

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VALVE CORPORATION,
Petitioner,

v.

IMMERSION CORPORATION,
Patent Owner.

Case No. TBD

Patent No. 8,749,507

**DECLARATION OF JEAN RENARD WARD
IN SUPPORT OF PETITION FOR
INTER PARTES REVIEW OF U.S. PATENT NO. 8,749,507**

Valve Exhibit 1003 Valve v. Immersion
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I, Jean Renard Ward, declare:

I. INTRODUCTION

A. Engagement

1. I have been retained on behalf of Valve Corporation (“Valve” or “Petitioner”) as an independent technical expert in the above-captioned IPR proceeding (“the IPR”). This document provides certain of my opinions concerning the patentability of claims in U.S. Patent No. 8,749,507 (EX1001, “the ’507 patent”), specifically claims 1-18 (the “Challenged Claims”). I make this Declaration in support of Valve’s Petition in the IPR.

2. For my work as an expert in this matter, I am being compensated for my services at my standard rate, plus actual expenses. My hourly compensation is based solely on the amount of time that I devote to activity related to this case and is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other personal or financial stake or interest in the outcome of the present proceeding. I do not have any expectation or promise of additional business with the Petitioner in exchange for the positions explained herein. My compensation is not dependent in any way upon the outcome of the *inter partes* review of the ’507 patent, nor on the outcome of any related litigation.

3. I make this Declaration based on my personal knowledge, including my education, training, research, and professional experience. I expect to make myself available for deposition in this matter. This Declaration is based on information currently available to me. I reserve the right to continue my investigation and study, which may include a review of documents and information that may be produced, as well as a review of deposition testimony from depositions for which transcripts are not yet available or that may yet have taken place in this matter. Therefore, I expressly reserve the right to expand or modify my opinions as my investigation and study continue, and to supplement my opinions in response to any additional information that becomes available to me, any matters raised by Immersion or the Patent Office, and/or other opinions provided by Immersion's experts, or in light of any relevant orders by an appropriate authoritative body.

B. Background and Qualifications

4. My curriculum vitae ("CV") detailing my educational background, professional experience, and list of publications is provided as Exhibit 1004. Some of my background and experience that qualifies me to offer the opinions in this Declaration as an expert in the technical issues in this case are as follows.

5. I received an SBEE degree (combined program in Electrical Engineering and Computer Science) from the Massachusetts Institute of Technology as a member of the class of 1973.

6. I am a practicing engineer. For a number of years, I have primarily been doing consulting projects and contract development work under the business name of Rueters-Ward Services. I have worked professionally in the general field of software engineering and relevant hardware for approximately 50 years, primarily in pen/touch computing and related technologies, applications of public-key cryptography, and web development. In recent years, my major projects have concerned pen/touch computing: also referred to simply as pen computing or touch computing. Pen computing refers to computing that makes use of a pen, stylus (including a finger), or other touch-sensitive tool, and a tablet or touchscreen. This is contrasted with computing that makes use of input devices such as a physical keyboard or a physical mouse.

7. During and immediately after my university studies, from 1973 to 1977, I worked at Data General Corporation on compilers and source-level emulation tools for a number of programming languages.

8. For the next approximately 17 years, I worked primarily on many aspects of pen computing, both software and hardware, at a number of development companies. From 1977 to 1987, I was heavily involved in the development of base technology and three generations of pen-computing products of Pencept Inc., a pioneering commercial company for pen-computing technology that I co-founded. Pencept filed for and was granted a number of patents for my

work during that time. My contributions included developing novel techniques for gesture and handwriting recognition, new paradigms for pen- and stylus-based user interfaces, two generations of an applicative computer language for gesture and handwriting recognition, and engineering solutions to problems with touchscreens and digitizing tablets.

9. While at Pencept, I participated in the re-engineering of off-the-shelf commercial tablets that detected touch from an electronic stylus; the engineering evaluation of off-the-shelf tablet technologies, including at least one having transparent touchscreen sensors that responded both to finger touches and to touch by a specialized stylus; and the design of a custom electronic tablet responsive to an electromagnetic stylus.

10. During that time and in the years following, I authored or co-authored a number of peer-reviewed articles concerning pen-computing, generative models for handwriting variability, and digitizer/touchscreen technologies and error behaviors. These articles are listed in my CV, which is provided at EX1004.

11. I was an invited speaker at an international research conference on handwriting recognition in Montreal, Canada. I also made presentations concerning gesture input for Pencept and its competitors to the Graphical Kernel System (GKS) and Programmer's Hierarchical Interactive Graphics System (PHIGS) standardization committees for computer graphics systems, and organized and

chaired a panel discussion concerning real-world problems of handwriting recognition technology at another academic conference. I was also invited to visit and speak to the research groups in pen computing at a number of major computer technology companies, including IBM in the United States and the AEG-Telefunken Research Center in Germany.

12. In 1989, I joined the Freestyle development group at Wang Laboratories as a Software Architect. Freestyle was a direct-manipulation pen-computing system that integrated stylus- and voice-input and annotations. During my tenure there, Wang filed for and later was granted U.S. and international patents for my work on simulating virtual keyboard and mouse input from stylus user input on a touch-sensitive tablet. In addition, I was the lead engineer for Wang on a joint hardware project with for a low-power, touchscreen technology using a capacitive stylus for a line of highly-portable handheld computers.

13. In 1991, at the end of Freestyle development, I joined Slate Corporation, a company formed to develop pen-centric applications for both the new Pen-Point (GO Corporation) and Pen Windows (Microsoft) operating systems for tablet and touchscreen computers. During that time, I was Slate's representative and the co-chair of a number of meetings involving GO Corporation, Microsoft, and other companies concerning the JOT cross-platform storage-level standard for compressed electronic ink data, and was the primary author of the first draft for

that standard. I made presentations regarding the history of pen computing to technical groups interested in the topic. I also conducted tutorials on touchscreen/pen interfaces and technology at two annual meetings of the Society for Information Display, the leading engineering society for display technologies.

14. From approximately 1993 onward, my professional work has been primarily as an independent developer and consultant in the areas of applications of public-key cryptography and computer security, in addition to pen/touch computing.

15. Since the late 1980s, I have maintained an extensive library of references relating to pen-computing, touchscreens, and related technical subjects. I have continually published a working annotated bibliography of these references on the internet for more than 20 years.

16. In about 1985 to 1987, I was preparing an article for publication in the IEEE journal "Systems Man and Cybernetics," which included a substantial review of problems presented by handwriting variability in the field of handwriting and gesture recognition using touch screens and tablets. About this same time, I also prepared a tutorial article for the IEEE publication Computer Graphics and Applications on some of the broad variety of touch screen and tablet technologies and an introduction to their technical limitations. In the course of preparing those articles, I began keeping a bibliography in electronic form, with annotations, to

assist in referencing the articles. I also spent several days, for each article, doing technical research in the MIT engineering library – the Internet did not exist at that time. At the end of those projects, I had an electronic database of several hundred references with annotations. To assist me in keeping up to date and preparing possible future presentations or articles (such as a presentation I gave a few years later on the history of pen and touchscreen computing), I decided to add other references I collected in my professional work, and to continue adding references of interest.

17. When the Internet became available, a number of technical people in computer-related fields began publishing their technical materials on the Internet as a service to each other. As a service to those with an interest in the field, I also began posting my bibliography online in about the early 1990s. In more recent years, because of my professional work and because of the relation to applications, the bibliography also contains references related to computer security, cryptography, and DRM digital rights management.

18. The bibliography is available on my professional web site at www.ruetersward.com, and on a number of mirrors. The annotations appearing in the bibliography were written by me to provide a short statement/reminder of what I thought was interesting and/or relevant about each reference at the time. It has been my usual practice to update the bibliography at irregular periods several times

a year or more often, as I had time. The bibliography has been cited in refereed technical papers by others, by the USPTO, and in academic degree theses such as at M.I.T.

19. I obtained copies of the many of the publications and references in the course of the projects I have worked on throughout my career, others through my independent reading and study. I keep hard or electronic copies of the majority of the references as part of my personal records. I have read the references in my bibliography because of my professional work, my intellectual interests, to keep up to date with developments in pen-computing and other fields, and/or to record the history of the field.

20. I also have a personal collection of touch screen and touch tablet devices that I have acquired over the years. These include equipment from past projects I have worked on, as well as other items I considered of note, including a very early model portable phone with an integrated touch screen and display, a very early calculator that used an electromechanical touchpad for handwritten entry of calculations, at least one model of a very early PDA with an integrated touch screen and display and handwriting recognition, and various models from the early 1990's of portable touchscreen computers running one or another complete touchscreen operating systems, and devices such as smartphones with haptic/vibrotactile feedback.

21. A copy of my curriculum vitae with descriptions of my education, professional achievements, and qualifications is attached to this declaration as EX1004. It includes a listing of relevant industry experience, publications, presentations, and prior testimony.

C. Bases of My Opinions and Materials Considered

22. I have reviewed the '507 patent, its prosecution history, and the prior art and other documents and materials cited herein. For ease of reference, the full list of documents that I have considered in forming the opinions provided below is included in Appendix A. I have also considered the documents cited and referenced herein, even if not included in Appendix A. Each of these materials is a type of document that experts in my field would have reasonably relied upon when forming their opinions and would have had access to either through the applicable patent office and/or well-known libraries, conferences, publications, organizations, and websites in the field as further discussed herein.

23. My opinions in this Declaration are based on my review of these documents, as well as upon my education, training, research, knowledge, and experience. When developing the opinions set forth in this declaration, unless specifically stated otherwise, I assumed the point of view of a person having ordinary skill in the art ("POSITA"), as described in Section III below.

24. The opinions and comments formulated during this assessment are based on observations and information available at the time of this investigation. I reserve the right to amend if further information is made available to me.

D. My Understanding of Patent Law

25. I am not an attorney. My knowledge of the law is that of a lay person. I offer no opinions on the law. Unless noted otherwise, wherever I may use a term that has some special meaning in a legal context, I imply no such special legal meaning should be assigned to use of that term. Further, as I have no special expertise in the law, I am likely unaware whether a term even might or might not have some special legal meaning, nor what any such meaning might be.

26. In developing my opinions, Petitioner's attorneys ("Counsel" for short) discussed various relevant legal principles with me. When I have thought that my understanding could be based inadvertently in some part on my experience elsewhere, I have sought to confirm or correct that understanding with Counsel. I understood these principles when they were explained to me and have relied upon such legal principles, as explained to me, in the course of forming the opinions set forth in this declaration. I summarize my understandings in this respect as follows:

27. I understand that “inter partes review” (IPR) is a proceeding before the United States Patent & Trademark Office for evaluating the patentability of an issued patent’s claims based on prior-art patents and printed publications.

28. I understand that, in this proceeding, Petitioner has the burden of proving that the challenged claims of the ’507 patent are unpatentable by a preponderance of the evidence. I understand that “preponderance of the evidence” means that a fact or conclusion is more likely true than not true. I have applied this burden in my analysis and in deriving the opinions in this declaration.

29. I understand that, in IPR proceedings, claim terms in a patent are “construed” or given their ordinary and customary meaning as understood by a person of ordinary skill in the art (“POSITA”) in the context of the entire patent and the prosecution history pertaining to the patent. If the specification or prosecution history provides a special definition for a claim term that differs from the meaning the term would otherwise possess, that special definition controls. I have applied these standards in my analysis and in deriving the opinions in this declaration.

