Paper No. ___

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE, INC.

Petitioner

v.

MEMORYWEB, LLC

Patent Owner

Patent No. 10,621,228

Patent No. 10,423,658

Inter Partes Review No. IPR2022-00031

Inter Partes Review No. IPR2022-00033

DECLARATION OF RAJEEV SURATI, PH.D

I, Rajeev Surati, Ph.D., declare as follows:

1. I make this declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters stated herein.

2. I have been retained on behalf of MemoryWeb, LLC, ("MemoryWeb" or "Patent Owner") as an independent expert consultant to provide this declaration concerning the technical subject matter relevant to U.S. Patent No. 10,621,228 ("the '228 patent") and U.S. Patent No. 10,423,658 ("the '658 patent") in connection with *inter partes* review ("IPR") petitions filed by Apple, Inc. ("Petitioner").

3. I am being compensated at my standard hourly rate of $560 per hour for the time I spend on this matter. My compensation is not based on the content of my opinions or the resolution of this matter, and I have no other interest in this proceeding.

4. In this declaration, I offer my expert opinion regarding the technical subject matter of claims 1-19 of the '228 patent and claims 1-15 of the '658 patent (collectively, "the challenged claims"). Specifically, I have considered whether the challenged claims are valid under 35 U.S.C. § 103. The substance and bases of my opinions appear below.

I. BACKGROUND AND QUALIFICATIONS

5. In formulating my opinions, I have relied on my knowledge, training, and experience in the relevant field, which I will summarize briefly here. In addition, my *curriculum vitae* (CV) is attached to this declaration.

6. I hold a Doctor of Philosophy in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology (awarded in 1999) with a Grade Point Average of 5.0/5.0. I obtained a Master of Science in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology (awarded in 1995) with a Grade Point Average of 5.0/5.0. I have a Bachelor of Science in Electrical Engineering from the Massachusetts Institute of Technology (awarded 1992) and graduated with a Grade Point Average of 4.9/5.0.

7. My Ph.D. thesis was entitled "Scalable Self-Calibrating Technology for Large Scale Displays." My Master's thesis was entitled "Practical Partial Evaluation." My Undergraduate thesis, which I received the MIT EECS's William A. Martin thesis prize for best undergraduate thesis, was entitled "A Parallelizing Compiler based on Partial Evaluation." Lastly, I was awarded the highly selective Department of Energy's Computational Science Fellowship in 1995, which funded my Ph.D. studies.

8. Between 1989 and 1999 I was employed as a researcher/programmer at the MIT Artificial Intelligence Lab. At the lab, I worked for Thomas F. Knight

Jr., Ph.D. He is one of the noted inventors of the first bit-mapped displays for computers, a core programmer on the ITS (intelligent time-sharing operating system), creator of several innovations in VLSI, and most recently noted as being one of the grandfathers of synthetic biology. I also worked for Professor Anant Agarwal on parallel computing and Professors Hal Abelson and Gerald J. Sussman on parallel and scientific computing.

9. In 1996, I began working on a Ph.D. thesis related to the display of multimedia across large displays. My Ph.D. thesis system was a special kind of display allowing one to create ultra-high-resolution displays composed of multiple projectors tiled with a slight overlap. A camera-based feedback system is used to create an inverse map to drive the system such that a person would only see a continuous, seamless display with no bezel or overlap. What content and how to drive it onto the display was a topic I became familiar with. Also, at this time, several interactive TV projects were going on at MIT, which I had exposure to from this vantage, especially concerning the idea that these large displays would be in the living rooms of the future. Thus, I became familiar with content encoding/decoding, user interfaces for driving large displays, multimedia content storage, high-resolution imagery, networks, recording, GPUs, storage of content, etc.

10. In 2002, MIT was awarded U.S. Patent 6,456,339, entitled "Super-resolution Display," for my Ph.D. work. Today this technology is better known as automatic calibration for projection mapping. My experience, along with a patent I developed and licensed based on my Ph.D. thesis, were used to create a new startup company called Scalable Display Technologies that works with a variety of Pro AV display companies' products.

11. While at MIT pursuing my doctorate, I started a company called Flash Communications in 1997, which invented an instant messaging platform focused on enterprise needs. It had its basis from my having observed the popularity at MIT of the Zephyr Instant Messaging Service from 1988 onwards. Given this enterprise focus, Microsoft soon acquired the company in 1998. We built both a client and server product, and the basic protocol we invented became the basis of the well-known XMPP protocol that was widely used in the mid-2000s among instant messaging providers. I worked on developing both the client and server products and particularly dealt with many, if not all, of the issues one might have to face when implementing contact lists.

12. Upon graduation, I joined Microsoft (as was required by Microsoft in the acquisition of Flash Communications) and worked on both client and server technologies related to instant messaging, covering both the Microsoft Exchange

Instant Messaging product that was released in 2000 and MSN Messenger. At Microsoft, I also worked on the client and server side of the products.

13. At Microsoft, I participated in development of the Instant Messaging and Presence Protocol (IMPP), which was at least partially derived from a similar protocol that I worked on at Flash. The IMPP protocol was later incorporated into the Extensible Messaging and Presence Protocol (XMPP) protocol that was used widely for instant messaging by Microsoft, Google, Cisco, Jabber, and several others.

14. As this XMPP adoption was going on, there was further internal discussion regarding the Session Initiation Protocol (SIP) protocol, which was eventually adopted more broadly by Microsoft for Instant Messaging. The SIP protocol is used for signaling and controlling multimedia communication sessions in applications of Internet telephony for voice and video calls, instant messaging over Internet Protocol (IP) networks, as well as mobile phone calling over LTE (VoLTE). While working at Flash and Microsoft, I was personally responsible for developing source code for parsing and processing input messages and generating output messages in accordance with the above-described protocols, and thus I have an extensive working knowledge of many different protocols used in multimedia communications systems. Furthermore, I worked on an SDK integrating the Exchange Servers with the MSN Servers.

15. In 2002, I served as a technical consultant for Cordant Communication, which was founded for the purpose of archiving instant messages. During this time period, I also served as an informal adviser to IMLogic, which also worked on message archiving. Later in 2007, I served as a technical adviser to Unify Square, which built software to manage Microsoft telephony and messaging solutions deployed in Fortune 500 companies. Unify Square was recently sold to Unisys.

16. From 2000 to 2007, I cofounded, led, and sold a business called photo.net to Namemedia, which is now part of GoDaddy.com. In 2000, while running the site, I worked on many features including a chat feature, a WAP interface to photo.net, and a rich user interface based on JavaScript. Photo.net for a time in early 2000 was considered a top 1,000 website so it received large amounts of traffic. Having built the site from running on a single computer that I installed in a datacenter to a full rack of computers in that data center, I became very familiar with the careful design and programming one needs to employ in building and maintaining such systems. I became intimately familiar with implementing file systems for use with multimedia and super high performance image encoding/decoding systems as well as real time delivery of high bandwidth content.

17. At photo.net, we prototyped many fundamental Internet community features such as photo sharing, social networking, and memberships in the late 1990s and early 2000s. This system was written on top of Oracle SQL Database and had to serve up many millions of web pages a day (corresponding to millions of records), with high volume inserts and also incorporated an ecommerce system used for billing of subscriptions, tracking users etc. I spent seven years running the site both writing new features driven by the Oracle SQL database and maintaining tables with many millions of records being generated. I also served as the database administrator for seven years, which provided me with personal and extensive operational experience running such a system, dealing with database query speed-up and more mundane day-to-day issues regarding maintaining relational databases such as backups, etc.

18. I also worked with the team at ArsDigita including Dr. Philip Greenspun, who created the photo.net site as a hobby in 1993 while we were at MIT, and who asked me to cofound the business with him in 1999 when I came back from Microsoft. ArsDigita built public open source community web site creation tools similar to what people today call Drupal on which many thousands of websites were built, including both enterprise and consumer web sites. ArsDigita's product came out of the work to develop photo.net, and photo.net

served as a prime example site of one using the ArsDigita System as its underlying content management system.

19. The photo sharing system on photo.net was built on top of a photo database engine called PhotoDB including features like key word tagging, folder, and even making custom fields that users could customize for making their own personal tables. I rebuilt and maintained much of the user interface for this in 2001 until the site was sold.

20. Because photo.net was focused on high-end amateur photographers, I worked with many consumer electronics manufacturers in the digital camera business. There, I implemented a photo sharing system involving the delivery of multimedia content. Additionally, I worked on e-commerce capabilities that involved some product configuration options. In running photo.net, I became intimately familiar with implementing file systems for use with multimedia and super high performance image encoding/decoding systems as well as real time delivery of high bandwidth content.

21. Messaging and broadcasting content were a core part of the offering of the site, and I managed the implementation and hosting aspect of setting up and running various SMTP, MTA, WAP, and SMS servers to enable communication with our user base. In that regard, WAP PUSH, which is a relevant protocol to messaging, was something I worked on as well at the time.

22. In 2001, I became involved with helping a rich user interface (UI) web company, Nexaweb, as both an investor and advisor. In that role, I worked on the underlying infrastructure for a device independent (mobile device, PC, etc.) way to write UIs for web application utilizing Java as a rendering engine backed by web server backend. Underlying that technology required providing server pushes over http. At that time JavaScript could provide a UI but it was not standardized across browsers, which made it hard to implement reliable systems that worked across browsers—especially ones that required server push underneath it.

23. In 2004, I founded Scalable Display Technologies (SDT) and I have been the President and Chairman of the company since the founding. Among its operations, SDT operates in the Audio Video domain and has licensed software and firmware to various companies including Hitachi and NEC. I also wrote a network synchronized media playback system involving encoding and decoding of video and audio content as well as real time recording and video capture, a product known as "ScalablePlayer." I was also involved in building a network architecture using both broadcast and point-to-point communication mechanisms.

24. Also, as detailed in my attached CV, I am an inventor of subject matter in approximately 10 U.S. Patents. I have also received additional patents, including: U.S. Patent No. 8,817,111, entitled "System and method of calibrating a

display system free of variation in system input resolution"; U.S. Patent No. 8,994,757, "System and method for providing improved display quality by display adjustment and image processing using optical feedback"; U.S. Patent No. 9,215,455, "System and method of calibrating a display system free of variation in system input resolution"; U.S. Patent No. 9,369,683, "System and method for calibrating a display system using manual and semi-manual techniques"; and U.S. Patent No. 9,497,447, "System and method for color and intensity calibrating of a display system for practical usage."

25. I am co-inventor of patented technology related to instant messaging upon I which focused on technology related to U.S. Patent No. 5,943,478 and associated technology that I had developed related to pop-up, two-way messaging over the Internet. While at Microsoft, I was an inventor on several patents including: U.S. Patent No. 6,260,148 relating to methods and systems for message forwarding and property notifications using electronic subscriptions; and U.S. Patent Nos. 6,415,318 and 6,604,133 relating to inter-enterprise messaging systems using bridgehead servers. Aspects of these patents relate specifically to messaging and notification technology in telecommunications systems.

26. I am on the advisory boards of several technology companies, including: Paneve, which develops general purpose ASICs coupled with compiler technology; Nexaweb, which develops real-time web application frameworks using

HTTPS; Antix Labs, which develops compiler technology for a universal gaming platform; and Permabit, which develops content addressable storage.

27. I have received several awards for my contributions as an inventor and entrepreneur, including the Global Indus. Technovator Award 2009 and Laureate of 2009 Computer World Honors Program.

28. In parallel with my work at SDT, I lectured at MIT on many subjects including the Android operating system, and I worked with a group of students on developing mobile applications for Android in 2008 with Rich Miner, who is a co-founder of Android. Many students created applications involving Google Maps and localization, so I was familiar with these. I also served as a lecturer and mentor at MIT Play Labs, which was an incubator for augmented reality (AR) and virtual reality (VR) software for mobile handsets and headset applications. Notably in addition to mobile handsets, Android runs on the Oculus headset. As part of that program, I worked with several startup companies on mobile applications including one that developed applications for Telegram, which is a cross-platform, cloud-based instant messaging system.

29. Since 2014, I have been working as an independent consultant for several companies including NEC, Hitachi, Hi Marley, and Estee Lauder.

30. In 2018, I became a senior partner at nCent Labs. In this role, I consulted on the development of an incentive market-based platform for block

chains and cryptocurrency. Part of my work at nCent Labs focused on the development of SMS messaging applications for the nCent platform.

31. Between 2019 and 2020, I served as a Technical Lead of the Skunkworks at Hydrow, which is a startup company that develops indoor rowing machines. In this role, I worked on special projects including development of a virtual reality experience using Magic Leap and Oculus to immerse users in a world of team-based rowing crew on a scull based on virtual reality (VR) cinematography.

32. I have published numerous papers on subjects relating to computing systems, computer network communications, databases, and other subjects within the realm of electrical and computer engineering.

33. In 2020, I started a company called Skyline Nav AI Inc. that develops technology using visual location (using skyline) to geo-locate the place a picture was taken as an alternative to GPS.

34. Over the past decade, I have served as a technical consultant and expert witness on matters relating to numerous patent infringement cases. In the course of this work, I have provided consulting services to a wide variety of technology companies including BritishTelecom, Apple, IBM, Philips, Shopify, Zillow, Polaris Powered Technologies, Amazon, Salesforce, Hitachi, Slack, Harris Teeter, and others.

35. I have been teaching a Big Data Class at Harvard Medical School one month of every year since 2018. The name of the class is "Computationally Enabled Medicine."

36. Finally, for the last 10 years I have served as an angel investor and also as a mentor for startup companies as part of different programs at MIT.

II. MATERIALS CONSIDERED

37. In forming the opinions set forth in herein, I have considered and relied upon my education, knowledge of the relevant field, and my experience. I have also reviewed and considered the '228 patent (Ex. 1001[228]), the '228 patent's file history (Ex. 1002[228]), the '658 patent (Ex. 1001[658]), the '658 patent's file history (Ex. 1002[658]) and at least the following additional materials:

- Apple Inc.'s Petition for *Inter Partes* Review of the '228 Patent ("the '228 Petition" or "Petition[228]"))
- Declaration of Dr. Loren Terveen Regarding U.S. Patent No. 10,621,228 (hereinafter, "Ex. 1003[228]")
- Apple Inc.'s Petition for *Inter Partes* Review of the '658 Patent ("the '658 Petition" or "Petition[658]")
- Declaration of Dr. Loren Terveen Regarding U.S. Patent No. 10,423,658 (hereinafter, "Ex. 1003[658]")
- Aperture 3 User Manual ("A3UM") (Ex. 1005)

- Aperture 3 Installation DVD purchased by counsel for Patent Owner
- Aperture 3 Software License Agreement (Ex. 2007)
- U.S. Pat. Pub. No. 2010/0058212 ("Belitz") (Ex. 1006)
- File History of U.S. Patent No. 9,552,376 (Ex. 1016)
- U.S. Patent App. Pub. No. 2011/0074811 (Ex. 1028)
- Todd Bogdan, *Announcing Picassa 3.5, now with name tags, better geotagging and more*, The Official Google Blog (Sept. 22, 2009) (Archive.org Nov. 11, 2009) (Ex. 1032)
- Stephen Shankland, *What's the best Web site for geotagged photos?*," CNET (Mar. 18, 2009) (Ex. 1033)
- Panoramio, *Embedding a Panoramio map into your web page*, (Archive.org Mar. 28, 2010) (Ex. 1034)
- Shu-Wai Chow, *PHP Web 2.0 Mashup Projects*, Packt Publishing (2007) (Ex. 1035)
- Google Code, Google Maps API Reference (Ex. 1040)
- U.S. Pat. Pub. No. 2009/0113350 ("Hibino") (Ex. 1041)
- Devin Coldewey, *Review: Aperture 3*, CrunchGear (Archive.org Mar. 22, 2010) (Ex. 1044)
- Tony Wu, *Using Aperture 3: Part 1* (Archive.org Apr. 2, 2010) (Ex. 1045)

- U.S. Patent App. Pub. No. 2007/0030391 to Kim (Ex. 1049)
- U.S. Patent No. 7,978,936 (Ex. 1050)
- Hyunmo Kang et al., *Capture, Annotated, Browse, Find, Share: Novel Interfaces for Personal Photo Management*, International Journal of Human-Computer Interaction, 23(3), 315-37 (2007) ("Kang") (Ex. 2002)
- Jaffe et al., *Generating Summaries and Visualization for Large Collections of Geo-Referenced Photographs*, Proceedings of the 8th ACM SIGMM International Workshop on Multimedia Information Retrieval, MIR 2006, October 26-27, 2006 ("Jaffe") (Ex. 2003)
- Allan Hoffman, *Create Great iPhone Photos: Apps, Tips, Tricks, and Effects*, No Starch Press, Inc. (Copyright 2011) (Ex. 2004)
- U.S. Patent Publication No. 2010/0171763 ("Bhatt") (Ex. 2005)
- Devin Coldewey, *Review: Aperture 3*, CrunchGear (https://techcrunch.com/2010/03/19/review-aperture-3/) (last accessed Feb. 2, 2022) (Ex. 2014)
- Hilary Greenbaum, *Who Made Google's Map Pin?*, The New York Times, (Apr. 18, 2011) (Ex. 2015)
- Google Developers, *Customizing a Google Map: Custom Markers* (last accessed Feb. 17, 2022) (Ex. 2016)

- KML4Earth, Google Earth/Maps Public Icons, http://kml4earth.appspot.com:80/icons.html (Archive.org May 27, 2012)

III. LEGAL STANDARDS

38. I am not a patent attorney nor have I independently researched the law on patentability. I have a general understanding of validity, prior art and priority date based on my discussions with counsel.

