

**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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INTELLIGENT PROTECTION MANAGEMENT CORP.,  
Petitioner,

v.

CISCO TECHNOLOGY, INC.,  
Patent Owner.

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Case IPR2025-01589  
U.S. Patent No. 8,941,708

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**DECLARATION OF OMID KIA, Ph. D. IN SUPPORT OF PETITION FOR  
*INTER PARTES* REVIEW OF U.S. PATENT NO. 8,941,708**

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**CLAIM LISTING**

|              |                                                                                                                                                                                                                                           |
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| <b>1.pre</b> | 1. A method comprising:                                                                                                                                                                                                                   |
| <b>1.a</b>   | providing, on a display, an object configured to be moved by a user<br>along an axis extending across video for a plurality of video<br>conference streams;                                                                               |
| <b>1.b</b>   | associating a plurality of predefined layouts for plurality of video<br>conference streams with respective intervals along the axis;                                                                                                      |
| <b>1.c</b>   | detecting a user action on the object indicating a position on the axis;<br>and                                                                                                                                                           |
| <b>1.d</b>   | composing, in response to the detecting of the user action, a composite<br>video signal using a layout, of the plurality of predefined layouts,<br>associated with an interval among the intervals within which the<br>position is lying. |
| <b>2.pre</b> | 2. The method according to claim 1,                                                                                                                                                                                                       |
| <b>2.a</b>   | wherein the composite video signal includes a spatial mix of the<br>plurality of video conference streams, and                                                                                                                            |
| <b>2.b</b>   | the layout defines one or more frames for containing the plurality of<br>video conference streams,                                                                                                                                        |
| <b>2.c</b>   | the method further comprising:                                                                                                                                                                                                            |

|              |                                                                                                                                                                                                                                |
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| <b>2.d</b>   | providing, for at least one of the intervals, a relationship between positions within the at least one of the intervals and a size and position of one or more frames of a respective layout associated with the interval, and |
| <b>2.e</b>   | calculating, in response to the detecting of the user action, a layout wherein the size and position of each frame of the layout is based on the relationship and the position.                                                |
| <b>3.pre</b> | 3. The method according to claim 1, further comprising:                                                                                                                                                                        |
| <b>3.a</b>   | associating M numbers of variations of one of the plurality of predefined layouts with M number of sub-intervals within one or more of the intervals;                                                                          |
| <b>3.b</b>   | identifying, in response to the detecting of the user action, a sub-interval among the sub-intervals within which the position is lying;                                                                                       |
| <b>3.c</b>   | selecting a layout, of the plurality of predefined layouts, associated with the sub-interval; and                                                                                                                              |
| <b>3.d</b>   | composing the composite video signal using the selected layout.                                                                                                                                                                |
| <b>4</b>     | 4. The method of claim 1, further comprising: identifying the interval among the intervals within which the position is lying.                                                                                                 |
| <b>5.pre</b> | 5. The method of claim 1, further comprising:                                                                                                                                                                                  |

|            |                                                                                                                                                                                                                                                                                   |
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| <b>5.a</b> | wherein the composite video signal includes a spatial mix of one or more video conference streams, and                                                                                                                                                                            |
| <b>5.b</b> | the layout defines one or more frames for containing the video conference streams.                                                                                                                                                                                                |
| <b>6</b>   | 6. The method of claim 5, further comprising: providing, for at least one of the intervals, a relationship between positions within the at least one of the intervals and the size and position of one or more frames of a respective layout associated with the interval.        |
| <b>7</b>   | 7. The method of claim 6, further comprising:<br><br>calculating a layout wherein the size and position of each frame of the layout is based on the relationship and the position.                                                                                                |
| <b>8</b>   | 8. The method of claim 1, further comprising:<br><br>providing, for at least one of the intervals, a relationship between positions within the at least one of the intervals and the size and position of one or more frames of a respective layout associated with the interval. |

|               |                                                                                                                                                                                                                                                          |
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| <b>9</b>      | 9. The method of claim 1, further comprising:<br><br>calculating, in response to the detecting of the user action, a layout<br><br>wherein a size and position of each frame of the layout is based on<br><br>the relationship and the position.         |
| <b>10.pre</b> | 10. A method comprising:                                                                                                                                                                                                                                 |
| <b>10.a</b>   | providing, on a display, an object configured to be moved by a user<br><br>along an axis;                                                                                                                                                                |
| <b>10.b</b>   | associating a plurality of predefined layouts with respective intervals<br><br>along the axis;                                                                                                                                                           |
| <b>10.c</b>   | detecting a user action on the object indicating a position on the axis;                                                                                                                                                                                 |
| <b>10.d</b>   | identifying an interval among the intervals within which the position is<br><br>lying;                                                                                                                                                                   |
| <b>10.e</b>   | selecting the layout associated with the interval; and                                                                                                                                                                                                   |
| <b>10.f</b>   | composing, in response to the detecting of the user action, a composite<br><br>video signal using the layout, of the plurality of predefined layouts,<br><br>associated with the interval among the intervals within which the<br><br>position is lying. |

|           |                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <b>11</b> | <p>11. The method according to claim 10, further comprising:</p> <p>providing the selected layout to a video composing unit, which</p> <p>composes the composite image and which is configured to receive</p> <p>a plurality of video conference streams and output a composite</p> <p>video signal comprising one or more of the received video</p> <p>conference streams based on a layout.</p> |
| <b>12</b> | <p>12. The method according to claim 10 , further comprising:</p> <p>displaying the composite video signal on the display, the display being</p> <p>of a video conference terminal.</p>                                                                                                                                                                                                           |
| <b>13</b> | <p>13. The method according to claim 12, further comprising:</p> <p>displaying the object on a display of a control device, which is</p> <p>connected to the video conference terminal, together with a replica</p> <p>of the composite video signal currently displayed on the display of</p> <p>the video conference terminal.</p>                                                              |
| <b>14</b> | <p>14. The method according to claim 10 , further comprising:</p> <p>displaying the object on the display, which is of a video conference</p> <p>terminal.</p>                                                                                                                                                                                                                                    |

|               |                                                                                                                                                                                                                                                                      |
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| <b>15</b>     | 15. The method according to claim 13, further comprising:<br><br>updating one of the composite video signal and the replica in real time<br><br>as the object is moved by the user.                                                                                  |
| <b>16.pre</b> | 16. A non-transitory computer-readable storage medium including<br><br>computer executable instructions, wherein the instructions, when<br><br>executed by a computer, cause the computer to perform a method,<br><br>the method comprising:                         |
| <b>16.a</b>   | providing, on a display, an object configured to be moved by a user<br><br>along an axis;                                                                                                                                                                            |
| <b>16.b</b>   | associating a plurality of predefined layouts with respective intervals<br><br>along the axis;                                                                                                                                                                       |
| <b>16.c</b>   | detecting a user action on the object indicating a position on the axis;                                                                                                                                                                                             |
| <b>16.d</b>   | selecting a layout, of the plurality of predefined layouts, associated<br><br>with an interval among the intervals within which the position on<br><br>the axis is lying; and                                                                                        |
| <b>16.e</b>   | composing, in response to the detecting of the user action, a composite<br><br>video signal using the layout, of the plurality of predefined layouts,<br><br>associated with the interval among the intervals within which the<br><br>position on the axis is lying. |

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| <b>17.pre</b> | 17. An apparatus comprising:                                                                                                                                                                                                                                                                         |
| <b>17.a</b>   | a processing unit configured to                                                                                                                                                                                                                                                                      |
| <b>17.b</b>   | provide, on a display, an object configured to be moved by a user<br>along an axis,                                                                                                                                                                                                                  |
| <b>17.c</b>   | associate a plurality of predefined layouts with respective intervals<br>along the axis, and                                                                                                                                                                                                         |
| <b>17.d</b>   | detect a user action on the object indicating a position on the axis; and                                                                                                                                                                                                                            |
| <b>17.e</b>   | a video composing unit configured to compose, in response to the user<br>action being detected by the processing unit, a composite video<br>signal using a layout, of the plurality of predefined layouts,<br>associated with an interval among the intervals within which the<br>position is lying, |
| <b>17.f</b>   | wherein the processing unit is further configured to identify an interval<br>among the intervals within which the position is lying,                                                                                                                                                                 |
| <b>17.g</b>   | select the layout associated with the interval, and                                                                                                                                                                                                                                                  |
| <b>17.h</b>   | provide the selected layout to the video composing unit.                                                                                                                                                                                                                                             |
| <b>18.pre</b> | 18. The apparatus according to claim 17, wherein                                                                                                                                                                                                                                                     |
| <b>18.a</b>   | the composite video signal includes a spatial mix of one of more video<br>conference streams,                                                                                                                                                                                                        |

|               |                                                                                                                                                                                                                              |
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| <b>18.b</b>   | the layout defines one or more frames for containing the video conference streams, and                                                                                                                                       |
| <b>18.c</b>   | the processing unit is further configured to                                                                                                                                                                                 |
| <b>18.d</b>   | provide, for at least one of the intervals, a relationship between positions within the at least one of the intervals and a size and position of one or more frames of a respective layout associated with the interval, and |
| <b>18.e</b>   | calculate, in response to the user action being detected, a layout wherein the size and position of each frame of the layout is based on the relationship and the position.                                                  |
| <b>19.pre</b> | 19. The apparatus according to claim 17, wherein                                                                                                                                                                             |
| <b>19.a</b>   | the processing unit is further configured to                                                                                                                                                                                 |
| <b>19.b</b>   | associate M numbers of variations of one of the plurality of predefined layouts with M number of sub-intervals within one or more of the intervals,                                                                          |
| <b>19.c</b>   | identify, in response to the user action being detected, a sub-interval among the sub-intervals within which the position is lying, and                                                                                      |
| <b>19.d</b>   | select a layout, of the plurality of predefined layouts, associated with the sub-interval; and                                                                                                                               |

|             |                                                                                                         |
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| <b>19.e</b> | the video composing unit is configured to compose the composite video signal using the selected layout. |
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I, Omid Kia, Ph. D., hereby declare as follows:

**I. INTRODUCTION**

1. I have been retained as an expert on behalf of Petitioner Intelligent Protection Management Corp. (“Petitioner” or “IPM”) to support a petition for *inter partes* review (“IPR”) of claims 1-19 (“the Challenged Claims”) of U.S. Patent No. 8,941,708 (“the ’708 patent”).

2. I am being compensated for my time in connection with this IPR at my standard rate for consulting services. My compensation is not dependent on the outcome of this proceeding, the results of my analysis, or on the substance of my opinions and testimony.

3. I have been asked to provide my opinion on the validity of claims 1-19 of the ’708 patent. In particular, I have been asked to consider whether U.S. Patent 8,421,840 (“Eleftheriadis”) in view of Mahemoff, “Ajax Design Patterns: Creating Web 2.0 Sites with Programming and Usability” (O’Reilly 2006) (“Mahemoff”) and U.S. Patent Application Publication No. US 2010/0302130 (“Kikuchi”) in view of Eleftheriadis discloses or at least suggests claims of the ’708 patent. Relatedly, I have also provided opinions on other matters as set forth in this Declaration, including whether U.S. Patent Application Publication No. US 2009/0015568 (“Koski”) discloses or at least suggests claims of the ’708 patent when considered with the Eleftheriadis, Mahemoff, and Kikuchi references.

4. In preparing this Declaration, I have reviewed the following materials, including other materials discussed in this document:

| Exhibit Number | Exhibit Description                                                                                                                       |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 1001           | U.S. Patent No. 8,941,708 (“the ’708 patent”)                                                                                             |
| 1002           | File History of U.S. Patent No. 8,941,708                                                                                                 |
| 1004           | U.S. Patent 8,421,840 (“Eleftheriadis”), issued Apr. 16, 2013, filed Jun. 9, 2009                                                         |
| 1005           | U.S. Patent Application Publication No. US 2010/0302130 (“Kikuchi”), published December 2, 2010                                           |
| 1006           | U.S. Patent 6,950,097 (“Hojabri”), issued Sep. 27, 2005                                                                                   |
| 1007           | Mahemoff, “Ajax Design Patterns: Creating Web 2.0 Sites with Programming and Usability” (O’Reilly 2006) (“Mahemoff”), published June 2006 |
| 1008           | U.S. Patent Application Publication No. US 2009/0015568 (“Koski”), published Jan. 15, 2009                                                |

## II. BACKGROUND AND QUALIFICATIONS

5. A brief summary of my background and qualifications is provided in this section. which I believe qualifies me to opine as one skilled in the art of relevant technology. A true and correct copy of my *curriculum vitae*, attached hereto, provides additional details regarding my background and qualifications.

6. I earned my Bachelor’s of Science in electrical engineering from Catholic University of America in 1987. In 1989, I completed my Master’s 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.

7. A chief focus of my career has been designing and developing computational imaging, video, and content processing systems for medical and other uses, considering all aspects of the user, patient and system components, including the requisite hardware, software, networking, 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. Among other things, my role involved the development of video pipeline processing, real-time storage and retrieval of live video, creating custom software applications, and integrating custom graphical user interfaces to meet customer demands. For example, I designed algorithms where a user exploits imaging and other available information by interacting with a user interface implemented in desktop, server and mobile environments.

8. My experience includes design and development of systems for video and content processing and communication, among many other concepts, including Video over IP, video surveillance, storage and processing of real-time live video,

multimedia compression and communication, and image and video indexing. For example, after I completed my Ph.D., I worked as an Electronics Engineer at the National Institute of Standard and Technology, where I performed research and development on various projects involving multimedia compression and communication and video indexing using media processing tools to develop new and innovative techniques for archiving, processing, and transmitting video and other media. I also researched techniques for serving large microscope images annotated with educational pointers for educational purposes and served as the U.S. Ambassador to the MPEG standardization Group working on the standards for MPEG-4 at the time. As another example, while working as a principal consultant for Sigma Vision, I authored several proposals directed to Video Over IP and video surveillance systems, including development of Video Over IP systems for thin clients that were java enabled. Later on, as President of Sigma Vision, I also performed several large scale consulting projects in the area of Video Over IP.

9. I am currently a senior systems engineer, serving as subject matter expert at Coastal Communication Consultants, Inc. (hereinafter referred to as “CCCi”). In this capacity, I serve as an expert in all of CCCi’s imaging and video data initiatives along with high-technology research and development. I also serve

as an expert in all of CCCi's activities pertaining to video processing, video surveillance, image/signal processing, and other software development problems.

10. Prior to joining CCCi, I served as the Chief Image Scientist at Northstrat Inc. (hereinafter referred to as "Northstrat") and Senior Scientist at ITT Exelis, Space Sciences Division (hereinafter referred to as "ITT Exelis") in a similar capacity. In my role at ITT Exelis and similarly Northstrat, I led research and development efforts with respect to all high technology development, including in the areas of video processing, compression, and standards.

11. ITT Exelis and Northstrat expanded their business into product-based services and as such utilized my innovative approach to develop high technology products that carried a service-based revenue model. ITT Exelis (now part of Harris Corporation) was a leader in Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance ("C4ISR") related products and systems and information and technical services, supplying military, government, and commercial customers in the United States and globally.

12. Also at ITT Exelis, I served as one of the leading experts in image and computer vision related activities. In particular I designed the camera processing for a large field of view, multi-sensor camera with field-steerable mirrors to be used in an Unmanned Aerial Vehicle (UAV). I also served as the video processing

subject matter expert to address all aspects of video coding and decoding as it pertains to image quality, channel model, display, format, indexing, error recovery, and transmission.

13. Prior to joining ITT, I served as the Chief Scientist at Imaging Sciences International, Inc. where my efforts catapulted the company into the leading Cone Beam Computed Tomography (CBCT) provider in the world. The application of CBCT was targeted for the general dental market with first adopters including Implantologists but later to other providers. I also served as the primary Intellectual Property Manager for all patent related work for Imaging Sciences and its affiliates, as well as a subject matter expert for all efforts involving digital imaging. Prior to joining Imaging Sciences, in my roles at Sigma Vision, Portis, and IMACOM, I researched and developed numerous medical and consumer technologies, involving imaging and signal processing, video processing, Video On Demand, video surveillance, and multimedia communication systems. These activities included hardware and software design throughout the entire system development cycle, including networking and user interface solutions.

