

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VALVE CORPORATION
Petitioner,

v.

IMMERSION CORPORATION
Patent Owner.

Case No. IPR2024-00556
U.S. Patent No. 9,748,507

EXHIBIT 2001

**DECLARATION OF CRAIG ROSENBERG, Ph.D.
IN SUPPORT OF IMMERSION CORPORATION'S
PATENT OWNER RESPONSE**

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I, Craig Rosenberg, declare as follows:

1. I have been retained by Folio Law Group PLLC, counsel for Patent Owner Immersion Corporation (“Immersion”) to assess the challenged claims of U.S. Patent No. 8,749,507 (“the ’507 patent”) in connection with this case which is the Petition for Inter Partes Review of the ’507 patent (“the Petition”).

2. I am being compensated for my work on this case and my fee is not contingent on the outcome of this case or on any of my opinions or the technical positions I explain in this report. In addition, I have no financial interest in the outcome of this case or any of the parties involved in this case.

3. I believe I am qualified to serve as a technical expert in this proceeding based on my educational and work experience, including my 30+ years of experience in human factors, user interface design, user interaction design, human-computer interaction, and software engineering from 1988 through today.

4. This declaration sets forth my opinions, which I formed based on my study of the evidence; my understanding as an expert in the field; and my training, education, research, knowledge, and personal and professional experience. All of my opinions stated in this declaration are based on my own personal knowledge, expertise, training, education, and professional judgment. In forming my opinions, I have relied on my knowledge and experience in human factors, user interface

design, user interaction design, human-computer interaction, and software engineering.

5. If I am called upon to do so, I would be competent to testify to the matters set forth herein. My qualifications to testify about the technical subject matter in this case and the relevant technology are outlined in my curriculum vitae and this section of this declaration. A copy of my current curriculum vitae is provided for this proceeding as Exhibit 2002.

6. This declaration is based on the information currently available to me. If additional information becomes available to me, I reserve the right to continue my analysis, which may include a review of documents and information that may be provided to me, as well as testimony from depositions that have not yet been taken at this time.

I. BACKGROUND AND QUALIFICATIONS

7. I earned my Bachelor of Science degree in Industrial Engineering, my Master of Science degree in Human Factors, and a Doctor of Philosophy in Human Factors from the University of Washington School of Engineering. For over 30 years, I have worked in human factors, user interface design, software development, software architecture, systems engineering, and modeling and simulation across various application areas, including aerospace, communications, entertainment, and healthcare.

8. I graduated from the University of Washington in 1988 with a Bachelor of Science in Industrial Engineering. After graduation, I continued my studies at the University of Washington College of Engineering. In 1990, I obtained a Master of Science degree in Human Factors. Human Factors is an engineering discipline that studies the design of products, processes, equipment, and systems to work more efficiently with humans. Human factors is concerned with reducing human error, increasing productivity and efficiency, and enhancing safety and comfort with a specific focus on the interactions and interfaces between humans and the products, processes, or systems with which they interact. In 1994, I graduated with a Doctor of Philosophy in Human Factors, focusing on advanced interface design. My Bachelor of Science, Master of Science, and Doctor of Philosophy degrees were all obtained at the University of Washington College of Engineering.

9. During my doctoral studies, I worked as an Associate Assistant Human Factors Professor at the University of Washington Industrial Engineering Department. My duties included teaching, writing research proposals, designing and conducting funded human factors experiments for the National Science Foundation, and hiring and supervising students. While studying at the University of Washington, I also worked as a human factors researcher. I designed and performed advanced human factors experiments relating to virtual environments and interface design, stereoscopic displays, and advanced visualization research, which the

National Science Foundation funded. My duties included user interface design, systems design, software development, graphics programming, experimental design, and hardware and software interfacing.

10. I have published twenty-one research papers in professional journals and proceedings in user interface design, computer graphics, and the design of spatial, stereographic, and auditory displays. I also authored a book chapter on augmented reality displays in the book “Virtual Environments and Advanced Interface Design” (Oxford University Press, 1995). In addition, I created one of the first virtual spatial musical instruments called the MIDIBIRD that, utilized the MIDI protocol, two six-dimensional spatial trackers, a music synthesizer, and a computer graphics workstation to create an advanced and novel musical instrument.

11. For the past 21 years, I have been a consultant for Global Technica, Sunny Day Software, Stanley Associates, Techrizon, CDI Corporation, and the Barr Group. In this capacity, I have provided advanced engineering services for many companies.

12. I consulted for the Boeing Company for 15 years as a senior human factors engineer, user interface designer, and software architect for various advanced commercial and military programs. Many of the projects that I was involved with at Boeing involved advanced software development, user interface design, agent-based software, and modeling and simulations in the areas of missile defense,

homeland security, battle command management, computer-aided design, networking and communications, air traffic control, location-based services, flight simulation, and Unmanned Aerial Vehicle (“UAV”) command and control. Additionally, I was the lead system architect developing advanced air traffic controller workstations and air traffic control analysis applications, toolsets, and trade study simulations for Boeing Air Traffic Management.

13. I was also the architect of the Boeing Human Agent Model. The Boeing Human Agent Model is an advanced model for the simulation of human sensory, cognitive, and motor performance as applied to the roles of air traffic controllers, pilots, and UAV operators. In another project, I was the lead human factors engineer and user interface designer for Boeing’s primary vector and raster computer-aided drafting and editing system that produces the maintenance manuals, shop floor illustrations, and service bulletins for aircraft produced by the Boeing Commercial Aircraft Company. Additional responsibilities in my time as a consultant include system engineering, requirements analysis, functional specification, use case development, user stories, application prototyping, modeling and simulation, object-oriented software architecture, graphical user interface analysis, and design, as well as UML, C++, C#, and Java software development.