A. Anticipation

39. I understand that anticipation analysis is a two-step process. The first step is to determine the meaning and scope of the asserted claims. Each claim must be viewed as a whole, and it is improper to ignore any element of the claim. For a claim to be anticipated under U.S. patent law: (1) each and every claim element must be identically disclosed, either explicitly or inherently, in a single prior art reference; (2) the claim elements disclosed in the single prior art reference must be arranged in the same way as in the claim; and (3) the identical invention must be disclosed in the single prior art reference, in as complete detail as set forth in the claim. Where even one element is not disclosed in a reference, the anticipation contention fails. Moreover, to serve as an anticipatory reference, the reference itself must be enabled, i.e., it must provide enough information so that a person of ordinary skill in the art can practice the subject matter of the reference without undue experimentation.

40. I further understand that where a prior art reference fails to explicitly disclose a claim element, the prior art reference inherently discloses the claim element only if the prior art reference must necessarily include the undisclosed claim element. Inherency may not be established by probabilities or possibilities. The fact that an element may result from a given set of circumstances is not sufficient to prove inherency. I have applied these principles in forming my opinions in this matter.

B. Obviousness

41. I understand that a patent claim is invalid under 35 U.S.C. § 103 as being obvious only if the differences between the claimed invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person of ordinary skill in that art. An obviousness analysis requires consideration of four factors: (1) scope and content of the prior art relied upon to challenge patentability; (2) differences between the prior art and the claimed invention; (3) the level of ordinary skill in the art at the time of the invention; and (4) the objective evidence of nonobviousness, such as commercial success, unexpected results, the failure of others to achieve the results of the invention, a long-felt need which the invention fills, copying of the invention by competitors, praise for the invention, skepticism for the invention, or independent development.

42. I understand that a prior art reference is proper to use in an obviousness determination if the prior art reference is analogous art to the claimed invention. I understand that a prior art reference is analogous art if at least one of the following two considerations is met. First, a prior art reference is analogous art if it is from the same field of endeavor as the claimed invention, even if the prior art reference addresses a different problem and/or arrives at a different solution. Second, a prior art reference is analogous art if the prior art reference is reasonably pertinent to the problem faced by the inventor, even if it is not in the same field of endeavor as the claimed invention.

43. I understand that it must be shown that one having ordinary skill in the art at the time of the invention would have had a reasonable expectation that a modification or combination of one or more prior art references would have succeeded. Furthermore, I understand that a claim may be obvious in view of a single prior art reference, without the need to combine references, if the elements of the claim that are not found in the reference can be supplied by the knowledge or common sense of one of ordinary skill in the relevant art. However, I understand that it is inappropriate to resolve obviousness issues by a retrospective analysis or hindsight reconstruction of the prior art and that the use of "hindsight reconstruction" is improper in analyzing the obviousness of a patent claim.

44. I further understand that the law recognizes several specific guidelines that inform the obviousness analysis. First, I understand that a reconstructive hindsight approach to this analysis, i.e., the improper use of post-invention information to help perform the selection and combination, or the improper use of the listing of elements in a claim as a blueprint to identify selected portions of different prior art references in an attempt to show that the claim is obvious, is not permitted. Second, I understand that any prior art that specifically teaches away from the claimed subject matter, i.e., prior art that would lead a person of ordinary skill in the art to a specifically different solution than the claimed invention, points to non-obviousness, and conversely, that any prior art that contains any teaching, suggestion, or motivation to modify or combine such prior art reference(s) points to the obviousness of such a modification or combination. Third, while many combinations of the prior art might be "obvious to try," I understand that any obvious to try analysis will not render a patent invalid unless it is shown that the possible combinations are: (1) sufficiently small in number so as to be reasonable to conclude that the combination would have been selected; and (2) such that the combination would have been believed to be one that would produce predictable and well understood results. Fourth, I understand that if a claimed invention that arises from the modification or combination of one or more prior art references uses known methods or techniques that yield predictable results, then that factor

also points to obviousness. Fifth, I understand that if a claimed invention that arises from the modification or combination of one or more prior art references is the result of known work in one field prompting variations of it for use in the same field or a different one based on design incentives or other market forces that yields predicable variations, then that factor also points to obviousness. Sixth, I understand that if a claimed invention that arises from the modification or combination of one or more prior art references is the result of routine optimization, then that factor also points to obviousness. Seventh, I understand that if a claimed invention that arises from the modification or combination of one or more prior art references is the result of a substitution of one known prior art element for another known prior art element to yield predictable results, then that factor also points to obviousness.

45. I understand that each alleged prior art reference in a proposed obviousness combination must be evaluated as an entirety, i.e., including those portions that would argue against obviousness, and must be considered for everything that it teaches, not simply the described invention or a preferred embodiment. I understand that it is impermissible to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art, or to ignore portions of the reference that argue against

obviousness. I also understand that all of the supposed prior art to be combined as proposed must also be evaluated as a whole, and should be evaluated for what they teach in combination as well as separately.

C. Dependent Claims

46. I understand that a dependent claim incorporates each and every limitation of the claim from which it depends. Thus, my understanding is that if a prior art reference fails to anticipate an independent claim, then that prior art reference also necessarily fails to anticipate all dependent claims that depend from the independent claim. Similarly, my understanding is that if a prior art reference or combination of prior art references fails to render obvious an independent claim, then that prior art reference or combination of prior art references also necessarily fails to render obvious all dependent claims that depend from the independent claim.

IV. OVERVIEW OF THE '228 AND '658 PATENTS

47. The '228 and '658 patents relate to methods that "allow people to organize, view, preserve these files with all the memory details captured, connected and vivified via an interactive interface." Ex. 1001[228] at 1:61-65. The patents describe methods for organizing digital files (e.g., digital photographs and videos) in inventive ways.

48. FIG. 41 in each patent show a map view including "an interactive map." Ex. 1001[228] at 29:41-45.

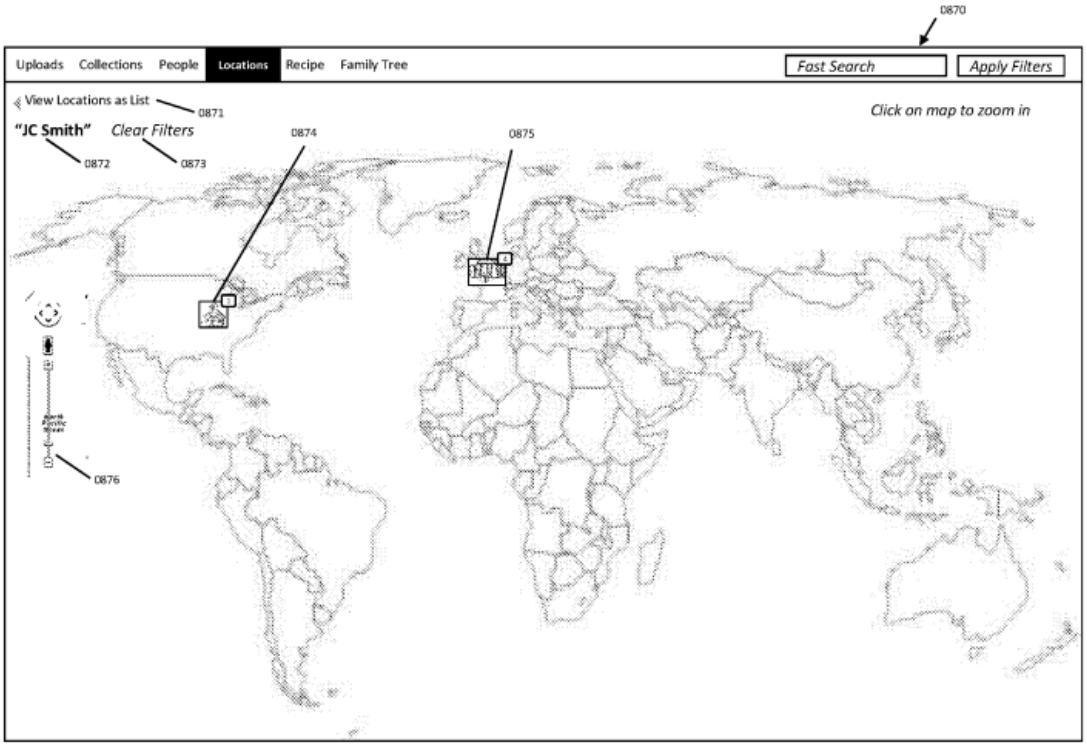


FIG. 41

49. In the map view, "individual or groups of Digital Files are illustrated as photo thumbnails (see indicators 0874 and 0875)) on the map." Ex. 1001[228] at 29:48-55. The user can "narrow the map view by either using the Zoom in/Zoom out bar (0876) on the left or simply selecting the map." *Id*. at 29:52-55. Further, "the user can select the thumbnail to see all the Digital Files with the same location (as seen FIG. 34 (indicator 1630))." Ex. 1001[228] at 29:48-55.

FIG. 34

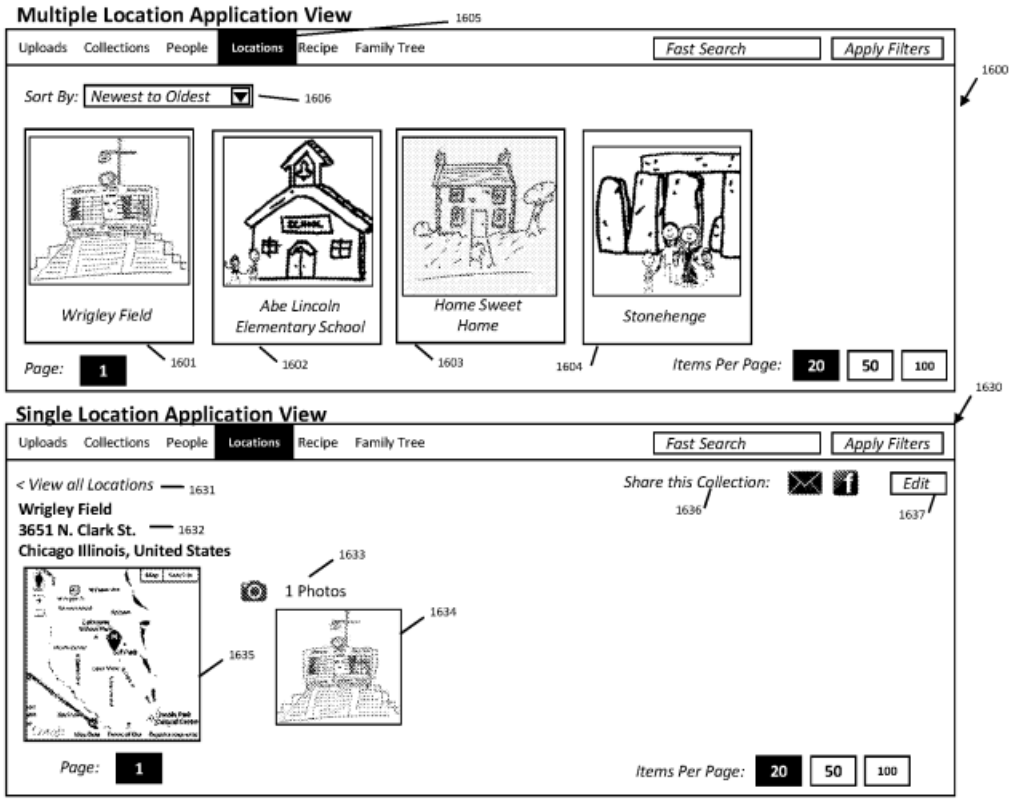


FIG. 34

50. In the "Single Location Application View" shown in FIG. 34, "a single location (1630) is illustrated," and this includes "[t]he individual location name" and "[t]humbnails of each Digital File within the specification collection." *Id*. at 24:22-28. Thus, the map view and location view allow users to efficiently and intuitively locate and display digital files associated with a particular location.

51. The '228 and '658 patents also describe a people view for organizing digital files. FIG. 32 illustrates a people view 1400 including for "each person, a

thumbnail of their face along with their name is depicted." Ex. 1001[228] at 22:59-23:4.

FIG. 32

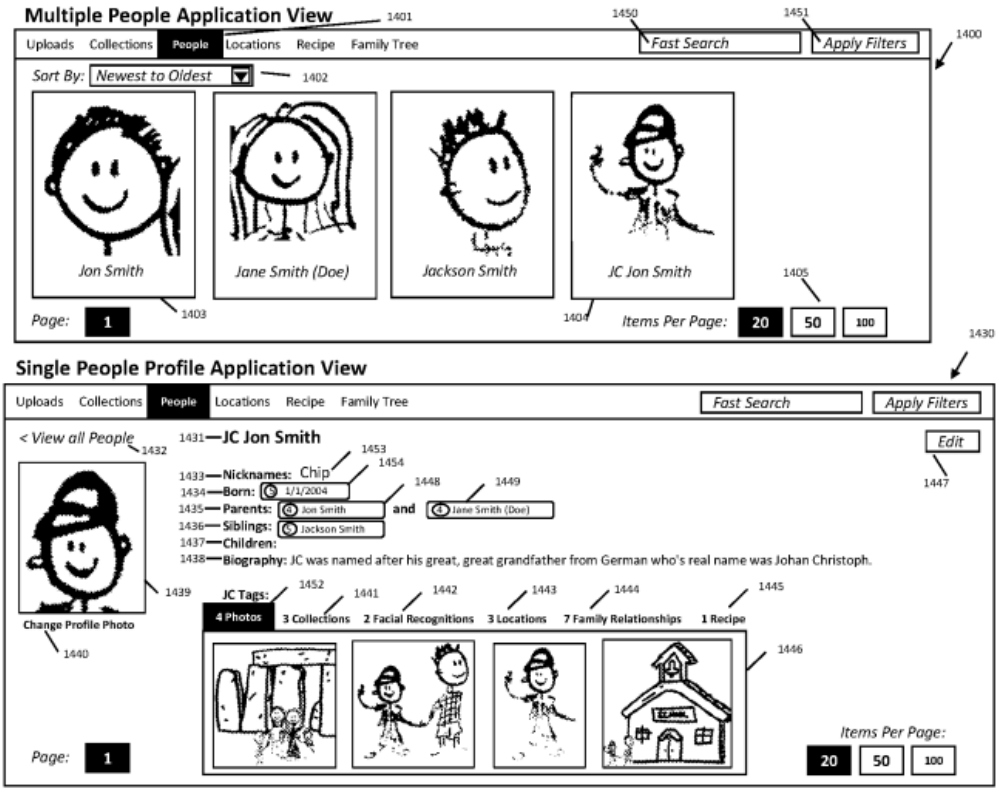


FIG. 32

52. The "Single People Profile Application View" includes a variety of information, including, for example, a person's name 1431, a profile photo 1440, and photos 1452 associated with that person. *Id*. at 23:12-49.

53. Independent claim 1 of the '228 patent is reproduced below. I have added identifiers in red for ease of reference.

[228][1pre] 1. A method comprising:

[228][1b] responsive to a first input, causing a map view to be displayed on an interface, the map view including:

[228][1c] (i) an interactive map;

[228][1d] (ii) a first location selectable thumbnail image at a first location on the interactive map; and

[228][1e] (iii) a second location selectable thumbnail image at a second location on the interactive map;

[228][1f] responsive to an input that is indicative of a selection of the first location selectable thumbnail image, causing a first location view to be displayed on the interface,

[228][1g] the first location view including (i) a first location name associated with the first location and (ii) a representation of at least a portion of one digital file in a first set of digital files,

[228][1h] each of the digital files in the first set of digital files being produced from outputs of one or more digital imaging devices, the first set of digital files including digital files associated with the first location;

[228][1i] responsive to an input that is indicative of a selection of the second location selectable thumbnail image, causing a second location view to be displayed on the interface,

[228][1j] the second location view including (i) a second location name associated with the second location and (ii) a representation of at least a portion of one digital file in a second set of digital files,

[228][1k] each of the digital files in the second set of digital files being produced from outputs of the one or more digital imaging devices, the second set of digital files including digital files associated with the second location; and

[228][1l] responsive to a second input that is subsequent to the first input, causing a people view to be displayed on the interface,

[228][1m] the people view including: (i) a first person selectable thumbnail image including a representation of a face of a first person, the first person being associated with a third set of digital files including digital photographs and videos;

[228][1n] (ii) a first name associated with the first person, the first name being displayed adjacent to the first person selectable thumbnail image;

[228][1o] (iii) a second person selectable thumbnail image including a representation of a face of a second person, the second person being associated with a fourth set of digital files including digital photographs and videos; and

[228][1p] (iv) a second name associated with the second person, the second name being displayed adjacent to the second person selectable thumbnail image.