14. Also, prior to that, and immediately after my graduation, I continued work in media compression and processing at the Compression Group in the Information Technology Laboratory of the National Institutes of Standards and

Technology. In this role, I continued my research and expanded on similar topics across several media forms. In particular, I served as the United States Government ambassador to the MPEG standardization group. I also expanded on my thesis research topic to exploit compressed-domain processing of media for images, video and multimedia content. I worked with engineers who utilized the MPEG standardization body's source code for performance, quality, and testing.

15. In these capacities, I have worked on many aspects of video and content systems, including algorithm development, software development, hardware development, networking architecture, and system design. I have also implemented video processing baselines for various products including performance criteria such as video quality, processing, and communication requirements.

### **III. UNDERSTANDING OF PATENT LAW**

16. In forming the opinions expressed in this Declaration, I relied upon my education and experience in the relevant field of the art, and I have considered the viewpoint of a person having ordinary skill in the relevant art at the time of the invention. I am not a patent attorney, nor have I independently researched the law of patent validity. Attorneys have explained certain legal principles to me that I have relied on in forming my opinions as set forth in my Declaration, including principles of prior art, anticipation, and obviousness.

17. I understand that in an *inter partes* review, the petitioner carries the burden of proving patent claim invalidity by a preponderance of the evidence on a claim-by-claim basis, based on either patents or printed publications. Each claim is analyzed independently. It is my understanding that when a party has the burden of proving a claim invalid by the preponderance of the evidence, the party must show that it is more likely than not that the claim is invalid.

18. I understand that a patent can be invalid for anticipation or for obviousness.

19. I understand that a patent claim may be invalidated as anticipated under § 102 of the patent statutes only if a single prior art reference discloses each and every limitation of the invention. To render a claim anticipated, the single reference must disclose each and every limitation of the claim either expressly or inherently, and must disclose every limitation of the claim as those limitations are arranged in the claim. I understand that a limitation inherently exists in a reference only if that limitation is necessarily disclosed by the reference. The mere fact that something may result from a given set of circumstances is not sufficient to show inherency, as inherency cannot be established by probabilities or possibilities.

20. I understand that under § 103 of the patent statutes, a patent claim may be invalid as obvious in view of a combination of prior art references or in

view of a single prior art reference. Obviousness is determined from the perspective of a hypothetical person of ordinary skill in the art (also known as a “POSITA” as discussed below in ¶¶25-28).

21. I understand that an obviousness analysis involves three factual inquiries: (1) the scope and content of the prior art, (2) differences between the prior art and the claims at issue, and (3) the level of ordinary skill in the art.

22. I understand that a patent claim may not be obvious if the prior art, either alone or in combination, and even when combined with the knowledge of one having ordinary skill in the art, does not disclose or suggest all of the limitations of a claim, i.e. that there remain differences between the prior art and the claim at issue. I also understand that a patent claim may not be obvious if a POSITA would not have modified or combined the prior art in a manner that would have disclosed or suggested all of the limitations of the claim.

23. In addition, I understand that a variety of factors are considered in determining whether an invention would have been obvious to a person of ordinary skill in the art. For example, a teaching, suggestion, or motivation in the prior art that would have led a person of ordinary skill in the art to modify a prior art reference or select multiple prior art references and combine them in such a fashion as in the claimed invention, may render an invention obvious. As well, a

combination of elements that was obvious to try, for example, in light of market pressures, may render an invention obvious if there was a reasonable expectation of success. I understand that other factors can be considered in an obviousness analysis, including: whether known elements are combined using known methods to create predictable results; whether one known element is substituted for another known element to obtain predictable results; whether a known technique is used to improve a similar device in the same way; whether a known technique is applied to a known device ready for improvement to yield predictable results; and whether design incentives or other market forces would have prompted a POSITA to implement predictable variations in known work in one field of endeavor for use of those predictable variations in either the same field or a different one.

24. I understand that an invention may not be obvious if the prior art reference(s) teaches away from the proposed modification or combination of prior art references. In addition, an invention may not obvious if the proposed combination creates “unpredictable results.” Also, an invention may not obvious if the proposed modification or combination would render the prior art device inoperable.

#### **IV. PERSON OF ORDINARY SKILL IN THE ART**

25. I understand that the factors considered in determining the level of ordinary skill in the art include education and experience of persons working in the art, and the types of problems encountered in the art.

26. A person of ordinary skill in the art (“POSITA”) relevant to the ’708 patent would be familiar with the technical field relating to human-computer interaction (HCI). A POSITA at the time of the invention would have had at least a college degree in fields related to HCI, such as computer science, industrial design, graphic design, computer or electrical engineering, and at least one year of experience with selection of display layouts in graphical user interfaces. Work experience can substitute for formal education and additional formal education can substitute for work experience.

27. The patent application for the ’708 patent was filed on July 27, 2012, and claims priority to a provisional application filed on July 29, 2011. My analysis and opinions are based on the perspective of a person of ordinary skill in the art as of July 29, 2011.

28. As noted above with regard to my education and experience as of July 29 2011, I possessed at least an ordinary level skill as of that date. I am familiar with the knowledge that a POSITA would have had at this time and the manner in which such a person would have viewed the available information at the time. My

declaration and opinions are offered from this perspective, even if my declaration does not specifically refer to the perspective of a POSITA in every instance below.

## **V. TECHNICAL INTRODUCTION TO THE '703 PATENT**

29. The '708 patent is entitled, “Method, Computer-Readable Storage Medium, and Apparatus for Modifying the Layout Used by a Video Composing Unit to Generate a Composite Video Signal.” It describes controlling video conferencing layouts based on a user’s interaction with an object along an axis, e.g., a slider or track bar. '708 patent, 2:8-17; 5:34-35.

30. More particularly, the '708 patent discloses providing a display with an object that users can move along a defined axis. '708 patent, 3:58-4:4. The system associates predefined video layouts with specific intervals along this axis, detects user actions that indicate a position of the object, and then composes the video output using the layout associated with that position of the object. *Id.*

31. In essence, the '708 patent discloses the selection of different video layouts using a slider. In one disclosed example, illustrated in Fig. 6 of the '708 patent and reproduced below, when the slider object 220 is present at the bottom of the display area, a single conference attendee is displayed (image A). When the slider object is moved slightly higher, one conference attendee is displayed in a larger sub-frame in the main screen, and an array of other attendees is displayed in smaller sub-frames at the bottom of the screen (image B). When the slider is

moved to the top of the display area, the conference attendees are all displayed at the same size in a gallery view on the display area (image C). The slider simply controls the visual size of the participants and the single attendee with respect to each other. As disclosed and claimed, the '708 patent applies the pre-existing concept of a slider to select between known alternatives for displaying video conference attendees on a display area.

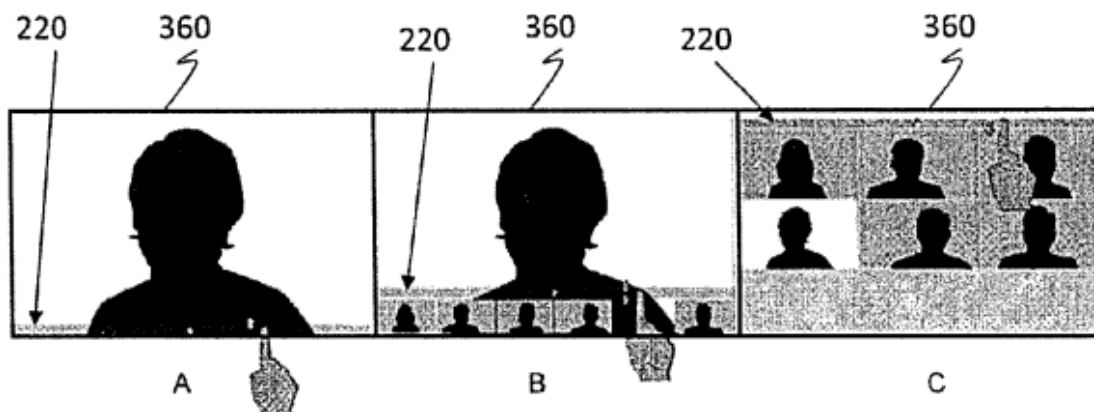


FIG. 6

32. The '708 patent discloses additional details but, in my opinion, these additional details do nothing more than describe the well-understood implementation of a slider. For example, Fig. 2 of the '708 patent shows a display area for displaying the composite video signal along with identified slider positions corresponding to different appearances of the display area ('708 patent, 4:24-26):

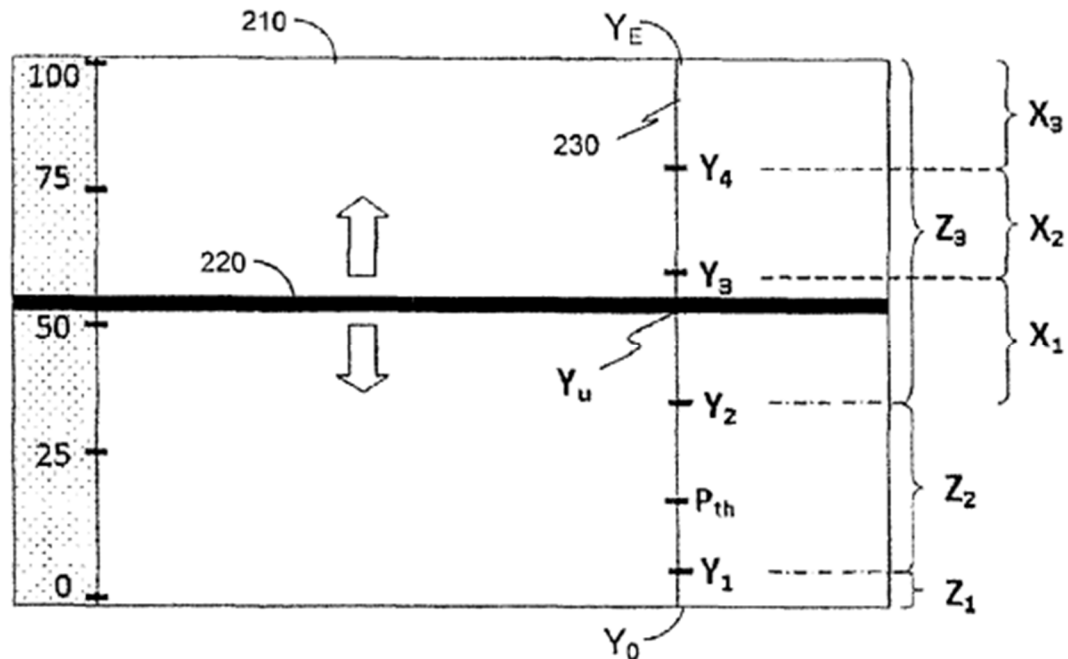


FIG. 2

A display at a video conferencing endpoint can overlay an object 220 on a video conferencing stream. Object 220, which serves as the slider handle, can be moved along an axis 230, as indicated by the arrows. Alternatively, object 220 may be displayed apart from the video conferencing stream or on a display of a control device associated with the endpoint. '708 patent, 4:30-47. The '708 patent discloses object 220 may have any shape, size, or form (such as a line or bar) and may be solid or partly or totally transparent. Also as disclosed in the '708 patent, object 220 could also appear in response to a user action. '708 patent, 5:7-16.

33. As shown in Fig. 2, object 220, which is moveable along axis 230, can have a starting position  $Y_0$  at one edge of a display and an end position  $Y_E$  at an opposite edge of the display. The object 220 and axis 230 could constitute a track

bar or slider, and a thumb (that is a small bar or pointer) could be slid along the axis. To use the track bar, the user changes the position of the thumb by dragging it, or clicking a position along the control line, or using arrow keys. '708 patent, 5:34-45.

34. A predefined layout type can be assigned to a zone along the track bar or slider. That is, a plurality (N) of predefined layout types can be associated with (N) respective intervals  $Z_N$ , as shown in Fig. 2, along the axis or continuous line 230. '708 patent, 5:46-48. These layout types may correspond to the layouts illustrated in Fig. 6, discussed above. As the '708 patent explains, “a ‘show only one participant in full screen (FOCUS)’ layout may be associated with a first interval  $Z_1$ , a ‘show one participant in full screen and a number of other participants in small frames (FOCUS+PRESENCE)’ layout may be associated with a second interval  $Z_2$ , and a ‘show all video conference streams in equal size (OVERVIEW)’ layout type may be associated with a third interval  $Z_3$ .” '708 patent, 5:49-55.

35. A zone can also have sub-intervals associated with a plurality (M) of variations of a layout (N) with M number of sub-intervals ( $X_M$ ), as shown for zone 3 of Fig. 2. As the '708 patent explains, “A ‘show all video conference streams in equal size (OVERVIEW)’ layout type may e.g., be associated with an interval  $Z_3$ .

A 2×2 frame variation of the OVERVIEW layout (shown in FIG. 7E) may e.g., be associated with a first sub-interval  $X_1$  of interval  $Z_3$ . A 3×3 frame variation of the OVERVIEW layout (shown in FIG. 7F) may e.g., be associated with a second sub-interval  $X_2$  of interval  $Z_3$ , and a 4×4 frame variation of the OVERVIEW layout may e.g., be associated with a third sub-interval  $X_3$  of interval  $Z_3$ .” ’708 patent, 6:16-30.

## **VI. CLAIM CONSTRUCTION**

36. I understand that it is sometimes necessary or useful for claim terms in a patent to be further explained or interpreted. This process, as I understand it, is commonly referred to as claim construction.

37. I understand that in IPRs, the Patent Board applies the same claim construction standard used by District Courts. This process involves construing claim terms in accordance with the ordinary and customary meaning of such terms, as understood by a POSITA, in light of the claim language, the patent’s specification, and any relevant prosecution history of correspondence between the patent applicant and the USPTO during the application process.

38. I also understand that certain “extrinsic” evidence, such as dictionaries or publications, can sometimes be useful to understand the meaning of a claim term, but that extrinsic evidence should not be used to contradict the patent’s claim language or prosecution history.

39. Except as otherwise noted below, my analysis and opinions are based on the ordinary and customary meaning of the claims.

40. I note that claim 9 depends on claim 1 contains the phrase “based on the relationship and the position.” I find this phrase to lack clear antecedent basis, especially as “a relationship” is not defined in claim 9 or claim 1 and “the position” could refer to “a position on the axis” of claim 1 or the “position of each frame” in claim 9. Solely for the purposes of this IPR, I will interpret “based on the relationship and the position” to refer to a relationship between slider intervals and layouts and the “position on the axis” of claim 1.

## **VII. CLAIMS 1-19 ARE UNPATENTABLE OVER THE PRIOR ART**

### **A. Sliders (or Track Bars) Were Well-Known User Interface Elements**

41. In my opinion, a POSITA’s background knowledge of user interfaces includes knowledge of “sliders” or “track bars” as user-interface elements. The terms “slider” and “track bar” can be used interchangeably by a POSITA, although a POSITA may generally use the term “slider” in connection with content presentation such as web applications and a “track bar” in conjunction with feature controls such as development of desktop/Windows applications. To avoid unnecessary verbosity, my analysis below will refer to “sliders” as encompassing both “sliders” and “track bars.”

42. A slider allows a user to choose a numeric value from a finite range, e.g., 1 to 100. A slider may also operate as a “discrete” slider, allowing only an allowable choice from a data spectrum to be selected (e.g., 10, 20, 30 ... 100). *See* Ex1007. To choose a value of the slider, a user moves a “handle” or “thumb” along an axis (e.g., horizontally or vertically). *Id.* For a continuous slider, the slider widget uses the location of the handle relative to the slider axis to determine which choice the user has selected. For a discrete slider, the slider widget determines which region (or interval) of the slider axis is associated with the handle’s location and uses the region (or interval) to determine which choice from the data spectrum has been selected.