30. I understand that a patent or other publication must first qualify as prior art before it can be used to render a patent claim anticipated or obvious. I understand that whether or not a particular reference qualifies as prior art is a legal

determination: as I am not a lawyer, I have relied on Counsel to inform me as to whether a reference qualifies as prior art.

31. I understand that determining whether a particular patent or printed publication constitutes prior art to a challenged patent claim can require determining the effective filing date (also known as the priority date) to which the challenged claim is entitled. I understand that for a patent claim to be entitled to the benefit of the filing date of an earlier application to which the patent claims priority, the earlier application must have described the claimed invention in sufficient detail to convey with reasonable clarity to the POSITA that the inventor had possession of the claimed invention as of the earlier application's filing date. I understand that a disclosure that merely renders the claimed invention obvious is not sufficient written description for the claim to be entitled to the benefit of the filing date of the application containing that disclosure.

32. I understand that for an invention claimed in a patent to be patentable, it must be, among other things, new (novel—i.e., not anticipated) and not obvious from the prior art. My understanding of these two legal standards is set forth below.

1. Legal Standard for Anticipation

33. I understand that for a patent claim to be “anticipated” by the prior art (and therefore not novel), each and every limitation of the claim must be found,

expressly or inherently, in a single prior-art reference. I understand that a claim limitation is disclosed for the purpose of anticipation if a POSITA would have understood the reference to disclose the limitation based on inferences that a POSITA would reasonably be expected to draw from the explicit teachings in the reference when read in light of the POSITA's knowledge and experience.

34. I understand that a claim limitation is inherent in a prior art reference if that limitation is necessarily present when practicing the teachings of the reference, regardless of whether a person of ordinary skill recognized the presence of that limitation in the prior art

2. Legal Standards of Obviousness

35. I understand that if a patent claim is not anticipated, a patent claim may be invalid if it would have been obvious in view of a single prior-art reference or a combination of prior-art references.

36. I understand that a patent claim is obvious if the differences between the subject matter of the claim and the prior art are such that the subject matter as a whole would have been obvious to a person of ordinary skill in the relevant field at the time the invention was made. Specifically, I understand that the obviousness question involves a consideration of:

- the scope and content of the prior art;
- the differences between the prior art and the claims at issue;

- the knowledge of a person of ordinary skill in the pertinent art; and
- if present, objective factors indicative of non-obviousness, such as commercial success, long-felt but unresolved needs, failure of others, etc. sometimes referred to as “secondary indicia” or “secondary considerations.”

37. To my knowledge, Patent Owner has not asserted any secondary considerations with respect to the '507 patent.

38. I understand that in order for a claimed invention to be considered obvious, a POSITA must have had a reason for combining teachings from multiple prior-art references (or for altering a single prior-art reference, in the case of obviousness in view of a single reference) in the fashion proposed.

39. I further understand that in determining whether a prior-art reference would have been combined with other prior art or with other information within the knowledge of a POSITA, the following are examples of approaches and rationales that may be considered:

- combining prior-art elements according to known methods to yield predictable results;
- simple substitution of one known element for another to obtain predictable results;
- use of a known technique to improve similar devices in the same way;

- applying a known technique to a known device ready for improvement to yield predictable results;
- applying a technique or approach that would have been “obvious to try,” i.e., choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success.
- known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;
- some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior-art reference or to combine prior-art reference teachings to arrive at the claimed invention. I understand that this teaching, suggestion or motivation may come from a prior-art reference or from the knowledge or common sense of one of ordinary skill in the art.

40. I understand that a universal motivation known in a particular field to improve technology can provide a motivation to combine prior art references even absent any hint or suggestion in the references themselves. I also understand that obviousness is determined in light of all the facts and that a given course of action often has simultaneous advantages and disadvantages, and that this does not

necessarily obviate the existence of a motivation to combine teachings from multiple references.

41. I understand that for a single reference or a combination of references to render the claimed invention obvious, a POSITA must have been able to arrive at the claimed invention by modifying, implementing, or combining the teachings of the applied references.

42. My understanding of any other legal principles is discussed where relevant in my declaration.

II. DESCRIPTION OF THE RELEVANT FIELD AND THE RELEVANT TIME FRAME

43. I have reviewed the '507 patent (EX1001) and its prosecution history (EX1002).

44. I understand that the '507 patent issued from U.S. Patent Application No. 13/441,108, filed April 6, 2012 as a continuation of Application No. 10/723,778 ("778-App"), filed November 26, 2003 (EX1001, field 63), which issued as U.S. Patent No. 8,164,573 (EX1020, "'573 patent") on April 24, 2012. I also reviewed the prosecution history for the '573 patent (EX1021).

45. I have been instructed by Counsel to assume the relevant timeframe for my analysis of the prior art in this Declaration is on or before November 26, 2003. I have used that point of view in forming my opinions below.

46. Based on my review of the '507 patent and its file history, I believe that the relevant general fields for the purposes of the '507 patent are graphical user interfaces, touch-input devices including touchpads, computer systems using touch-sensitive position input devices like pen computing systems, and haptic feedback to touch-input devices.

III. PERSON HAVING ORDINARY SKILL IN THE ART

47. I understand that the novelty of a patent claim is based on the point of view of a Person of Ordinary Skill in the Art ("POSITA"). I understand that a POSITA is a hypothetical person of ordinary inventive skill in the relevant art, who would also be aware and understand the teachings of all possible prior art references. I also understand that a POSITA is not an automaton, but a person of ordinary creativity. I have applied this standard throughout my declaration.

48. I was asked to provide an opinion as to the level of skill for a POSITA as of November 26, 2003.

49. The '507 patent relates to determining user intent to make various gestures on a touch-sensitive input device based on contact data reflecting the user's interaction with the device such as pressure, pressure change, position, speed of movement of a contact point across the touchpad surface, and so on. The '507 patent further concerns providing haptic feedback (tactile sensations) to the

user through the input device after determining user gestures based on the input device interaction.

50. In the context of the '507 patent and the relevant prior art, a POSITA in this matter would have had a Bachelors' degree in computer science, electrical engineering, or a comparable 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 devices as well as with the basic electronic and hardware operation of such devices.

51. In reaching this opinion as to the hypothetical POSITA, I have considered the types of problems encountered in the art, the prior art solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level and professional capabilities of workers in the field

52. I have at least the qualifications of a POSITA. In many aspects my qualifications and expertise exceed that of a POSITA. However, I have also worked with many people who fit the characteristics of the POSITA, and I am familiar with their level of skill in and around November 26, 2003.

53. When developing my opinions for this declaration, and unless otherwise noted, my analysis and conclusions are based on the point of view and expertise of a POSITA.

IV. PRIMARY REFERENCES CONSIDERED

54. As discussed more fully in Section IX, my analysis in this declaration focuses primarily on the following references:

Reference	Exhibit No.	Shorthand
U.S. Patent No. 6,590,568, “Touch Screen Drag And Drop Input Technique”	EX1005	Astala
U.S. Patent Pub. No. US 2002/0033795, “Haptic Interface For Laptop Computers And Other Portable Devices”	EX1006	Shahoian
U.S. Patent Pub. No. 2002/0057263, “Simulating Gestures of A Pointing Device Using A Stylus And Providing Feedback Thereto”	EX1007	Keely
U.S. Patent No. 7,256,773, “Detection of A Dwell Gesture By Examining Parameters Associated With Pen Motion”	EX1008	Kolmykov-Zotov or KZ

55. I have been informed by Counsel that each of Astala, Shahoian, Keely, and Kolmykov-Zotov is prior art to claims 1-18 of the '507 patent.

V. SUMMARY OF MY OPINIONS

56. As discussed more fully in Section IX, my opinion is that claims 1-18 of the '507 patent are unpatentable¹. In particular, it is my opinion that:

- Astala+Shahoian renders obvious claims 1-18.
- Keely+Kolmykov-Zotov renders obvious claims 1, 6-9, 13-14, and 18.
- Keely+Kolmykov-Zotov+Shahoian renders obvious claims 2-5, 10-12, and 15-17.

VI. TECHNOLOGY BACKGROUND

57. As part of my analysis and review, I considered what would be known and understood by a POSITA as of November 26, 2003, which Counsel has informed me is the earliest potential priority date for Claims 1-18. The following overview, of course, cannot be exhaustive.

A. An Overview of Touchpads and Similar Devices

58. The following is not intended to provide a narrow definition of any term, but to show the breadth of understanding a POSITA would have in considering the art, and teachings of the art.

¹To the extent that “unpatentable” may have a special legal meaning, I use the term only to indicate that, based on my analysis, it is my opinion that a claim is either anticipated or obvious.

59. In context, a POSITA would have understood that touchpads broadly include a class of sensor devices that sense a touch or contact in some fashion and produce a useful signal in response.² A given touchpad device may be intended primarily to be used to detect touches by a particular type of object, such as a finger or a special stylus.

60. Many touchpad devices have a flat surface to be touched. Touchpad devices include devices usable for pointing, in that they can be used to input position values for a touch on a surface (for example, “x” and “y co-ordinates”, or sometimes only a single position ordinate). Thus they may be used as locator devices – that is, they can be used to input a position or location – and general teachings regarding locator devices would apply.

61. Other terms used to describe touch-sensitive input devices or touchpad-type devices include proximity sensors, touch(-sensitive) surface/device, contact sensor, touchscreen, tablet, touch tablet, touch plate, digitizer

² I give further notes of terms for touchpad below. For ease in reading, I will generally just use the terms “touchpad” or “digitizer” (short for “tablet digitizer”). Exceptions may be in a particular context such as when quoting from a reference, or may be inadvertent. A POSITA would understand this in no way implies any distinction of teachings.

tablet/pad/panel (also just “digitizer”), touch panel, stylus input device, telautograph, telescriber, cursor pad, handwriting input transducer, electronic/digital writing board or writing plaque, electronic drawing board, scriptoscope, electronic/digitizing pantograph, electrographic/graphical input device, light pen/gun, graphics table/tablet, telewriter, writing telegraph, electrowriter, touch mouse, electronic/digital whiteboard, touch(-sensitive) display, tabletop (touch) display, and so forth. Further terms used to describe touchpad devices or equivalent technology include positional input device, handwriting terminal, touch sensitive orthogonal data field input device, etc.

62. If encountering a reference that used the terms touchpad and touchscreen (for example) distinctly, a POSITA would recognize that a touchscreen has been taught to be constructed using a transparent touchpad integrated with a display, as well as other ways to integrate with a display.³ A POSITA would understand that a reference to a touchscreen also teaches a

³ For example, this is described in EX1053 (Negroponte, “HUNCH An Experiment in Sketch Recognition”) on page 22-1-4: “The tablet has... a transparent surface which permits it to be used vertically in front of the display with the minor inconvenience of a half inch parallax [sic] (figure 6).”

touchpad, or that the teachings may be applied to a touchpad, and vice versa, as for all these devices.

63. A POSITA would also know and understand that some touchpad devices only provide contact/non-contact information, or only pressure/force information, or a valuator input, and no direct X/Y (or X/Y/Z) position information. A POSITA would also know and could apply teachings of how devices could be used to provide locator input, nonetheless. For example, a POSITA would know that X/Y position values (that is, locator input) can be done by combining two valuator inputs by using one input for an X value and another for a Y value.