54. Independent claim 1 of the '658 patent is reproduced below. I have added identifiers in red for ease of reference.

[658][1pre] 1. A computer-implemented method of displaying at least a portion of a plurality of (i) digital photographs, (ii) videos, or (iii) a combination of (i) and (ii), each of the digital photographs and videos being associated with a geotag indicative of geographic coordinates where the respective digital photograph or video was taken, the method comprising:

[658][a] displaying an application view on a video display device including displaying a plurality of selectable elements, the plurality of selectable elements including a location selectable element;

[658][b] responsive to a click or tap of the location selectable element, displaying a map view on a video display device, the displaying the map view including displaying:

[658][b][i] (i) a representation of an interactive map;

[658][b][ii] (ii) a first location selectable thumbnail image at a first location on the interactive map, the first location being associated with the geographic coordinates of a first geotag, a

first set of digital photographs and videos including all of the digital photographs and videos associated with the first geotag;

[658][b][iii] (iii) a first count value image partially overlapping the first location selectable thumbnail image, the first count value image including a first number that corresponds to the number of digital photographs and videos in the first set of digital photographs and videos;

[658][b][iv] (iv) a second location selectable thumbnail image at a second location on the interactive map, the second location being associated with the geographic coordinates of a second geotag, a second set of digital photographs and videos including all of the digital photographs and videos associated with the second geotag; and

[658][b][v] (v) a second count value image partially overlapping the second location selectable thumbnail image, the second count value image including a second number that corresponds to the number of digital photographs and videos in the second set of digital photographs and videos;

[658][c] responsive to a click or tap of the first location selectable thumbnail image, displaying a first location view on the video display device, the

displaying the first location view including displaying (i) a first location name associated with the first geotag and (ii) a scaled replica of each of the digital photographs and videos in the first set of digital photographs and videos, the displayed scaled replicas of each of the digital photographs and videos in the first set of digital photographs and videos not being overlaid on the interactive map; and

[658][d] responsive to a click or tap of the second location selectable thumbnail image, displaying a second location view on the video display device, the displaying the second location view including displaying (i) a second location name corresponding to the second geotag and (ii) a scaled replica of each of the digital photographs and videos in the second set of digital photographs and videos, the displayed scaled replicas of each of the digital photographs and videos in the second set of digital photographs and videos not being overlaid on the interactive map.

V. THE '228 AND '658 PATENTS' EFFECTIVE FILING DATES

55. I understand that the application leading to the '228 patent, U.S. Patent Application No. 16/578,238, was filed on September 20, 2019. I also understand that the '228 patent claims priority to U.S. Patent Application No.

14/193,426, filed on February 28, 2014 and U.S. Patent Application No. 13/157,214, filed on June 9, 2011.

56. I understand that the application leading to the '658 patent, U.S. Application No. 15/375,927, was filed on December 12, 2016. I also understand that the '658 patent claims priority to U.S. Patent Application No. 14/193,426, filed on February 28, 2014 and U.S. Patent Application No. 13/157,214, filed on June 9, 2011.

57. I understand that the Petition and Dr. Terveen applied June 9, 2011 as the effective filing date for the challenged claims. For purposes of this declaration, I have been asked to assume that the effective filing date or "time of the invention" for the '228 and '658 patents is June 9, 2011. However, my views and opinions herein will be the same regardless of whether the effective filing date of either patent is June 9, 2011 or February 28, 2014.

VI. LEVEL OF SKILL IN THE ART

58. I understand that the level of ordinary skill in the relevant art at the time of the invention is relevant to inquiries such as the meaning of claim terms, the meaning of disclosures found in the prior art, and the reasons one of ordinary skill in the art may have for combining references.

59. I have reviewed the definition of the level of ordinary skill in the art proposed by Petitioner and Dr. Terveen, who state that a person having ordinary

skill in the art ("POSITA") with respect to the '228 and '658 patents would have had (1) at least a bachelor's degree in computer science, computer engineering, or electrical engineering, and (2) at least one year of experience designing graphical user interfaces for applications such as photo management systems. Petition[228] at 9; Petition[658] at 9. For purposes of this declaration, I have been asked to apply this level of skill in the art in my analysis, but I reserve the right to identify a level of skill in the art for the '228 patent and/or the '658 patent that differs from Petitioner's proposal should an IPR be instituted.

60. I was, at the time of invention, and still am, one of at least ordinary skill in the art through my education and experience under Petitioner's proposed definition. I am very familiar with people having this level of skill.

VII. OPINIONS

61. I understand that Petitioner and Dr. Terveen assert that the challenged claims of the '228 and '658 patents are invalid as allegedly obvious over A3UM (Ex. 1005) in view of Belitz (Ex. 1006), and other additional references.

A. Summary of Petitioner's References

1. A3UM (Ex. 1005)

62. A3UM is a collection of HTML files that comprise the user manual for Apple Inc.'s Aperture 3 software product. Ex. 1005; Petition[228] at 13. A3UM describes, among other things, a Faces feature and a Places feature in the

Aperture 3 software product. *See, e.g.*, Ex. 1005 at 28-30. The Aperture 3 interface has a variety of components including (1) a Viewer pane; (2) an Inspector pane; (3) a Browser pane; and (4) a toolbar. Ex. 1005 at 47-51 (describing Browser and Viewer panes). These are shown below:

Ex. 1005 at 46

63. In the Places view, a push pin on a map in the view pane marks the location where an image was taken, and the selected image is shown in the browser pane.

Ex. 1005 at 436

64. The Faces view shows confirmed images of people that appear in images in the photo library. Ex. 1005 at 28-29. Aperture 3 scans all of the images in the library to detect faces. *Id*. at 418.

Ex. 1005 at 29

65. Exhibits to the Petition indicate that the facial recognition process underlying the Aperture 3 Faces feature was not successful in practice. There is at least one report that "Faces plainly doesn't work." Ex. 1044 at 1. Another exhibit states that "Faces found faces in the chaotic patterns in the water next to whales, while it failed to recognise actual faces in many clear, topside photos." Ex. 1045 at 7.

2. Belitz (Ex. 1006)

66. Belitz is directed to a user interface for displaying "special locations" on a map. Ex. 1006 at Title, ¶¶ 2, 4, 19, 71. Belitz states that "it would be useful to be able to a present a user with an overview of associated images to special locations which enables [the] user to clearly see the associations. *Id*. at ¶ 4. Figs. 4(a) – (c) are screenshots of a device. *Id*. at ¶ 36.

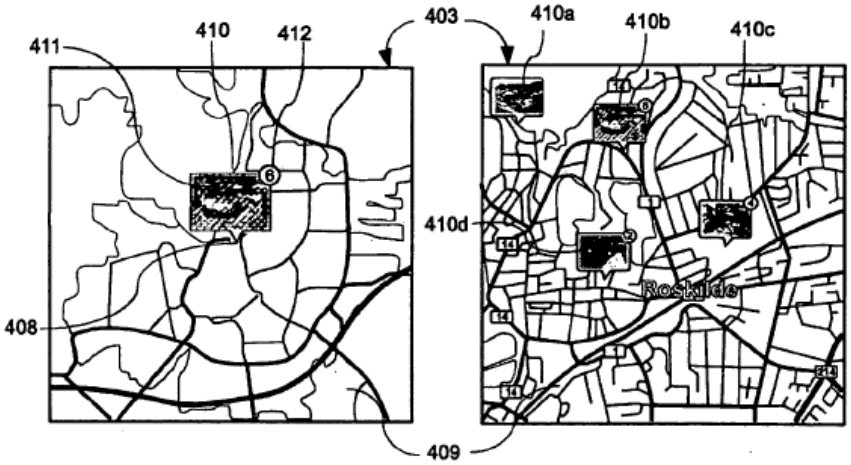


Fig. 4a Fig. 4b

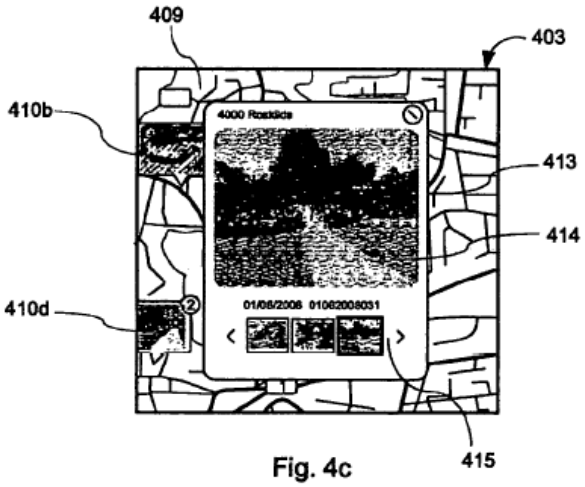


Fig. 4c

67. The screenshots above have a graphical object 410 that indicates a location 408 on the map 409. Ex. 1006 at ¶ 51.

B. Comparison Between Petitioner's References and References Cited During Prosecution

68. I have been asked to compare certain references that I understand were considered during prosecution of the '228 patent, the '658 patent, and/or one of its parent applications against the references Petitioner relies on.

1. Prosecution history of the related '426 application

69. I understand that both the '228 patent and the '658 patent claim priority to U.S. Application No. 14/193,426 ("the related '426 application"), which issued as U.S. Patent No. 9,552,376.

70. I understand that during prosecution of the related '426 application, the examiner rejected pending claims based on a publication entitled "Capture, Annotate, Browse, Find, Share: Novel Interfaces for Personal Photo Management" by Kang et al. ("Kang," Ex. 2002) in view of a publication entitled "Generating Summaries and Visualization for Large Collections of Georeferenced Photographs" by Jaffe et al. ("Jaffe," Ex. 2003) and further in view of U.S. Patent Pub. No. 2009/0113350 ("Hibino," Ex. 1041) in an office action dated April 15, 2016 ("the April 2016 Office Action"). Ex. 1016 at 366-70.

71. I understand that in another Office Action dated June 3, 2016 ("the June 2016 Office Action"), the examiner again rejected the claims based on Kang, Jaffe, and Hibino, and further in view of Tanaka (Ex. 1042). Ex. 1016 at 433-37. The examiner asserted that it would be obvious to modify Kang to include an interactive map, a first thumbnail image at a first location on the interactive map, and a second thumbnail image at a second location on the interactive map in view of Jaffe, "with the motivation of automatically selecting a summary set of photos from a large collection of geo-referenced photographs." *Id*. at 433-435. The

examiner also found that Hibino disclosed selectable thumbnails, and that it would be obvious to modify Kang/Jaffe so that the thumbnails on the map were selectable. *Id*. at 435-436. The examiner further applied Tanaka as disclosing count value images partially overlapping or directly connected to thumbnail images, and that it would be obvious to further modify Kang in view of Tanaka "with the motivation of sorting pictures into groups and enabling ease of operation in selecting picture data. *Id*. at 436-437.

72. When allowing the claims in the '426 application, the examiner acknowledged that "many systems are well known to the prior art that enable organizing, tagging, navigating, and searching collections of pictures, including pictures which have been geotagged and which may be displayed on an interactive map." Ex. 1016 at 516. However, none of the art teach or suggest "systems such as those claimed," which "allow[] navigation between the various enumerated views . . . wherein each view includes each of the enumerated elements." *Id*.

73. I understand that all three of Kang, Jaffe, and Hibino are cited on the faces of the '228 and '658 patents and therefore were considered by the examiner during prosecution. I understand that Hibino and Tanaka were specifically identified in the notices of allowance for both the '228 patent and the '658 patent. Ex. 1002[228] at 361; Ex. 1002[658] at 173-177.

74. I understand that no office actions (claim rejections) were issued during prosecution of the '228 patent. Ex. 1002[228]. I also understand that no office actions (claims rejections) were issued during prosecution of the '658 patent. Ex. 1002[658].

2. A3UM is substantially the same as previously-considered references

75. The Places and Faces features in A3UM that Petitioner relies on in the '228 and '658 Petitions are substantially the same as disclosures in several references that were considered during prosecution of those patents.

76. I understand that the Hoffman book (Ex. 2004) was cited and considered during prosecution of the '228 patent. Hoffman shows a map "with red pins marking locations with photos." Ex. 2004 at 32.

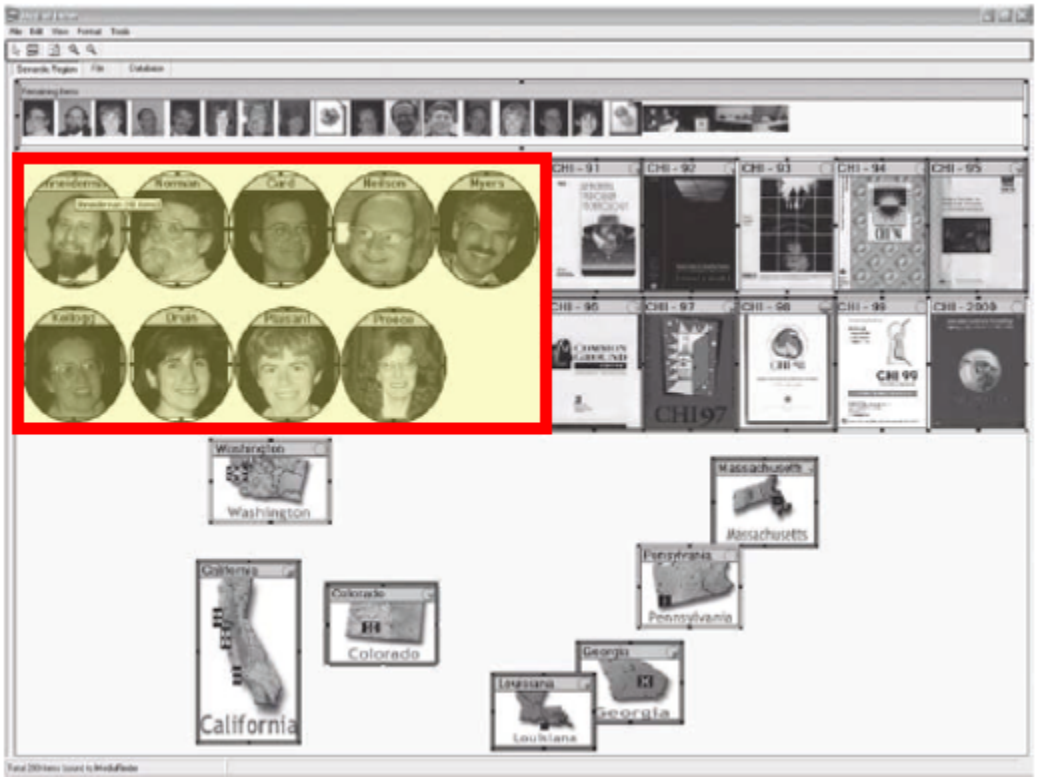
Ex. 1005 at 437 (Aperture 3 Places)

Ex. 2004 at 32 (iPhone Places)

Hoffman states that one can "[t]ap a pin" to "see how many images are tagged for that location" and then "[t]ap the arrow in the blue circle to view those images." Ex. 2004 at 32. Hoffman shows a Faces feature "that sorts your images by occasion and by individual" using "face detection technology to find people in your photos." Ex. 2002 at 32. These are same or substantially the was the features in A3UM that the '228 Petition relies on. Petition[228] at 18-19, 32-34.

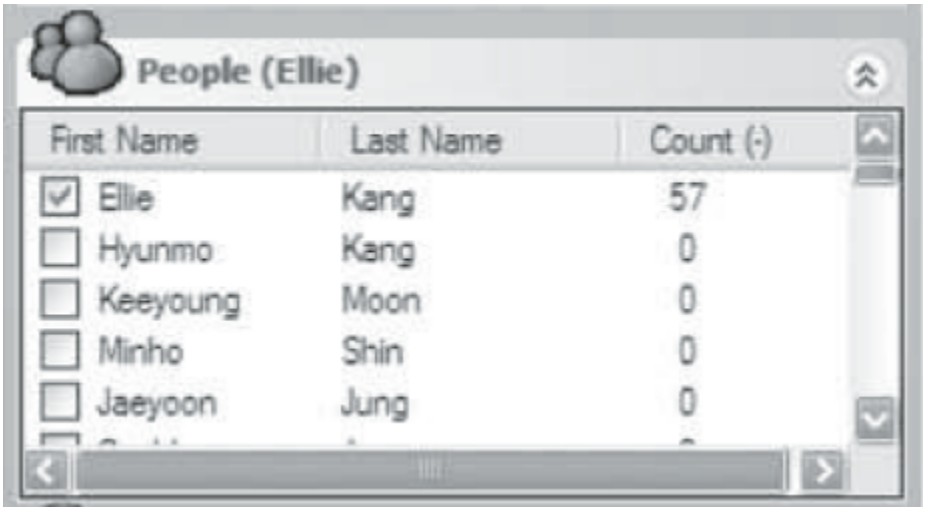
77. I understand that Kang (Ex. 2002) was cited and considered during prosecution of the '228 patent and during prosecution of the '658 patent. I also understand that Kang was applied in claim rejections during prosecution of the '426 application. The disclosures in Kang are substantially the same as the A3UM Places feature relied on in the '228 and '658 Petitions for claim 1 and also the Faces feature relied on in the '228 Petition for claim 1.