14. In 1995 and 1996, I was hired as the lead human factors engineer and user interface designer for the first two-way pager produced by AT&T. Before this

technology, individuals could receive pages but had no way to respond utilizing their pager. This new technology allowed users to use a small handheld device to receive and send canned or custom text messages, access and update an address book, and access and update a personal calendar. This high-profile project involved designing the entire feature set, user interface/user interaction design and specification, and all graphical design standards. In addition, I designed the notification alerts for the pager associated with receiving messages, timers, alarms, etc.

15. From 1999 to 2001, I was the lead human factors engineer and user interface designer for a company called Eyematic Interfaces, where I was responsible for all user interface design and development activities associated with real-time mobile handheld 3D facial tracking, animation, avatar creation, and editing software for a product for Mattel. My work involved user interface design, human factors analysis, requirements gathering and analysis, and functional specifications.

16. I was the lead user interface designer for a company called ObjectSpeed, which developed a portable handheld telephone for use in homes and businesses with many of the same capabilities we take for granted in mobile cellular phones. This portable multifunction device supports voice, email, chat, video conferencing, internet radio, streaming media, Microsoft Outlook integration, photo taking, sharing, notifications, etc. I designed all the user interface elements for this

device. The ObjectSpeed device was specifically designed and developed as a portable handheld device.

17. I was the lead user interface designer for Ahaza, which was building IPv6 routers. I designed the user interfaces to configure and control these advanced network hardware devices. My responsibilities included requirements analysis, functional specification, user interface design, user experience design, and human factors analysis.

18. I am the founder, inventor, user interface designer, and software architect of WhereWuz. WhereWuz is a company that produces advanced mobile software running on GPS-enabled smartphones and handheld devices. WhereWuz allows users to record exactly where they have been and query this data for subsequent retrieval based on time or location. WhereWuz was designed and developed to run on handheld devices.

19. I am the co-founder of a medical technology company called Healium. Healium developed advanced wearable and handheld user interface technology to allow physicians to interact more effectively with electronic medical records.

20. I am the co-founder of StratoScientific, a medical technology company that is developing innovative technologies that turns a standard handheld smartphone into a full-featured digital stethoscope, incorporating visualization and machine learning for telemedicine.

21. I designed and developed a large software project for Disney World called xVR that allowed the operational employees of Disney World to utilize a handheld device to view the current and historical status of all of the guests of Disney World within multiple attractions and one of their restaurants. The application could run in a real-time/live mode where it would display data collected from sensors that showed the location and status of all guests within the attraction; the application could also be run in a fast-time/simulated mode. The application was developed on a laptop computer and designed to run on various devices, including laptops, personal computers, smartphones, and tablets. In addition, I investigated the use of notifications for MagicBand.

22. I have worked on multiple user interface projects involving haptics for AT&T, Boeing, Disney, and ObjectSpeed. For AT&T, I designed and developed the entire user interface for AT&T's first two-way pager, including vibratory alerts associated with new messages. For Boeing, I worked on improving the realism of flight simulators, including the fidelity of vibratory alerts associated with their stick shakers. For Disney, I investigated the use of vibrotactile alerting for MagicBand users. For ObjectSpeed, I designed the vibratory alerting associated with notifications.

23. I have worked on many projects that utilized touchscreen interfaces, including projects for ObjectSpeed, WhereWuz, Disney, US ARMY, Healium, and StratoScientific.

24. I have received several awards for my engineering work relating to interface design, computer graphics, and the design of spatial, stereographic, and auditory displays, including a \$10,000 scholarship from the I/ITSEC for advancing the field of interactive computer graphics for flight simulation and a Link Foundation award for furthering the field of flight simulation and virtual interface design. I have also created computer graphic illustrations for several popular book covers and animations for a movie produced by MIRAMAR.

25. My curriculum vitae, Exhibit 2002 provides more information about my educational and professional background.

26. The combination of my education, research, training, and work experience in software development, human factors, user interface design, user interaction design, and human-computer interaction enables me to provide analysis and opinions on the subject matter of this litigation.

II. BASES OF OPINIONS

27. In the course of performing my analysis and forming my opinions, I have reviewed the Petition and its Exhibits 1001–1008 including the materials listed below and the materials I cite within this declaration:

- IPR Petition IPR2024-00556
- U.S. Patent No. 8,749,507 (“the ’507 Patent”) (Ex. 1001)
- Prosecution History of the ’507 Patent. (Ex. 1002)
- Declaration of Jean R. Ward (Ex. 1003)
- US Patent No. 6,590,569 (“Astala”) (Ex. 1005)
- U.S. Patent Pub. No. 2002/0033795 (“Shahoian”) (Ex. 1006)
- U.S. Patent Pub. No. 2002/0057263 (“Keely”) (Ex. 1007)
- U.S. Patent No. 7,256,773 (“Kolmykov-Zotov”) (Ex. 1008)

III. SUMMARY OF OPINIONS

28. The Petition raises three grounds of invalidity. Ground 1 of the Petition alleges that claims 1-18 are rendered obvious by Astala (Ex. 1005) in combination with Shahoian (Ex. 1006). Ground 2 alleges that claims 1, 6-9, 13-14 and 18 are rendered obvious by Keely (Ex. 1007) in combination with Kolmykov-Zotov (Ex. 1008). Ground 3 alleges that claims 2-5, 10-12, and 15-17 are rendered obvious by Keely (Ex. 1007) in combination with Kolmykov-Zotov (Ex. 1008) and Shahoian (Ex. 1006).