64. A POSITA would have been familiar with the teachings of locator devices and other types of devices, such as explained in references that teach classification of input devices by their use into locator, evaluator, pick, and other types of input devices.⁴ A POSITA would understand that touchpads are readily used as locator devices, and that locator devices generally may be substituted one for another in a system with only readily-understood changes, such as converting relative position input to absolute position or vice-versa, or converting a force to

⁴ For example, EX1054 (Foley, “Fundamentals of Interactive Computer Graphics” (1982)) and EX1055, (Buxton, “There’s More to Interaction than Meets the Eye”).

relative position information, etc. A POSITA would therefore understand that teachings regarding one kind of locator device (for example: mouse, joystick, or light pen) may be applied to other kinds of locator devices (for example: touchpad, gaze tracker, or stylus tablet).

65. On this point, a POSITA would know and understand that it was a conventional practice for vendors of touchscreen, tablet, and touchpad devices to include or provide a mouse-like “relative” output mode or a “mouse driver” software so that their device could be substituted more readily for a computer mouse in the large number of existing computer applications and computer systems.⁵

66. A POSITA would be well-aware that many touchpads also provide additional information beyond X/Y position information, such as a force/pressure (or pseudo-force/pressure) value or proximity height. Force/pressure as well as proximity values may be used as a “z” ordinate input values, as may values from additional input devices. Other information that some devices provide about a touch or contact may include lateral forces/pressures, contact area (which may be

⁵ For example, a POSITA would have known how this is noted in EX1056 (PC Magazine, “Alternative Input--Digitizing Tablets-Pointing the Way to Easier Input”) at page 228.

used as a surrogate for force/pressure, *e.g.*, pressing harder with a compliant fingertip tends to increase the contact area and/or degree of capacitive coupling), thermal information, contact area shape or orientation, touches (or near-touches) by multiple objects, information about the type of object (*e.g.* a special stylus vs. a finger), etc.

67. In my opinion, “pseudo-pressure” is not an established term of the art. However, in the context of the ’507 patent, a POSITA would have recognized the descriptions of “not a direct measure of pressure” (EX1001, 3:10-14)], “may not accurately represent the amount of pressure actually exerted on the touchpad” (EX1001, 3:19-21), and “size or makeup of different users’ fingers, affects the capacitance change for any given change in pressure” (EX1001, 3:32-39) from multiple teachings of the prior art.

68. These familiar teachings would include techniques for approximate/indirect measurements of force/pressure, for example: an approximate increase in contact area as a pliable stylus such as a fingertip is pressed with more force on a surface; a decrease or change in contact resistance between two conductive elements as they are pressed together with more force; or a change in capacitance as two conductors are pressed into closer proximity or with greater proximate areas; summing of capacitance measurements across multiple sensor elements; or combinations of these.

69. While many touchpad devices provide position information for the touch, a POSITA would also understand the term to include touchpads that simply report a touch on the pad (without providing information about where on the pad the touch occurred). Further, a POSITA would understand that touch pads that report position may also comprise multiple smaller touchpad component sensors, the position information being derived from which sensor component(s) indicated a touch or degree of touch.

70. A POSITA would also know and understand the teachings of virtual/simulated/logical devices that may be implemented comprising a touchpad, and that the virtual devices are intended to be, and are, obvious equivalents to their non-virtual models. For example, touch-buttons, keys, sliders, and keypads, keyboards, computer mice, trackballs, and also virtual touchpads may be emulated via or in areas on a touchpad device, or using data from a touchpad device. This would include understanding that multiple such virtual devices may be implemented on a single physical touchpad. Thus a POSITA would also understand that properties and teachings of the physical devices may be applied to the virtual devices.

71. Similarly, a POSITA would also find it equally obvious to replace a virtual device with an equivalent physical device.

72. A POSITA would know and understand techniques for implementing many different virtual devices with touchpads, including virtual rotary devices such as scroll wheels, rotary selectors, knobs, and jog dials/wheels. Virtual devices provide the same functionality as the equivalent physical device, but in a simulated fashion. On this point, a POSITA would also be abundantly aware of the teachings of virtual keypads and keyboards producing “typed” characters on a display, and virtual buttons.⁶

73. Historically, a POSITA would know that the technology for touchpads (with reporting of position and at least one bit of pressure information) date back at least to the telautograph,⁷ and touchpads were integrated with digital computers by

⁶ Exemplary references include: EX1057 (U.S. Patent No. 5,491,495) (teaching implementations of simulated/virtual keyboards, computer mice, and touchpads); EX1058, (Buxton, “Issues and Techniques in Touch-Sensitive Tablet Input”) (teaching advantages of virtual input devices in general, and of pressure sensing with a larger number of levels of pressure); EX1059 (U.S. Patent No. 4,202,041) (describing dynamically variable keyboard terminal, teaching “soft” keyboards, referencing virtual pushbuttons in prior art).

⁷ For example, although perhaps not the earliest reference, EX1060 (U.S. Patent No. 494,562) is one such reference.

the 1960's;⁸ thus, a POSITA would be aware that the range of relevant prior art is both very deep and very broad.

74. Location information could be determined more-or-less directly (*e.g.*, from actual position on the surface, or from which sub-component(s) reported a detection), or indirectly or algorithmically (*e.g.*, from a computation involving detected forces at edges or corners of the surface, or from propagation times for an acoustic, optical, or magnetostrictive signal, or reflections). A POSITA would also know that sensing need not be incorporated into a touch surface itself. For example, position could be detected via one or more light beams above the working surface, via camera-based imaging, via sensors behind the surface, or via a pantographic mechanism separate from the surface.

75. A POSITA would also know that a touch on a surface may be detected in many ways, including indirectly by a proxy for physical contact, such as proximity or force/pressure signals of a sensor of the surface exceeding some

⁸ For example: EX1030 (Davis, "The RAND Tablet: A Man-Machine Graphical Communication Device") (teaching a stylus-tablet touch input device for interactive use with a computer); EX1031 (U.S. Patent No. 3,482,241) (teaching a touch display (touchscreen) measuring changes in capacitance).

threshold, or by a force-sensitive or mechanical switch in the tip of a stylus separate from the surface.

76. To the extent there may be an attempt to argue that a touchpad or touch-sensitive device in the prior art must respond to an “actual” touch, a POSITA would have known that common technologies for touchpads included capacitive sensing of proximity, and electromagnetic signal coupling with an electronic stylus. Capacitive sensors work by measuring changes in capacitance, either self-capacitance or mutual-capacitance,⁹ caused by a conductive object in proximity. It would be well known to a POSITA that capacitive sensors may not respond at all to a touch by a non-conductive object (such as a plastic stylus or a pencil), since they induce no change in capacitance. It would also be well-known that they may not respond to finger touches if the user is wearing a non-conductive

⁹ A POSITA would appreciate that self-capacitance sensors measure an increase in capacitance to ground, and mutual-capacitance sensors measure a decrease in capacitance between two conductors. On this point, a POSITA would also be familiar with the practical complexities of capacitively-coupled noise and poor grounding.

glove, has particularly dry skin, or under some grounding conditions, and that they can respond with false touches due to water droplets, etc.¹⁰

77. On the same point, a POSITA would know that the electromagnetic sensors would generally not respond to any touch by a finger, but only by a particularly-matching electronic stylus.

78. A POSITA would know also about similar quirks of other sensing technologies, such as optical sensing. In general, a POSITA would understand that touches are detected functionally.

79. As I discuss further below, a POSITA would also understand the many ways multiple sensor technologies had been and could be integrated in one device, to multiple effects.¹¹

¹⁰ This all would have been abundantly well known to a POSITA, but it is mentioned, for example, in EX1032 (U.S. Patent No. 5,708,460) at 1:29-30 (“Accordingly, such [a capacitive type] system will not respond to touch with a glove or a non-capacitive stylus.”).

¹¹ One of many such examples a POSITA would have known, is EX1033 (U.S. Patent No. 6,492,979, “Kent”). Kent teaches incorporating both FSR (force sensing resistor) and capacitive sensing in one device and various alternatives, including using capacitive sensing for position and FSR sensing for pressure, and

B. An Overview of Haptics

80. A POSITA would be familiar with the term “haptics” as referring to a relation to contact or touch involving the human body. In the context of the relevant art it would have been used to characterize both input to a system via touch, and output or display from a system and perceived by one or more of the human senses of touch.¹² A POSITA would also know that other terms used in the art, such as “tactile,” “kinesthetic,” “tactual,” “force output,” etc. had also been used interchangeably with “haptic” in various contexts, and would understand the meanings in context.

also using either or both in determining position to accomplish greater reliability of performance. *See, e.g.,* Kent, Abstract, 3:14-16 (“In one embodiment of the invention, projective-capacitive sensors are used as the primary sensor and one or more force sensors are used to obtain touch validation.”). Kent also cites to multiple further examples in its own prior art, such as EX1034, U.S. Patent No. 5,510,813, as an example of using resistive/conducting to determine a touch position and capacitive sensing for detecting the force of the touch. Kent, 1:64-2:5.

¹² For example, a POSITA would have known how EX1035 (Buxton, “Touch Gesture and Marking,” chapter 7 of Baecker, *Human-Computer Interaction*) discusses both haptic input and haptic output, as well as force feedback.

81. For ease in reading, I will generally use the terms “haptic” and “tactile.” Concerning haptic output or display, a POSITA would be familiar with multiple examples of and techniques for haptic output and feedback, including forces, vibrations, and electrical stimulation, as well as patterns of haptic output.¹³

82. In addition to haptic/touch input devices (discussed in part above along with touchpad haptic input devices), a POSITA would have been familiar with multiple kinds of electronically-controlled haptic/tactile actuators for output of haptic effects. These would include voice-coil actuators,¹⁴ oscillatory or

¹³ For example, EX1036 (U.S. Patent No. 6,160,489) teaches the use of a plurality of distinctive tactile alert patterns (vibrations) generated with an axially offset counterweight driven by a motor, since audible alerts may not be heard. EX1037 (Strong, “An Electrotactile Display”) teaches direct electro-tactile stimulation of the nerves in touching fingers, using different amplitudes to indicate different touch areas and boundaries.

¹⁴ For example, EX1038 (Massie, “Initial Haptic Explorations with the Phantom: Virtual Touch Through Point Interaction”) teaches piezo elements and voice-coil speakers as vibrotactile actuators.

piezoelectric actuators,¹⁵ solenoids,¹⁶ and electromagnetic¹⁷ actuators, among many others.

83. A POSITA would be familiar with various techniques involving force-based feedback or output, such as simulations of real-world sensation. As one example, a POSITA would be familiar with techniques for simulating clicks, frictions, textures, and resistive forces, via special and/or temporal patterns of vibrations.¹⁸

¹⁵ For example, EX1039 (Bliss, “Optical-to-Tactile Image Conversion for the Blind”) describes piezoelectric actuators for producing tactile vibrations at small spacing.

¹⁶ For example, EX1040 (European Patent Publication No. EP0265011A1) teaches using piezoelectric or electromagnetic tactile elements as a matter of design choice for a computer mouse: a computer processor sends signals to activate the tactile elements, such as to produce vibrations while the cursor coincides to a special area.

