UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

BMW OF NORTH AMERICA, LLC,

Petitioner,

v.

NORTHSTAR SYSTEMS LLC,

Patent Owner.

Patent No. 8,032,297
Filing Date: May 8, 2008
Issue Date: October 4, 2011

Inventor: Gabriel Jakobson
Title: METHOD AND SYSTEM FOR DISPLAYING NAVIGATION INFORMATION ON AN ELECTRONIC MAP

---

# DECLARATION OF DR. OMID KIA

Case No. IPR2023-00890

---

I, Dr. Omid Kia, declare as follows:

## I. BACKGROUND AND QUALIFICATIONS

1. The details of my education, work experience, and research are summarized in my curriculum vitae ("CV") which is attached to this Report as **Exhibit A**. I have summarized some of the relevant information about my experience and qualifications below.

2. I have over 25 years of experience in design and development of imaging systems for various purposes including consumer, video, medical, and portable imaging systems amongst many other modalities. My experience includes design and development of systems for visualization, among many other concepts, including remote sensing and surveillance systems that require registration to map services, such as Geospatial Information Systems (GIS), and various algorithms intended for understanding of the visualized effects.

3. As for my educational background, I earned my Bachelor of Science in electrical engineering from Catholic University America in 1987. In 1989, I completed my Master of Science in electrical engineering from the University of Illinois at Chicago. I then attended the University of Maryland at College Park, where I earned my Ph.D. in electrical engineering in 1997.

4. A chief focus of my career has been designing and developing imaging systems for medical and other uses, considering all aspects of the user, patient and

system components, including the requisite hardware, software, and user-facing system elements. My experience in this space spans industry and academia. For example, after I completed my Ph.D., I took the position of Chief Technical Officer at IMACOM in 1999. In this role, I managed a team of engineers in developing medical imaging software – including both ultrasound and X-ray imaging applications. On the software side of this work, my role involved creating custom software applications and integrating custom graphical user interfaces to meet customer demands. For example, I have designed algorithms where the user interface exploits the underlying information by interacting with the user interface implemented in desktop, server and mobile environments.

5. I left IMACOM in 2001 and have spent much of the last 20 years consulting in the imaging space, with a heavy focus on software applications, including graphical user interfaces. For example, in my role as President and Principal Consultant at Sigma Vision from 2000 to 2002, I was responsible for the full software development cycle, including user interface design, for imaging products. Similarly, in my role as Chief Scientist at Imaging Sciences International from 2004 to 2009, I managed all technical directives falling under digital imaging, including for various medical imaging products the related software user interface development. Today I maintain an active consulting practice with Coastal Communication Consultants Inc., where I provide subject matter expertise on all

aspects of software development, design, and implementation as it pertains to image-based analysis, including remote sensing and surveillance.

6. With respect to the subject matter of the patents considered in this Declaration, the following are additional technically relevant aspects of my experience in design and development of systems that require a user interface with visualization of a generated image along with information related to various aspects of the image. In my role as a technical leader in the general field of Computer Vision, I researched and analyzed a number of problem areas related to remote sensing and surveillance where image registration to a base map was necessary. In these areas, I routinely designed estimation and detection algorithms for target tracking, occlusion analysis, material classification and scene characterization. In some aspects of the research and development the information regarding locations on the map was used for calibration, orthorectification, data fusion and user defined needs. Most of my work has revolved around very specific algorithms that can exploit or tease out certain elements of what is being visualized and, thus, many of the interfaces that I have created have utilized innovative techniques for exploitation of data that goes beyond simple graphical user interfaces.

7. All of these development efforts required analysis of the user workflow with imaging and visualization requirements to implement a context dependent processing flow. I also developed a variety of graphical image overlays for various

purposes such as textual and graphical annotations, measurements (point, linear and volume measurements), targeting, temporal processing and highlighting of hidden features. I also designed and developed a number of image merging, mosaicking, stabilizing and assortment of image content analysis delivered to the user based on either automatic or with user driven interfaces. My various experiences designing and developing graphical user interfaces included utilization of image data as live, static or video types of data.

8. This Declaration contains statements of my opinions formed to date and the bases and reasons for those opinions. I may offer additional opinions based on further review of the materials in this proceeding, including opinions and/or testimony of other expert witnesses.

## II. MATERIALS CONSIDERED

9. The materials I considered include the ’297 Patent and the prosecution history for the ’297 Patent and its related patents. I also considered the materials that I refer to and that I cite in this Declaration.

10. I also considered all papers and exhibits filed in IPR2023-00890 including the Petition (“Pet.”) and the Declaration of Dr. Rosenberg.

11. I have also considered the Board’s Decision on Institution (IPR2023-00890, Paper 11) (“Inst.”) in this proceeding.

12. I have also considered any exhibits attached to the Patent Owner's Response in this proceeding, including the deposition transcript of Dr. Rosenberg.

13. In addition, I have drawn on my experience and knowledge, as discussed above and described more fully in my CV.

## III. LEGAL PRINCIPLES

14. I understand that a patent claim is unpatentable as "obvious" if the subject matter of the claim as a whole would have been obvious to a person of ordinary skill in the art as of the time of the invention at issue.

15. I understand that the use of the "person of ordinary skill" rubric is to prevent one from improperly, in the present day, using hindsight to decide whether a claim is obvious.

16. I understand that the following factors must be evaluated to determine whether the claimed subject matter is obvious: (1) the scope and content of the prior art; (2) the difference or differences, if any, between the scope of the patent claim and the scope of the prior art; and (3) the level of ordinary skill in the art at the time of the invention.

17. I understand that, unlike anticipation, which allows consideration of only one item of prior art, obviousness may be shown by considering more than one item of prior art. I understand that, when considering a combination of prior art references as part of an obviousness analysis, it can be important to ascertain if the

references are from the same field of endeavor and also to ascertain whether there is any reason that would have prompted a person of ordinary skill in the relevant art to combine the elements in the way the claim does. In other words, a claim generally cannot be rendered obvious by combining (i) art from across different fields, including outside the field of the claimed invention, or (ii) art that itself teaches away from combination with other art that would otherwise provide its missing limitations, or (iii) art for which there is not at least an articulable, common sense reason to bridge the gap between its disclosure and the claim at issue.

18. Moreover, I understand that so-called "objective indicia of nonobviousness," also known as "secondary considerations," are also to be considered when assessing obviousness. I understand that this objective evidence includes at least: the commercial success of the invention; the long felt but unresolved need to develop the invention; any praise of the invention in the market; and copying by others. I also understand that evidence of objective indicia of non-obviousness must be commensurate in scope with the claimed subject matter; *i.e.*, that there must be a nexus or connection between the criteria and the claim itself.

19. I understand that the disclosure of an asserted prior art reference must provide an enabling disclosure of the desired subject matter and that mere naming or description of the subject matter is insufficient; to be enabling, I understand that it must be able to be produced without undue experimentation.

20. I understand that I must construe a claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and consistent with the prosecution history pertaining to the patent.

## IV. LEVEL OF ORDINARY SKILL IN THE ART

26. I understand that I should perform my analysis from the viewpoint of a person of ordinary skill in the art. I understand that this hypothetical person of ordinary skill in the art is considered to have the normal skills of a person in a certain technical field. I understand that factors that may be considered in determining the level of ordinary skill in the art include: (1) the education level of the inventor; (2) the types of problems encountered in the art; (3) the prior art solutions to those problems; (4) rapidity with which innovations are made; (5) the sophistication of the technology; and (6) the education level of active workers in the field.

27. I have reviewed the proposed level of skill in the art set forth by the Board in the Institution Decision, and to which I agree, and have adopted it for my analysis here. More specifically, I have applied a POSITA that would have had at least a Bachelor degree in Computer or Electrical Engineering, or equivalent engineering discipline, and approximately three years' experience in telecommunications, navigation, or geolocation systems. Additional education could substitute for professional experience, and significant work experience could substitute for formal education.

28. My qualifications and experience exceed those of a person of ordinary skill in the art. Nonetheless, my analysis and opinions herein regarding the ’297 Patent are given from the perspective of a person of ordinary skill in the art.

## V. CLAIM CONSTRUCTION

29. I have been informed by counsel that, for purposes of my analysis in this *inter partes* review proceeding, claim terms should be given their ordinary and customary meaning within the context of the patent in which the terms are used, *i.e.*, the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention in light of what the patent teaches, unless it appears that the inventors were using them to mean something else. Additionally, the specification and prosecution history must be consulted to confirm whether the patentee has acted as his/her own lexicographer (*i.e.*, provided special meaning to any disputed terms), or intentionally disclaimed, disavowed, or surrendered any claim scope).

30. I have further been informed by counsel that a person of ordinary skill in the art is deemed to read a claim term, not only in the context of the particular claim in which the disputed term appears, but also in the context of the entire patent, including the specification and the prosecution history. The prosecution file history provides evidence of how both the Patent Office and the inventors understood the terms of the patent, particularly in light of what was known in the prior art. Further,



NorthStar Exhibit No. 2003, IPR2023-00890
Page 009

where the specification describes a claim term broadly, arguments and amendments made during prosecution may require a more narrow interpretation. For these reasons, the words of the claim must be interpreted in view of, and be consistent with, the entire specification. The specification is the primary basis for construing the claims and provides a safeguard such that correct constructions closely align with the specification. Ultimately, the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim as set forth in the patent itself.

31. I have further been informed by counsel that, to determine how a person of ordinary skill would understand a claim term, one should look to those sources available that show what a person of skill in the art would have understood disputed claim language to mean. Such sources include the words of the claims themselves, the remainder of the patent's specification, the prosecution history of the patent (all considered "intrinsic" evidence), and "extrinsic" evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art. I understand that one looks primarily to the intrinsic patent evidence, but extrinsic evidence may also be useful in interpreting patent claims when the intrinsic evidence itself is insufficient. Additionally, the context in which a term is used in the Asserted Claims can be highly instructive. Likewise, other claims of the patent in question, both asserted and not asserted, can inform the meaning of a claim term. For example,



NorthStar Exhibit No. 2003, IPR2023-00890
Page 010

because claim terms are normally used consistently throughout the patent, the usage of a term in one claim can often illuminate the meaning of the same term in other claims. Differences among claims can also be a useful guide in understanding the meaning of particular claim terms.

32. I have further been informed by counsel that, while intrinsic evidence is of primary importance, extrinsic evidence, *e.g.*, all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises, can also be considered. For example, technical dictionaries may help one better understand the underlying technology and the way in which one of skill in the art might use the claim terms. Extrinsic evidence should not be considered, however, divorced from the context of the intrinsic evidence. Evidence beyond the patent specification, prosecution history, and other claims in the patent should not be relied upon unless the claim language is ambiguous in light of these intrinsic sources. Furthermore, while extrinsic evidence can shed useful light on the relevant art, it is less significant than the intrinsic record in determining the legally operative meaning of claim language.

## VI. THE ’297 PATENT

33. I have reviewed the ’297 Patent, which is entitled “Method and System for Displaying Navigation Information on an Electronic Map” and issued on October 4, 2011. In general, the ’297 Patent relates to novel ways of displaying and

interacting with map-objects ("MO"), such as points-of-interest or way-points. Patent at 1:7-11. The invention of the '297 Patent is, in part, related to a novel way to display map information graphically. I note that engineering problems related to graphical user interfaces may not be the most programmatically complex but are nonetheless very difficult and require ingenuity and invention. The prior art as of 2008 allowed for conventional "zoom in" and "zoom out" functionality to allow users to see beyond a particular map view. *Id*. at 1:15-23. When a Map Object ("MO") is beyond the boundary of the visible map, the prior art further allowed a user to view such object by one of the following mechanisms: (1) panning a map in the general direction of the MO until the visible area of the map includes the MO, (2) zooming out until the visible area of the map includes the MO, and (3) selecting a reference to the MO from a menu or hyperlink. *Id.* at 1:35-45. Indeed, option (2) is the prior problem created by the Suomela reference, and option (3) is the prior problem created by the Kreitler reference. The prior art as of 2008 (including both Suomela and Kreitler) did not permit users to easily view locations of off-screen MOs, or to select or navigate to these off-screen MOs.