43. As explained in Mahemoff, use of a discrete slider provides advantages in graphical user interface design:

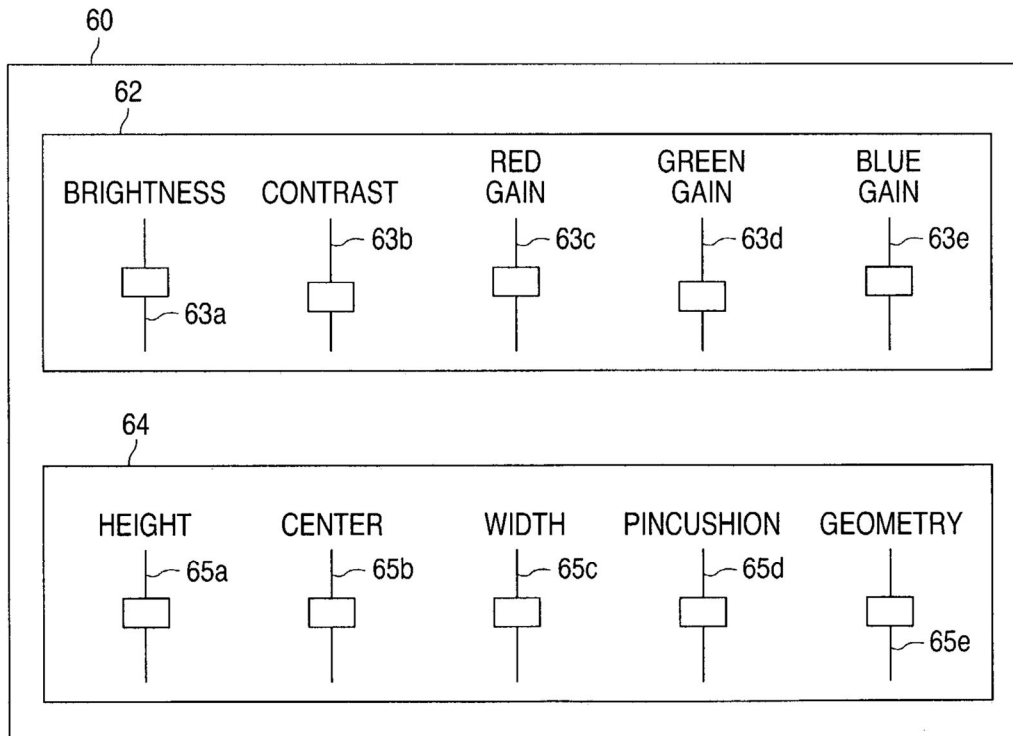
Standard HTML contains two related input controls: radiobuttons and selectors. Each of these lets you specify a value from a fixed list of choices. The biggest advantage of a Slider is that the data range can be continuous as well as discrete. Of course, “continuous” is an approximation, since you can only have as many choices as there are pixels in the Slider range. But with most Sliders, that means you have hundreds of unique values, which is continuous for most intents and purposes.

A Slider can also show discrete data by identifying several points along the range. When the user releases the handle, the Slider jumps to the nearest point. *Why use a Slider when radio buttons and selectors already support discrete data? A Slider provides a better visual indication that the data resides in a spectrum. Also, it's often faster because the user can click anywhere in the region as opposed to aiming precisely at a radiobutton or opening up a dialog box.*

Mahemoff, 10 (emphasis added).

**B. Sliders Were Known to Control Video Displays**

44. In my opinion, a POSITA would have also known that sliders could be used to control video displays. For example, Hojabri provided an on-screen display for a video display that could control image display characteristics, such as height, width, and geometry, using sliders (Hojabri, FIG. 5, 5:5-11):

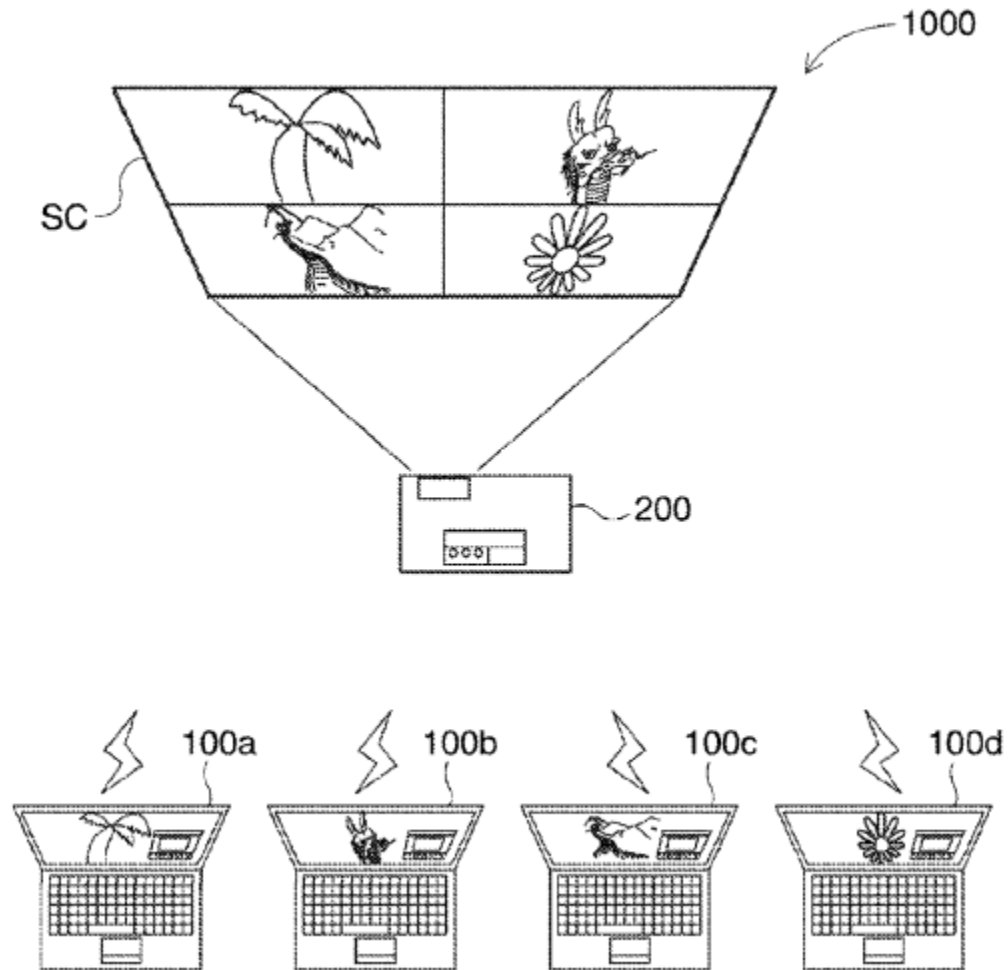
**FIG. 5**

“Examples of the image characteristics to be controlled by this subsequent video processing include, without limitation: pin cushion, geometry, height, width and centering.” Hojabri, 5:5-11. A POSITA would understand that altering the geometry of the image would change the layout of the image.

45. Further, Kikuchi, entitled, “Image Display System, Image Display Device, and Image Display Method,” describes controlling screen layout of a display using sliders, where the display consists of images from different sources. For example, image supply devices 100a through 100d each provide an image to

image display device 200 for projection onto a display SC (Kikuchi, FIG. 1,

¶[0057]):



46. FIGS. 18A1 through 24B2 of Kikuchi show how display content of the projection screen SC can be changed using a slider 342. Kikuchi, ¶[0122]. When a pointer 341 is moved to a position on a boundary (a frame line) between the layout frames in the screen image 310 in the operation window, the pointer 341 changes to the slider 342. Kikuchi, ¶[0123].

47. The image display system allows the display layout mode to be changed by dragging the slider 342. Kikuchi, ¶[0125]. FIG. 18A1 shows the state in which the slider 342 is displayed at the right circumferential end of the screen image 310, and FIG. 18B1 shows the state in which the slider 342 is displayed at the left circumferential end of the screen image 310. Kikuchi, FIGS. 18A1, 18A2 18B1, 18B2, ¶[0123]. By dragging the slider in the single screen display mode, the mode of the display can be changed to a dual display mode (Kikuchi, ¶[0124]):

FIG. 18A1

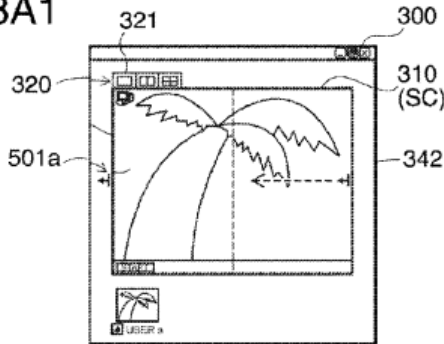


FIG. 18B1

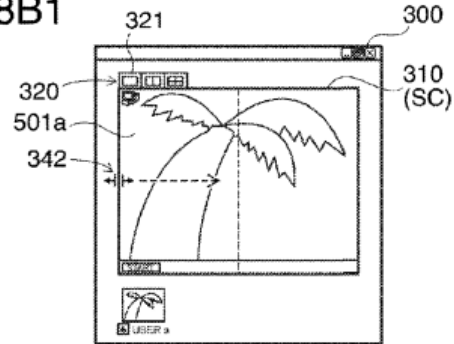


FIG. 18A2

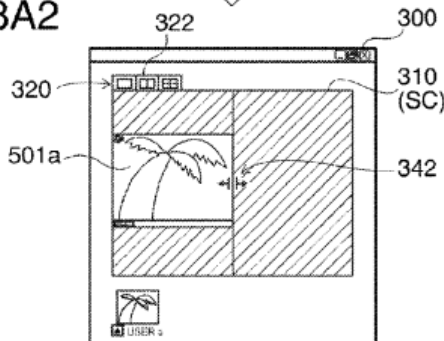
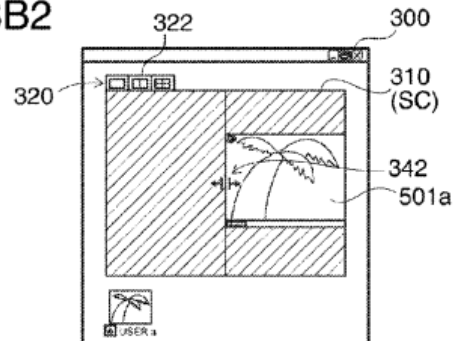


FIG. 18B2



48. Similarly, the display mode can be changed from a dual display mode to a single display mode by operation of the slider 342. In FIGS. 20A1 and 20B1,

two image supply devices 100a, 100b supply images 501a, 501b for display on the projection screen SC in the dual screen display mode (Kikuchi, ¶[0128]):

FIG. 20A1

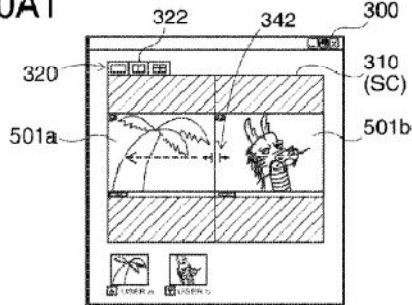


FIG. 20B1

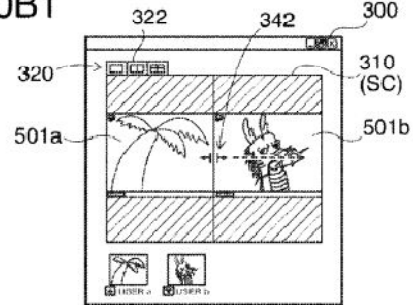


FIG. 20A2

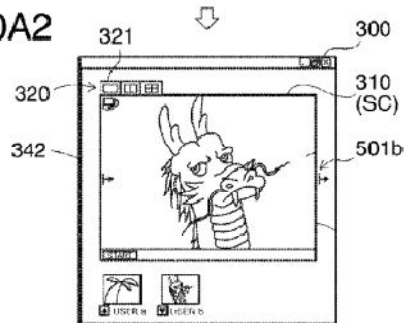
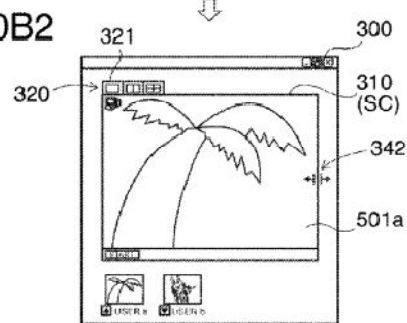


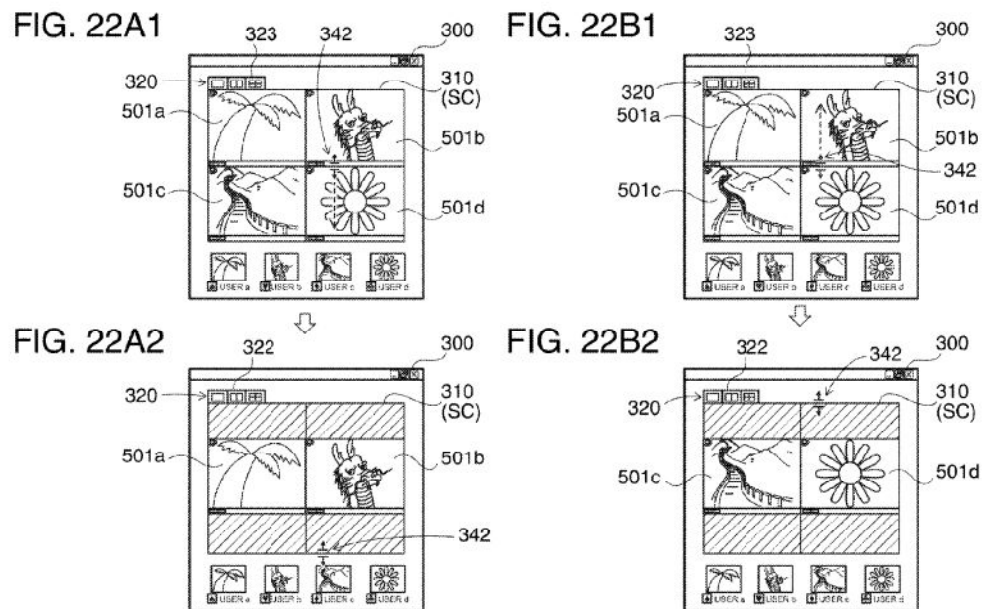
FIG. 20B2



49. In this display state, the slider 342 is displayed on the layout frame located at the center of the screen image 310, and the slider 342 is dragged leftward (in the direction of the dashed arrow in FIG. 20A1) or rightward (in the direction of the dashed arrow in FIG. 20B1). When the slider 342 is dragged leftward, the projection screen SC is switched to the single screen display mode, and supply image 501b is displayed in the entire surface (FIG. 20A2). On the other hand, when the slider 342 is dragged rightward, the projection screen SC is

switched to the single screen display mode, and supply image 501a is displayed in the entire surface (FIG. 20B2). Kikuchi, ¶[0128].

50. Kikuchi also allows for the display mode to be changed from a quad screen display mode to a dual screen display mode by operation of a slider. FIGS. 22A1 and 22B1 show images from all of the image supply devices 100a through 100d displayed in the quad screen display mode (Kikuchi, ¶[0130]):



51. In FIG. 22A1, the slider 342 is dragged downward from a position on the layout frame vertically dividing the screen image 310. Then, the display mode of the projection screen SC is switched to the dual screen display mode based on supply images 501a, 501b (which were previously displayed in the upper layout

frames in the quad screen display mode) as shown in FIG. 22A2. On the other hand, in FIG. 22B1, the slider 342 is dragged upward from a position on the layout frame vertically dividing the screen image 310 and the two lower supply images 501c, 501d are displayed in the dual screen mode as shown in FIG. 22B2.

Kikuchi, ¶[0130].