¹⁷ For example, EX1041 (U.S. Patent No. 5,388,992) teaches voice-coil or small motor transducers to produce tactually perceived vibrations and also teaches directly converting output sound signals to tactile vibrations.

¹⁸ For example, EX1042 (IBM, “Mouse Ball-Actuating Device with Force and Tactile Feedback”) teaches tactile outputs for clicks, vibrations, crossing over line

84. A POSITA would also be aware of the broad motivations for incorporating haptic feedback in interactive systems such as to take the place of lacking haptic feedback of mechanical systems,¹⁹ providing “cue” information about an object or some status,²⁰ a confirmation that an input or gesture was

boundaries, and making mouse detents. It also teaches different tactile feedback for different regions, such as stepping over a grid or into an illegal zone. EX1043 (Fukumoto, “Active Click Tactile Feedback for Touch Panels”) teaches generating click feel sensations to a tapping fingertip using short periods of vibration, vibrating the whole touch panel. EX1044 (PCT Publication No. WO9200559A1) teaches simulating textures via vibrations when the user’s finger or stylus is moving across a surface, as well as “soft” function keys.

¹⁹ For example, EX1045 (Massie, “The PHANToM Haptic Interface—A Device for Probing Virtual Objects”) teaches the importance of haptic cues and “feeling the [virtual] buttons click”, when virtual buttons substitute for physical buttons/switches with the absence of sound. EX1045, 7.

²⁰ As one example, EX1046 (U.S. Patent No. 5,982,352) teaches a “digitizer” pad or touchscreen “incorporating tactile feedback cues, both passive and active, via piezo vibrators, air blasts, sound waves or the like, as well as sensing of force location.” EX1046,6:56-59.

accomplished successfully,²¹ to provide different haptic feedback or output to indicate an action on a particular region or software element,²² or to provide output and feedback circumstances in which audio, visual, or other output or display might not be effective.²³

²¹ For example, EX1047 (U.S. Patent No. 6,131,097) teaches the use of haptic cues, for example to indicate a particular selection has actually occurred.

²² For example, EX1048 (U.S. Patent No. 6,337,678) teaches graphical buttons, and a control processor receiving commands which specify the type of haptic response each touch exhibits, with different feels between disabled and enabled buttons. EX1049 (U.S. Patent No. 6,219,034) teaches associating operating system user interface elements, such as buttons, with types of tactile commands, as well as teaching profiles. EX1050 (U.S. Patent No. 6,219,032) teaches associating force sensations with graphical objects, to assist the user in selecting a desired function or to inform the user of graphical objects.

²³ For example, EX1051 (U.S. Patent No. 4,885,565) teaches tactile feedback to indicate a successful selection via a touchscreen, because audio feedback may be masked by radio or road noise, and to minimize taking away visual contact.

85. As well as this, a POSITA would know the teachings of providing varying feedback depending on force/pressure levels of an input.²⁴

86. In addition, a POSITA would also be aware of the historical range of teachings of vibrational and force haptic feedback, including feedback based on a pressure sensor input, in critical situations. Accordingly, a POSITA would appreciate the width and depth of the range of relevant prior art.

²⁴ For example, a POSITA would know the teachings of references such as: EX1052 (U.S. Patent No. 6,424,333), which teaches vibrational feedback of varying levels depending on the force or pressure input by a user on an object.

VII. THE '507 PATENT²⁵

A. '507 Patent Embodiments

87. The '507 patent is directed to systems and methods for interpreting inputs received from a touch-sensitive input device (1:25-27) that can be, e.g., a touchpad, touch panel, or touchscreen (2:39-41, Fig. 1), which a POSITA would have understood were implemented with touch-sensitive position sensors. These devices respond to a touch contact by reporting position data (and perhaps additional data about the contact, such as pressure/force) in digital form. Typically the data of the most recent contact are reported at a fixed rate. There are multiple terms of the art of these devices²⁶, with some references using them slightly differently, as noted above in §VI. In as much as the terms would at times be used interchangeably, and as these devices generally produced equivalent position data, and as it was known to incorporate multiple technologies in a single device (e.g. a capacitive sensor for position contact data, and a force transducer for

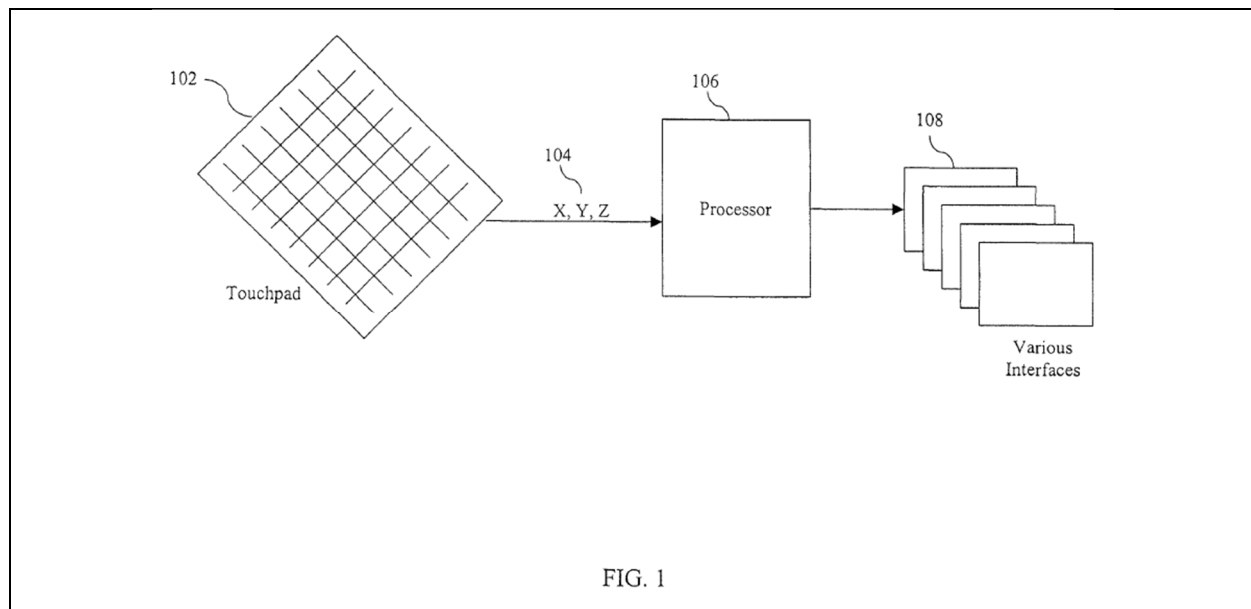
²⁵ Unless otherwise noted all citations in Section VII refer to the '507 patent, EX1001. Furthermore, throughout this Declaration unless otherwise indicated all emphases in quotations are added.

²⁶ For example: digitizing tablet, touchpad, touchpanel, stylus input device, etc.

pressure/force contact data²⁷; a transparent touch pad incorporated with a display to form a touchscreen²⁸), a POSITA would understand the relevant teachings to be inter-applicable, and the devices to be interchangeable as a matter of appropriate design choice.

88. In this declaration, I will generally use the term “digitizer” (as in “tablet position digitizer”), in as much as it conveniently covers the many terms of the art for these devices.

89. The '507 patent responds to alleged need “for accurately determining [user] intent based on data [from] a touch-sensitive input device.” 2:1-3.



²⁷See for example EX1033 (“Kent”).

²⁸ For example, this is described in EX1053 (“Negroponte”), concerning its Figure 6.

90. Touchpad 102 senses a stylus (or finger) on the surface of the touchpad 102, and sends parameters indicating X/Y position and pressure to processor 106. 2:41-45, 3:51-52.

91. Touchpad 102 provides a “pseudo pressure or Z parameter” that is “an estimation” of touchpad surface “vertical displacement based on the size” of a change in capacitance rather than a “direct measure of pressure” or “a measure of the actual vertical displacement by a conductor at a single point on the touchpad 102.” 3:10-19.

92. The pseudo pressure “may not accurately represent the amount of pressure actually exerted on the touchpad 102” because the sensed change in capacitance varies with factors other than pressure such as the size of a user finger pressed against the touchpad. 3:19-39. “[O]ther embodiments” may sense “actual pressure” (2:60-61) by, e.g., using “an attached explicit pressure sensor” (2:61-63).

93. Disclosed embodiments determine user intent from position (X/Y) and pressure (Z) parameters reflecting the user/ touchpad interaction. 4:56-58.

94. Determining user intent means recognizing a gesture from the sensed parameters. For example, in one embodiment Figure 3 shows determining particular user “gestures” (e.g., tapping 310, touching 318, pressing 326) from the touchpad’s user-interaction data. Fig. 3, 7:7-32, 8:5-50.

B. Challenged Claims

95. Claims 1-18 are reproduced in the Claim List (Appendix B).

Independent claim 1 is reproduced below with labels for individual limitations added:

1[PRE] 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 a haptic effect.

96. Claim 9 recites a computer-readable medium (“CRM”) for implementing claim 1’s method. Claim 14 recites a processor communicating with CRM and configured to perform claim 1’s method. Dependent claims add limitations on contact data (claims 2-5) and “gesture” analysis (claims 6-8). Dependent claims 10-13 (CRM) and 15-18 (system) add limitations similar to those in claims 2-4 and 6. Dependent claims 10-13 (CRM) and 15-18 (system) implement the methods in claims 2-4 and 6. EX1019 shows a comparison of the claim language in different claims and where claim language is reused in various claims.

C. Prosecution History

97. The ’507 patent issued from Application No. 13/441,108 (EX1002, 429)—a continuation of Application No. 10/723,778 (“’778-App”), filed November 26, 2003 (*Id.*, 11). I understand that Immersion entered multiple claim amendments to overcome rejections. EX1002, 66-70, 342-348, 368-373, 393-397. The Examiner rejected application-claim 1 as anticipated by Patent No. 6,118,435 (“Fujita”). EX1002, 320. In response, Immersion added limitations [1E] and [1E1] to [1E3] (EX1002, 344) and argued that “Fujita does not disclose or suggest ‘comparing a change in pressure to a change in pressure threshold.’” EX1002, 350-351.

98. I understand that Immersion filed application-claims 1, 3, and 4 providing:

1. A method comprising:
receiving contact data from an input device;
determining whether to output a haptic effect based on the contact data; and
outputting the haptic effect based on the contact data.

* * *

3. The method of claim 2, further comprising determining a gesture associated with the contact data.
4. The method of claim 3, wherein the determining a gesture comprises determining one of a tapping or a pressing gesture.

EX1002, 32.

99. I understand that the Examiner rejected application-claims 1, 3, and 4 (and others) as lacking written description. EX1002, 53-54.

100. I understand that on November 19, 2012, Immersion amended application-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~~.

EX1002, 67.

101. I understand that the Examiner rejected application-claim 1 as anticipated by U.S. Patent No. 6,118,435 (“Fujita”). EX1002, 320.

102. On May 13, 2012, Immersion cancelled application-claim 3 and amended application-claim 1 to distinguish Fujita. The changes included replacing “intent” with “gesture” in “determining an intent based on the contact data” (which the Examiner said Fujita disclosed). This amendment amounted to incorporating an amended version of the language from cancelled application-claim 3 (“determining a gesture ~~associated with~~ based on the contact data”):

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.

EX1002, 344. Immersion argued Fujita failed to meet the language corresponding to limitations [1D] to [1E3]. Immersion argued that “Fujita does not disclose or suggest ‘comparing a change in pressure to a change in pressure threshold.’”