29. Based on my analysis of the Petition and the exhibits cited in the Petition, it is my opinion that none of Grounds 1 to 3 render claims 1-18 of the ’507 patent anticipated or obvious.

IV. APPLICABLE LEGAL STANDARDS

A. Ordinary Skill in the Art

30. My opinions in this declaration are based on the understandings of a person of ordinary skill in the art—sometimes referred to as an “ordinary artisan” or by the acronyms “POSITA” or “POSA” (person of ordinary skill in the art)—as of the time of the invention, which I understand to be the earliest priority date (November 26, 2003) of the ’507 Patent. I understand that the person of ordinary skill in the art is a hypothetical person who is presumed to have known the art relevant to the challenged claims of the ’507 Patent at the time of the invention.

31. I understand that, in assessing the level of skill of a person of ordinary skill in the art, one should consider the type of problems encountered in the art, the prior solutions to those problems found in the prior art references, the rapidity with which innovations are made, the sophistication of the technology, the level of education of active workers in the field, and my own experience working with those of skill in the art at the time of the invention. I have considered these factors in reaching my opinion as to the hypothetical POSITA that I set forth below.

32. I understand that the Petitioner has proposed that the level of skill in the art at the time of the ’507 patent is as follows:

A person of ordinary skill in the art (“POSA”) on November 26, 2003 would have a bachelor’s degree in electrical engineering, computer science, or a related field, plus at least two years of

industry or graduate level experience with software engineering, haptics programming, and/or human-computer interaction, including experience with user-interfaces and applications involving touchscreens, touchpads, and related technologies.

Pet. at 7 (citing EX1003, ¶¶ 47-51).

33. In my opinion, the definition of a POSA should be defined as:

A person of ordinary skill in the art would have possessed a bachelor's degree in electrical engineering or computer science (or an equivalent degree), and two years of practical or industry experience in the field of human-computer interaction, including implementation of computer-based systems and software for providing haptic feedback effects to a user. A person could also have qualified as an ordinarily skilled artisan with more formal education and less practical or industry experience, or vice versa.

34. Consistent with either definition, I was at the time of invention, and am, a POSA through my education, research experience and work experience. As of the date of the invention, I was familiar with the types of problems encountered in systems that use haptic feedback and the rapidity at which innovations are made.

B. Claim Construction

35. I understand that Petitioner believes the Board's construction of the term "determining a press if: the pressure is greater than a pressure threshold, the

change in pressure is greater than a change in pressure threshold, and a first interval has elapsed” was wrong. More specifically, Petitioner does not believe that the pressure conditions must “be maintained for the duration of the first interval.” Pet. at 8. For the opinions and analysis I provide below, resolution of this particular question is not necessary. My analysis does not depend on a particular interpretation of when pressure thresholds are met in relation to a time interval and therefore I have not provided any opinions relating to a specific construction of this term.

36. I understand that in interpreting the claims of the ’507 Patent in this IPR according to their plain and ordinary meaning, one must take into consideration the so-called “intrinsic evidence” of the patent consisting of (1) the claim language; (2) the specification; and (3) the prosecution history.

37. I understand that claim terms may be explicitly defined in the patent specification or they may be implicitly defined through consistent usage in the specification. I also understand that the scope of claim terms may be limited by statements in the specification or prosecution history where the applicant unambiguously disavows or disclaims subject matter.

C. Anticipation

38. Counsel has informed me, and I understand, that a showing of anticipation involves a comparison of the construed claims to the alleged prior art and, to anticipate a patent claim, a single prior art reference must disclose each

element of the claimed invention, either expressly or inherently. The prior art reference must also have disclosed each element prior to disclosure of the claimed invention.

39. Further, a party claiming inherency must prove that the alleged inherent element or feature necessarily is present by clear and convincing evidence. The fact that the feature is likely to have existed is not sufficient. It must be shown that the feature was necessarily present in the reference to show inherency.

D. Obviousness

40. Counsel has informed me, and I understand, that an issued patent claim is invalid as obvious if it can be shown that the differences between the patented subject matter 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 having ordinary skill in the art. Relevant considerations include the level of ordinary skill in the art; the scope and content of the prior art; differences between the prior art and the claims at issue; and the objective indicia, or secondary considerations, of non-obviousness.

41. In this regard, I am informed and I understand that the secondary considerations of non-obviousness could include factors such as commercial success, long felt but unresolved needs, the failure of others, skepticism by experts, praise by others, award and accolades, and copying.

42. Counsel has informed me, and I understand, that in order to evaluate the obviousness of any claim of the '507 Patent over a given prior art combination, I should analyze whether the prior art references, included collectively in the combination, disclose each and every element of the allegedly invalid claim as those references are read by the person of ordinary skill in the art at the time of the invention.

43. Counsel has informed me, and I understand, that even where all of the claim limitations are expressly disclosed in the prior art references, there must be some showing that a person of ordinary skill in the art would have been motivated to combine such prior art references, and explanation of how the combination would be achieved, and that there would have been a reasonable expectation of successfully achieving the claimed invention from such combination.

44. Counsel has informed me, and I understand, that absent some additional reasoning, mere routine optimization for a person of ordinary skill in the art to arrive at the claimed invention through the combination of prior art references is insufficient to support a conclusion of obviousness.