52. FIG. 24A1 shows the operation window 300 when all of the image supply devices 100a through 100d are connected to the image display device 200, and the respective supply images 501a through 501d are displayed in the quad screen display mode (Kikuchi, ¶[0132]):

FIG. 24A1

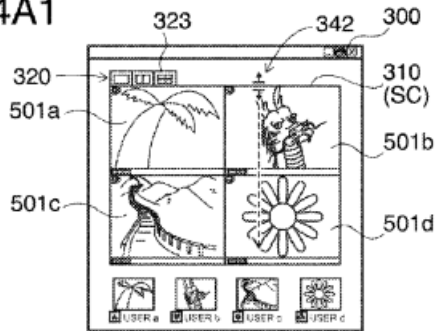


FIG. 24B1

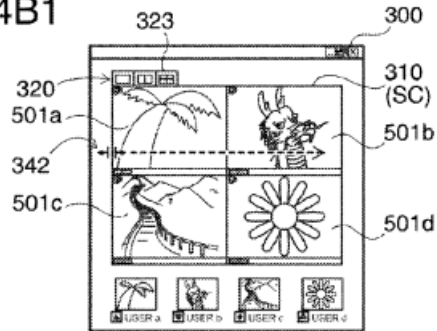


FIG. 24A2

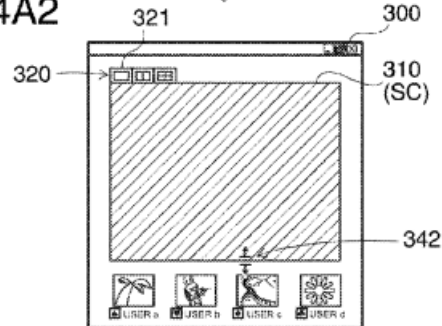
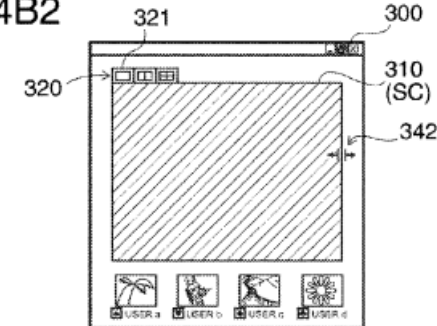


FIG. 24B2



53. When the slider 342 is displayed at the top edge of the display is dragged to the bottom edge of the display or dragged from the left edge to the right edge, the display mode of the projection screen SC is switched to the single screen display mode, and all of the supply images 501a through 501d are set to the nondisplay state, as shown in FIG. 24A2 and 24B2. Kikuchi, ¶[0132].

**C. Video Conferencing Systems Provided Different Display Modes**

54. A POSITA would have also known that video conferencing systems could have different display modes for displaying video conference participants. Eleftheriadis, for example, shows various layouts for a video conferencing system (Eleftheriadis, FIG. 8):

**FIG. 8: Exemplary Enlarged Mode Layouts**

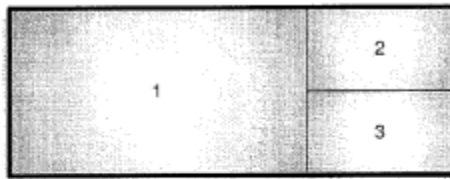


FIG. 8(a) 3-way, rectangular horizontal

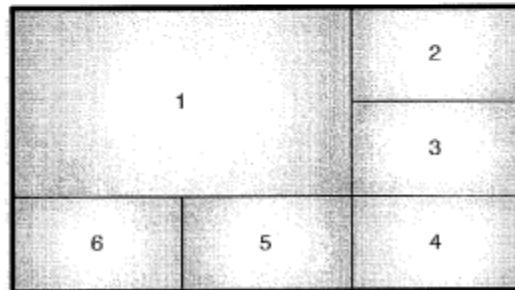


FIG. 8(b) 6-way, rectangular matrix

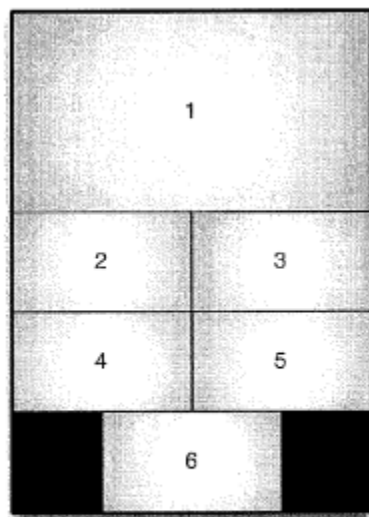


FIG. 8(c) 6-way, rectangular vertical

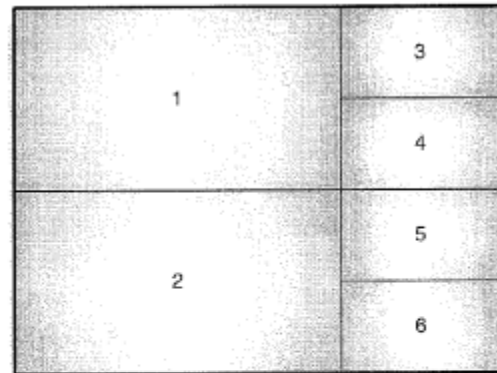
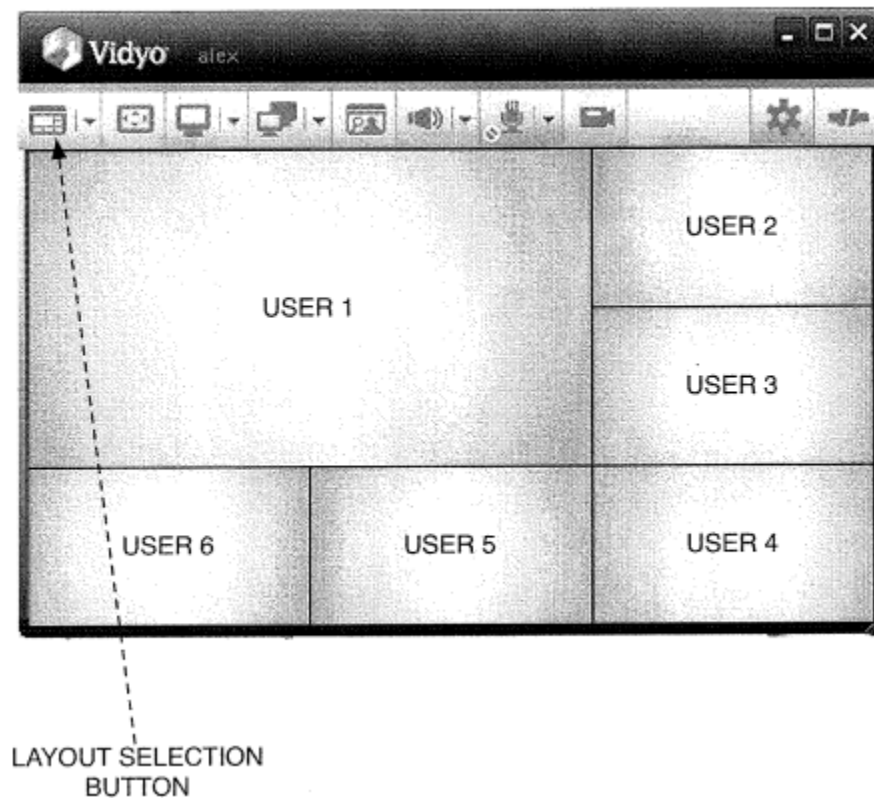


FIG. 8(d) 6-way, 2 enlarged views, rectangular matrix

55. FIG. 11 of Eleftheriadis depicts a user interface with a layout selection button toggled to enlarged mode (of FIG. 8) (Eleftheriadis, 12:60-67):

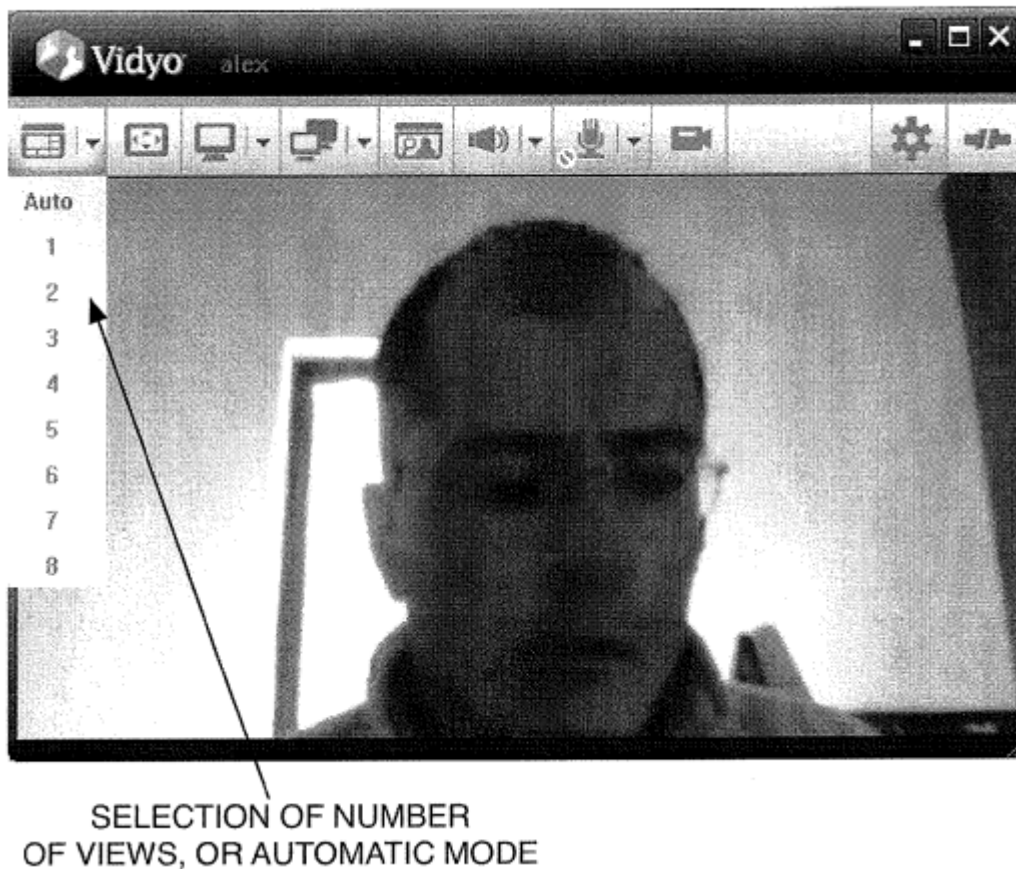
**FIG. 11: User Interface - Active Speaker Layout**



The layout shown in FIG. 11 provides an actual active speaker layout, with 6 views. *Id.*

56. For each of the layout categories, such as the enlarged mode of FIG. 11, a dropdown menu allows the user to select the largest number of views to be shown on screen. Eleftheriadis, 13:1-12. FIG. 12 of Eleftheriadis shows a dropdown menu (FIG. 12):

**FIG. 12: Selection of Number of Views**



57. Eleftheriadis’s pull down menu is simply a set of selectable numbered items. As is shown in the example of FIG. 12, the selectable numbered items are nothing more than a numeric value from a finite range of numbers. Eleftheriadis discloses that the “the user is presented with a choice of 1 to 8 views” (Eleftheriadis, 13:6-7) which represent a finite range of numbers.

**D. The Obviousness of Using a Slider to Select Video Layout Modes in a Video Conferencing Systems**

58. It is my opinion that a POSITA would have found that the use of a slider to select a video layout in a video conferencing system to have been obvious.

59. A POSITA would have found Eleftheriadis to be in the same field of endeavor as the '708 patent because it is a video conferencing reference with a graphical user interface. As shown above in Eleftheriadis, a drop-down menu displays options for a finite number of views. As a user moves a pointer in a downward direction, the different views are selected depending on the location along the drop-down vertical axis in which a user moves the pointer. This functionality has analogies to the well-recognized operation of a discrete slider.

60. The question of why a POSITA would use a discrete slider in the system like Eleftheriadis, which uses a selector, is expressly asked and answered in Mahemoff:

A Slider can also show discrete data by identifying several points along the range. When the user releases the handle, the Slider jumps to the nearest point. Why use a Slider when radio buttons and selectors already support discrete data? A Slider provides a better visual indication that the data resides in a spectrum. Also, it's often faster because the user can click anywhere in the region as

opposed to aiming precisely at a radiobutton or opening up a dialog box.

Mahemoff, 10. A POSITA would have found the sliders of Mahemoff to have been analogous art to graphical user interface (GUI) controls for a video conferencing system because a POSITA would recognize that GUI techniques can be applied to different applications including video applications. A POSITA would recognize that the pull down menu items of Eleftheriadis are data selections that belong in Mahemoff's "data that resides in a spectrum" and that selection of such data is interchangeable. Accordingly, it would have been obvious to use a slider to represent the available video view modes (or layouts) instead of the representations in a drop-down menu because use of a discrete slider is an art-recognized alternative widget to choose a particular value within a data spectrum and can provide the advantages of better visualization and selection speed.

61. This motivation to use a slider in video display system is confirmed by the use of sliders in video display systems. Hojabri discloses a slider for altering image characteristics and Kikuchi expressly provides a slider for image layout selection. A POSITA would have found Hojabri's image display techniques to have been analogous art to video conferencing system as each system seeks to solve the problem of displaying received content on a display screen. Also, a POSITA would have found Kikuchi's image presentation system to have been

analogous art to video conferencing system as each system seeks to solve the problem of displaying content from different sources onto a display screen. A POSITA would have thus looked to Hojabri and Kikuchi to change video layout modes in a video conference system and noted the presence of sliders, confirming the motivation to use them for Eleftheriadis's video layout selection.

62. A POSITA would have had a reasonable success in providing a video conference system with a layout slider, as the only engineering challenges would be replacing user interface aspects for making selections, which could be achieved with a redesign of software using known programming techniques.

**E. Ground 1: Eleftheriadis in view of Mahemoff Discloses or At Least Suggests Claims 1, 4, 5, 9-12, 14, and 16-17**

**1. Independent Claim 1: 1[pre] “1. A method comprising:”**

63. The combination of Eleftheriadis and Mahemoff (the “EM Combination”) would provide discrete slider functionality from Mahemoff as an alternative to the menu-based selection of discrete video conferencing layouts in Eleftheriadis and would incorporate that slider onto video display, as suggested by Mahemoff. Thus, the combination would provide a method.

**a) [1.a] “providing, on a display, an object configured to be moved by a user along an axis extending across video for a plurality of video conference streams;”**

64. The EM Combination would provide, on a display, an object configured to be moved by a user along an axis extending across video for a plurality of video conference streams. The Mahemoff discrete slider would have a “handle” moveable along a “scale” or “line.” Mahemoff, 10. Just as a POSITA would understand a slider, the “line” in Mahemoff would correspond to the “axis” and the handle would correspond to the claimed “object.” FIG. 8 of Eleftheriadis shows various layouts which the menu of Eleftheriadis’s FIG. 12 or the slider of the combination would extend across. A POSITA would recognize how to implement the display setting menu of Eleftheriadis as the data spectrum in Mahemoff’s slider.

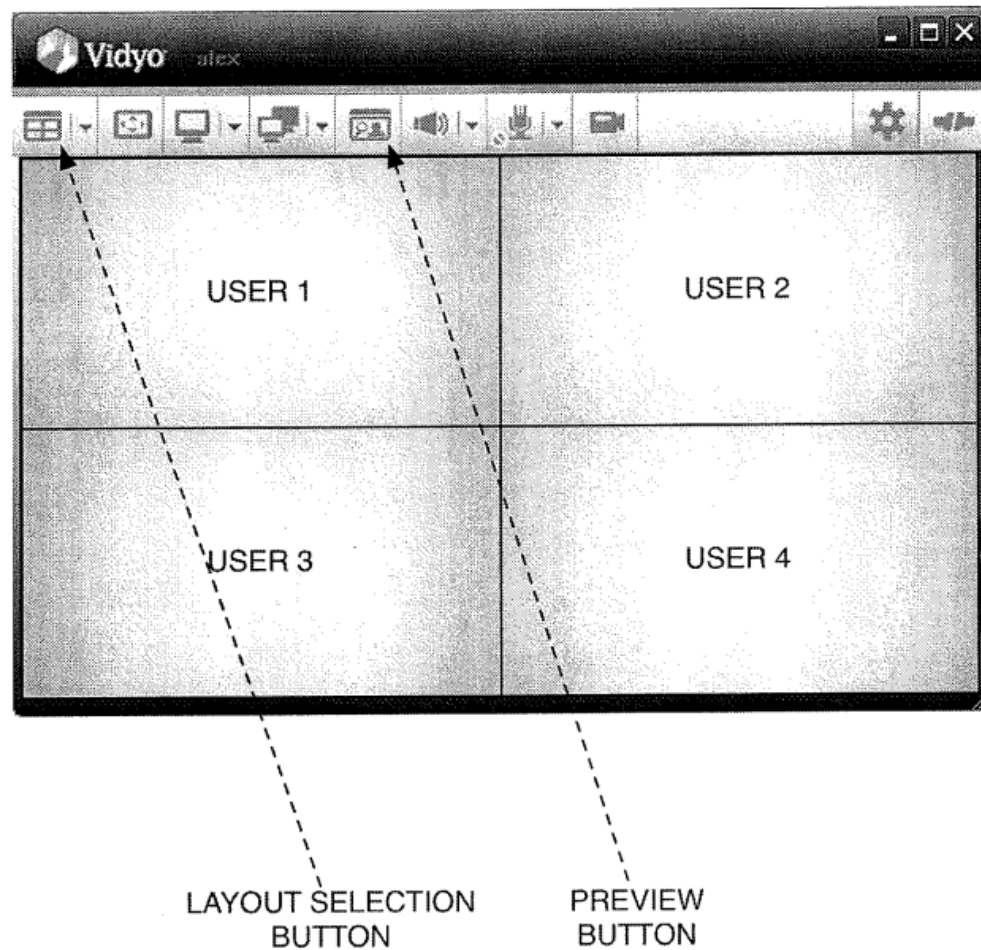
**b) [1.b] “associating a plurality of predefined layouts for plurality of video conference streams with respective intervals along the axis;”**

65. The EM Combination would associate predefined layouts for video conference streams with respective intervals along the axis.