34. The '297 Patent solves these problems by utilizing an Object Vector Indicator ("OVI"). According to the '297 Patent, OVIs may include information referencing MOs, as well as information on the MO's direction, distance, travel-time to the MO, estimated time-of-arrival, and other information. *Id.* at 1:49-2:17. The

'297 Patent teaches several examples of OVIs that reference remote location markers. *Id.* at 3:39-54. For example, Figure 2C depicts two map objects, 1 and 2, where Map Object 1 has a corresponding OVI 208:

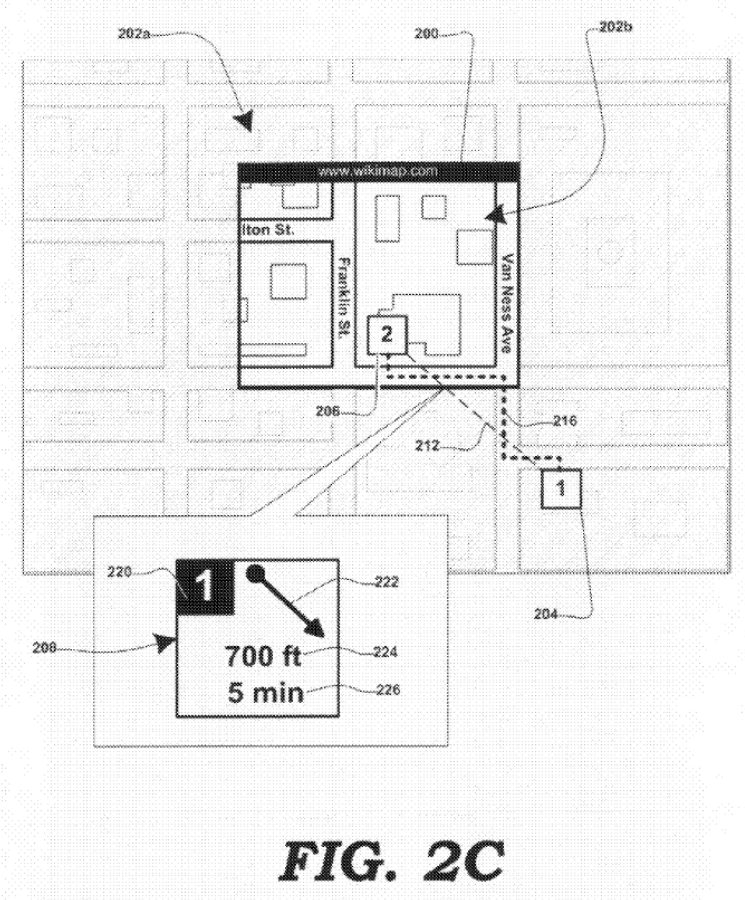



FIG. 2C

*Id.* at Fig. 2C. Furthermore, the '297 Patent describes various calculations that may be used to create and place OVIs including Figure 2D and Figure 4B and in the specification. *Id.* at Figs 2, 4; Col. 8, l. 60-Col. 9, l. 25. As described in an example embodiment, such calculations may include obtaining a location of an MO, calculating a vector of a current location to an MO, calculating travel distance from

a current location to an MO, and calculating a travel time from a current location to an MO, and calculating the placement of an OVI on the periphery of a map.

35. The prior art of record does not teach or disclose the use of OVIs in computer maps. Moreover, the prior art in the Petition does not teach or disclose how to create or use OVIs. Further, the prior art in the Petition does not teach or disclose how to create an OVI associated with a social network. The Petition relies on mere speculation and hindsight to arrive at the claimed OVIs.

## VII. THE ALLEGED PRIOR ART

36. The Petition primarily relies on two prior art references: U.S. Patent No. 9,607,092 to Kreitler (Ex. 1005, "Kreitler") and U.S. Patent No. 6,697,734 to Suomela (Ex. 1006, "Suomela"). While both references relate to map technology, neither reference describes Object Vector Indicators as claimed in the '297 Patent.

37. Kreitler describes "icons" of interest to users that are displayed on maps and that may allow users to interact with them. Ex. 1005 at 6:14-42. For example, Kreitler says that "icon[s] may have hyperlinks to other parts of the information system." *Id.* at 6:34-35. Maps with hyperlinks to points of interest were already of record as in the prior art as set forth in the '297 Patent. ("[S]electing the reference to the MO from the menu/the hyperlinked list item"). Ex. 1001 at 1:44-45. Kreitler's mapping system was primitive and was not focused on providing directions or distances between two points on the map. The only depictions of cardinal direction

are in Figure 1 and the accompanying discussion in Column 6, which states that "if the user is looking at the center of San Francisco, and San Francisco International Airport is to the south of the city, an icon may be displayed on the south border of the image that points in the general direction of San Francisco Airport." Ex. 1005 at 6:50-55. While Kreitler only mentions the "South" icon, it could be inferred that other cardinal direction icons may be used, such as "North," "East," and "West." However, Kreitler does not allow these icons to be displayed dynamically based on changing positions. Also, while Kreitler discloses points of interest on the map (e.g., hotels) and point of interest off the map (e.g., airports), Kreitler does not disclose any direction or distance calculations between a point of interest on the map and a point of interest off the map, and thus vectors are not contemplated. Furthermore, because Kreitler only describes the "South" icon in relation to the center of San Francisco and because vector calculations are not disclosed, it is possible that a vector between a point of interest and the relevant airport could be West or East, but Kreitler's icon could display South. The Petition does not address any of these limitations of Kreitler.

38. A POSITA would know, understand, and appreciate in 2008 that the display of a single map showing locations of interest as MOs does not require calculation of distance and direction. That is because a map showing MOs only requires location information, readily available from a data store, that can easily be

converted to pixel locations to be overlaid on the map. However, distance and direction require additional computing power, multiplied by the number of MOs that are to be displayed prior to the user selecting any of them. Once the user selects an MO, further processing can provide additional information such as distance, direction, travel route and other features commensurate with an associated delay in processing; however, in 2008 conserving power for both a graphically agile system and limited processing capability in relevant devices would be a huge concern to the POSITA. Therefore, wasting processing resources on determining distance and direction for initial visualization of all the MOs in either Kreitler or Suomela would have been counterintuitive. It would have been extremely taxing to calculate distance and direction for all the resulting MOs for every location search. Instead, the feature of just displaying the MOs quickly on a map would render the service much more palatable.

39. For example, the calculation necessary to place the "airport" icon in a specific place is not disclosed by Kreitler, whereas the '297 Patent describes express teachings for calculating placement of the icon. The '297 Patent includes express teaching of an "imaginary line," as disclosed in '297 Patent. Ex. 1001 7:13-46, 15:16-33. A POSITA would understand from the description in the '297 Patent how to draw a line from a current location to the Map Object for placement of the MO as an OVI. The POSITA would further understand, through teachings of '297 Patent,

that an imaginary line can also be computed in the same way with map coordinates that are off the display region and extrapolate along that line to place the OVI on the outer edge of the display region since the map considered in '297 Patent consists of "[v]isible area of a map 106 [that] may represent a small portion of a much larger virtual map". Ex. 1001, 2:66-3:6. The data, information, and procedure to implement this is readily available to the POSITA by considering the teachings of the '297 Patent and is not present in Kreitler. Furthermore, certain aspects of the '297 Patent require recalculation of position of an OVI, which Kreitler is completely incapable of performing.

40. Suomela is similarly rudimentary. Suomela describes mapping software depicted on a primitive Nokia phone. Suomela further describes a map 24 with a border region, where objects may be displayed. While Suomela describes these objects as including an airport icon 34, lighthouse icon 30, and mountain icon 32, icons themselves do not include any distance or direction information, and therefore are not vectors. To the extent Suomela describes distance and direction, it is as a separately reported and displayed functionality: direction indicators 42 and distance indicators 44. Ex. 1006 at 4:34-56. In other words, while Suomela may have access to this information, it is not provided as part of the icon itself, and there is no indication that Suomela's icons could be created with distance and direction information in those icons. Furthermore, Suomela simply discloses a natural

extension to the traditional map by showing **two maps**. Thus, the icons disclosed by Suomela are displayed on a map at or near their actual locations. Suomela discloses "a system and method for displaying a map having two scales" (*Id.* at 1:7-8) in the field of the invention and numerous other references to two scales throughout the disclosure. A POSITA reading Suomela will not recognize that the subject matter of Suomela "relates to displaying information associated with a map-objects . . . that are outside the visible area of a map" (Ex. 1001, 1:8-11) as is disclosed in the field of invention of the '297 Patent. A POSITA reading Suomela would know and understand how to query a map system for retrieval of a relevant object in the visible region of the detailed map and would have to only modify that slightly with a different query that includes a larger radius. Once the "map features" (Ex. 1006 at 4:22) are available, the POSITA can for the "detail area . . . generate a map display of geographical area" (Ex. 1006 at 4:23-26) and "generate a map display of a geographical area in a band . . . around the . . . detail area 24." (Ex. 1006 at 4:31-33). Generating both the detailed and the band of maps is a generation of a visible map and does not constitute a map that is not visualized, a fundamental divergence from the spirit and scope of the '297 Patent where objects outside of the visible area of a map is visualized. Furthermore, Dr. Rosenberg's concept of OVIs (Ex. 1003 at ¶¶ 77-79; Ex. 2004, Rosenberg Tr. at 66:14-67:14, 68:10-71:9, 71:14-72:5, Feb. 2, 2024) that are on the perimeter of the map is actually a description of objects

rendered in what Suomela refers to as an object area. *See, e.g.,* "The digital map includes a detail area having a first scale located in a substantially central portion of the map and an object area having a second scale located in a peripheral portion of the map. Objects are shown in the object area in orientations related to the detail area." (Ex. 1006, Abstract). Given that Suomela only considers display of objects on maps, a POSITA would not be informed as to how to derive any insight into the computing of any relevant information for objects that are ***outside of the map***, a requirement for implementing claimed OVIs. Thus, Suomela is not directed to object vector indicators.

