salvagio expressly discloses storing insurance policies, including "policy number[s]" associated with a geographic location identifier such as a property's address: "FIG. 3 illustrates a method of processing an insurance claim. **At step 300, server 204 (as shown illustratively in FIG. 2) may receive property-specific information from a field service agency or company. The property-specific information, which may be part of an electronic data file, may include a description of the property, the current location of the property**, notes entered by an inspector who has inspected the property, and the like. At step 305, server 204 may **process the received file** by adding insurance information which may cover the property. **For instance, the server 204 may determine and add**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00208

information such as the insurance carrier, **insurance policy number**, the effective date of insurance, the maximum amount of coverage under the policy, the person who procured the insurance, the expiration date of the policy, and the like." *E.g.*, EX1006 (**Salvagio**), 6:5-19, Figs.4 (disclosing "Insurance Policy"), 5-7 (showing "Policy Number"):

FIG. 4

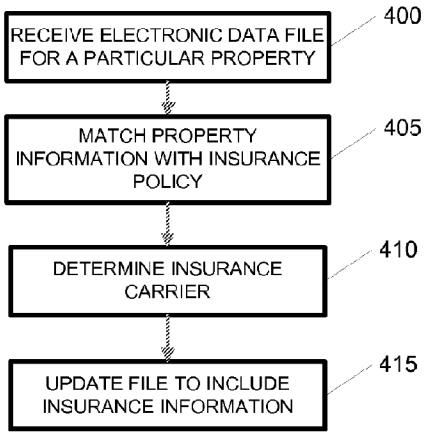
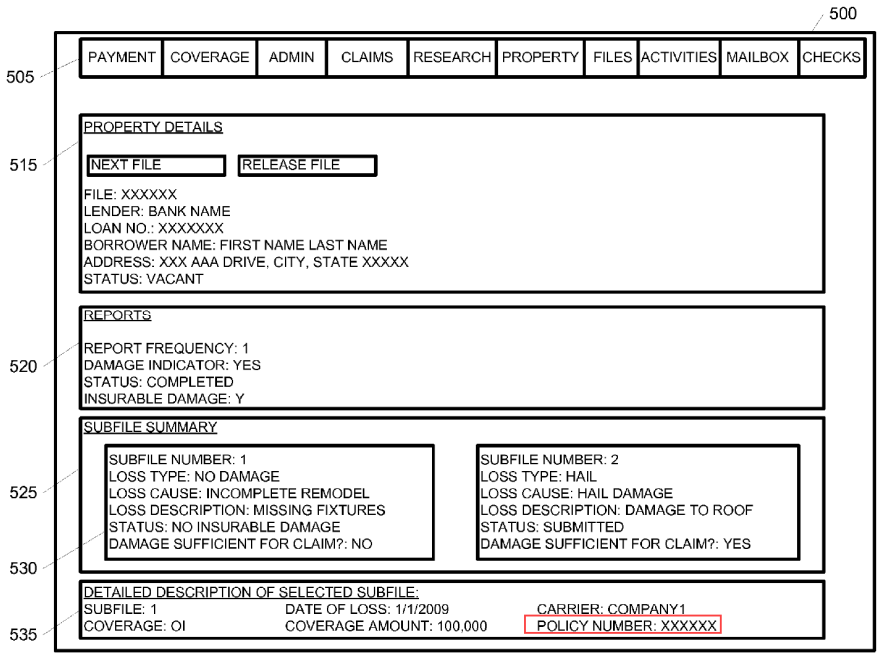


FIG. 5



347. Salvagio further discloses that users search Salvagio's database of insurance information and insurance policies using geographic location identifiers such as address: "In step 1230, **user input identifying one or more properties may be received. The user input may include, for example, a street address, city, state, ZIP code**, a loan number, a work order number, a claim number, a borrower first name, and/or a borrower last name. In step 1235, it may be determined, based on property damage information, whether a property identified by the user input in step 1230 is damaged. Determining whether a property identified by the user input is damaged may include, for example, searching a database based on the user input, locating and retrieving records about the property (and/or other properties), and determining, based on those records, whether property damage information indicates

that the property is damaged. The searching of the database and retrieving of records may be based on a database query. In one or more configurations, the property damage information may indicate the extent of the damage, the estimated cost of repair, and the like. For example, the property damage information may indicate that the property is "lightly damaged", "moderately damaged", or "severely damaged"; or, the property damage information may indicate that the property has an amount of damage expressed in terms of monetary value (e.g., "$12,000.00 of Damage")." *E.g.*, EX1006 (**Salvagio**), 11:11-32; *see also, e.g.*, EX1006 (**Salvagio**).

348. Salvagio further discloses searching a database to retrieve property records, including those related to insurance claims: "In step 1240, it may be determined, based on insurance claim information, whether an insurance claim was filed with respect to the property and/or the damage thereto. **Determining whether an insurance claim was filed may include, for example, searching a database based on the user input, locating and retrieving records about the property (and/or other properties), and determining, based on those records, whether insurance claim information indicates that an insurance claim has been filed**. It is contemplated that in certain configurations, the property damage information may indicate that a property is damaged, while the insurance claim information may indicate that no insurance claim has been filed. For example, a property in foreclosure may have been damaged, but because the extent of the damage is lower

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00211

than a deductible amount of a relevant insurance policy, no insurance claim was filed under that insurance policy." *E.g.*, EX1006 (**Salvagio**), 11:33-48.

349. As discussed (cl.10.b), POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement the combined Harris-Florance system to compare retrieved location information with retrieved parcel information to, *e.g.*, determine and output parcels at which crimes or other incidents occurred. For the reasons discussed in claim 10 POSITA would have understood that in response to a user query (by, *e.g.*, "an insurance provider or claims administrator," EX1006, Abstract) seeking certain types of information, *e.g.*, crimes and the parcels at which they occurred as well as insurance information concerning those parcels (*e.g.*, to "file insurance claims," "receive a determination of coverage," "determine damage," and/or "track… insurance claims" as expressly taught in Salvagio (EX1006, 2:26-30)), Harris-Florance-Salvagio would have retrieved from its data repository all data items regarding the location of those incidents, parcel information, and insurance policy information within that geographic search area. In my opinion, **POSITA would have further been motivated and found it obvious, straightforward, and advantageous to implement the combined Harris-Florance system using Salvagio's disclosed data including insurance policy information and insurance policies (each associated with a geographic location identifier) to compare—in response to a user query of Harris's**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00212

multiple, disparate data sets further seeking insurance policies associated with parcels at which crimes or other incidents have occurred (*see* cl.10.b)—retrieved insurance policy information associated with a particular property with the parcels at which such incidents occurred to determine and output insurance policies associated with those properties. This would have advantageously enabled a user of the combined system who is concerned with crimes occurring within particular parcels (*see* cl.10) to, *e.g.*, "receive a determination of coverage," "file insurance claims," "determine damage," and/or "track… insurance claims" as to crimes in such parcels using the combined database, as expressly discussed in Salvagio. *E.g.*, EX1006 (**Salvagio**), 2:26-30, 2:46-50. To determine and output insurance policies associated with the geographic location identifier, POSITA would have found it obvious, advantageous, and straightforward to use well-known database operations, such as "join" (which would have been performed by Harris's processor), EX1015, 1[10]—a well-known operation that compares

[10] Gotlieb, L., "Computing Joins of Relations," (EX1015) was published in SIGMOD '75: Proceedings of the 1975 ACM SIGMOD international conference on Management of data (May 1975), where it would have been presented and distrib-

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00213

different, disparate data sets based on something other than spatial attributes (such as address or parcel number, as opposed to latitude/longitude)—on data stored in, *e.g.*, database tables (Harris's expressly disclosed database tables, *e.g.*, EX1004 (**Harris**), 9:35-37)) to compare the retrieved insurance policy information with the parcels associated with the incidents (*see* cl.10) to determine whether there is any overlap in those data sets and determine and output any insurance policies associated with the geographic location identifier associated with such parcels. For POSITA, this would have been an obvious, routine implementation choice and clear this would work, predictably yielding the expected functionality with a reasonable expectation of success. *See* ¶133.

350. As also discussed above (cl.11.a), in my opinion, **POSITA would have been motivated and found it obvious, straightforward, and advantageous to**

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uted to attendees. Those in my field (including POSITA) were aware of this conference (which is still held yearly) and would have been looking for the papers from it. As of February 2016, those in my field (including POSITA) also regularly went to the Association for Computing Machinery (ACM) Digital Library website to search for papers. Further, prior to 2016, papers from ACM conferences were available on ACM Digital Library and could be found using search engines, such as Google.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00214

implement the Harris-Florance combination's retrieval of information (performed by Harris's processor, *see* cl.12b) from Harris's (or Harris-Florance's) integrated centralized property database—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial and temporal components (*e.g.*, EX1004 (Harris), 4:7-33, Fig.1)—using, as one data source, Salvagio's teachings of *insurance policy information and insurance policies* (which Salvagio also stores in a database). For POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosures that its system uses multiple different types of geo-temporal data, *e.g.*, EX1004 (**Harris**), 5:50-65 and Salvagio's express disclosures that its data has geo-spatial components accessible based on, *e.g.*, location data, including to determine and display (output) to the user insurance policies associated with a geographic location identifier in the database, *e.g.*, EX1006 (**Salvagio**), Abstract, 6:5-19, 8:8-18, 10:48-63) clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.

* * *

351. Thus, in my opinion, Harris in view of Florance and Salvagio renders obvious this limitation.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00215

4. Element 11.c

352. Claim 11.c recites "**output the insurance policies associated with the geographic location identifier.**" **In my opinion, Harris in view of Florance and Salvagio renders obvious this limitation (Ground 4).**

353. In my opinion, **Harris discloses the processor outputting data associated with the geographic location identifier** (*see* cl.9.g, cl.12.b)**.** *See* discussion of cl.9.g.

354. In my opinion, **Salvagio discloses insurance policies associated with a geographic location identifier** (*see* cl.11.b)**.** *See* discussion of cl.11.b.

355. For example, Salvagio discloses outputting stored information including insurance policies associated with a particular property: "FIG. 7 illustrates a claims summary file. **Interface 700 may display file information. In one aspect, the claims summary file may contain, where applicable,** general information regarding the servicing of the file (e.g., file number, claim status, file creation date, claims team agent assigned to the file, and the like), property information (e.g., access info, location of property, and the like), loss information (e.g., subfile number, cause of loss, description of damaged property, date of loss, inspection date and the like) as shown in block 705. **In addition, the claims summary file may** include lender information (e.g., loan number, lender date, lender contact information), **insurance information (e.g., carrier name, carrier contact**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00216

information), policy information (e.g., policy number, policy effective date, coverage amount, damage threshold, deductible amount), claim information (e.g., date the claim was filed, status of claim, whether claim is disputed, estimate of claim). Where applicable, the claims summary file may also allow the input of information relating to any payments made on the claim or any other activities to be performed (e.g., scheduled follow-up). In addition, block 705 may include a query button selectable by an agent desiring to view claims summary block 715 and 725." *E.g.*, EX1006 (**Salvagio**), 9:6-27.

356. Salvagio further discloses, *e.g.*, that "[i]n step 1240, it may be determined, based on insurance claim information, whether an insurance claim was filed with respect to the property and/or the damage thereto. **Determining whether an insurance claim was filed may include, for example, searching a database based on the user input, locating and retrieving records about the property (and/or other properties), and determining, based on those records, whether insurance claim information indicates that an insurance claim has been filed**. It is contemplated that in certain configurations, the property damage information may indicate that a property is damaged, while the insurance claim information may indicate that no insurance claim has been filed. For example, a property in foreclosure may have been damaged, but because the extent of the damage is lower

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00217

than a deductible amount of a relevant insurance policy, no insurance claim was filed under that insurance policy." *E.g.*, EX1006 (**Salvagio**), 11:33-48.

357. As discussed above (cl.11.a, cl.11.b), in my opinion, **POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris-Florance's disclosed retrieval of information (performed by Harris's processor, *see* cl.12.b) from an integrated centralized property database using Salvagio's teachings of *insurance policy information*.** And as discussed (*see* cl.11.a, 11.b), for POSITA, this would have been an obvious, routine implementation choice and clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.

* * *

358. Thus, in my opinion, Harris in view of Florance and Salvagio renders obvious this limitation.

359. Accordingly, in my opinion, claim 11 is rendered obvious over Harris in view of Florance and Salvagio.

VIII. SECONDARY CONSIDERATIONS

360. At this time, including after review of the documents and materials cited herein, as well as those identified in Appendix B, there is no evidence of secondary considerations or objective indicia of non-obviousness with a nexus to the '648 patent, and it is my opinion that each of the Challenged Claims of the '648

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00218

patent is anticipated by or obvious over the prior art. I understand that if EagleView presents evidence of objective factors that it argues supports a finding of non-obviousness, I may be asked to review such evidence and to formulate an opinion and reserve the right to address any such evidence and/or arguments that EagleView may raise in this regard.

IX. CONCLUSION

361. In summary, for the reasons described above and in Appendix C, I have concluded that each of the Challenged Claims is invalid as anticipated under 35 U.S.C. § 102(a) or obvious under 35 U.S.C. § 103 in light of the prior art references discussed above and the knowledge of POSITA.

362. Specifically it is my opinion that **Ground 1**: Harris anticipates claims 1, 2, 4, 5, 6, 9, 12, 13, and 15; **Ground 2**: Harris renders obvious claims 1, 2, 4, 5, 6, 9, 12, 13, and 15; **Ground 3**: Harris in view of Florance renders obvious claims 9-10, 12, 13, and 15; **Ground 4**: Harris in view of Florance and Salvagio renders obvious claim 11.

363. To the extent it is argued that any further disclosure is required for any of the limitations in the Challenged Claims that I have identified herein as being disclosed, either explicitly or inherently, by the references listed in Appendix B, POSITA would certainly have found that limitation obvious to include based on the

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00219

same explicit disclosure or inherent disclosures and analysis I have identified in my declaration.

364. I reserve the right to supplement by opinions in the future and to respond to any arguments that Patent Owner or its expert(s) may raise and to take into account any new information as it becomes available to me.

365. I have been warned that willful false statements and the like are punishable by fine or imprisonment, or both. I make this declaration of my own personal knowledge, and all statements made of my own knowledge are true. All statements made on information and belief are believed to be true. If called to testify as to the truth of the matters stated herein, I could and would testify competently.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on March 23, 2024 at Irvine, California.



Cyrus Shahabi, Ph.D.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00220

APPENDIX A

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Education

Ph.D.	Computer Science, University of Southern California, Los Angeles, CA Advisor: Professor Shahram Ghandeharizadeh Title: Scheduling the retrievals of continuous media objects	1996
M.S.	Computer Science, University of Southern California, Los Angeles, CA Research Topic: *"Parallel Object Oriented Database Systems"*	1993
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Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00222

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Publications

Refereed Journal Articles

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Other Scholarly Publications

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2. N. Saxena, W. Zhang, and C. Shahabi, Missed Opportunities in Fair AI. *Proceedings of the SIAM International Conference on Data Mining (SDM)*, Minneapolis-St. Paul Twin Cities, MN, April 2023: 961-964 **Vision Paper**.
3. S. Min, R. Ahuja, Y. Liu, A. Zaidi, C. Phu, L. Nocera, and C. Shahabi, CrowdMap: Spatiotemporal Visualization of Anonymous Occupancy Data for Pandemic Response, *28th International Conference on Advances in Geographic Information Systems (SIGSPATIAL)*, Beijing, China, November 2021 **(Demo Paper)**.
4. Y. Da, R. Ahuja, L. Xiong, and C. Shahabi, REACT: Real-Time Contact Tracing and Risk Monitoring via Privacy-Enhanced Mobile Tracking, *37th IEEE International Conference on Data Engineering (ICDE)*, Chania, Greece, April 2021 **(Demo Paper)**.
5. G. Constantinou, O. Orhan, R. Kondepudi, H. Cho, S. H. Kim, A. Alfarrarjeh, and C. Shahabi, FloraVision: A Spatial Crowd-based Learning System for California Native Plants, *37th IEEE International Conference on Data Engineering (ICDE)*, Chania, Greece, April 2021 **(Demo Paper)**.
6. L. Nocera, G. Constantinou, L. V. Tran, S. H. Kim, G. Kahn, and C. Shahabi, Crosstown Foundry: A Scalable Data-driven Journalism Platform for Hyper-local News, *International Conference on Management of Data (SIGMOD)*, Virtual Event, China, June 2021 **(Demo Paper)**.
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8. A. Alfarrarjeh, S. H. Kim, V. Hegde, Akshansh, C. Shahabi, Q. Xie, and S. Ravada, A Class of R*-tree Indexes for Spatial-Visual Search of Geo-tagged Street Images. *36th IEEE International Conference on Data Engineering (ICDE)*, Dallas, TX, USA, April 20-24, 2020 (Short Paper).
9. K. Nguyen, J. Yang, Y. Lin, J. Lin, Y. Y. Chiang, and C. Shahabi, Los angeles metro bus data analysis using GPS trajectory and schedule data (demo paper), *Proceedings of the 26th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (SIGSPATIAL 2018)*, Seattle, WA, November 2018: 560-563 (demonstration).
10. A. Alfarrarjeh, S. H. Kim, S. Agrawal, M. Ashok, S. Y. Kim, and C. Shahabi, Image Classification to Determine the Level of Street Cleanliness: A Case Study, *Proc. of the IEEE International Conference on Multimedia Big Data (BigMM 2018)*, Xi'an, China, September 2018, **(Short Paper, Acceptance Rate 28.1%)**.
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12. M. Yue, L. Fan, and C. Shahabi, Inferring Traffic Incident Start Time with Loop Sensor Data, *The 25th ACM International Conference on Information and Knowledge Management (CIKM)*, Indianapolis, IN, October 2016 **(Best Demonstration Award)**.
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25. U. Demiryurek, F. Banaei-Kashani and C. Shahabi, A Case for Time-Dependent Shortest Path Computation in Spatial Networks, *ACM SIGSPATIAL ACMGIS*, San Jose, CA, November 2010 (short paper).
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27. U. Demiryurek, F. Banaei-Kashani and C. Shahabi, TransDec: A Spatiotemporal Query Processing Framework for Transportation Systems (Demo), *26th IEEE International Conference on Data Engineering (ICDE 2010)*, Long Beach, California, USA, March 2010 (Demo Paper).
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48. G. Barish, Y. S. Chen, D. Pasquo, C. Knoblock, S. Minton, I. Muslea and C. Shahabi, Distributed Information Integration for Heterogeneous Datatypes, In *Proceedings of IEEE Conference on Data Engineering (ICDE'2000)*, San Diego, California, February 2000 (Demonstration).
49. C. Shahabi and Y. S. Chen, Soft Queries in Image Retrieval Systems, In *Proceedings of SPIE Electronic Imaging 2000*, San Jose, California, January 2000.
50. R. Zimmermann, M. Kolahdouzan and C. Shahabi, MASAA: A Case Study in Building a Distributed Integrated Media Database, In *Proceedings of the New Trends in Multimedia Systems in the Software Technology Track of the Thirty-Third Hawaii International Conference on System Sciences (HICSS-33)*, Maui, Hawaii, January 2000.
51. A. Dashti and C. Shahabi, Data Placement Techniques for Serpentine Tapes, In *Proceedings of the New Trends in Multimedia Systems in the Software Technology Track of the Thirty-Third Hawaii International Conference on System Sciences (HICSS-33)*, Maui, Hawaii, January 2000.
52. C. Shahabi, M. Safar and H. Ai, Multiple Index Structures for Efficient Retrieval of 2D Objects, In *Proceedings of the IEEE International Conference on Data Engineering (ICDE)*, March 1999 (Poster).
53. C. Shahabi, L. Khan, V. Shah and D. McLeod, Run-Time Optimization of Join Queries for Distributed Databases over the Internet, In *Proceedings of Communication Networks and Distributed Systems Modeling and Simulation (CNDS)*, January 1999.
54. C. Shahabi and L. Khan, Selective Placement and Replication Strategies for Storing Audio Clips in A Naval Application, In *Proceedings of the SPIE Multimedia Storage and Archiving Systems III*, November 1998.
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56. C. Shahabi, A. Dashti and S. Ghandeharizadeh, Continuous Media Retrieval Optimizer for Hierarchical Storage Structures, In *Proceedings of the International Workshop on Issues and Applications of Database Technology (IADT)*, July 1998.
57. C. Shahabi, M. Alshayeji and S. Wang, A Buffering Policy for Distributed Continuous Media Servers, In *Proceedings of the World Automation Congress (WAC), IFMIP*, May 1998.
58. S. Ghandeharizadeh, L. Ramos and C. Shahabi, An Overview of Techniques for Continuous Retrieval of Multimedia Data *In ACM SIGARCH Computer Architecture News, 21, No. 5*, December 1993 (Invited paper).

Industrial Articles

1. S. Tavakkol, F. Han, B. Mayer, M. Phillips, C. Shahabi, Y. Y. Chiang, and R. Kiveris, Kartta Labs: Collaborative Time Travel, *54th Hawaii International Conference on System Sciences (HICSS)* Kauai, Hawaii, USA, January 2021.
2. Revolutionary Approach to Network Storage for the New Millennium. In *T.H.E. Journal*, May 98.
3. Network Storage for the Next Millennium. In *Storage Inc.*, Spring 98.

Grants

Highlights:

- Single PI NSF awards: IIS 2021, IIS 2019, CNS 2015, IIS 2013, IIS 2011, CyberTrust 2008, SGER 2007, PECASE 2003, ITR 2000.
- PI on non-NSF grants: NIH 2022 $1,200,000; NGA NURI 2021 $600,000; NGA 2019 $344,485; NIJ 2011 $995,172; JPL 1998 $497,000.
- Google Faculty awards: 2019 $55,552; 2013 $62,067; 2010 $40,000; 2006 $25,00; 2005 $100,000.

Previous:

- C. Shahabi, PI, **Cisco, 07/26/2021 - 07/25/2022**: Machine Learning Techniques for Outlier Detection in Network Traffic, $ 25,000.
- C. Shahabi, PI (Collaborative), **NSF, 05/01/2020 - 04/30/2022**: RAPID: Collaborative: REACT: Real-time Contact Tracing and Risk Monitoring via Privacy-enhanced Mobile Tracking, $ 83,185 (My Share).
- C. Shahabi, PI **US Department of Transportation, 08/01/2021 - 7/31/2022:** Evaluating Accessibility of Los Angeles Metropolitan Area Using Data-Driven Time-Dependent Reachability Analysis $ 90,082.
- G. Giuliano, C. Shahabi, et. al., **Los Angeles County-Metropolitan Transportation Authority 01/01/2021-12/30/2021**: Archived Data Management System Technical Support Services $ 160,000 (My Share).
- C. Shahabi, PI **CALTRANS, 08/01/2020 - 9/30/2021:** Large-scale and Long-term Forecasting of Performance Measurement of Public Transportation Systems $72,367.
- C. Shahabi, PI **US Department of Transportation, 08/01/2020 - 9/30/2021:** Freight Volume Modeling on Major Highway Links $90,082.
- C. Shahabi, PI, **Microsoft, 01/31/2020 - 01/30/2021**: Privacy-Preserving Machine Learning Techniques for Improving Individual and Organizational Productivity, $ 250,000.
- C. Shahabi, PI, **Google, 05/01/2019 - 04/31/2020**: Accurate and Scalable Techniques to Protect Spatiotemporal Data with Geo-Indistinguishability, $ 55,552.
- C. Shahabi, PI, **NGA, 05/01/2019 - 04/31/2020**: All-Scale Trajectory Clustering for Moving Behavior Detection with Spatiotemporal Recurrent Convolutional Neural Networks, $ 344,485.
- G. Giuliano, C. Shahabi, et. al., **Los Angeles County Service Authority for Freeway Emergencies (LA-SAFE) 07/01/2017-09/30/2020**: Archived Data Management System Maintenance, $427,624.
- G. Giuliano, C. Shahabi, et. al., **CALTRANS, 02/01/2019 - 1/31/2020:** Deep-Learning Traffic Flow Predictions for Forecasting Performance Measurement of Public Transportation Systems, $100,000.
- C. Shahabi, PI, **Oracle Labs, 08/01/2018 - 07/31/2019**: Spatial Visual Index for Large Geo-Tagged Image Database, $ 99,910.00.
- J. L. Ambite, C. Shahabi, et. al., **NIH, 10/01/2015 - 9/30/2019)**: Pediatric Research using Integrated Sensor Monitoring Systems (PRISMS): Data and Software Coordination and Integration Center (DSCIC), $118.952 (total: $999,394).
- C. Shahabi, PI, **NSF CNS, 04/1/2015 - 03/31/2018**: BDD: Human-Centered Situation Awareness Platform for Disaster Response and Recovery, $ 299,976.
- G. Giuliano, C. Shahabi, et. al., **CALTRANS, 01/01/2017 - 12/31/2017:** Trajectory Data Mining for Performance Measurement of Public Transportation Systems, $100,000.
- C. Shahabi, PI, **NSF III, 08/16/2013 - 08/15/2017**: GeoCrowd – A Generic Framework for Trustworthy Spatial Crowdsourcing, $ 490,000.
- C. Shahabi, PI, **Chevron CiSoft, 01/01/2013 - 12/31/2017:** Efficient and Scalable Data Cleansing and Compression towards Smart Data Management, $672,000.
- P. Kuhn, C. Shahabi, et. al., **NIH, 10/01/2015 - 9/30/2017)**: Monitoring Kinetic Movement in Elderly Patients Undergoing Cytotoxic Chemotherapy, $372,573 (total: ˜$1M).

- G. Giuliano, C. Shahabi, et. al., **Los Angeles County Metropolitan Transportation Authority 07/1/2015 - 06/30/2017**: Archived Data Management System Maintenance, $ 293,125 (total: $330,000).
- C. Shahabi, PI, **Northrop Grumman Corporation, 10/01/2015 - 11/30/2016**: Privacy-Aware Mobile Crowdsourcing, $ 55,000.
- C. Shahabi, PI, **NSF III, 08/16/2011- 08/15/2015**: Real-World Traffic Data Management for Time-Dependent Spatial Queries, $ 579,610.
- C. Shahabi, PI, **Google, 05/01/2010 - 04/31/2011**: Textual-Spatial-Temporal Ranking and Indexing of Web 2.0, $ 40,000.
- C. Shahabi, PI, **Oracle, 6/1/2013- 12/31/2015**: Time-dependent Vehicle Routing for Fleets , $ 194,936.
- C. Shahabi, PI, **Californina-DOT, 01/01/2015 - 12/31/2015:** Analysis and Prediction of Transportation Systems Incidents for Better Mobility and Safety in Transportation Systems, $99,999.
- G. Giuliano, C. Shahabi, et. al., **Los Angeles County Metropolitan Transportation Authority 08/16/2010 - 08/15/2014**: Archived Data Management System for Regional Integration of ITS, $ 1,065,914 (total: $ 1,979,124).
- C. Shahabi, PI, **Northrop Grumman Corporation, 12/30/2013 - 12/31/2014**: Geolocation based camera activity motion sensing to enable persistent persons of interest identification and movement tracking across multiple surveillance camera video frames and video feeds, $ 30,000.
- C. Shahabi, PI, **Google, 6/1/2013- 5/30/2014**: GeoCrowd - Harnessing the Power of Crowd for On-Demand Geographical Data Collection, $ 62,067.
- C. Shahabi, PI, **HP Labs, 9/1/2012 - 8/31/2013**: Traffic-Aware Route Planning for Delivery Businesses, $ 55,000.
- C. Shahabi, PI, **Vietnam Education Foundation, 07/01/2012- 06/30/2013**: VEF US Faculty Scholar Program, $ 55,000.
- C. Shahabi, PI, **Northrop Grumman Corporation, 06/01/2012 - 05/30/2013**: A Spatiotemporal Database Approach for Effective Multi-Source Activity Surveillance, $ 40,000.
- J. Taplin, C. Shahabi, et. al., **Intel, 12/1/2011 - 07/31/2013**: Real-Time Vision Based Traffic Flow Measurements, $ 244,000 (total: $ 300,000).
- C. Shahabi, PI, **NIJ, 10/01/2011- 12/30/2013**: Janus: Multi -Source Event Collection System for Efficient Surveillance of Criminal Activity, $ 995,172.
- C. Shahabi, PI, **Chevron CiSoft, 01/01/2012 - 12/31/2013:** Production Attribute Relevant Time Mapping: A Data Cleansing and Visualization Project, $352,000.
- C. Shahabi, PI, **Northrop Grumman Corporation, 08/16/2013 - 08/15/2014**: Cloud-based geo-reference data indexing, querying and retrieval methods for multisource data association and exploitation, $ 30,000.
- C. Shahabi, PI, **Microsoft, 12/16/2010- 12/15/2012**: Traffic Stream Data Processing with StreamInsight $ 100,000.
- C. Shahabi, PI, **NSF CyberTrust, 08/08-08/12**: Enabling Location Privacy; Moving beyond k-anonymity, cloaking and anonymizers, $ 386,666.
- C. Shahabi, PI, **Vietnam Education Foundation, 07/01/2011- 06/30/2012**: VEF US Faculty Scholar Program, $ 27,836.
- C. Shahabi, PI, **METRANS, 1/10-12/10**: A Geospatial Framework for Dynamic Route Planning Using Congestion Prediction in Transportation Systems, $ 90,000.
- C. Shahabi, **Chevron CiSoft, 01/01/2010 - 12/31/2010:** General Data Management & Advanced Queries $380,000.
- C. Shahabi and Roger Zimmermann, **NSF, 1/2/2006 - 31/1/2009:** HYDRA- High Performance Data Recording Architecture for Streaming Media $270,000.
- C. Shahabi, **Chevron CiSoft, 01/01/2009 - 12/31/2009:** General Data Management & Advanced Queries $450,000.
- C. Shahabi, PI, **NSF PECASE, 09/03-08/09**: Immersive Sensor Data Streams, $ 400,000.
- C. Shahabi, PI, **METRANS, 1/09-12/09**: A Geospatial Framework for Dynamic Route Planning Using Congestion Prediction in Transportation Systems, $ 90,000.