66. Eleftheriadis explains its disclosure is “more generally applicable to a broad spectrum of layouts of practical significance. Layouts can be separated into two major categories, or modes: standard, and enlarged. In the standard mode, all participants (that are shown on the screen) are shown in the same view sizes. In the enlarged mode, one or more views are shown in a larger size, whereas the others

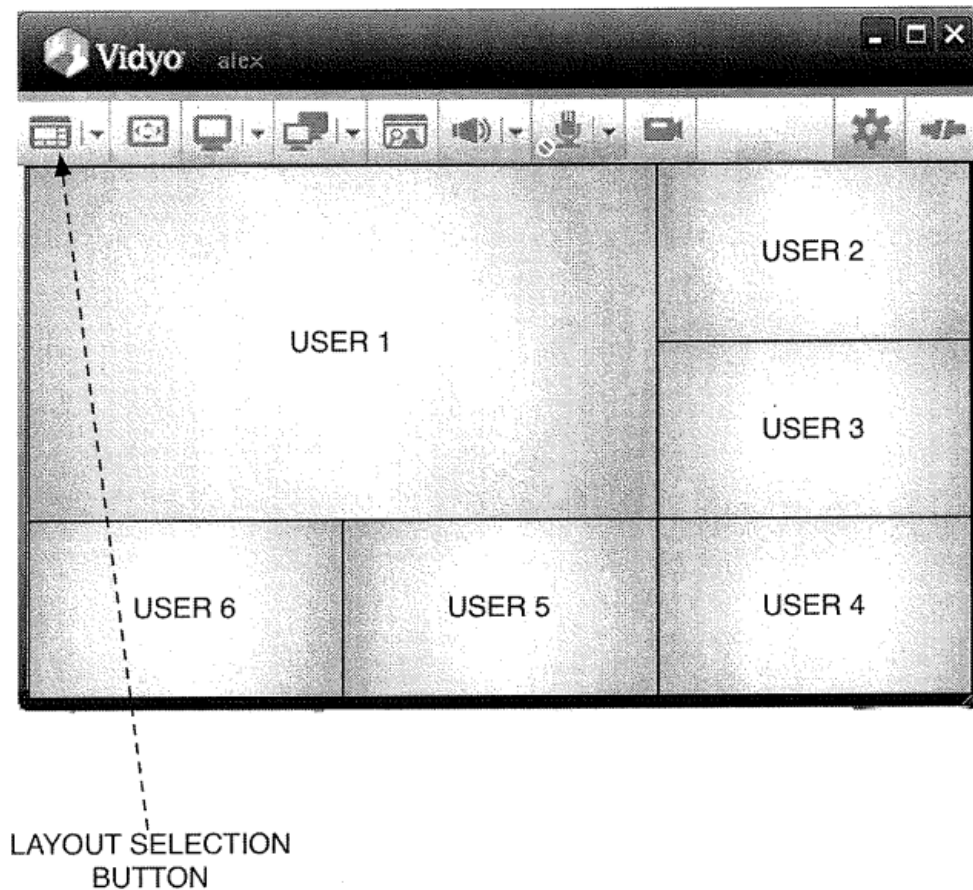
are shown in smaller view sizes.” Eleftheriadis, 9:57-64. FIG. 10 of Eleftheriadis shows a standard layout of a user interface:

**FIG. 10: User Interface - Standard Layout**



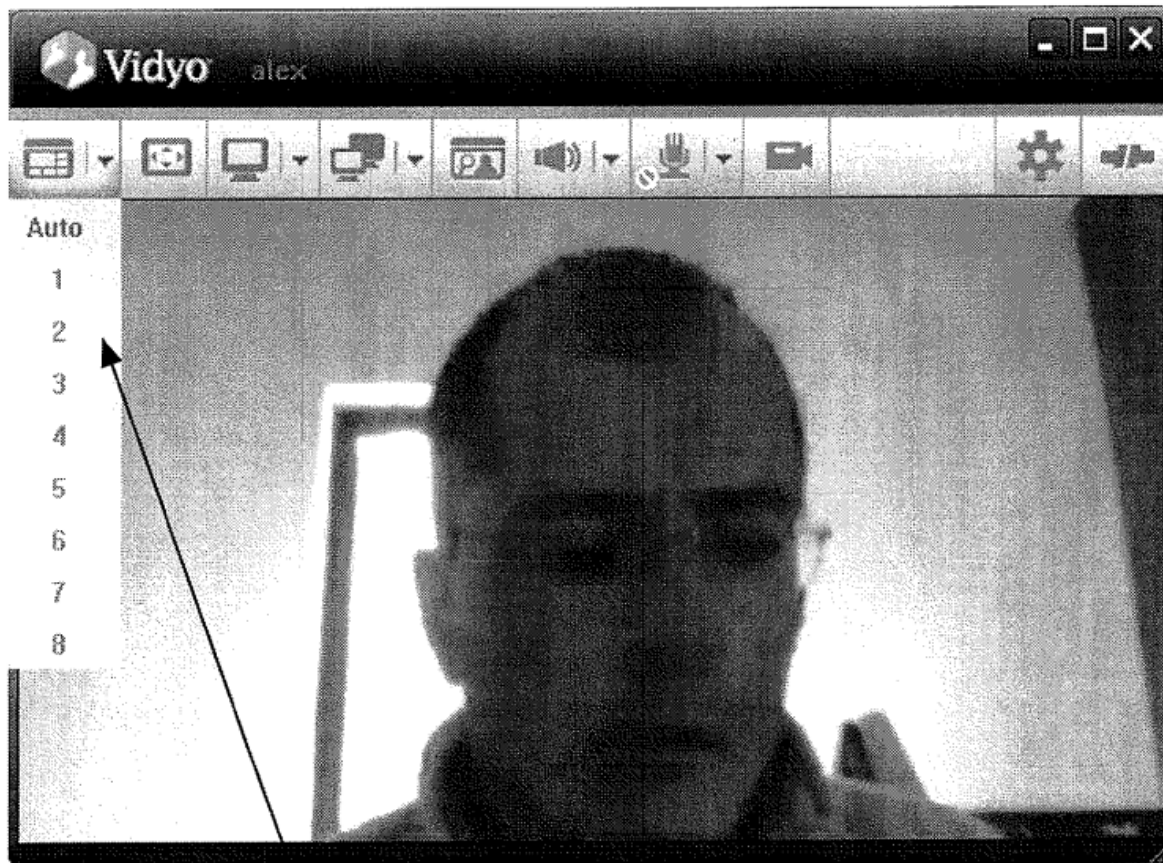
67. FIG. 11 of Eleftheriadis shows a layout of a user interface with an enlarged view:

**FIG. 11: User Interface - Active Speaker Layout**



68. As explained with regard to FIG. 12 of Eleftheriadis, “[f]or each of the layout categories, the user can select the largest number of views to be shown on screen. In the user interface of an exemplary embodiment, this is performed using the drop-down button to the right of the layout selection button. FIG. 12 shows the user interface when the drop-down button is pressed. The user is presented with a choice of 1 to 8 views, or automatic determination of the number of on-screen views.” Eleftheriadis, 13:1-12; FIG. 12.

**FIG. 12: Selection of Number of Views**



SELECTION OF NUMBER  
OF VIEWS, OR AUTOMATIC MODE

69. By setting the number  $N$  of views to include in the screen and the number of enlarged views  $P$ , the system prefilters layouts stored in layouts table 1504 “based on the values of the  $N$  and  $P$  parameters, as well as any other constraints that can have been placed (e.g., minimum view size)” and then selects a layout. Eleftheriadis, 17:20-36; FIG. 15. In addition, Eleftheriadis notes “it is always possible to allow a user at the Receiver to manually assign streams to

views. For example, the user can be allowed to select a particular layout, and drag-and-drop streams from a displayed list to layout positions to assign a stream to a particular view.” Eleftheriadis, 17:56-61.

70. Thus, The EM combination discloses or at least suggests associating values along the discrete slider of Mahemoff with respective layout views as provided in the menu structure displayed in FIG. 12 of Eleftheriadis, where each layout is “predefined” in the system.

**c) [1.c] “detecting a user action on the object indicating a position on the axis; and”**

71. The EM combination would detect a user action on the object indicating a position on the axis. A POSITA would recognize that a slider operates by a user acting on a handle and moving the handle to a position on the slider, such as to a discrete point on the slider or within a region of the slider, to indicate a value. *See, e.g.*, Mahemoff, 10 (“When the user releases the handle, the Slider jumps to the nearest point.”); *id.* (“A typical implementation separates the scale from the handle. The scale consists of a line, possibly with some notches and labels.”); *id.* (“because the user can click anywhere in the region”).

**d) [1.d] “composing, in response to the detecting of the user action, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying.”**

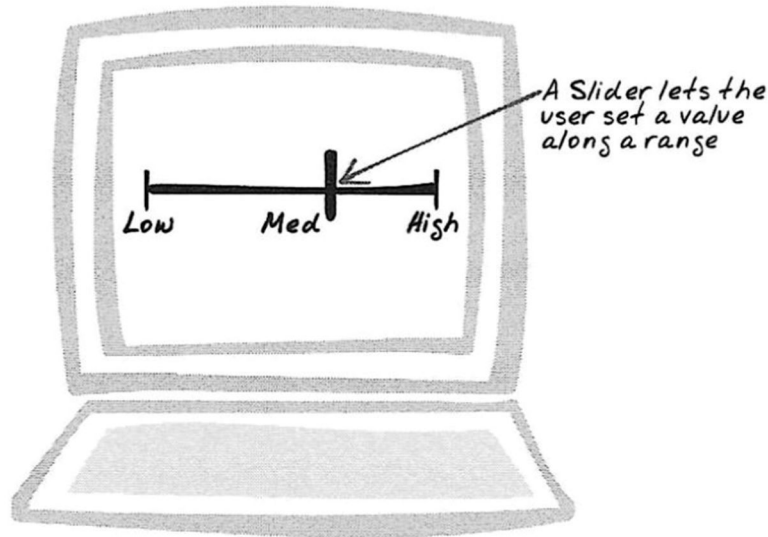
72. The EM Combination would compose a composite video signal based on a user’s interaction with a discrete slider.

73. As Eleftheriadis discloses, “[o]ne focus of the disclosed subject matter is the operation of the Receiver 307 and its interaction with the Server 305 when scalable coding is used. ... It can be further assumed that a particular layout has been chosen by the user at the Receiver 307 ... . The upsampling and *composition process occurs at the Receiver 307 itself*, the Server 305 is only informed about which layer packets to forward to the particular Receiver 307.” Eleftheriadis, 8:26-9:9; *see also* Eleftheriadis, 7:21-51 (describing a legacy system of FIG. 2 that composites video at an MCU). A POSITA would understand that the “compositing” in Eleftheriadis corresponds to “composing” in the claims as the ’708 patent’s reference to a process of combining content from different sources as “composing” is not standard in the art. Typically, a POSITA would use the term “compositing” when referring to combining video elements from separate sources.

74. In addition, Eleftheriadis creates a composite video signal using a layout when after the process of Eleftheriadis (described with regard to FIG. 15 or

a user as detailed above in element [1.b]), selects a particular layout, and it becomes effective. Eleftheriadis, 17:37-49.

75. In the combination, the particular layout is selected with Mahemoff's slider. Mahemoff explains that a discrete slider would recognize the position of the handle of the slider relative to discrete intervals in which the handle is lying. *See, e.g.*, Mahemoff, 10 ("When the user releases the handle, the Slider jumps to the nearest point."); *id.* ("A typical implementation separates the scale from the handle. The scale consists of a line, possibly with some notches and labels."). As further example on Mahemoff's discrete slider, Mahemoff describes a use case where the continuous slider is further divided into intervals. Mahemoff discloses that "the scale is continuous ... to set a precise value along a spectrum" and "the user [] choose[s] a value within the range." Mahemoff, 9. Mahemoff illustrates this concept in FIGURE 14-1 titled slider shown below.



76. A POSITA considering the disclosure in Mahemoff would understand and appreciate that the continuous slider can include the capability of the discrete slider to implement interval among intervals within which the position is lying. For example, the intervals shown in FIGURE 14-1 of Mahemoff shows the “Low” to “Med” interval and the “Med” to “High” interval.

77. A POSITA would understand from the EM Combination that arrangements of views disclosed in Eleftheriadis (Eleftheriadis FIGs. 4-12) have geometrical limitations that can be implemented through algorithmic details (FIGs. 15-17) or with table lookups, which is known by a POSITA that a table is an implementation of a function when used in computing environments. Then with varying numbers of views to be presented, a POSITA would know that modification to these algorithms or tables would be made differently prompting the

POSITA to implement intervals that best satisfy their intended purpose, such as utilization of the full screen space or full attendance with speaker focus.

Implementing particular intervals to fit the varying range of presentations would have been obvious to a POSITA and have a reasonable expectation of success.

78. As such, the EM Combination would detect a user's action, determine where the handle of the slider moved to (and possibly from), as taught by Mahemoff, and associate a layout with the final position of the handle of the slider, analogous to the menu selection in FIGs. 10-12 of Eleftheriadis, and compose a composite video signal based on the associated layout from a plurality of predefined layouts, such as a layout associated with a discrete number of views in defined intervals are selected, as in FIGs. 10-12 of Eleftheriadis.

**2. Claim 4: “4. The method of claim 1, further comprising: identifying the interval among the intervals within which the position is lying.”**

79. The EM Combination discloses or at least suggests identifying the interval among the intervals within which the position is lying. A slider would identify the interval where the user moved the slider handle to. *See, e.g.*, Mahemoff, 10 (“When the user releases the handle, the Slider jumps to the nearest point.).

**3. Claim 5: [5.pre] “5. The method of claim 1, further comprising:”**

80. The EM Combination discloses or at least suggests the claimed method of claim 1 as discussed above.

**a) [5.a] “wherein the composite video signal includes a spatial mix of one or more video conference streams, and”**

81. The composite video signal of the EM combination would include a spatial mix of the plurality of video conference streams. A POSITA would understand a spatial mix of video streams in the '708 patent to include compositing multiple streams of video signals from different endpoints into a video stream to be sent to an endpoint. A POSITA faced with the problem of presenting multiple video signals would know that the presentation of the video feeds requires a distribution across the visual field of the viewing element. A POSITA would understand that without such a distribution the system would act much like a tuner where only one signal is presented at a time with the potential for a smart tuner to automatically change video signals when a speaker is more active than others. But a spatial mix for displaying more than one video signal across the visual field at the same time allows a distribution of video signals to form the composite video. A POSITA would understand the variety of distributions and their intended purposes. For example, Eleftheriadis's system provides a number of different techniques to transmit video signals received at an MCU from multiple endpoints to a receiver.