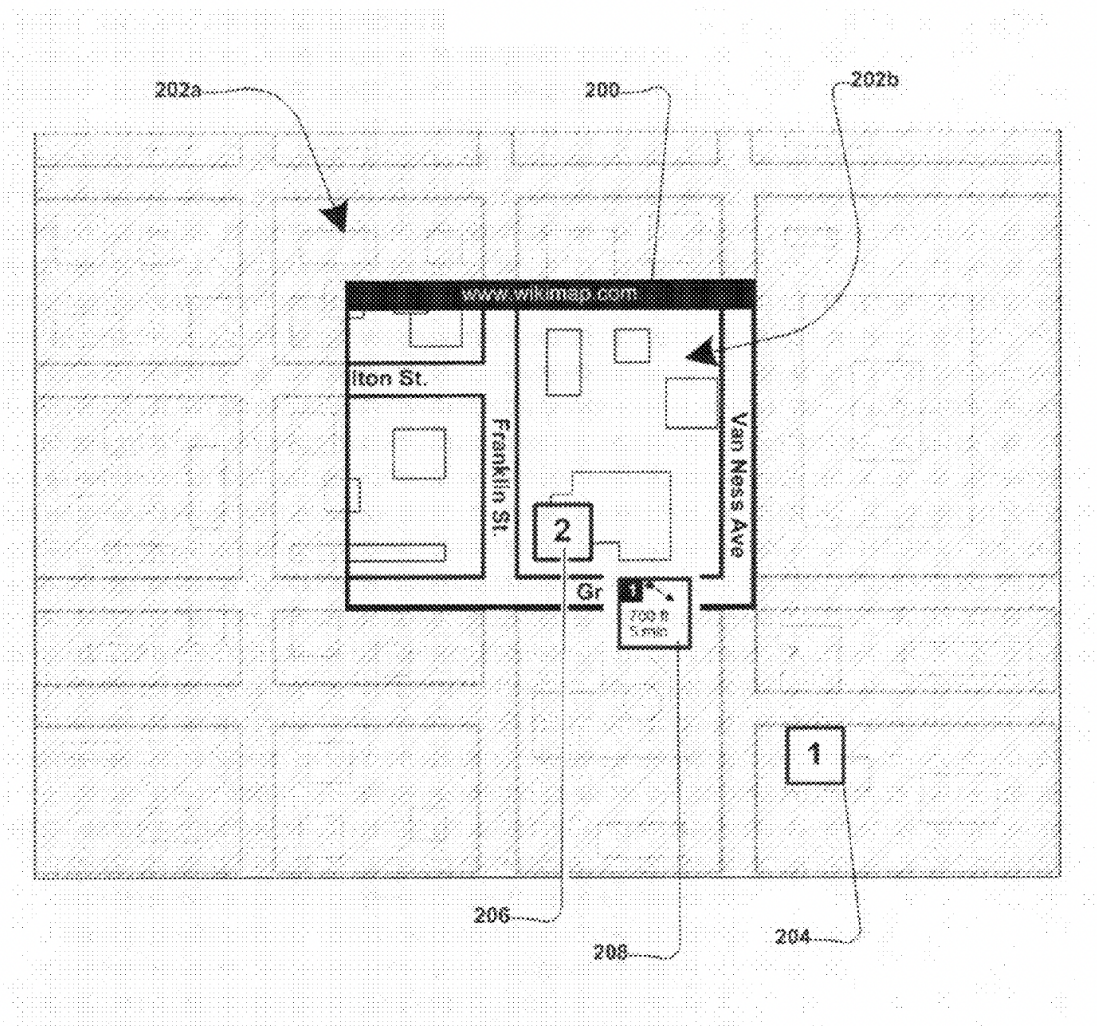
## VIII. ANY COMBINATION OF KREITLER AND SUOMELA DOES NOT RENDER ANY OF THE CHALLENGED CLAIMS OBVIOUS

### A. The Prior Art Does Not Disclose "Displaying an OVI Containing the Distance and Travel-Related Information"

41. The Petition does not identify any computation disclosed in the prior art, let alone "computing distance and travel-related information from a location within the selected area of the electronic map to the MO", "computing a placement position of an OVI referencing the MO on the map-display application", or "calculating a placement position of an OVI on the display." Because the claim terms are similar, Patent Owner addresses this argument in the context of Claim 1.

42. The '297 Patent describes several methods of computing and displaying a placement position of the OVI. For example, the '297 Patent describes an example

of an OVI as being "displayed on the periphery of the map region 202b." Ex. 1001 at 4:36-48. The placement of OVI 208 is calculated based on "the intersection of an imaginary line 212 connecting the location markers 204 and 206 and the periphery of the map region 202b." *Id.*




*Id.* at Fig. 2B. The '297 Patent further describes an alternate embodiment where the "OVI 208 may be positioned at the intersection of the imaginary line 212 and the border of the map-display application 200." *Id*. at 4:36-48. This process is readily understood specifically with relation to placement of the OVI and other features

shown in Figures 2B-C, 8C, 9A-E because of the explanation of a "virtual map" as disclosed by the '297 Patent. The patent discloses "A map display application **100** (e.g. an internet browser), on a computing device (e.g. a personal computer, a personal digital assistant, a cellular phone, etc.) may display a visible area of a map **106**. The visible area of a map **106** may represent a small portion of a much larger virtual map—while the larger virtual map (e.g. the entire globe, continent, state, city, etc.) may be outside the display area and not visible to the user, the portion comprising the visible area of a map **106**, may be visible to the user. The visible area of a map **106** may include location markers visible to the user. The map-display application **100** may also include references to location markers outside a visible area of a map **106**" (Ex. 1001 2:63-3:8) and "FIG. 7 is a generalized block diagram illustrating displaying object vector indicators ("OVI") on a directions map, according to one embodiment of the present invention. A map display application **700** (e.g. an internet browser), on a computing device (e.g. a personal computer, a personal digital assistant, a cellular phone, etc.) may display a visible area of a map **750**. The visible area of a map **750** may represent a portion of a larger virtual map—while the larger virtual map (e.g. the entire globe) may remain invisible to the user, its portion comprising the visible area of a map **750**, may be visible to the user. The visible area of the map **750** may include one or more MOs

visible to the user. The map-display application **700** may also include references to MOs outside a visible area of a map **750**." (Ex. 1001, 12:12-25).

43. Nothing in the prior art approaches the disclosure of placement of an OVI. The Petition relies only on Figure 1 of the Kreitler reference and the statement that "an icon may be displayed on the south border of the image that points in the general direction of San Francisco Airport." Pet. at 23-24. The mere fact that an icon ***may be displayed*** does not necessitate computation of a placement position referencing the map object. The placement of the "south" icon is hard coded as static information and therefore not computed by Kreitler. Kreitler does not teach or disclose any algorithms for calculating position or direction information.

44. Kreitler discloses functionality for Yahoo maps from the mid 2000's. Indeed, Kreitler worked for Yahoo! at the time of the filing of the patent and the patent was assigned to Yahoo!.[1] Furthermore, Kreitler discloses that it is intended for use with a map server that is "developed and used by Yahoo! Maps." Ex. 1005 at 10:29-32. Thus, it is my opinion that one of ordinary skill in the art at the time of the filing of Kreitler would have been informed by the Yahoo! Maps application and would have understood the teachings of Kreitler in view of this map application. I have personal experience with Yahoo! Maps, including experience with this

[1] https://www.linkedin.com/in/jeremykreitler/details/experience/

technology in the early 2000's iterations. I have reviewed web sources that describe the operations of Yahoo! Maps from the early 2000s and I have also reviewed several videos that refreshed my recollection regarding the operation of Yahoo! Maps as described by Kreitler.[2] The Yahoo! Map application as of the 2006 to 2008 timeframe did not have functionality to dynamically create the "south" icon. Instead, these resources would have been statically loaded from XML resources. Kreitler describes its application as running in a "browser." *E.g.*, Ex. 1005 at Col. 12; FIG. 4. The Yahoo! Map applications were basic web browser applications and required the use of stock image resources. The graphic resource for 110 would, therefore, have been a static image like the compass 108, the update button, and the zoom levels 106. These resources would have been loaded as images via HTML in the web browser. Accordingly, one of ordinary skill in the art would not have understood Kreitler to teach or disclose "computing distance and travel-related information from a location within the selected area of the electronic map to the MO", "computing a placement position of an OVI referencing the MO on the map-display application"

[2] https://www.youtube.com/watch?v=UfjHcDWvH8E;
https://www.youtube.com/watch?v=mqY9HvsGZR0;
https://www.youtube.com/watch?v=0X8oY97mrq8;
https://www.youtube.com/watch?v=08rOmQQiaDM

or "calculating a placement position of an OVI on the display."

45. I have had practical experience with Yahoo! Maps in the relevant time period and I recall that there were no movable position icons where "the position is based on the location of the off-map MO." My understanding of Yahoo! Maps would have been consistent with one of ordinary skill in the art's understanding in the relevant time period. More specifically, one of ordinary skill in the art would not have believed that Kreitler taught or disclosed OVIs that contain distance or travel-related information. Accordingly, the combination fails.

### B. The Petition Does Not Sufficiently Set Forth how the Prior Art Discloses OVIs

46. Challenged Claims 1-30 require "displaying an OVI" with reference information for an MO (e.g., distance and travel-related information). The Petition does not teach or disclose creating an OVI containing distance and travel-related information, as required by Claims 1-30.

47. The '297 Patent describes an OVI as more than merely a link to a map object. Ex. 1001 at 1:43-45. More specifically, the '297 Patent describes creating an OVI by calculating distance and travel-related information as, for example, "computing an imaginary travel path 216 between the location marker 206 and the location marker 204." *Id.* at 4:65-67. The '297 Patent further states that travel-related information, such as direction of travel, may be calculated based on "an angle alpha 230 between the imaginary line 212, connecting the location markers 206 and 204,

and the Y axis of the display or any other direction." *Id*. at 5:22-37. The result is that "the vector 222 may point to the location marker 204." *Id.* Neither Suomela nor Kreitler teaches or discloses an OVI, and the combined teachings of Suomela and Kreitler also fail to arrive at the claimed OVI.

**1. Claims 1-30**

48. Petitioner relies primarily on Kreitler to teach the "OVI" element required by the claims. Petitioner's rationale appears to be that, because Kreitler depicts a "special icon" where the special icon "indicat[es] an off-map MO including the direction of the MO," the OVI limitation is met. *See, e.g.*, Pet. at 22. However, the "special icon" of Kreitler is essentially just a static hyperlink as was present in the prior art – it is not a vector. A vector must be more than a mere hyperlink—it must have some magnitude and direction associated with the indicator. Even if the claims do not require Euclidean vectors, the OVI must be more than a static hyperlink disclosed by Kreitler. While the "special icon" can be depicted as an arrow on the border of Kreitler's map, there is no relation between the off-screen object and any object on the screen. The Petition refers to a distance/direction calculated as between the San Francisco Airport and "hotel 104" which are depicted in green and blue annotations in the Petition:

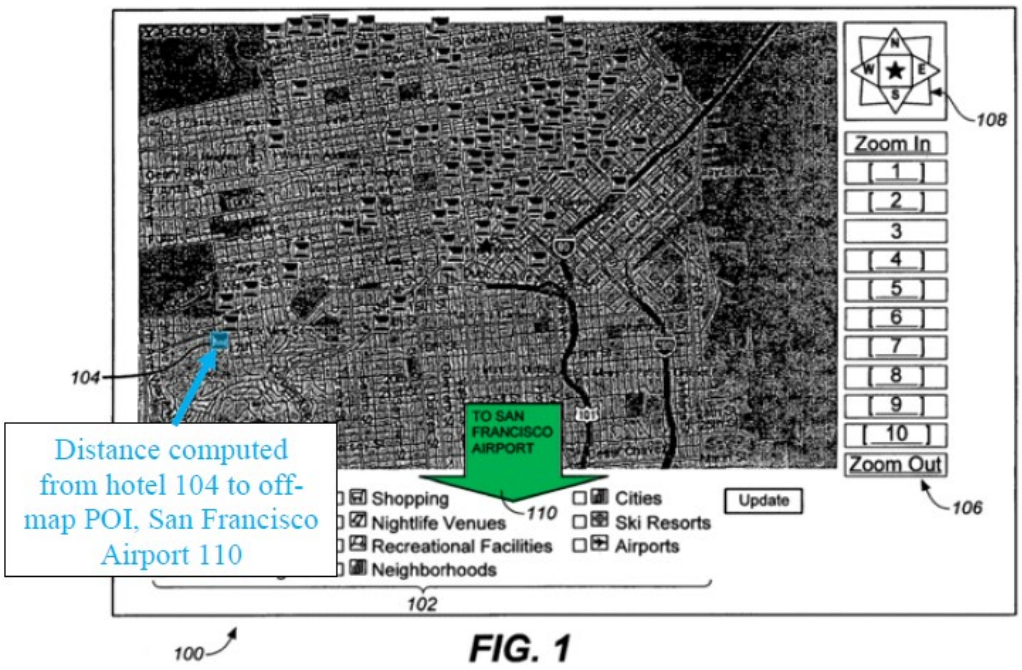



FIG. 1

*Kreitler*, Fig. 1.