78. For example, Figure 9(b) of Kang (reproduced and annotated below), shows photos organized by people.



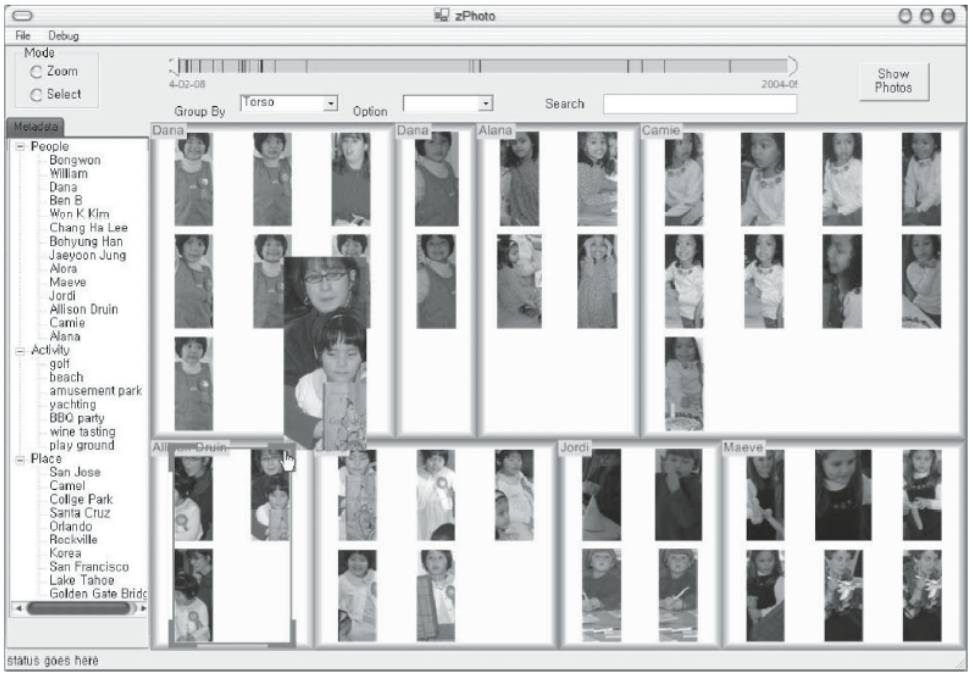
Ex. 2002 at Figure 9(b) (annotated)

79. Kang also describes searching photos based on, *inter alia*, "the people in the photo" and then displaying "how many people (and who) appear in the searched photos," as shown below. Ex. 2002 at 19-20.



Ex. 2002 at Figure 10 (excerpted)

80. In Figure 3, Kang "shows the clusters of identified people." Ex. 2002 at 8.

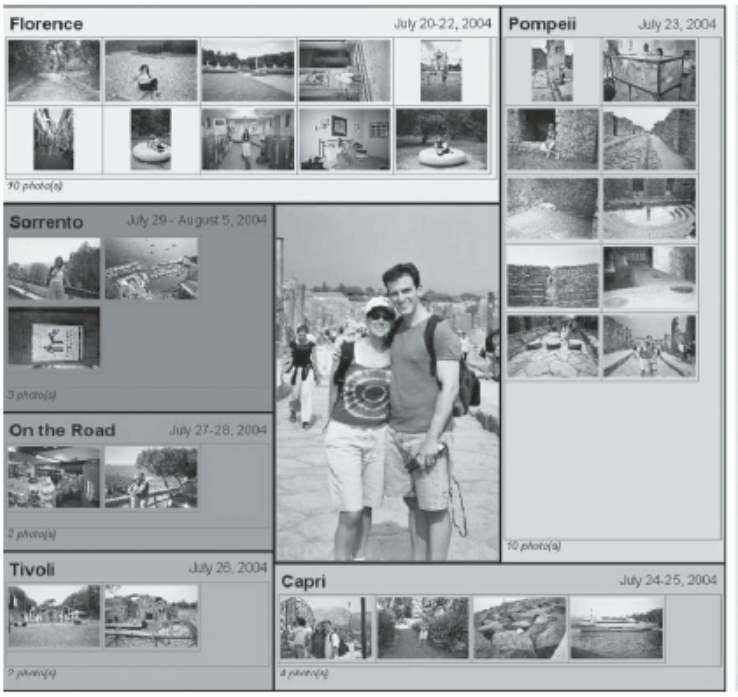


Ex. 2002 at Figure 3

81. The "Faces" feature in A3UM that Petitioner relies on for claim 1 in the '228 Petition is substantially the same as the subject matter in Kang. As an example, Petitioner's screenshot of the Faces feature in A3UM is substantially the same as Figure 6(b) of Kang, as evidenced by the side-by-side comparison below:

Ex. 1005 (Petition[228] at 46) Ex. 2002 at Figure 9(b) (excerpted)

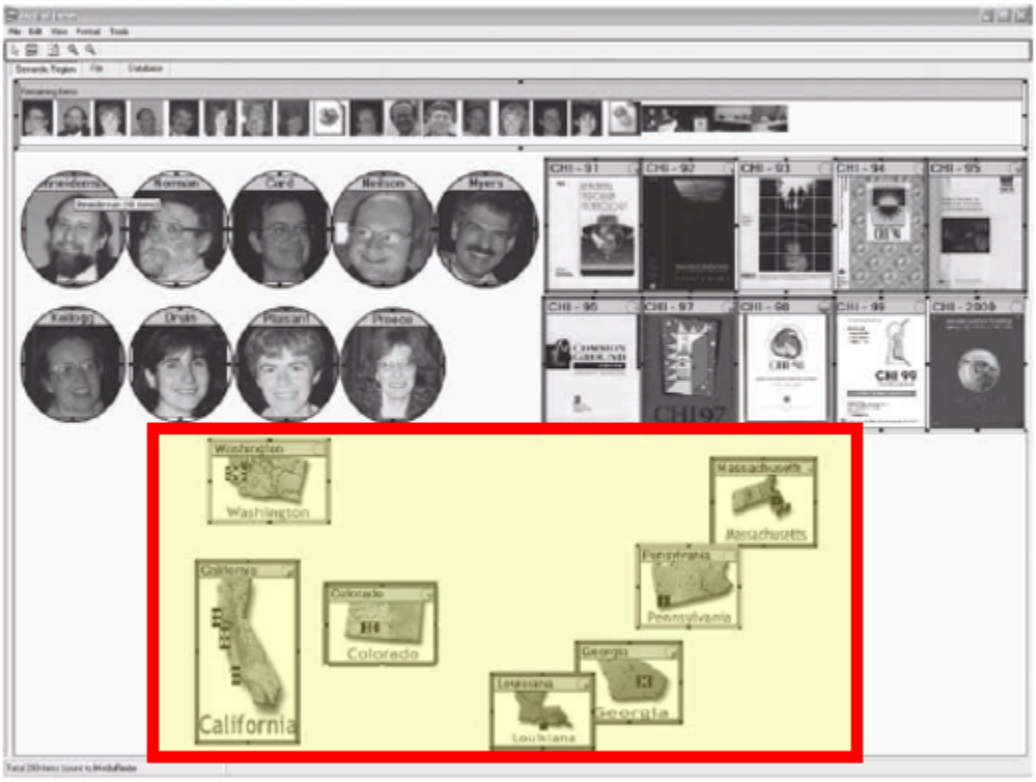
82. Additionally, similar to the Places feature in A3UM, Kang describes grouping images based on location. For example, Figure 5(b) shows images from 6 different locations. For each location, Kang displays the number of images in the bottom right corner (e.g., for Florence it says that there are 10 photo(s)).



Ex. 2002 at Figure 5(b)

83. For each location, Kang displays the number of images in the bottom right corner (e.g., for Florence it says that there are 10 photo(s)). I understand the examiner during prosecution of the '426 application stated that Kang shows "displaying a first count value proximate to a first user selectable thumbnail image corresponding to a number of digital photographs or images or videos in a first set of digital files having a first geotag" and "displaying a second count value proximate to a second user selectable thumbnail image corresponding to a number of digital photographs or images or videos in a second set of digital files having a second geotag." Ex. 1016 at 367.

84. Figure 9(b) in Kang also shows images organized based on a "U.S. map" showing which states photos were taken in.



Ex. 2002 at Figure 9(b) (annotated)

85. Kang is similar to A3UM because Kang provides for organizing images based on location. In particular, Figure 9(b) of Kang is substantially similar to the "Places" view in A3UM in that both convey location information associated with images using a geographic map (or at least a portion of a map). Indeed, Kang even shows markers on the map portions that appear to indicate where images were taken.

86. I understand that the examiner stated in the April 2016 Office Action that Kang discloses "storing . . . a plurality of digital files . . . each of the digital files having embedded therein content data and metadata. . . the metadata including

a geotag indicative of geographic coordinates where the digital photograph or image or video was taken." Ex. 1016 at 366. This further shows that Kang is substantially similar to Places in A3UM because it organizes images based on location.

87. I understand that Bhatt was also cited and considered during prosecution of the '228 patent. I also understand that Bhatt is assigned to Apple.

88. Bhatt describes substantially the same features as the Places view in A3UM. Ex. 2005. For example, FIG. 2 illustrates a location panel 200, a map 205, and an object 210 resembling a pin on the map 205 where the selected image was captured. Ex. 2005 at ¶¶ 23-24.

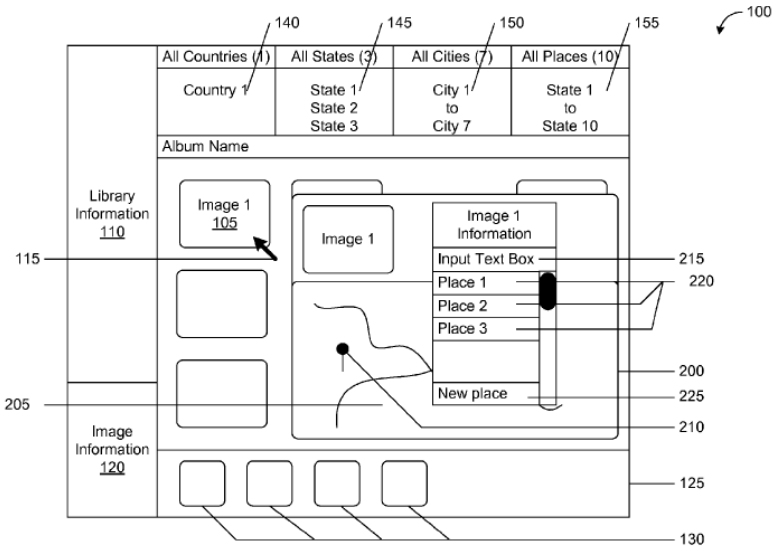
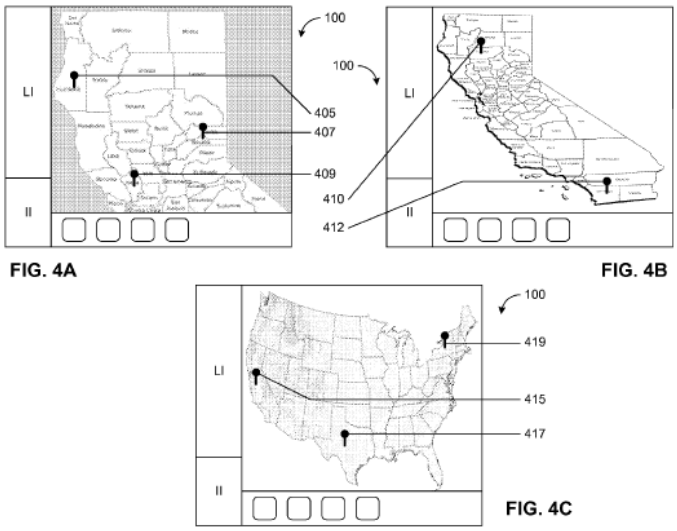


FIG. 2

Ex. 2005 at FIG. 3

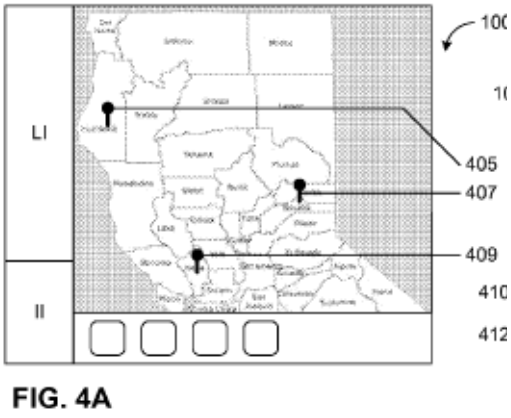
89. FIGS. 4A-4C of Bhatt show maps with multiple push pins indicating the locations of images. Ex. 2005 at ¶ 41; Ex. 2001 at ¶



Ex. 2005

90. As shown by the comparison below, Bhatt's maps with push pins are substantially the same as the Places feature in A3UM that Petitioner relies on.

Ex. 1005 at 437



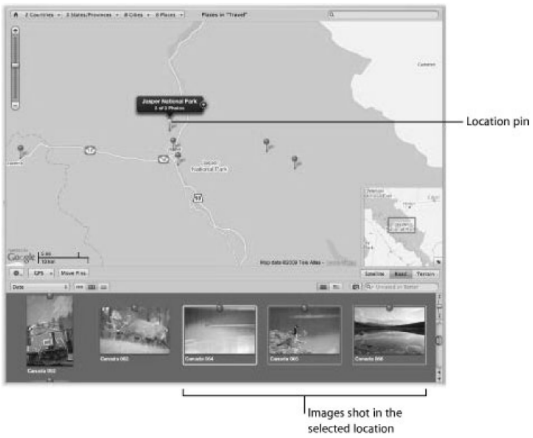
Ex. 2005 at FIG. 4A

91. Accordingly, in my opinion, there is nothing new about the portions of A3UM that Petitioner relies on compared to the references that were already considered during prosecution.

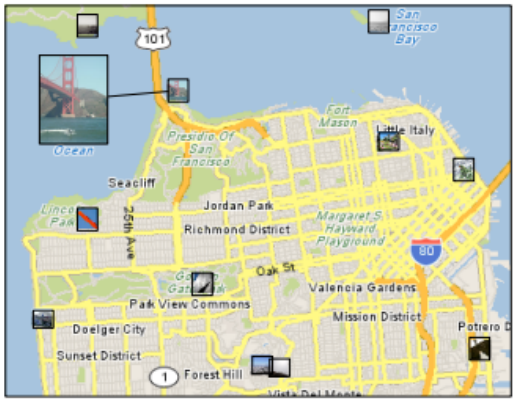
3. Belitz is substantially the same as previously-considered references

92. I understand that Jaffe (Ex. 2003) was cited and considered during prosecution of the '228 patent and during prosecution of the '658 patent. I also understand that Jaffe was applied in claim rejections by the examiner during prosecution of the related '426 application.

93. Jaffe is similar to the portions of A3UM relied on Petitioner in that both show an interactive map, but differs in that it does not use push pins like A3UM.

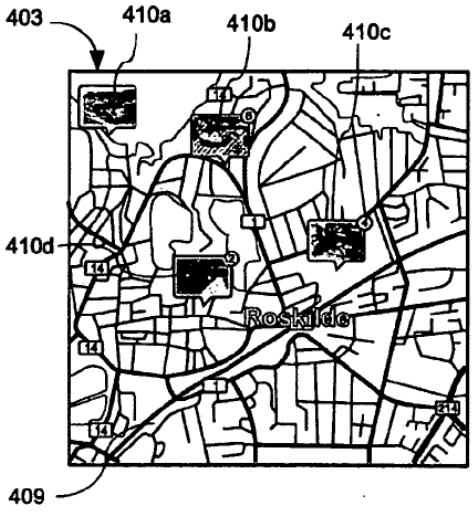


Ex. 1005 at 437

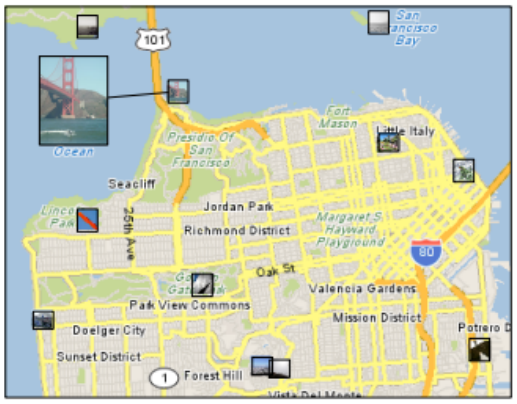


Ex. 2003 at Figure 1(a)

94. Jaffe contains substantially the same features as the portions of Belitz that Petitioner relies on: both references illustrate images on an interactive map.



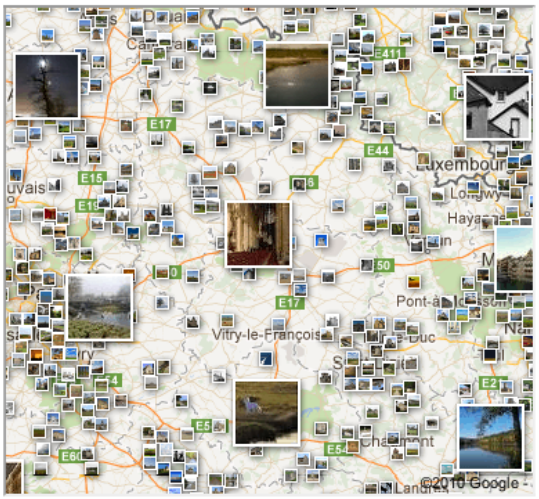
Ex. 1006 at FIG. 4b



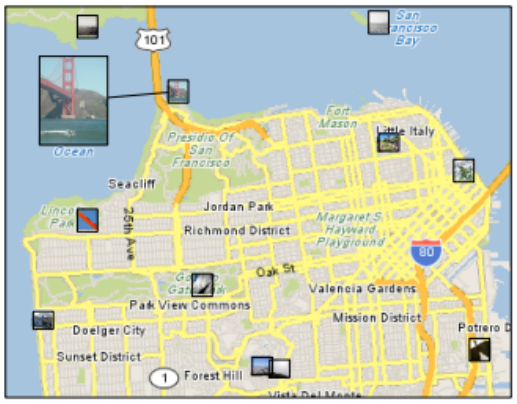
Ex. 2003 at Figure 1(a)

95. I understand that the examiner stated in the April 2016 Office Action that Jaffe shows "each set of photographs associated with a particular geotag may be represented by a summary photograph displayed as a thumbnail on the interactive map at a location corresponding to the geotag associated with the group." *Id*. These features in Jaffe are the same as the Belitz features Petitioner is relying on here.