See Eleftheriadis, FIGS. 2 and 3 of 7:21-9:21 (explaining techniques for an MCU to provide composite video signals to a receiver). For example, FIGs. 4, 8, and 11 of Eleftheriadis shows display of a spatial mix of video streams received from an MCU.

**b) [5.b] “the layout defines one or more frames for containing the video conference streams.”**

82. The layout of the EM Combination would define frames for containing the video conference streams. For example, FIGs. 4, 8, and 11 of Eleftheriadis show the use of frames for a display of a spatial mix of video streams received from an MCU.

**4. Claim 9: “9. The method of claim 1, further comprising: calculating, in response to the detecting of the user action, a layout wherein a size and position of each frame of the layout is based on the relationship and the position.”**

83. The EM Combination would include calculating, in response to the detecting of the user action, a layout wherein a size and position of each frame of the layout is based on a relationship between intervals of the slider and the position of the slider.<sup>1</sup> As discussed above, Eleftheriadis discloses calculating a layout

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<sup>1</sup> As noted in the Claim Construction section, solely for the purposes of this IPR, I will interpret “based on the relationship and the position” in claim 9 to refer to a

involving the size and position of each frame, and the EM Combination's use of a discrete slider discloses or at least suggests using the position of slider's handle and relationship of that position to the predetermined layouts to render the selected layout. Eleftheriadis states (Eleftheriadis, 12:25-39):

“Given the large number of possibilities between different layout structures, it is important to properly guide a user through the possible choices. Clearly, the user should not be burdened to calculate how different views can fit together. He or she should rather provide indications to the Receiver system of his/her general preferences. Specifically, in an exemplary embodiment the user indicates to the Receiver system the size of the screen, and whether or not a standard or enlarged mode layout should be used. In the latter case, the user can also indicate the number of enlarged views to be used.”

Eleftheriadis then calculates the layout based on the user's selection of the number of views N and the number of enlarged views P and other variables. Eleftheriadis, 13:12-17:49.

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relationship between slider intervals and layouts and the “position on the axis” of claim 1.

**5. Independent Claim 10: [10.pre] “10. A method comprising:”**

84. As discussed above with regard to claim 1, the EM Combination would provide discrete slider functionality of Mahemoff as an alternative to the menu-based selection of discrete video conferencing layouts in Eleftheriadis. Thus, the combination would provide a method.

**a) [10.a] “providing, on a display, an object configured to be moved by a user along an axis;”**

85. The EM Combination discloses or at least suggests the recitations of element [10.a] for the reasons stated above with regard to element [1.a].

**b) [10.b] “associating a plurality of predefined layouts with respective intervals along the axis;”**

86. The EM Combination discloses or at least suggests the recitations of element [10.b] for the reasons stated above with regard to element [1.b].

**c) [10.c] “detecting a user action on the object indicating a position on the axis;”**

87. The EM Combination discloses or at least suggests the recitations of element [10.c] for the reasons stated above with regard to element [1.c].

**d) [10.d] “identifying an interval among the intervals within which the position is lying;”**

88. The EM Combination discloses or at least suggests the recitations of element [10.d] for the reasons stated above with regard to claim 4.

**e) [10.e] “selecting the layout associated with the interval; and”**

89. The EM Combination discloses or at least suggests selecting a layout associated with an interval of a discrete slider for the reasons stated above with regard to element [1.d].

**f) [10.f] “composing, in response to the detecting of the user action, a composite video signal using the layout, of the plurality of predefined layouts, associated with the interval among the intervals within which the position is lying.”**

90. The EM Combination discloses or at least suggests the recitations of element [10.f] for the reasons stated above with regard to element [1.d].

**6. Claim 11: “11. The method according to claim 10, further comprising: providing the selected layout to a video composing unit, which composes the composite image and which is configured to receive a plurality of video conference streams and output a composite video signal comprising one or more of the received video conference streams based on a layout.”**

91. The EM combination discloses or at least suggests providing the selected layout to a video composing unit, as claimed. As discussed above with regard to claim 4, the video compositing unit of Eleftheriadis provides a composite image based on the received video conference streams. Eleftheriadis states (Eleftheriadis, 12:25-39):

“Given the large number of possibilities between different layout structures, it is important to properly guide a user through the possible choices. Clearly, the

user should not be burdened to calculate how different views can fit together. He or she should rather provide indications to the Receiver system of his/her general preferences. Specifically, in an exemplary embodiment the user indicates to the Receiver system the size of the screen, and whether or not a standard or enlarged mode layout should be used. In the latter case, the user can also indicate the number of enlarged views to be used.”

92. Further, and as described above with regard to elements [1.b] and [1.d], Eleftheriadis then calculates the layout based on the user’s selection of the number of views N and the number of enlarged views P and other variables and produces a composite image. Eleftheriadis, 8:26-9:9; 13:12-17:49; FIG. 3; FIGS. 10-12; FIG. 15; *see also* Eleftheriadis, 7:21-51; FIG. 2.

**7. Claim 12: “12. The method according to claim 10 , further comprising: displaying the composite video signal on the display, the display being of a video conference terminal.”**

93. The EM Combination discloses or at least suggests displaying the composite video signal on the display of a video conference terminal. *See, e.g.*, Eleftheriadis, FIG. 12.

**8. Claim 14: “14. The method according to claim 10, further comprising: displaying the object on the display, which is of a video conference terminal.”**

94. The EM Combination would disclose or at least suggest displaying the object on the display of a video conference terminal for the reasons stated above with regard to element [1.a].

**9. Independent Claim 16: [16.pre] “16. A non-transitory computer-readable storage medium including computer executable instructions, wherein the instructions, when executed by a computer, cause the computer to perform a method, the method comprising:”**

95. The EM Combination discloses or at least suggests a non-transitory computer-readable storage medium including computer executable instructions, wherein the instructions, when executed by a computer, cause the computer to perform a method. *See, e.g.,* Eleftheriadis, 24:19-28 (“It will be understood that in accordance with the disclosed subject matter, the techniques described herein can be implemented using any suitable combination of hardware and software. The software (i.e., instructions) for implementing and operating the aforementioned layout management techniques can be provided on computer-readable media, which can include, without limitation, firmware, memory, storage devices, microcontrollers, microprocessors, integrated circuits, ASICs, on-line downloadable media, and other available media.”).

**a) [16.a] “providing, on a display, an object configured to be moved by a user along an axis;”**

96. The EM Combination discloses or at least suggests the recitations of element [16.a] for the reasons stated above with regard to element [1.a].

**b) [16.b] “associating a plurality of predefined layouts with respective intervals along the axis;”**

97. The EM Combination discloses or at least suggests the recitations of element [16.b] for the reasons stated above with regard to element [1.b].

**c) [16.c] “detecting a user action on the object indicating a position on the axis;”**

98. The EM Combination discloses or at least suggests the recitations of element [16.c] for the reasons stated above with regard to element [1.c].

**d) [16.d] “selecting a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position on the axis is lying; and”**

99. The EM Combination discloses or at least suggests the recitations of element [16.d] for the reasons stated above with regard to claim 4 and element [10.e].

**e) [16.e] “composing, in response to the detecting of the user action, a composite video signal using the layout, of the plurality of predefined layouts, associated with the interval among the intervals within which the position on the axis is lying.”**

100. The EM Combination discloses or at least suggests the recitations of element [16.e] for the reasons stated above with regard to element [1.d].

**10. Independent Claim 17: [17.pre] “17. An apparatus comprising:”**

101. The EM Combination discloses or at least suggests an apparatus as discussed below.

**a) [17.a] “a processing unit configured to”**

102. The EM Combination discloses or at least suggests a processor unit. *See, e.g.*, Eleftheriadis, 24:19-28 (“It will be understood that in accordance with the disclosed subject matter, the techniques described herein can be implemented using any suitable combination of hardware and software.”).

**b) [17.b] “provide, on a display, an object configured to be moved by a user along an axis,”**

103. The EM Combination discloses or at least suggests the recitations of element [17.b] for the reasons stated above with regard to element [1.a].

**c) [17.c] “associate a plurality of predefined layouts with respective intervals along the axis, and”**

104. The EM Combination discloses or at least suggests the recitations of element [17.c] for the reasons stated above with regard to element [1.b].

**d) [17.d] “detect a user action on the object indicating a position on the axis; and”**

105. The EM Combination discloses or at least suggests the recitations of element [17.d] for the reasons stated above with regard to element [1.c].

**e) [17.e] “a video composing unit configured to compose, in response to the user action being detected by the**

**processing unit, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying, wherein the processing unit is further configured to”**

106. The EM Combination discloses or at least suggests the recitations of element [17.e] for the reasons stated above with regard to element [1.d].

**f) [17.f] “identify an interval among the intervals within which the position is lying,”**

107. The EM Combination discloses or at least suggests the recitations of element [17.f] for the reasons stated above with regard to element [10.d].

**g) [17.g] “select the layout associated with the interval, and”**

108. The EM Combination discloses or at least suggests the recitations of element [17.g] for the reasons stated above with regard to element [10.e].

**h) [17.h] “provide the selected layout to the video composing unit.”**

109. The EM Combination discloses or at least suggests the recitations of element [17.h] for the reasons stated above with regard to element [10.f].

**F. Ground 2: Eleftheriadis and Mahemoff and in further view of Koski Discloses or At Least Suggests Claims 1-12, 14, and 16-19**

110. The EM Combination discloses or at least suggests claims 1, 4, 5, 9-12, 14, and 16-17 as noted above in Ground 1. Thus, the combination of Eleftheriadis, Mahemoff, and Koski satisfies claims 1, 4, 5, 9-12, 14, and 16-17 for the reasons stated above in Ground 1. Concerning claims 2-3, 6-8, and 18-19, the

EM Combination in further view of Koski also discloses or at least suggests claims 2-3, 6-8, and 18-19.

111. A POSITA would have recognized that sliders may be organized to consist of a linear array of collections for different categories to be selected. For example, Koski describes a “Method and Apparatus for Implementing Slider Detents,” in which sliders including collections, for example, entries that begin with a letter of alphabet, with the detents of the slider corresponding to a zone encompassing entries for that category (Koski, FIG. 3, ¶[0044]-[0045]):

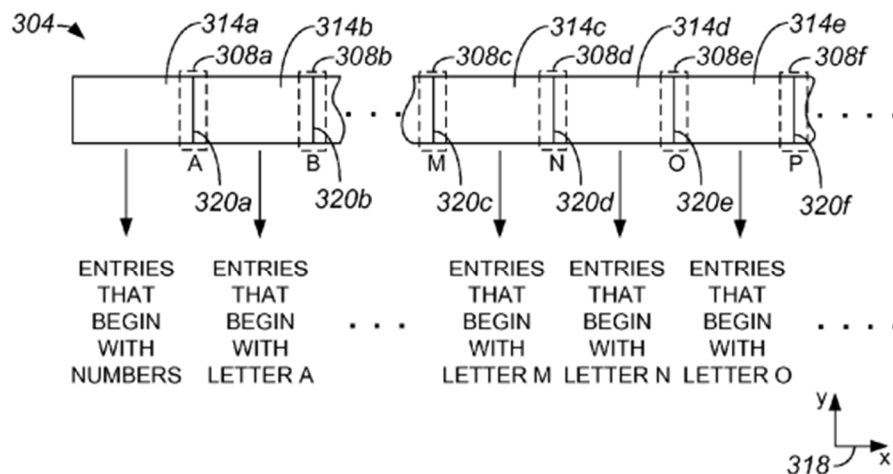


FIG. 3

See also Koski, [0046] (“For example, if a slider (not shown) enters Zone 308a, the scrolling process is near the beginning of the elements in a collection that start with the letter ‘A’ An entry such as ‘Aardvark’ is likely to be associated with Zone 308a, while an entry such as ‘Apple’ is more likely to be in Zone 314b and an

entry such as ‘Azalea’ is more likely to be in Zone 308b, i.e., the Zone that substantially surrounds point of interest 320b.”).

112. A POSITA would recognize the similarities in the slider of Mahemoff and Koski in that Mahemoff and Koski both have regions (e.g., zones such as “Entries That Begin With Letter A” in Koski) and Koski adds the discrete points within those regions.

113. Analogously, a POSITA would have found it obvious to have implemented the menu selection of Eleftheriadis using a collection slider approach by placing the standard mode of Eleftheriadis in one category with detents associated with its number of views and the enlarged mode of Eleftheriadis in another category associated with its number of views to allow a user to select a mode and view layout through operation of a slider. As noted above, a POSITA would have recognized menu-based and slider-based user interface controls as alternative ways to allow a user to make a selection, and would have been motivated to provide a slider-based control to permit a linear traversal of available options in a controlled way.

**1. Claim 2: [2.pre] “The method according to claim 1,”**

114. The EM Combination discloses or at least suggests the claimed method according to claim 1 for the reasons discussed above.

**a) [2.a] “wherein the composite video signal includes a spatial mix of the plurality of video conference streams, and”**

115. As noted above concerning claim element [5.a] in Ground 1, the composite video signal of the EM Combination would include a spatial mix of the plurality of video conference streams. For example, FIGs. 4, 8, and 11 of Eleftheriadis shows a display resulting from a spatial mix of video streams.

**b) [2.b] “the layout defines one or more frames for containing the plurality of video conference streams,”**

116. As discussed above regarding element [5.b] in Ground 1, the layout of the EM Combination would define frames for containing the video conference streams. For example, FIG. 4, 8, and 11 of Eleftheriadis shows one or more frames for containing the plurality of video conference streams.

**c) [2.c] “the method further comprising:”**

117. The combination of the EM Combination with Koski discloses or at least suggests the claimed method as discussed below.

**d) [2.d] “providing, for at least one of the intervals, a relationship between positions within the at least one of the intervals and a size and position of one or more frames of a respective layout associated with the interval, and”**

118. The combination of the EM Combination with Koski would provide for at least one of the intervals, a relationship between positions within the interval and a size and position of one or more frames of a respective layout associated

with the interval. As disclosed in Eleftheriadis, a video conferencing layout could include a standard mode layout (FIG. 4) or enlarged mode layouts (FIG. 8), each with different sizes and positions of frames. A POSITA would have found it obvious to associate a discrete range of the slider for one of the modes (such as associating a standard mode as in the range 0-49 and an enlarged mode as 50-99) and associate a number of views for that mode as discrete values in mode's range (such as 29 for a three-view standard mode and 39 for a four-view standard mode or 79 for a three-view enlarged mode and 89 for a four-view enlarged mode) as such would allow a user's to intuitively grasp the different modes and views within those modes.

119. Additionally, a POSITA would have recognized that sliders may be organized to consist of a linear array of collections for different categories to be selected. For example, Koski describes a “Method and Apparatus for Implementing Slider Detents,” in which sliders including collections, for example, intervals associated with a letter of alphabet (such as letter A), with the detents of the slider in that interval corresponding to an entry within that category (entries that begin with letter A) (Koski, FIG. 3, ¶[0044]-[0045]):

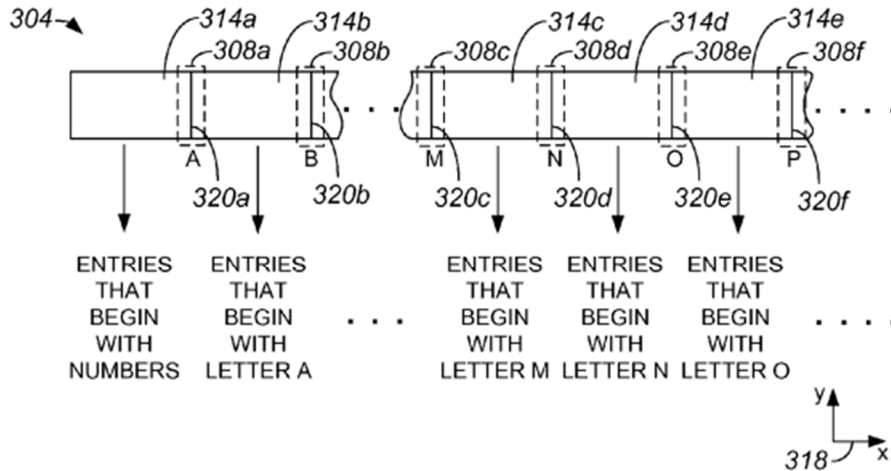


FIG. 3

Analogously, a POSITA would have found it obvious to have implemented the menu selection of Eleftheriadis using a collection slider approach by placing the standard mode of Eleftheriadis in one category with detents associated with entries for its number of views and the enlarged mode of Eleftheriadis in another category with detents associated with entries for its number of views to allow a user to select and mode and view layout through operation of a slider.

e) [2.e] “calculating, in response to the detecting of the user action, a layout wherein the size and position of each frame of the layout is based on the relationship and the position.”