45. Counsel has informed me, and I understand, that to rely on a reference it must be analogous prior art. Counsel has informed me and I understand that a reference is considered analogous prior art: (1) if the reference is from the same field of endeavor as the claimed subject matter, or (2) if the reference "is reasonably

pertinent to the particular problem with which the inventor is involved,” even though the reference is not within the field of the inventor’s endeavor.

46. Counsel has informed me, and I understand in considering the obviousness of a claimed invention, one should not view the invention and the prior art with the benefit of hindsight. In an obviousness analysis, one must be aware of the distortion caused by hindsight bias and must be cautious of arguments reliant upon ex post reasoning. Counsel has instructed me, and I understand that when considering obviousness, I should not consider what is known today or what was learned from the invention of the ’507 patent itself. Instead, obviousness is assessed by the person of ordinary skill in the art at the time the invention of the ’507 Patent was made, but without the knowledge of the invention.

47. In this regard, I am informed and I understand that the ’507 Patent may not be used as a guide or roadmap to select, understand, and combine or modify the prior art because such an approach would improperly apply hindsight bias to the obviousness analysis. Also, at a minimum, this approach discounts the value of combining various existing features or principles in the prior art in an inventive way so as to achieve a novel result.

48. Counsel has informed me, and I understand, that obviousness cannot be predicated on what was unknown at the time of the invention, even if the inherency of a certain feature is later established. Counsel has also informed me, and I

understand, that unknown or undisclosed properties of the prior art (such as features in the prior art that the obviousness combination or rationale to combine might rely on, but are not disclosed or taught by the reference) may not be relied upon to provide the rationale for modifying or combining the prior art to reach the claimed subject matter.

49. Counsel has informed me, and I understand, that a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference or would be led in a direction divergent from the path that was taken by the applicant of the '507 Patent.

V. OVERVIEW OF THE '507 PATENT

50. The '507 Patent, filed on April 6, 2012, claims priority to an application from November 26, 2003. It describes techniques for accurately sensing a user's intended input on standard touchpad and touchscreen devices. Unlike other input devices like mice, which primarily respond to movement or button presses, both changes in position and pressure on the touchpad are necessary to discern the user's intent. This is described in Ex. 1001 at 1:46-55. According to the '507 Patent, "a conventional mouse includes a ball or optical sensor for determining changes in position of the mouse, The mouse also includes one or more buttons for performing a control function, such as selecting a graphical representation on a screen. In these systems, a user's intent to make a position change or provide control input is

apparent to the system. In contrast, conventional touchpads combine the position and control functionality in a way that often masks a user's intent to make a positional change or control input . . . Changes in position on the touchpad and in the pressure exerted on the surface of the touchpad must be used to determine the user's intent." Ex. 1001 at 1:39-55. This often results in misinterpretations between intentional touches and accidental contact, as noted in Ex. 1001 at 1:55-60.

51. The limitations of conventional touch devices arise from their method of input detection. As described in the '507 Patent, "[t]ouchpads work by utilizing resistance, capacitance, or membrane switches." Ex. 1001 at 2:55-56. These sensing methods do not directly measure pressure but instead provide what the '507 Patent refers to as "pseudo pressure." Ex. 1001 at 2:54-55. This "pseudo pressure" does not necessarily represent the amount of force actually exerted on the touch-sensitive input device (Ex. 1001 at 3:19-21) because variations in the size of users' fingers or the manner in which they press on the device can alter the readings. Ex. 1001 at 3:40-42 and 3:28-31. "The larger the surface of the conductor used on the touchpad 102, e.g., a user's finger, the larger the change in capacitance per amount of pressure exerted." Ex. 1001 at 3:22-24. Additionally, "[i]f a user presses heavily against the touchpad 102 with a fleshy part of the finger, the amount of the touchpad 102 covered by the finger is greater than when the same part of the finger is touching

lightly.” Ex. 1001 at 3:24-28. “[P]seudo pressure, is also greater when the user presses heavily with a bony part of a finger.” Ex. 1001 at 3:28-31.

52. The ’507 Patent describes a number of factors that affect pseudo pressure measurements:

Variables affecting the ability of a program to determine what a user is attempting to do include the following: the physical difference between users; the different angles at which a user may place their finger while using a touchpad; the variance in pressure between different users and between the same user; the movement of the finger across the touchpad while simultaneously attempting to perform actions on the touchpad.

Ex. 1001 at 1:58-65.

53. The ’507 Patent proposes solutions to the problem of determining intended touches versus accidental or incidental contact with the surface of the touch-sensitive input device. Ex. 1001 at 4:56-63. According to the ’507 Patent, determining whether a user intended a press includes determining whether the pressure associated with the press exceeds a pressure threshold, whether the change in pressure exceeds a change in pressure threshold, and whether a time interval has elapsed. E.g., Ex. 1001 at 10:31-42.

54. The ’507 Patent describes these various thresholds as adaptable to compensate for the different ways different users may touch the device. Ex. 1001 at 5:44-48. Some example adaptable thresholds include: “thresholds for pressure,

pseudo pressure, pseudo-pressure change, velocity and other measures . . . Adaptive thresholds may rely on various parameters including, for example, the length of time the input device has been active, the placement of the [finger] on the surface of the device and the current user of the device.” *Id.* at 5:11-20. These thresholds can be calculated and applied on an ongoing basis, and thresholds may be modified based on the identity of the user. 5:44-48.

55. The ’507 Patent details the use of various time measurements to discern whether a gesture was intentional. It utilizes an initial tick count to measure the duration a finger stays on a screen element. This initial tick count is then incorporated into the gesture recognition algorithm. Ex. 1001 at 6:9-13. Following the start of this tick count, the system performs other checks and sets different thresholds in response. Ex. 1001 at 6:14-15, 34-48; 6:58-7:6.