96. As background, Petitioner and Dr. Terveen cite to a screenshot from Panoramio from Ex. 1034. As shown below, Jaffe illustrates substantially the same map-related features that Petitioner and Dr. Terveen point to in Ex. 1034.

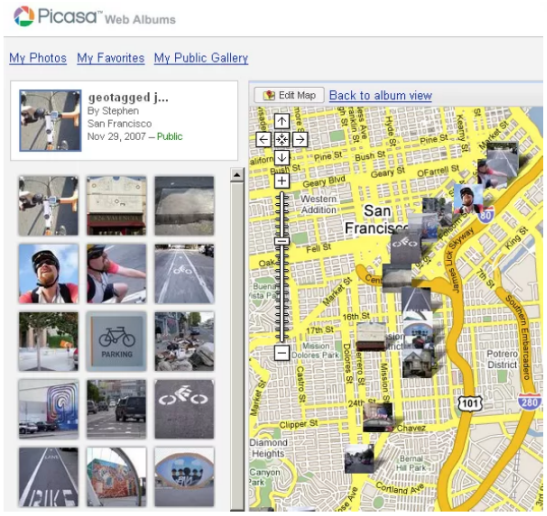


Ex. 1024 (Panoramio)

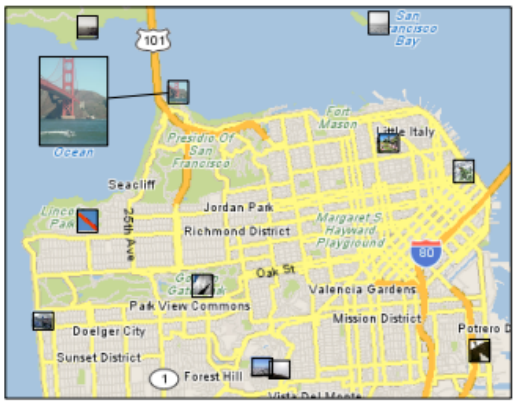


Ex. 2003 at Figure 1(a)

97. Petitioner and Dr. Terveen cite to a screenshot from Google Picasa from Ex. 1033. As shown below, Jaffe illustrates substantially the same map-related features that Petitioner and Dr. Terveen point to from Ex. 1033.



Ex. 1033 (Picasa)



Ex. 2003 at Figure 1(a)

98. Accordingly, in my opinion, there is little or nothing new about the portions of Belitz that Petitioner relies on compared to the references that were already considered during prosecution.

4. The Office considered substantially the same obviousness combination as in the Petitions

99. As discussed herein, Petitioner argues in both the '228 Petition and the '658 Petition that it would have been obvious to modify the A3UM Places feature map to include the thumbnail images shown in Belitz. *See* Petition[228] at 24-31; Petition[658] at 24-30. This alleged obviousness combination is substantially the same as the Kang-Jaffe-Hibino combination that the examiner applied during prosecution of the related '426 application.

100. I understand that in the April 2016 Office Action issued during prosecution of the '426 application, the examiner asserted that it would have been obvious at the time of the invention to "modify the teachings of Kang with the teachings of Jaffe to include a "first view" including "an interactive map . . . a first thumbnail image at a first location on the interactive map corresponding to the geographic coordinates of the first geotag . . . [and] a second thumbnail image at a second location on the interactive map corresponding to the geographic coordinates of the second geotag." Ex. 1016 at 368-69. The examiner also asserted that Jaffe shows "each set of photographs associated with a particular

geotag may be represented by a summary photograph displayed as a thumbnail on the interactive map at a location corresponding to the geotag associated with the group." *Id*.

101. In the April 2016 Office Action, the examiner stated that Hibino "supports a variety of visualization views, including a map based location view, which display thumbnails representative of groups of images, wherein selection of a representative thumbnail by clicking on the thumbnail in the visualization view opens a view of thumbnails of all photographs associated with the group of images represented by the thumbnail in a second view," citing paragraphs 51-53 and 59 and Figure 15. Ex. 1016 at 370-71. The examiner also asserted that it would be obvious in view of Hibino to modify Kang and Jaffe so that responsive to a click or tap of the first/second user selectable thumbnail image, a third/fourth view would be displayed that is not overlaid on the interactive map and includes scaled replicas of the digital files in the first/second set of digital files having the first/second geotag. *Id*. at 381-83. The examiner also asserted that Kang discloses displaying a count value corresponding to the number of digital files having a tag. Ex. 1016 at 373.

102. The modification of A3UM with Belitz that Petitioner relies on is substantially as the Kang, Jaffe, and Hibino combination applied during prosecution of the '426 application. The examiner proposed modifying Kang

(which as discussed above organizes photos by people and locations) to include an interactive map with a first thumbnail at a first location on the map and a second thumbnail at a second location on the map in view Jaffe and Hibino. Similarly, Petitioner is proposing to modify A3UM to include an interactive map with a first thumbnail at a first location on the map and a second thumbnail at a second location on the map in view of Belitz.

103. In another Office Action that was dated June 3, 2016 ("the June 2016 Office Action"), the examiner again rejected the claims based on Kang, Jaffe, Hibino, and additionally in view of Tanaka (Ex. 1042). Ex. 1016 at 433-37. Similar to as in the prior office action, the examiner indicated that it would be obvious to modify Kang to include an interactive map, a first thumbnail image at a first location on the interactive map, and a second thumbnail image at a second location on the interactive map in view of Jaffe, "with the motivation of automatically selecting a summary set of photos from a large collection of geo-referenced photographs." Ex. 1016 at 433-435.

104. The examiner also found in the June 2016 Office Action that Hibino disclosed selectable thumbnails, and that it would be obvious to modify Kang/Jaffe so that the thumbnails on the map were selectable. *Id*. at 435-436. The examiner then applied Tanaka as disclosing count value images partially overlapping or directly connected to thumbnail images, and asserted that it would be obvious to

further modify Kang in view of Tanaka "with the motivation of sorting pictures into groups and enabling ease of operation in selecting picture data." *Id*. at 436-437.

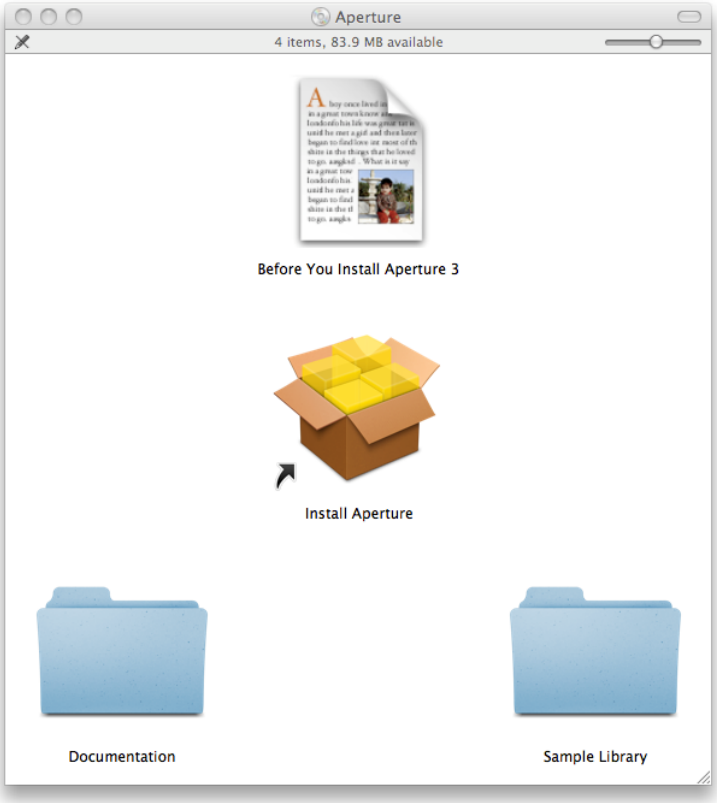
105. The modification of A3UM with Belitz that Petitioner relies on is substantially as the Kang, Jaffe, Hibino, and Tanaka combination applied during prosecution of the '426 application. The examiner proposed modifying Kang (which as discussed above organizes photos by people and locations) to include an interactive map with a first thumbnail at a first location on the map and a second thumbnail at a second location on the map in view Jaffe and Hibino. Similarly, Petitioner is proposing to modify A3UM to include an interactive map with a first thumbnail at a first location on the map and a second thumbnail at a second location on the map in view of Belitz. The examiner also found that it would be obvious to use count value images in view of Tanaka. Similarly, Petitioner is relying on the numbers shown in Figs. 4(a)-4(c) of Belitz for the count value image elements in claim 1 of the '658 patent. Accordingly, the combination of Jaffe, Hibino, and Tanaka is substantially the same as Belitz, and the Kang combination with these three references is substantially the same as the A3UM and Belitz combination proposed by Petitioner.

C. Accessing A3UM HTML Files

106. I have reviewed the portions of Dr. Terveen's declaration where he describes how one would allegedly be able to access the HTML files that comprise the A3UM from the Aperture 3 installation disk. Ex. 1003[228] at ¶¶ 69-98; Ex. 1003[658] at ¶¶ 70-99.

107. I understand that Patent Owner's counsel purchased a copy of Aperture 3 from a third party via eBay. Ex. 2006. Via video conference, I directed counsel for Patent Owner to insert the Aperture 3 disk in a MacBook Pro running Mac OS X 10.6.8 and observed the resulting displays.

108. The first screen that appeared on the MacBook Pro after inserting the disk is reproduced below.



109. As Dr. Terveen acknowledges in his declaration, the "Packages" folder is not visible because it is hidden. Ex. 1003[228] at ¶ 79; Ex. 1003[658] at ¶ 80. Dr. Terveen states that he "configured the Mac laptop to show all files (both visible and 'invisible')." Ex. 1003[228] at ¶ 77; Ex. 1003[658] at ¶ 78. However, I note that Dr. Terveen does not explain what steps he took to configure the Mac laptop to show "invisible" files on the Aperture 3 installation DVD.

110. In examining the folder that opens when the Aperture 3 disk is inserted, I did not see any menu options to toggle hidden or invisible files on or off.

111. Only after searching on the Internet to determine how to configure the Mac to show hidden files was I able to reproduce the steps that Dr. Terveen describes in his declaration. As far as I was able to tell, the only way to do so was to open the "Terminal" utility and enter the following command: defaults write com.apple.Finder AppleShowAllFiles YES. Then, one would have to enter the following command in the Terminal utility to restart the Finder window to make that change effective: killall Finder.

112. Dr. Terveen asserts that "a skilled artisan would have been able to readily locate and display the files that make up the Aperture 3 user manual . . . as stored within the compressed Archive.pax.gz file in the Aperture.pgk file on the Aperture 3 installation DVD." Ex. 1003[228] at ¶ 93; Ex. 1003[658] at ¶ 94. I disagree; in my view, a skilled artisan exercising reasonable diligence would not locate the HTML files that make up the Aperture 3 user manual within the Aperture 3 installation DVD as described by Dr. Terveen. Dr. Terveen's process would require more at least a dozen different steps to get to the HTML files. Among other things, Dr. Terveen's process requires selecting the Archive.pax.gz folder to save locally and decompress it to eventually view the content therein, even though there is seemingly no way to know ahead of time that this folder would contain the HTML files that make up the Aperture 3 user guide, or what else

this folder might contain. When finally reaching the folder containing the HTML files, there are over 700 individual HTML files.

D. A3UM Facial Recognition and Videos

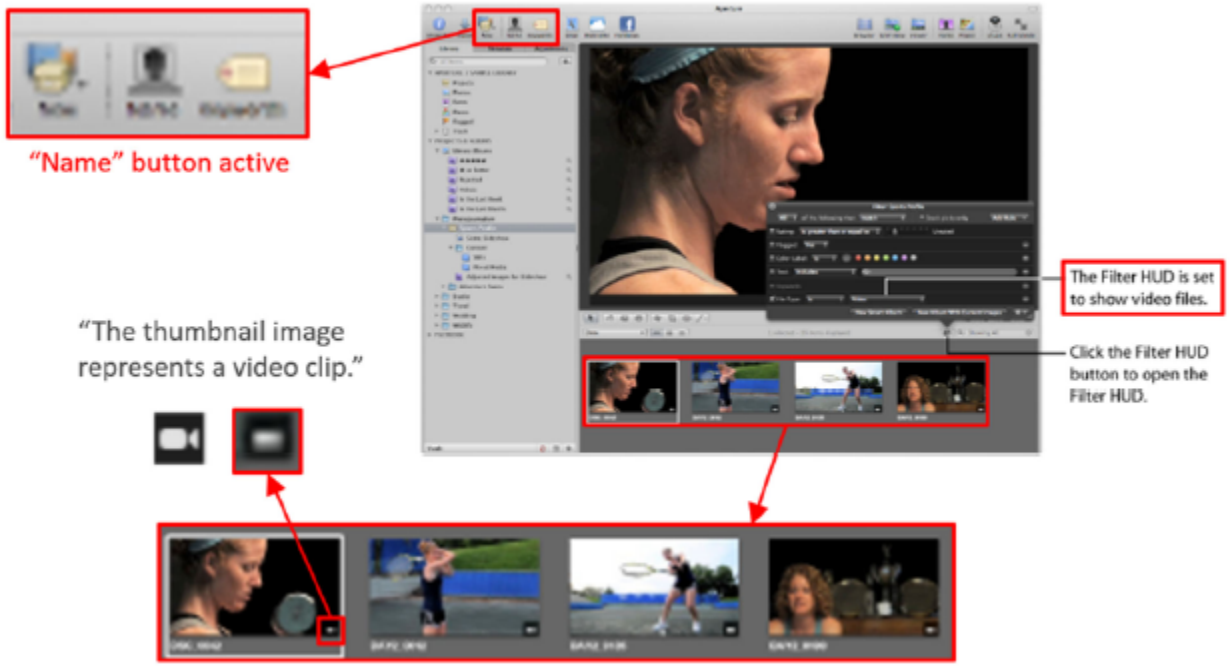
113. Claim 1 of the '228 patent recites "responsive to a second input that is subsequent to the first input, causing a people view to be displayed on the interface." Ex. 1001[228] at 35:61-63. The claimed "people view" includes "a first person selectable thumbnail image including a representation of a face of a first person, the first person being associated with a third set of digital files including digital photographs ***and videos***." *Id*. at 35:64-67 (emphasis added). Claim 1 recites that the people view also includes "a second person selectable thumbnail image including a representation of a face of a second person, the second person being associated with a fourth set of digital files including digital photographs ***and videos***." *Id*. at 36:4-8 (emphasis added).

114. I understand that Petitioner and Dr. Terveen argue that a POSITA would understand that the facial recognition features in A3UM would apply to videos as well as still images. Petition[228] at 49-52; Ex. 1003[228] at ¶¶ 174-176. I disagree. As an initial matter, I note that the A3UM does not explicitly state that videos would be included within the Faces feature. It appears from the A3UM and Aperture 3 itself that this feature only applies to still images.

115. First, I understand Petitioner alleges that the A3UM uses the term "images" to refer to photos, audio clips, and video clips and that this means that when A3UM uses the word "image" in describing the Faces feature, this necessarily includes videos. Petition[228] at 49; Ex. 1003[228] at ¶¶ 175-176. I disagree; a POSITA would not understand from the A3UM that use of the word "image" necessarily includes both photos and videos.

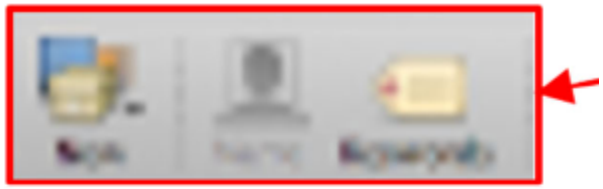
116. There are many examples where the A3UM specifically differentiates between an "image" and a "video." *See, e.g.*, Ex. 1005 at 2 ("You can have Aperture store image, audio, and video files in the library"), 13 ("In addition to importing digital image files, Aperture can also import . . . an audio or video file"), 84 (" . . . slideshows that include video and audio clips as well as images"), 157 ("You can import images . . . You can also import audio and video files"), 159 ("Aperture supports most image, audio, and video file formats"), 166 (" . . . importing the files as reference images, audio clips, and video clips"), 169 (referring to "image files, audio files, or video files"), 180 ("To exclude image files, leaving only audio and video files . . . "). A3UM's consistent distinction between an "image" and a "video" would lead a POSITA to believe that when A3UM discusses only images in connection with the Faces feature, this excludes videos.