120. The combination of the EM Combination with Koski would include calculating a layout wherein the size and position of each frame of the layout is based on the relationship and the position. As discussed above, Eleftheriadis each disclose calculating a layout involving the size and position of each frame, and the

combination's use of a discrete slider discloses or at least suggests using the position of slider's handle and relationship of that position to the predetermined layouts to render the selected layout, including for a collection slider like provided in Koski. Also, Eleftheriadis states (Eleftheriadis, 12:25-39):

“Given the large number of possibilities between different layout structures, it is important to properly guide a user through the possible choices. Clearly, the user should not be burdened to calculate how different views can fit together. He or she should rather provide indications to the Receiver system of his/her general preferences. Specifically, in an exemplary embodiment the user indicates to the Receiver system the size of the screen, and whether or not a standard or enlarged mode layout should be used. In the latter case, the user can also indicate the number of enlarged views to be used.”

Eleftheriadis then calculates the layout based on the user's selection of the number of views N and the number of enlarged views P and other variables. Eleftheriadis, 13:12-17:49.

**2. Claim 3: [3.pre] “3. The method according to claim 1, further comprising:”**

121. The combination of the EM Combination with Koski discloses or at least suggests the claimed method as noted above and further discussed below.

**a) [3.a] “associating M numbers of variations of one of the plurality of predefined layouts with M number of sub-intervals within one or more of the intervals;”**

The combination of the EM Combination with Koski discloses or at least suggests the recitations of element [3.a] for the reasons stated above with regard to element [2.d].

**b) [3.b] “identifying, in response to the detecting of the user action, a sub-interval among the sub-intervals within which the position is lying;”**

122. The combination of the EM Combination with Koski discloses or at least suggests the recitations of element [3.b] for the reasons stated above with regard to element [2.e].

**c) [3.c] “selecting a layout, of the plurality of predefined layouts, associated with the sub-interval; and”**

123. The combination of the EM Combination with Koski discloses or at least suggests the recitations of element [3.c] for the reasons stated above with regard to element [2.e].

**d) [3.d] “composing the composite video signal using the selected layout.”**

124. As described above with regard to elements [1.b], [1.d], and [2.e], Eleftheriadis then calculates the layout based on the user’s selection of the number of views N and the number of enlarged views P and other variables and produces a composite video signal. Eleftheriadis, 8:26-9:9; 13:12-17:49; FIG. 3; FIGS. 10-12;

FIG. 15; *see also* Eleftheriadis, 7:21-51; FIG. 2. Thus, the combination of the EM Combination with Koski discloses or at least suggests the recitations of element [3.d] for the reasons stated above with regard to elements [1.b], [1.d], and [2.e].

**3. Claim 6: “6. The method of claim 5, further comprising: providing, for at least one of the intervals, a relationship between positions within the at least one of the intervals and the size and position of one or more frames of a respective layout associated with the interval.”**

125. The combination of the EM Combination with Koski discloses or at least suggests the recitations of claim 6 for the reasons stated above with regard to element [2.d].

**4. Claim 7: “7. The method of claim 6, further comprising: calculating a layout wherein the size and position of each frame of the layout is based on the relationship and the position.”**

126. The combination of the EM Combination with Koski discloses or at least suggests the recitations of claim 7 for the reasons stated above with regard to element [2.e].

**5. Claim 8: “8. The method of claim 1, further comprising: providing, for at least one of the intervals, a relationship between positions within the at least one of the intervals and the size and position of one or more frames of a respective layout associated with the interval.”**

127. The combination of the EM Combination with Koski discloses or at least suggests the recitations of claim 8 for the reasons stated above with regard to element [2.d].

**6. Claim 18: [18.pre] “18. The apparatus according to claim 17, wherein”**

128. The combination of the EM Combination with Koski discloses or at least suggests the claimed method according to claim 17 for the reasons discussed above.

**a) [18.a] “the composite video signal includes a spatial mix of one of more video conference streams,”**

129. The combination of the EM Combination with Koski discloses or at least suggests the recitations of element [18.a] for the reasons stated above with regard to element [2.a].

**b) [18.b] “the layout defines one or more frames for containing the video conference streams, and”**

130. The combination of the EM Combination with Koski discloses or at least suggests the recitations of element [18.b] for the reasons stated above with regard to element [2.b].

**c) [18.c] “the processing unit is further configured to”**

131. The combination of the EM Combination with Koski discloses or at least suggests the claimed processing unit as discussed below.

**d) [18.d] “provide, for at least one of the intervals, a relationship between positions within the at least one of the intervals and a size and position of one or more frames of a respective layout associated with the interval, and”**

132. The combination of the EM Combination with Koski discloses or at least suggests the recitations of element [18.d] for the reasons stated above with regard to element [2.d].

**e) [18.e] “calculate, in response to the user action being detected, a layout wherein the size and position of each frame of the layout is based on the relationship and the position.”**

133. The combination of the EM Combination with Koski discloses or at least suggests the recitations of element [18.e] for the reasons stated above with regard to element [2.e].

**7. Claim 19: [19.pre] “19. The apparatus according to claim 17, wherein”**

134. The combination of the EM Combination with Koski discloses or at least suggests the claimed method according to claim 17 for the reasons discussed above.

**a) [19.a] “the processing unit is further configured to”**

135. The combination of the EM Combination with Koski discloses or at least suggests the claimed processing unit as discussed below.

**b) [19.b] “associate M numbers of variations of one of the plurality of predefined layouts with M number of sub-intervals within one or more of the intervals,”**

136. The combination of the EM Combination with Koski discloses or at least suggests the recitations of element [19.b] for the reasons stated above with regard to elements [2.d] and [3.a].

**c) [19.c] “identify, in response to the user action being detected, a sub-interval among the sub-intervals within which the position is lying, and”**

137. The combination of the EM Combination with Koski discloses or at least suggests the recitations of element [19.c] for the reasons stated above with regard to elements [2.e] and [3.b].

**d) [19.d] “select a layout, of the plurality of predefined layouts, associated with the sub-interval; and”**

138. The combination of the EM Combination with Koski discloses or at least suggests the recitations of element [19.d] for the reasons stated above with regard to elements [2.e] and [3.c].

**e) [19.e] “the video composing unit is configured to compose the composite video signal using the selected layout.”**

139. The combination of the EM Combination with Koski discloses or at least suggests the recitations of element [19.e] for the reasons stated above with regard to elements [2.e] and [3.d].

**G. Ground 3: Eleftheriadis in view of Mahemoff and in Further View of Kikuchi Discloses or At Least Suggests Claims 1, 4, 5, and 9-17**

140. The EM Combination discloses or at least suggests claims 1, 4, 5, 9-12, 14, and 16-17 as noted above in Ground 1. As explained below, based on the teachings of Kikuchi, with regard to claims 13 and 15, a POSITA would have found it obvious to provide a remote control screen for controlling a video layout. Accordingly, the EM Combination, when considered in further view of Kikuchi, discloses or at least suggests claims 1, 4, 5, and 9-17.

**1. Claim 13: “13. The method according to claim 12, further comprising: displaying the object on a display of a control device, which is connected to the video conference terminal, together with a replica of the composite video signal currently displayed on the display of the video conference terminal.”**

141. The combination of the EM Combination with Kikuchi discloses or at least suggests displaying the slider and handle on a display of a control device connected to the video conference terminal, together with a replica of the composite video signal currently displayed on the display of the video conference terminal. As explained in Kikuchi, Kikuchi provides a screen SC for displaying a composite of images, and includes displays in devices supplying the images with an “operation window” to control what is shown on the screen SC. *See* Kikuchi, FIGS. 5A and 5B, ¶[0077]-[0078] (“the display image of the projection screen SC and the screen image 310 of the operation window 300 are synchronized with each

other.”). A POSITA would have recognized the benefits in having a synchronized control device, such as in Kikuchi, for controlling a video conference screen because providing a separate control device would allow user adjustment of the layout of the video conference with a device proximate to the user.

**2. Claim 15: “15. The method according to claim 13, further comprising: updating one of the composite video signal and the replica in real time as the object is moved by the user.”**

142. The combination described with regard to claim 13 discloses or at least suggests the recitations of claim 15 for the reasons stated above with regard to claim 13. *See* Kikuchi, FIGS. 5A and 5B, ¶[0077]-[0078] (“the display image of the projection screen SC and the screen image 310 of the operation window 300 are synchronized with each other.”);

143. Further, a POSITA would find it obvious to update the composite video signal in real time as a slider object is operated. For example, in Kikuchi, an operation window shows the “real time” state of a projection screen displaying a composite video signal. Kikuchi, ¶[0078] (“The screen image 310 reflects the display content of the projection screen SC in real time due to the communication between the image display device 200 and each of the image supply devices 100a through 100d connected thereto.”). In addition, in Kikuchi, merely dragging Kikuchi’s slider changes the views, without any indication of delay or confirmation, suggesting real time operation as a slider object is moved. Kikuchi,

¶[0130] (“In this display state, in FIG. 22A1, the slider 342 is *dragged downward* from a position on the layout frame vertically dividing the screen image 310. *Then*, the display mode of the projection screen SC is switched to the dual screen display mode, and the two supply images 501a, 501b having been displayed in the upper layout frames in the quad screen display mode are continuously displayed without interruption (FIG. 22A2).”) (emphasis added). A POSITA would analogize this operation of slider controls to other well-known slider controls, where desired operations occur in real time, such as a volume control slider on a media player. Moreover, Eleftheriadis contemplates “automatic” switching of view modes. *See* Eleftheriadis, 17:64-18:2.

144. Thus, it would have been obvious for the combination of the EM Combination with Kikuchi to update either the composite video signal or the replica in real time as a slider is dragged by a user.

**H. Ground 4: Kikuchi in view of Eleftheriadis Discloses or At Least Suggests Claims 1, 4, 5, and 9-17**

145. As noted above, Kikuchi’s draggable slider allows for an intuitive action, such as sliding from the middle of the screen to left in the dual layout mode to select a right image in a single layout mode. But, Kikuchi’s preferred embodiment is directed to image display in a presentation environment and, thus, does not explicitly disclose application in a video conferencing environment.

146. As also discussed above, Eleftheriadis discloses a video conferencing system. It would have been obvious to a POSITA to apply the video conferencing system of Eleftheriadis to Kikuchi's video display system so as to allow Kikuchi's slider to select video layouts in Eleftheriadis because it would allow Kikuchi's display to be used for remote users and achieve other known benefits of video conferencing. A POSITA would have a reasonable expectation of success of applying Kikuchi's techniques to video conferencing because video conferencing was a mature technology and Kikuchi's techniques simply provide a graphical user interface (GUI) for an imaging system and, at a conceptual level, video is a rapid sequence of images displayed one after another to create the illusion of continuous motion, so use of Kikuchi's GUI for use in displaying video instead of images would be a natural step to take. Also, configuring a system with a different GUI would have a reasonable expectation of success.

**1. Independent Claim 1: 1[pre] “1. A method comprising:”**

147. The combination of Kikuchi and Eleftheriadis (the “KE Combination”) would provide Kikuchi's video display slider to select the video conferencing layouts of Eleftheriadis. Thus, the combination would provide a method.

**a) [1.a] “providing, on a display, an object configured to be moved by a user along an axis extending across video for a plurality of video conference streams;”**

148. The KE Combination would provide, on a display, an object configured to be moved by a user along an axis extending across video for a plurality of video conference streams. Kikuchi provides, for example, that “the slider 342 is dragged leftward (in the direction of the dashed arrow in FIG. 20A1) or rightward (in the direction of the dashed arrow in FIG. 20B1).” Kikuchi, ¶[0128]. Thus, the KE Combination would include a display on which a user may drag the object along an axis extending across video for a plurality of video conference streams.

**b) [1.b] “associating a plurality of predefined layouts for plurality of video conference streams with respective intervals along the axis;”**

149. The KE Combination would associate predefined layouts for video conference streams with respective intervals along the axis. Kikuchi, which as shown in FIG. 20A1 and 20B1 of Kikuchi, provides a slider on a horizontal axis on a display with two images with 2 intervals. Positioning the slider handle 342 in the left interval changes the layout to a first predefined layout associated with the right single image (FIG. 20A2), and positioning the slider handle in the right interval changes the layout to a second predefined layout for left right single image (FIG. 20B2). FIG. 24B1 provides a third interval for the horizontal axis, from the far left of the screen to the far-right of the screen. Similarly, in FIG. 22A1, FIG. 22B1, and FIG. 24A1 of Kikuchi, the vertical axis has at least three intervals. One is from

the middle of the screen downward (Fig. 22A2) and another upward (Fig. 22B2). The third interval is from the top of the screen to the bottom of the screen (Fig. 24A1 and 24A2).

**c) [1.c] “detecting a user action on the object indicating a position on the axis; and”**

150. The KE Combination would detect a user action on the object indicating a position on the axis. Kikuchi’s slider operates by a user acting on a handle and moving the handle of the slider 342 from and to different positions as noted above.

**d) [1.d] “composing, in response to the detecting of the user action, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying.”**

151. The KE Combination would compose a composite video signal based on a user’s interaction with a discrete slider. As such, it would detect a user’s action, determine where the handle of the slider moved to (and possibly from), as taught by Kikuchi, and compose a composite video signal based on the associated layout from a plurality of predefined layouts, as taught by Kikuchi which composes layouts based on the movement of its slider from initial and final positions and corresponding intervals for both a horizontal axis and a vertical axis.

152. For example, FIGS. 20 and 22, depicted below, show that Kikuchi composes, in response to the detecting of the user action, a composite video signal

using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying:

FIG. 20A1

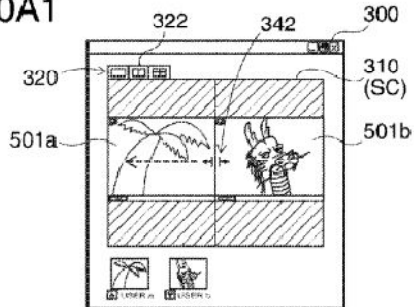


FIG. 20B1

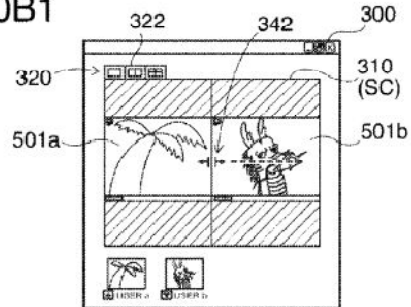


FIG. 20A2

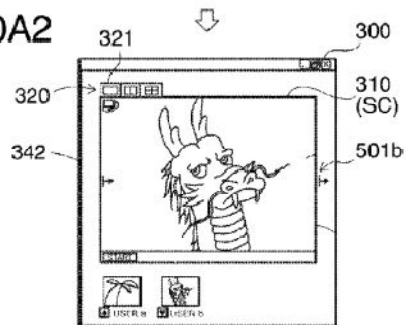


FIG. 20B2

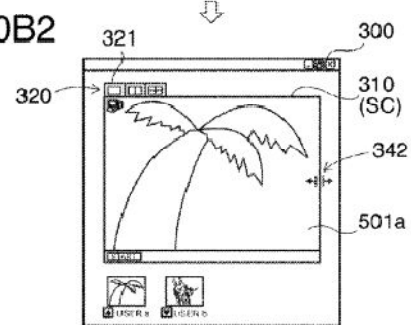


FIG. 22A1

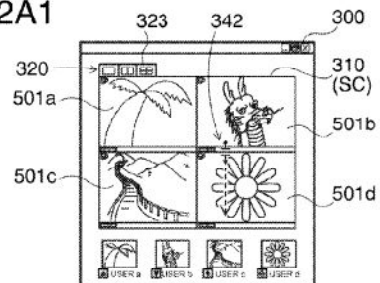


FIG. 22B1

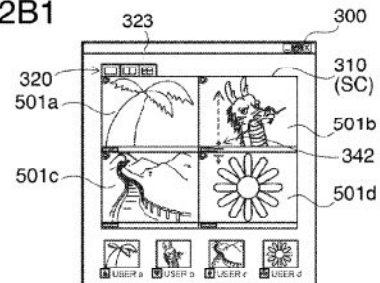


FIG. 22A2

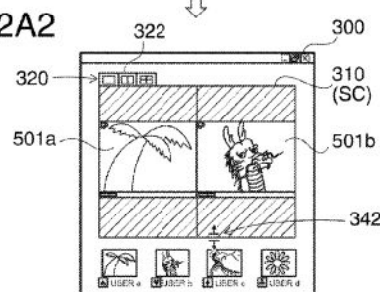
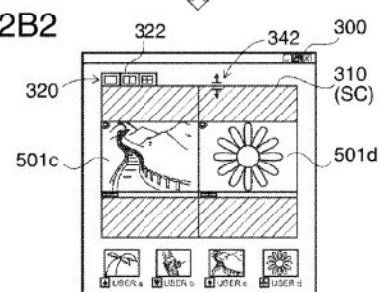


FIG. 22B2



153. In addition, Eleftheriadis creates a composite video signal using a layout when after the process of Eleftheriadis (described with regard to FIG. 15 or a user as detailed above in element [1.b]), selects a particular layout, and it becomes effective. Eleftheriadis, 17:37-49.