- C. Shahabi, **Chevron CiSoft, 01/01/2008 - 12/31/2008:** General Data Management & Advanced Queries $600,000.
- E. Hovy, D. McLeod, P. Pantel, C. Shahabi, ... **DHS, 12/06-12/08:** CKID: Large-Scale Strategic Knowledge Discovery from Multiple Media $803,775.00 (through Geosmeble Technologies).
- Craig Knoblock, C. Shahabi and J. Wilson, **NSF ITR, 10/03-09/08**: Framework for Integrating Geospatial and Online Data to Respond to Unexpected Events, $ 1,186,000.
- C. Shahabi, **AFRL 05/05-09/08; subcontract from ISI**: Entity Base, $20,000.
- C. Shahabi, **NSF, 09/01/07-08/31/08:** SGER: Blind Evaluation of Spatial Queries with Hilbert Curves to Preserve Location Privacy $77,685.
- C. Shahabi, **JPL, 08/20/2007 - 07/19/2008:** On-the Fly Retrieval and Fusion of 5-D Earth Science Data for Effective Visualization and Decision Support $70,000.
- C. Shahabi, **Chevron CiSoft, 01/01/2004 - 12/31/2007:** Real-Time Data Management $835,000.
- C. Shahabi (PI), **Google, 08/06-09/07:** OSR-OnLine Map Services, $25,000.
- S. Ghandeharizadeh and C. Shahabi **NSF IDM, 09/03-08/07**: Management and Processing of Continuous Streams from Moving Sensors $ 300,000.
- C. Shahabi (PI) **Microsoft, 12/05-11/06:** ProDA: Online Scientific Data Analysis with Wavelets, Web-Services, and Smart Clients, $50,000.
- C. Shahabi (PI), C. Knoblock, U. Neumann and R. Nevatia, **Microsoft, 12/05-11/06:** GeoDec: Geospatial Decision Making, $50,000.
- C. Shahabi (PI), C. Knoblock, U. Neumann and R. Nevatia, **Annenberg Center, 12/05-11/06:** GeoDec: A Geospatial Decision Making Environment, $50,000.
- C. Shahabi (PI), C. Knoblock, U. Neumann and R. Nevatia, **Google, 11/05-10/06:** Accurate and Rapid Construction of Information-Rich 3D City Models, $100,000.
- C. Shahabi, PI, **JPL, 09/03-06/06:** Support of GENESIS-II statistical queries, $ 495,794.
  As part of: Tom Yunck (JPL) et. al., **NASA, 09/03-08/08**: GENESIS-II: Data Fusion and Analysis for Multi-Sensor Earth System Science.
- G. Burns, S. Ghandeharizadeh, C. Shahabi, **NLM, 05/01/01 - 04/30/06**: Knowledge management of the Neuroscientific literature, $ 1,200,000.
- C. Shahabi, PI, **USGS, 09/03-08/04:** Automatic Vector to Image Conflation, $ 10,000.
- C. Shahabi, PI, **NSF ITR, 09/00-08/04**: An Infrastructure for the Real-Time Delivery of High Quality Continuous Media from Distributed Scalable Servers to Multiple Clients, $ 456,357.
- S. Ghandeharizadeh, C. Knoblock, C. Papadopoulos, C. Shahabi, **Microsoft, 01/03-12/03:** Proteus: A System for Execution of Dynamically Composed Web Services Using GXA, $250,000.
- C. Knoblock and C. Shahabi, **DoD DURIP (Equipment only), 04/02-03/04:** Information System for Integrating Geographic Data Sources, $220,000.
- C. Shahabi, PI, **ISI, 06/01/00 to 08/31/03:** Active Template Reasoning and Optimization, $ 320,230.
  As part of: Craig Knoblock et. al., **DARPA, 06/00-08/03**: Active Template Reasoning and Optimization, $ 2,114,000.
- C. Shahabi, PI, **JPL, 09/98-01/03:** Support of GENESIS queries on a distributed database environment, $ 497,000.
  As part of: Tom Yunck (JPL), C. Shahabi et. al., **NASA, 09/98-09/01**: GPS environmental and earth science information system (GENESIS), $ 2,336,000.
- S. Ghandeharizadeh, C. Knoblock, C. Papadopoulos, C. Shahabi, **Microsoft, 01/02-12/02:** Composing Web Sources Using a Scalable .NET Middleware, $200,000.
- C. Shahabi, PI, **NCR, 07/01-06/02:** Implementation of PROPOLYNE on the Teradata platform, $50,000.
- U. Neumann, S. Rizzo and C. Shahabi, **NCR, 07/00-06/01:** Kiosks That See and React, $85,000.
- C. Knoblock and C. Shahabi, **NCR-GDIS, 07/98-06/01:** Integration of video, images, and semistructured data in a geographical information system, $300,000.
- A. Sawchuk, C. Shahabi, et. al., **NSF, 10/97-09/00** (Major Research Instrumentation program, MRI 97-24567, **Equipment only**): High performance processors and networks for video compression, distributed visualization, database systems, and collaborative telepresence $ 1,000,000.

- C. Shahabi, PI, **Hughes, 08/97-07/98:** Audio processing for twenty-first century surface combatant (SC-21) multimodal watchstations, $ 30,000.
- C. Shahabi, PI, **NCR, 07/97-06/98:** Utilization and extension of NCR parallel multimedia database system (M-DBS) for IMSC system integration experiments and applications, $ 100,000.
- J. Kuo and C. Shahabi, **Hughes, 08/96-05/97:** Selective & progressive transmission of wavelet compressed imagery data, $ 30,000.

Current:

- C. Shahabi, PI, **Novateur Research Solutions (Prime: IARPA), 04/2023 - 03/2027**: ROMULUS and REMUS, Two Systems for Building Mega-City Intelligence, $ 800,000.
- C. Shahabi, PI, **NIH NLM, 1/14/2022 - 01/13/2025**: SCH: Wearables for Health and Disease Knowledge (W4H), $ 1,200,000.
- C. Shahabi, PI, **NSF IIS, 10/1/2021 - 09/30/2024**: NeuroDB: A Neural Network Framework for Efficiently Answering Database Queries Approximately, $ 500,000.
- C. Shahabi, PI, **NGA NURI, 10/1/2021 - 09/30/2024**: Mining Large Multi-Scale Trajectory Data for Moving Behavior Detection $ 600,000.
- L. Xiong (PI), C. Shahabi, etc. **NSF, 10/01/2021 - 09/30/2024**: SCC-IRG JST: Hyperlocal Risk Monitoring and Pandemic Preparedness through Privacy-Enhanced Mobility and Social Interactions Analysis, $ 300,000 (My Share).
- C. Shahabi, PI, **NSF IIS, 08/16/2019 - 08/15/2023**: PE4GQ - Practical Encryption for Geospatial Queries on Private Data, $ 306,814.
- C. Shahabi, PI, **US Department of Transportation, 07/2023 - 06/2024:** Validation of Freight Volume Modeling on Major Highway Links $100,000.
- G. Giuliano, C. Shahabi, et. al., **Los Angeles County-Metropolitan Transportation Authority 05/2022-05/2023**: Archived Data Management System Technical Support Services $ 136,000 (My Share).

Teaching Experience

2023-present
Dept of Computer Science, University of Southern California, Los Angeles, CA.
Machine Learning in Databases course (CSCI-699). The purpose of this course is to bring the student up to date in recent advancements and utilization of Machine Learning (ML) approaches in the field of Databases. The course will first cover various Machine Learning techniques (e.g., Deep Learning, NLP, reinforcement learning) used for indexing, query optimization, approximate query processing, and system tuning, and proceed with techniques used to potentially replace a database with an ML model. Students in the course will be guided through the recent database and ML literature from the VLDB, SIGMOD, ICDE, ICLR, and SIGKDD conferences.

2007-present
Dept of Computer Science, University of Southern California, Los Angeles, CA.
Geospatial Information Management course (CSCI-587). The focus of this course is on studying techniques to efficiently store, manipulate, index and query geospatial information in support of real-world geographical and decision-making applications. In this course, the students become familiar with a variety of geospatial applications (e.g., location-based services, online maps) and datasets (e.g., road-network data, aerial imagery, 3D models). Meanwhile, as part of the course projects, the students will learn to use the state-of-the-art geospatial software tools, applications and libraries such as those provided by Apple (e.g., iPhone), Oracle, Google (e.g., Android) and Microsoft.

2002-2004
Dept of Computer Science, University of Southern California, Los Angeles, CA.

Multidimensional Databases course (CSCI-599). This seminar course covers several research papers related to (a) introduction to multidimensional databases, (b) OLAP applications, (c) approximation techniques, (d) multidimensional index structures, (e) dimension reduction techniques, and (f) multidimensional data mining.

2000-2002
Dept of Computer Science, University of Southern California, Los Angeles, CA.
Spatial and Temporal Databases course (CSCI-599). This seminar course covers several research papers related to (a) the ontology, structure, and representation of space and time, (b) the data models and query languages to represent spatial, temporal and spatio-temporal data, (c) techniques for efficient processing and evaluating queries on multidimensional data, (d) query processing algorithms, storage structures and indexing techniques, and (e) architectures for spatial, temporal and spatio-temporal Database Management Systems.

1999-2002
Dept of Computer Science, University of Southern California, Los Angeles, CA.
Database Management course (CSCI-585). This course covers important subjects in the design and implementation of relational, object-oriented and object-relational database management systems. It also includes lectures on Spatial, OLAP and Multimedia Databases as well as XML and its query languages. During this course, students experiment with an object-relational DBMS, currently Informix Universal Server v9.12. Students also develop a Java application that submits SQL3 queries to Informix through JDBC and RMI.

1997-1998
Dept of Computer Science, University of Southern California, Los Angeles, CA.
File and Database Management course (CSCI-485). This course covers important subjects in the design and implementation of relational database management systems. During this course, students implement a mini relational DBMS incrementally in four layers. Topics such as crash recovery and concurrency control as well as E-R diagram, relational model, and SQL language are covered in this course.

Students

- Undergraduate Students: Jena Bhandari, Jonathan Qin, Eric Jiang, Yingzhe Liu, Brian Plotnik, Matthew Lim, Abbas Zaidi, and Xiaochen Yang.
- Doctoral Students: Maria Despoina Siampou, Yuehan Qin, Arash Hajisafi, Nripsuta Saxena, Haowen Lin, Sepanta Zeighami, Chrysovalantis Anastasiou.
- Ph.D. Graduates: Ritesh Ahuja (Fall 2022, Oracle), Giorgos Constantinou (Summer 2021, Amazon), Kien Nguyen (Summer 2021, Facebook), Luan Tran (Summer 2021, Worldquant LLC), Mingxuan Yue (Summer 2021, Google), Abdullah Alfarrarjeh (Fall 2019, German Jordanian University (GJU)), Yaguang Li (Spring 2019, Google), Mohammad Asghari (Fall 2018, Google), Ying Lu (Spring 2018, Didi),Hien To (Fall 2017, Amazon), Dingxiong Deng (Summer 2017, Facebook), Rose Yu (May 2017, UCSD), Afsin Akdogan (December 2015, Google), Huy Pham (August 2015, Oracle), Bei Pan (May 2014, Microsoft), Ali Khodaei (May 2013, Facebook), Houtan Shirani-Mehr (May 2013, Uber), Leyla Kazemi (Oct 2012, Microsoft), Ugur Demiryurek (Aug 2012, Apple), Ling Hu (July 2012, Google), SongHua Xing (Dec 2011, Oracle), Jeff Khoshgozaran (May 2010, Tilofy), Hyunjin Yoon (September 2009, ETRI), SunHee Yoon (August 2008, LookAllure), Mehrdad Jahangiri (August 2008; Snapchat), Mehdi Sharifzadeh (May 2007; Google), Kiyoung Yang (May 2007; Microsoft), Farnoush Banaei-Kashani (Dec 2006; U. of Colorado, Denver), Jason Chen (May 2005; Surfline Wavetrak), Mohammad R. Kolahdouzan (August 2004; Rubicon Project), Dean Yao (May 2003; Jinfonet Software), Yi-Shin Chen (November 2002; National TsingHua U.), Maytham Safar (September 2000; Kuwait U.), Mohammad Alshayeji (April 99; Kuwait U.), Ali Dashti (April 99; Kuwait U.).
- Post-Doctorate Graduates: Min Young Mun (Samsung), Sanjay Purushotham (Assistant Professor at UMBC), Liyue Fan (Assistant Professor at UNC Charlotte), Han Su (Associate Professor

at the University of Electronic Science and Technology of China), Tobias Emirch (August 2014; Ludwig-Maximilians-Universitt Mnchen), Barak Fishbain (Assistant Professor at the Technion Israel Institute of Technology), Tim Marsh (Summer 2006; now at Queensland College of Art).

Honors/Awards

- ACM SIGSPATIAL 2023 10-Year Impact Award, November 2023.
- National Academy of Inventors **(NAI) Fellow**, 2021.
- Endowed Chair, 2019: Helen N. and Emmett H. Jones Professor of Engineering.
- **IEEE Fellow**, 2014.
- Vietnam Education Foundation U.S. Faculty Scholar 2012-13.
- Vietnam Education Foundation U.S. Faculty Scholar 2011-12.
- Organizer of the National Academy of Engineering "Japan-America Frontiers of Engineering" program, 2011.
- Invited speaker in the National Research Council (of the National Academies) Committee on New Research Directions for the National Geospatial-Intelligence Agency, May 2010.
- ACM Distinguished Scientists award, 2009.
- Participant in the National Academy of Engineering "Frontiers of Engineering" program, 2005.
- Presidential Early Career Award for Scientists and Engineers, **PECASE** Award, 2003.
- NSF CAREER Award, 2002.
- Okawa Foundation Research Grant for Information and Telecommunications, 2001.

Selected Invited Talks

1. October 2023, Privacy-preserving Release of Location Data for Health Applications, USC AI4Health Center, Los Angeles, CA.
2. October 2023, Preserving Privacy in Location Data for Urban Mobility Research. UC Riverside?s Department of Computer Science and Engineering Colloquium Talk, Los Angeles, CA.
3. June 2023, Privacy-Preserving Release of Location Data for Urban Mobility Research. Google?s Sustainable Urban Mobility: Simulation and Optimization Workshop, Mountain View, CA.
4. April 2023, Spatial Data Intelligence & Privacy: Past, Present and Future International Conference on Spatial Data and Intelligence, Beijing, China (remote).
5. December 2022, PREP: Pandemic Risk Evaluation Platform Beyond Contact Tracing for COVID-19, Tokyo University, Tokyo, Japan.
6. November 2022, Basic Science Perspectives on Human-Centered Computing, Keynote Talk, Human-Centric Computing in Ophthalmology forum supported by USC Ginsburg Institute and the Future Vision Forum.
7. October 2022, Location & Privacy: Past, Present and Future – A Spatial Data Perspective, Colloquium Talk, Department of Computer Science, University of Southampton (UK).
8. September 2022, Startups Founded by Database Researchers, VLDB Panel 2022, Sydney, Australia.
9. May 2022, PREP: Pandemic Risk Evaluation Platform Beyond Contact Tracing for COVID-19, Korea University, Seoul, South Korea.

10. October 2021, Location & Privacy: Past, Present and Future – A Spatial Data Perspective, Distinguished Lecture, Department of Electrical and Computer Science, Texas A&M University-Kingsville.
11. May 2021, Location & Privacy: Past, Present and Future – A Spatial Data Perspective, Computational Mobility workshop, part of the Google Algorithms Workshop Series on Markets, Mobility, and the Mind.
12. October 2020, Transportation Data, Applications & Research for Smart Cities, Distinguished Lecture, Department of Electrical and Computer Engineering, Iowa State University, Iowa.
13. November 2019, Transportation Data, Applications & Research for Smart Cities, The 20th KOCSEA Technical Symposium, Atlanta, GA, (Keynote).
14. October 2019, Transportation Data, Applications & Research for Smart Cities, CS Colloquium, Purdue University, West Lafayette, Indiana.
15. September 2019 Enabling Spatial-Visual Search for Geospatial Image Databases, The Fifth IEEE International Conference on Multimedia Big Data (BigMM 2019), Singapore (Keynote).
16. June 2018, Inference of Social Relationships from Location Data, The19th IEEE International Conference on Mobile Data Management, Aalborg, Denmark (Keynote).
17. September 2016, Inference of Social Relationships from Location Data, The 18th Asia Pacific Web Conference, APWEB 2016, Suzhou, China (keynote).
18. July 2016, Privacy-Preserving Inference of Social Relationships from Location Data, The third Privacy Preserving IR Workshop, PIR 2016, Pisa, Italy (keynote).
19. August 2015, Inferring people's social behavior by exploiting their spatiotemporal location data, 14th International Symposium on Algorithms and Data Structures, WADS 2015, Victoria, BC, Canada (keynote).
20. June 2015 Inferring and impacting people's social behavior by exploiting their spatiotemporal location data, Google TechTalk, Mountain View, CA.
21. June 2015 Spatial Indexing and Spatial Crowdsourcing of User-Generated-Video, Australian Database Conference, Melbourne, Australia.

    The second USC-HKUST Joint Conference in Big Data Applications, HKUST, Hong Kong.
22. May 2014, GeoCrowd: Harnessing the power of Crowd for On-Demand Geographical Data Collection, Web and Wireless GIS 2014, Seoul, South Korea (keynote).
23. March 2014, Geo-Immersion: A Data-Centric (Big-Data) Approach towards Situational Awareness, Big Data to Knowledge Workshop, UCLA.
24. December 2013, University Startups: Strong IP Portfolio, Weak Business Models, Business of IP Asia Forum, Hong Kong. Business of IP Asia Forum, Hong Kong Convention and Exhibition Centre, Hong Kong.

    First USC-HKUST Joint Conference in Big Data Applications, HKUST, Hong Kong.
25. September 2013, Geo-Immersion: A data-centric (Big-Data) approach towards situational awareness, Distinguished Seminar, KT Advanced Institute of Technology, Seoul, Korea.
26. August 2013, TransDec: A Big-Data Framework for Decision-Making in Transportation Systems, 13th International Symposium on Spatial and Temporal Databases (SSTD 2013), Munich, Germany, August 2013 (keynote).
27. June 2013, GeoCrowd: Harnessing the Power of Crowd for On-Demand Geographical Data Collection, MobiDE 2013, New York, New York, USA (keynote).
28. April 2013, Traffic Congestion, TransDec, ClearPath, and Time-Dependent A*: A Big-Data Problem, A System Solution, A Product, and an Algorithm, Computer Science and Artificial Intelligence Laboratory (CSAIL), MIT.

29. February 2013, TransDec: A "Big Data" Framework for Decision Making in Transportation Systems, Workshop on Big Data Analytics, National University of Singapore.
30. August 2012, From Real-World Co-occurrences to Social Connections , The Fourth International Conference on Emerging Databases-Technologies, Applications, and Theory (EDB 2012), Seoul, Korea (Keynote).
31. May 2012, TransDec: A Big-Data Framework for Decision-Making in Transportation Systems, Database Seminar Series, UC-San Diego, San Diego, CA.
32. April 2012, TransDec: A Data-Driven Framework for Decision-Making in Transportation Systems, SIAM Data Mining. 1st International Workshop on Analytics for Cyber-physical Systems (ACS-2012), Anaheim, CA (Keynote).
33. March 2012, TransDec: A Big-Data Framework for Decision-Making in Transportation Systems, Computer Science Seminar Series, UC-Irvine, Irvine, CA.
34. September 2011, An Introduction to USC Integrated Media Systems Center (IMSC), Northrop Grumman, Carson, CA.
35. August 2011, An Introduction to USC Integrated Media Systems Center (IMSC), Hanoi University of Science and Technology, Hanoi, Vietnam.
36. June 2011, An Introduction to USC Integrated Media Systems Center (IMSC), University of Tokyo, Tokyo, Japan.
37. June 2011, An Introduction to USC Integrated Media Systems Center (IMSC), Panasonic, Tokyo, Japan.
38. May 2011, An Introduction to USC Integrated Media Systems Center (IMSC), Shanghai Jiao-Tong University, Shanghai, China.
39. August 2010, TransDec: A Data-Driven Framework for Decision-Making in Transportation Systems, Japan's National Institute of Information and Communications Technologies (NICT), Keihanna, Japan.
40. June 2010, TransDec: A Data-Driven Framework for Decision-Making in Transportation Systems, Geoinformatics 2010, Peking University, Beijing, China.
41. May 2010, Participatory Urban Data Collection: Planning and Optimization, Workshop on New Research Directions for NGA, National Research Council of The National Academies, Washington, D.C.
42. May 2010, TransDec: A Data-Driven Framework for Decision-Making in Transportation Systems, University of California, Computer Science Department, Santa Barbara, CA.
43. May 2010, TransDec: A Data-Driven Framework for Decision-Making in Transportation Systems, University of Minnesota, Computer Science Department, Minneapolis, MN.
44. April 2010, TransDec: A Data-Driven Framework for Decision-Making in Transportation Systems, The California University Transportation Centers and The CalTrans Division of Research & Innovation, Sacramento, CA.
45. March 2010, TransDec: A Data-Driven Framework for Decision-Making in Transportation Systems, 6th International Workshop on Databases in Networked Information Systems (DNIS 2010), Aizu-Wakamatsu, Japan.
46. October 2009, Participatory Urban Data Collection: Planning and Optimization, Tsinghua University, Beijing, China.
47. April 2009, GeoRealism: Expanding the human ability to comprehend a larger geo space, University of California, Irvine, CA.
48. Feb 2009, GeoRealism: Expanding the human ability to comprehend a larger geo space, National Reconnaissance Office, Chantilly, VA.
49. October 2007, Geospatial Decision Making and Spatial Skyline Queries, University of Tokyo, Tokyo, Japan.

50. October 2007, Location Privacy in Geospatial Decision Making, 5th International Workshop on Databases in Networked Information Systems (DNIS 2007), Aizu-Wakamatsu, Japan (keynote talk).
51. August 2007, Geospatial Decision Making and Spatial Skyline Queries, National University of Singapore (NUS), Singapore.
52. July 2007, Geospatial Decision Making and Spatial Skyline Queries, Peking University (PKU), Beijing, China.
53. July 2007, Geospatial Decision Making and Spatial Skyline Queries, Chinese Academy of Sciences (CAS), Beijing, China.
54. February 2007, Geospatial Information Extraction and Integration, Lawrence Livermore National Laboratory, Livermore, CA.
55. September 2006, GeoDec: Enabling Geospatial Decision Making, ETRI, Korea.
56. June 2006, GeoDec: Enabling Geospatial Decision Making, Air Force Research Lab (AFRL) - Chief Scientist seminar series, Rome, NY.
57. May 2006, GeoDec: Enabling Geospatial Decision Making, Google, Mountain View, CA.
58. January 2006, GeoDec: Enabling Geospatial Decision Making, UC Irvine, CA.
59. December 2005, GeoDec: Enabling Geospatial Decision Making, Microsoft Research Center, Redmond, WA.
60. August 2005, Wavelets and Web-Services (W2) for Online Scientific Data Analysis, , Lawrence Livermore National Laboratory, Livermore, CA.
61. May 2005, Modelling Peer-to-Peer Data Networks Under Complex System Theory, Seoul National University, Seoul, Korea.
62. March 2005, Modelling Peer-to-Peer Data Networks Under Complex System Theory, 4th International Workshop on Databases in Networked Information Systems (DNIS 2005), Aizu-Wakamatsu, Japan.
63. March 2005, Modelling Peer-to-Peer Data Networks Under Complex System Theory, Department of Computer Science, National Tsing Hua University, HsingChu, Taiwan.
64. February 2005, Geospatial Information Integration, Geotech Event, Vancouver, Canada.
65. January 2005, Applications of the Complex System Theory to Peer-to-Peer Data Networks, UC Riverside Computer Science Dept., Riverside, California.
66. October 2004, Application of the Complex System Theory to Peer-to-peer Data Networks, at Air Force Research Laboratory, Information Directorate, Dayton, Ohio.
67. June 2004, Integration of geospatial and online data for crisis management, at ACM SIGMOD-Databases in Virtual Organizations, Paris, France.
68. May 2004, A Suite of Web-Services for Wavelet-based Analysis of Large Atmospheric Datasets, at Microsoft-Scientific Data Intensive Computing Workshop, Bellevue, Washington.
69. December 2003, A Study of Querical Data Networks as Complex Systems, at Kuwait University, Kuwait.
70. September 2003, Web Information Personalization: Challenges and Approaches, at the 3nd International Workshop on Databases in Networked Information Systems (DNIS 2003), Aizu-Wakamatsu, Japan.
71. March 2003, Wavelets for Efficient Querying of Large Multidimensional Datasets, at the 35th Symposium on the Interface, Salt Lake City, Utah.
72. February 2003, Wavelets for Efficient Querying of Large Multidimensional Datasets, at the 11th Mardi Gras Conference, Baton Rouge, Louisiana.

73. January 2003, Real-Time Pattern Isolation And Recognition Over Immersive Sensor Data Streams, at the 9th International Conference On Multi-Media Modeling, Taiwan.

Services

- **Chair** ACM SIGSPATIAL (July 2017-June 2020).
- **Member of Editorial Board:** ACM Transactions on Spatial Algorithms and Systems, TSAS (2013-present), VLDB Journal (2009-2015), Journal of Spatial Information Science (2009-present), ACM Computers in Entertainment magazine (2004-present), IEEE TKDE (2010-2013), IEEE Transaction on Parallel and Distributed Systems (2005-2009), PVLDB (2008 and 2009), ACM SIGMOD DiSC (2002).
- **Program Committee co-Chair** PVLDB Volume 17 (VLDB2024)
- **Program Committee Associate-Editor** PVLDB Volume 16 (VLDB2023)
- **Program Committee Vice-Chair** IEEE ICDE 2020.
- **Program Committee co-Chair** of the Spatial Gems Workshop at 2019, 2020, 2021 and 2022 ACM SIGSPATIAL Conference.
- **Program Committee co-Chair** of the Joint APWEB and WAIM 2017.
- **Program Committee co-Chair** of the IEEE Mobile Data Management 2016 (MDM 16).
- **Program Committee co-Chair** of the 3rd International Conference on Big Data and Smart Computing 2016 (BigComp'16).
- **Senior PC Member** International Conference on Database Systems for Advanced Applications (DASFAA 2021).
- **Member of the Evaluation Committee** IEEE CS Fellows 2021 and 2022.
- **Sponsorship Chair** of the ACM SIGSPATIAL Conference on Advances in Geographic Information Systems 2015 (ACM SIGSPATIAL GIS'16).
- **Sponsorship Chair** of the ACM SIGSPATIAL Conference on Advances in Geographic Information Systems 2015 (ACM-GIS'15).
- **General co-Chair** of the International Symposium on Spatial and Temporal Databases 2015 (SSTD'15).
- **Program Committee co-Chair** of the 20th International Conference on Database Systems for Advanced Applications 2015 (DASFAA'15).
- **Sponsorship Chair** of the ACM SIGSPATIAL Conference on Advances in Geographic Information Systems 2014 (ACM-GIS'14).
- **Program Committee co-Chair** of the IEEE Mobile Data Management 2013 (MDM'13).
- **Program Committee co-Chair** of the First IEEE International Conference on Big Data 2013.
- **Demonstration Chair** of ACM SIGMOD 2013.
- **Sponsorship Chair** of the ACM SIGSPATIAL Conference on Advances in Geographic Information Systems 2013(ACM SIGSPATIAL GIS 2013).
- **Sponsorship Chair** of the ACM SIGSPATIAL Conference on Advances in Geographic Information Systems 2012 (ACM-GIS'12).
- **Chair** of the first ACM SIGSPATIAL Nomination Committee 2011 (founding committee).
- **Sponsorship Chair** of the ACM SIGSPATIAL Conference on Advances in Geographic Information Systems 2011 (ACM-GIS'11).
- **Sponsorship Chair** of the ACM SIGSPATIAL Conference on Advances in Geographic Information Systems 2010 (ACM-GIS'10).
- **General vice-chair** of the ACM SIGSPATIAL Conference on Advances in Geographic Information Systems 2009 (ACM-GIS'09).
- **General chair** of the ACM Conference on Advances in Geographic Information Systems 2008 (ACM-GIS'08).
- **General co-chair** of the ACM Symposium on Advances in Geographic Information Systems 2007 (ACM-GIS'07).
- **Steering Committee member** of the IEEE Workshop on Networking Meet Databases, 2005-2008.