EX1002, 350-351. In the parent case, application-claim 1 recited “outputting a press signal if... the change in pressure is greater than a change in pressure threshold[.]” E.g., EX1021, 136. I understand that the Board reversed Examiner obviousness rejections over Gillespie (EX1014, discussed below) and Astala concerning the “change in pressure” limitation, stating (EX1028, 5):

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 the Appellants, this is not the same as evaluating a change in pressure against a change in pressure threshold. While in some instances the pressure value and the change in pressure value may be the same (e.g. an increase in pressure from 0 to 5 results is a change in pressure of 5), these values are not synonymous and they do not always represent the same value (e.g., an increase in pressure from 1 to 5 results in a change in pressure of 4). As such, we agree with the Appellants that the Examiner has failed to establish a prima facie case of obviousness.

103. On June 25, 2013, the Examiner rejected application-claim 1 for obviousness-type double patenting over claim 11 in the parent U.S. Patent No. 8,164,573, in view of EX1014, U.S. Patent No. 5,880,411 (“Gillespie”). EX1002, 385-386. I am informed that obviousness-type double patenting is a determination that a claim is unpatentable as obvious over the claim of an earlier-expiring,

commonly owned patent claim. The Examiner found that “Gillespie teaches determining a gesture based on a pressure signal on the touch pad and if the pressure is greater than a pressure threshold (Z_{th}) and the change in pressure is greater than a change in pressure threshold ($Z_{pushdown}$, col. 48, line 65 to col. 49, lines 12 for example).” EX1002, 386.

104. The passage the Examiner relied upon in Gillespie for teaching “the change in pressure is greater than a change in pressure threshold” at EX1014, 48:65-49:12 is as follows:

Another gesture which is useful in specialized applications is a “push” gesture, which simply compares the Z (pressure) information against a second Z threshold $Z_{pushDown}$, considerably higher than the basic finger detection threshold, and simulates a mouse button action whenever Z exceeds this threshold. This “push” gesture is similar to the way pen-based pointing devices normally operate; however, it is too imprecise and too tiring on the finger to use as the primary click or drag gesture. The “push” gesture is most useful in special contexts such as freehand drawing programs.

FIG. 19 is a timing diagram illustrating a “push” gesture. To perform this gesture, the finger is first brought near enough to cause cursor motion without causing a virtual button press.

105. Gillespie further described a change in pressure (e.g., “pressure increase” and “pressure reduces”) and comparing that change to pressure

thresholds (e.g., “threshold ZpushDown,” “threshold ZpushUp”), providing at EX1014, 49:12-17,

Next, the finger pressure increases past threshold Zpush Down, causing the Virtual button to be pressed. Later, the pressure reduces below a threshold ZpushUp, causing the virtual button to be released. If ZpushUp is somewhat lower than Zpush Down, the resulting hysteresis will prevent unwanted oscillation on the virtual button if the finger pressure varies slightly around the “push’ threshold.

106. I understand that Immersion filed a terminal disclaimer (EX1002, 400) and the Examiner allowed claims without explanation. EX1002, 410. I am informed by Counsel that a terminal disclaimer means that Immersion agreed that the ’507 patent claims would expire no later than the claims of the parent application.

D. Apple IPRs

107. Immersion previously asserted the ’507 patent against Apple in district court and at the ITC. While those proceedings were pending, Apple filed IPR2016-01777 challenging thirteen ’507 patent claims in September 2016. EX1022, 3. The -01777 petition identified Shahoian as a secondary reference solely for providing haptic feedback. EX1023, 15. Seven months later Apple filed IPR2017-01310 with a single ground Astala+Shahoian challenging all 18 claims.

EX1024, 3. The -01310 petition again identified Shahoian solely for providing haptic feedback. EX1024, 40.

108. The Board denied institution in -01777, finding the two primary references did not meet a “determining a press” claim construction discussed below at §VIII.A. EX1023, 15-17. The Board also denied the -01310 petition. EX1026, 14. I understand that the discretionary denial means that the Board never considered the merits of Astala+Shahoian in -01310. I also understand that in -01777 the Board never considered the disclosure in Immersion’s Shahoian publication beyond finding that it failed to supply the disclosure that the Board found missing in the -01777 primary references. EX1023, 15-17.

VIII. CLAIM INTERPRETATION

109. I have been informed that in IPR2016-01777, the Board construed the term “determining a press” in limitation [1E], and that in an International Trade Commission investigation in 2017, the administrative law judge (“ALJ”) construed other claim terms.

A. “determining a press if... a first interval has elapsed”

110. Limitation [1E] recites “determining a press if” criteria in limitations [1E1]-[1E3] are met:

[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;

111. I have been informed that in IPR2016-01777 the panel required the conditions in [1E1] and [1E2] “be maintained for the duration of the first interval [in [1E3]] before a press is determined” (EX1023, 14-15). This construction excludes the ’507 specification’s two embodiments.

112. I understand that the ITC did not require that [1E1]-[1E2]’s conditions persist for the first time interval. EX1015, 46-56.

113. As detailed below, the ’507 specification confirms that “determining a press” [1E] only requires meeting [1E1]-[1E3] individually, without requiring that the [1E1] or [1E2] conditions persist throughout the [1E3] “first interval.”

1. Claim language

114. [1E1] determines whether pressure exceeds a threshold without specifying a point in time for the comparison.

115. [1E2] evaluates a difference between pressure measurements at two points in time.

116. Aside from time (which can “elapse”) [1E3] gives no detail what the “first interval” measures. The specification, however, explains that it measures time of contact by a finger or stylus with the input device. [1E3] does not limit

when the “first interval” begins, and thus does not require that it begin only once a pressure or change in pressure exceeds a threshold.

2. Specification

117. Construing “determining a press” [1E] to require that [1E1] or [1E2] be met throughout the [1E3] “first interval” would exclude each ’507 patent embodiment.

118. The specification discloses two “press” determination embodiments. EX1001, Fig. 2 (step 236), Fig. 3 (step 326).

a. Fig. 2 Embodiment

119. Fig. 2 shows two time intervals: a “first tick count” and a “release tick count.” The release tick count does not start (step 228) until after a first “pressing” determination (step 226).

120. Before step 216 determines that the “first tick count [started at step 208] has elapsed” (EX1001, 6:34-35), step 220 sets a “first threshold.” Step 216 checks [1E3] whether a “first tick count [started at step 208] has elapsed.” EX1001, 6:34-35. If so (as claimed), step 218 sets a “move threshold”; if not step 220 sets a “first threshold.” *Id.*, 6:58-62 (“first tick count is set when the finger goes from a non-touching to a touching state and is used to measure a time interval during which a different (higher) set of thresholds is used because users typically push harder when they first touch[.]”).

121. Only after checking whether the first tick count elapsed does Fig. 2's process check [1E2] at step 222 whether a "change in pseudo pressure exceeds the threshold value" (EX1001, 6:37-41), then (if so) checks [1E1] at step 224 whether the then-current pseudo pressure exceeds a threshold (EX1001, 6:41-47). Fig. 2's process does so regardless of whether it determines (in step 216) that the first tick count has elapsed or not.

122. The comparisons are predicates to determining a press: step 226 determines a press [1E] after a step 224 determination that [1E1] is met, which can only occur after step 222 determines that [1E2] is met.

123. The determination of whether the first tick count has elapsed or not at step 216 ([1E3]) only impacts which threshold values (set at 218 or 220) the determinations in step 222 ([1E2]) and step 224 ([1E1]) use. Steps 222 and 224 follow a step 216 determination whether [1E3] is met. EX1001, 6:45-47. These [1E1]-[1E3] determinations are made individually in Fig. 2.

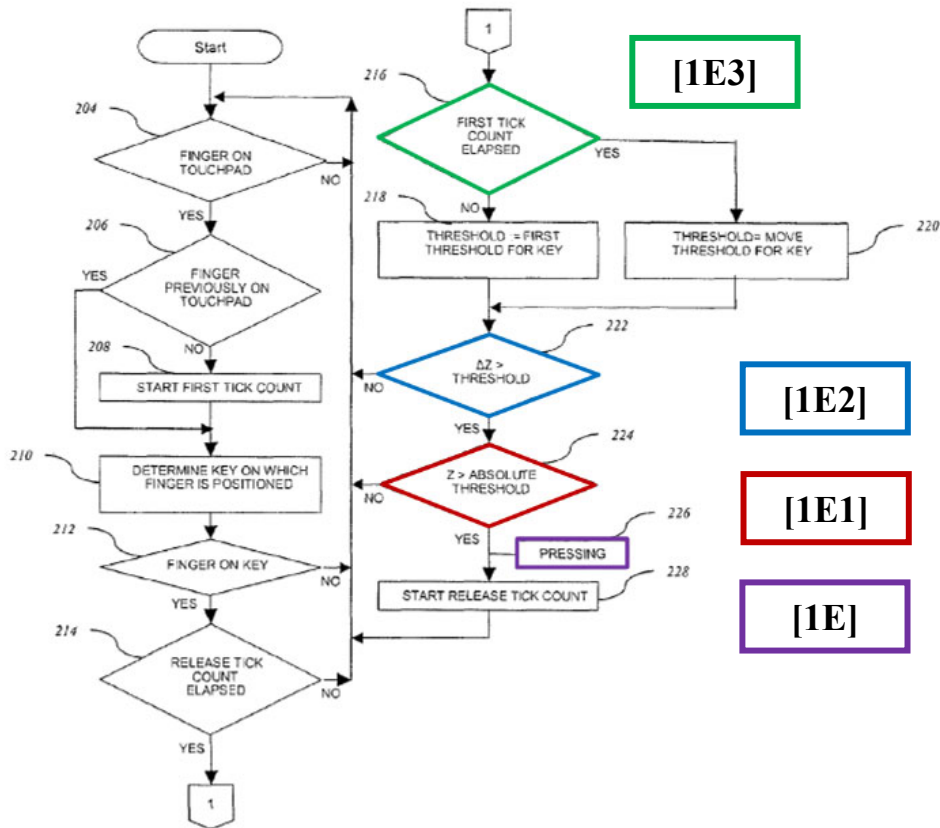


FIG. 2

124. The release tick count “start(s)” (step 228) after a “pressing” determination (step 226) because it “measure[s] a time interval following detection of a press” and ensures that no “further press detection” is performed via which another press is determined until the release tick count has elapsed (EX1001, 6:62-7:6). Only after a “pressing” determination (step 226) does the release tick count “start” (step 228). Taking the release tick count in the alternative as the “first interval,” then step 214 checks whether the release tick count has elapsed ([1E3]) before additional “pressing” determinations can be made, relying on subsequent

comparisons—step 222 ([1E2]) and step 224 ([1E1])—that are distinct from whether the release tick count elapsed in step 214.

125. Neither interval in Fig. 2—neither the first tick count, nor the release tick count—measures how long a pressure or pressure change persists above a threshold.