154. In the combination, when the particular layout in either Kikuchi or Eleftheriadis is selected in response to user action in Kikuchi, the composite video is generated based on the user action associated with an interval among the intervals as described above. In my opinion a POSITA would understand this combination to disclose or at least suggest claim element [1.d].

**2. Claim 4: “4. The method of claim 1, further comprising: identifying the interval among the intervals within which the position is lying.”**

155. The KE Combination discloses or at least suggests identifying the interval among the intervals within which the position is lying. A slider would identify the interval where the user moved the slider handle to. For example, FIG. 22A1 of Kikuchi shows the slider 342 moved down to a lower interval, and the system identifying that position and modifying the layout from a quad view mode to a dual view mode of the upper portion of the quad view mode as a result. In addition, the KE combination discussed in claim element [1.d] above discloses or at least suggests this additional claim limitation, which is obvious.

**3. Claim 5: [5.pre] “5. The method of claim 1, further comprising:”**

156. The KE Combination discloses or at least suggests the claimed method of claim 1 as discussed above and further discussed below.

**a) [5.a] “wherein the composite video signal includes a spatial mix of one or more video conference streams, and”**

157. The composite video signal of the KE Combination would include a spatial mix of the plurality of video conference streams. For example, Eleftheriadis discloses a spatial mix of video streams as explained with regard to element [5.a] in Ground 1. Also, Kikuchi’s Figures also show a spatial mix of video images because they display multiple streams, which would be provided by spatial mixing for analogous reasons as explained with regard to Eleftheriadis and element [5.a] in Ground 1.

**b) [5.b] “the layout defines one or more frames for containing the video conference streams.”**

158. The layout of the KE Combination would define frames for containing the video conference streams. For example, FIG. 12 of Eleftheriadis shows the use of frames to provide the spatial mix of video conference streams as explained with regard to element [5.b] in Ground 1. Also, Kikuchi’s Figures show frames to provide a spatial mix of video images.

**4. Claim 9: “9. The method of claim 1, further comprising: calculating, in response to the detecting of the user action, a**

**layout wherein a size and position of each frame of the layout is based on the relationship and the position.”**

159. The KE Combination would include calculating, in response to the detecting of the user action, a layout wherein a size and position of each frame of the layout is based on a relationship between intervals of the slider and the position of the slider.<sup>2</sup> As discussed above, Eleftheriadis and Kikuchi each disclose calculating a layout involving the size and position of each frame, and the combination’s use of a slider discloses or at least suggests using the position of slider’s handle and relationship of that position to the predetermined layouts to render the selected layout. For example, FIG. 22A1 of Kikuchi shows the slider 342 moved from down to a lower interval, and the system identifying that and placing the layout from a quad view mode to a dual view mode of the upper portion of the quad view mode. Also, Eleftheriadis states (Eleftheriadis, 12:25-39):

“Given the large number of possibilities between  
different layout structures, it is important to properly

---

<sup>2</sup> As noted in the Claim Construction section, solely for the purposes of this IPR, I will interpret “based on the relationship and the position” in claim 9 to refer to a relationship between slider intervals and layouts and the “position on the axis” of claim 1.

guide a user through the possible choices. Clearly, the user should not be burdened to calculate how different views can fit together. He or she should rather provide indications to the Receiver system of his/her general preferences. Specifically, in an exemplary embodiment the user indicates to the Receiver system the size of the screen, and whether or not a standard or enlarged mode layout should be used. In the latter case, the user can also indicate the number of enlarged views to be used.”

Eleftheriadis then calculates the layout based on the user’s selection of the number of views N and the number of enlarged views P and other variables. Eleftheriadis, 13:12-17:49.

**5. Independent Claim 10: [10.pre] “10. A method comprising:”**

160. The KE Combination would provide a method.

**a) [10.a] “providing, on a display, an object configured to be moved by a user along an axis;”**

161. The KE Combination discloses or at least suggests the recitations of element [10.a] for the reasons stated above with regard to element [1.a].

**b) [10.b] “associating a plurality of predefined layouts with respective intervals along the axis;”**

162. The KE Combination discloses or at least suggests the recitations of element [10.b] for the reasons stated above with regard to element [1.b].

**c) [10.c] “detecting a user action on the object indicating a position on the axis;”**

163. The KE Combination discloses or at least suggests the recitations of element [10.c] for the reasons stated above with regard to element [1.c].

**d) [10.d] “identifying an interval among the intervals within which the position is lying;”**

164. The KE Combination discloses or at least suggests the recitations of element [10.d] for the reasons stated above with regard to claim 4.

**e) [10.e] “selecting the layout associated with the interval; and”**

165. The KE Combination discloses or at least suggests the recitations of element [10.e] for the reasons stated above with regard to element [1.d].

**f) [10.f] “composing, in response to the detecting of the user action, a composite video signal using the layout, of the plurality of predefined layouts, associated with the interval among the intervals within which the position is lying.”**

166. The KE Combination discloses or at least suggests the recitations of element [10.f] for the reasons stated above with regard to element [1.d].

**6. Claim 11: “11. The method according to claim 10, further comprising: providing the selected layout to a video composing unit, which composes the composite image and which is configured to receive a plurality of video conference streams and output a composite video signal comprising one or more of the received video conference streams based on a layout.”**

167. The KE Combination discloses or at least suggests providing the selected layout to a video composing unit, as claimed. The video composing unit

in the video conferencing system of Eleftheriadis provides a composite image based on the received video conference streams, as discussed in Ground 1 with regard to elements [1.b] and [1.d]. Moreover, Eleftheriadis states (Eleftheriadis, 12:25-39):

“Given the large number of possibilities between different layout structures, it is important to properly guide a user through the possible choices. Clearly, the user should not be burdened to calculate how different views can fit together. He or she should rather provide indications to the Receiver system of his/her general preferences. Specifically, in an exemplary embodiment the user indicates to the Receiver system the size of the screen, and whether or not a standard or enlarged mode layout should be used. In the latter case, the user can also indicate the number of enlarged views to be used.”

168. Thus, Eleftheriadis then calculates the layout based on the user’s selection of the number of views  $N$  and the number of enlarged views  $P$  and other variables and produces a composite image in the KE combination. Eleftheriadis, 13:12-17:49.

**7. Claim 12: “12. The method according to claim 10 , further comprising: displaying the composite video signal on the display, the display being of a video conference terminal.”**

169. The KE Combination discloses or at least suggests displaying the composite video signal on the display of a video conference terminal. *See, e.g.*, Eleftheriadis, FIG. 12.

**8. Claim 13: “13. The method according to claim 12, further comprising: displaying the object on a display of a control device, which is connected to the video conference terminal, together with a replica of the composite video signal currently displayed on the display of the video conference terminal.”**

170. The KE Combination discloses or at least suggests displaying the slider and handle on a display of a control device connected to the video conference terminal, together with a replica of the composite video signal currently displayed on the display of the video conference terminal. As explained in Kikuchi, Kikuchi provides a screen SC for displaying a composite of images, and includes displays in devices supplying the images with an “operation window” to control what is shown on the screen SC. *See* Kikuchi, FIGS. 5A and 5B, ¶[0077]-[0078] (“the display image of the projection screen SC and the screen image 310 of the operation window 300 are synchronized with each other.”).

**9. Claim 14: “14. The method according to claim 10, further comprising: displaying the object on the display, which is of a video conference terminal.”**

171. The KE Combination would disclose or at least suggest displaying the object on the display of a video conference terminal for the reasons stated above with regard to element [1.a]. Specifically, as Eleftheriadis is a video conferencing

system, the KE combination would display the slider of Kikuchi on a video conferencing terminal.

**10. Claim 15: “15. The method according to claim 13, further comprising: updating one of the composite video signal and the replica in real time as the object is moved by the user.”**

172. The KE Combination discloses or at least suggests the recitations of claim 15 for the reasons stated above with regard to claim 13 in Ground 4 and the reasons stated above in Ground 3 for claim 15.

**11. Independent Claim 16: [16.pre] “16. A non-transitory computer-readable storage medium including computer executable instructions, wherein the instructions, when executed by a computer, cause the computer to perform a method, the method comprising:”**

173. The KE Combination discloses or at least suggests a non-transitory computer-readable storage medium including computer executable instructions, wherein the instructions, when executed by a computer, cause the computer to perform a method. *See, e.g.*, Eleftheriadis, 24:19-28 (“It will be understood that in accordance with the disclosed subject matter, the techniques described herein can be implemented using any suitable combination of hardware and software. The software (i.e., instructions) for implementing and operating the aforementioned layout management techniques can be provided on computer-readable media, which can include, without limitation, firmware, memory, storage devices,

microcontrollers, microprocessors, integrated circuits, ASICs, on-line downloadable media, and other available media.”).

**a) [16.a] “providing, on a display, an object configured to be moved by a user along an axis;”**

174. The KE Combination discloses or at least suggests the recitations of element [16.a] for the reasons stated above with regard to element [1.a].

**b) [16.b] “associating a plurality of predefined layouts with respective intervals along the axis;”**

175. The KE Combination discloses or at least suggests the recitations of element [16.b] for the reasons stated above with regard to element [1.b].

**c) [16.c] “detecting a user action on the object indicating a position on the axis;”**

176. The KE Combination discloses or at least suggests the recitations of element [16.c] for the reasons stated above with regard to element [1.c].

**d) [16.d] “selecting a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position on the axis is lying; and”**

177. The KE Combination discloses or at least suggests the recitations of element [16.d] for the reasons stated above with regard to claim 4 and element [10.e].

**e) [16.e] “composing, in response to the detecting of the user action, a composite video signal using the layout, of the plurality of predefined layouts, associated with the interval**

**among the intervals within which the position on the axis is lying.”**

178. The KE Combination discloses or at least suggests the recitations of element [16.e] for the reasons stated above with regard to element [1.d].

**12. Independent Claim 17: [17.pre] “17. An apparatus comprising:”**

179. The KE Combination discloses or at least suggests an apparatus as discussed below.

**a) [17.a] “a processing unit configured to”**

180. The KE Combination discloses or at least suggests a processor unit. *See, e.g.*, Eleftheriadis, 24:19-28 (“It will be understood that in accordance with the disclosed subject matter, the techniques described herein can be implemented using any suitable combination of hardware and software.”).

**b) [17.b] “provide, on a display, an object configured to be moved by a user along an axis,”**

181. The KE Combination discloses or at least suggests the recitations of element [17.b] for the reasons stated above with regard to element [1.a].

**c) [17.c] “associate a plurality of predefined layouts with respective intervals along the axis, and”**

182. The KE Combination discloses or at least suggests the recitations of element [17.c] for the reasons stated above with regard to element [1.b].

**d) [17.d] “detect a user action on the object indicating a position on the axis; and”**

183. The KE Combination discloses or at least suggests the recitations of element [17.d] for the reasons stated above with regard to element [1.c].

**e) [17.e] “a video composing unit configured to compose, in response to the user action being detected by the processing unit, a composite video signal using a layout, of the plurality of predefined layouts, associated with an interval among the intervals within which the position is lying, wherein the processing unit is further configured to”**

184. The KE Combination discloses or at least suggests the recitations of element [17.e] for the reasons stated above with regard to element [1.d].

**f) [17.f] “identify an interval among the intervals within which the position is lying,”**

185. The KE Combination discloses or at least suggests the recitations of element [17.f] for the reasons stated above with regard to element [10.d].

**g) [17.g] “select the layout associated with the interval, and”**

186. The KE Combination discloses or at least suggests the recitations of element [17.g] for the reasons stated above with regard to element [10.e].

**h) [17.h] “provide the selected layout to the video composing unit.”**

187. The KE Combination discloses or at least suggests the recitations of element [17.h] for the reasons stated above with regard to element [10.f].

**I. Ground 5: Kikuchi in view of Eleftheriadis and in Further view of Koski Discloses or At Least Suggests Claims 1-19**

188. The KE Combination discloses or at least suggests claims 1, 4, 5, and 9-17 as noted above in Ground 1. Thus, the combination of Kikuchi, Eleftheriadis, and Koski satisfies claims 1, 4, 5, and 9-17 for the reasons stated above in Ground 4. Concerning claims 2-3, 6-8, and 18-19, the KE Combination in further view of Koski also discloses or at least suggests claims 2-3, 6-8, and 18-19 for the same reasons as provided in Ground 2 concerning the EM Combination in further view of Koski.

This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare under penalty of perjury under the laws of the United States of America that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I understand that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. 1001) and may jeopardize the validity of the application or any patent issuing thereon.

By: Omid Kia  
Omid Kia

Dated: 10/28/2025

**Omid E. Kia**  
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(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.

**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 3<sup>rd</sup> 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.

**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**.

**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.

**Research/Teaching Assistant**, Department of Electrical Engineering and Computer Science, UIC, Chicago, IL. September 1987 to August 1989.

**Research: Digital signal processing and homomorphic analysis** 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.

- 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. Crown, 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, 8<sup>th</sup> Conference on Space Weather, Spokane, Washington, January 2011.
- O. Kia, C. Rodgers and B. Bradford, Dual use RF-based Sensing 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

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. Sauvola. 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.

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. Jaroczyk Jr. of Littelfuse, Inc. – June 2014.

2:13-cv-0052 – Eastern District of Texas, 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.

Investigation No. 337-TA-1379/1380, In the Matter of Certain Certain Video Capable Electronic Devices, Including Computers, Streaming Devices, Televisions, and Components and Modules thereof, United States International Trade Commission, Nokia v. Hewlett Packard, Amazon et. al. – March 2024 – Expert for Plaintiff.

5:23-CV-00092-RWS, Maxell v. Samsung, Eastern District of Texas Texarkana Division – October 2024 – Expert for Defendant.

IPR2025-00635, 00314, 00275, 00314, 00316, 00275 Inter Partes Review of U.S. Patents 11,871,088, 10,425,697, 11,039,218, 10,425,697, 10805687 and 11039218 Sportradar AG v. SportsCastr Inc – United States Patent and Trademark Office before the Patent Trial and Appeal Board – December 2024 – Expert for Plaintiff.

IPR2024-00923, 00924, 00925, Inter Partes Review of U.S. Patents 10,873,685, 7,612,805, and 8,451,339, SONY Corporation v. Optimum Imaging Technologies LLC – United States Patent and Trademark Office before the Patent Trial and Appeal Board – January 2025 – Expert for Defendant.

2:25-cv-00081-JRG, Valtrus Innovations LTD v. The Home Depot Inc, Eastern District of Texas Marshall Division – January 2025 – 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.