- **Program chair** of the ACM Symposium on Advances in Geographic Information Systems 2005 (ACM-GIS'05).
- **Founding Program chair** of the IEEE Workshop on Networking Meet Databases (NetDB'05).
- **Founding Program chair** of the ACM Workshop on Web Information and Data Management (WIDM'99).
- **Local Chair:** ACM SIGMETRICS 2002.
- **Committee member** of several conferences, e.g., VLDB, ACM SIGMOD, IEEE ICDE, ACM SIGKDD, IEEE ICDM, ACM GIS, SSTD, ACM Multimedia.
- **Member of the National Science Foundation Expeditions Site Visit panel** in the Division of Information and Intelligent Systems (IIS) in 2014.
- **Member of the National Science Foundation proposal review panel** in the Division of Information and Intelligent Systems (IIS) in 1999, 2003, 2005, 2007, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 and 2022.
- **Member of the National Science Foundation proposal review panel** in the Division of Computer and Network Systems (CNS) in 2004 and 2008.
- **Member of the National Science Foundation proposal review panel** in the CISE Advanced Computational Research program in 2000.

Patents

1. **Throwaway spatial index structure for dynamic point data**; with Afsin Akdogan, and Ugur Demiryurek, Patent No. 9,501,509, United States, November 2016.
2. **Traffic prediction using real-world transportation data**; with Bei Pan, and Ugur Demiryurek, Patent No. 9,286,793, United States, March 2016.
3. **Processing time-based geospatial data**; with Ching-Chien Chen and Craig A. Knoblock, Patent No. 8,953,887, United States, February 2015.
4. **Precisely locating features on geospatial imagery**; with Ching-Chien Chen, Dipsy Kapoor, and Craig A. Knoblock, Patent No. 8,675,995, United States, March 2014.
5. **Systems and methods for linking content to individual image features**; with Craig A. Knoblock, Ching-Chien Chen, and Dipsy Kapoor, Patent No. 8,670,617, United States, March 2014.
6. **Hierarchical and exact fastest path computation in time-dependent spatial networks**, with Ugur Demiryurek, Patent No. 8,660,789, United States, February 2014.
7. **Dynamically linking relevant documents to regions of interest**; with Craig A. Knoblock, Dipsy Kapoor, and Ching-Chien Chen, Patent No. 8,635,228, issued in Jan 2014.
8. **Efficient K-nearest neighbor search in time-dependent spatial networks**; with Ugur Demiryurek and Farnoush Banaei-Kashani, Patent No. 8,566,030, issued in October 2013.
9. **Blind evaluation of nearest neighbor queries wherein locations of users are transformed into a transformed space using a plurality of keys**; with Ali Khoshgozaran, and Houtan Shirani-Mehr, Patent No. 8,099,380, issued in January 2012.
10. **Methods for Fast Progressive Evaluation of Polynomial Range-Sum Queries on Real-time Datacubes**; with Rolfe Schmidt, Patent No. 8,090,730, issued in January 2012.
11. **Continuous Media System**; with Roger Zimmermann, Kun Fu, and Shu-Yuen Didi Yao, Patent No. 7,742,504, issued in June 2010. This technology has been licensed to The Global-Theater Inc. in October 2000 and Prentice Hall in 2002.
12. **System and method for fusing geospatial data**; with Ching-Chien Chen, Craig A. Knoblock, Yao-Yi Chiang, Patent No. 7,660,441, issued on February 2010.

13. **Pseudorandom Data Storage**; with Shu-Yuen Didi Yao and Roger Zimmermann, Patent No. 7,096,328, issued in August 2006.
14. **Multi-Threshold Smoothing**; with Kun Fu and Roger Zimmermann, Patent No. 6,910,079, issued on 06-21-2005.

Industrial Experience

Part-time Visiting Researcher 2020-2020
Google, Mountain View, CA
Geospatial visualization of 3D buildings in time, Kartta Labs.

Chief Scientist and Co-Founder 2014-2019
TallyGo, LLC, NEW YORK, NY 10010
GPS Navigation, path planning, traffic data analysis.
Acquired in March 2019.

Advisor 2013-2018
Tilofy, Marina Del Ray, CA
Spatiotemporal event filtering.

Chief Scientist and Founder 2013-2014
ClearPath, Las Vegas, NV
GPS Navigation, path planning, traffic data analysis.

Scientific Advisor 2012-2013
Terrago Technologies, Manhattan Beach, CA
Geospatial data collection, integration and distribution.

CTO and Founder 2005-2012 **(Acquired)**
Geosemble Technologies, El Segundo, CA
Acquired in July 2012.

Consultant and Member of Advisory Board 2001-2007
TierFleet, Irvine, CA
Advisement in the design and development of a middleware to perform load balancing among several web-accessible database servers.

Consultant and Member of Advisory Board 1999-2005
TelSurf Networks, Los Angeles, CA
Advisement in the design and development of a multimedia database system to store audio clips and generate customized audio packages tailored to user preferences.

Consultant 1996-1998
Procom Technology, Irvine, CA

APPENDIX B

Exhibit	Description
EX1001	U.S. Patent No. 10,671,648
EX1002	U.S. Patent No. 10,671,648 File History
EX1004	U.S. Patent No. 9,501,507 (Harris)
EX1005	U.S. Patent Pub. No. 2009/0132316 (Florance)
EX1006	U.S. Patent No. 8,401,877 (Salvagio)
EX1007	U.S. Patent No. 8,260,775 (Ahn)
EX1008	Samet, H., "Foundations of Multidimensional and Metric Data Structures" (2006)
EX1009	U.S. Pub. No. 2016/0210326 (Tolman)
EX1010	U.S. Patent No. 9,927,941 (Steimle)
EX1011	U.S. Patent Pub. No. 2009/0063424 (Iwamura)
EX1015	Gotlieb, L., "Computing Joins of Relations," SIGMOD '75: Proceedings of the 1975 ACM SIGMOD international conference on Management of data (May 1975)

APPENDIX C

Claim 12	Prior Art
[12.pre]: A system, comprising:	**To the extent the preamble is limiting, Harris discloses or renders obvious the preamble. (Grounds 1-3)**[1] **Harris discloses a system** (*e.g.*, "data analysis system for analyzing data object collections that include geo-temporal data"; "computer systems… for indexing and searching geo-temporal data stored in a data repository")**.** *See, e.g.*, EX1004,[2] Abstract ("**A method and apparatus for a data analysis system for analyzing data object collections**

[1] As discussed in n.3, *infra*, as to claims 9 and 12, Ground 3 relies on Florance to address potential arguments regarding the scope of "integrated centralized property database." *See* EX1001, cls.9.a, 12.a.

[2] While Harris sometimes refers to "an embodiment" or "embodiments" in cataloging features of its disclosed system, POSITA would have understood Harris to disclose a single system or method with multiple optional features. POSITA would thus have at once envisaged Harris's disclosures as a single embodiment. *See also* EX1004, 13:37–41 ("specific details… may vary from implementation to implementation"). Indeed, Harris's disclosures are arranged in groupings of core categories of features present in every implementation: "Data Sources," "Data Repository," "Geo-temporal Data Importation," "Indexing Geospatial Data," "Indexing Geo-temporal Data," "Geo-temporal Search Operations," and hardware and software for carrying out these functions. E.g., EX1004, 2:38-46. As

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00264

explained herein, Harris's disclosures of these core features anticipate or at minimum render obvious the features of the challenged claims. To the extent PO argues Harris somehow discloses multiple distinct embodiments, combining them as disclosed in the limitation-by-limitation mappings herein would certainly have been obvious, advantageous, and straightforward to POSITA, including because Harris expressly states that "[t]he present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository," EX1004, 2:50–52, and that its various disclosures (including these recitations of core feature categories, EX1004, 2:38-46) are directed to "facilitating low latency searches of large and dynamic data sets that include geo-temporal data." EX1004, 2:1–3. This and other combinations proposed in the Grounds are implemented in well-understood, wholly predictable technology (*e.g.*, hardware and software), further underscoring POSITA's reasonable expectation of success for each combination. As '648 itself acknowledges, hardware capable of implementing '648's claims was already known to POSITA. EX1001, 14:46-15:5 (stating its "data aggregation system 614 may be implemented in software, hardware, firmware, or in any combination thereof" with no further limitation or explanation of these generic terms). *See also*, *e.g.*, EX1006, 4:16-5:64 (described system can be implemented on, *e.g.*, "a generic computing device 101"), Figs.1-2;

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00265

Claim 12	Prior Art
	that include geo-temporal data is provided. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are generated based on the specified time granularities. Geo-temporal input data is indexed based on the generated temporal index bucket groups. **The system allows a data analyst to specify geo-temporal queries that include both geospatial component and a temporal component. The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the temporal index bucket groups**."), 2:1-3 ("The present disclosure attempts to address these problems and others, facilitating low latency searches of large and dynamic data that include geo-temporal data."), 2:50-67 ("**The present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository**. Geo-temporal data generally refers to data that includes both a geospatial component and a temporal component. The geospatial component may comprise one or more stored data values indicating a geographic location and the temporal component may comprise one or more values indicating a point in time or range of time. In general terms, in order to more efficiently process requests for geo-temporal data stored in a key-value data repository, a geo-temporal indexing structure is generated and managed in computer memory; for example, indexes may be stored on disk and cached in memory on demand. In an embodiment, the geo-temporal indexing structure is based in

EX1004, 11:47-48 (described system can be implemented on, *e.g.*, computer using "general purpose microprocessor").

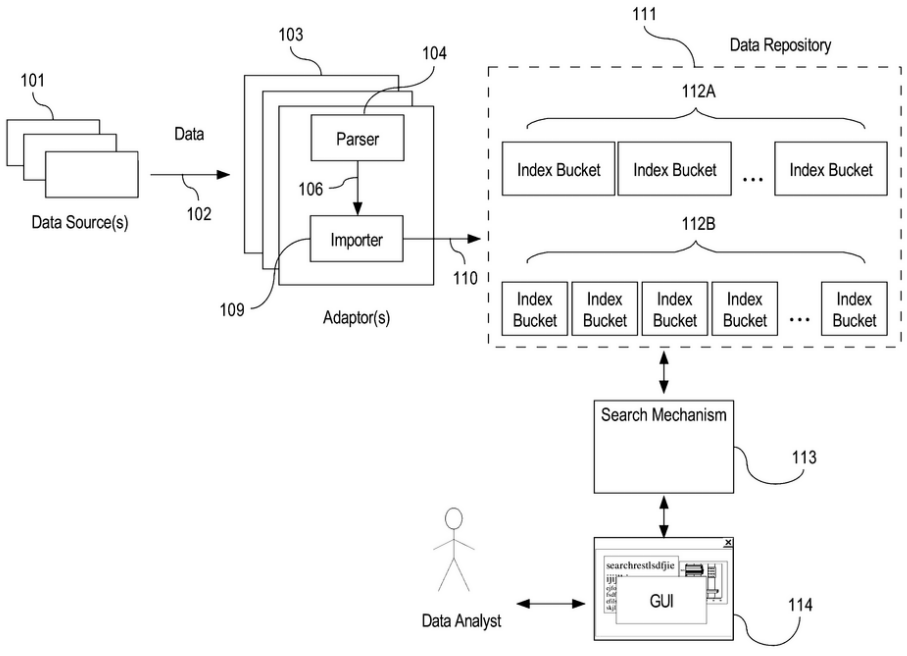
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00266

Claim 12	Prior Art
	part on user input specifying one or more time sets or granularities that are likely to correspond to time ranges specified in user requests for the stored and indexed geo-temporal data."), 4:7-17 ("**FIG. 1 illustrates an example computer system for indexing and searching geo-temporal data.** In an embodiment, an organization or entity may manage one or more data sources **101** that generate data, perhaps continuously or on an ongoing or periodic basis. Any sizeable organization will typically manage multiple data sources **101** that generate a large amount of data. Example data sources **101** include databases, log files, transaction logs, call data records, access logs, netflows, authentication logs, authorization logs, e-mail message spools, and any other container for data."), 4:44-5:24 ("Data sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data. Organizations would appreciate a way to efficiently analyze these collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest**. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, for example, a request for all activities within a single city block within the past five years to all activities within an entire city within the past five hours. One approach for processing a geo-temporal query is to first perform a geographically-focused search for all data objects reflecting activities in the specified geographical area and subsequently filtering the returned geographical results based on the specified temporal range. However, processing queries in this manner often may result in filtering of the majority of the geographically-focused search results because the vast majority of the results may fall outside of the temporal range specified in

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00267

Claim 12	Prior Art
	a query. For example, if a large volume of crime report data is recorded for a particular geographic area over a period of many years and a user subsequently submits a query for crime reports in the particular geographic area for the past day, the majority of data returned by a geographically-focused search will be filtered out in order to refine the results to the specified temporal range. **Referring again to FIG. 1, in an embodiment a data processing system comprises a data repository 111, one or more adaptors 103, and a search mechanism 113 with an interface 114.** The data repository 111, the adaptors(s) 103, the search mechanism 113, and the interface 114 may be interconnected to one another using any suitable data communication mechanism such as, for example, one or more data networks. The one or more data networks may include one or more local area networks (LANs), one or more wide area networks (WANs), or internetworks such as the public Internet. **The components of the system may be distributed across one or more computer systems such as the computer system 500 of FIG. 5, which is further described herein.** When distributed across multiple computer systems, components may additionally be distributed geographically, for example, across one or more data centers. "), 10:24-48 ("FIG. 4 illustrates a flow diagram of a process for carrying out a geo-temporal query in accordance with one or more of embodiments described herein. In an embodiment, **a search query is received (block 400) that includes both a geospatial component and a temporal component**. In response to receiving a query, one or more second queries are generated (block 402), with each of the second queries corresponding to a particular temporal index bucket of a temporal index bucket group. In an embodiment, the temporal index buckets are selected to correspond to the temporal component of the query. For example, assume that particular geo-temporal data has been indexed into a first temporal index bucket group based on a time granularity of years and a second temporal index bucket group based on a time granularity of days. If a geo-temporal query is received that specifies a

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00268

Claim 12	Prior Art
	temporal range of Jan. 1, 2011 to Jan. 2, 2012, the system may transform the geo-temporal query into a second query against the bucket corresponding to the data year 2011 and two additional second queries corresponding to the days of Jan. 1, 2012 and Jan. 2, 2012. In response to each of the second queries, zero or more results are returned from each of the particular temporal index buckets (block 404). **The results returned from each of the temporal index buckets are those results that satisfy the geospatial component of the query**."), cl.8 ("**A non-transitory computer-readable medium storing one or more sequences of instructions, which when executed by one or more processors, cause the one or more processors to carry out the steps of:**…."), Fig. 1. FIG. 1 
[12.a]: an integrated centralized property	**Harris discloses or renders obvious this limitation. (Grounds 1-2, 4)**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00269

Claim 12	Prior Art
database[3] stored on	**Harris discloses an integrated centralized property database** (*e.g.*, "geo-temporal data may be obtained from

[3] '648 confirms "an integrated centralized property database" includes, *e.g.*, "a full time history associated with ***any given point on earth***. In ***some embodiments***, this point ***may be identified by latitude and longitude coordinates***" (EX1001, 48-53), and "the integrated centralized property database may store a variety of information of all types ***which is related to one or more geographic points on the earth***." EX1001, 2:6-8, 2:57-60 ("stored data may include at least one of… building code data… [and] crime data"). '648 contrasts the "drawbacks" of collecting data based on, *e.g.*, "parcels, lots, townships, cities, ZIP Codes," etc., explaining "[t]hese identifiers may have changed over time such that they represent different points on the earth at different time." EX1001, 1:29-34. '648's claims do not require the storage of any particular type of data, instead specifying only "data items associated with one or more geographic location identifiers ***indicating a particular geographic point on earth***." *E.g.*, EX1001, cl.12. '648's "integrated centralized ***property*** database" thus does not require storage of "property" information and does not require its stored information to be linked to a particular "property," instead simply requiring that stored data be linked to, *e.g.*, a "a particular geographic point on earth." As discussed herein, Harris expressly

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00270

Claim 12	Prior Art
computer-readable storage media, the integrated	potentially multiple disparate data sources and… is received and indexed in a data repository"; "data repository 111 may operate on one or more computing nodes of a cluster of computing nodes"; "a data processing system comprises a data

discloses an "integrated centralized property database," because Harris discloses, *inter alia*, storing in its data repository geographic location identifiers indicating a particular point on earth (*e.g.*, "one or more numerical values specifying a longitude and latitude," EX1004, 5:65-6:2). Harris thus expressly discloses this limitation. Additionally, to the extent it is argued that storage of "property" information or information linked to a specific "property" is required, Harris expressly discloses this limitation because it discloses storing, *e.g.*, "stored data objects pertaining to a particular geographic area around ***the user's home***," EX1004, 9:56-61, and data indicating "using a key card to gain access to a ***building***," EX1004, 4:21-25; *see* EX1001, 3:57-61 ("aggregated information may be related to parcels and ***buildings associated with that [geographic] point***… [and] ***buildings on that point***"), and Harris expressly discloses that such data would have been associated with a particular geographic point on earth. EX1004, 4:27-30 (identifying such data as "[g]eo-temporal data… that may reflect activities… that include both a geospatial component and a temporal component."). In addition, as discussed herein, Florance expressly discloses the use of "property information," and thus Harris in view of Florance also renders obvious this limitation.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00271

Claim 12	Prior Art
centralized property database including a plurality of data items, each of the plurality of data items being associated with one or more geographic location identifiers indicating a particular geographic point on earth, and at least a portion of the plurality of data items further being associated with one or more time identifiers including one or more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth;	repository 111"; "database" that "store[s]" "geo-temporal data"; "data stored in data repository… may be stored as key-value pairs") **stored on computer-readable storage media** (*e.g.*, "indexes may be stored on disk and cached in memory on demand"; "storage media… that store data"; Fig.5 ("computer system" upon which system "implemented," including storage media including, *e.g.*, "Main Memory" 506, "Storage Device" 510))**, the integrated centralized property database including a plurality of data items** (*e.g.*, multiple items of geo-temporal data "associated with a geospatial component and a temporal component" (such as "crime reports received within a particular city," "cell phone call records," or "data objects pertaining to a particular geographical area around the user's home") are received, "stored in a data repository," and "indexed"; system "facilitat[es]… searches of large and dynamic data sets that include geo-temporal data," "receiving" or "retrieving input data… from a source" and "consum[ing that] input data… and stor[ing] the data in the data repository"; Fig.1 (data from "Data Source(s)" 101 stored in "Data Repository" 111))**, each of the plurality of data items being associated with one or more geographic location identifiers indicating a particular geographic point on earth** (*e.g.*, "cell phone call records… each associated with data values reflecting a particular geographic location"; "numeric values representing a longitude and latitude corresponding to a geographic location"; the "geo-temporal data… includes… a geospatial component"; "data that includes one or more values representing a geospatial component"; "geo-temporal input data is received that is associated with a geospatial component," such as "crime reports received within a particular city… includ[ing] values representing a longitude and latitude corresponding to the geographical location of the incident")**, and at least a portion of the plurality of data items further being associated with one or more time identifiers including one or more time or time periods indicative of a time history of an associated data item regarding the associated geographic point on earth** (*e.g.*, the "geo-temporal data… includes both a geospatial component and a temporal component"; "data that includes one or more values representing a geospatial

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00272

Claim 12	Prior Art
	component and one or more values representing a temporal component"; "geo-temporal input data is received that is associated with a geospatial component and a temporal component" such as "a time value indicating an approximate time the incident in the crime reported occurred"; "geospatial component may comprise one or more stored data values indicating a geographic location and the temporal component may comprise one or more values indicating a point in time or range of time"; "data objects associated with particular geographic regions and that are associated with temporal components with particular year time spans and/or particular hour time spans"; "all activities within a single city block within the past five years to all activities within an entire city within the past five hours")**.** *See, e.g.*, EX1004, Abstract ("A method and apparatus for a data analysis system for **analyzing data object collections that include geo-temporal data** is provided. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are generated based on the specified time granularities. **Geo-temporal input data is indexed based on the generated temporal index bucket groups. The system allows a data analyst to specify geo-temporal queries that include both geospatial component and a temporal component**. The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the temporal index bucket groups."), 1:6-8 ("The present disclosure generally relates to computer based analysis of **geospatial data that includes a temporal component**."), 1:13-20 ("**Data analysts and other computer users often interact with and request data from computer-based databases containing large collections of data objects.** The data object collections may be generated and collected by

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00273

Claim 12	Prior Art
	various corporations, businesses, governmental agencies, and other organizations and often represent huge amounts of data. For example, the data may include DNS traffic logs, transaction logs of banks, call data records, or any other potentially high-volume data."), 1:21-37 ("**One particular type of data that such organizations may often collect and analyze is geospatial data. Geospatial data generally represents any data that includes a geographical component and that associates the data with particular geographic locations or areas.** For example, a crime enforcement agency may track data that corresponds to crime reports received within a particular city. **One item of information stored in association with each crime report may include a geographical component indicating a location of the incident specified by the crime report. An example data object representing each crime report may include values representing a longitude and latitude corresponding to the geographical location of the incident.** A data analyst with access to such data may then specify geospatial search requests such as, for example, a search request for crime reports associated with incidents within a specified geographical radius or within a four block perimeter."), 1:38-50 ("**Organizations also frequently collect data that includes a temporal component**. A temporal component generally refers to one or more data values that indicate a particular point in time, such as a date and/or time of day, or a range of time. **For example, in reference to the example crime report information, a crime enforcement agency may store in association with each crime report a time value indicating an approximate time the incident in the crime report occurred**. **In the example, by storing the temporal information, data analysts may specify requests for data objects associated with a particular time range of interest, for example, all crime reports associated with an incident that occurred within the past three months**."),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00274

Claim 12	Prior Art
	2:1-3 ("The present disclosure attempts to address these problems and others, facilitating low latency searches of **large and dynamic data sets that include geo-temporal data**."), 2:24-25 ("computer system upon which… [system] may be implemented"), 2:50-67 ("The present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository. **Geo-temporal data generally refers to data that includes both a geospatial component and a temporal component. The geospatial component may comprise one or more stored data values indicating a geographic location and the temporal component may comprise one or more values indicating a point in time or range of time.** In general terms, in order to more efficiently process requests for geo-temporal data stored in a key-value data repository, a geo-temporal indexing structure is generated and managed in computer memory; for example, indexes may be stored on disk and cached in memory on demand. In an embodiment, the geo-temporal indexing structure is based in part on user input specifying one or more time sets or granularities that are likely to correspond to time ranges specified in user requests for the stored and indexed geo-temporal data."), 3:1-11 ("**The geo-temporal data may be obtained from potentially multiple disparate data sources and examples of geo-temporal data include, but are not limited to, network traffic logs, bank transaction records, phone call records, crime data, or any other data that includes both a geospatial and temporal component**. **In an embodiment, the geo-temporal data is received and indexed in a data repository based on a geospatial component of the data.** In an embodiment, the indexing of the geo-temporal data based on the geospatial component may be based on Z-order curves, Hilbert curves, or any other geospatial indexing technique."),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00275

Claim 12	Prior Art
	4:7-17 ("FIG. 1 illustrates an example computer system for indexing and searching geo-temporal data. **In an embodiment, an organization or entity may manage one or more data sources 101 that generate data, perhaps continuously or on an ongoing or periodic basis. Any sizeable organization will typically manage multiple data sources 101 that generate a large amount of data. Example data sources 101 include databases, log files, transaction logs, call data records, access logs, netflows, authentication logs, authorization logs, e-mail message spools, and any other container for data**."), 4:19-33 ("Data generated by data sources 101 includes, but is not limited to, any data that reflects an activity of an individual person or organization. The activity may be an online activity, such as, for example, accessing a website, sending or receiving an e-mail, or making an online payment with a credit card or an offline activity such as, for example, using a key card to gain access to a building. **Data generated by data sources 101 also includes, but is not limited to, geo-temporal data. Geo-temporal data is data that may reflect activities such as those identified above and other activities that include both a geospatial component and a temporal component**. **For example, geo-temporal data may reflect cell phone call records that are each associated with data values reflecting a particular geographic location of the cell phone and a particular time that the call was made or received**."), 4:34-43 ("**[D]ata generated by data sources 101 adheres to some sort of data structure or data format**. For example, **data stored in a database may adhere to a relational database structure or related schema**. As another example, data in a log file, including geo-temporal data, may be formatted in eXtensible Markup Language (XML), Keyhole Markup Language (KML), or in plain-text (e.g., ASCII) with whitespace characters (e.g., tab, space, and newline characters) providing structure, or generally any other machine-parseable character based format."),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00276

Claim 12	Prior Art
	4:44-59 ("**Data sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data**. Organizations would appreciate a way to efficiently analyze these collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest**. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, **for example, a request for all activities within a single city block within the past five years to all activities within an entire city within the past five hours**."), 4:60-5:8 ("One approach for processing a geo-temporal query is to first perform a geographically-focused search for all data objects reflecting activities in the specified geographical area and subsequently filtering the returned geographical results based on the specified temporal range. However, processing queries in this manner often may result in filtering of the majority of the geographically-focused search results because the vast majority of the results may fall outside of the temporal range specified in a query. **For example, if a large volume of crime report data is recorded for a particular geographic area over a period of many years and a user subsequently submits a query for crime reports in the particular geographic area for the past day**, the majority of data returned by a geographically-focused search will be filtered out in order to refine the results to the specified temporal range."), 5:9-24 ("Referring again to FIG. 1, **in an embodiment a data processing system comprises a data repository 111, one or more adaptors 103, and a search mechanism 113 with an interface 114.** The data repository 111, the adaptors(s) 103, the search mechanism 113, and the interface 114 may be interconnected to one another using any suitable data

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00277

Claim 12	Prior Art
	communication mechanism such as, for example, one or more data networks. The one or more data networks may include one or more local area networks (LANs), one or more wide area networks (WANs), or internetworks such as the public Internet. The components of the system may be distributed across one or more computer systems such as the computer system 500 of FIG. 5, which is further described herein. When distributed across multiple computer systems, components may additionally be distributed geographically, for example, across one or more data centers."), 5:26-35 ("**The data repository 111 may operate on one or more computing nodes of a cluster of computing nodes.** The computing nodes may be interconnected via a communication bus such as one or more local area data networks, one or more wide area data networks, the Internet, or other suitable data network or communication mechanism. In an embodiment, data stored in data repository 111 may be stored as key-value pairs. In an embodiment, in order to handle large data sets, the stored key-value pairs may be distributed across the computing nodes of the cluster."), 5:51-58 ("**The adaptor(s) 103 are configured to consume input data 102 and store the data in the data repository 111**. There may be an adaptor 103 for each type of data source 101. For example, there may be an adaptor for ingesting input data 102 produced by a database system data source 101 and another adaptor 103 for a web access log data source 101. In an embodiment, at least one adaptor 103 is configured to ingest geo-temporal data from a data source 101."), 5:59-6:6 ("In this context, the term "input data" refers to data that is presented as input to the system. That is, data that is obtained by an adaptor 103 from a data source 101 for processing and possible input into the data repository 111. **The term 'geo-temporal data' refers to any input data that includes one or more values representing a geospatial component and one or more values representing a temporal component. For example, values representing a geospatial**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00278