Pet. at 22 (annotations in original). However, nothing in Kreitler indicates that the direction arrow has anything to do with the magnitude of distance and direction between the hotel 104 and the San Francisco Airport Instead, the arrow merely depicts that the San Francisco Airport is below the bottom of the map, without any regard as to whether it is East or West of any particular point on the map. For example, even if the direction from the hotel 104 to the San Francisco Airport were predominantly "East," the arrow depicted on screen would still point South. I reviewed standard maps of the area and overlaid a larger map onto Figure 1 of Kreitler. Based on the location of the hotel and the location of San Francisco airport, one of ordinary skill in the art would not have expected the airport icon to appear in

the bottom middle of the map. Instead, the icon should have appeared in the bottom right corner if it were to have had the claimed distance and travel-related information.

49. Petitioner does not attempt to explain how this rudimentary arrow could be encoded with sufficient information to create the claimed OVI. Accordingly, the Petition is deficient and should be denied in its entirety.

**2. Additional Distinctions for Claims 1-17**

50. Claims 1-17 require additional limitations regarding creation and display of the claimed OVIs, including explicit calculations of both distance and travel-related information. For these calculation limitations, Petitioner relies on the combination of Kreitler and Suomela. However, Petitioner does not acknowledge teachings in Suomela that teach against or otherwise negate the combination.

51. The prior art does not disclose "computing distance and travel-related information from a location within the selected area of the electronic map to the MO." This computation must be performed before displaying the OVI. However, for the computation of distance and travel-related information, Petitioner relies only on Kreitler. Pet. at 21-22. Petitioner shows an annotated version of Figure 1, which displays the alleged "OVI" prior to any map object being selected:

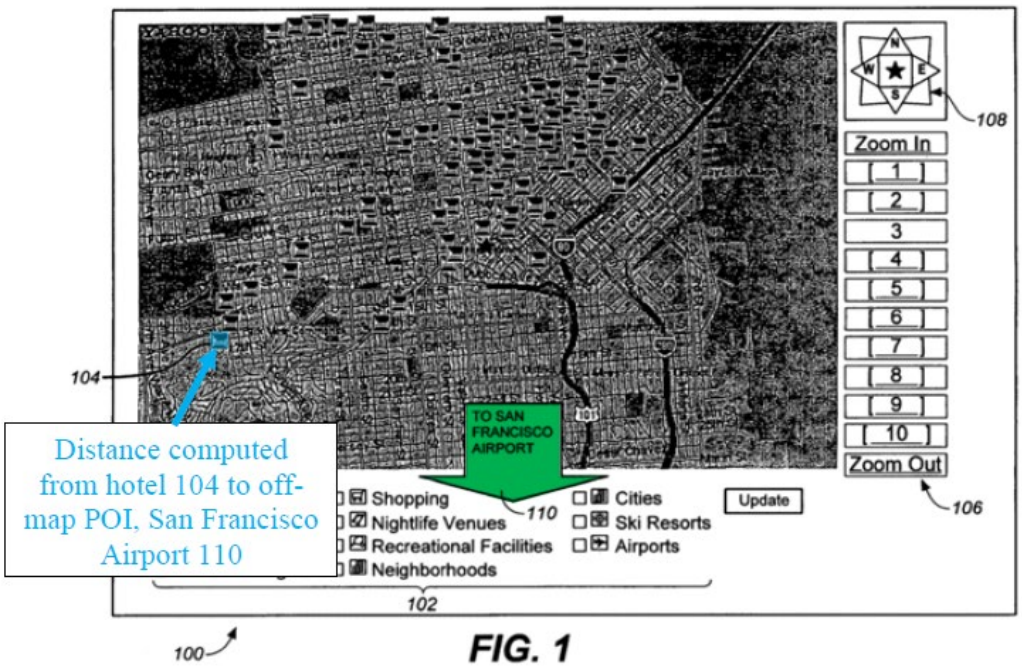



FIG. 1

*Kreitler*, Fig. 1.

Pet. at 22 (annotations in original). Because the green arrow is displayed without any map object selected, distance and direction cannot be known at the time of the green arrow's creation and placement. Indeed, distance and direction are not known until after a map object is later selected because Kreitler states that "selecting a hotel would allow the user to obtain the distance of other items in relation to the selected hotel." *Id.* Ex. 1005 at 7:5-9. Kreitler's disclosure, instead, indicates that the "special icon" is unrelated to any calculation of distance or direction, and thus the "special icon" is not ***created*** containing the distance and travel-related information. Therefore, the creation limitations are not met.

52. Regarding limitation 1g, Petitioner admits that Kreitler on its own does

not disclose an OVI with distance information. Instead, Petitioner relies on Suomela to "expressly disclose[] displaying both distance and travel-related information." Pet. at 25. However, Petitioner relies on the bare conclusion that "a POSITA would have been motivated to add *Suomela's* distance and travel-related information to *Kreitler's* OVI to provide further helpful information to a user." *Id.* at 25-26. This hindsight-based statement ignores the disclosure of Suomela, which teaches distance and direction information as ***separate*** from object indicators, not ***contained*** in object indicators. For example, Figure 5 of Suomela may depict that distance and direction are associated with objects 29; however, the claims require something programmatical not mere association.

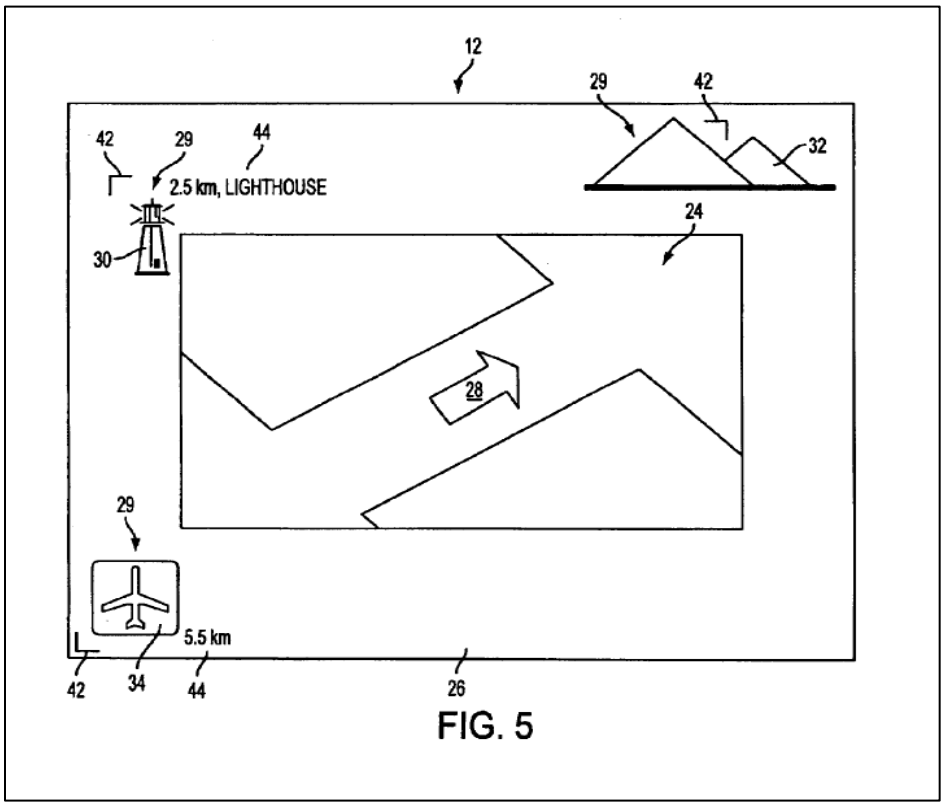


FIG. 5

Ex. 1006 at Fig. 5. Suomela further states that "direction indicators 42 and distance indicators 44 may be selectively shown," indicating that these are ***not contained*** by the objects 29. *Id.* at 4:45-47. In other words, if the objects 29 themselves were able to indicate distance or direction on their own, these additional display parameters would not be needed. Suomela's teaching of separate indicators for distance and direction teaches against an OVI ***containing*** distance and direction or, at the very least, provides contradictory teachings that the Petitioner should have addressed.

53. Rather than address the fact that Suomela's objects 29 do not ***contain*** distance indicators 44 and direction indicators 42, Petitioner entirely ignores this disclosure and concludes that one of skill in the art would have combined these parameters in Kreitler's objects without any rational basis. More specifically, Petitioner states that one of skill in the art would have been motivated to modify Kreitler's special icons to include distance information taught by Suomela but does not explain why one of skill in the art would have modified the separate distance and direction indicators of Suomela to include those within Kreitler's objects. Pet. at 9. Petitioner's mappings of the combined teachings of Kreitler and Suomela miss the mark and it is not possible for one of skill in the art to arrive at the claims without impermissible hindsight. More specifically, Suomela's depiction of objects as separate from distance and direction notations appears to be a deliberate design choice. Because the objects of Suomela are on-map (as opposed to the claimed off-

map), Suomela does not need to include direction indicators as the direction is apparent from the icon itself by virtue of Suomela's "two map" solution. Indeed, there is no motivation, either technical or logical, for Suomela to include yet another attribute as part of the icon itself. Indeed, Suomela's small form factor Nokia device would already have been taxed with many computations and adding yet another attribute to the icons would not have been optimal.

### C. The Petition Does Not Explain How the Prior Art Discloses "creating an object vector indicator ("OVI") for each of the MOs"

54. Petitioner acknowledges that Claims 18-22 require multiple OVIs. Pet. at 29. While Petitioner relies primarily on Kreitler for disclosing one OVI (which is not taught for reasons set forth supra), Petitioner pivots its argument for claim 18 to map "multiple OVIs with icons" to Suomela. *Id.* One of ordinary skill in the art would not have been motivated to modify Kreitler to add more OVIs, despite the teachings of Suomela at least because such an addition would render Kreitler inoperable. For example, if Kreitler were modified to add a second icon whose location is "south," Kreitler does not explain how or where that icon could be displayed other than by overwriting the San Francisco Airport icon and Petitioner does not attempt to explain the inoperability of this combination. Even if one of ordinary skill in the art would place the icons side-by-side that would be nothing more than a list of links, which is already in the prior art and noted in the '297 Patent.

Kreitler had the opportunity and knowledge to add Oakland airport generally to the east, but he only included San Francisco airport to the south indicating that it is a hardcoded link.

55. In the alternative, even if one were to assume that Petitioner intended to present a combination of Suomela's icons with Kreitler's map, that combination also fails. Petitioner only identifies the "lighthouse icon 30," the "mountain icon 32," and the "airport icon 34." Pet. at 30. None of these icons contain distance or travel-related information. Distances are presented separately (e.g., 44) and travel-related information such as direction, are presented with arrows 42. Suomela's icons alone would not satisfy the OVI limitations and thus the combination fails. Accordingly, because Kreitler cannot support multiple direction icons, and because Suomela's icons alone are not OVIs, the combination fails.

### D. Petitioner's Motivation to Combine is Conclusory and Does Not Support a Finding of Obviousness Under a Preponderance of the Evidence

56. Petitioner attempts to combine two different approaches to mapping interfaces and relies primarily on its expert, Dr. Rosenberg, to support this combination. The combination fails for two reasons: first, the conclusory combination fails because it is based on Dr. Rosenberg's personal experience—an approach that has already been rejected by the Board in prior cases involving Dr. Rosenberg; second, the proposed combination vitiates the inventive concept of

the Suomela by eliminating the "two scale" solution. As I have learned from counsel, my understanding is that such vitiation of a prior art reference's inventive concept is improper and can defeat motivation to combine.