56. Independent claim 1 is recited below:

1. A method comprising:

[1A] receiving contact data from an input device;

[1B] determining an interaction with a displayed object on a screen based on the contact data;

[1C] responsive to determining the interaction, determining a gesture based on the contact data comprising:

[1D] determining a pressure and a change in pressure based on the contact data, and

[1E] determining a press if:

[1E1] the pressure is greater than a pressure threshold,

[1E2] the change in pressure is greater than a change in pressure threshold, and

[1E3] a first interval has elapsed; and

[1F] responsive to determining the gesture, outputting the haptic effect.

VI. FILE HISTORY OF THE '507 PATENT

57. I have reviewed the file history for the '507 Patent, its parent, and the Final Written Decisions for IPR2017-01310 and IPR2017-01777. I have provided a summary of relevant parts of those proceedings below.

58. The '507 Patent was filed as U.S. Pat. App. S/N 13/41,108 on April 6, 2012. It claims priority to a parent application, U.S. Pat. App. S/N 10/723,778, filed on November 26, 2003.

59. On July 19, 2012, the Patent Office rejected all claims in an Office Action. The rejections were as follows:

- a. Original Claims 10-15 were rejected pursuant to 35 U.S.C. § 101, and all claims based on 35 U.S.C. § 112 because “the specification does not

disclose how to determine a haptic effect based on the received contact data, therefore the application does not provide support for ‘receiving contact data from an input device; and determining whether to output a haptic effect based on the contact data’” Ex. 1002 at 53-54.

- b. Additionally, claims were rejected pursuant to 35 U.S.C. § 102(b) as anticipated by the Fujita reference and based on Fujita combined with Hsu. Ex. 1002 at 56.

60. In response, the applicants amended the claims to distinguish them from prior art. An example of the amendments is shown below with respect to claim 1:

1. (Currently Amended) A method comprising:
receiving contact data from an input device;
determining an intent based on the contact data and a displayed object on a screen;
determining whether to output a haptic effect based on the intent-contact data; and
responsive to determining to output the haptic effect based on the intent, outputting the
haptic effect ~~based on the contact data~~.

Ex. 1002 at 67. Applicants argued that Fujita did not disclose “determining an intent based on the contact data and a displayed object on the screen.” Ex. 1002 at 73.

61. On December 11, 2012, the Patent Office again rejected claims based on Section 112, arguing that the specification did not disclose “determin[ing] a haptic effect based on the intent and to output the haptic effect as a result thereof.”

The Office Action also rejected the claims over prior art based on the same Fujita reference and combination with Fujita.

62. On May 12, 2013, the applicants submitted amended claims in response to the December 11, 2012 Office Action. Claim 1 is again shown as exemplary below:

1. (Currently Amended) A method comprising:
receiving contact data from an input device;
determining an interaction with a displayed object on a screen based on the contact data;
responsive to determining the interaction, determining a gesture based on the contact data
~~an intent-based comprising:~~
determining a pressure and a change in pressure based on the contact data, and
determining a press if:
the pressure is greater than a pressure threshold,
the change in pressure is greater than a change in pressure threshold, and
a first interval has elapsed; and ~~and a displayed object on a screen;~~
~~determining whether to output a haptic effect based on the intent; and~~
responsive to determining the gesture ~~to output the haptic effect based on the intent,~~
outputting the haptic effect.

63. After filing a terminal disclaimer, these amended claims were allowed.

64. During prosecution of the parent application, U.S. Pat. App. SN 10/723,778, the same Astala reference was considered by the Patent Office. In that prosecution, the examiner had asserted Gilliespie in combination with Astala

rendered the claims obvious. Exhibit 2002 (U.S. Patent Application SN 10/723,778 File History, Appeal 2009-015440) at 5. Notably, the claims at issue there contained the same limitation, “the change in pressure is greater than a change in pressure threshold,” as found in the independent claims of the ’507 Patent. *Id.* In relevant part, the examiner cited the following disclosure from Gillespie as teaching this claim limitation: “To perform the gesture, the finger is first brought near enough to cause cursor motion without causing a virtual button press. Next, the finger pressure increases past the threshold ZpushDown, causing the virtual button to be pressed” (Gillespie at 49:8-12). Ex. 2002 (U.S. Patent Application SN 10/723,778 File History, Office Action dated March 6, 2008) at 5.

65. Applicants appealed the rejection to the Board of Patent Appeals and Interferences. The BPAI reversed the examiner’s rejection stating the following:

Gillespie teaches that as a finger pressure increases past a threshold, a virtual button is pressed. Gillespie 49:12-13. The Examiner found that this “increase” in pressure is the same as a change in pressure. Ans. 9. However, this description merely teaches comparing a pressure value against a threshold value. As argued by Appellants, this is not the same as evaluating a change in pressure against a change in pressure threshold.

Ex. 2002 (U.S. Patent Application SN 10/723,778 File History, Appeal 2009-015440) at 5.

66. The '507 Patent was previously challenged by Apple, Inc. in *Inter Partes* Review No. IPR2016-01777. The Board denied institution. The Petition included two grounds: (1) Toda in combination with Shahoian, and (2) Morimura in combination with Shahoian. Ex. 1002 at 456. The Board found that the pressure comparisons in the independent claims must occur during the first interval of time:

In other words, in order to determine that a user is pressing, the following three conditions must be met: (1) the pressure exceeds the pressure threshold; (2) the change in pressure is greater than the change threshold; and (3) the first interval has elapsed. In the process described in Figure 3, the first two conditions must be maintained for the duration of the first interval, i.e., the user must continue to touch for the duration of the first interval, before a press is recognized.