Claim 12	Prior Art
	component may include one or more numerical values specifying a longitude and latitude or any other representation of a geographical location. A temporal component includes one or more values specifying one or more points in time and may be specified, for example, by a character string or numerical value representing a midnight Coordinated Universal Time (UTC) value or any other representation of time values."), 6:7-10 ("An adaptor 103 may obtain input data 102 through any number of means including receiving input data 102 from a data source or **retrieving input data 102 from a data source 101**."), 7:32-36 ("The one-dimensional representation may be a single numeric value and the multidimensional data representation may be **numeric values representing a longitude and latitude corresponding to a geographic location**."), 7:47-59 ("Similar to the specification of particular input data 102 as geospatially searchable, in an embodiment, input data 102 may include geo-temporal data that is specified as geo-temporally searchable. FIG. 3 is a flow diagram of a process for indexing geo-temporal data in accordance with one or more embodiments described herein. **Initially, geo-temporal input data is received that is associated with a geospatial component and a temporal component (block 300).** The geo-temporal input data is indexed in a geospatial index based on the geospatial component (block 302). For example, the geo-temporal data may be indexed in data repository 111 according to a geospatial indexing technique such as the techniques described above."), 7:60-8:8 ("In an embodiment, temporal index configuration data is received specifying one or more time granularities (e.g., years, months, days, hours, etc.) (block 304). **In an embodiment, the temporal index configuration data may be specified by a user involved in the importation of input data 102 by using, for example, interface 114. In other embodiments, the particular time granularities may be**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00279

Claim 12	Prior Art
	specified as part of a data import configuration file or other user input mechanisms. In an embodiment, the particular time granularities may be specified before, during, or after the input data 102 is imported into data repository 111. For example, geo-temporal data that has previously been geospatially indexed may be re-indexed based on a temporal component, or geo-temporal data of input data 102 may be contemporaneously geospatially and temporally indexed at the time of data importation."), 8:9-35 ("In an embodiment, based on the received temporal index configuration data, an index bucket group is generated for each time granularity specified in the temporal index configuration data (block 306). In an embodiment, the generation of a temporal index bucket group includes storing a copy of the geospatial index data in one or more temporal index buckets. Each particular temporal index bucket in a temporal index bucket group represents a particular range of time spanning an amount of time equal to the time granularity of the temporal index bucket group. In an embodiment, each temporal index bucket group stores a copy of the geospatial index data, with each index entry of the geospatial index stored in a particular temporal index bucket. The particular temporal index bucket storing each geospatial index entry is the temporal index bucket that is associated with a time range that includes the value specified by the temporal component of the data object referenced by the geospatial index entry. For example, if a temporal index bucket group is generated for a time granularity of years, and a particular data object of input data 102 includes a temporal component specifying a time value that falls within the year 2010, the geospatial index entry for that data object may be stored in a temporal index bucket representing the year 2010 in the year granularity temporal index bucket group. In an embodiment, each temporal index bucket is stored in data repository 111 and represented by a row key in the distributed key-value data repository."), 8:36-57 ("**In general, the user-specified time granularities correspond to time granularities that are expected by the**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00280

Claim 12	Prior Art
	user or others to be specified in geo-temporal queries against the data as stored in data repository 111. For example, an analyst involved in the importation of geo-temporal data may be aware that users often desire to search for **data objects associated with particular geographic regions and that are associated with temporal components within particular year time spans and/or particular hour time spans**. **In the example, an analyst involved in the importation of data may specify temporal index configuration data indicating two time granularities for the geo-temporal input data: a year time granularity and an hour time granularity**. For example, temporal index bucket group 112A in FIG. 1 may correspond to the index bucket group for the year time granularity and temporal index bucket group 112B may correspond to the index bucket group for the hour granularity. In the example, generated temporal index buckets of temporal index bucket group 112A may represent particular year timespans (e.g., 1978, 2002, 2009, 2012) and generated temporal index buckets of temporal index bucket group 112B may represent particular day timespans (e.g., Mar. 15, 1978; Jan. 10, 2009).”), 8:58-9:4 (“In an embodiment, based on the temporal component of the input data, an indexed reference to the input data is stored in a particular temporal index bucket of each generated temporal index bucket group (block 308). In an embodiment, if a temporal index bucket in a particular temporal index bucket group does not yet exist for the temporal value specified by the input data, a new temporal index bucket is generated for the temporal index bucket group. In reference to the example temporal index bucket groups 112A and 11B, if input data is received specifying a temporal component value corresponding to the date Jan. 10, 2009 and no temporal bucket exists in day granularity temporal index bucket group 112B corresponding to January 10, a new temporal index bucket is generated.”), 12:12-27 (“Computer system 500 may implement the techniques described herein using customized hard-wired logic, one or more ASICs or FPGAs, firmware and/or program

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00281

Claim 12	Prior Art
	logic which in combination with the computer system causes or programs computer system 500 to be a special-purpose machine. **According to one embodiment, the techniques herein are performed by computer system 500 in response to processor 504 executing one or more sequences of one or more instructions contained in main memory 506. Such instructions may be read into main memory 506 from another storage medium, such as storage device 510.** Execution of the sequences of instructions contained in main memory 506 causes processor 504 to perform the process steps described herein. In alternative embodiments, hard-wired circuitry may be used in place of or in combination with software instructions."), 12:28-41 ("**The term "storage media" as used herein refers to any non-transitory media that store data and/or instructions that cause a machine to operate in a specific fashion.** Such storage media may comprise non-volatile media and/or volatile media. Non-volatile media includes, for example, optical disks, magnetic disks, or solid-state drives, such as storage device 510. Volatile media includes dynamic memory, such as main memory 506. Common forms of storage media include, for example, a floppy disk, a flexible disk, hard disk, solid-state drive, magnetic tape, or any other magnetic data storage medium, a CD-ROM, any other optical data storage medium, any physical medium with patterns of holes, a RAM, a PROM, and EPROM, a FLASH-EPROM, NVRAM, any other memory chip or cartridge."), Fig.1 ("Data Source(s)" 101 and "Importer" 109; "Data Repository" 111):

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00282

Claim 12	Prior Art

FIG. 1

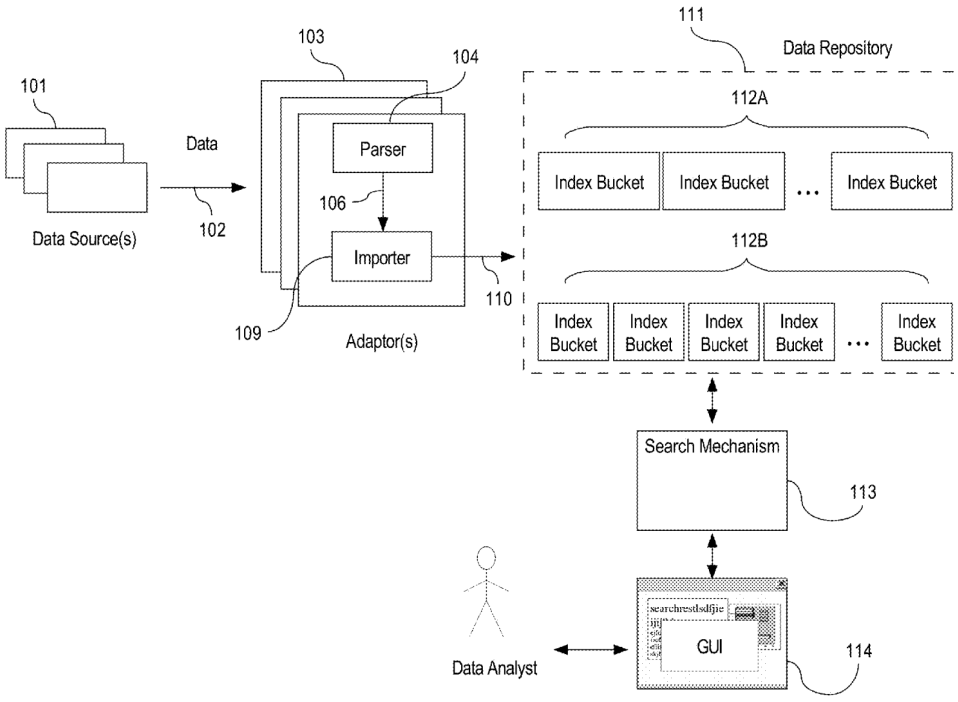


Fig.3:

FIG. 3

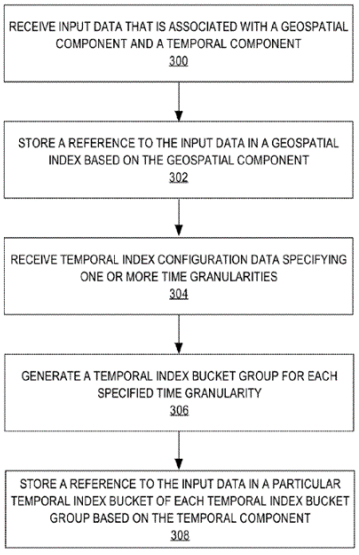
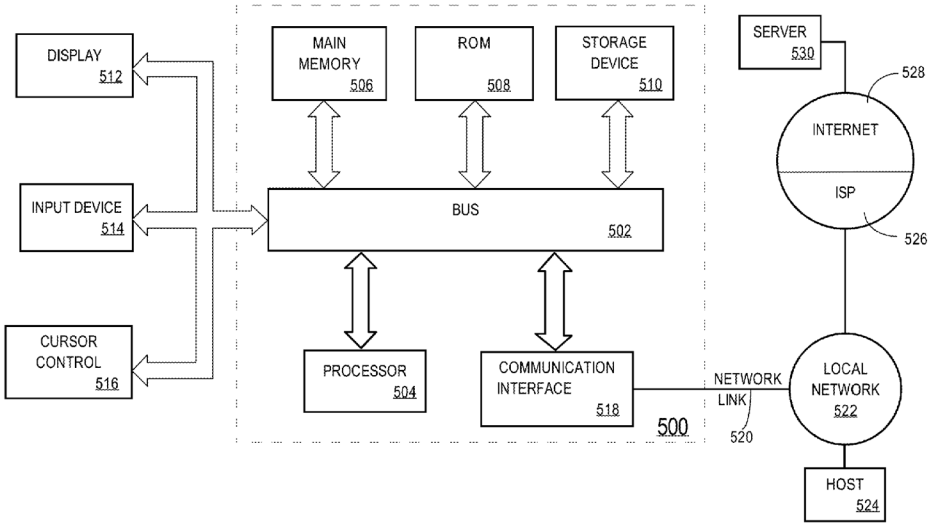


Fig. 5 (*e.g.*, storage media such as "Main Memory" 506, "Storage Device" 510):

Claim 12	Prior Art
	FIG. 5  **Harris in view of Florance also renders obvious this limitation based on the same Harris disclosures above in combination with the Florance disclosures below, including in particular Florance's disclosures of storing "property information" in a database (on which I rely for Ground 3).** **Florance discloses storing property information** (*e.g.*, "property information," "property within a geographical area, "properties for which the database has information") in a "central real estate database." EX1005, ¶85 ("The system of the present invention also provides a unique method for ***searching for property within a geographical area using a map linked to a database that stores geographically pertinent information***. As an example, the map includes icons showing the locations of ***properties for which the database has information***. As a user drags a mouse pointer over an icon, a window pops-up displaying the geographically pertinent information from the database. For example, the information in the window could include a photograph of the property along with its sales price."),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00284

Claim 12	Prior Art
	¶101 ("The data stored in the databases of the present invention is from various sources. For example, ***property information*** can be obtained by researching information sold and information available. Tenant information can be obtained through personal inspection of properties and from brokers. Market analytics are obtained through an historical analysis. In addition, tax assessment information provides yet another source of information."), ¶103, ("The coordinated research of this embodiment demonstrates the value of having a ***fully integrated database***, which, in this instance, relates to commercial real estate. Another advantage afforded by a ***comprehensive integrated commercial real estate database*** is the ability to link comparable sales records to current lists of tenants in ***particular buildings***."), ¶150, ("In an aspect of this embodiment of the present invention, the ***real estate data includes property information and tenant information, and the unified group of correlated databases includes a property information database*** and a tenant information database. Optionally, the real estate data further includes ***comparable property information***, assessment information, and market analytics information, and the unified group of correlated databases further includes a comparable property information database, an assessment information database, and a market analytics information database."), ¶165 ("In another aspect of this embodiment of the present invention, data mining applications include at least one of a ***property information database***, a tenant information database, an assessment information database, a comparable property information database, and a market analytics information database."). POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's integrated centralized database—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00285

Claim 12	Prior Art
	and temporal components (*e.g.*, EX1004, 4:7-33, Fig.1)—using, as one data source, Florance's teachings of property information (which Florance also stores in a database). POSITA would have recognized that using Florance's disclosed property information in Harris's database would have advantageously added another useful type of data to Harris's existing integrated centralized database, thus increasing its usefulness to users performing geo-temporal searches as Harris expressly discloses—including to associate information regarding a particular point or points on earth with particular properties in the centralized database. Indeed, as Harris expressly discloses, "[o]rganizations would appreciate a way to efficiently analyze collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry." EX1004, 4:46-49. For example, Florance itself teaches "the value of having a ***fully integrated database***, which… relates to commercial real estate," EX1005, ¶103, and a database user who "***search[es] for property within a geographical area using a map linked to a database that stores geographically pertinent information***," EX1005, ¶85. For POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosures that its system uses multiple different types of geo-temporal data, *e.g.*, EX1004, 5:50-65 and Florance's express disclosures that its property information is stored in a database with both geo-spatial and temporal components and accessible based on, *e.g.*, location data, *e.g.*, EX1005, ¶¶85, 103, 150) clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.[4]

[4] This and other combinations proposed in the Grounds are implemented in well-understood, wholly predictable technology (*e.g.*, hardware and software), further underscoring POSITA's reasonable expectation of success for each combination. As '648 itself acknowledges, hardware capable of implementing '648's claims was

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00286

Claim 12	Prior Art
[12.b]: at least one computer processor communicatively coupled with the integrated centralized property database, the at least one computer processor configured to:	**Harris discloses or renders obvious this limitation. (Grounds 1-3)** **Harris discloses at least one computer processor communicatively coupled with the integrated centralized property database** (*see* cl.12.a)**, the at least one computer processor** (*e.g.*, "techniques herein are performed by computer system 500 in response to processor 504 executing one or more sequences of one or more instructions contained in main memory 506"; "processor… perform[s] the process steps"; "processor"; "hardware processor… coupled with bus… for processing information"; "techniques described herein are implemented by one or more special-purpose computing devices" including "one or more general purpose hardware processors programmed to perform the techniques pursuant to program instructions"; "data repository… may operate on one or more computing nodes"; "components of the system" including "data repository" (*e.g.* Fig. 1), "may be distributed across one or more computer systems such as the computer system 500 of Fig. 5" which "includes a bus… or other communication mechanism for communicating information, and a hardware processor… coupled with [the] bus… for processing information," and "main memory… or other

already known to POSITA. EX1001, 14:46-15:5 (stating its "data aggregation system 614 may be implemented in software, hardware, firmware, or in any combination thereof" with no further limitation or explanation of these generic terms). *See also*, *e.g.*, EX1006, 4:16-5:64 (described system can be implemented on, *e.g.*, "a generic computing device 101"), Figs.1-2; EX1004, 11:47-48 (described system can be implemented on, *e.g.*, computer using "general purpose microprocessor").

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00287

Claim 12	Prior Art
	dynamic storage device, coupled to [the] bus… for storing information and instructions to be executed by [the] processor"; Fig.5 (including "PROCESSOR" 504 communicating with storage media (*e.g.*, "Main Memory" 506, "Storage Device" 510) via "Bus" 502); "processors… carry out the steps")**.** *See, e.g.*, EX1004, 5:9-24 ("Referring again to FIG. 1, in an embodiment a data processing system comprises a data repository 111, one or more adaptors 103, and a search mechanism 113 with an interface 114. **The data repository 111, the adaptors(s) 103, the search mechanism 113, and the interface 114 may be interconnected to one another using any suitable data communication mechanism such as, for example, one or more data networks. The one or more data networks may include one or more local area networks (LANs), one or more wide area networks (WANs), or internetworks such as the public Internet.** The components of the system may be distributed across one or more computer systems such as the computer system 500 of FIG. 5, which is further described herein. When distributed across multiple computer systems, components may additionally be distributed geographically, for example, across one or more data centers."), 5:26-35 ("**The data repository 111 may operate on one or more computing nodes of a cluster of computing nodes. The computing nodes may be interconnected via a communication bus such as one or more local area data networks, one or more wide area data networks, the Internet, or other suitable data network or communication mechanism.** In an embodiment, data stored in data repository 111 may be stored as key-value pairs. In an embodiment, in order to handle large data sets, the stored key-value pairs may be distributed across the computing nodes of the cluster."), 5:36-49 ("In some embodiments, the data repository 111 is implemented using the Apache Cassandra distributed database management system. Apache Cassandra is an open source software project maintained by the Apache Software Foundation and currently available online at the Internet domain

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00288

Claim 12	Prior Art
	cassandra.apache.org. In other embodiments, the data repository 111 is implemented using the Apache HBase distributed database management system. Apache HBase is open source software maintained by the Apache Software Foundation and currently available online at the Internet domain hbase.apache.org. However, other distributed key-value data store systems may be used for the data repository 111 and the present embodiments are not limited to only the Apache Cassandra or the Apache HBase system."), 11:24-48 ("**According to one embodiment, the techniques described herein are implemented by one or more special-purpose computing devices**. The special-purpose computing devices may be hard-wired to perform the techniques, or may include digital electronic devices such as one or more application-specific integrated circuits (ASICs) or field programmable gate arrays (FPGAs) that are persistently programmed to perform the techniques, or may include one or more **general purpose hardware processors programmed to perform the techniques pursuant to program instructions in firmware, memory, other storage, or a combination**. Such special-purpose computing devices may also combine custom hard-wired logic, ASICs, or FPGAs with custom programming to accomplish the techniques. The special-purpose computing devices may be desktop computer systems, portable computer systems, handheld devices, networking devices or any other device that incorporates hard-wired and/or program logic to implement the techniques. For example, FIG. 5 is a block diagram that illustrates a computer system 500 upon which an embodiment may be implemented. **Computer system 500 includes a bus 502 or other communication mechanism for communicating information, and a hardware processor 504 coupled with bus 502 for processing information. Hardware processor 504 may be, for example, a general purpose microprocessor. Computer system 500 also includes a main memory 506, such as a random access memory (RAM) or other dynamic storage device, coupled to bus 502 for storing information and instructions to be executed by processor 504. Main**

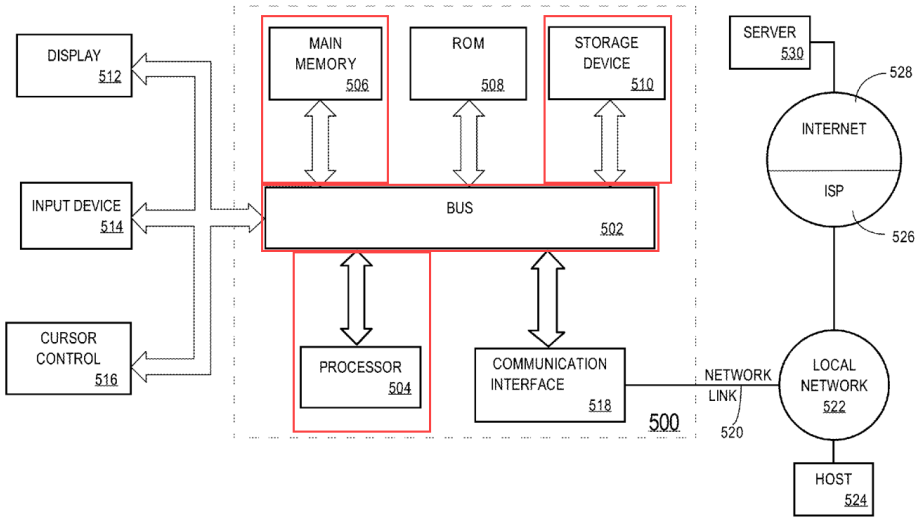
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00289

Claim 12	Prior Art
	memory 506 also may be used for storing temporary variables or other intermediate information during execution of instructions to be executed by processor 504. Such instructions, when stored in non-transitory storage media accessible to processor 504, render computer system 500 into a special-purpose machine that is customized to perform the operations specified in the instructions. Computer system 500 further includes a read only memory (ROM) 508 or other static storage device coupled to bus 502 for storing static information and instructions for processor 504. A storage device 510, such as a magnetic disk, optical disk, or solid-state drive is provided and coupled to bus 502 for storing information and instructions."), 12:12-27 ("Computer system 500 may implement the techniques described herein using customized hard-wired logic, one or more ASICs or FPGAs, firmware and/or program logic which in combination with the computer system causes or programs computer system 500 to be a special-purpose machine. **According to one embodiment, the techniques herein are performed by computer system 500 in response to processor 504 executing one or more sequences of one or more instructions contained in main memory 506. Such instructions may be read into main memory 506 from another storage medium, such as storage device 510. Execution of the sequences of instructions contained in main memory 506 causes processor 504 to perform the process steps described herein.** In alternative embodiments, hard-wired circuitry may be used in place of or in combination with software instructions."), 12:50-65 ("**Various forms of media may be involved in carrying one or more sequences of one or more instructions to processor 504 for execution.** For example, the instructions may initially be carried on a magnetic disk or solid-state drive of a remote computer. The remote computer can load the instructions into its dynamic memory and send the instructions over a telephone line using a modem. A modem local to computer system 500 can receive the data on the

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00290

Claim 12	Prior Art
	telephone line and use an infra-red transmitter to convert the data to an infra-red signal. An infra-red detector can receive the data carried in the infra-red signal and appropriate circuitry can place the data on bus 502. **Bus 502 carries the data to main memory 506, from which processor 504 retrieves and executes the instructions. The instructions received by main memory 506 may optionally be stored on storage device 510 either before or after execution by processor 504.**"), 13:28-36 ("**Computer system 500 can send messages and receive data, including program code, through the network(s), network link 520 and communication interface 518. In the Internet example, a server 530 might transmit a requested code for an application program through Internet 528, ISP 526, local network 522 and communication interface 518. The received code may be executed by processor 504 as it is received, and/or stored in storage device 510, or other non-volatile storage for later execution.**"), cl.8 ("processors to carry out the steps"), Fig.5.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00291

Claim 12	Prior Art
	FIG. 5 
[12.c]: receive, from a user computer system, a query of a geographic location[5] and time information indicative of the time history of an associated	**Harris discloses or renders obvious this limitation. (Grounds 1-3)** **Harris discloses the processor** (*see* cl.12.b) **receiving, from a user computer system** (*e.g.*, "processors" "receiv[e]… search query" from "interface"; "search mechanism" and "data repository" "receiv[e] a query" from "interface"; "a search query is received"; "user interface… represents one way to receive input from a user to specify a geo-temporal query"; "graphical user interface… that enables a user to specify a set of search parameters"; "interface components that enable a user

[5] '648 independent claim 1 requires "a query regarding a geographic location" and independent claim 9 requires "a query including a geographic location identifier" both of which are included in the scope of cl.12.c.'s "query of a geographic location" mapped and thus as shown herein, Harris expressly discloses these limitations. *See also* n.6.

Claim 12	Prior Art
data item regarding the geographic point on earth;	to specify a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters"; Fig.1 (including "Data Analyst" using "GUI" 114 to query "Data Repository" 111 via "Search Mechanism" 113); "search mechanism 113, and the interface 114… may be distributed across one or more computer systems such as the computer system 500 of FIG. 5"; Fig.5 (including, *e.g.*, "BUS" 502 connecting, *e.g.*, "PROCESSOR" 504, "COMMUNICATION INTERFACE" 518, "INPUT DEVICE" 514, etc.))**, a query of a geographic location[6] and time information indicative of**

[6] '648 confirms "a query of a geographic location" includes not only a discrete geographic point, but also an area or region on the earth. For example, '648 claim 1 also requires "a query regarding a geographic location" and dependent claims 4 and 5 further require the query include "a region on the earth" (claim 4) "identified by multiple geocoded locations" (claim 5), thus making clear that "a geographic location" includes not only discrete points but multiple points or areas on the earth. Harris's disclosure of queries including "a geospatial bounding area," EX1004, 9:38-46, is thus an express disclosure of this limitation. Moreover, even if '648 required a query to include a discrete geographic point, Harris expressly discloses this limitation because (1) POSITA would have understood that Harris's "geospatial bounding area" or "search parameters" including "a search string" (EX1004, 10:10-14) include a single geographic point (*e.g.*, bounding area drawn to include a single point or search string corresponding to only one

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00293

Claim 12	Prior Art
	the time history of an associated data item regarding the geographic point on earth[7] (*e.g.*, "data analyst… specif[ies] geo-temporal queries that include both [a] geospatial component and a temporal component"; "a query that includes

longitude/latitude value); (2) Harris's queries include "***one*** or more geographical search parameters," EX1004, 6:64-7:1, which POSITA would have understood to include, *e.g.*, a query with ***one*** geographical search parameter (*e.g.*, single latitude/longitude value) corresponding to a single point on the earth; and (3) to perform a query for data objects "within a four block perimeter" of a "geographical location of [an] incident," EX1004, 1:33-37 (*i.e.*, a distance-based search around a single point), POSITA would have understood that the single point would have been included in the query.