### 1. Dr. Rosenberg's Motivation to Combine is Conclusory and Should be Rejected

57. Dr. Rosenberg's proposed combination of Suomela and Kreitler relies on three separate rationales, where an error in any of his rationales would render his entire analysis incomplete. *See*, *e.g.*, Ex. 1003 at 36-41. His first conclusory motivation is that one of skill in the art would have combined the icons from Suomela with the icons of Kreitler to arrive at the claimed OVIs. *Id*. at 37. Dr. Rosenberg reduces this combination to "adding information to the display" which he alleges "would have required only a modification of the graphical display." *Id*. at 37. This rationale is conclusory and presupposes that because the Challenged Claims of the '297 Patent are "graphical," it would have been routine and therefore obvious. However, graphical improvements may encapsulate an algorithmic baseline encapsulating an innovative process, may be patentable, and are not per-se obvious. I have numerous personal experiences in enabling certain algorithmic designs into a graphical depiction providing unique and innovative features to the end-user. There are virtually infinite graphical configurations and Dr. Rosenberg does not indicate why one of ordinary skill in the art would have deviated from the different approaches of either Kreitler or Suomela to arrive at the claims without



NorthStar Exhibit No. 2003, IPR2023-00890
Page 033

hindsight.

58. When asked about whether he made the same mistakes in this proceeding as in other IPR proceedings, I note that Dr. Rosenberg testified "I don't believe I have made mistakes." *See, e.g.*, Ex. 2004 at 30:23-31:6. Despite these criticisms, Dr. Rosenberg did not modify his approach in the present case and has provided the same conclusory type of argument without any technical rationale.

### 2. Dr. Rosenberg Failed to Acknowledge the "Two Scale" Solution of Suomela and His Obviousness Analysis Fails

59. My understanding of the law from counsel is that obviousness combinations are improper if doing so would alter the inventive concept of the prior art. Petitioner's proposed combination eviscerates the inventive concept of the Suomela reference because the combination eliminates Suomela's "two scales."

60. The title of the Suomela reference is "System and Method for Displaying a Map Having Two Scales." Ex. 1006 at 1. Suomela's Abstract states that "the digital map includes a detail area having a first scale located in a substantially central portion of the map and an object area having a second scale located in a peripheral portion of the map." *Id*. at Abstract.

61. In describing the prior art, Suomela explains that "conventional maps typically show[] only one scale at a time and [are] thus limited to providing either detailed large scale views with few, if any, landmarks included therein, or small scale

views." Suomela at 1:51-55. Suomela then describes how such single-view solutions are not optimal. *Id*. at 1:55-60. Suomela then describes the invention unequivocally as follows: "the present invention provides a system and method for displaying a map having two simultaneously displayed scales." *Id.* at 1:66-2:1. Suomela describes various embodiments where each of the two scales have different areas, such as 1:5,000 and 1:500,000. Suomela describes these as "large scale" and small scale" and allocates the different scales to the "object area 26" and "detail area 24." *Id*. at Col. 4. Suomela then claims the invention as "a cohesive map having areas of different scales" with "a first scale" and "a second scale." *Id*. at Claim 1. Indeed without at least two different scales, the inventive concept of the Suomela reference is completely vitiated.

62. Despite Suomela's emphasis on two scales, Dr. Rosenberg did not even mention this concept in his Declaration. I performed a word search for "two scales" and there were no results. *See generally* Ex. 1003. The only place that Dr. Rosenberg even talks about scale is where he cites Suomela directly and relates it to Suomela's "processor" opining that a POSITA would have been motivated to continuously center Suomela's view around the user's current location. Ex. 1003, ¶ 165. Indeed, Dr. Rosenberg's combination of Kreitler with Suomela presumes that Suomela would apply to maps with only one scale. Dr. Rosenberg states that "a person of ordinary skill in the art would have been motivated to modify Kreitler's special icons

to include distance information, as taught by Suomela, to provide the user with distance information without requiring the user to specifically request navigation to the **off-map items of interest**." Ex. 1003 at 36 (emphasis added). This argument does not make sense because Kreitler solved its problem by **eliminating off-map items of interest**. Kreitler provides a two-scale solution where the items of interest are always on the map and are therefore never "off-map." Dr. Rosenberg's failure to acknowledge this difference is fatal to his analysis because not only does it undermine his reasoning in his motivation to combine, but it also removes the inventive concept of Suomela.

63. From reading Dr. Rosenberg's deposition transcript, his error is apparent. Dr. Rosenberg admitted that he did not believe scales were relevant to the Suomela reference.

> Q. According to the Nokia reference, Figure 5 shows two scales, two map scales, a zoomed-in scale and a zoomed-out scale, right?
>
> A. I would not characterize it in that way. I would say there is a scale associated with zoomed in but there is not a scale associated with the object area, that border area. There does not -- there is not necessarily a scale. A scale wouldn't imply a certain number of centimeters on the screen corresponds to a certain number of kilometers in



NorthStar Exhibit No. 2003, IPR2023-00890
Page 036

> the real world. And I don't believe that that's required in the object area to have a scale.

Ex. 2004 at 67:18-68:9. Even though he specifically cited Suomela disclosing the detail area with correspondence of display screen size to real world distance from Suomela 4:23-27 (Ex. 1003, ¶ 165) but completely ignoring Suomela's very next sentence describing the object area in the same fashion where "[f]urther, suppose object area 26 had a display size of 6 cm by 5 cm centered around display area 24; thus, having an effective object area 26 that is 2 cm wide around display area 24. For a 1:500,000 scale, processor 14 would generate a map display of a geographical area in a band about 10 kilometers around the geographical area represented in detail area 24" (Ex. 1006 at 4:27-33). Dr. Rosenberg then stated that the focus of Suomela was "not around the specifics of scales, . . . I guess that's not the focus of the invention." *Id.* at 73:3-7. However, after reviewing the reference at his deposition and realizing that it is titled "System and Method for Displaying a Map Having Two Scales," Dr. Rosenberg finally began to change his answers. When pressed again regarding the object of the Suomela invention, Dr Rosenberg stated:

> [I]t would **require two scales** because the object area is necessarily a much more zoomed-out scale than the detailed area.

Ex. 2004 at 74:18-21.



NorthStar Exhibit No. 2003, IPR2023-00890
Page 037

64. The concept of two map areas with different maps scales directly contradicts the combination required to meet the Challenged Claims. Indeed, the solution of the ’297 Patent achieves its result without requiring two or more mapping areas with differing scales. For example, Claim 1 of the ’297 Patent specifies a “selected area of an electronic map.” If objects are inside this area, they are displayed as Map Objects. If objects are outside of this area, OVIs are created and displayed **on the selected area of the electronic map**, not in a separate map area with a different scale.

65. Therefore, Dr. Rosenberg’s analysis fails at least because Dr. Rosenberg did not address the inventive “two scale” concept in his motivation to combine section and the Petitioner fails to meet its burden of proof.

## IX. SUMMARY OF OPINIONS

66. It is my opinion that the Board should confirm the validity of the Challenged Claims. I reserve the right to supplement my opinions in response to any additional contentions by Petitioner or opinions by Dr. Rosenberg, and as the Board permits.

67. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section

1001 of Title 18 of the United States Code.

Executed on March 1st, 2024 in Potomac, MD.



Omid Kia

# EXHIBIT A

**Omid E. Kia**
10813 Rock Run Drive, Potomac, MD 20854
omidkia@me.com
(240) 899-7333

## Expertise:

**Software:** Full lifecycle software development as requirements management, solution architecture, implementation and testing. Large and small scale software development ranging from Enterprise class solution development to small embedded real time software development. Design and develop large array of algorithms for signal, image, video and content processing. Performance and algorithmic analysis of software components with strong mathematical basis.

**Hardware:** Large image/video-based hardware solutions with pipeline and microprocessor based system for simple and complex applications. Interface of high performance imaging components into a digital infrastructure at chip and camera level designs. Single board systems with high performance devices for time critical controls.

**Science:** Strong ability for analysis and understanding of all diagnostic imaging modalities such as all X-ray, Nuclear Medicine and Ultrasound imaging modalities in terms of energy source, detectors and intermediate processing. Proven record of introducing new concepts to existing problems using physical and mathematical models. Strong ability to analyze, design and develop signal/image/video/content processing algorithms and in particular develop various computed processing algorithms for demanding problems.

## Education:

### Ph.D. in Electrical Engineering
University of Maryland at College Park (UMCP), May 1997
Major Field of interest: Control and Communication theory
Thesis Topic: Document Image Compression and Analysis

### M.S. in Electrical Engineering
University of Illinois at Chicago (UIC), August 1989 G.P.A. 5.0/5.0
Major Field of Interest: Control theory and Automation
Master's Project: Streamlined Methodology for Digital Controller Design.

### B.S. in Electrical Engineering
Catholic University of America (CUA), May 1987, G.P.A. 4.0/4.0
Major Field of Interest: Computer Engineering and Control
Senior Design Project: Design and Implementation of an Underwater Dive Computer.

## Accomplishments:

**Chief Scientist,** Northstrat: Grew new science ventures while supporting customer contract on a full-time basis.
**Chief Engineer,** ITT Exelis: Grew the company footprint at the customer site by promoting technical solutions and demonstrating associated value.
**Principal Engineer,** ITT Exelis: Patented IP and grew initial project to a long term processing chain effort at customer site.


NorthStar Exhibit No. 2003, IPR2023-00890
Page 041

**Senior Scientist,** ITT Exelis: Patented IP in fields of LIDAR, FMV, Space Weather and Radars. Landed $1.5M project associated with only one pursuit.
**Chief Scientist,** Imaging Sciences: Grew the company from a $2M company to $145M and beyond with a revolutionary dental imaging machine.
**President,** Sigma Vision: Developed revolutionary x-ray imaging product for veterinary market that is currently supporting three separate companies worldwide.

**Experience:**

**Subject Matter Expert,** Coastal Communication Consultants Inc., Manassas, VA September 2017 – Now.
Serve as a subject matter expert in the general fields image science, data science, software development and transition to operational setting. Utilize classical estimation and detection theory techniques in conjunction with feature extraction and pattern analysis to derive effective data science algorithms. Also perform software development to integrate algorithms into existing and new systems. Interface with customer requirements by educating programmers and customers on the realm of possibilities with real demonstrable techniques. Also continue to serve as the subject matter expert in the areas of video processing, compression and standards for multiple contracts. Submitted responses to Request for Information and Proposals to area customers for imaging, image processing, remote sensing, content process, signal processing and related technology oriented solutions.

**Chief Image Scientist,** Northstrat Inc., Sterling, VA November 2013 – September 2017.
Served as the chief image scientist and led research and development efforts with respect to all high technology development efforts. Served as the subject matter expert in the areas of video processing, compression and standards for multiple contracts. Submitted responses to Request for Information and Proposals to area customers for imaging, image processing, remote sensing, content process, signal processing and related technology oriented solutions. Support multiple programs as a subject matter expert as video processing, low light imaging, Lidar data processing, Synthetic aperture radar imaging and data fusion. Perform array of computer vision algorithms and physics-based signal processing and analysis. Utilized image science, signal processing, software development and engineering practices to bring multiple research concepts to an operational setting.