Ex. 1002 at 454. The Board found neither combination met this language and denied institution. Ex. 1002 at 462-463.

67. The '507 Patent was subsequently challenged in IPR2017-01310 by the same petitioner as for the -01777 matter, and uses the same art and arguments used in Ground 1 of the present Petition. However, the Board exercised its discretion to deny institution. Ex. 1026 at 14.

VII. ASTALA-SHAHOIAN DOES NOT TEACH THE CHALLENGED CLAIMS OF THE '507 PATENT

A. The Astala Reference (Ex. 1005)

68. Titled “Touch Screen Drag and Drop Input Technique,” the Astala reference describes detecting drag-and-drop gestures traditionally performed by a

mouse but on a touch-sensitive input device, to perform actions such as moving a file into a directory. Ex. 1005 at Abst. Unlike the '507 Patent, Astala does not directly address determining whether a user pressed the surface of a touch sensitive device or is the contact related to handling or carrying the device. See Ex. 1001 at 1:39-55; 10:38-42 (Claim 1: “determining a press if . . .”). Astala is focused on distinguishing between a drag versus a subsequent touch. Ex. 1005 at 2:2-8.

69. Astala describes a conventional way of distinguishing between two mouse-type input actions by measuring time. “For example, pressing a selection point for a first determined time period may correspond to single clicking the left button on a mouse. On the other hand, pressing a selection point for a second predetermined period of time, which is longer than the first predetermined period of time, may correspond to double-clicking the left button on the mouse.” Ex. 1005 at 2:32-38.

70. Astala assumes an initial touch has occurred, and does not suggest a method of determining whether a press has occurred. For example, in describing Fig. 6, Astala merely “detects” a touch input and does not explain anything further regarding how that initial touch was detected: “The process begins at step 700. At step 702, a touch screen input is detected. That is, the touch of an object, such as a finger or pointed stylus, on the touch screen 70 is detected.” All the other tests in Astala are used to discriminate between various mouse actions, e.g., whether the

touch is a selection of a file, the dragging of the file to a different location on the GUI, or the dropping of the file. *See* Ex. 1005 at 9:15-65.

B. The Shahoian Reference (Ex. 1006)

71. U.S. Patent Application Publication No. 2002/0033795 by Shahoian et al. describes a computer system equipped with a touch input device and an actuator. This system generates haptic feedback following user interactions on the touch input device (Ex. 1006, [0008]). The touch input device detects the proximity of an object and relays coordinate data to a processor ([0041]). Additionally, a local microprocessor within the system processes input signals from the sensors and directs output signals to actuators based on commands from a host processor ([0066]). The actuator then delivers haptic feedback to the user, which is activated upon the detection of user contact on the touch input device ([0077]).

C. Astala-Shahoian Does Not Disclose “Determining a Press” as Recited in Claim 1 of the ’507 Patent

72. I have reviewed the Petition and Declaration of Petitioner’s expert, Mr. Jean Ward (Ex. 1003) regarding how Petitioner alleges that Astala discloses the criteria recited by the independent claims of the ’507 Patent to determine whether a press has occurred. As I described above, the independent claims recite limitations for making this determination. An exemplary claim is claim 1, reciting the following:

[1E] determining a press if:

[1E1] the pressure is greater than a pressure threshold,

[1E2] the change in pressure is greater than a change in pressure threshold, and

[1E3] a first interval has elapsed; and

Through this language, the claim of the '507 Patent determines whether a press has occurred. As explained in more detail below, Astala uses instant pressure (as opposed to a change in pressure) and time to discriminate between various mouse gestures but assumes that the initial touch occurred and the event was not as a result of handling or carrying the device. By my review, Astala does not appear to disclose determining whether a press has occurred using a change in pressure or a change in pressure threshold as required by the '507 Patent claims, e.g., “determining a press if”

73. As described by the '507 Patent, determining whether a press has occurred on the device is complicated by a number of factors, including the sensing technology (resistive, capacitive) and physical differences between users (finger shape). Ex. 1001 at 2:54-3:50. As such, the '507 Patent proposes using three criteria for “determining a press.” Ex. 1001 at 10:38-43.

74. In contrast, the Astala reference teaches only two factors: the instant pressure (as opposed to a change in pressures) and duration of contact to be used to determine which mouse input is being simulated by a user's gesture on the touch-

sensitive device. Ex. 1005 at 2:11-14, 2:32-38, Figs. 1-2; 3:30-34. This appears to have been a traditional technique for simulating mouse inputs such as drag and drop operations in touch-sensitive systems before the '507 Patent.

75. Astala discloses a three-step process for determining a “drag and drop” gesture: (1) selecting a user interface element such as an icon by applying pressure to it; (2) decreasing the pressure and moving the stylus across the screen in a dragging motion; and (3) applying pressure again at the end of the drag motion to “drop” the user interface element. Ex. 1005 at 9:3-65.

76. Astala does not appear to disclose “determining a press” using the criteria recited in the claims of the '507 Patent. For example, Astala does not disclose “determining a press” based on “the change in pressure but rather appears to only use the instant pressure and duration of a first and second touch. Ex. 1005 at 9:27-30 (“At step 710, a determination is made that the value of the pressure z of touch input 732 is greater than a predetermined value Z_a over the period of time.”), 9:50-53 (“At step 716, a second touch input is detected by determining that the value of the pressure z of the object on the touch screen 70 is greater than a predetermined pressure value z_B (which may be equal to z_A) over a period of time.”).