[7] Cl.12.c's reference to "the geographic point on earth" refers to stored data items (cl.12.a) rather than the query contents or syntax. As discussed (*see* cl.12.a), Harris expressly discloses its stored data items are associated with one or more geographic location identifiers indicating a particular geographic point on earth (*e.g.*, "longitude and latitude corresponding to a geographic location," EX1004, 7:32-36), and thus Harris's disclosed queries of its stored data items are queries "regarding the geographic point on earth." To the extent it is argued that Harris's query must include a "geographic point on the earth," Harris discloses or renders obvious this limitation as explained above. *See* n.6.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00294

Claim 12	Prior Art
	a geospatial component and a temporal component"; "Graphical user interface 200 includes interface components that allow a user to specify both a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters, respectively"; "Information… may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest" such as "a request for all activities within a single city block within the past five years [or] all activities within an entire city within the past five hours"; "search for data objects associated with particular geographic regions"; "geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest")**.** *See, e.g.*, EX1004, Abstract ("A method and apparatus for a data analysis system for analyzing data object collections that include geo-temporal data is provided. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are generated based on the specified time granularities. Geo-temporal input data is indexed based on the generated temporal index bucket groups. **The system allows a data analyst to specify geo-temporal queries that include both geospatial component and a temporal component**. The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the temporal index bucket groups."), 1:21-37 ("One particular type of data that such organizations may often collect and analyze is geospatial data. Geospatial data generally represents any data that includes a geographical component and that associates the data with particular geographic locations or areas. For example, a crime enforcement agency may track data that corresponds to crime reports received within a particular city. One item of

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00295

Claim 12	Prior Art
	information stored in association with each crime report may include a geographical component indicating a location of the incident specified by the crime report. An example data object representing each crime report may include values representing a longitude and latitude corresponding to the geographical location of the incident. **A data analyst with access to such data may then specify geospatial search requests such as, for example, a search request for crime reports associated with incidents within a specified geographical radius or within a four block perimeter**."), 1:38-50 ("Organizations also frequently collect data that includes a temporal component. A temporal component generally refers to one or more data values that indicate a particular point in time, such as a date and/or time of day, or a range of time. For example, in reference to the example crime report information, a crime enforcement agency may store in association with each crime report a time value indicating an approximate time the incident in the crime report occurred. In the example, by storing the temporal information, **data analysts may specify requests for data objects associated with a particular time range of interest, for example, all crime reports associated with an incident that occurred within the past three months**."), 2:50-67 ("**The present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository**. Geo-temporal data generally refers to data that includes both a geospatial component and a temporal component. The geospatial component may comprise one or more stored data values indicating a geographic location and the temporal component may comprise one or more values indicating a point in time or range of time. In general terms, in order to more efficiently process requests for geo-temporal data stored in a key-value data repository, a geo-temporal indexing structure is generated and managed in computer memory; for example, indexes may be stored on disk and cached in memory on demand. In an embodiment, the geo-temporal indexing structure is based in

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00296

Claim 12	Prior Art
	part on user input specifying one or more time sets or granularities that are likely to correspond to time ranges specified in user requests for the stored and indexed geo-temporal data."), 4:7-17 ("**FIG. 1 illustrates an example computer system for indexing and searching geo-temporal data**. In an embodiment, an organization or entity may manage one or more data sources 101 that generate data, perhaps continuously or on an ongoing or periodic basis. Any sizeable organization will typically manage multiple data sources 101 that generate a large amount of data. Example data sources 101 include databases, log files, transaction logs, call data records, access logs, netflows, authentication logs, authorization logs, e-mail message spools, and any other container for data."), 4:44-59 ("Data sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data. Organizations would appreciate a way to efficiently analyze these collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, for example, a request for all activities within a single city block within the past five years to all activities within an entire city within the past five hours**."), 5:9-24 ("Referring again to FIG. 1, in an embodiment a data processing system comprises a data repository 111, one or more adaptors 103, and **a search mechanism 113 with an interface 114**. **The data repository 111, the adaptors(s) 103, the search mechanism 113, and the interface 114 may be interconnected to one another using any suitable data**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00297

Claim 12	Prior Art
	communication mechanism such as, for example, one or more data networks. The one or more data networks may include one or more local area networks (LANs), one or more wide area networks (WANs), or internetworks such as the public Internet. The components of the system may be distributed across one or more computer systems such as the computer system 500 of FIG. 5, which is further described herein. When distributed across multiple computer systems, components may additionally be distributed geographically, for example, across one or more data centers."), 6:58-7:4 ("In an embodiment, input data 102 that includes a geospatial component may be specified as geospatially searchable. **For example, a user may configure parser 104 and/or importer 109 to identify particular data items of input data 102 as geospatially searchable data**. In other embodiments, data items of input data 102 may be specified as geospatially searchable by default and without user input. In general, **geospatially searchable data may be searched using queries that specify one or more geographical search parameters such as, for example, latitude and longitude values that define a geographical area**. In an embodiment, input data 102 that includes a geospatial component and that is specified to be geospatially searchable is geospatially indexed in the data repository 111, as further described below."), 8:36-57 ("**In general, the user-specified time granularities correspond to time granularities that are expected by the user or others to be specified in geo-temporal queries against the data as stored in data repository 111**. **For example, an analyst involved in the importation of geo-temporal data may be aware that users often desire to search for data objects associated with particular geographic regions and that are associated with temporal components within particular year time spans and/or particular hour time spans.** In the example, an analyst involved in the importation of data may specify temporal index configuration data indicating two time granularities for the geo-temporal input data: a year time granularity and an hour time

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00298

Claim 12	Prior Art
	granularity. For example, temporal index bucket group 112A in FIG. 1 may correspond to the index bucket group for the year time granularity and temporal index bucket group 112B may correspond to the index bucket group for the hour granularity. In the example, generated temporal index buckets of temporal index bucket group 112A may represent particular year timespans (e.g., 1978, 2002, 2009, 2012) and generated temporal index buckets of temporal index bucket group 112B may represent particular day timespans (e.g., Mar. 15, 1978; Jan. 10, 2009).”), 9:26-37 (“Further, no particular graphical user interface is required and the disclosure is intended to encompass the geo-temporal query processing approaches that are described independent of any graphical user interface, and it is not intended to be limited to any particular graphical user interface or other form of display. For example, the example graphical user interface merely represents one way to receive input from a user to specify a geo-temporal query; in other embodiments, programmatic methods may be used to obtain the same query specification information and other forms of data output may be used such as logging, reporting, storing in database tables, storing in spreadsheets, etc.”), 9:38-46 (“In general, a search mechanism 113 receives as input a set of geo-temporal search parameters and provides as output a set of search results. **FIG. 2 illustrates an example graphical user interface 200 that enables a user to specify a set of search parameters for a geo-temporal query**. **Graphical user interface 200 includes interface components that enable a user to specify both a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters, respectively**.”), 9:47-64 (“Interface component 204 illustrates a representation of a geographical map that may be used to **specify one or more desired geospatial bounding areas**. For example, bounding area 206 represents an example bounding area that a user may specify on the map using an input mechanism such as, for

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00299

Claim 12	Prior Art
	example, a mouse pointer to draw the bounding area on the map. In an embodiment, a specified bounding area such as **bounding area 206 defines a geographical area of interest to the user that will be specified as a geospatial search parameter in a resulting geo-temporal query**. For example, if a user was interested in stored data objects pertaining to a particular geographical area around the user's home, the user may specify a bounding area that includes both the geographical location of the user's home and any surrounding area of interest using interface component 204. In an embodiment, a bounding area may be defined using a number of shapes including, but not limited to, a radial or polygonal bounding area."), 9:65-10:23 ("**In an embodiment, a user may additionally specify a temporal range of interest using graphical user interface 200. In an embodiment, a specified temporal range for a geo temporal query may include one or more of a start date and/or time value and an end date and/or time value**. **Graphical interface component 202 illustrates an example interface component enabling a user to specify a temporal range as a search parameter.** An interface component such as interface component 202 may include, among other input elements, one or more input elements for entering date and time values. **For example, a user may enter one or more dates using text boxes, a calendar, or any other interface component for entering dates and/or time values**. In addition to specifying a temporal range, interface component 202 may include one or more additional input parameters enabling the specification of one or more other search parameters, for example, a search string, a sort order, etc. **In an embodiment, a geo-temporal query may be generated based on the input received at graphical user interface 200. For example, search mechanism may transform the user input received at graphical user interface 200 into a textual representation of a geo-temporal query that includes search parameters corresponding to the user input received at graphical user interface 200. After the geo-temporal query is generated, the geo-temporal query may be processed by search mechanism 113.**"),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00300

Claim 12	Prior Art
	10:24-43 ("FIG. 4 illustrates a flow diagram of a process for carrying out a geo-temporal query in accordance with one or more of embodiments described herein. **In an embodiment, a search query is received (block 400) that includes both a geospatial component and a temporal component.** In response to receiving a query, one or more second queries are generated (block 402), with each of the second queries corresponding to a particular temporal index bucket of a temporal index bucket group. In an embodiment, the temporal index buckets are selected to correspond to the temporal component of the query. For example, assume that particular geo-temporal data has been indexed into a first temporal index bucket group based on a time granularity of years and a second temporal index bucket group based on a time granularity of days. If a geo-temporal query is received that specifies a temporal range of Jan. 1, 2011 to Jan. 2, 2012, the system may transform the geo-temporal query into a second query against the bucket corresponding to the data year 2011 and two additional second queries corresponding to the days of Jan. 1, 2012 and Jan. 2, 2012."), 10:59-11:19 ("In an embodiment, processing a geo-temporal query may include one more steps of post-filtering. As a result of the particular partitioning of the temporal index buckets, the result set returned by the one or more second queries may include one or more data items that are not within the exact temporal range specified by the geo-temporal query. In an embodiment, the search mechanism 113 may filter (block 406) the one or more results that are not within the specified temporal range. For example, assume that a geo-temporal index is created using a specified time granularity of an hour, resulting in a temporal index bucket group with one or more temporal index buckets of hour time ranges (e.g., 1:00 pm-2:00 pm, 2:00 pm-3:00 pm, 3:00 pm-4:00 pm, etc.). **An example geo-temporal query may then include a temporal search parameter specifying a time range on a particular day between 2:15 pm and 3:15 pm**. In response to receiving the example geo-temporal query, the search mechanism 113 may transform the

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00301

Claim 12	Prior Art
	query into two queries that query the temporal index buckets that index data objects associated with a temporal value between the time ranges of 2:00 pm-3:00 pm and 3:00 pm-4:00 pm, respectively. After retrieving any data objects from either or both of the two index buckets that satisfy any geospatial component of the query, search mechanism 113 may post-filter the data object results in order to filter any data objects that are associated with a temporal value outside of the range specified in the query, i.e., those data objects in the temporal ranges of 2:00 pm-2:14 pm and 3:16 pm-4:00 pm."), 11:24-48 ("According to one embodiment, the techniques described herein are implemented by one or more special-purpose computing devices. The special-purpose computing devices may be hard-wired to perform the techniques, or may include digital electronic devices such as one or more application-specific integrated circuits (ASICs) or field programmable gate arrays (FPGAs) that are persistently programmed to perform the techniques, or may include one or more **general purpose hardware processors programmed to perform the techniques pursuant to program instructions** in firmware, memory, other storage, or a combination. Such special-purpose computing devices may also combine custom hard-wired logic, ASICs, or FPGAs with custom programming to accomplish the techniques. The special-purpose computing devices may be desktop computer systems, portable computer systems, handheld devices, networking devices or any other device that incorporates hard-wired and/or program logic to implement the techniques. For example, FIG. 5 is a block diagram that illustrates a computer system 500 upon which an embodiment may be implemented. Computer system 500 includes a bus 502 or other communication mechanism for communicating information, and a **hardware processor 504 coupled with bus 502 for processing information. Hardware processor 504 may be, for example, a general purpose microprocessor.** Computer system 500 also includes a main memory 506, such as a random access memory (RAM) or other dynamic storage device, coupled to bus 502 for storing information and **instructions to**

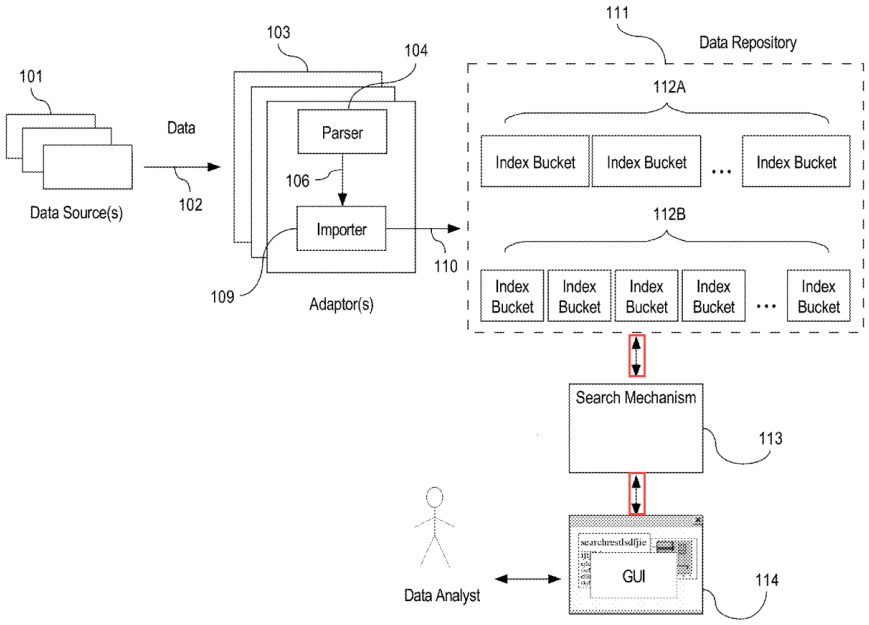
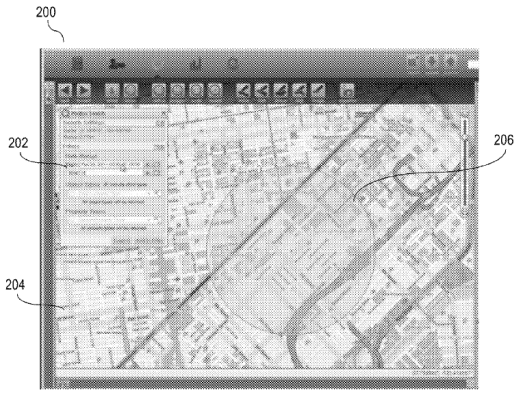
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00302

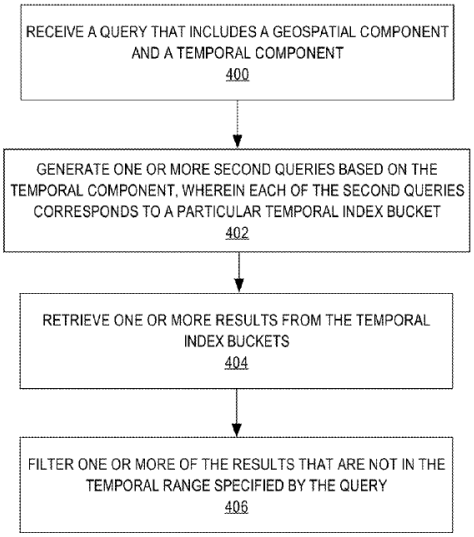
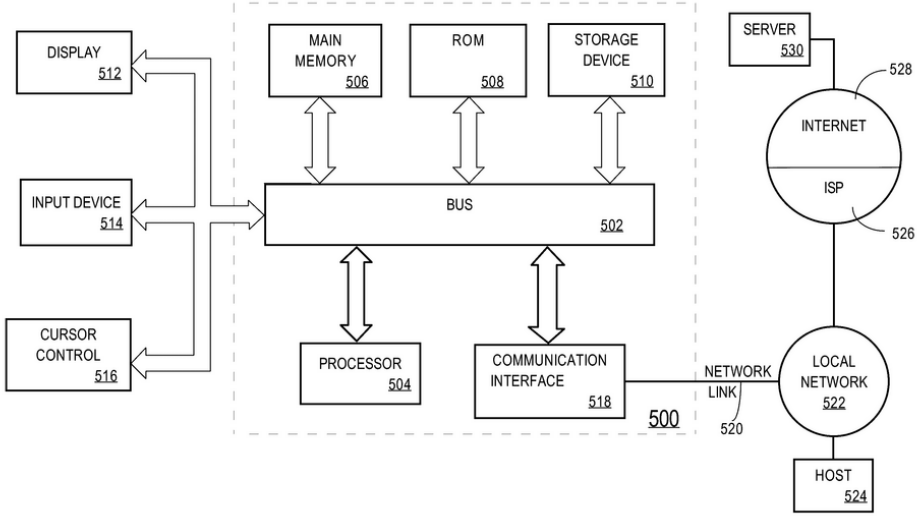
Claim 12	Prior Art
	be executed by processor 504. Main memory 506 also may be used for storing temporary variables or other intermediate information during execution of instructions to be executed by processor 504. Such instructions, when stored in non-transitory storage media accessible to processor 504, render computer system 500 into a special-purpose machine that is customized to perform the operations specified in the instructions. Computer system 500 further includes a read only memory (ROM) 508 or other static storage device coupled to bus 502 for **storing static information and instructions for processor 504**. A storage device 510, such as a magnetic disk, optical disk, or solid-state drive is provided and coupled to bus 502 for storing information and instructions."), 11:66-12:11 ("Computer system 500 may be coupled via bus 502 to a display 512, such as a cathode ray tube (CRT), for displaying information to a computer user. **An input device 514, including alphanumeric and other keys, is coupled to bus 502 for communicating information and command selections to processor 504. Another type of user input device is cursor control 516, such as a mouse, a trackball, or cursor direction keys for communicating direction information and command selections to processor 504 and for controlling cursor movement on display 512.** This input device typically has two degrees of freedom in two axes, a first axis (e.g., x) and a second axis (e.g., y), that allows the device to specify positions in a plane."), 13:14-27 ("**Network link 520 typically provides data communication through one or more networks to other data devices**. For example, network link 520 may provide a connection through local network 522 to a host computer 524 or to data equipment operated by an Internet Service Provider (ISP) 526. ISP 526 in turn provides data communication services through the world wide packet data communication network now commonly referred to as the "Internet" 528. Local network 522 and Internet 528 both use electrical, electromagnetic or optical signals that carry digital data streams. The signals through the various networks and the

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00303

Claim 12	Prior Art
	signals on network link 520 and through **communication interface 518**, which carry the digital data to and from computer system 500, are example forms of transmission media."), 12:66-13:13 ("**Computer system 500 also includes a communication interface 518 coupled to bus 502. Communication interface 518 provides a two-way data communication coupling** to a network link 520 that is connected to a local network 522. For example, communication interface 518 may be an integrated services digital network (ISDN) card, cable modem, satellite modem, or a modem to provide a data communication connection to a corresponding type of telephone line. As another example, communication interface 518 may be a local area network (LAN) card to provide a data communication connection to a compatible LAN. Wireless links may also be implemented. In any such implementation, communication interface 518 sends and receives electrical, electromagnetic or optical signals that carry digital data streams representing various types of information."), 13:28-36 ("**Computer system 500 can send messages and receive data, including program code, through the network(s), network link 520 and communication interface 518. In the Internet example, a server 530 might transmit a requested code for an application program through Internet 528, ISP 526, local network 522 and communication interface 518. The received code may be executed by processor 504 as it is received, and/or stored in storage device 510, or other non-volatile storage for later execution.**"). Claim 8 ("the one or more processors carry out the steps of… receiving a search query") Fig.1 (double arrow showing receiving from GUI); Fig.2, Fig.4, Fig.5 ("processor 504").

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00304

Claim 12	Prior Art
	FIG. 1  FIG. 2 

Claim 12	Prior Art
	FIG. 4  FIG. 5 
[12.d]: retrieve, from the integrated centralized property database, data items having	**Harris discloses or renders obvious this limitation. (Grounds 1-3)** **Harris discloses the processor** (*see* cl.12.b) **retrieving, from the integrated centralized property database** (*see* cl.12a)**, data items having associated geographic location identifiers**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00306

Claim 12	Prior Art
associated geographic location identifiers matching the received geographic location and having associated time identifiers matching the time information, and	(*see* cl.12.a) **matching the received geographic location**[8] (*see* cl.12.c) **and having associated time identifiers** (*see* cl.12.a) **matching the time information** (*e.g.*, "retrieve one or more results from the temporal index buckets" stored in "data repository"; "geo-temporal queries… include both [a] geospatial component and a temporal component. The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the index"; "In response to receiving the… geo-temporal query, the search mechanism" retrieves indexed "data objects associated with a temporal value" from "data repository" satisfying the query and "satisfy[ing] any geospatial component of the query"; "data returned by a geographically-focused search will be filtered…to refine the results to the specified temporal range"; "[t]he results returned from each of the temporal index buckets are those results that satisfy the geospatial component of the query," *e.g.*, "crime report" and "geographical location of the incident," including "values representing a latitude and longitude"; *see* cl.12.c)**.** *See, e.g.*, EX1004, Abstract ("A method and apparatus for a data analysis system for analyzing data object collections that include geo-temporal data is provided. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are generated based on the specified time granularities. Geo-temporal input data is indexed based on the generated temporal index bucket groups. **The system allows a data analyst to specify geo-temporal queries that include both geospatial component and a temporal component. The system transforms geo-temporal queries into one or more**

[8] For the combined Harris-Florance system (Ground 3), retrieved data includes Florance's property information (*see* cl.12.a).

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00307

Claim 12	Prior Art
	second queries that retrieve data items based on the temporal index bucket groups."), 1:21-37 ("**One particular type of data that such organizations may often collect and analyze is geospatial data. Geospatial data generally represents any data that includes a geographical component and that associates the data with particular geographic locations or areas.** For example, a crime enforcement agency may track data that corresponds to crime reports received within a particular city. **One item of information stored in association with each crime report may include a geographical component indicating a location of the incident specified by the crime report. An example data object representing each crime report may include values representing a longitude and latitude corresponding to the geographical location of the incident.** A data analyst with access to such data may then specify geospatial search requests such as, for example, a search request for crime reports associated with incidents within a specified geographical radius or within a four block perimeter."), 1:38-50 ("Organizations also frequently collect data that includes a temporal component. A temporal component generally refers to one or more data values that indicate a particular point in time, such as a date and/or time of day, or a range of time. For example, in reference to the example crime report information, a crime enforcement agency may store in association with each crime report a time value indicating an approximate time the incident in the crime report occurred. In the example, by storing the temporal information, **data analysts may specify requests for data objects associated with a particular time range of interest, for example, all crime reports associated with an incident that occurred within the past three months**."), 4:49-59 ("**Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00308

Claim 12	Prior Art
	geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, for example, a request for all activities within a single city block within the past five years to all activities within an entire city within the past five hours."), 8:36-57 ("**In general, the user-specified time granularities correspond to time granularities that are expected by the user or others to be specified in geo-temporal queries against the data as stored in data repository 111**. **For example, an analyst involved in the importation of geo-temporal data may be aware that users often desire to search for data objects associated with particular geographic regions and that are associated with temporal components within particular year time spans and/or particular hour time spans.** In the example, an analyst involved in the importation of data may specify temporal index configuration data indicating two time granularities for the geo-temporal input data: a year time granularity and an hour time granularity. For example, temporal index bucket group 112A in FIG. 1 may correspond to the index bucket group for the year time granularity and temporal index bucket group 112B may correspond to the index bucket group for the hour granularity. In the example, generated temporal index buckets of temporal index bucket group 112A may represent particular year timespans (e.g., 1978, 2002, 2009, 2012) and generated temporal index buckets of temporal index bucket group 112B may represent particular day timespans (e.g., Mar. 15, 1978; Jan. 10, 2009)."), 9:38-46 ("**In general, a search mechanism 113 receives as input a set of geo-temporal search parameters and provides as output a set of search results.** FIG. 2 illustrates an example graphical user interface 200 that enables a user to specify a set of search parameters for a geo-temporal query. Graphical user interface 200 includes interface components that enable a user to specify both a geospatial bounding area and a time value or

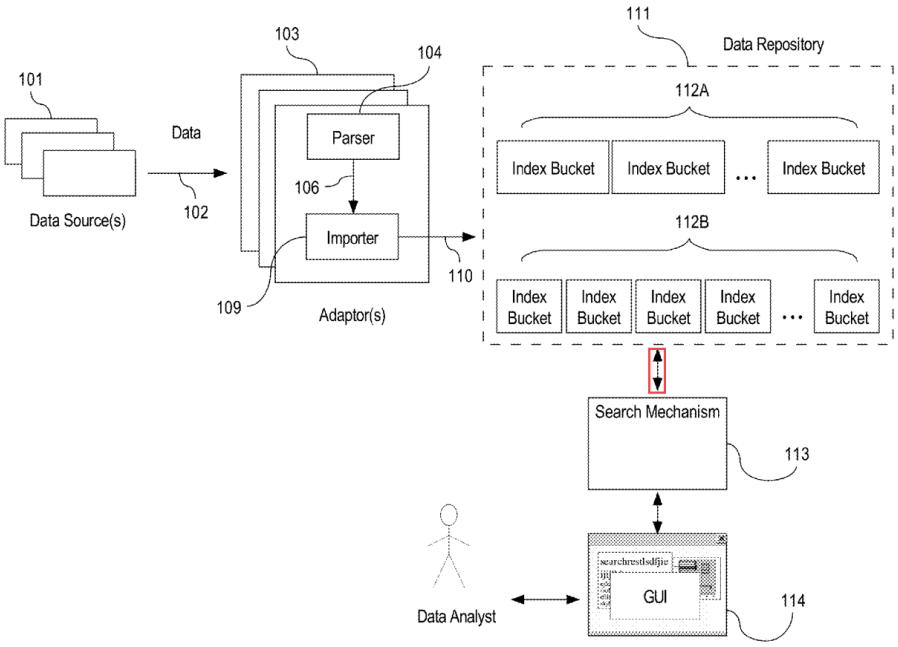
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00309

Claim 12	Prior Art
	range of time values as geospatial and temporal search parameters, respectively."), 9:65-10:23 ("In an embodiment, a user may additionally specify a temporal range of interest using graphical user interface 200. In an embodiment, a specified temporal range for a geo temporal query may include one or more of a start date and/or time value and an end date and/or time value. Graphical interface component 202 illustrates an example interface component enabling a user to specify a temporal range as a search parameter. An interface component such as interface component 202 may include, among other input elements, one or more input elements for entering date and time values. For example, a user may enter one or more dates using text boxes, a calendar, or any other interface component for entering dates and/or time values. In addition to specifying a temporal range, interface component 202 may include one or more additional input parameters enabling the specification of one or more other search parameters, for example, a search string, a sort order, etc. **In an embodiment, a geo-temporal query may be generated based on the input received at graphical user interface 200. For example, search mechanism may transform the user input received at graphical user interface 200 into a textual representation of a geo-temporal query that includes search parameters corresponding to the user input received at graphical user interface 200. After the geo-temporal query is generated, the geo-temporal query may be processed by search mechanism 113.**"), 10:24-48 ("FIG. 4 illustrates a flow diagram of a process for carrying out a geo-temporal query in accordance with one or more of embodiments described herein. In an embodiment, a search query is received (block 400) that includes both a geospatial component and a temporal component. In response to receiving a query, one or more second queries are generated (block 402), with each of the second queries corresponding to a particular temporal index bucket of a temporal index bucket group. **In an embodiment, the temporal index buckets are selected to correspond to the temporal component of the**

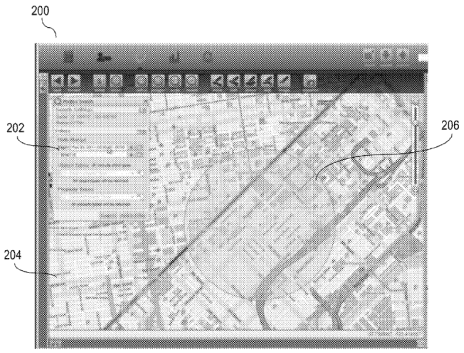
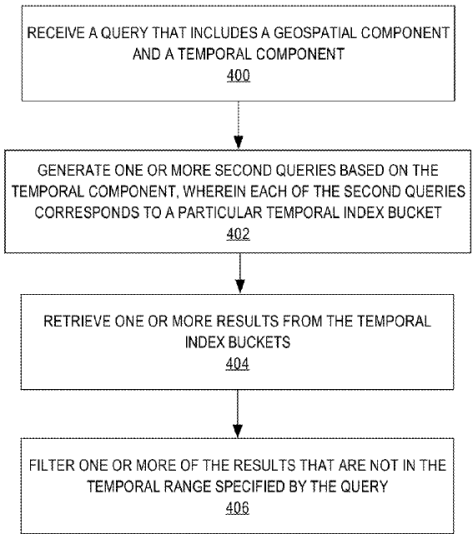
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00310

Claim 12	Prior Art
	query. For example, assume that particular geo-temporal data has been indexed into a first temporal index bucket group based on a time granularity of years and a second temporal index bucket group based on a time granularity of days. If a geo-temporal query is received that specifies a temporal range of Jan. 1, 2011 to Jan. 2, 2012, the system may transform the geo-temporal query into a second query against the bucket corresponding to the data year 2011 and two additional second queries corresponding to the days of Jan. 1, 2012 and Jan. 2, 2012."), 10:44-58 ("In response to each of the second queries, zero or more results are returned from each of the particular temporal index buckets (block 404). **The results returned from each of the temporal index buckets are those results that satisfy the geospatial component of the query**. Thus, in an embodiment, processing each of the second queries includes processing the geospatial component of the geo-temporal query on the data stored in each of the buckets. For example, if the data in data repository 111 is geospatially indexed using Z-order curve values, the geospatial component of the query may be transformed into one or more Z-order values and the values may be used to return corresponding results from each of the temporal index buckets. In an embodiment, the zero or more results returned from each of the one or more temporal index buckets are aggregated to form an initial result set."), 10:59-11:19 ("In an embodiment, processing a geo-temporal query may include one more steps of post-filtering. As a result of the particular partitioning of the temporal index buckets, the result set returned by the one or more second queries may include one or more data items that are not within the exact temporal range specified by the geo-temporal query. In an embodiment, the search mechanism 113 may filter (block 406) the one or more results that are not within the specified temporal range. For example, assume that a geo-temporal index is created using a specified time granularity of an hour, resulting in a temporal index bucket group with one or more temporal index buckets of hour time ranges (e.g., 1:00 pm-2:00 pm, 2:00 pm-

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00311

Claim 12	Prior Art
	3:00 pm, 3:00 pm-4:00 pm, etc.). An example geo-temporal query may then include a temporal search parameter specifying a time range on a particular day between 2:15 pm and 3:15 pm. In response to receiving the example geo-temporal query, the search mechanism 113 may transform the query into two queries that query the temporal index buckets that index data objects associated with a temporal value between the time ranges of 2:00 pm-3:00 pm and 3:00 pm-4:00 pm, respectively. **After retrieving any data objects from either or both of the two index buckets that satisfy any geospatial component of the query, search mechanism 113 may post-filter the data object results in order to filter any data objects that are associated with a temporal value outside of the range specified in the query, i.e., those data objects in the temporal ranges of 2:00 pm-2:14 pm and 3:16 pm-4:00 pm**."). Fig.1 (double arrow indicating retrieval of data from "Data Repository" by "Search Mechanism"), Fig.2, Fig.4. FIG. 1 

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00312

Claim 12	Prior Art
	FIG. 2  FIG. 4 
[12.e]: provide the retrieved data items to the user computer system via a graphical user interface.	**Harris discloses or renders obvious this limitation. (Grounds 1-3)** **Harris discloses providing the retrieved data items to the user computer system via a graphical user interface** (*e.g.*, "search mechanism 113… provides as output a set of search results" on, *e.g.*, Fig.2's "graphical user interface," including, *e.g.*, "crime report" and "geographical location of the incident," including "values representing a latitude and longitude"; outputting the retrieved data items to Fig.1's "Data Analyst" having two-way interactions to query and receive

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00313

Claim 12	Prior Art
	results through "GUI" 114 which, in turn, has two-way interaction with "Data Repository" 111 via "Search Mechanism" 113; "displaying information to a computer user" (*e.g.*, "data objects" "satisfy[ing]… the query") including on Fig.5's "display 512, such as a cathode ray tube (CRT)")**.** *See, e.g.*, EX1004, Abstract ("A method and apparatus for a data analysis system for analyzing data object collections that include geo-temporal data is provided. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are generated based on the specified time granularities. Geo-temporal input data is indexed based on the generated temporal index bucket groups. The system allows a data analyst to specify geo-temporal queries that include both geospatial component and a temporal component. **The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the temporal index bucket groups**."), 1:38-50 ("Organizations also frequently collect data that includes a temporal component. A temporal component generally refers to one or more data values that indicate a particular point in time, such as a date and/or time of day, or a range of time. For example, in reference to the example crime report information, a crime enforcement agency may store in association with each crime report a time value indicating an approximate time the incident in the crime report occurred. In the example, by storing the temporal information, **data analysts may specify requests for data objects associated with a particular time range of interest, for example, all crime reports associated with an incident that occurred within the past three months**."), 5:9-24 ("Referring again to FIG. 1, in an embodiment a data processing system comprises a data repository 111, one or more adaptors 103, and **a search mechanism 113 with an interface**