**Chief Engineer,** ITT Exelis, Space Systems Division, Herndon, VA October 2011 – November 2013.
Served as the chief engineer and led technical efforts in an NRO program at the Washington Innovation Center. Developed technical solutions across a large array of image and signal processing problems. Contributed to ground breaking solutions and fundamental shifts in workflow utilizing expertise in mathematics, physics, software development, hardware exploitation, market demand and business partners. Routinely applied a multi-disciplinary approach to complex problems.

**Principal Scientist,** ITT Exelis Space Systems Division, Herndon, VA September 2012 – November 2012.
After initial research and development in LIDAR super resolution, was awarded a contract to implement and compare results with existing LIDAR super resolution algorithms. Lead a team of scientists to implement and expand on original concept and insert in existing processing chain. Delivered results that exceeded expectations and fundamentally identified shortcomings in the current process flow. Performed this project while serving as the Chief Engineer at an NRO program.

**Senior Staff Scientist,** ITT Space Systems Division, Herndon, VA June 2009 – October 2011.
Serve as an expert in all pursuits pertaining to remote sensing, surveillance and image/signal processing problems. Primarily served as the lead scientist in all technical activities including space situational awareness, 3D scene modeling, persistence surveillance, super-resolution (for lidar systems), scale space compression (for lidar systems) and space weather efforts. Inventor in concepts leading to patent applications and pursuits. Leader of the Compression Cell, which creates, motivates and organizes current and ongoing capabilities in compression including image, video, volumetric and other data modes within the Space System Division group. Involved with efforts in building ideas matched to pursuits for Full Motion Video, Situational Awareness, Space Weather and several Surveillance initiatives as the primary scientist. Interests include volumetric processing, multi-mode image/data processing, radar processing, automatic target recognition, computational imaging,

compression and knowledge management which involves preliminary work for submittal into corporate and government channels for funding opportunities. These efforts require substantial knowledge of the current state of the art and fundamental understanding of strengths and weaknesses of prevailing methodologies in order to make a viable case for pursuit.

**Expert Consultant,** Part-time consulting, Jan 2002 – now.
Perform expert consulting for Intellectual Property and High Technology development. Intellectual property consulting in all areas of high technology and in particular, imaging, compression, encryption, standard based encoding, consumer devices, medical devices, patient management, embedded solutions and smart energy. Work involves expert analysis of portfolio holdings, analysis of potential infringers, licensing opportunities and litigation support. High technology development in areas of medical imaging, electrical health record, medical devices and smart energy devices have been pursued with inventions being pursued. Consult in dental imaging and in particular Cone Beam Computed Tomography and Podiatric Radiography. Perform consulting for law firms, patent analysis firms and high technology companies.

**Chief Scientist,** Imaging Sciences International, Inc. Hatfield, PA Jan 2004 – April 2009.
Chief Scientist and director of digital X-ray Development. Perform, direct and manage all technical directives falling under digital imaging including software development, hardware development, receptor development and various signal/image processing algorithms. As chief scientist I performed the first look at all 3rd party technology suggestions and assessed value for our product. These spanned technologies across software, hardware and physics based (primarily x-ray and visible light) solutions. Spearheaded a detector development effort which involved working with internal and external resources along with performance based selection of outside vendors. These detectors are designed to operate under very low light conditions and efficient manner. Served as the primary Intellectual Property Manager for all patent related work for Imaging Sciences and other sister companies, under the Danaher umbrella, dealing with imaging work. In this capacity I managed a group of scientists and lawyers to address all aspects of patent related issues including foreign filings, office action response, infringement cases and new technology protection. Write detailed white papers, patents and articles for state of the art technologies. Performed due diligence activities for large purchases in terms of technology assessment, competitive analysis, resource utilization and product roadmaps. This was the lead technical role in several acquisitions.

In a development capacity, developed and inspired unique functional components for a next generation head and neck computed tomography unit. Invented algorithms in scatter correction, focal trough detection and various visualization mechanisms. Developed a revolutionary panoramic image capture modality that enables the practitioner to perform unprecedented imaging. Performed management duties for volume understanding (segmentation, estimation and detection of physical shapes) and movement detection algorithms for integration into a motion corrected sensor. Developed hardware assisted processing to offload processing requirements to dedicated components using soft core FPGA programming, embedded LINUX, integrated microprocessor devices and software interface. Various Optical, X-ray and Nuclear image modalities are used to enable a growing market segment.

**President,** Sigma Vision Inc. Rockville MD Jan 2002 – Dec 2003.
Co-founder of Sigma Vision which was originally incorporated to serve as a shell for consulting activities in the high technology area specifically in the image and signal processing platforms. Researched, designed and developed a line of products which spans Radiography/Fluoroscopy imaging in X-Ray modality**, Computed Radiography** (CR) in X-Ray modality, **Digital Radiography** (DR) in X-Ray Modality, Picture Archiving in all modalities and various image processing packages. Provided detailed expertise to vendors that have development work in the same area. In all aspects of this work, performed cutting edge HW/SW techniques to provide a solution along with algorithm development to overcome sensor shortcomings. The result was a stable and cost-effective offering to small and medium size diagnostic imaging centers. Performed research with several national laboratories for custom signal processing such as adaptive contrast enhancement, image stitching and mosaic, cone-beam CT and other diagnostic related imaging. The diagnostic imaging products were applied to human, veterinary and non-destructive testing applications. In a non-medical capacity, Performed several large scale consulting in areas of **Video over IP**, debugging proprietary image processing algorithms, serve as **expert witness** in large scale patent litigations and general medical imaging product development.


NorthStar Exhibit No. 2003, IPR2023-00890
Page 043

**Senior Vice President,** Portris Inc. Reston VA February 2001 – November 2001.
In charge of front-end **application development**, all **research and development** effort, high level **algorithm development** and technology assessment. As the first technology hire of Portris Inc., helped implement the company for product development and Venture Capital funding, provided key technology and solutions in order to achieve a suite of meaningful patents, defined product suite and development plan and in-depth architecture and planning of the product. Formulated the basis of a collaborative knowledge management system by separating content and presentation; and further decomposing content in terms of a relational paradigm of basic constituent atomic knowledge elements to for a higher level of understanding. Implemented the relational aspect in a database utilizing an appropriate **data model** that supported several abstract applications. Also provided key components of knowledge representation and modeling from inception to development. Was the leading technology and solution provider in all areas of **computing, operating systems, development platform, front-end systems, back-end systems and knowledge representation.** Served as the chief scientist for all of the technical related activities.

**Principal Consultant,** Sigma Vision, Inc. North Bethesda, MD July 2000 – May 2002.
Performed consulting services, which included proposal writing, submission, research and development. Wrote proposals for **Video Over IP, Video surveillance and Document Duplicate Detection** for submissions to government and private industry. Performed research and development in **Video Over IP** for thin clients that were java enabled. Performed design, analysis and modeling of the system for a complete software development cycle. Served as an expert witness in patent enforcement phase of Intellectual Property Law. Researched and analyzed various **X-Ray imaging** products and provided insight into their software, hardware and physics based operations. Provided technical assistance for medical imaging companies in planning, development and debugging of their systems. Developed imaging workstations for Computed Radiography, Special Purpose Video Capture and overall system design and integration. Developed embedded solutions for X-ray arm and table movement for collision avoidance.

**Chief Technical Officer,** IMACOM, Inc. Rockville MD October 1999 – January 2001.
In charge of all technical work including hardware and software research, design and implementation for **X-Ray medical imaging** application. In this position, developed software and hardware solutions, debug software and hardware problems in the system and formulated company strategy for attainable product bases. In this position, as hardware designer, used Field Programmable Logic Array to develop a **video pipeline processing, real-time storage** of live video to computer hard disks, develop **analog filter and signal exchange banks** for analog signals, designing and integrating custom graphics video cards and control systems**.** Also in this position, as software engineer, designed **threading software for real-time storage,** improved **image processing** capabilities and compression, created custom software, and planned, designed and implemented new customer solutions. In this capacity, managed a group of hardware and software engineers, planned and estimated project life-cycles, and was involved with new technology research and development such as **high resolution ultrasound imaging**, large format X-Ray imaging and **Video Surveillance.**

**Electronics Engineer (Research Scientist),** National Institute of Standard and Technology, Gaithersburg, MD (NIST), April 1997 – November 1999.
Member of the Multimedia and Digital Video Group, Advanced Technology Division and Information Technology Laboratory. Worked on various projects including **document image processing**, an extension of Ph.D. research, **Large image-browsing, multimedia compression and communication, medical image understanding, digital library metrics,** and **image and video indexing** problems. Used **mathematical formulation** and **media processing tools** to find new and innovative techniques to archive, process and transmit information. Worked on **pattern recognition and feature extraction** research for medical application. Initiated interest in **video indexing** and **digital library metrics** research in the group. Performed as a principal investigator in the above projects. Attended MPEG standardization meetings to provide technical expertise to NIST's Advanced Technology Program's initiatives.

**Affiliate Research Scientist,** Center for Automation Research (CfAR), Language and Media Processing Laboratory (LAMP), University of Maryland, College Park MD, April 1997 – present.
Hold an affiliate research scientist position at LAMP to collaborate with researchers at the lab in areas such as **video indexing and image enhancement and multimedia processing, archiving and indexing.**


NorthStar Exhibit No. 2003, IPR2023-00890
Page 044

**Part time lecturer,** University of Maryland Baltimore County (UMBC), Department of Computer Science, August 1998 – September 1999.
Held a lectureship position at UMBC teaching Assembly language programming. This position is held under an accredited program for a computer science curriculum.

**Graduate Research Assistant (GRA),** Center for Automation Research (CfAR), University of Maryland, College Park, MD March 1995-April 1997.
Worked with Dr. David Doermann (co-director of LAMP) with Professor Rama Chellappa (Associate director of CfAR) as the academic advisor.
**Ph.D. Thesis: Document image compression and analysis:** constructor of an information hierarchy geared towards **information retrieval**. Preservation of symbol **Structure** was exploited to yield natural extensions to **lossy compression, progressive transmission** and promotion of **compressed-domain** document image processing. Various concepts were considered including **vector quantization, wavelet transforms, pattern matching and entropy analysis** to demonstrate performance and feasibility. Several mathematical analysis tools were used along with application development and testing.
**Projects:** Involved in handwriting character recognition utilizing **energy minimization** techniques to reconstruct handwritten strokes. A priori knowledge of character shapes was used to detect and segment off-line characters. The unique aspect of this research was exploitation of connected features **(primitives)** and use of an appropriate cost function to optimize a **minimum cost solution.** Also of interest was derivation of the detected character's stability and **region of convergence** to determine a goodness of fit parameter for higher-level programming. Part of this research involved **mathematical analysis** in the field of **optimization** and **control** with applications to the field of **image processing.** The rest involved programming and proof of principle. Was one of the pioneering researchers to develop the document duplicate detection work at the lab. Utilized **Region of Convergence** performance criteria and **random-process analysis** in conjunction with **Tree-based** search algorithm and **N-Gram** signature creation to prove, design and implement a complete detection system.