126. The “first tick count is used to determine the length of time the finger remains on the key” (EX1001, 6:10-12), while the “release tick count is used to measure a time interval following the detection of a press during which the finger is deemed to be pressing” (EX1001, 6:62-65). If the release tick count interval was considered to be the “first interval” as claimed, it does not measure how long a pressure or change in pressure has exceeded a threshold. The Fig. 2 embodiment does not support requiring that conditions [1E1]-[1E2] persist throughout a first interval.

b. Fig. 3 Embodiment

127. Fig. 3’s embodiment describes two examples of touching. Step 302 checks [1E1] whether pressure (Z) exceeds an upper threshold. EX1001, 8:5-8, Fig. 3. For a new touching to be recognized, the pressure must exceed an upper threshold. EX1001, 7:16-25. Then, the pressure must fall below a lower threshold to determine that the touching ended. EX1001, 7:25-27.

128. If there was no “previous touching” (steps 304, 318) then without the step 302 determination the process will never advance to step 326, which will never determine a “pressing.” EX1001, 7:16-25. When pressure exceeds the upper threshold and there was no previous touching, a first tick count is started (step 316) and a “touching” determined (step 318). EX1001, 8:26-28. Step 322 checks [1E2] whether a “change in pseudo pressure” exceeds “the threshold” (EX1001, 8:42-46, Fig. 3). If so, step 324 checks [1E3] “whether the first interval has elapsed,” and if so, step 326 [1E] determines a “pressing.” EX1001, 8:45-49, Fig. 3.

129. If pressure is below an upper threshold (step 302) but there was previous touching (steps 304, 318), then step 306 checks [1E1] whether pressure (Z) exceeds a lower threshold. EX1001, 7:25-27, 8:29-30, Fig. 3. Since there was a previous touching (explained further below), step 306 is only reached after a prior determination at step 302 that pressure exceeded an upper threshold.

130. At this point the pressure must fall below a lower threshold to conclude that the user is no longer touching the touchpad. EX1001, 7:25-27.

131. A “pressing” determination requires a pressure above the upper threshold (step 302, [1E1]), but not that the pressure persist above that upper threshold throughout the first interval.

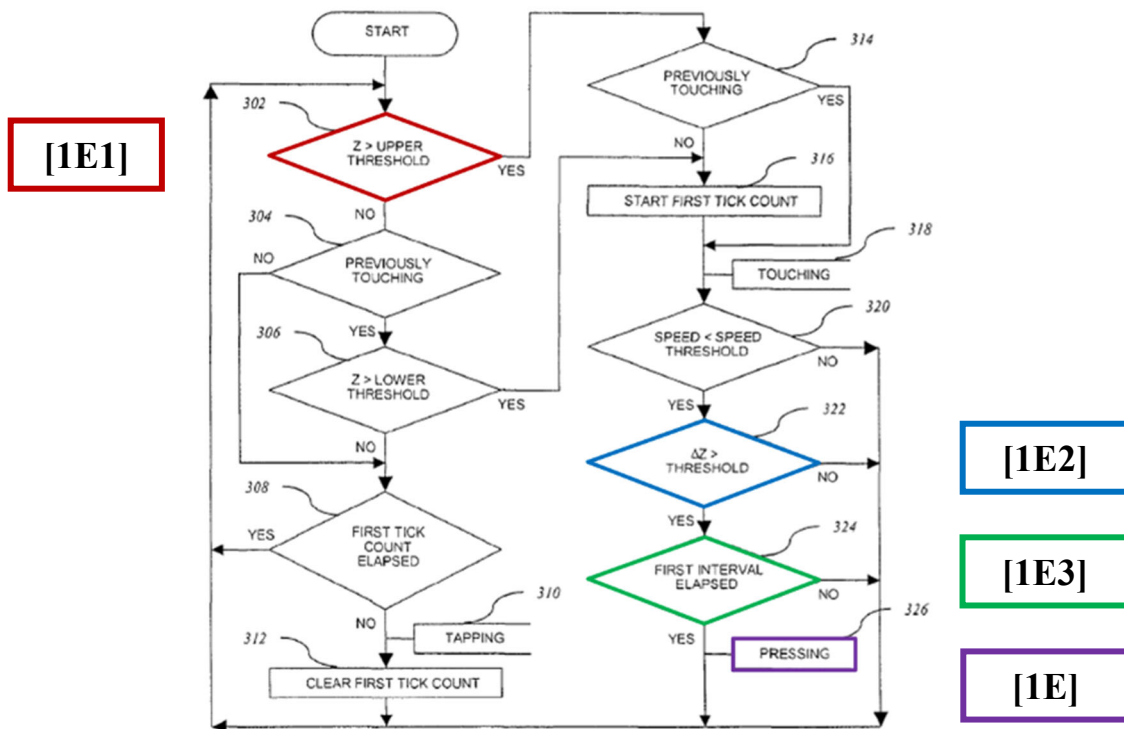


FIG. 3

132. When the pressure exceeds the upper threshold and there was no previous touching, a first tick count is started (step 316) and a “touching” is determined (step 318). EX1001, 8:26-28.

133. Then (with an intermediate step) step 322 checks [1E2] whether a “change in pseudo pressure” exceeds “the threshold” (EX1001, 8:42-46, Fig. 3).

134. If so, step 324 checks [1E3] “whether the first interval has elapsed” (EX1001, 8:45-48, Fig. 3). If so, step 326 [1E] determines a “pressing” (EX1001, 8:48-49, Fig. 3).

135. The “first interval” (step 324) and “first tick count” (steps 316, 308, 312) are different things. EX1001, Fig. 3.

136. Fig. 3's embodiment does not require meeting conditions [1E1]-[1E2] throughout the entire first interval. If the pressure change [1E2] comparison in step 322 fails while the first interval timer is running—e.g., before the first interval elapses—then the process does not terminate and find the absence of a “pressing.”

137. Instead, the process returns to step 302. As long as the pressure remains above the lower threshold, the process continues. If the “change in pseudo pressure” exceeds “the threshold” at a later pass through step 322 after the first interval has elapsed, step 326 still determines a “pressing” [1E]. EX1001, Fig. 3.

138. Thus, determining a press does not require that the pressure change persist over the entire first interval.

139. The same is true for [1E1]'s determination of whether the pressure exceeds a pressure threshold. As I explained above, a “pressing” will not be detected unless there is detection of a pressure above the upper threshold. EX1001, 7:16-25.

140. However, once a new touching is determined, the pressure must fall below the lower threshold to conclude that the touching has ended. EX1001, 7:25-27. If the step 302 determination of pressure above an upper threshold fails, the process does not terminate and find no “pressing.” So long as the pressure remains above the lower threshold (step 306), the process continues so that if the other

conditions are met, a touch will be detected after the first interval elapses.

EX1001, Fig. 3 and 7:25-27.

141. A “pressing” cannot be determined (step 326) based on a new touching until the first interval has elapsed (step 324). EX1001, 8:45-50.

142. When it determines that the first interval has not elapsed (step 324), the process returns to step 302 and again determines whether the pressure exceeds the upper threshold. E.g., before the first interval elapses, the process returns to step 302 and again tests whether the pressure is above the upper threshold.

EX1001, Fig. 3.

143. If that determination fails, the process does not terminate and find the absence of a “pressing.”

144. Instead, while pressure remains above a lower threshold (step 306), the process continues so that if the other conditions are met, a touch will be detected after the first interval elapses. EX1001, Fig. 3 and 7:25-27.

145. Thus, a “pressing” determination requires a pressure above the upper threshold (step 302, [1E1]), but does not require that the pressure persist above that upper threshold throughout the first interval.

B. ITC Constructions

146. I have been informed that the ITC construed three terms from claim 1, as follows:

Term	EX1015	Construction
“pressure”	47	“application of force from a contact”
“pseudo pressure”	53	“an indirect measure of pressure”
“determining a press if... the change in pressure is greater than a change in pressure threshold”	56	“determining that a press has occurred if the magnitude of the change in pressure (positive or negative) is greater than a static or adaptive threshold for the change in pressure.”

147. In my opinion, the term “pseudo pressure” is not an established term of the art, and has no plain-and-ordinary meaning. However, under any reasonable construction the prior art references that I discuss below meet “pseudo pressure” and the other terms that the ITC construed because the prior art meets the ’507 patent descriptions relevant to these claim terms. As a result, I understand that no explicit construction is needed for these terms.

148. In the following analysis, where I do not discuss a particular claim construction, I apply the ordinary meaning that the claim term would have had to a POSITA at the time of invention.

IX. UNPATENTABILITY ANALYSIS

149. In this analysis I have been instructed by Counsel to assume that Astala, Shahoian, Keely, and Kolmykov-Zotov are prior art to each Challenged Claim.

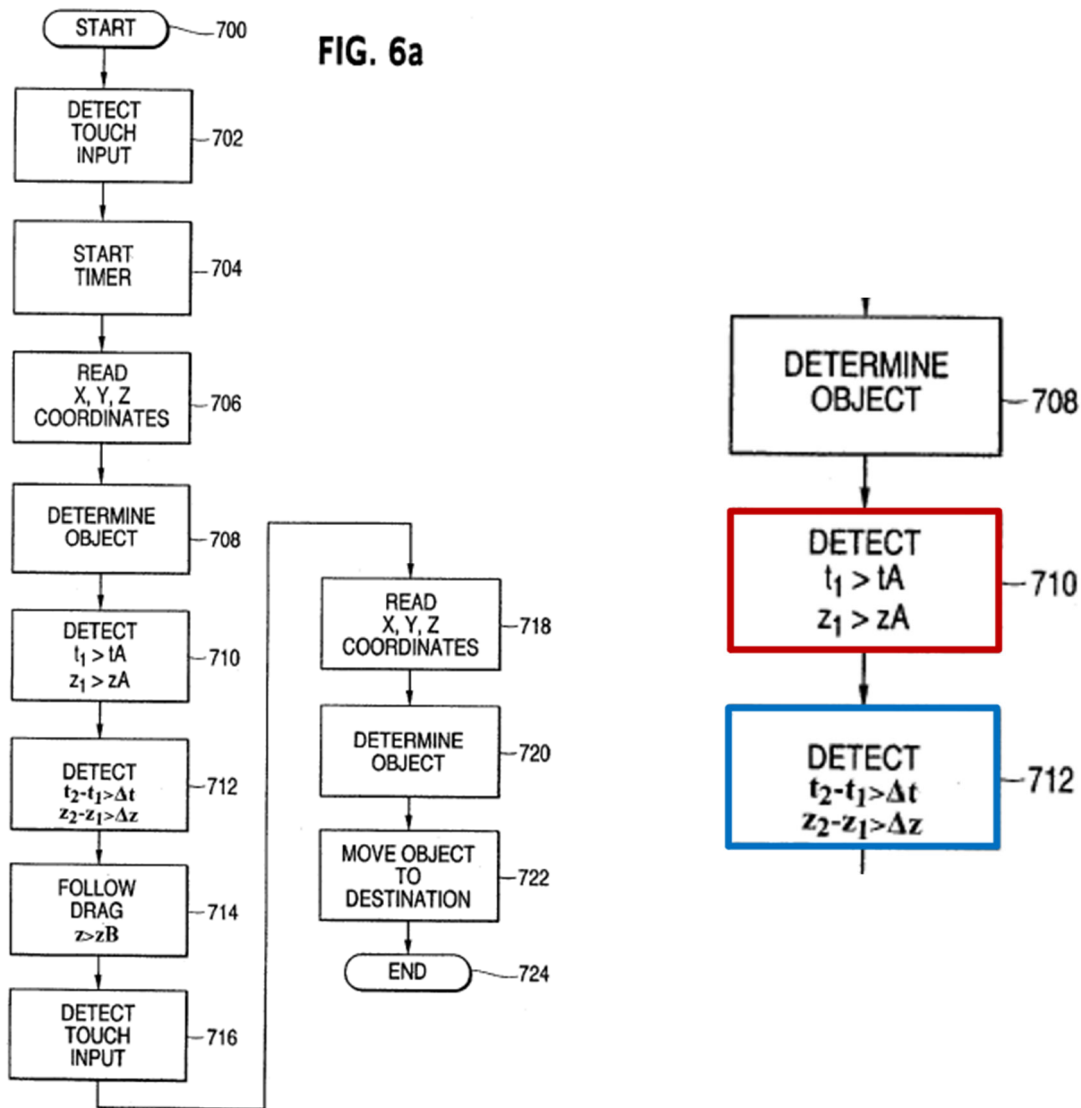
A. Ground 1: Astala+Shahoian Renders Obvious Claims 1-18.