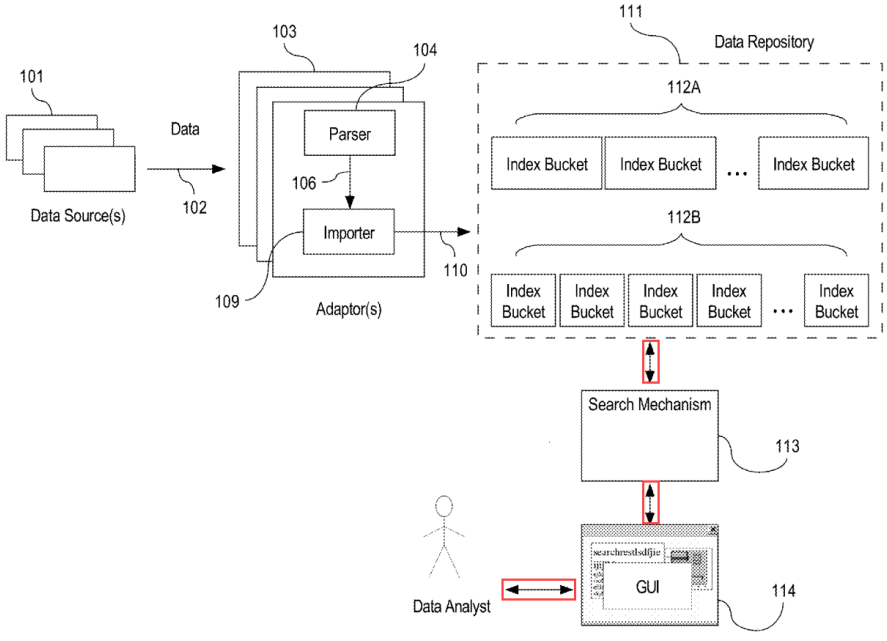
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00314

Claim 12	Prior Art
	114. **The data repository 111, the adaptors(s) 103, the search mechanism 113, and the interface 114 may be interconnected to one another using any suitable data communication mechanism such as, for example, one or more data networks.** The one or more data networks may include one or more local area networks (LANs), one or more wide area networks (WANs), or internetworks such as the public Internet. The components of the system may be distributed across one or more computer systems such as the computer system 500 of FIG. 5, which is further described herein. When distributed across multiple computer systems, components may additionally be distributed geographically, for example, across one or more data centers."), 9:38-46 ("**In general, a search mechanism 113 receives as input a set of geo-temporal search parameters and provides as output a set of search results**. FIG. 2 illustrates an example graphical user interface 200 that enables a user to specify a set of search parameters for a geo-temporal query. Graphical user interface 200 includes interface components that enable a user to specify both a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters, respectively."), 9:65-10:23 ("In an embodiment, a user may additionally specify a temporal range of interest using graphical user interface 200. In an embodiment, a specified temporal range for a geo temporal query may include one or more of a start date and/or time value and an end date and/or time value. Graphical interface component 202 illustrates an example interface component enabling a user to specify a temporal range as a search parameter. An interface component such as interface component 202 may include, among other input elements, one or more input elements for entering date and time values. For example, a user may enter one or more dates using text boxes, a calendar, or any other interface component for entering dates and/or time values. In addition to specifying a temporal range, interface component 202 may include one or more additional input parameters enabling the specification of one or more other

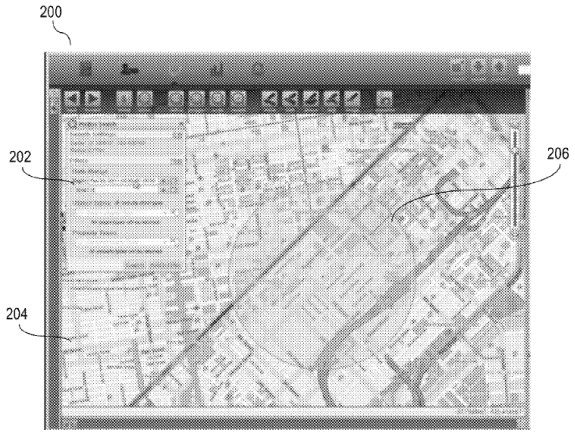
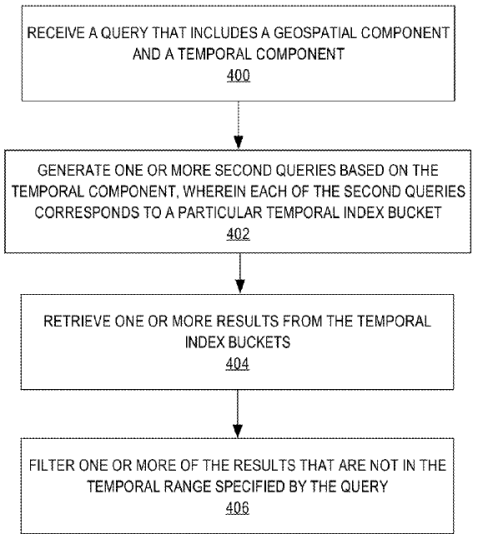
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00315

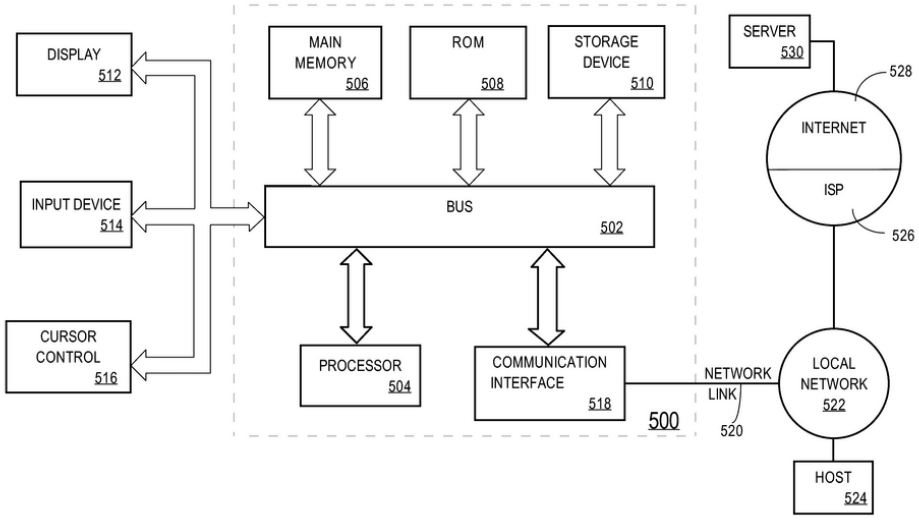
Claim 12	Prior Art
	search parameters, for example, a search string, a sort order, etc. **In an embodiment, a geo-temporal query may be generated based on the input received at graphical user interface 200. For example, search mechanism may transform the user input received at graphical user interface 200 into a textual representation of a geo-temporal query that includes search parameters corresponding to the user input received at graphical user interface 200. After the geo-temporal query is generated, the geo-temporal query may be processed by search mechanism 113.**"), 10:59-11:19 ("In an embodiment, processing a geo-temporal query may include one more steps of post-filtering. As a result of the particular partitioning of the temporal index buckets, the result set returned by the one or more second queries may include one or more data items that are not within the exact temporal range specified by the geo-temporal query. In an embodiment, the search mechanism 113 may filter (block 406) the one or more results that are not within the specified temporal range. For example, assume that a geo-temporal index is created using a specified time granularity of an hour, resulting in a temporal index bucket group with one or more temporal index buckets of hour time ranges (e.g., 1:00 pm-2:00 pm, 2:00 pm-3:00 pm, 3:00 pm-4:00 pm, etc.). An example geo-temporal query may then include a temporal search parameter specifying a time range on a particular day between 2:15 pm and 3:15 pm. In response to receiving the example geo-temporal query, the search mechanism 113 may transform the query into two queries that query the temporal index buckets that index data objects associated with a temporal value between the time ranges of 2:00 pm-3:00 pm and 3:00 pm-4:00 pm, respectively. **After retrieving any data objects from either or both of the two index buckets that satisfy any geospatial component of the query, search mechanism 113 may post-filter the data object results in order to filter any data objects that are associated with a temporal value outside of the range specified in the query, i.e., those data objects in the temporal ranges of 2:00 pm-2:14 pm and 3:16 pm-4:00 pm**."),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00316

Claim 12	Prior Art
	11:66-12:11 ("**Computer system 500 may be coupled via bus 502 to a display 512, such as a cathode ray tube (CRT), for displaying information to a computer user.** An input device 514, including alphanumeric and other keys, is coupled to bus 502 for communicating information and command selections to processor 504. Another type of user input device is cursor control 516, such as a mouse, a trackball, or cursor direction keys for communicating direction information and command selections to processor 504 and for controlling cursor movement on display 512. This input device typically has two degrees of freedom in two axes, a first axis (e.g., x) and a second axis (e.g., y), that allows the device to specify positions in a plane."), Fig.1 (outputting indicated by double arrows from "Data Repository" to "Search Mechanism," from "Search Mechanism" to "GUI," and from "GUI" to "Data Analyst"), Fig.2, Fig.4, Fig.5. FIG. 1 

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00317

Claim 12	Prior Art
	FIG. 2  FIG. 4 

Claim 12	Prior Art
	FIG. 5 

Claim 13	Prior Art
[13]: The system of claim 12, wherein the one or more geographic location identifiers include latitude and longitude coordinates.	**Harris discloses or renders obvious this claim. (Grounds 1-2)** **Alternatively, Harris in view of Florance renders obvious this claim. (Ground 3)** **Harris discloses or renders obvious, or Harris in view of Florance renders obvious the system of claim 12** (*see* cl.12)**, and Harris discloses wherein the one or more geographic location identifiers include latitude and longitude coordinates** (*e.g.*, "values representing a geospatial component may include one or more numerical values specifying a longitude and latitude"; "values representing" or "specifying a latitude and longitude"; *see* cl.12.a)**.** *See, e.g.*, EX1004, 1:21-37 ("One particular type of data that such organizations may often collect and analyze is geospatial data. Geospatial data generally represents any data that includes a geographical component and that associates the data with

Claim 13	Prior Art
	particular geographic locations or areas. For example, a crime enforcement agency may track data that corresponds to crime reports received within a particular city. One item of information stored in association with each crime report may include a geographical component indicating a location of the incident specified by the crime report. **An example data object representing each crime report may include values representing a longitude and latitude corresponding to the geographical location of the incident.** A data analyst with access to such data may then specify geospatial search requests such as, for example, a search request for crime reports associated with incidents within a specified geographical radius or within a four block perimeter."), 5:59-6:6 ("In this context, the term "input data" refers to data that is presented as input to the system. That is, data that is obtained by an adaptor 103 from a data source 101 for processing and possible input into the data repository 111. **The term 'geo-temporal data' refers to any input data that includes one or more values representing a geospatial component and one or more values representing a temporal component. For example, values representing a geospatial component may include one or more numerical values specifying a longitude and latitude or any other representation of a geographical location. A temporal component includes one or more values specifying one or more points in time and may be specified, for example, by a character string or numerical value representing a midnight Coordinated Universal Time (UTC) value or any other representation of time values**."), 6:58-7:4 ("In an embodiment, input data 102 that includes a geospatial component may be specified as geospatially searchable. **For example, a user may configure parser 104 and/or importer 109 to identify particular data items of input data 102 as geospatially searchable data**. In other embodiments, data items of input data 102 may be specified as geospatially searchable by default and without user input. In general, **geospatially searchable data may be searched using queries that specify one or more geographical search parameters such**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00320

Claim 13	Prior Art
	as, for example, latitude and longitude values that define a geographical area. In an embodiment, input data 102 that includes a geospatial component and that is specified to be geospatially searchable is geospatially indexed in the data repository 111, as further described below."), 7:32-36 ("The one-dimensional representation may be a single numeric value and the multidimensional data representation may be **numeric values representing a longitude and latitude corresponding to a geographic location**.").

Claim 15	Prior Art
[15]: The system of claim 12, wherein the time identifier includes one or more time periods.	**Harris discloses or renders obvious this claim. (Grounds 1-2)** **Alternatively, Harris in view of Florance renders obvious this claim. (Ground 3)** **Harris discloses or renders obvious, or Harris in view of Florance renders obvious the system of claim 12** (*see* cl.12)**, and Harris discloses wherein the time identifier includes one or more time periods** (*e.g.*, "particular range of time associated with the particular temporal index bucket"; "particular geo-temporal data includes data with temporal components associated with time values falling within each of the years 2000-2010"; "temporal component may comprise one or more values indicating a… range of time")**.** *See, e.g.*, EX1004, 2:50-67 ("The present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository. Geo-temporal data generally refers to data that includes both a geospatial component and a temporal component. **The geospatial component may comprise one or more stored data values indicating a geographic location and the temporal component may comprise one or more values indicating a point in time or range of time.** In general terms, in order to more efficiently process requests for geo-temporal data stored in a key-value data

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00321

Claim 15	Prior Art
	repository, a geo-temporal indexing structure is generated and managed in computer memory; for example, indexes may be stored on disk and cached in memory on demand. **In an embodiment, the geo-temporal indexing structure is based in part on user input specifying one or more time sets or granularities that are likely to correspond to time ranges specified in user requests for the stored and indexed geo-temporal data**."), 3:12-32 ("In an embodiment, in addition to geospatially indexing the geo-temporal data, the data is further indexed in the data repository based on a temporal component of the data and based on received user input specifying one or more time granularities that a user may, for example, anticipate to be **time granularities that are likely to correspond to user requests against the indexed data. Examples of various time granularities that may be used in embodiments, or together in one embodiment, include years, months, days, and any other useful measure of time**. In an embodiment, a "temporal index bucket" group comprising one or more temporal index buckets is created in the data repository for each of the user-specified time granularities. In an embodiment, each temporal index bucket of a temporal index bucket group corresponds to a particular range of time equal to the corresponding time granularity for that bucket group. Each particular temporal index bucket includes one or more references to geospatially indexed data objects that are associated with a temporal value that falls within the particular range of time associated with the particular temporal index bucket."), 3:50-4:3 ("In an embodiment, requests for geo-temporal data indexed in a data repository are processed using one or more of the generated index bucket groups. For example, a geo-temporal request may be a query specifying one or more geospatial search parameters and one or more temporal search parameters. In an embodiment, a geo-temporal request for geo-temporal data indexed according to the methods described herein is transformed into one or more second requests against one or more temporal index buckets based on the temporal component specified in the request. For example, assume particular geo-temporal data

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00322

Claim 15	Prior Art
	includes data with temporal components associated with time values falling within each of the years 2000-2010 and is indexed according to a time granularity of years. The temporal index bucket group may then include a temporal index bucket for each of the years 2000, 2001, 2002, and so forth. **If a geo-temporal query is received specifying a particular geospatial and a temporal range spanning the years 2008 and 2009, the geo-temporal query may be transformed into separate queries against the 2008 and 2009 temporal index buckets**."), 4:44-59 ("Data sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data. Organizations would appreciate a way to efficiently analyze these collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest**. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, for example, a request for all activities within a single city block **within the past five years** to all activities within an entire city **within the past five hours**."), 8:36-57 ("**In general, the user-specified time granularities correspond to time granularities that are expected by the user or others to be specified in geo-temporal queries against the data as stored in data repository 111**. **For example, an analyst involved in the importation of geo-temporal data may be aware that users often desire to search for data objects associated with particular geographic regions and that are associated with temporal components within particular year time spans and/or particular hour time spans.** In the example, an analyst involved in the importation of data may specify temporal index configuration data indicating two time granularities for the geo-temporal input data: a year time granularity and an hour time granularity. For example,

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00323

Claim 15	Prior Art
	temporal index bucket group 112A in FIG. 1 may correspond to the index bucket group for the year time granularity and temporal index bucket group 112B may correspond to the index bucket group for the hour granularity. In the example, generated temporal index buckets of temporal index bucket group 112A may represent particular year timespans (e.g., 1978, 2002, 2009, 2012) and generated temporal index buckets of temporal index bucket group 112B may represent particular day timespans (e.g., Mar. 15, 1978; Jan. 10, 2009).”), 9:38-46 (“In general, a search mechanism 113 receives as input a set of geo-temporal search parameters and provides as output a set of search results. FIG. 2 illustrates an example graphical user interface 200 that enables a user to specify a set of search parameters for a geo-temporal query. **Graphical user interface 200 includes interface components that enable a user to specify both a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters, respectively.”),** col:9:65-col:10:14 (“**In an embodiment, a user may additionally specify a temporal range of interest using graphical user interface 200**. **In an embodiment, a specified temporal range for a geo-temporal query may include one or more of a start date and/or time value and an end date and/or time value**. Graphical interface component 202 illustrates an example interface component enabling a user to specify a temporal range as a search parameter. An interface component such as interface component 202 may include, among other input elements, one or more input elements for entering date and time values. For example, a user may enter one or more dates using text boxes, a calendar, or any other interface component for entering dates and/or time values. In addition to specifying a temporal range, interface component 202 may include one or more additional input parameters enabling the specification of one or more other search parameters, for example, a search string, a sort order, etc.”),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00324

Claim 15	Prior Art
	10:24-43 ("FIG. 4 illustrates a flow diagram of a process for carrying out a geo-temporal query in accordance with one or more of embodiments described herein. In an embodiment, a search query is received (block 400) that includes both a geospatial component and a temporal component. In response to receiving a query, one or more second queries are generated (block 402), with each of the second queries corresponding to a particular temporal index bucket of a temporal index bucket group. In an embodiment, the temporal index buckets are selected to correspond to the temporal component of the query. For example, assume that particular geo-temporal data has been indexed into a first temporal index bucket group based on a time granularity of years and a second temporal index bucket group based on a time granularity of days. **If a geo-temporal query is received that specifies a temporal range of Jan. 1, 2011 to Jan. 2, 2012, the system may transform the geo-temporal query into a second query against the bucket corresponding to the data year 2011 and two additional second queries corresponding to the days of Jan. 1, 2012 and Jan. 2, 2012**."), 10:59-11:19 ("In an embodiment, processing a geo-temporal query may include one more steps of post-filtering. As a result of the particular partitioning of the temporal index buckets, the result set returned by the one or more second queries may include one or more data items that are not within the exact temporal range specified by the geo-temporal query. In an embodiment, the search mechanism 113 may filter (block 406) the one or more results that are not within the specified temporal range. For example, assume that a geo-temporal index is created using a specified time granularity of an hour, resulting in a temporal index bucket group with one or more temporal index buckets of hour time ranges (e.g., 1:00 pm-2:00 pm, 2:00 pm-3:00 pm, 3:00 pm-4:00 pm, etc.). **An example geo-temporal query may then include a temporal search parameter specifying a time range on a particular day between 2:15 pm and 3:15 pm. In response to receiving the example geo-temporal query, the search mechanism 113 may transform the query into two queries that query the temporal index buckets that index data objects associated with a temporal value between the time ranges of 2:00 pm-3:00 pm**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00325

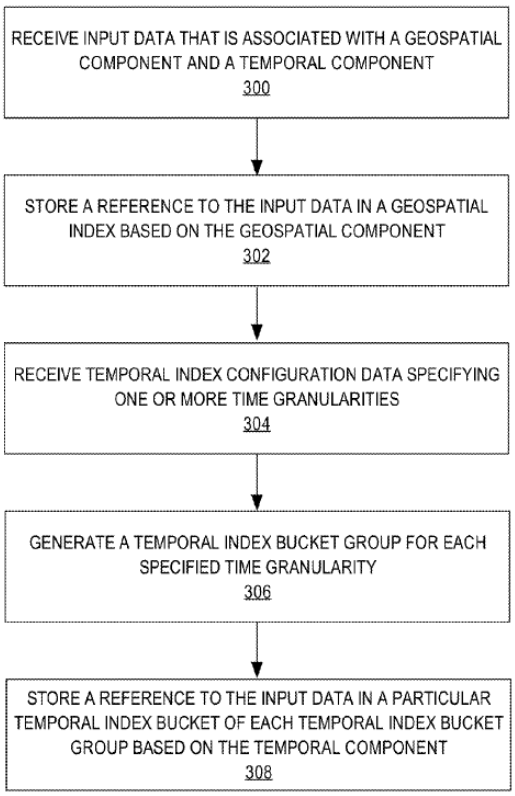
Claim 15	Prior Art
	and 3:00 pm-4:00 pm, respectively. After retrieving any data objects from either or both of the two index buckets that satisfy any geospatial component of the query, search mechanism 113 may post-filter the data object results in order to filter any data objects that are associated with a temporal value outside of the range specified in the query, i.e., those data objects in the temporal ranges of 2:00 pm-2:14 pm and 3:16 pm-4:00 pm.”).

Claim 1	Prior Art
[1.pre]: A method, comprising:	**To the extent the preamble is limiting, Harris discloses or renders obvious the preamble. (Grounds 1-2)** **Harris discloses a method** (*e.g.*, “method and apparatus for a data analysis system for analyzing data object collections that include geo-temporal data”; “methods for indexing and searching geo-temporal data stored in a data repository”; “method of creating and processing geo-temporal queries”)**.** *See, e.g.*, EX1004, Abstract (“**A method and apparatus for a data analysis system for analyzing data object collections that include geo-temporal data is provided**. One or more temporal granularities are specified for the purpose of generating a geo-temporal data index. The time granularities correspond to temporal ranges expected to correspond to temporal ranges specified in user queries against the data. One or more temporal index bucket groups are generated based on the specified time granularities. Geo-temporal input data is indexed based on the generated temporal index bucket groups. The system allows a data analyst to specify geo-temporal queries that include both geospatial component and a temporal component. The system transforms geo-temporal queries into one or more second queries that retrieve data items based on the temporal index bucket groups.”),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00326

Claim 1	Prior Art
	2:1-3 ("The present disclosure attempts to address these problems and others, facilitating low latency searches of large and dynamic data that include geo-temporal data."), 2:50-67 ("**The present disclosure is directed to computer systems and methods for indexing and searching geo-temporal data stored in a data repository**. Geo-temporal data generally refers to data that includes both a geospatial component and a temporal component. The geospatial component may comprise one or more stored data values indicating a geographic location and the temporal component may comprise one or more values indicating a point in time or range of time. In general terms, in order to more efficiently process requests for geo-temporal data stored in a key-value data repository, a geo-temporal indexing structure is generated and managed in computer memory; for example, indexes may be stored on disk and cached in memory on demand. In an embodiment, the geo-temporal indexing structure is based in part on user input specifying one or more time sets or granularities that are likely to correspond to time ranges specified in user requests for the stored and indexed geo-temporal data."), 9:8-25 ("For the purposes of clearly illustrating how the functions described herein operate upon geo-temporal queries, the following sections describe an example graphical user interface display for specifying a geo-temporal query. However, the graphical user interface display described herein represents only a selected example of a visualization for the geo-temporal query operations that are described herein. **Thus, the disclosure broadly encompasses any method of creating and processing geo-temporal queries that are described herein**. In the following description, it will be assumed for the sake of illustration that the geo-temporal search functionality is provided by a combination of a search mechanism **113** and the data repository **111**. However, this is just one possible implementation. Other implementations where the search functionality is provided entirely be the data repository **111** or a combination of the data repository **111**, a search mechanism **113**, and one or more other system component(s) are also possible."),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00327

Claim 1	Prior Art
	Claim 1 ("**A computer-implemented method for indexing data items that are associated with a geospatial component and a temporal component, the computer implemented method comprising**…."), Fig. 3. FIG. 3 
[1.a]: storing a plurality of data items in a data aggregation	**Harris discloses or renders obvious this limitation. (Grounds 1-2)** **Harris discloses storing a plurality of data items in a data aggregation system** (*e.g.*, system including, *e.g.*, "data repository," "one or more adaptors"; *see* cl.12.a (mapping for storing data in an "integrated centralized property database,))**, each of the plurality of data items being associated with one or more geographic location identifiers of a particular geographic point on earth** (*see* cl.12.a.)**, wherein at least a portion of the plurality of data items stored in the data aggregation system are further associated with one or more time identifiers including one or**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00328

Claim 1	Prior Art
system,[9] each of the plurality of data items being associated with one or more geographic location identifiers of a particular geographic point on earth, wherein at least a portion of the plurality of data items stored in the data aggregation system are further associated with one or	**more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth** (*see* cl.12.a)**.** *See, e.g.*, EX1004, 5:9-12 ("data processing system comprises a data repository 111, one or more adaptors 103, and a search mechanism 113 with an interface 114").

[9] As discussed (*see* §VI.C), I understand that the claimed "data aggregation system" is a system that aggregates data from multiple distributed external data sources into a centralized database. EX1001, 1:48-62, 14:42-15:63, Fig. 6; EX1012, 2, 5-7, 10. Harris discloses this limitation. *See* cl.12.a. To the extent aggregating data is not required, the claims are broader and clearly met.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00329

Claim 1	Prior Art
more time identifiers including one or more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth;	
[1.b]: receiving, by at least one processor, a query regarding a geographic location and including time information;	**Harris discloses or renders obvious this limitation. (Grounds 1-2)** **Harris discloses receiving, by at least one processor** (*see* cl.12.b, cl.12.c)**, a query regarding a geographic location and including time information;** (*see* cl.12.c)**.**
[1.c]: retrieving, from the data aggregation system, data items having associated	**Harris discloses or renders obvious this limitation. (Grounds 1-2)**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00330

Claim 1	Prior Art
geographic location identifiers matching the received geographic location and having associated time identifiers matching the received time information; and	**Harris discloses retrieving, from the data aggregation system[10]** (*see* cl.12.d mapping "retrieve, from the integrated centralized property database"; the "integrated centralized property database" is part of a "data aggregation system" (*see* cl.1.a)), **data items having associated geographic location identifiers matching the received geographic location and having associated time identifiers matching the received time information; and** (*see* cl.12.d)**.**
[1.d]: outputting the	**Harris discloses or renders obvious this limitation. (Grounds 1-2)**

[10] Harris discloses retrieving data from its "data repository" (which is a component in Claim 1's "data aggregation system") and thus Harris discloses "retrieving[] from the data aggregation system." To the extent it is argued data must be retrieved by a user or user computer external to the data aggregation system, Harris expressly discloses a data analyst external to the data aggregation system retrieving data from its system (*see* EX1004, Fig.1 (stick figure "Data Analyst")) and also that its system "can send messages and receive data… through [] networks," EX1004, 13:28-30, and thus would have been accessible from a user computer system external to the data aggregation system.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00331

Claim 1	Prior Art
retrieved data items.	**Harris discloses outputting[11] the retrieved data items** (*see* cl.12.e)**.**

Claim 2	Prior Art
[2]: The method of claim 1, wherein the one or more geographic location identifiers include latitude and longitude coordinates of a surface of the earth.	**Harris discloses or renders obvious this limitation. (Grounds 1-2)** **Harris discloses the method of claim 1, wherein the one or more geographic location identifiers** (*see* cl.1) **include latitude and longitude coordinates of a surface of the earth** (*e.g.*, "values representing a geospatial component may include one or more numerical values specifying a longitude and latitude"; "values representing" or "specifying a latitude and longitude")**.** *See, e.g.*, EX1004, 1:21-37 ("One particular type of data that such organizations may often collect and analyze is geospatial data. Geospatial data generally represents any data that includes a geographical component and that associates the data with particular geographic locations or areas. For example, a crime enforcement agency may track data that corresponds to crime reports received within a particular city. One item of information stored in association with each crime report may include a geographical component indicating a location of the incident specified by the crime report. **An example data object representing each crime report may include values representing a longitude and latitude corresponding to the geographical location of the incident.** A data analyst with access to such data may then specify geospatial search requests such as, for example, a search request for crime reports associated with incidents within a specified geographical radius or within a four block perimeter."), 5:59-6:6 ("In this context, the term "input data" refers to data that is presented as input to the system. That is, data that is obtained

[11] "Outputting" includes providing the retrieved data items to a user via a graphical user interface, and thus Harris expressly discloses this limitation (*see* cl.12.e).