117. I also understand that Petitioner and Dr. Terveen allege that A3UM shows examples where the Name button is "active" in cases where a face is visible, and that this means that the "active" Name button signals that the software detected a face. Petition[228] at 50-51; Ex. 1003[228] at ¶¶ 178-182. Petitioner's annotations are reproduced below:



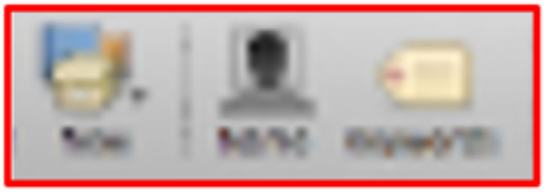
Petition[228] at 51 (annotating Ex. 1005 at 23)

118. Petitioner and Dr. Terveen attempt to contrast the "active" Name button examples against examples where the Name button is "inactive" (greyed-out), and conclude that the "inactive" Name button means that there is no face to detect in the selected image. Petition[228] at 51-52; Ex. 1003[228] at ¶ 181.



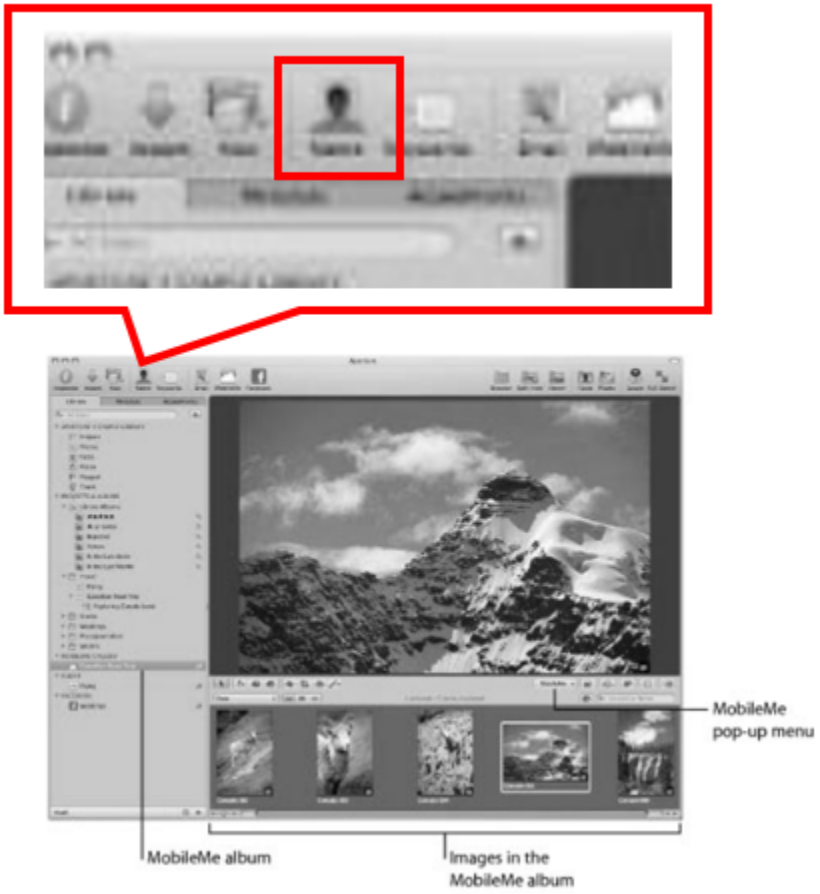
"Name" button INACTIVE when picture of airplanes selected

v.



"Name" button ACTIVE when video of person selected

119. From this, Petitioner and Dr. Terveen allege that because the Name button is "active" in an example with a video, this means that the software detected a face in the video. I disagree; reviewing A3UM in its entirety, it is clear that whether the Name button is "active" or "inactive" does not correlate to whether there is a face in the selected image. I located several examples where the Name button is "active" even though there is no face in the selected image. Ex. 1005 at 7, 15 (image of boat), 21, 24, 472-73 (images of bear), 40 (image of horses), 510 (images of penguins), 1024 (image of mountain). Below, I reproduced and annotated one of these instances:



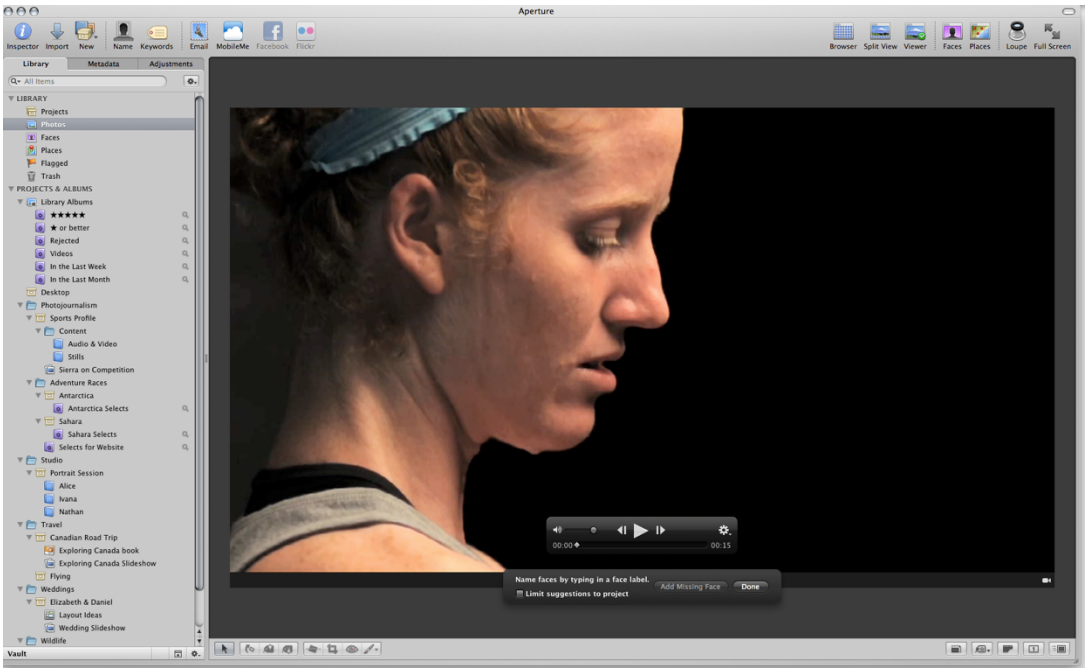
Ex. 1005 at 1024 (annotated)

120. In my view, a POSITA would instead understand that the varying appearance of the Name button throughout A3UM is a function of whether the Faces feature is enabled or disabled by the user. That is, when the Faces feature is disabled, the Name button will be "inactive." Conversely, when the Faces feature is enabled, the Name button will be "active." There is an option to enable or disable the Faces feature in the Preferences menu, shown below:

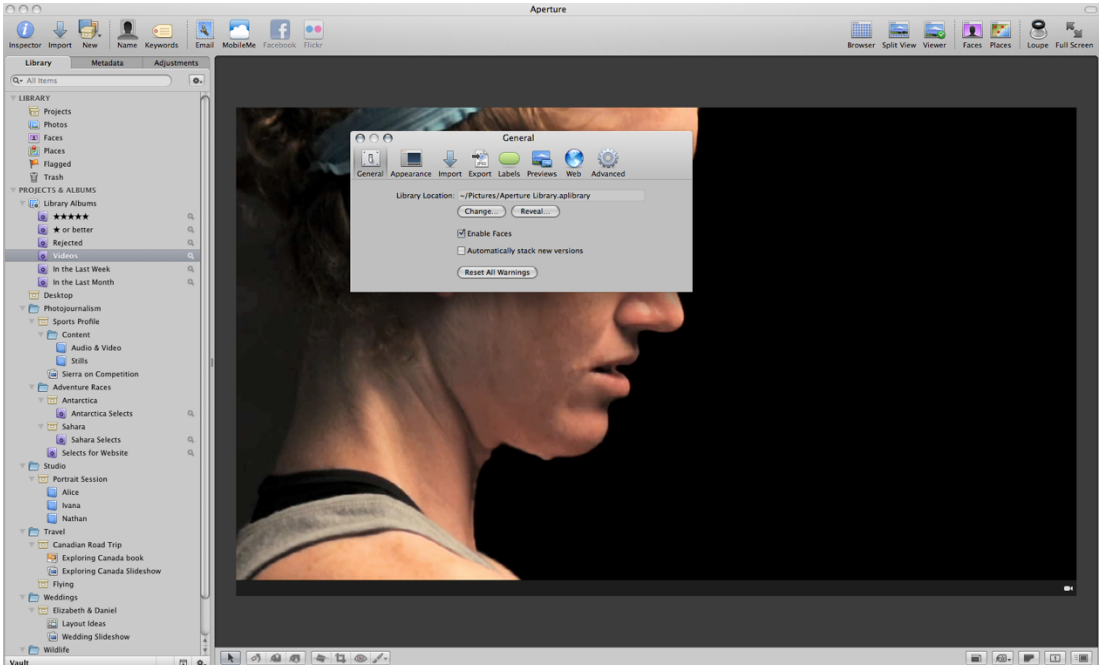
Ex. 1005 at 1057

121. As discussed above, I reviewed an installed copy of Aperture 3 on a MacBook computer via videoconference with counsel for Patent Owner. I understand that Aperture 3 software was loaded with the sample library of files included with the installation DVD. I investigated whether Aperture 3 detects faces in videos as Petitioner and Dr. Terveen suggest based on A3UM. Based on my review, I concluded that it does not.

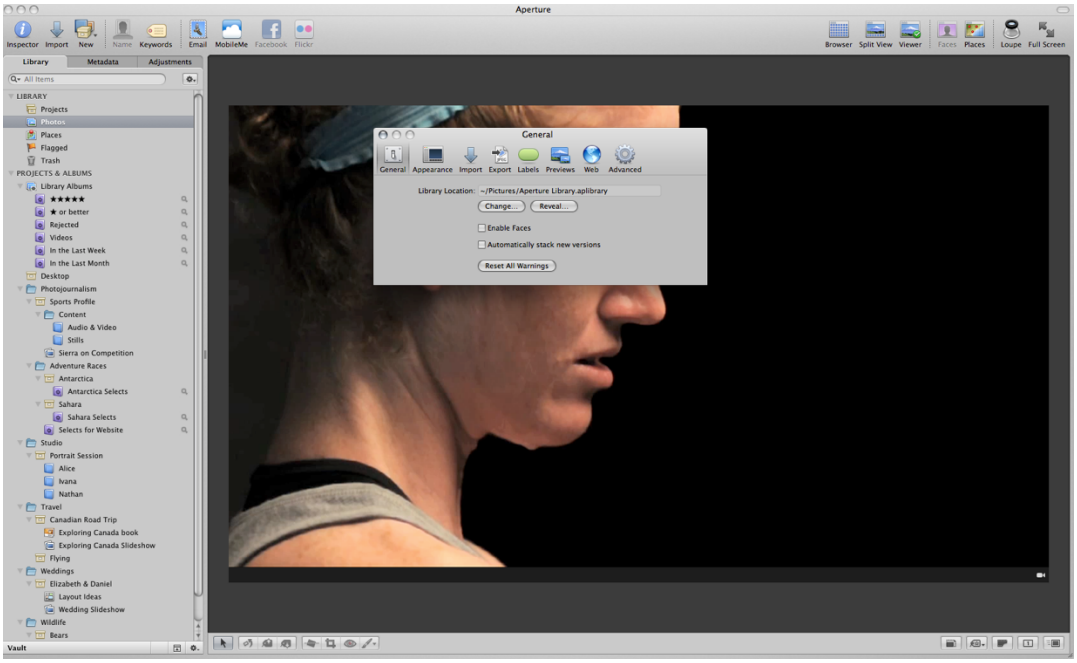
122. The video shown on page 23 of the A3UM that Petitioner and Dr. Terveen cite to was included in the sample library. Petition[228] at 51; Ex. 1003[228] at ¶ 180. When I viewed this video, the Name button was "active."



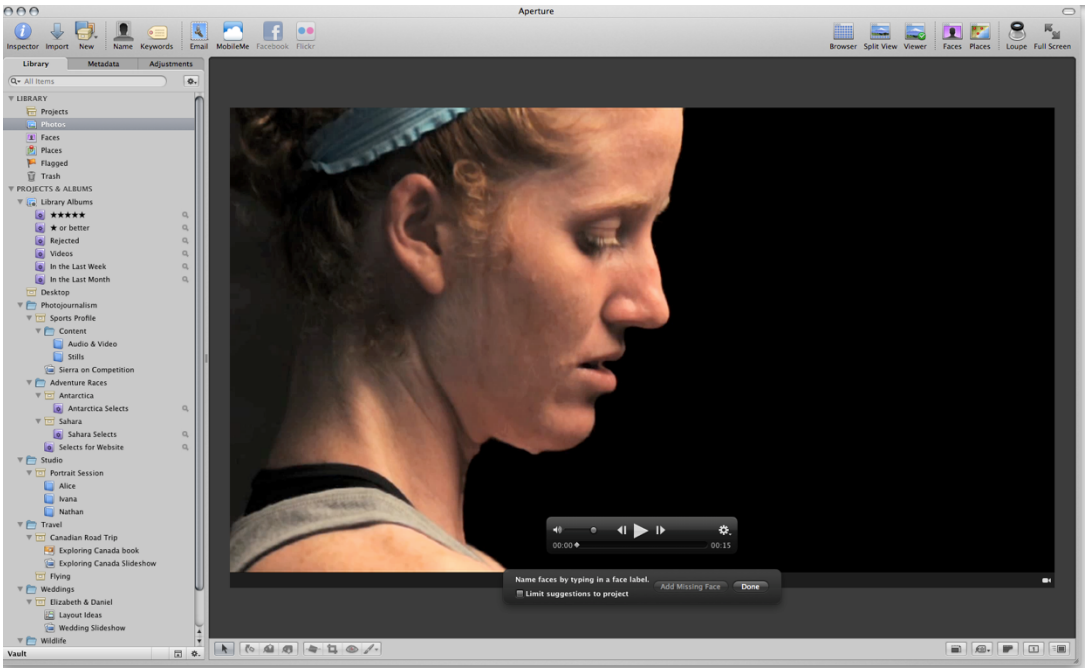
123. Next, I directed that the Faces feature be disabled in the Preferences menu, as shown on page 1057 of the A3UM.



124. As shown below, the Name button became greyed-out and "inactive" when the Faces feature was disabled.



125. I found that even when the Faces feature was enabled, Aperture 3 did not appear to detect any face in the video when the Name button was selected, contrary to Petitioner and Dr. Terveen's suggestion that it does.



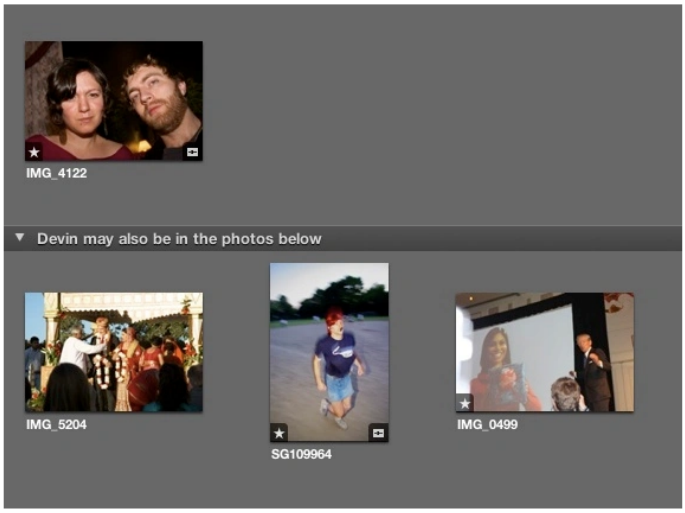
126. This stands in contrast to still images. Below is an example where the Name button was selected for a still image and a white box appears around the detected face. I did not observe this behavior for the video above.

127. For the '228 patent, Petitioner argues alternatively that it would have been obvious "to modify A3UM to allow videos to be associated with faces." Petition[228] at 52. Petitioner argues that adding videos in the Faces view would involve "at most detecting faces in the representative image of the video." Petition[228] at 53. Petitioner alleges that it was known "to detect faces in videos" by "extracting keyframes and then identifying faces." *Id*. (citing Ex. 1049 and Ex. 1050). I disagree with Petitioner's assertion that this would have been obvious.

128. First, I note that exhibits to the Petition indicate that the facial detection feature described in A3UM was not a viable or successful feature in practice. For example, in Ex. 1044, a user complains that "Faces plainly doesn't work." Ex. 1044 at 1. This individual indicated that Aperture 3 "spent literally five hours going through my photos (about 1000 per hour)" to detect faces. *Id*.

129. The text in Ex. 1044 suggests there should be a screenshot showing what happened, but the image is not present in Ex. 1044. I understand Ex. 2014 is a copy of the same URL, and that this is the image that is referenced in Ex. 1044.

There are some kinks to be worked out. Faces plainly doesn't work. After it spent literally five hours going through my photos (about 1000 per hour), this is what it has come up with:



130. Given that it reportedly took five hours to do this at about 1,000 photos per hour, this user appears to have had approximately 5,000 photos. However, Aperture 3 apparently only detected a face in at most four of those photos (~0.08% of the photos). This shows that the facial recognition feature described in A3UM was not successful in practice.