**Research Engineer,** Glynn Scientific Inc. Annapolis, MD Oct. 1989- Oct. 1994.
**Analysis:** Performed optimization analysis on several cost functions spanning various performance criteria. Used **Matrix Algebra, optimal control theory,** and **partial differential analysis** to derive various optimal conditions. Performed analysis on fingerprints, OCR, SONAR systems and stock market performance problems. While performing such tasks, played the role of program manager in some cases and task leader in others. Also involved in writing problem statements, statements of work, required time and manpower for purposes of project life analysis and system requirements for the overall package.
**Image processing:** Performed various image enhancements to aid in feature finding, classification and detection algorithms. Analyzed pattern recognition problems using **quadratic Bayes** algorithms, **maximum likelihood** algorithms, **nearest neighbor** algorithms and **model/template matching** algorithms. Also applied neural network techniques for feature extraction and pattern recognition. Image enhancement was done in the fingerprint and OCR cases. Pattern recognition and detection were performed on fingerprints, OCR, SONAR and RADAR problems. Responsibilities included program management, principal researcher and support.
**RADAR:** Supported data acquisition and proof of principle pertaining to **ATR** concepts. Designed and tested performance analysis tools to be used for classification of various targets. Analyzed system performance under limited conditions using noise, resolution and target models. Involved in overall system support and syntactic implementation. Responsibilities for these tasks were only in support and did not involve full time effort.
**ASW:** Performed and analyzed various methods of **signal processing** and **detection** for implementation in sonar systems. Various signals were designed with frequency and phase hopping characteristics in order to meet system requirements for **counter-detection, resolution in range and Doppler.** Effects of **multi-path** and **reverberation** were considered. Statistical **probabilities of detection, signal interception and false alarms** were thoroughly investigated. Adaptive and standard signal processing algorithms were utilized for improved performance under certain conditions (including ESPRIT and MUSIC algorithms). Supported design and data processing related to ASW platform sea tests. Mostly involved in a support role while taking the lead in the area of statistics in counter detection.
**Systems Administration:** As the systems manager, responsible for maintaining the in-house computer systems and for recommending new technology and solutions for the company's computing needs. Special tasks included installing and streamlining work to be done on an array processor and providing compatible modes of data transfer.


NorthStar Exhibit No. 2003, IPR2023-00890
Page 045

**Research/Teaching Assistant,** Department of Electrical Engineering and Computer Science, UIC, Chicago, IL. September 1987 to August 1989.
**Research: Digital signal processing and homomorphic analsysis** on arterial load for isolating reflection. Control system design and analysis was done for master's work. Continuous and discrete time control were thoroughly investigated for process control. Exploited the characteristics of process control plants to get a robust controller able to withstand the changing of the process and simple enough to re-tune with a calculator.
**Teaching:** Taught departmental courses in computer architecture and computer programming which included classes in excess of 30 students. Taught laboratory and discussion sessions on a wide variety of subjects including, but not limited to, computer programming, circuits, electric machinery and control systems.

**Research Engineer,** School of Engineering and Architecture, CUA, Washington DC, September 1985 – August 1987.
Worked as a systems engineer in the robotics lab and the CAD lab. Designed and built peripheral circuitry for the computer and control of various robot actuators. Performed experiments to control an underwater robot. Was very active in computer programming and hardware design. Designed voice synthesizer board and wrote machine language program to use the board. Designed and implemented a microprocessor-based device to notify an underwater diver of depth, time under water, time left with air in tank and decompression depth and time needed. This device was designed using a 6800 microprocessor, UV-Prom and associated electronics.

## Consulting Experience:

Coastal Communication Consultants, Inc., September 2017 – Now. Serve as a consultant and a contractor to various opportunities as a Subject Matter Expert in the general area of image and data science.

GHB Intellect, June 2013 – Now. Provide consulting services for patent and intellectual property review and analysis.

Northstrat Inc, November 2013 – September 2017. Serve as a consultant and a contractor to various opportunities as a Subject Matter Expert in the general area of image science.

Parsa Wireless Communications, February 2012 – April 2016. Provide consulting services for patent and intellectual property review and analysis.

ITT-Exelis-Harris, June 2009 – November 2013. Serve as a consultant and a contractor to various opportunities as a Subject Matter Expert in the general area of image science.

## Patents:

- O. Kia, Secure and mobile biometric authentication for electronic health record management, US Patent 9,553,727 on January 24, 2017.
- O. Kia, Digital Radiographic Device Having a Linear Scanner, US Patents 8,662,749, 9,125,571 and 9,380,989 on March 4, 2014, September 8, 2015 and July 5, 2016.
- O. Kia and J. Graybill, System and method for providing temporal-spatial registration of images, US Patent 9,071,819, June 30, 2015.
- C. Rodgers and O. Kia, System and method of visualization of species characterization, dynamics and stratification of the magnetosphere, US Patent 9,037,413, May 19, 2015.
- O. Kia, Methods, apparatus, and systems for super resolution of LIDAR data sets, US Patent 8,818,124, August 26, 2014.
- O. Kia and C. Rodgers, System and method of visualization of species characterization, dynamics and stratification of the magnetosphere, US Patent 8,616,052, December 31, 2013.


NorthStar Exhibit No. 2003, IPR2023-00890
Page 046

- O. Kia and S. Dockstader, Photogrammetric method and system for stitching and stabilizing camera images, US Patent 8,559,757, October 15, 2013.
- H. Tancredi, E. Marandola, F. Speranza, and O. Kia, Adjustable scanner, US Patent 8,503,603, August 6, 2013.
- O. Kia, C. Rodgers and B. Bradford, Systems and Methods for Space Situational Awareness and Space weather, US Patent 8,193,968, June 5, 2012.
- A. Singh, E. Marandola, O. Kia and U. Mundry, Locating an Elongated Object in a Three Dimensional Data Array, US Patent 7,817,830, October 2010.
- O. Kia, K. Subramanyan and P. Crawn, Method and Apparatus for Generating A Panoramic Image By Combining Image Data Generated From Multiple Perspectives, US Patent 7,756,247, July 2010.
- J. Gregorio and O. Kia, Cephalometric X-ray Imaging Apparatus, Patent Application 20090196395, August 2009.
- A. Singh, E. Marandola, O. Kia and U. Mundry, Generating Panoramic Views of the Jaw Using a Fixed Reference Point and Crossing Points of Multiple Rays, US Patent 7,545,909, June 2009.
- A. Singh and O. Kia. Location of focal place. US Patent 7,460,638, Dec. 2008.
- O. Kia, A. Singh, E. Marandola and U. Mundry, Scatter Correction, Patent Application 20070086560, April 2007.
- K. Hartigan, S. Hunter, D. Loukonine, B. Morgan and O. Kia. Method and System for Tracking and Reporting Time Spent on Tasks. US Patent 6,832,176, Dec. 2004.
- C. Henderson and O. Kia. Method and System for Collaborative Knowledge Management, United States Patent Application, 20030009536, Jan. 2003.

## Publications:

- A. Bright, O. Kia, J. Graybill, S. Cruz, Shape-based topologies for real-time onboard image generation. In proceeding of the SPIE, Airborne Intelligence, Surveillance, Reconnaissance (ISR) Systems and Applications IX, volume 8360, May 1, 2012.
- C. Rodgers and O. Kia, Ionosphere Mitigation Through Species Characterization And Stratification, AMS Annual Meeting, *8th Conference on Space Weather,* Spokane, Washington, January 2011.
- O. Kia, C. Rodgers and B. Bradford, Dual use RF-based Sending for Proximity and Space Weather Event Detection. In proceeding of the *SPIE, Radar Sensor Technology XIV,* volume 7669 pp. 76690C-7669C-12, 2010.
- O. Kia, 3D Imaging: Should I go digital, Orthodontic Products, June 2004.
- O. Kia and D. Doermann. Residual coding in document image compression. *IEEE Transactions on Image Processing,* 9:961-969, 2000.
- O. Kia, J. Vossoughi, G. Lopez and S. Sirohey. Image Based Evaluation of Vascular Residual Strain. In *International Journal of Artificial Intelligence Tools,* 9:247-263, 2000.
- O. Kia, D. Doermann, A. Rosenfeld and R. Chellappa. Symbolic compression and processing of document images. *Computer vision and Image Understanding,* 70:335-319, 1998.
- O. Kia and D. Doermann. Document image coding for processing and retrieval. *Journal of VLSI Signal Processing Systems for Signal, Image and Video Technology,* 20:121-135, 1998.
- H. Li, D. Doermann and O. Kia. Automatic Text Detection and Tracking in Digital Video. *IEEE Transactions on Image Processing,* 9:147-156, 2000.
- H. Li, D. Doermann and O. Kia. Text Extraction, Enhancement and OCR in Digital Videos. *Book chapter in Springer Verlag, 1999.*
- D. Doermann, H. Li and O. Kia. The detection of duplicates in document image databases. In *Image Vision and Computing Journal,* (16) 12-13 (1998), pp 907-920.
- Omid E. Kia. *Document Image Compression and Analysis.* Ph.D. thesis, University of Maryland, College Park, 1997.
- O. Kia, S. Sirohey and J. Vossoughi. Image-based Evaluation of Vascular Residual Strain. In proceedings of the *International Conference on Information Intelligence and Systems, pp. 444-451, 1999.*
- J. Sauvola and O. Kia. Distributed Processing of Multimedia Extended Documents. In the proceedings of the *International Workshop on Multimedia Signal Processing, 1999.*
- O. Kia, J. Sauvola and D. Doermann. Network-diffused media scaling for multimedia content services. *In Interactive Distributed Multimedia Systems and Telecommunication Services,* Eds. M. Diaz, P. Owezarski


NorthStar Exhibit No. 2003, IPR2023-00890
Page 047

and P. Senac. In proceedings of the *International Workshop on Interactive Distributed Multimedia Systems and Telecommunications Services, pp. 149-162, 1999.*

- H. Li, O. Kia and D. Doermann. Text Extraction and Recognition in Digital Video. In the proceedings of the *International Workshop on Document Analysis Systems,* pp 119-128, 1998.
- H. Li, D. Doermann and O. Kia. Automatic Text Extraction and Tracking in Digital Video. *LAMP Technical Report,* LAMP-TR-028, CAR-TR-900, CS-TR-3962, Dec. 1998.
- H. Li, O. Kia and D. Doermann. Text Enhancement in Digital Video. In the proceedings of the *SPIE – Document Recognition and Retrieval,* volume 3651, pp 2-9, 1999.
- O. Kia and J. Sauvolla. Active documents for mobile services. In the proceedings of the *IEEE workshop on Multimedia Signal Processing,* pp. 227-232, 1998.
- O. Kia and A. Schaff. Data Representation and Handling for Large Image Browsing. In the proceedings of the *SPIE – Multimedia Storage and Archiving Systems,* pp. 37-46, 1998.
- O. Kia and D. Doermann. OCR-based Rate-Distortion Analysis of Residual Coding. In the proceedings of the *International Conference on Image Processing,* Volume III, pp. 690-693, 1997.
- O. Kia and D. Doermann. Integrated Segmentation and Clustering for Enhanced Compression of Document Images. In the proceedings of the *International Conference on Document Analysis and Recognition,* Volume I, page 406, 1997.
- O. Kia and D. Doermann. Document Image Coding for Processing and Retrieval. In Proceedings of the *IEEE Workshop on Multimedia Signal Processing,* pp. 331-336, 1997.
- J. Sauvola and O. Kia. Hyperdocument management for compression, transmission and processing. In Proceedings of the *IEEE Workshop on Multimedia Signal Processing,* pp. 537-542, 1997.
- O. Kia and D. Doermann. Structure-preserving Image Compression and Transmission. In Proceedings of the *International Conference on Image Processing,* Volume I, pp. 193-196, 1996.
- O. Kia and D. Doermann. Symbolic Compression for Document Analysis. In Proceedings of the *International Conference on Pattern Recognition*, Volume III, pp. 664-668, 1996.
- O. Kia, D. Doermann and Rama Chellappa. Compressed-domain Document Retrieval and Analysis. In Proceedings of the *SPIE – Multimedia Storage and Archiving Systems,* Volume 291, pp. 176-187, 1996.
- D. Doermann and O. Kia. Hybrid thinning through reconstruction. In Proceedings of the *International Conference on Document Analysis and Recognition,* Volume II, pp. 632-635, 1995.