77. These above two touch inputs are the only inputs described in Astala for determining a touch input— the instant pressure and time. Ex.1005 at 9:27-30 (first touch input), 9:50-53 (second touch input), cl. 14 (two touch inputs described

in Claim 14). Astala assumes presses occurred and does not use the three-part test the '507 Patent claims for “determining a press.”

78. Additionally, Astala only checks for a decrease in pressure after the first touch input has been detected. Astala does not use a detected decrease in pressure to “determine a press.” Astala uses decreasing pressure to indicate the user is initiating a “dragging” sequence but not the selection of an item (the initial press). Ex. 1005 at Fig. 6(a) (step 712). The decrease in pressure indicates to the system that the user wants the icon to be “dragged across the face of the touch screen 70 at the reduced pressure” (step 714). Ex. 1103 at 9:40-42, Fig. 6(a). As discussed above, Astala checks for “reduced pressure” only after the user has already selected a display element (icon), i.e., after the initial press has occurred.

VIII. KEELY + KOLMYKO-ZOTOV DOES NOT TEACH THE CHALLENGED CLAIMS OF THE '507 PATENT

A. The Keely Reference (Ex. 1007)

79. The Keely reference describes simulating mouse gestures on touch-sensitive input devices such as trackpads or touchscreens used with a stylus. Ex. 1007 at Abst., ¶ 2, ¶ 4. “The present invention is directed generally to apparatus and methods for simulating various gestures of a pointing device with multiple switches, such as a two-button mouse in a computer system.” ¶ 2. Keely describes the problems with simulating mouse gestures on a touch-sensitive input device as, “[u]sing the tip of the stylus-type device, there is presently no convenient way to

simulate or distinguish between, for example, a right click as opposed to a left click as interpreted by the operating system.” Ex. 1007 at ¶ 5.

80. Keely describes simulating mouse clicks as follows: “a left-click of a mouse may be simulated, e.g., where the user holds the stylus down on the touch-sensitive display surface without substantial movement and then removes the stylus from the display surface before the expiration of a threshold amount of time. A right click of a mouse may be simulated, e.g., where a user waits until at least the threshold amount of time before removing the stylus. Where the stylus is moved along the display surface during certain stylus gestures, left or right dragging may thereby be simulated.” Ex. 1007 at ¶¶ 8.

81. The Keely reference is focused on the simulation of mouse functions and, as such, does not use criteria such as that recited in limitations 1E1-1E3 of claim 1 of the ’507 Patent. For example, Keely discusses using lack of movement of the stylus, and the amount of time the stylus maintains contact with the surface of the device to discriminate between a simulated left click versus simulated right click, a selection gesture versus a drag operation. E.g., Ex. 1007 at ¶ 23 (drag example), ¶ 24 (left click example, ¶ 25 (right click example). Keely, however, does not disclose using pressure, change in pressure, or time information to determine whether a press has occurred. In fact, Keely never mentions “pressure” or “change in pressure” at all. Rather, Keely only describes “the user may touch the stylus or other user similar

user pointing device to the display surface 202, an action referred to herein as ‘placing the stylus down’ (step 301).” Ex. 1007 at ¶ 23. Keely describes touch-sensitive devices as “electromagnetic pen digitizers” and “optical digitizers,” which detect contact and proximity using different mechanisms other than sensing pressure. Additionally, Keely mentions a “touch-sensitive display” that determines “proximity” of the “tip of the stylus” but never mentions whether these types of displays use “pressure” or “change in pressure” to determine a press. Ex. 1007 at ¶ 21.

B. Kolmykov-Zotov Reference (Ex. 1008)

82. The Kolmykov-Zotov reference describes simulating left and right mouse click actions when using a pen-based touch-sensitive system similar to Keely: “This invention generally relates to systems, methods, and computer-readable media for detecting a dwell gesture made using an electronic pen in a pen-based computing system and determine whether the gesture is intended to constitute a ‘press-and-hold’ action. A ‘press-and-hold’ action, in at least some pen-based computing systems, may be used to activate and/or access various functions of the computer operating systems, e.g., the functions of a conventional right mouse click.” Ex. 1008 at 1:7-15.

83. Kolmykov-Zotov suggests “tapping” as a left mouse click (Ex. 1008 at 2:7-10) and “press-and-hold” as a right mouse click (*id.* at 2:29-39): “A press-and-

hold action, however, also can be difficult for some users to perform because it can be difficult, for at least some, to hold a pen perfectly steady for a predetermined time period. . . If at any time during the press-and-hold determination time, the pen tip 10 strays outside of the predetermined area 14, the gesture is determined to not constitute a press-and-hold.” Ex. 1008 at 2:40-57.

84. Because users have problems holding the pen steady enough to distinguish between a dwell and a drag operation, the Kolmykov-Zotov reference suggests a “pen-steadiness factor” and proposes a “steadiness parameter measurement” as a solution. Ex. 1008 at 11:1-23. Importantly, pen-steadiness is determined during the “pen-down” event and does not make any evaluation of pen steadiness during the initial pen-down action. Ex. 1008 at 11:6-11. “If a press-and-hold action is intended, typically the pen tip will not move much while the user is attempting to activate press-and-hold processing, although some amount of drift in the pen tip location can be expected, as some users may not be able to hold a pen perfectly still for an extended time period.” Ex. 1008 at 11:34-39.

85. Kolmykov-Zotov described the proposed steadiness parameter as follows: “The ‘steadiness factor,’ or ‘S’ in this example simply constitutes the number or consecutive measurements in which the X and Y coordinates of the pen tip location did not change from the previous measurement.” Ex. 1008 at 11:58-61.