131. Ex. 1045 reports similar problems and states that "Faces found faces in the chaotic patterns in the water next to whales, while it failed to recognise actual faces in many clear, topside photos." Ex. 1045 at 7. Ex. 1045 also states that the Faces functionality is "of no interest to me." *Id*.

132. Ex. 2007 is a copy of the license agreement that appeared during installation of the Aperture 3 software. I note that this agreement requires the user

to acknowledge that "results from the use of the Faces feature may vary." Ex. 2007 at 1.

133. In light of the documented problems with the Aperture 3 Faces feature for still images, in my opinion, a POSITA would not have a reasonable expectation of success in modifying A3UM to extend the facial recognition feature to videos. Additionally, given these problems and frustrating user experiences, in my opinion, a POSITA would not have been motivated to modify A3UM to extend the facial recognition feature to videos.

134. Petitioner suggests that one could detect faces in videos by "extracting keyframes and then identifying faces." Petition[228] at 53; Ex. 1003[228] at ¶ 184. Petitioner cites Ex. 1049 and Ex. 1050 for this premise. I note that Ex. 1050 does not discuss keyframes at all, it merely suggests detecting a face in a video frame. Ex. 1050 at 2:17-27.

135. The cited paragraphs of Ex. 1049 describe (1) determining "frames belonging to a respective scene by detecting scene change among frames," (2) "detect[ing] faces from the determined frames . . . to determine face detection frames," and (3) "cluster[ing] the determined face detection frames . . . to determine the key-frames." Ex. 1049 at ¶ 14. Petitioner suggests that Ex. 1049 describes "extracting keyframes and ***then*** identifying faces," but it appears Ex.

1049 is describing, at most, the opposite order of operations and does not support Petitioner's interpretation. Petition[228] at 53.

136. Detecting faces in a video using keyframes would require at least two steps. First, the system would have to decode the video to obtain the keyframes. Second, the system would have to analyze each keyframe to attempt to identify faces. For example, if a sixty-minute video contained one keyframe every ten seconds, the system would need to attempt to detect faces in sixty keyframes for the one video.

137. Thus, detecting faces in videos using keyframes as Petitioner suggests would require significantly more computational resources than detecting faces in still images. This additional requirement would further suggest to a POSITA that they should not reasonably expect to be successful in extending the facial recognition features in A3UM from still images to videos, especially in view of the documented problems with the un-modified features. The techniques Petitioner points to for detecting faces in videos would not address the documented problems with still images in Aperture 3. In other words, a POSITA would reasonably expect that the documented problems with still images would be as bad for videos.

138. Further, the additional computation requirements would lead a POSITA away from extending the facial recognition features in A3UM from still images to videos. A3UM states that "***all*** images in your library" are scanned to

detect faces. Ex. 1005 at 418 (emphasis added). If videos were added to this task, and a large number of video frames were analyzed, this would significantly increase the time it would take to detect faces in the library. For instance, Ex. 1044 indicates it took 5 hours to analyze about 5,000 photos. As an illustration, assume that a given user has a number of videos that are collectively 60 minutes long and that the videos were shot at 24 frames per second (fps), which was a typical setting at the time of the invention. In this example, there would be over 86,000 video frames, which would add several days to the processing time. Even if those video frames were reduced by 95% using only keyframes for facial recognition, this would still take several hours to analyze. A POSITA would recognize that it is undesirable to occupy computation resources on the Mac computer running Aperture 3 for extended periods of time (e.g., hours or days) because this would worsen the user experience and degrade the perform of other programs.

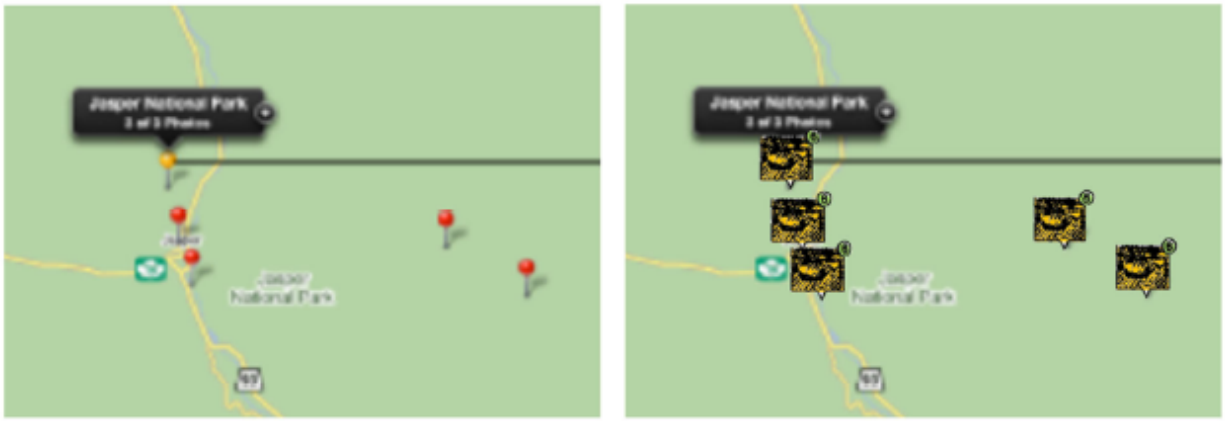
E. Modifying A3UM with Belitz

139. Claim 1 of the '228 patent recites, *inter alia*, "map view" including "an interactive map," "a first location selectable thumbnail image at a first location on the interactive map, and "a second location selectable thumbnail image at a second location on the interactive map." Ex. 1001[228].

140. Claim 1 of the '658 patent recites a "map view," and that displaying the map view includes displaying:

- (i) a representation of an interactive map;
- (ii) a first location selectable thumbnail image at a first location on the interactive map, the first location being associated with the geographic coordinates of a first geotag, a first set of digital photographs and videos including all of the digital photographs and videos associated with the first geotag;
- (iii) a first count value image partially overlapping the first location selectable thumbnail image, the first count value image including a first number that corresponds to the number of digital photographs and videos in the first set of digital photographs and videos;
- (iv) a second location selectable thumbnail image at a second location on the interactive map, the second location being associated with the geographic coordinates of a second geotag, a second set of digital photographs and videos including all of the digital photographs and videos associated with the second geotag; and
- (v) a second count value image partially overlapping the second location selectable thumbnail image, the second count value image including a second number that corresponds to the number of digital photographs and videos in the second set of digital photographs and videos;

141. For both the '228 patent and the '658 patent, Petitioner argues that it would have been obvious to modify A3UM's Places feature to incorporate Belitz's graphic object functionality, including its thumbnails and counts. Petition[228] at 24-31; Petition[658] at 24-30. Petitioner's proposed modification to A3UM is shown below:

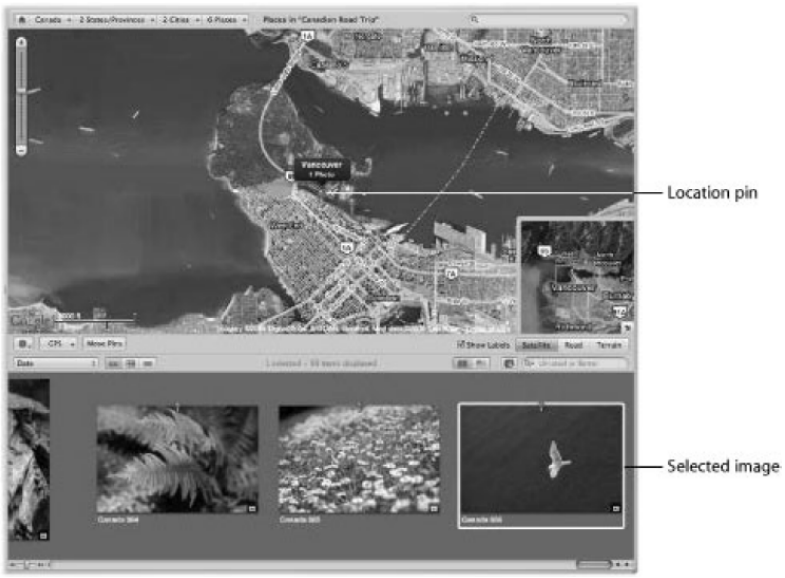


A3UM A3UM-Belitz

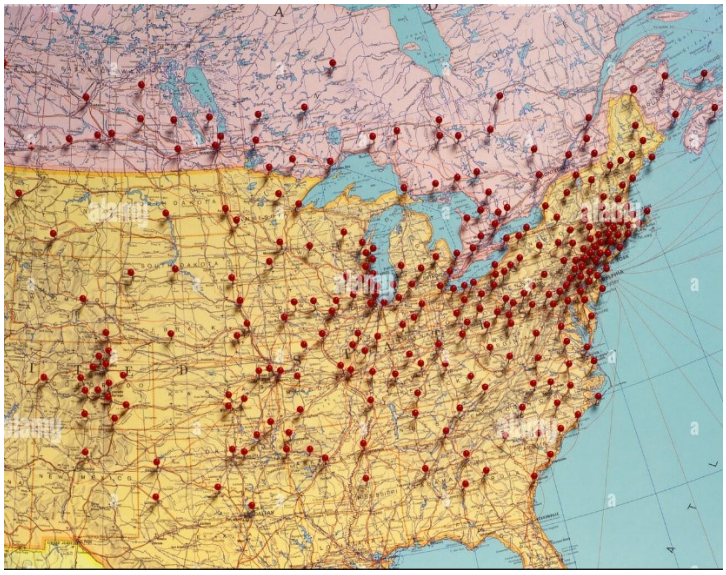
Petition[228] at 27; Petition[658] at 26

142. Petitioner argues that the thumbnail map markers in Belitz are "a functional equivalent of" the pins used in A3UM. I disagree. While there are some similarities, the thumbnail images and pins have different design considerations.

143. In A3UM, red location pins mark the locations where images or groups of images were shot. Ex. 1005 at 435.



144. The location pins in A3UM are a digital version of placing physical push pins in a map to show, for example, locations a person has visited.

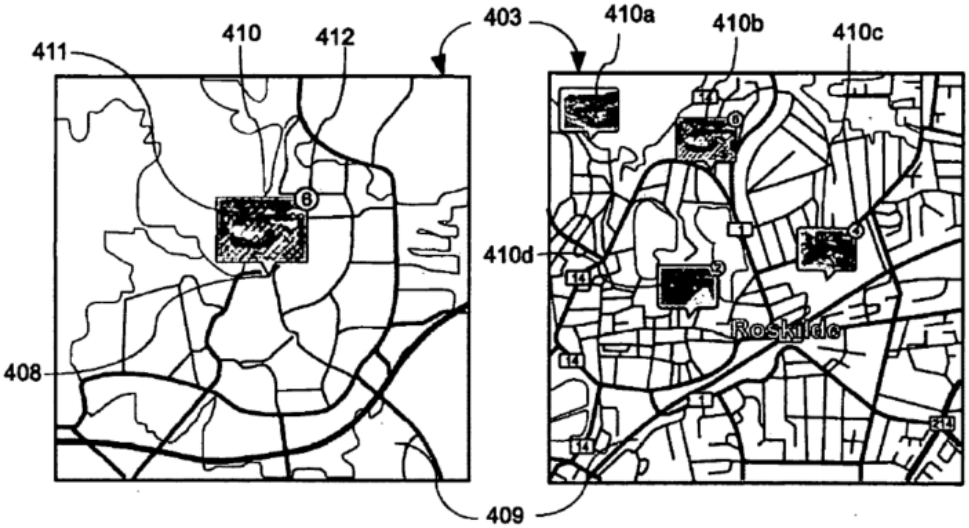


145. In the physical example, each push pin has a very thin portion that sticks into the map and a spherical portion on top. This allows one to position many push pins together in a very small area on the map to mark locations that are

relatively close together. Further, being very thin, the push pins do not obscure the underlying map, so one can still see the geography and location names printed on the map, even with many push pins. Using push pins is a very precise way of conveying all locations of interest at the same time, even if those locations are close together on the map, while minimizing any interference with the ability to see the underlying map. In other words, the shape of the push pin is intentional to avoid obscuring the map.

146. The push pins in the A3UM are similar to the well-known Google Maps marker symbol, which is intentionally shaped in a way that avoids obscuring the map. Ex. 2015 (discussing how Google "avoiding putting a dot or star flat on the map because it intended to obscure the area").

147. Turning to Belitz, overlaying thumbnail images on a map does not serve the same functions as the push pins on the map. The thumbnail image can convey image information. However, the thumbnails are inherently much larger than the thin, almost two-dimensional push pins and would obscure far more of the map than using a push pin.



Ex. 1006 at Figs. 4a-4b

148. Belitz specifically states that these thumbnail images are intended to mark "special locations." Ex. 1006 at ¶¶ 2, 4, 10, 19, 71. This "special locations" qualifier is in Belitz's title. Petitioner argues that all of the push pins in A3UM would be replaced by Belitz's thumbnails for every location, not just for "special locations." That Belitz is limited to "special locations" makes sense because if the thumbnails were used for every location they would potentially clutter the map. *See, e.g.*, Ex. 1033 at 4 ("thumbnails [on a map] can get pretty crowded"); Ex. 1034 at 1 (showing thumbnails cluttering the map).

149. The difference between using a push pin like A3UM and a thumbnail image like Belitz can be seen by comparing FIGS. 5 and 41 of the '228 and '658 patents. In FIG. 5, there is a push pin positioned somewhere in northern Europe.

Ex. 1001[228] at FIG. 5 (excerpted); Ex. 1001[658] at FIG. 5 (excerpted)

150. In Fig. 41, there is a thumbnail image positioned in northern Europe, but as can be seen below, compared to the push pin in FIG. 5, the thumbnail image obscures much of Europe on the map (e.g., almost all of the UK).

Ex. 1001[228] at FIG. 41 (excerpted); Ex. 1001[658] at FIG. 41 (excerpted)

151. Using these figures as an example, suppose a user has photos in five different countries throughout Europe. Push pins would be able to show with precision which countries the photos were taken in. If the push pins were substituted for thumbnail images, the map would get too cluttered. Even if those thumbnails were consolidated into one because of space constraints on the map, then 80% of the location information that would have been available in the push pin implementation is lost.

152. In Petitioner's proposed A3UM-Belitz combination, the thumbnail images are much larger than the push pins, obscuring an area of the map that is many orders of magnitude greater than in the case of the push pins. For example, text is visible on the map in A3UM between the three push pins on the left side of the screenshot, but that text is completely obscured when those push pins are substituted for thumbnail images. Thus, the map will convey less information in Petitioner's A3UM-Belitz combination than it otherwise would in A3UM without modification.

A3UM

A3UM-Belitz

Petition[228] at 27; Petition[658] at 26

153. For at least these reasons, I disagree with Dr. Terveen's assertion that the A3UM push pins and Belitz thumbnails were "interchangeable" and that this alone would motivate a POSITA to use thumbnails instead of push pins. Ex. 1003[228] at ¶ 127; Ex. 1003[658] at ¶ 129. Dr. Terveen does not address the fact that using thumbnail images would obscure much more of the underlying map than push pins, and what the alleged benefits to using a thumbnail image would be such that a POSITA would have a reason to make that tradeoff.

154. In Petitioner's proposed combination of A3UM and Belitz for both patents, the pop-up window in A3UM including the number of images (*see* Ex. 1005 at 435) is retained along with the Belitz thumbnail/number feature:

A3UM

A3UM-Belitz

Petition[228] at 27; Petition[658] at 26

Given the limited real estate on the screen and also to limit obscuring the map, a POSITA would not modify A3UM to display duplicative information. The '658 Petition does not identify any reason why a POSITA would modify A3UM to include the same number from the pop-up window again in relatively close proximity.

155. I also observe that in Petitioner's proposed combination of A3UM and Belitz, all of the thumbnail images and numbers are the same at all five locations. A POSITA would not modify A3UM in this way. If every location has exactly the same thumbnail and number, as Petitioner proposes, the thumbnail and number combination would provide no conceivable benefit relative to the push pins and would only obscure the map, as discussed above.

156. Petitioner argues that a POSITA "would have been motivated to" combine A3UM and Belitz because "Belitz expressly teaches that 'it would be

useful to be able to present a user with an overview of associated images to special locations which enables to [sic] user to clearly see the associations." Petition[228] at 28 (quoting Ex. 1006 at ¶¶ 4, 15); Petition[658] at 27 (quoting same). In my view, A3UM already achieves Belitz's objective because it provides associations between images and locations, so there would be no reason to modify A3UM to objective Belitz's stated objective.

Ex. 1005 at 30

157. Dr. Terveen asserts that a POSITA would have had a reasonable expectation of success in modifying A3UM with Belitz. In particular, Dr. Terveen asserts that A3UM employs Google Maps, and that the Google Maps API would have enabled a skilled artisan to implement custom map markers such as

photothumbnails and overlays on embedded Google maps with routine effort. Ex. 1003[228] at ¶¶ 130-32; Ex. 1003[658] at ¶¶ 132-34. I disagree.

158. Dr. Terveen cites to Ex. 1035, which is a textbook entitled "PHP Web 2.0 Mashup Projects" (hereinafter, "PHP Web"), as allegedly describing how to customize the markers in Google Maps. Dr. Terveen also cites to Ex. 1040, which describes the Google Maps API. As detailed below, Dr. Terveen's assertion that using the Google Maps API to overlay thumbnails on the map would have involved routine effort is contradicted by the documentation he cites.