**Expert Witness Cases:**

The following is a complete list of cases which I have provided expert opinions through either trial testimony, deposition, report, or declarations.

District of Delaware – Fenster Family Patent Holding *et al.* v. Philips Medical *et al.* – Consultant and arbitration for the plaintiff.

4:03-CV-276 – Eastern District of Texas, Sherman – STM v. Motorola *etc al.* – Expert report for the plaintiff.

C.A. No. 04-0048 – District of Delaware – Fenster Family Patent Holding *et al.* v. Siemens Medical Solutions USA *et al.* – Expert report and Deposition assistant for the plaintiff.

04-CV-01363 – Southern District of New York – John Amico *et al.* v. Nhega LLC *et al.* – Expert report for the plaintiff.

2:08CV389 – Eastern District of Texas, Marshall Division – Hospital Systems Corporation v. General Electric Company *et al.* – Expert report for invalidity for the plaintiff.

22-C-09-000274 MM – Circuit Court for Wicomico County, Maryland, Diana Donaway et al, v. Jodi D. Jones M.D. et. al. – October 2010 – Expert for Defendant on HIS system.


NorthStar Exhibit No. 2003, IPR2023-00890
Page 048

Patent Interference No. 105,890 (SCM) – USPTO: Patent Trial and Appeal Board – Andreas Kotowski *et-al* (Rapiscan Systems, Inc.) v. Richard Mastronardi et-al (American Science and Engineering Inc.) – June 2013.

2:10-CV-00029 – Eastern District of Texas, Marshall – Princeton Digital Image Corporation v. Canon Inc *et al.* – Expert consulting for plaintiff.

Patent Re-examination 90/013,078 – USPTO: Declaration for patent examination for Joseph P. Jaronczyk Jr. of LittelFuse, Inc. – June 2014.

2:13-cv-0052 – Eastern District of Texax, Marshall – Trover Group Inc. etc. al. v. Tyco International LTD et. al, - April 2014 – Expert for plaintiff.

1:14-cv-00261-UNA – District court for the District of Delaware – Celebrate International LLC v. LeapFrog Enterprises, Inc. et. al., February 2014 – Expert for plaintiff.

Inter Partes Review of US Patent No. 5,751,346, AXIS Communications Inc. et. al. v. Trover Group Inc. – United States Patent and Trademark Office before the Patent Trial and Appeal Board – December 2014 – Expert for Defendant.

Civil No. 385518V, The Circuit Court for Montgomery County, Maryland, ProExpress Distributors LLC v. Grand Electronics, Inc. Et. Al., February 2015 – Expert for defendant.

2:13-cv-1047-JRG Consolidated Lead case, United States District Court for the Eastern District of Texas Marshall Division, Trover Group Inc. and the Security Center Inc. v. Dedicated Micros Inc. et. al., April 2015 – Expert for plaintiff

12CV0380 CAB (DHB) United States District Court Southern District of California, SONIX Technology Co. Ltd. v. Kenji Yoshida and Grip IP, PTE, Ltd, April 2015 – Expert for defendants.

1:11-cv-00117-LY Consolidated Lead Case, United States District Court for the Western District of Texas Austin Division, Source Prose, Inc. v. AT&T Mobility et. al, May 2015 – Expert for Plaintiff.

13-cv-453-SLR-SRF, United States District Court for the District of Delaware, Intellectual Ventures I et. al, v. Toshiba Corporation et. al. December 2015 – Expert for Plaintiff.

6:14-cv-680-RWS, Consolidated case, United States District Court Eastern District of Texas Tyler Division, TracBeam LLC, v. T-Mobile US, Inc. et al, and TracBeam LLC, v. Apple Inc., March 2016 – Expert for Plaintiff.

2:15-cv-1503, United States District Court for the Eastern District of Texas, Marshall Division, TIVO Inc. v. Samsung Electronics Co. LTD et al., April 2016 – Expert for Defendant.

IPR2016-00212, Inter Partes Review of U.S. Patent 7,974,339, Google Inc. v. Vedanti Systems Limited – United States Patent and Trademark Office before the Patent Trial and Appeal Board – May 2016 – Expert for defendant.

2:15-cv-01274-JRG-RSP, Blitzsafe v Honda et. al., United States District Court for the Eastern District of Texas Marshall Division – August 2016 – Expert for Plaintiff.

2:16-cv-980, Intellectual Ventures II LLC v. FEDEX Corp et al. United States District Court for the Eastern District of Texas Marshall Division – March 2017 – Expert for Plaintiff.

8:16-cv-01194-MSS-TGW, University of South Florida Research Foundation, Inc. v. Fujifilm Medical Systems USA, United States District Court for the Middle District of Florida, Tampa Division – July 2017 – Expert for Plaintiff.

Investigation No. 337-TA-1061, In the Matter of Certain Bar Code Readers, Scan Engines, Products Containing the Same, and Components Thereof, United States International Trade Commission, Honeywell v. Code – October 2017 – Expert for Plaintiff.

4:16-cv-03595, Arya et al v. Dufossat et al, United States District Court for the Southern District of Texas, Houston Division – February 2018 – Expert for defendant.

1:12-cv-01461, Princeton Digital Image Corporation v. Konami Digital Entertainment Inc., et al. United States District Court for the District of Delaware – May 2018 – Expert for Plaintiff.

2:17-cv-00516-JRG, AGIS v Apple, et al. United State District Court for the Eastern District of Texas Marshall Division – July 2018 – Expert for Plaintiff.

IPR2018, Inter Partes Review of U.S. Patent 8,331,715, Samsung Electronics Co. LTD. v. Fotonation Limited – United States Patent and Trademark Office before the Patent Trial and Appeal Board – November 2018 – Expert for Plaintiff.

17-1059, First Wheel Management Limited v. Inventist, Inc. and Shane Chen, United States District Court for the District of Delaware – January 2019 – Expert for Plaintiff.

IPR2019-00218, Inter Partes Review of U.S. Patent 7,965,408, Altamont Software Inc. v. Sorna Corporation – United States Patent and Trademark Office before the Patent Trial and Appeal Board – February 2019 – Expert for Defendant.

2:17-cv-00422-JRG, Blitzsafe v Mercedes et. al., United States District Court for the Eastern District of Texas Marshall Division – April 2019 – Expert for Plaintiff.

C.A. No. 17-1386-LPS-CJB, Osseo Imaging v Planmeca USA, United States District Court for the District of Delaware, May 2019, Expert for Plaintiff.

Civil Action No. 2:18-cv-00506-JRG, UNILOC v. Samsung et al, United States District Court for the Eastern District of Texas Marshall Division – September 2019 – Expert for Plaintiff.

2:18-CV-00171-RWS-RSP, CXT Systems v. Academy et al, United States District Court for the Eastern District of Texas Marshall Division – September 2019 – Expert for Plaintiff.

Investigation No. 337-TA-1061, In the Matter of Certain Bar Code Readers, Scan Engines, Products Containing the Same, and Components Thereof, United States International Trade Commission, Honeywell v. Opticon – October 2019 – Expert for Plaintiff.

C/09/591436, Hand Held Products v. Opticon, District Court The Hague – July 2020 – Expert for Plaintiff.

2:19-cv-00361-JRG, AGIS v. Google et al, United States District Court for the Eastern District of Texas Marshall Division – September 2020 – Expert for Plaintiff.

C.A. No. 20-842 (CFC) AMO v. ALCON v. AMO & Johnson & Johnson, District Court for the District of Delaware – February 2021 – Expert for Plaintiff in counter suit.

IPR2021-01003, Inter Partes Review of U.S. Patent 8,398,236, Johnson & Johnson Surgical Vision Inc, v. ALCON Inc – United States Patent and Trademark Office before the Patent Trial and Appeal Board – September 2021 – Expert for Defendant.

2:20-cv-00349-JRG LONGHORN HD v. NETSCOUT SYSTEMS, District Court for the Eastern District of Texas, Marshall Division – July 2021 – Expert for Plaintiff.

2:21-cv-00099-JRG LONGHORN HD v. JUNIPER NETWORKS, District Court for the Eastern District of Texas, Marshall Division – November 2021 – Expert for Plaintiff.

2:20-cv-0319-JRG, 2:21-cv-0110-JRG United Services Automobile Association v. PNC Bank, District Court for the Eastern District of Texas, Marshall Division – July 2021 – Expert for Defendant.

Investigation No. 337-TA-1285, In the Matter of Certain Bar Code Scanners, Mobile Computers with Barcode Scanning Capabilities, Scan Engines, and Components Thereof, United States International Trade Commission, Honeywell v. Zebra – September 2021 – Expert for Plaintiff.

IPR2022-00218, Inter Partes Review of U.S. Patent 7,400,704, Sigray Inc, v. Carl Zeiss X-Ray Microscopy Inc – United States Patent and Trademark Office before the Patent Trial and Appeal Board – November 2021 – Expert for Plaintiff.

2:21-cv-00148-JRG NETWORK MONITORING LLC v. SKYSCANNER LTD, District Court for the Eastern District of Texas, Marshall Division – February 2022 – Expert for Plaintiff.

IPR2022-01576, Inter Partes Review of U.S. Patent 9,538,985, Butterfly Network Inc., v. FujiFilm Sonosite, Inc. – United States Patent and Trademark Office before the Patent Trial and Appeal Board – September 2022 – Expert for Plaintiff.

5:21-cv-01129-EJD, Carl Zeiss X-ray Microscopy, Inc, v. Sigray Inc., District Court Northern District of California – October 2022 – Expert for Defendant.

2:20-cv-00851-TSZ, International Business Machines Corporation v. Zillow Group, Inc., District Court Western District of Washington at Seattle – October 2022 – Expert for Plaintiff.

IPR2022-01374, Inter Partes Review of U.S. Patent 7,557,711, Zebra Technologies Corporation, v. Lone Star SCM Systems, LTD – United States Patent and Trademark Office before the Patent Trial and Appeal Board – October 2022 – Expert for Defendant.

6:22-cv-004433, 3SHAPE A/S v. Medit Corp, District Court for the Western District of Texas, Waco Division – December 2022 – Expert for Defendant.

Investigation No. 337-TA-1324, In the Matter of Certain Mobile Electronic Devices, United States International Trade Commission, Maxell v. Motorola, Lenovo et. al. – November 2022 – Expert for Defendant.

5:22-CV-00069-RWS, Pantech v. OnePlus, District Court for the Eastern District of Texas Texarkana Division – August 2023 – Expert for Defendant.

IPR2023-00890, 00934, 01017, Inter Partes Review of U.S. Patents 8,014,943, 8.478,527 and 8,032,297, BMW of North America LLC v. Northstar Systems LLC – United States Patent and Trademark Office before the Patent Trial and Appeal Board – January 2024 – Expert for Defendant.

3:23-cv-1937, Kustom Signals Inc. v. Applied Concepts Inc., District Court for Northern District of Texas Dallas Division – January 2024 – Expert for Plaintiff.

**Computer Languages:**

C/C++ (UNIX, MS-Windows), Visual Basic, JAVA (Unix, Windows, Symbian EPOC), Assembly language (8086, 68000, Z80) and Matlab.

**Systems:**

X86 (MS-Windows, LINUX, DOS), Sun SPARC (SunOS, Solaris), UNIX (HPUX, AIX, SGI), Macintosh, IBM Mainframe, Digital VAX/VMS.

**Associations and awards:**

Affiliate research faculty at University of Maryland at College Park, Language and Media Processing Laboratory and University of Oulu, Finland, Information Processing Laboratory.
Member of Tau Beta Pi, Eta Kappa Nu, and IEEE Computer and Signal Processing Group, 1983-present.
Tuition Scholarship recipient, UIC, 1987-1989.
Dean's List, CUA, 1985-1987.