86. Kolmykov-Zotov describes using a number of different measurements to discriminate between various gestures, such as selection or drag, by examining the “hold” portion of a press-and-hold event. In contrast to the ’507 Patent, Kolmykov-Zotov does not disclose how to determine whether a press occurs; it assumes one has happened using some sort of unexplained “contact” or “proximity” detection. E.g., Ex. 1008 at 13:58-65 (“As the procedure starts, (S500), system and methods according to this example of the present invention determine whether a ‘pen-down’ event is occurring S502 (e.g., whether a pen has contacted or come proximate to the digitizer screen surface)”). Like Keely, Kolmykov-Zotov is directed to simulating various mouse actions such as left- or right-clicks, single- or double-clicks, or selection versus drag-and-drop actions when using a pen-style input device and, as such, is not teaching how to determine if a press happened, as Kolmykov-Zotov is concerned with what happens after the press event.

C. Keely combined with Kolmykov-Zotov Does Not Disclose “Determining a Press” as Recited in the Independent Claims of the ’507 Patent

87. I have reviewed the Petition and Declaration of Petitioner’s expert, Mr. Jean Ward (Ex. 1003), regarding how Petitioner alleges that Keely and Kolmykov-Zotov disclose the criteria recited by the independent claims of the ’507 Patent to determine whether a press has occurred.

88. As I discussed above in connection with these two references, both Keely and Kolmykov-Zotov are directed to simulating actions users normally perform with a conventional mouse-type pointing device. Ex. 1007 at Abst. (“A method and apparatus for simulating at least one gesture of a pointing device such as a mouse. A left click, right click, left drag, right drag, and/or mouse movement may be simulated using a stylus in conjunction with a touch-sensitive display surface.”); Ex. 1008 at Abst. (“System, methods, and computer-readable media are used to determine whether specific electronic pen gestures with respect to pen-based computing systems should be processed as “press-and-hold” gestures (e.g., to activate right mouse button click actions).” These two references discuss conventional techniques for determining whether a user’s gesture with a pointing device such as a stylus or finger indicates a type of mouse gesture such as a left-click, right-click, or a drag. Ex. 1007 at ¶ 8; Ex. 1008 at 5:10-14. The references achieve this by determining whether the position of the stylus on the surface of the touch device has moved (so-called steadiness parameter in Kolmykov-Zotov, Ex. 1008 at 11:6-45), whether a certain amount of time has passed, or “stroke size” (12:33-54). *Id.*

89. As I discussed above, the 507 Patent claims recited three criteria that must be met to determine whether the user pressed the touch-sensitive device or

whether the user pressed the touch-sensitive device. Ex. 1001 at Abst., 1:46-54, 2:48-3:21.

90. The portions of Kolmykov-Zotov cited by the petition do not disclose “determining a press.” These sections describe determining whether a “press-and-hold” event has occurred by evaluating the “hold” portion and assumes that the press has already occurred. Ex. 1008 at 5:11-14. For example, in describing the press-and-hold determination, Kolmykov-Zotov describes a “pen-down event,” but does not describe how that event is detected. For example, in Fig. 7, Kolmykov-Zotov shows a decision box (S502) labeled “Pen-Down Event Occurring?” but does not describe how that event is determined. The portion of the Kolmykov-Zotov that describes step S502 does not mention pressure, pressure change, or time at all but only identifies “contact” or “proximity” to the touch surface: “As the procedure starts (S500), systems and methods according to this example of the invention determine whether a ‘pen-down’ event is occurring S502 (e.g., whether a pen has contacted or come proximate to the digitizer screen surface).” Ex. 1008 at 13:58-14:10. Kolmykov-Zotov expressly defines a “Pen-Down Event” as follows:

An event that is initiated at the time a pen approaches proximate to, makes contact with, and/or otherwise interacts with a digitizer. Typically, a pen-down event will end at the time the pen leaves the digitizer surface, moves a distance away from the surface, and/or otherwise stops interacting

with the digitizer (e.g., the digitizer may no longer sense the presence of the pen (also called a “pen-up event” in this specification). Because some pens are “active,” a pen-down event may begin before the pen contacts the digitizer surface (i.e., the digitizer may sense the presence of the pen as it approaches the digitizer surface and as it remains proximate to the digitizer surface). Additionally, a pen-down event may continue after the pen actually leaves the digitizer surface (i.e., the digitizer may sense the presence of the pen after it leaves the digitizer surface, while it remains in proximity to the digitizer surface). In some instances or some systems, a pen-down event may require actual physical contact between the pen and the digitizer surface.

Ex. 1008 at 4:59-5:10.

91. It is notable that Kolmykov-Zotov discusses the use of a “digitizer” that can sense the “presence of the pen.” Kolmykov-Zotov discloses the use of an “electromagnetic pen digitizer” or “optical digitizer” and does not disclose that these technologies can sense pressure. It appears that these technologies may have determined contact or proximity of the stylus device without using pressure. In any event, Kolmykov-Zotov doesn’t disclose pressure or change in pressure as being used to determine the pen-down event. Ex. 1008 at 9:28-33. As such, it is my opinion that the Petition does not disclose “determining a press . . .” as required by the independent claims of the ’507 Patent.

I declare under penalty of perjury that the foregoing is true and correct. I acknowledge that willful false statements and the like are punishable by fine and/or imprisonment, that all statements made of my own knowledge are true, and that all statements made on information and belief are believed to be true.

Executed May 15, 2024, in Shoreline, Washington.

By: 
Craig Rosenberg