159. The PHP Web textbook describes a "GMarker object" that is shown on the Google Map.

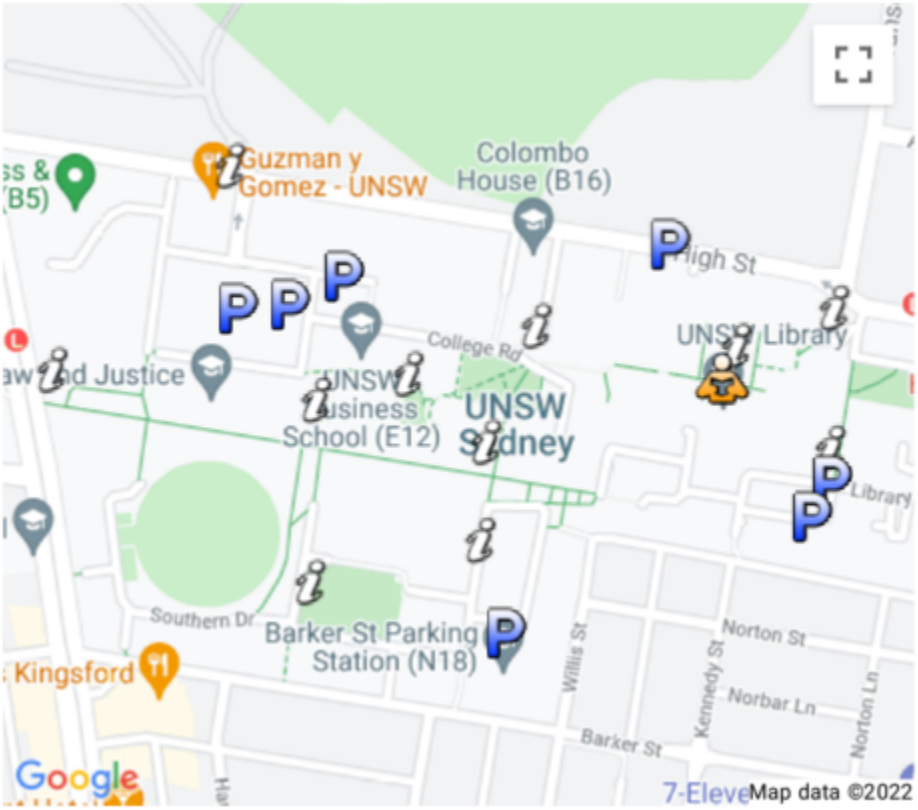
160. The PHP textbook also describes a "GMarkerOptions object . . . whose sole purpose is to tweak the marker." Ex. 1035 at 239. This allows one to "do things like add your own customer icons or make the marker draggable." *Id*.

161. At the bottom of the page Petitioner cites describing the GMarkerOptions object, the PHP textbook invites the reader to "[c]onsult the GmarkerOptions documentation . . . for everything you can do to markers," and provides the URL corresponding to the Google Maps API in Ex. 1040. Ex. 1035 at 239. In the section of the Google Maps API document regarding "class GIcon," the document states that "[a]n icon specifies the images used to display a GMarker on the map." Ex. 1040 at 40. However, contrary to Dr. Terveen's assertions, the Google Maps API document goes on to state that "specifying an icon is actually ***quite complex***" as opposed to using the default Maps icon G_DEFAULT_ICON." *Id*. (emphasis added).

162. It appears that Dr. Terveen is suggesting that the ability to customize the marker means that one could simply replace the default marker with a photograph using the Google Maps API. I do not agree that a POSITA would read the description of the GMarkerOptions object this way. Instead, the description suggests that one can substitute the default marker shown above with another symbol or shape, not that it would be substituted with a photograph.

163. For example, Ex. 2017 is an Internet Archive printout from May 2012 illustrates "a collection of icons Google makes available for Google Earth and Google Maps." Ex. 2017 at 1. These icons are symbols or shapes, like a pushpin or paddle, not a photograph from a photo library. *Id*. at 2-3.

164. In the current description of the Google Map customer markers, the example customized markers are limited to symbols, and there is no indication that photographs are suggested in the Google Maps API.



Ex. 2016

165. For at least these reasons, I disagree with Petitioner and Dr. Terveen's assertions that it would have been obvious to modify A3UM with the features in

Belitz. I reserve the right to identify additional reasons and evidence why a POSITA would not combine these references should the Board institute an IPR of the '228 patent or the '658 patent.

VIII. CONCLUSION

166. I reserve the right to modify or supplement my opinions, if necessary, based on further review and analysis of the evidence in this case, including review and analysis of information that may be provided to me subsequent to the date of this Declaration.

I declare that all statements made herein of my own knowledge are true and all statements made on information and believe are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Date: February 23, 2022

Rajeev Surati, Ph.D.

Curriculum Vitae

Rajeev Surati Ph.D.

62 Putnam Ave
Cambridge
Tel: **+1 508 472 5319** . **MA, 02139**

E-mail: raj@alum.mit.edu

Profile: MIT PhD technologist in Electrical Engineering and Computer Science – Builder and Manager of teams translating research into successful Products. Built and sold Microsoft its real-time communications technology platform (2 way messaging, instant messaging, Voip, etc…) Built ran and sold a top 1000 web site (one of the first offering photo sharing) from 2000-2007 and programmed several key modules including live chat, bulletin boards, photo ratings, photo sharing social networking etc…,Built a company around my PhD Thesis that implemented Structured Light based camera systems. Such systems are now a standard requirement in multi-projector based immersive systems (military simulators) in Late 90s now a successful Company with Disney, Pixar, Universal and all branches of the military as clients. Areas of expertise include: database backed web sites, web analytics, instant messaging, chat, compilers, display technology, image processing, machine vision, AI, billing, GPU. Also a talented programmer in C++. C, C#, java, python, scheme, LISP, Javascript, php etc.

Expert Experience:

Extensive experience in IPR, Patent , Trade Secret, FINRA, ITC, Federal and State Court. Written 10s of Expert Reports. Experienced at least 15 Depositions, Court Tutorial and Trial Testimony.

Education:

Massachusetts Institute of Technology SB, 1992, SM, 1995, Ph.D.1999
GPA: SB 4.9/5.0 SM: 5.0/5.0 Ph.D. 5.0/5.0 all In Electrical Engineering and Computer Science

SB Thesis: *A Parallelizing Compiler Based on Partial Evaluation* – Dept. Thesis Prize (later)
--Early Days of How to fill Floating Point Pipelines
SM Thesis: *An Object System Based on Partial Evaluation*
--Getting Good Computation Throughput – with Abstraction
Ph.D. Thesis: *Scalable Technology for Large Scale Seamless Displays*
--Making Massive Resolution Display a Reality

Employment:

Skyline Nav AI Inc. **9/2020 – Present**
Position: **Co**founder, President

Commercializing A Camera Based GPS Alternative – using Visual Cues to Localize. Technology Licensed and Developed at US Army Research Lab.

Hydrow. **5/2019 – 3/2020**
Position: Skunkworks Technical Head

Ran Innovation Initiative for Connected Fitness Startup to build a vr experience to fully immerse a person into a rowing on the water experience using magic leap and oculus Quest.

nCent Labs **4/2018 – 12/2019**
Position: Senior Partner

Company is a Stanford, MIT Spinout that has created an incentive platform on top of blockchain and is based upon the nCent crypto currency. I have been working on corporate, business development, and product development matters.

Computation and Imaging **1/2015 – Present**
Position: President

Consultancy providing strategic and implementation services to companies related to IP and

business Issues as well as product development including android based systems. Clients include NEC, Apple, Sony, and Estee Lauder.

Scalable Display Technologies **1/2004 – October 2014**
Position: President, Chairman, and Co-Founder

World's leading provider of technologies to build and maintain seamless tiled large displays. Core technology in auto-calibration of large displays. Today the company is the worldwide leader in auto-calibration in the simulation and training space, largest provider of projector cam software on both an OEM and direct to customer basis with over 100,000 licenses sold worldwide. We have created a new class of products that has disrupted the high end of the market by over the last 10 years focusing on folding the cost of warping down from 10,000 dollars per channel to less than 100 dollars per channel The Technology is based on my Ph.D. thesis and seminal projector camera patents filed while at MIT in 1998. I program/product managed our relationships and software architecture integrating it with NVIDIA, AMD, NEC, Sony, etc based on them as both customers and product channels. We have opened up a huge market for new classes of products for which we are a key component. I also have developed our whiteboard strategy which is beginning to bear fruit delivering systems with NEC. I have been able to bridge the divide between Japan Brands and their technology focus to bring products to market with their sales organizations by acting as a business/product management intermediary.

Photo.net. **7/2000-May 2007**
Position: President, Co-Founder, Chairman

Turned world's largest and best amateur photographer site from a simple forum site into a viable growing community based business along with Philip Greenspun. Ran a preLAMP stack based on AOLServer, tcl, and Oracle 9 with innovative features such as: photo-sharing, click through advertising, digital subscriptions for vanity purposes etc. Innovated very early business models in this space around subscriptions, clickthroughs, banner advertising, and revenue sharing. Sold business quite profitably to NameMedia in 2007. I ran it while running another startup.

Microsoft **7/1999 - 7/2000**
Position: Software Development Engineer

Worked on Exchange 2000 IM Server and MSN Messenger.
Wrote patents on publish-subscribe architectures etc. Position created post sale of Flash Communications Wrote in C++, used COM etc. XML etc.

Flash Communications **2/1997 – 02/1998**
Position: CTO, Co-Founder
Founded company while in PhD program, developed market plan, core technology, and implementation targeted at a Microsoft acquisition. Built team, raised funding, and wrote designed product software with team. Company sold to Microsoft, prior to finishing my PhD thesis.

Oak Ridge National Lab
Position: Summer Intern
Spectroscopy Group building Lab- on-a-Chip.

MIT AI Lab **9/1992 – 6/1998**
Position: Research Assistant
Worked with computer science and Electrical Engineering Professors: Thomas F. Knight, Gerald Jay Sussman, and Hal Abelson on a wide variety of projects. Helped build an early VLIW computer architecture with HP and mainly designed a special software compiler that did register allocation, parallelization to fill floating point pipeline. I also worked on camera feedback based projector systems, and on projects in the early days of the web: HTTP, TCP, UDP, database backed web systems etc.

Naval Research Labs
Position: Summer Intern

Worked on wavelet decomposition and classification based on said decomposition of radar return signal in C/C++. Wrote visualization tools that dramatically improved the investigative cycle time. Lots of hacking with postscript to help visualize results.

Technology Hackers Inc **6/1992-12/1992**
Position: Electrical Engineer
Built a 512 node 2D array of phased array microphones.

Microsoft **6/1988-8/1988, 6/1999-9/1999**
Worked on Microsoft PC Client for Mail, Microsoft File, Microsoft Works (pre Windows).

Technology Advisory Boards UnifySquare, Paneve (General Purpose Asic coupled with Compiler Technology), Nexaweb (Realtime Web Application framework using HTTPS), Antix Labs (Compiler Technology for universal gaming platform), Permabit (Content Addressable Storage), Evoque.

Awards: Department of Energy Computational Science Graduate Fellow 1995-97, William A Martin Thesis Prize for Best Undergraduate Thesis in Computer Science 1992, Global Indus Technovator Award 2009, Laureate of 2009 Computer World Honors Program, MIT 6.270 Lego Robot 1991 – Robot was named with Nuclear Capabilities on fields of RoboHockey.

Investments: Angel Investor in over 40 startups.

Patents:

5,943,478	System for immediate popup messaging across the internet
6,260,148	Methods and systems for message forwarding and property notifications using electronic subscriptions
6,415,318	Inter-enterprise messaging system using bridgehead servers
6,456,339	Super-resolution display
6,604,133	Inter-enterprise messaging system using bridgehead servers
8,817,111	System and method of calibrating a display system free of variation in system input resolution
8,994,757	System and method for providing improved display quality by display adjustment and image processing using optical feedback
9,215,455	System and method of calibrating a display system free of variation in system input resolution
9,369,683	System and method for calibrating a display system using manual and semi-manual techniques
9,497,447	System and method for color and intensity calibrating of a display system for practical usage
9,860,494	System and method for calibrating a display system using a short throw camera
10,163,195	Spatio-temporal differential synthesis of detail images for high dynamic range imaging
10,319,137	System and method for injection of mapping functions
10,503,059	System and method for calibrating a display system using manual and semi-manual techniques
10,523,910	System and method for providing improved display quality by display adjustment and image processing using optical feedback
11,159,774	System and method for providing improved display quality by display adjustment and image processing using optical feedback

Systems Built (Individually or as part of a team):
Spambot: One of the Internet's first free to use Mailing List Servers that was database backed
Photo.net's photo sharing system: One of the first on the internet, and given rave reviews as one of the best systems out in 2003.
Photo.net's mobile WAP interface
MIT Supercomputing Toolkit: VLIW 8 processor system out of discrete electronic parts
Microsoft Exchange 2000 IM Server and MSN Messenger Service
Internet Coke Machine: 1993 – food transfer protocol (modified ftp server hooked up to micro-controlled coke machine)

Skills: C++, C, Scheme, TCL, C#, Java,SQL, dabbled in PERL, python, etc.], TCP, mobile app development, and networking, image processing, firmware programming etc. Did Oracle DB management for photo.net. Very fast at learning enough to implement what I need done to solve a problem, E&M, machine vision, etc.

References: Available upon request.

Publications:

Partial Evaluation for Scientific Computing: The Supercomputer Toolkit Experience A. Berlin and R. Surati, Proc of ACM SIGPLAN Workshop on Partial Evaluation and Semantics-Based Program Manipulation, 1994

Exploiting the Parallelism Exposed by Partial Evaluation.
By: Rajeev J. Surati, Andrew A. Berlin
In: IFIP PACT, 1994

A Parallelizing Compiler Based on Partial Evaluation, MIT Artificial Intelligence Laboratory Technical Report, TR-1377, July, 1993

Invited Talks:

Ultra High Resolution Displays and Interactive Eye-point Using CUDA NVIDIA GPU Computing Conference 2010

Using the GPU to Create Seamless Displays from Multiple Projectors SIGGRAPH 2011 NVIDIA Presentation.

Seamless Scalable Displays - Using NVIDIA Warp + Intensity API NVIDIA GPU Computing Conference 2012

Using Warp and Blend API in Distributed and Single Renderer's / Update on Warping Standards with Bei Wang (Walt Disney Imagineering), NVIDIA GPU Computing Conference 2013

Mid-Tier VR: Cost Reducing the Cave by Embracing the GPU with Bei Wang – Walt Disney Imagineering, NVIDIA GPU Computing Conference 2014

Teaching:

MIT Teaching Assistant:
6.001 Structure and Interpretation of Computer Programs (2 times),
6.002 Circuits,
6.013 Electro and Magneto Quasi-static Systems.
ArsDigita University: Lecturer Probabilistic Systems.
ArsDigita Database Programming Bootcamp Instructor
MIT Course on Android Mobile Programming
Harvard Medical School Computational Medicine course – handling BIG Data.

Litigation Matters Involving Testimony (Trial or Deposition)

- *WhatsApp and Facebook v. Triplay Inc*., IPR 2016-00740, IPR 2016-01659,60,61,62 (PTAB)
- *WhatsApp and Facebook vs Triplay Inc.*, No. 13-1703 (D. Del.)
- *Honeywell International v. The Code Corporation et al*., In the Matter of Certain Bar Code Readers, Scan Engines, Products, Containing the Same, and Components Thereof, International Trade Commission Investigation
- *RPost vs Trend Micro*, Case No.: 3:13-cv-5227-VC, 3:14-cv-2824-VC (N. Cal. D.C.)
- *Ford Motor Company v. Versata Software, Inc*., IPR 2016-01015 and IPR 2016-01019 (PTAB)
- *Progressive Solutions Inc. vs City of Oakland*, No: 3:16-cv- 04805-SK (N. Cal. D.C.)
- *RPost vs Sophos Corporation*, Nos. 1:13-cv-12856 (D. Mass), 1:14-cv-13628 (D. Mass.)
- *RPost vs Symantec Corporation*, No.: 3:14-cv-00238 VC (N. Cal. D.C.)
- *Inteum Company LLC vs National University of Singapo*re, No. 2:17-cv-01252 (W. WA D.C.)
- *Kipu Systems Co. vs Zencharts LLC*, No. 1:17-cv-24733-KMW (S. FL D.C.)
- *Karl Stohrs vs Steris Corporation*, No1:2018cv0169 (N. OH D.C)
- *WTRI vs PMI*, No. 3:18-cv-0192 7(S.D. California)
- *Facebook and Whatsapp vs Blackberry Inc.*, IPR2019-00528, IPR2019-00516, IPR2019-00899, IPR2019—00925 (PTAB)
- *IPComm Gmbh & Co. KG vs AT&T*, No. 2:20-cv-00322 (E. D. Texas)
- *IPComm Gmbh & Co. KG vs AT&T*, No. 2:20-cv-00323 (E. D. Texas)
- *IPComm Gmbh & Co. KG vs AT&T*, No. 2:20-cv-00321(E. D. Texas)