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00332

Claim 2	Prior Art
	by an adaptor 103 from a data source 101 for processing and possible input into the data repository 111. **The term 'geo-temporal data' refers to any input data that includes one or more values representing a geospatial component and one or more values representing a temporal component. For example, values representing a geospatial component may include one or more numerical values specifying a longitude and latitude or any other representation of a geographical location.** A temporal component includes one or more values specifying one or more points in time and may be specified, for example, by a character string or numerical value representing a midnight Coordinated Universal Time (UTC) value or any other representation of time values."), 6:58-7:4 ("In an embodiment, input data 102 that includes a geospatial component may be specified as geospatially searchable. For example, a user may configure parser 104 and/or importer 109 to identify particular data items of input data 102 as geospatially searchable data. In other embodiments, data items of input data 102 may be specified as geospatially searchable by default and without user input. **In general, geospatially searchable data may be searched using queries that specify one or more geographical search parameters such as, for example, latitude and longitude values that define a geographical area**. In an embodiment, input data 102 that includes a geospatial component and that is specified to be geospatially searchable is geospatially indexed in the data repository 111, as further described below."), 7:32-36 ("The one-dimensional representation may be a single numeric value and the multidimensional data representation may be numeric values representing a longitude and latitude corresponding to a geographic location.").

Claim 4	Prior Art
[4]: The method of claim 1,	**Harris discloses or renders obvious this limitation. (Grounds 1-2)**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00333

Claim 4	Prior Art
wherein the received geographic location includes a region on the earth.	**Harris discloses the method of claim 1** (*see* cl.1)**, wherein the received geographic location** (*see* cl.1. (citing cl.12.c)) **includes a region on the earth** (*e.g.*, "search for data objects associated with particular geographic regions"; "geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest")**.** *See, e.g.*, EX1004, 1:21-37 ("One particular type of data that such organizations may often collect and analyze is geospatial data. Geospatial data generally represents any data that includes a geographical component and that associates the data with particular geographic locations or areas. For example, a crime enforcement agency may track data that corresponds to crime reports received within a particular city. One item of information stored in association with each crime report may include a geographical component indicating a location of the incident specified by the crime report. An example data object representing each crime report may include values representing a longitude and latitude corresponding to the geographical location of the incident. **A data analyst with access to such data may then specify geospatial search requests such as, for example, a search request for crime reports associated with incidents within a specified geographical radius or within a four block perimeter**."), 4:44-59 ("Data sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data. Organizations would appreciate a way to efficiently analyze these collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest**. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, for example, a request for all activities **within a single city block**

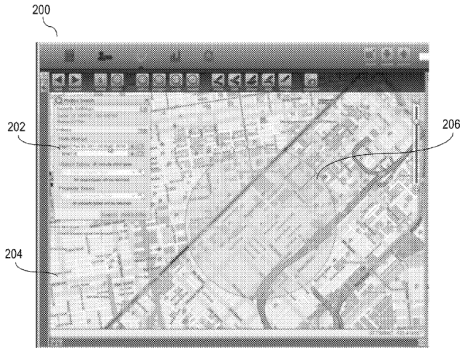
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00334

Claim 4	Prior Art
	within the past five years to all activities **within an entire city** within the past five hours."), 5:59-6:6 ("In this context, the term "input data" refers to data that is presented as input to the system. That is, data that is obtained by an adaptor 103 from a data source 101 for processing and possible input into the data repository 111. **The term 'geo-temporal data' refers to any input data that includes one or more values representing a geospatial component and one or more values representing a temporal component. For example, values representing a geospatial component may include one or more numerical values specifying a longitude and latitude or any other representation of a geographical location**. A temporal component includes one or more values specifying one or more points in time and may be specified, for example, by a character string or numerical value representing a midnight Coordinated Universal Time (UTC) value or any other representation of time values."), 6:58-7:4 ("In an embodiment, input data 102 that includes a geospatial component may be specified as geospatially searchable. For example, a user may configure parser 104 and/or importer 109 to identify particular data items of input data 102 as geospatially searchable data. In other embodiments, data items of input data 102 may be specified as geospatially searchable by default and without user input. **In general, geospatially searchable data may be searched using queries that specify one or more geographical search parameters such as, for example, latitude and longitude values that define a geographical area**. In an embodiment, input data 102 that includes a geospatial component and that is specified to be geospatially searchable is geospatially indexed in the data repository 111, as further described below."), 8:36-57 ("In general, the user-specified time granularities correspond to time granularities that are expected by the user or others to be specified in geo-temporal queries against the data as stored in data repository 111. **For example, an analyst involved**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00335

Claim 4	Prior Art
	in the importation of geo-temporal data may be aware that users often desire to search for data objects associated with particular geographic regions and that are associated with temporal components within particular year time spans and/or particular hour time spans. In the example, an analyst involved in the importation of data may specify temporal index configuration data indicating two time granularities for the geo-temporal input data: a year time granularity and an hour time granularity. For example, temporal index bucket group 112A in FIG. 1 may correspond to the index bucket group for the year time granularity and temporal index bucket group 112B may correspond to the index bucket group for the hour granularity. In the example, generated temporal index buckets of temporal index bucket group 112A may represent particular year timespans (e.g., 1978, 2002, 2009, 2012) and generated temporal index buckets of temporal index bucket group 112B may represent particular day timespans (e.g., Mar. 15, 1978; Jan. 10, 2009).”), 9:47-64 (“Interface component 204 illustrates a representation of a **geographical map that may be used to specify one or more desired geospatial bounding areas**. For example, bounding area 206 represents an example bounding area that a user may specify on the map using an input mechanism such as, for example, a mouse pointer to draw the bounding area on the map. In an embodiment, a specified bounding area such as **bounding area 206 defines a geographical area of interest to the user that will be specified as a geospatial search parameter in a resulting geo-temporal query**. For example, if a user was interested in stored data objects pertaining to a particular geographical area around the user’s home, the user may specify a **bounding area that includes both the geographical location of the user’s home and any surrounding area of interest** using interface component 204. In an embodiment, a bounding area may be defined using a number of shapes including, but not limited to, a radial or polygonal bounding area.”), Fig.2:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00336

Claim 4	Prior Art
	FIG. 2 

Claim 5	Prior Art
[5]: The method of claim 4, wherein the region on the earth is identified by multiple geocoded[12] locations, the multiple geocoded locations described in at least	**Harris discloses or renders obvious this limitation. (Grounds 1-2)** **Harris discloses the method of claim 4** (*see* cl.4)**, wherein the region on the earth** (*see* cl.4 (citing cl.1)) **is identified by multiple geocoded locations** (*e.g.*, "geospatially searchable data may be searched using queries that specify one or more geographical search parameters")**, the multiple geocoded locations described in at least latitude and longitude coordinates** (*e.g.*, "latitude and longitude values that define a geographical area")**.** *See, e.g.*, EX1004, 6:58-7:4 ("In an embodiment, input data 102 that includes a geospatial component may be specified as geospatially searchable. For example, a user may configure parser

[12] '648 confirms that geocoding information includes latitude, longitude, and/or Z-axis information. EX1001, 1:67-2:3 ("data items may be processed to determine or extract geocoding information, such as latitude, longitude and/or Z-axis information (i.e., height above or depth below the surface of the earth")).

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00337

Claim 5	Prior Art
latitude and longitude coordinates.	104 and/or importer 109 to identify particular data items of input data 102 as geospatially searchable data. In other embodiments, data items of input data 102 may be specified as geospatially searchable by default and without user input. **In general, geospatially searchable data may be searched using queries that specify one <u>or more</u> geographical search parameters such as, for example, latitude and longitude values that define a geographical area**. In an embodiment, input data 102 that includes a geospatial component and that is specified to be geospatially searchable is geospatially indexed in the data repository 111, as further described below."), 9:47-64 ("Interface component 204 illustrates a representation of a **geographical map that may be used to specify one <u>or more</u> desired geospatial bounding areas**. For example, bounding area 206 represents an example bounding area that a user may specify on the map using an input mechanism such as, for example, a mouse pointer to draw the bounding area on the map. In an embodiment, a specified bounding area such as bounding area 206 defines a geographical area of interest to the user that will be specified as a geospatial search parameter in a resulting geo-temporal query. For example, if a user was interested in stored data objects pertaining to a particular geographical area around the user's home, the user may specify a **bounding area that includes both the geographical location of the user's home and any surrounding area of interest** using interface component 204. In an embodiment, **a bounding area may be defined using a number of shapes** including, but not limited to, a radial or polygonal bounding area."), Cl.4.

Claim 6	Prior Art
[6]: The method of claim 1, wherein the time	**Harris discloses or renders obvious this limitation. (Grounds 1-2)** **Harris discloses the method of claim 1** (*see* cl.1)**, wherein the time information of the query includes one or more time**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00338

Claim 6	Prior Art
information of the query includes one or more time periods.	**periods** (*e.g.*, "temporal range of interest"; "specified temporal range"; "range of time values" specified by user as "temporal search parameters"; "query is received that specifies a temporal range"; "temporal search parameters corresponding to… time ranges of interest"; "query is received specifying a particular geospatial and a temporal range spanning the years 2008 and 2009"; *see* cl.15)**.** EX1004, 3:50-4:3 ("[R]equests for geo-temporal data indexed in a data repository are processed using one or more of the generated index bucket groups. For example, a geo-temporal request may be a query specifying one or more geospatial search parameters and one or more temporal search parameters. In an embodiment, a geo-temporal request for geo-temporal data indexed according to the methods described herein is transformed into one or more second requests against one or more temporal index buckets based on the temporal component specified in the request. For example, assume particular geo-temporal data includes data with temporal components associated with time values falling within each of the years 2000-2010 and is indexed according to a time granularity of years. The temporal index bucket group may then include a temporal index bucket for each of the years 2000, 2001, 2002, and so forth. **If a geo-temporal query is received specifying a particular geospatial and a temporal range spanning the years 2008 and 2009, the geo-temporal query may be transformed into separate queries against the 2008 and 2009 temporal index buckets**."), 9:65-10:14 ("In an embodiment, a user may additionally specify a temporal range of interest using graphical user interface 200. In an embodiment, a specified temporal range for a geo-temporal query may include one or more of a start date and/or time value and an end date and/or time value. Graphical interface component 202 illustrates an example interface component enabling a user to specify a temporal range as a search parameter. An interface component such as interface component 202 may include, among other input elements, one or more input elements for entering date and time values. For example, a user may enter one or more dates using text boxes, a calendar, or any other interface component for

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00339

Claim 6	Prior Art
	entering dates and/or time values. In addition to specifying a temporal range, interface component 202 may include one or more additional input parameters enabling the specification of one or more other search parameters, for example, a search string, a sort order, etc."), 9:38-46 ("In general, a search mechanism 113 receives as input a set of geo-temporal search parameters and provides as output a set of search results. FIG. 2 illustrates an example graphical user interface 200 that enables a user to specify a set of search parameters for a geo-temporal query. **Graphical user interface 200 includes interface components that enable a user to specify both a geospatial bounding area and a time value or range of time values as geospatial and temporal search parameters, respectively."**), 10:24-43 ("FIG. 4 illustrates a flow diagram of a process for carrying out a geo-temporal query in accordance with one or more of embodiments described herein. In an embodiment, a search query is received (block 400) that includes both a geospatial component and a temporal component. In response to receiving a query, one or more second queries are generated (block 402), with each of the second queries corresponding to a particular temporal index bucket of a temporal index bucket group. In an embodiment, the temporal index buckets are selected to correspond to the temporal component of the query. For example, assume that particular geo-temporal data has been indexed into a first temporal index bucket group based on a time granularity of years and a second temporal index bucket group based on a time granularity of days. **If a geo-temporal query is received that specifies a temporal range of Jan. 1, 2011 to Jan. 2, 2012, the system may transform the geo-temporal query into a second query against the bucket corresponding to the data year 2011 and two additional second queries corresponding to the days of Jan. 1, 2012 and Jan. 2, 2012**."), 4:44-59 ("Data sources 101 of an organization may generate and collect large amounts of data that includes geo-temporal data. Organizations would appreciate a way to efficiently analyze these

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00340

Claim 6	Prior Art
	collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry. **Information included in geo-temporal data may be requested in geo-temporal queries that specify one or more geospatial search parameters corresponding to geographical areas of interest and one or more temporal search parameters corresponding to points in time or time ranges of interest**. The geo-temporal information reflecting activities of interest may be as varied along the geospatial and temporal dimensions as, for example, a request for all activities within a single city block **within the past five years** to all activities within an entire city **within the past five hours**."), 10:59-11:19 ("[P]rocessing a geo-temporal query may include one more steps of post-filtering. As a result of the particular partitioning of the temporal index buckets, the result set returned by the one or more second queries may include one or more data items that are not within the exact temporal range specified by the geo-temporal query. In an embodiment, the search mechanism 113 may filter (block 406) the one or more results that are not within the specified temporal range. For example, assume that a geo-temporal index is created using a specified time granularity of an hour, resulting in a temporal index bucket group with one or more temporal index buckets of hour time ranges (e.g., 1:00 pm-2:00 pm, 2:00 pm-3:00 pm, 3:00 pm-4:00 pm, etc.). **An example geo-temporal query may then include a temporal search parameter specifying a time range on a particular day between 2:15 pm and 3:15 pm. In response to receiving the example geo-temporal query, the search mechanism 113 may transform the query into two queries that query the temporal index buckets that index data objects associated with a temporal value between the time ranges of 2:00 pm-3:00 pm and 3:00 pm-4:00 pm, respectively.** After retrieving any data objects from either or both of the two index buckets that satisfy any geospatial component of the query, search mechanism 113 may post-filter the data object results in order to filter any data objects that are associated with a temporal value outside of the range specified in the query, i.e., those data objects in the temporal ranges of 2:00 pm-2:14 pm and 3:16 pm-4:00 pm.").

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00341

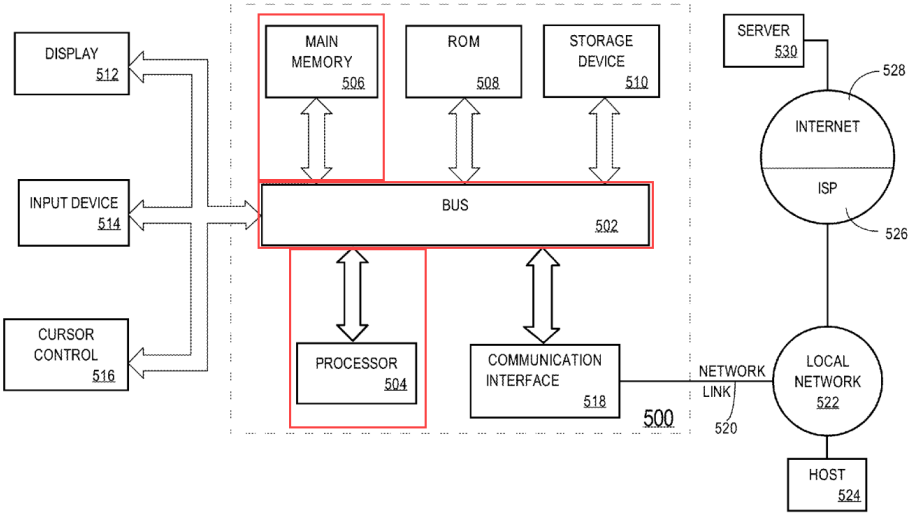
Claim 6	Prior Art

Claim 9	Prior Art
[9.pre]: A system, comprising:	**To the extent the preamble is limiting, Harris discloses or renders obvious the preamble. (Grounds 1-4)** **Harris discloses a system** (*see* cl.12.pre)**.**
[9.a]: a computer processor;	**Harris discloses or renders obvious this limitation. (Grounds 1-4)** **Harris discloses a computer processor** (*see* cl.12.b)**.**
[9.b]: a memory coupled to the processor; and	**Harris discloses or renders obvious this limitation. (Grounds 1-4)** **Harris discloses a memory coupled to the processor** (*e.g.*, "Bus 502 carries the data to main memory 506, from which processor 504 retrieves and executes the instructions"; "main memory… or other dynamic storage device, coupled to [the] bus… for storing information and instructions to be executed by [the] processor"; "Main Memory" coupled to "Processor" (*see* cl.12.b) via "Bus" (Fig.5); *see* cl.12.a)**.** *See, e.g.*, EX1004, 11:24-48 ("**According to one embodiment, the techniques described herein are implemented by one or more special-purpose computing devices**. The special-purpose computing devices may be hard-wired to perform the techniques, or may include digital electronic devices such as one or more application-specific integrated circuits (ASICs) or field programmable gate arrays (FPGAs) that are persistently programmed to perform the techniques, or may include one or more **general purpose hardware processors programmed to perform the techniques pursuant to program instructions in firmware, memory, other storage, or a combination**. Such special-purpose computing devices may also combine custom hard-wired logic, ASICs, or FPGAs with custom programming to accomplish the techniques. The special-purpose computing devices may be desktop computer systems, portable computer systems, handheld devices, networking devices or any other device that incorporates hard-wired and/or program logic to

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00342

Claim 9	Prior Art
	implement the techniques. For example, FIG. 5 is a block diagram that illustrates a computer system 500 upon which an embodiment may be implemented. **Computer system 500 includes a bus 502 or other communication mechanism for communicating information, and a hardware processor 504 coupled with bus 502 for processing information. Hardware processor 504 may be, for example, a general purpose microprocessor. Computer system 500 also includes a main memory 506, such as a random access memory (RAM) or other dynamic storage device, coupled to bus 502 for storing information and instructions to be executed by processor 504. Main memory 506 also may be used for storing temporary variables or other intermediate information during execution of instructions to be executed by processor 504. Such instructions, when stored in non-transitory storage media accessible to processor 504, render computer system 500 into a special-purpose machine that is customized to perform the operations specified in the instructions.** Computer system 500 further includes a read only memory (ROM) 508 or other static storage device coupled to bus 502 for storing static information and instructions for processor 504. A storage device 510, such as a magnetic disk, optical disk, or solid-state drive is provided and coupled to bus 502 for storing information and instructions."), 12:50-65 ("**Various forms of media may be involved in carrying one or more sequences of one or more instructions to processor 504 for execution.** For example, the instructions may initially be carried on a magnetic disk or solid-state drive of a remote computer. The remote computer can load the instructions into its dynamic memory and send the instructions over a telephone line using a modem. A modem local to computer system 500 can receive the data on the telephone line and use an infra-red transmitter to convert the data to an infra-red signal. An infra-red detector can receive the data carried in the infra-red signal and appropriate circuitry can place the data on bus 502. **Bus 502 carries the data to main memory 506, from which processor 504 retrieves and executes the instructions. The instructions received by main memory 506 may**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00343

Claim 9	Prior Art
	optionally be stored on storage device 510 either before or after execution by processor 504."), Fig.5: FIG. 5 
[9.c]: an integrated centralized property database, the processor being configured to:	**Harris discloses or renders obvious this limitation. (Grounds 1-2, 4)** **Harris discloses an integrated centralized property database** (*see* cl.12.a), **the processor being configured to** (*see* cl.12.b)**.** **Harris in view of Florance also renders obvious this limitation (Ground 3)** **Florance discloses property information** (*see* cl.12.a) stored in a "central real estate database."
[9.d]: [the processor configured to] receive from a user	**Harris discloses or renders obvious this limitation. (Grounds 1-4)** **Harris discloses the processor** (*see* cl.12.b-c) **receiving, from a user computer** (*see* cl.12.c)**, a query including a geographic**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00344

Claim 9	Prior Art
computer a query including a geographic location identifier, the	**location identifier**[13] (*see* cl.12.a, cl.12.c), **the geographic location identifier including one of a geocoded location and multiple geocoded locations identifying a polygon** (*e.g.*, "latitude and longitude values that define a geographical area"; "specify[ing] on the map" corners and/or edges forming "polygonal bounding area";[14] *see* cl.12.c[15])**.**

[13] *See* n.**Error! Bookmark not defined.**.

[14] POSITA would have understood that by, for example, drawing a polygonal bounding area on a map, a user, through the user computer, specifies geocoded locations to "define a geographical area of interest" and that these geolocations would include, *e.g.*, the latitudes and longitudes or the corners or edges of the bounding area, which the system uses "as a geospatial search parameter in a resulting geo-temporal query." EX1004, 6:65-7:1 ("queries that specify one or more geographical search parameters such as… latitude and longitude values that define a geographical area"), 9:47-64, 10:17-21 ("search mechanism may transform the user input received at graphical user interface 200 into a textual representation of the geo-temporal query that includes search parameters corresponding to the user input").

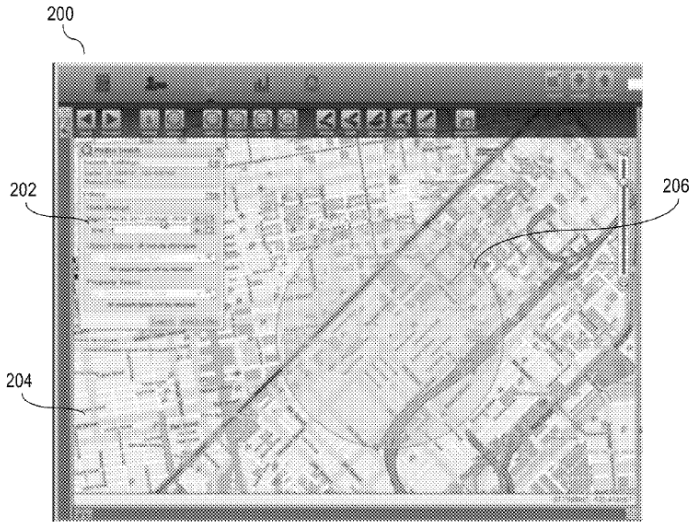
[15] Harris discloses this limitation for the same reasons given in cl.12.c. To the extent claim 9's received "geographic location identifier" is narrower than claim 12's received "geographic location," as shown, this limitation is expressly

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00345

Claim 9	Prior Art
geographic location identifier including one of a geocoded location and multiple geocoded locations identifying a polygon,	*See, e.g.*, EX1004, 6:58-7:4 ("In an embodiment, input data 102 that includes a geospatial component may be specified as geospatially searchable. **For example, a user may configure parser 104 and/or importer 109 to identify particular data items of input data 102 as geospatially searchable data**. In other embodiments, data items of input data 102 may be specified as geospatially searchable by default and without user input. In general, **geospatially searchable data may be searched using queries that specify one or more geographical search parameters such as, for example, latitude and longitude values that define a geographical area**. In an embodiment, input data 102 that includes a geospatial component and that is specified to be geospatially searchable is geospatially indexed in the data repository 111, as further described below."), 9:47-64 ("Interface component 204 illustrates a representation of a geographical map that may be used to **specify one or more desired geospatial bounding areas**. For example, bounding area 206 represents an example **bounding area that a user may specify on the map** using an input mechanism such as, for example, a mouse pointer to draw the bounding area on the map. In an embodiment, a specified bounding area such as ***bounding area 206 defines a geographical area of interest to the user that will be specified as a geospatial search parameter in a resulting geo-temporal query***. For example, if a user was interested in stored data objects pertaining to a particular geographical area around the user's home, the user may ***specify a bounding area*** that includes both the geographical location of the user's home and any surrounding area of interest using interface component 204. In an embodiment, ***a bounding area may be defined using a number of shapes including***, but not limited to, a radial or ***polygonal bounding area***."),

disclosed by Harris's "latitude and longitude values that define a geographical area." EX1004, 6:58-7:4.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00346

Claim 9	Prior Art
	Fig.2: 
[9.e]: [the processor configured to] receive from the user computer a time period identifier	**Harris discloses or renders obvious this limitation. (Grounds 1-4)** **Harris discloses the processor** (*see* cl.12.b) **receiving from the user computer** (*see* cl.12.c) **a time period identifier[16] including one or more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth** (*see* cl.12.c, cl.15)**.**

[16] Cl.12.c explains its "time information" is "indicative of the time history of an associated data item" and cl.9.e states "a time period identifier" includes "one or more time periods ***indicative of a time history of an associated data item***." Thus "time periods" "indicative of the time history of an associated data item," which Harris expressly discloses(*see* cl.12.c), also satisfy this limitation.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00347

Claim 9	Prior Art
including one or more time or time periods, indicative of a time history of an associated data item regarding the associated geographic point on earth,	
[9.f]: [the processor being configured to] retrieve	**Harris discloses or renders obvious this limitation. (Grounds 1-4)** **Harris discloses the processor** (*see* cl.12.b) **retrieving, from the integrated centralized property database, location data,[17] the**

[17] '648 claim 9 expressly states "location data" includes "data associated with the geographic location identifier of a geographic location on the earth." As discussed (*see* cl.12.a, cl.12.d), Harris expressly discloses storing and retrieving such data. To the extent it is argued "location data" includes only a geographic location identifier of a geographic location on the earth (*e.g.*, latitude and longitude), Harris also expressly discloses this, disclosing a stored "data object representing each crime report may ***include values representing a longitude and latitude*** corresponding to the geographical location of the incident," that its users submit queries "for crime reports associated with incidents within a specified geographical

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00348

Claim 9	Prior Art
from the integrated centralized property database location data, the location data including data associated with the geographic location identifier of a geographic location on the earth, and associated with the received time period identifier, and	**location data including data associated with the geographic location identifier of a geographic location on the earth** (*see* "having associated geographic location identifiers" in cl.12.d))**, and associated with the received time period identifier** (*see* "having associated time identifiers matching the received time information" in cl.12.d)**.**
[9.g]: [the processor configured to] provide the retrieved	**Harris discloses or renders obvious this limitation. (Grounds 1-4)**

radius," and that Harris's system retrieves and outputs these data (including location data) because Harris's system retrieves and outputs all results that "satisfy the geospatial [and temporal] component of the query." *E.g.*, EX1004, 1:30-37, 4:30-3 ("cell phone call records that are each associated with data values reflecting a particular geographic location of the cell phone"), 10:46-48.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00349

Claim 9	Prior Art
location data to the user computer via a graphical user interface.	**Harris discloses the processor** (*see* cl.12.b) **providing the retrieved location data[18] to the user computer via a graphical user interface** (*see* cl.12.e)**.**

Claim 10	Prior Art
[10.pre]: The system of claim 9, the processor further configured to:	**Harris in view of Florance renders obvious claim 10. (Ground 3)** **To the extent the preamble is limiting, Harris discloses or renders obvious the preamble. (Grounds 1-2, 4)** **Additionally, Harris in view of Florance renders obvious the preamble. (Ground 3)** **Harris discloses or renders obvious, or Harris in view of Florance renders obvious the system of claim 9, the processor further configured to:** (*see* cl.9)**.**
[10.a]: retrieve parcel information from the integrated centralized property database;	**Harris in view of Florance renders this limitation obvious. (Ground 3)** **Harris discloses or renders obvious, or Harris in view of Florance renders obvious the processor retrieving information from the integrated centralized property database** (*see* cl.9.c, cl.12.b)**.** **Florance further discloses parcel information[19]** (*e.g.*, "latitudes and longitudes associated with the property"; "who owns the

[18] *See* n.17.