1. Astala

150. Astala discloses algorithms for gesture determination from user interaction with a touchscreen, such as dragging file folders into a directory on a graphic display. Astala, Abstract, Fig. 6a-6d, 1:18-21, 9:40-65.

151. Astala determines a press after determining that a user interacts with a displayed object (step 708) based on the touch location (step 706). Figure 6a (excerpted and annotated below) shows testing whether: (1) sensed pressure (z_1) exceeds a threshold pressure (z_A) (**step 710**); (2) sensed change in pressure ($z_2 - z_1$) exceeds a threshold pressure change (Δz) (**step 712**); and (3) a time interval has elapsed ($t_2 - t_1 > \Delta t$) (**step 712**). Astala, Fig. 6a, 9:15-39.

152. In Fig. 6a (annotated below), Astala determines that a user has pressed on a displayed object (identified in step 708) based on several determinations.



153. First, in step 710 test whether pressure (z_1) exceeds a threshold pressure (z_A) and does so for a time period (t_1) greater than a predetermined time period (t_A). Astala, 9:25-35.

154. Second, step 712 tests whether pressure (z_2) on the object has been reduced from pressure (z_1) by an amount greater than a predetermined pressure

differential (Δz). Astala, 9:35-40. Astala also checks whether a time interval has elapsed ($t_2 - t_1 > \Delta t$) (step 712). Astala, Fig. 6a, 9:15-39.

155. In steps 710 and 712 Astala determines that the user has pressed a selected object, as explained above, in a manner preceding a drag of the object. Astala, 9:40-65, Fig. 6a.

2. Shahoian

156. Shahoian describes techniques for providing haptic feedback to touchpads or touchscreens (Shahoian, [0007], [0040]-[0043] (touchpad 16), [0055]-[0057] (touchscreen 52)) based on gesture determination to “assist and inform the user of targeting and other control tasks within [a] graphical environment” (Shahoian, [0006]). For example, “haptic feedback can... be useful to indicate to the user that a button has been pressed, e.g. a small vibration is output when a button is activated.” [0178].

157. Shahoian describes known touchpads as capacitive, resistive, or using “a different type of sensing,” identifies exemplary prior art touchpads using such sensing, and discusses how capacitive and resistive touchpads provided pressure sensing. Shahoian, [0041].

158. Astala and Shahoian are from the same field of endeavor as the '507 patent and are reasonably pertinent to the '507 patent's gesture recognition from touch-sensitive input data.

3. Reasons to Combine Astala and Shahoian

159. Shahoian explains that “[o]ne problem with existing touchpads is that there is no haptic feedback provided to the user” to “assist and inform the user” how user gestures have been interpreted. Shahoian, [0006]. Astala’s existing touchscreen lacks such haptic feedback.

160. Therefore a POSITA would have recognized that Astala’s touchscreen was ready for the improvement that Shahoian provides, *i.e.*, haptic feedback associated with touchpad/touchscreen input gestures.

161. A POSITA would have recognized that incorporating Shahoian’s haptic feedback into Astala’s touchscreen would have had benefits taught by Shahoian, including informing users how touchpad gestures were interpreted and “assist[ing] users in noisy environments... where sound may not be easily heard by the user.” Shahoian, [0178]; *id.*, [0006], [0178], [0187]-[0188], [0192]. The haptic feedback is thus useful where audible feedback fails.

162. This would “enhance interactions and manipulations in a displayed graphical environment” like Astala’s, or “when controlling an electronic device.” Shahoian, [0007]. For example, providing a user with haptic feedback when an object has been pressed in a manner that will allow it to be dragged, and when the object has been dropped at a new location, would improve Astala’s “drag-and-drop” gesture.

163. Astala discloses detecting the “pressure z of touch input” (Astala, 9:26-28) but does not disclose particular pressure sensors. That implementation detail was a design choice a POSITA would have made routinely.

164. A POSITA would have had reasons to use Shahoian’s pressure-sensing components in Astala.

165. Shahoian teaches the benefits of capacitive pseudo pressure sensing when using haptic feedback. Shahoian, [0041] (“[c]apacitive touchpads... may be better suited... in some embodiments, since excessive pressure on the touchpad may in some cases interfere with... haptic feedback.”); *see below* §IX.A.5 (discussing Shahoian’s sensors). On this point, a POSITA would have understood Shahoian also to teach that capacitive touchpads respond to lighter touches than some other kinds of touchpads. Further, this is in the context that Shahoian teaches that “[t]he user contacts the touchpad most commonly with a fingertip”; Shahoian [0005].

166. A POSITA also would have understood that actual pressure sensors may provide more accurate input because “capacitive touchpads are prone to inadvertent cursor positioning[.]” EX1009, (“Martinelli”), 2:54-56.

167. Thus, a POSITA would have had reasons to use both actual and pseudo pressure sensing in Astala’s touchscreen to provide a single device suitable for multiple use cases and applications, and to more accurately determine gestures.

This is consistent with Astala's own disclosure, which teaches input by both a finger or a stylus, as well as by some other pointed object. Astala, 2:19-23.

168. For example, a POSITA would have understood that a given application might work well for touches by a finger using a change in capacitance, e.g., what the '507 patent describes as a pseudo-pressure (EX1001, 3:5-50), but work less well for touches by a hard and non-conductive stylus. This was well-known and is mentioned in references such as in EX1032 (U.S. Patent No. 5,708,460), 1:29-30 ("Accordingly, such [a capacitive-type] system will not respond to touch with a glove or a **non-capacitive stylus**").²⁹

169. A POSITA also would have understood that a device sensing actual force or pressure might work well for touches by a stylus, but work less well for light touches by a finger, while a device using pseudo-pressure of a change in capacitance or contact area might work well for a finger touch, but not work at all for a hard and/or non-conductive/non-capacitive stylus. A POSITA also would

²⁹A POSITA would have understood that while this may be an occasional circumstance with a finger, and addition only under specific conditions, and with known remediations, it would *always* be a problem with a non-capacitive stylus, such as one made of a non-conductive plastic material.

have understood that combining more than one kind of sensing modality in a single device was a design choice.

170. A POSITA would have known that devices combining different sensing modalities were well-known in the art, such as for combining both stylus and finger touch input in one device. A POSITA would have understood that combining different sensors in a single touch-sensitive input device was also a design choice made to support different types of input, to improve the accuracy of determining input, and to provide sensors supporting different functionality that might be used by different applications using the touch-sensitive input device.

171. For example, EX1033 (U.S. Patent No. 6,492,979, “Kent”)—entitled “Dual Sensor Touchscreen Utilizing Projective-Capacitive and Force Touch Sensors”—teaches multiple embodiments combining capacitive touch sensing and force touch sensing for improved reliability and flexibility. In some embodiments, both types of sensing report contact data. The combined sensing is used to “invalidate” inadvertent input, meaning Kent demonstrates that it was known to improve the interpretation of user intent to input data by using multiple sensing modalities. E.g., Kent, Abstract:

A method and apparatus for discriminating against false touches in a touchscreen system is provided. **The system is designed to confirm a touch registered by one touch sensor with another touch sensor, preferably of a different sensor type, prior to acting upon the**

touch (i.e., sending touch coordinates to the operating system). . . . If the touch registered by the first touch sensor is not confirmed by the second touch sensor, the touch is invalidated. Thus the strengths of one type of sensor are used to overcome the deficiencies of another type of sensor. (emphasis added).

172. Kent describes multiple references that combine sensing techniques for finger touch and stylus touch input in one device in its own prior art discussion. E.g., Kent, 1:51-55 (“Various systems have been designed **that utilize two different touchscreen technologies for a variety of purposes**, primarily as a means of accommodating different touch mechanisms, e.g., a finger and a stylus, for data entry.”) (emphasis added), 1:56-2:47 (discussing prior art examples).

173. As another example, EX1071 (U.S. Patent Pub. No. 2005/0162411, “VanBerkel”) teaches a pen (stylus) input system which is capable of being used alongside finger input, where the pen is what may be termed a cordless pen. Input from a finger would be readily distinguished from input from the pen. The input system may be incorporated in a display device. VanBerkel, Abstract. In the context of VanBerkel’s specification, a POSITA would understand this to teach a touchscreen.

174. VanBerkel teaches combining different sensing mechanisms in one device: one for touches by a pen, another for touches by a finger. VanBerkel teaches an embodiment in which a pen (“user-holdable device”) comprises a

conducting tip and a resonant circuit operable to provide an induced alternating voltage: means for sensing an output from the conducting tip of the pen determines a position of the conducting tip by comparing sensed output strengths when the tip is in the vicinity of the sensing means. VanBerkel, [0010]-[0012]. VanBerkel further teaches that the tuning frequency of the resonant circuit may be varied with the pressure applied in pressing the pen (using features known in the art), to display different thickness lines in response to the pressure. VanBerkel, [0088]. A POSITA would understand this to teach a force sensor.

175. VanBerkel also teaches that its system further comprises means for sensing a user's finger, for example by capacitive current sensing or electric field sensing, in which electric field sensing electrodes sense a change in an electric field due to the presence of the user's finger. VanBerkel, [0019]. VanBerkel teachings include sensing the user's finger via capacitive coupling, in a "conventional manner[.]" VanBerkel, [0050].

176. Thus, a POSITA would have understood that VanBerkel describes using different sensing mechanisms/modalities in a single device.

177. EX1061 (U.S. Patent No. 5,673,066, "Toda") also teaches a tablet / control plate based on a change in an electrostatic capacitance (Toda, 1:16-20), combined with a pressure-sensitive sensor on the back surface of the operation plate for detecting the touch pressure (Toda, 2:28-37), for preventing unintentional

switch inputs (Toda, 3:27-34). A POSITA would have understood that Toda thus also describes a single touch-sensitive input device using multiple input sensors.

178. Other references further demonstrate that it was well-known to use multiple sensors in a single touch-sensitive input device:

- EX1072 (“Duwaer”), “Data Processing System With A Touch Screen And A Digitizing Tablet, Both Integrated In An Input Device,” shows multiple “sensing means” for an integrated touchscreen and digitizing tablet. E.g., Duwaer, 2:25-65 (describing two independent, physically distinct sensing means in a single touch-sensitive input device).
- EX1073 (“Greanias”), “Stylus Sensing System,” describes multiple input sensing mechanisms in a single touch-sensitive input device. E.g., Greanias, 3:66-4:11 (describing “radiative signal measuring” for stylus input and “capacitive measurement” for finger input).
- EX1074 (“Seybold”), “Method and Apparatus For Multi-Mode Handwritten Input and Hand Directed Control of a Computing Device,” describes, e.g., a single touch-sensitive input device having “a conventional capacitance sensing layer” and a “bottom layer” that “detects the motion of a specially made pen or stylus.” Seybold, 4:24-45.