[19] To the extent "property information" and "parcel information" (as required by cl.10.a) are different from one another in '648's claims, Florance expressly discloses both. *See* cl.12.a.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00350

Claim 10	Prior Art
	parcels around where the user is standing, who the tenants are, what the rent is, and what the sale points are"; "a record associated with the property [in] the real estate database… [which] can include, for example,… land use, lot size, building square footage, percent improved, stories, zoning, and total assessed value") stored in a "central real estate database." *See, e.g.*, EX1005, ¶0330 ("Linking position data to commercial information is also useful in contexts other than the mobile vehicle. The system could be used to transmit location sensitive real estate information to a user's PDA or laptop computer, for example. For example, PDA's such as those made by Palm™ will soon have both a OPS capability and a data transmission capacity. **Using the system of the present invention, information could be retrieved from the database of the present invention and displayed on the user's PDA or laptop computer based on the user's location**. The information can be stored locally with the user or transmitted to the user from a remote database. **For example, a user in Loudoun County investigating a property, looking at 5 or 6 adjoining parcels could have a Palm VII telling the user who owns the parcels around where the user is standing, who the tenants are, what the rent is, and what the sale points are**."), ¶0397 ("Under the location subheading, the Overview page lists the property's metro market, county, submarket, and zip code. **This section also provides the map book and page on which to find the property, the block/lot of the property, and the parcel number**. This section also provides an area for narrative comments about the location."), ¶0602 ("In response to the selection, in step 1306, a **record associated with the property** is retrieved from the **real estate database**. The record is populated with information retrieved from a public record. For example, the public record can be a tax assessment record. As another example, the public record can be retrieved from a private database of business information. **The information retrieved from the public record can include, for example, assessor parcel number, legal description, address,**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00351

Claim 10	Prior Art
	land use, lot size, building square footage, percent improved, stories, zoning, and total assessed value."), ¶611 ("The additional information can also include footprints of the property that indicate, for example, the latitudes and longitudes associated with the property and the property's offsets from the street."), ¶0619 ("FIG. 135 illustrates an exemplary method 1311 for geocoding a property, according to an embodiment of the present invention. The property would be associated with a geocode in a real estate database, for example. As shown, the method begins in step 1312 by electronically retrieving a public record of the property. This public record could be obtained by, for example, querying a public records database through a computer network (e.g. the Internet) or by downloading a group of public records from a public records database. The public records database could be provided by a government organization, such as those associated with construction permits, urban planning, zoning, or tax assessment. **The public record can contain property information such as address, owner, lessee(s), assessed value, purchase price, and assessor parcel number (APN).**"), ¶634 ("FIGS. 136-138 illustrate an exemplary dispatcher interface, according to an embodiment of the present invention. **The dispatcher interface displays information accessed from a central real estate database and indicates the properties in the vicinity of the field researcher that have been researched and those that require further investigation.** Optionally, the dispatcher interface also indicates the geographic position of the field researcher. The dispatcher interface provides significant quality control functions, including allowing the dispatcher to monitor whether the field researcher has missed updating relevant buildings."). POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's disclosed retrieval of information from an integrated centralized property database (performed by Harris's processor, *see*

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00352

Claim 10	Prior Art
	cl.12.b)—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial and temporal components (*e.g.*, EX1004, 4:7-33, Fig.1)—using, as one data source for retrieval, Florance's teachings of ***parcel information*** (which Florance also stores in a database). POSITA would have recognized that doing so would have advantageously made available for retrieval another useful type of data to Harris's (or Harris-Florance's) existing integrated centralized property database for retrieval in response to queries, thus increasing its usefulness to users performing geo-temporal searches as Harris expressly discloses—including to determine and display (output) to the user parcels associated with a geographic location identifier in the centralized database. Indeed, as Harris expressly discloses, "[o]rganizations would appreciate a way to efficiently analyze collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry." EX1004, 4:46-49. For example, Florance itself teaches that a database user "investigating a property" in some location and "looking at 5 or 6 adjoining parcels could" advantageously use a database including parcel information to "tell[] the user who owns the parcels around where the user is standing, who the tenants are, what the rent is, and what the sale points are." EX1005, ¶0330. For POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosures that its system uses multiple different types of geo-temporal data, *e.g.*, EX1004, 5:50-65, and Florance's express disclosure that its parcel information is stored in a database with both geo-spatial and temporal components and accessible based on, *e.g.*, location data, including to determine and display (output) to the user parcels associated with a geographic location identifier in the centralized database, *e.g.*, EX1005, ¶¶330, 397, 602, 619, 634) clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.[20]
[10.b]: compare the	**Harris in view of Florance renders this limitation obvious. (Ground 3)**

[20] *See* n.4.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00353

Claim 10	Prior Art
retrieved parcel information with the location data to determine parcels associated with the geographic location identifier; and	**Harris renders obvious the processor comparing retrieved information with the location data to determine information associated with the geographic location identifier** (*see* cl.9.f, cl.12.b, cl.12.d). **Florance discloses parcel information** (*see* cl.10.a) **and parcels** (*e.g.*, "assessor parcel number, legal description, address") **associated with a geographic location identifier** (*e.g.*, "[t]he property would be associated with a geocode in a real estate database")**.** *See, e.g.*, EX1005, ¶0330 ("Linking position data to commercial information is also useful in contexts other than the mobile vehicle. The system could be used to transmit location sensitive real estate information to a user's PDA or laptop computer, for example. For example, PDA's such as those made by Palm™ will soon have both a OPS capability and a data transmission capacity. **Using the system of the present invention, information could be retrieved from the database of the present invention and displayed on the user's PDA or laptop computer based on the user's location**. The information can be stored locally with the user or transmitted to the user from a remote database. **For example, a user in Loudoun County investigating a property, looking at 5 or 6 adjoining parcels could have a Palm VII telling the user who owns the parcels around where the user is standing, who the tenants are, what the rent is, and what the sale points are**."), ¶0397 ("Under the location subheading, the Overview page lists the property's metro market, county, submarket, and zip code. **This section also provides the map book and page on which to find the property, the block/lot of the property, and the parcel number**. This section also provides an area for narrative comments about the location."), ¶0619 ("**FIG. 135 illustrates an exemplary method 1311 for geocoding a property, according to an embodiment of the**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00354

Claim 10	Prior Art
	present invention. The property would be associated with a geocode in a real estate database, for example. As shown, the method begins in step 1312 by electronically retrieving a public record of the property. This public record could be obtained by, for example, querying a public records database through a computer network (e.g. the Internet) or by downloading a group of public records from a public records database. The public records database could be provided by a government organization, such as those associated with construction permits, urban planning, zoning, or tax assessment. **The public record can contain property information such as address, owner, lessee(s), assessed value, purchase price, and assessor parcel number (APN).**"). POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's disclosed querying (performed by Harris's processor) of multiple different types of data from disparate sources stored in Harris's (or Harris-Florance's) integrated centralized property database (including Florance's parcel information and parcels in the combined Harris-Florance system), and including multiple search parameters (*e.g.*, "***one or more other search parameters***, for example, a search string, a sort order, etc." EX1004, 10:13-14) to compare location data and parcel information retrieved in response to a query to determine parcels associated with the geographic location identifier of the query (*e.g.*, in response to a query requesting crimes that occurred at particular parcels within a geographic area, to output crimes and the parcels at which they occurred). Harris expressly discloses, *e.g.*, that "[d]ata analysts and other computer users often interact with and request data from computer-based databases containing large collections of data objects" from many organizations, for example, making "a search request for crime reports associated with incidents within a specified geographical radius" or many other types of data. EX1004, 1:13-17, 1:35-37, 3:1-6 ("bank transaction records, phone call records"), 4:24-25 ("using a key card to gain access to a building"), 4:30-32 ("cell phone call records… associated with data values reflecting a particular geographic location"). And Florance expressly discloses users beneficially searching for other

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00355

Claim 10	Prior Art
	types of information, including parcel information, such as "a user… investigating a property, looking at 5 or 6 adjoining parcels could" query, *e.g.*, "who owns the parcels around where the user are standing" and querying "the block/lot of the property and the parcel number." EX1005, ¶¶330, 397. POSITA would thus have understood users beneficially query the Harris-Florance system across the various types of information it stores, and would have found it obvious to do so across the various types of information in the combined Harris-Florance system (containing parcel information as well as, for example, crime information). Harris also discloses that in response to queries, all data items satisfying the geospatial and temporal aspects of the query are retrieved. *E.g.*, EX1004, 10:44-58. POSITA would have thus have understood that in response to a user query seeking, *e.g.*, information as to crimes within a certain geographic search area and the parcels at which they occurred, Harris-Florance would have retrieved from its data repository all data items "representing a longitude and latitude corresponding to the geographical location of… incident[s]" within that geographic search area and further retrieved parcel information (*e.g.*, based on "latitudes and longitudes associated with the property") within that geographic search area. To determine and output, from within this larger group of retrieved data, those parcels associated with the latitudes/longitudes of the incidents (as requested by the user query), POSITA would have found it obvious, advantageous, and straightforward to use well-known database operations to compare the retrieved parcel information with the location data concerning the incidents, such as "spatial join" (which would have been performed by Harris's processor)—which was a well-known operation that compares different, disparate data sets each having spatial attributes (*e.g.*, longitude/latitude) stored in, *e.g.*, database tables (such as Harris's expressly disclosed database tables ("other forms of data output may be used such as… storing in database tables," EX1004, 9:35-37)) to determine whether there is any overlap in those data sets and determine whether any crimes occurred at longitudes/latitudes matching longitudes/latitudes associated with parcels stored in Harris's database**,** and output the requested results of that comparison, *i.e.*, parcel(s) associated with the location(s) at which any incidents occurred (*e.g.*, the assessor

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00356

Claim 10	Prior Art
	parcel number, legal description, and/or address). EX1008, 5. For POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosure of querying data with spatial attributes obtained from "disparate" sources, EX1004, 3:1-6, using multiple search parameters, EX1004, 10:13-14**,** storing results in database tables, EX1004, 9:35-37, and outputting the specific results requested by users and Florance's express disclosures of beneficially querying and identifying parcels associated with a particular location, EX1005, ¶330), clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.[21] As discussed (*see* cl.10.a), POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's disclosed retrieval of information from an integrated centralized property database—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial and temporal components (*e.g.*, EX1004, 4:7-33, Fig.1)—using, as one data source, Florance's teachings of ***parcel information*** and further using parcels associated with a geographic location identifier (which Florance also stores in a database). And as discussed (*see* cl.10.a), for POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosures that its system uses multiple different types of geo-temporal data, *e.g.*, EX1004, 5:50-65 and Florance's express disclosures that its parcel information and parcels are stored in a database with both geo-spatial and temporal components and accessible based on, *e.g.*, location data, including to compare location data with parcel information to determine and display (output) to the user parcels associated with a geographic location identifier in the database, *e.g.*, EX1005, ¶¶330, 397, 602, 619, 634) clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.

[21] *See* n.4.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00357

Claim 10	Prior Art
[10.c]: output the parcels associated with the geographic location identifier.	**Harris in view of Florance renders this limitation obvious. (Ground 3)** **Harris discloses the processor outputting information associated with the geographic location identifier** (*see* cl.9.g, cl.12.b)**.** **Florance discloses parcels associated with a geographic location identifier** (*see* cl.10.b)**.** As discussed (*see* cl.10.a, cl.10.b), POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's (or Harris-Florance's) disclosed retrieval of information from an integrated centralized property database using Florance's teachings of parcel information and parcels to determine and display (output) to the user parcels associated with a geographic location identifier in the database. And as discussed (*see* cl.10.a, cl.10.b), for POSITA, this would have been an obvious, routine implementation choice and clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.

Claim 11	Prior Art
[11.pre]: The system of claim 10, the processor further configured to:	**Harris in view of Florance and Salvagio renders obvious claim 11. (Ground 4)** **To the extent the preamble is limiting, Harris in view of Florance renders it obvious. (Ground 3)** **Harris in view of Florance render obvious the system of claim 10, the processor further configured to:** (*see* cl.10)**.**
[11.a]: retrieve insurance policy information from the	**Harris in view of Florance and Salvagio render this limitation obvious. (Ground 4)** **Harris discloses or renders obvious, or Harris in view of Florance renders obvious the processor retrieving**

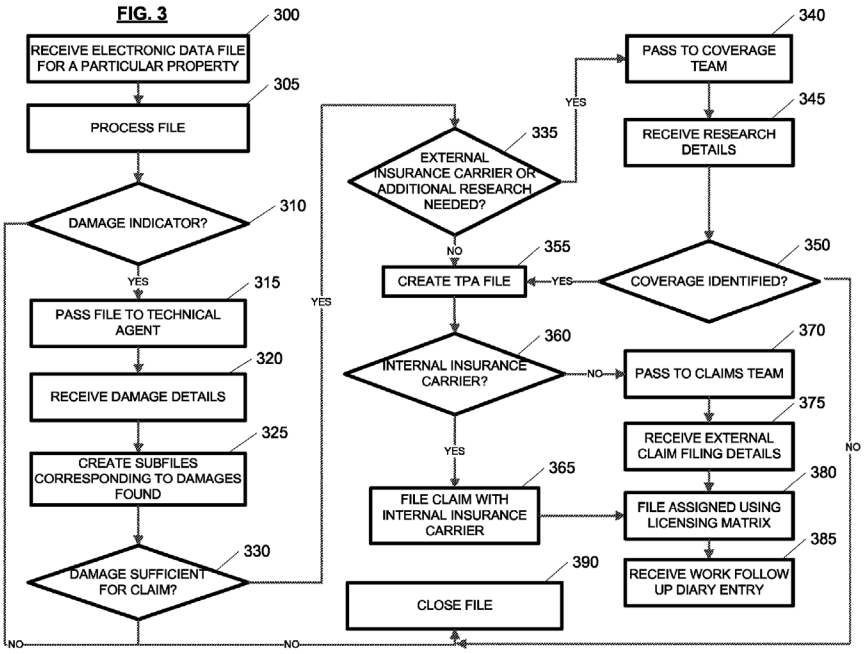
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00358

Claim 11	Prior Art
integrated centralized property database;	**information from the integrated centralized property database** (*see* cl.9.c, cl.9.f, cl.12.b)**.** **Salvagio discloses insurance policy information** (*e.g.*, "insurance carrier,… the effective date of insurance, the maximum amount of coverage under the policy, the person who procured the insurance, the expiration date of the policy, and the like"; "insurance information") in a "property database." *See, e.g.*, EX1006, Abstract ("A method, computer-readable medium, and apparatus by which a user may access **information about one or more properties** may be **used by an insurance provider or claims administrator** to provide an information portal to its clients. User input identifying one or more foreclosed properties may be received. Then, property data may be retrieved from a **property database**, and the property data may include property damage information and insurance claim information for each of the identified properties. Then, based on the retrieved property data, it may be determined whether an identified property is damaged and whether an insurance claim was filed. Subsequently, information corresponding to the identified property may be displayed, and this information may include a damage indicator and an insurance claim status indicator."). 6:5-19 ("FIG. 3 illustrates a method of processing an insurance claim. At step 300, server 204 (as shown illustratively in FIG. 2) may receive property-specific information from a field service agency or company. The property-specific information, which may be part of an electronic data file, may include a description of the property, the current location of the property, notes entered by an inspector who has inspected the property, and the like. **At step 305, server 204 may process the received file by adding insurance information which may cover the property. For instance, the server 204 may determine and add information such as the insurance carrier, insurance policy number, the effective date of insurance, the maximum amount of coverage under the policy, the person who procured the insurance, the expiration date of the policy, and the like**."),

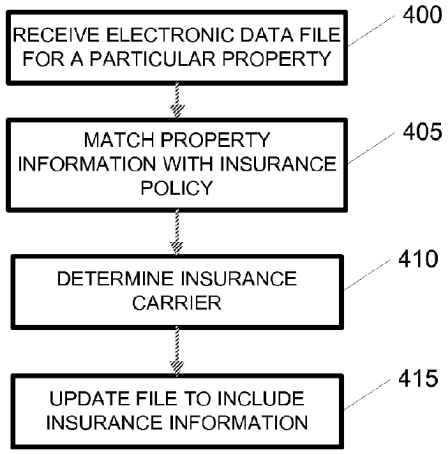
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00359

Claim 11	Prior Art
	8:8-18 ("FIG. 4 illustrates a method of preparing an insurance file. **At step 400, the server, e.g., server 204, may receive an electronic data file for a particular property. The server may determine the corresponding insurance policy at step 405. For example, the server may match information provided in the data file and the insurance policy such as a property address, property owner, and the like. At step 410, the server may determine an insurance carrier based on the insurance policy information. At step 415, the server may update the electronic data file to include the insurance information including the insurance carrier and the like.**"), 10:48-63 ("In step 1205, user input identifying one or more properties may be received. The **user input may include, for example, a street address, city, state, ZIP code**, a loan number, a work order number, a claim number, a borrower first name, and/or a borrower last name. In step 1210, **one or more databases may be searched based on the user input** received in step 1205. In step 1215, **information corresponding to each of the one or more properties found in the search may be displayed**, enabling the user to access and view the results of the searching step 1210. The information displayed in step 1215 may include a record number, a loan number, an address, a borrower's name, a work order number, a report date, a sub-file number, a loss type indicator, a status indicator, a number of claims, a dispute indicator, and/or a claim amount paid. The information displayed in step 1215 may also include other information, as further described below."), 11:17-25 ("Determining whether a property identified by the user input is damaged may include, for example, searching a database based on the user input, locating and retrieving records about the property (and/or other properties), and determining, based on those records, whether property damage information indicates that the property is damaged. The searching of the database and retrieving of records may be based on a database query."), 11:63-64 ("database in which property information is stored"),

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00360

Claim 11	Prior Art
	cl.1 ("maintaining a **property database** at an information portal server, the property database containing property-specific information for one or more foreclosed properties"), cl.7 ("maintaining a property database, the property database containing property-specific information for one or more foreclosed properties"), Fig. 3 (including "PROCESS FILE" step 305)  Fig.4:

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00361

Claim 11	Prior Art
	FIG. 4  As discussed (*see* cl.10.a), POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris's disclosed retrieval of information from an integrated centralized property database—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial and temporal components (*e.g.*, EX1004, 4:7-33, Fig.1)—using, as one data source, Florance's teachings of ***parcel information*** (which Florance also stores in a database). POSITA would further have been motivated and found it obvious, straightforward, and advantageous to implement the resulting Harris-Florance combination's retrieval of information from Harris's (or Harris-Florance's) integrated centralized property database—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial and temporal components (*e.g.*, EX1004, 4:7-33, Fig.1)—using, as one data source, Salvagio's teachings of ***insurance policy information*** (which Salvagio stores in a database). POSITA would have recognized that doing so would have advantageously added another useful type of data to Harris-Florance's existing integrated centralized property database, thus increasing its usefulness to users performing geo-temporal searches as Harris expressly discloses—including to determine and display (output) to the user insurance policies associated with a geographic location identifier in the centralized database. Indeed, as Harris expressly discloses,

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00362

Claim 11	Prior Art
	"[o]rganizations would appreciate a way to efficiently analyze collections of data including geo-temporal data to quickly identify information of interest or information pertinent to a line of inquiry." EX1004, 4:46-49. For example, Salvagio itself discloses it is desirable to "avoid wasting… time and resources" in retrieving insurance information as part of, *e.g.*, a claims process. EX1006, 1:56-62. For POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosures that its system uses multiple different types of geo-temporal data, *e.g.*, EX1004, 5:50-65 and Salvagio's express disclosures that its data has geo-spatial components accessible based on, *e.g.*, location data, including to determine and display (output) to the user insurance policies associated with a geographic location identifier in the database, *e.g.*, EX1006, Abstract, 6:5-19, 8:8-18, 10:48-63) clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.[22]
[11.b]: compare the retrieved insurance policy information with the parcels associated with the geographic location identifier to determine the insurance policies associated with the	**Harris in view of Florance and Salvagio render this limitation obvious. (Ground 4)** **Harris renders obvious the processor comparing retrieved information with the geographic location identifier to determine information associated with the geographic location identifier** (*see* cl.9.f, cl.12.b)**.** **Florance discloses parcels associated with a geographic location identifier** (*see* cl.10.b)**.** **Salvagio discloses insurance policy information** (*see* cl.11.a) **and insurance policies** (*e.g.*, "insurance policy"; "policy number") **associated with a geographic location identifier** (*e.g.*, "particular property" identified by, *e.g.*, "street address…, city…, state…, [and] a ZIP code")**.**

[22] *See* n.4.

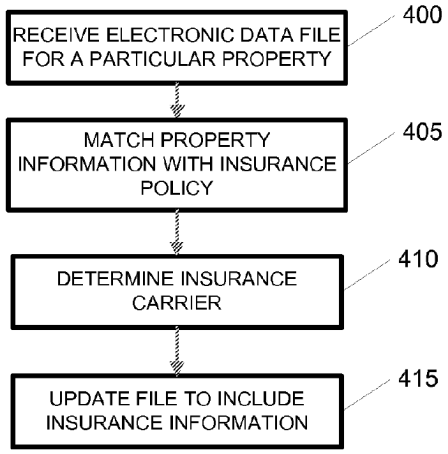
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00363

Claim 11	Prior Art
geographic location identifier; and	*See, e.g.*, EX1006, 6:5-19 (**"**FIG. 3 illustrates a method of processing an insurance claim. **At step 300, server 204 (as shown illustratively in FIG. 2) may receive property-specific information from a field service agency or company. The property-specific information, which may be part of an electronic data file, may include a description of the property, the current location of the property**, notes entered by an inspector who has inspected the property, and the like. At step 305, server 204 may **process the received file by adding insurance information which may cover the property. For instance, the server 204 may determine and add information such as the insurance carrier, insurance policy number**, the effective date of insurance, the maximum amount of coverage under the policy, the person who procured the insurance, the expiration date of the policy, and the like."), 8:8-18 ("FIG. 4 illustrates a method of preparing an insurance file. **At step 400, the server, e.g., server 204, may receive an electronic data file for a particular property.… At step 415, the server may update the electronic data file to include the insurance information including the insurance carrier and the like.**"), 9:6-27 (**"**FIG. 7 illustrates a claims summary file. **Interface 700 may display file information. In one aspect, the claims summary file may contain, where applicable,** general information regarding the servicing of the file (e.g., file number, claim status, file creation date, claims team agent assigned to the file, and the like), **property information (e.g., access info, location of property, and the like), loss information (e.g., subfile number, cause of loss, description of damaged property, date of loss, inspection date and the like) as shown in block 705. In addition, the claims summary file may include lender information (e.g., loan number, lender date, lender contact information), insurance information (e.g., carrier name, carrier contact information), policy information (e.g., policy number, policy effective date, coverage amount, damage threshold, deductible amount), claim information (e.g., date the claim was filed, status of claim, whether claim is**

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00364

Claim 11	Prior Art
	disputed, estimate of claim). Where applicable, the claims summary file may also allow the input of information relating to any payments made on the claim or any other activities to be performed (e.g., scheduled follow-up). In addition, block 705 may include a query button selectable by an agent desiring to view claims summary block 715 and 725."), 11:11-32 ("In step 1230, **user input identifying one or more properties may be received. The user input may include, for example, a street address, city, state, ZIP code**, a loan number, a work order number, a claim number, a borrower first name, and/or a borrower last name. In step 1235, it may be determined, based on property damage information, whether a property identified by the user input in step 1230 is damaged. Determining whether a property identified by the user input is damaged may include, for example, searching a database based on the user input, locating and retrieving records about the property (and/or other properties), and determining, based on those records, whether property damage information indicates that the property is damaged. The searching of the database and retrieving of records may be based on a database query. In one or more configurations, the property damage information may indicate the extent of the damage, the estimated cost of repair, and the like. For example, the property damage information may indicate that the property is "lightly damaged", "moderately damaged", or "severely damaged"; or, the property damage information may indicate that the property has an amount of damage expressed in terms of monetary value (e.g., "$12,000.00 of Damage").), 11:33-48 ("In step 1240, it may be determined, based on insurance claim information, whether an insurance claim was filed with respect to the property and/or the damage thereto. **Determining whether an insurance claim was filed may include, for example, searching a database based on the user input, locating and retrieving records about the property (and/or other properties), and determining, based on those records, whether insurance claim information indicates that an insurance claim has been filed**. It is contemplated that in certain configurations, the property damage information may indicate that

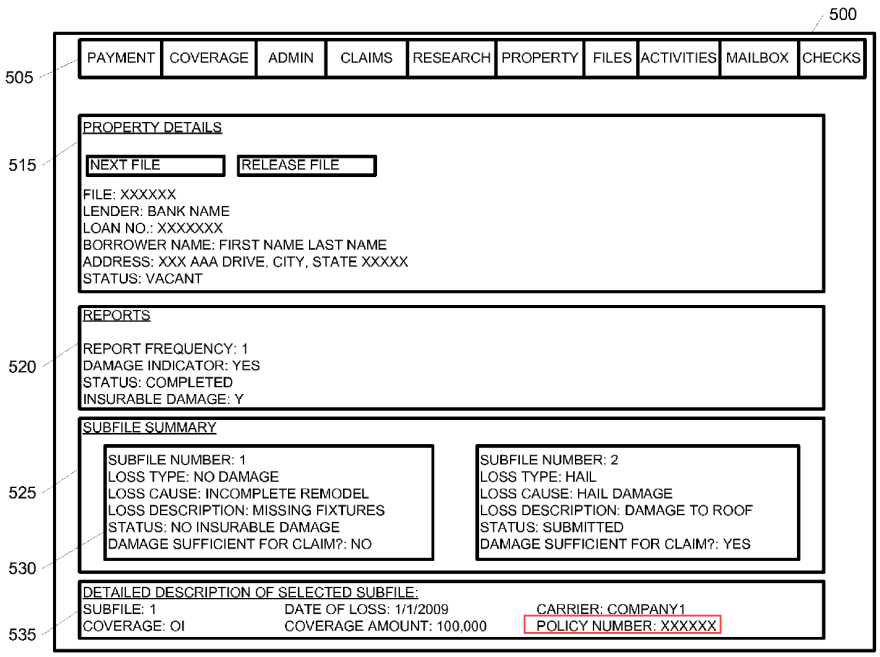
Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00365

Claim 11	Prior Art
	a property is damaged, while the insurance claim information may indicate that no insurance claim has been filed. For example, a property in foreclosure may have been damaged, but because the extent of the damage is lower than a deductible amount of a relevant insurance policy, no insurance claim was filed under that insurance policy.”). Figs.4 (showing “Insurance Policy”), 5-7 (showing “Policy Number”): **FIG. 4** 

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00366

Claim 11	Prior Art

FIG. 5



As discussed (cl.10.b), POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement the combined Harris-Florance system to compare retrieved location information with retrieved parcel information to, *e.g.*, determine and output parcels at which crimes or other incidents occurred. For the reasons discussed in claim 10, POSITA would have understood that in response to a user query (by, *e.g.*, "an insurance provider or claims administrator," EX1006, Abstract) seeking certain types of information, *e.g.*, crimes and the parcels at which they occurred as well as insurance information concerning those parcels (*e.g.*, to "file insurance claims," "receive a determination of coverage," "determine damage," and/or "track… insurance claims" as expressly taught in Salvagio (EX1006, 2:26-30)), Harris-Florance-Salvagio would have retrieved from its data repository all data items regarding the location of those incidents, parcel information, and insurance policy information within that geographic search area. POSITA would have further been motivated and found it obvious, straightforward, and advantageous to implement the combined Harris-Florance system using Salvagio's disclosed data including insurance policy information and insurance policies (each

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00367

Claim 11	Prior Art
	associated with a geographic location identifier) to compare—in response to a user query of Harris's multiple, disparate data sets further seeking insurance policies associated with parcels at which crimes or other incidents have occurred (*see* cl.10.b)—retrieved insurance policy information associated with a particular property with the parcels at which such incidents occurred to determine and output insurance policies associated with those properties. This would have advantageously enabled a user of the combined system who is concerned with crimes occurring within particular parcels (*see* cl.10) to, *e.g.*, "receive a determination of coverage," "file insurance claims," "determine damage," and/or "track… insurance claims" as to crimes in such parcels using the combined database, as expressly discussed in Salvagio. EX1006, 2:26-30, 2:46-50. To determine and output insurance policies associated with the geographic location identifier, POSITA would have found it obvious, advantageous, and straightforward to use well-known database operations, such as "join" (which would have been performed by Harris's processor), EX1015, 1—a well-known operation that compares different, disparate data sets based on something other than spatial attributes (such as address or parcel number, as opposed to latitude/longitude)—on data stored in, *e.g.*, database tables (Harris's expressly disclosed database tables, EX1004, 9:35-37)) to compare the retrieved insurance policy information with the parcels associated with the incidents (*see* cl.10) to determine whether there is any overlap in those data sets and determine and output any insurance policies associated with the geographic location identifier associated with such parcels. For POSITA, this would have been an obvious, routine implementation choice and clear this would work, predictably yielding the expected functionality with a reasonable expectation of success. As also discussed above (cl.11.a) POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement the Harris-Florance combination's retrieval of information (performed by Harris's processor, *see* cl.12b) from Harris's (or Harris-Florance's) integrated centralized property database—formed from data sources including, *e.g.*, "databases" of information with both geo-spatial and temporal

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00368

Claim 11	Prior Art
	components (*e.g.*, EX1004, 4:7-33, Fig.1)—using, as one data source, Salvagio's teachings of ***insurance policy information and insurance policies*** (which Salvagio also stores in a database). For POSITA, this would have been an obvious, routine implementation choice and (particularly given Harris's express disclosures that its system uses multiple different types of geo-temporal data, *e.g.*, EX1004, 5:50-65 and Salvagio's express disclosures that its data has geo-spatial components accessible based on, *e.g.*, location data, including to determine and display (output) to the user insurance policies associated with a geographic location identifier in the database, *e.g.*, EX1006, Abstract, 6:5-19, 8:8-18, 10:48-63) clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.
[11.c]: output the insurance policies associated with the geographic location identifier.	**Harris in view of Salvagio renders this limitation obvious. (Ground 4)** **Harris discloses the processor outputting data associated with the geographic location identifier** (*see* cl.9.g, cl.12.b)**.** **Salvagio discloses insurance policies associated with a geographic location identifier** (*see* cl.11.b)**.** As discussed above (cl.11.a, cl.11.b) POSITA would have been motivated and found it obvious, straightforward, and advantageous to implement Harris-Florance's disclosed retrieval of information (performed by Harris's processor, *see* cl.12b) from an integrated centralized property database using Salvagio's teachings of ***insurance policy information***. And as discussed (*see* cl.11.a, 11.b), for POSITA, this would have been an obvious, routine implementation choice and clear this would work, predictably yielding the expected functionality with a reasonable expectation of success.

Nearmap US Exhibit 1003
Nearmap US, Inc. v. Eagle View Techs., Inc.
IPR2024-00716
Page 00369