- EX1075 (“Stein”), “Position Sensing Computer Input Device,” describes “capacitive type sensing for sensing the human touch and resistive sensing for the stylus[.]” Stein, 4:59-66.
- EX1076 (“Perski”), “Dual Function Input Device And Method,” describes multiple sensing systems in a single touch-sensitive input device. E.g., Perski, Abstract (first sensing system for detecting a “stylus and like objects,” and second system “may detect touch pressure”), 2:66-3:29 (further explaining the multiple sensing systems can operate simultaneously).

179. Thus, a POSITA would have had reasons to use actual and pseudo pressure sensing in Astala’s touchscreen because this would provide support for multiple use cases, would support input to different applications, would provide pressure-sensing appropriate to different input mechanisms (for example a finger and a stylus), and would determine gestures more accurately.

180. A POSITA reasonably would have expected the combination of Astala with Shahoian’s haptic feedback and pressure-sensors to succeed for the same reasons they worked in Shahoian, because the sensing mechanisms were known and predictable, and because it was known to combine different sensing mechanisms in a single touch-sensitive input device. The know-how required to integrate Shahoian’s pseudo-pressure and actual pressure sensors in a single touch-

sensitive input device—both in terms of the hardware and in terms of the software using the sensors—was well within the ordinary level of skill on a POSITA on November 26, 2003.

181. Astala+Shahoian uses Shahoian’s haptic feedback and pressure sensors for their intended use as taught by Shahoian.

182. Shahoian demonstrates algorithms for haptic feedback that were known and predictable, so a POSITA reasonably would have expected their use with Astala to succeed.

183. In the Astala-Shahoian combination, Astala’s touchscreen includes Shahoian’s capacitive “pseudo pressure” sensors and actual resistive pressure sensors. I discuss this further below in relation to claim 2 in §IX.A.5.

184. Astala-Shahoian’s touchscreen incorporates Shahoian’s haptic feedback (e.g., vibration), for example to inform the user that the system recognized a “press” (Astala, Fig. 6a, steps 710, 712) that precedes dragging an object using Astala’s drag-and-drop technique (Astala, Fig. 6a, step 714), rather than, e.g., mere tapping or touching. Shahoian, [0178]; Astala, 9:15-39. This haptic feedback helps ensure that the user’s gestures were properly interpreted because it confirms to the user that the input was handled as intended.

4. Claim 1

a. 1[PRE]: “A method comprising:”

185. Astala+Shahoia performs a method that makes a gesture determination and provides haptic feedback as discussed below at §§IX.A.4.b-IX.A.4.j (limitations [1A]-[1F]).

b. [1A]: “receiving contact data from an input device”

i. Claim Terms

(1) “input device”

186. The '507 patent describes touchpads, touch screens, and touch panels as input devices. EX1001, 1:33-35, Fig. 1 (touchpad 102).

(2) “contact data”

187. A POSITA would have understood “contact data” as meaning data representing user contact with the input device. EX1001, claim 2 (“contact data” comprises “an actual pressure and a pseudo pressure”), claim 4 (contact data “based on a contact” on a “touch-sensitive input device”), claim 5 (“contact information” comprises “position data”), claim 1 (determining “an interaction with a displayed object” ([1B]), and “a pressure and a change in pressure” ([1D]) “based on” contact data); EX1002, 320-321 (Examiner identified “contact data” as “a touch,” “pressure,” and “pressing the touch panel at a pressure”).

ii. Astala+Shahoian meets [1A].

188. Astala+Shahoian uses Astala's touch screen, which is an "input device" meeting [1A]. Astala, 1:41-47 ("touch screen input device"), 2:20-24, 9:15-16 ("touch screen input is detected").

189. "Touch screen input" by "an object, such as a finger or pointed stylus" is "detected" on touch screen 70. Astala, 9:15-18, Fig. 6(a) (step 702), 9:8-29 ("touch input 732").

190. Astala's "touch screen controller... monitors touch screen-input parameters for processing the touch inputs on the touch screen display[.]" Astala, 8:54-56. A POSITA would have understood that Astala's "touch screen-input parameters" and "touch input 732" are contact data because they represent user contact with the touch screen.

191. A POSITA would have understood that Astala's controller "received" contact data because it "monitors" contact data "for processing," and processes contact data to determine gestures. Astala, 6:23-27, 8:54-56, 9:21-65 (analyzing contact data), Fig. 6a.

192. In addition, Shahoian incorporates by reference EX1010 ("Rosenberg"). Shahoian, [0049]. I understand from Counsel that incorporation by reference (here, Rosenberg) means that the incorporated reference is available as if fully set forth within the document that incorporates it (here, Shahoian) and is

thus part of the disclosure in the incorporating document (Shahoian). Rosenberg discloses a “computer... can receive sensor data... from sensors of input devices” (Rosenberg, 6:57-60), confirming that this was conventionally how Astala worked.

c. [1B]: “determining an interaction with a displayed object on a screen based on the contact data”

193. Astala+Shahoian meets limitation [1B] because it implements Astala’s method of determining user interaction with a displayed “FILE” object (the “displayed object”) based on contact data providing X/Y coordinates of touch input 732 on the touchscreen. Astala, 9:3-8 (“a technique utilizing touch screen inputs for dragging... *objects displayed on the touch screen*”), 9:16-27 (determining “touch input 732 being disposed over the object file 1 of window 728”), Figs. 6a-6b (steps 706, 708).

194. “At step 708, a determination is made that file 1 is the object, that is, the selected item of touch input 732[.]” Astala, 9:26-27.

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

195. Astala+Shahoian meets limitation [1C] because it uses Astala’s gesture determination based on “touch input 732” (contact data) as discussed below at §§IX.A.4.e-IX.A.4.i for limitations [1D]-[1E3]. *See also* Astala, Fig. 6a, 9:9-65.

196. As discussed below, Astala determines several gestures that the user performs when dragging and dropping objects. Astala, Fig. 6a (steps 702-704, 710-724).

197. These gestures are all determined “responsive to determining the interaction” the user has with the displayed object, such as the file object discussed above at §IX.A.4.c (limitation [1B]). Astala, 9:3-27 (“At step 708, a determination is made that file 1 is... the selected item[] of touch input 732[.]”), Fig. 6a (steps 706-708).

198. Astala’s “dragging and dropping” moves a selected object from one location to another. Astala, 2:45-47.

199. A POSITA would have understood this includes at least three gestures: (1) pressing the object in a manner that designates the object for movement (analogous to picking the object up); (2) moving the object to a new location; and (3) dropping the object (analogous to putting the object down).

200. The gesture detection (1)—meaning pressing the object in a manner that designates the object for movement—is performed by steps 710 and 712 and that is the gesture detection that is mapped herein to claim 1. The gesture determination in steps 710 and 712 is for the object determined in step 708, and thus “responsive to determining the interaction” with the object in limitation [1B]. This is discussed above at §IX.A.4.c; Astala, 9:26-27.

e. [1D]: “determining a pressure and a change in pressure based on the contact data”

i. “determining a pressure”

201. Using Astala’s gesture-determination method, after determining the object contacted in step 708, Astala+Shahoian determines whether the sensed pressure (z_1) exceeds a threshold pressure (z_A) (**step 710**). Astala, Fig. 6a, 9:28-29.

202. Determining that the pressure meets a threshold involves determining the pressure (z_1).

203. The pressure determination is based on pressure (contact data) sensed by the touch screen. *See* above §IX.A.4.d (limitation [1C]).

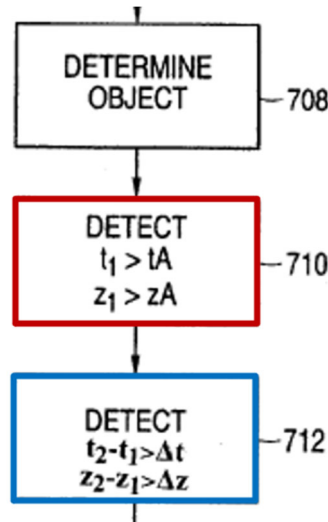
204. Astala+Shahoian senses “pressure” under any reasonable construction because this was conventionally how digitizers providing touchpads or touchscreens worked. *See, e.g.,* Shahoian, [0005], [0007], [0041].

ii. “determining... a change in pressure”

205. Astala+Shahoian uses Astala’s gesture-determination method that determines a change in pressure ($z_2 - z_1$) (**step 712** in Fig. 6a) by determining whether “the value of the pressure z of the object on the touch screen 70 has been *reduced* by an amount greater than a predetermined pressure differential Δz .”

Astala, 9:36-39.

206. Determining the change (reduction) in pressure is based on pressure measurements (contact data) from the touchscreen because the detected pressure represents “the pressure z of touch input 732.” Astala, 9:28-29.

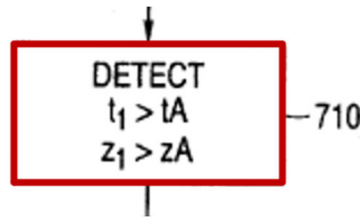


f. [1E]: “determining a press if”

207. Astala+Shahoian meets limitation [1E] because it meets limitations [1E1]-[1E3] as discussed below at §§IX.A.4.g-IX.A.4.i.

g. [1E1]: “the pressure is greater than a pressure threshold”

208. Astala+Shahoian meets limitation [1E1] because Astala’s gesture-determination method determines whether sensed pressure (z_1) exceeds threshold pressure (z_A) (**step 710**). See above §IX.A.4.e; Astala, Fig. 6a, 9:28-29 (“a determination is made that the value of the pressure z of touch input 732 is greater than a predetermined value Z_a ”); 9:32-34 (“pressure of the object touching the touch screen 70 is determined to be greater than a predetermined pressure value”).



h. [1E2]: “the change in pressure is greater than a change in pressure threshold”

209. Using Astala’s gesture-determination method, Astala+Shahoian meets limitation [1E2] two ways.

i. Astala+Shahoian Determining Whether a Pressure Reduction Exceeds a Threshold Meets [1E2]

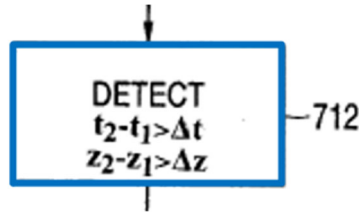
210. A POSITA would have understood that a pressure change has a magnitude and sign. A POSITA also would have understood that a claimed “change in pressure threshold” quantifies an amount (magnitude) of change and not the change’s sign (positive/negative). EX1017, 1028 (magnitude measures the “size” of a quantity).

211. Limitation [1E2] refers to a “change in pressure” (which can be positive or negative) and does not require a pressure “increase.” Thus, [1E2] requires determining “if the *magnitude* of the change in pressure (*positive or negative*) is greater” than a threshold. See above §VIII.B.

212. Astala’s gesture-determination method determines whether a change in pressure ($z_2 - z_1$) is *greater than* (“>”) a threshold pressure change (Δz) in Fig. 6a [step 712](#) by determining whether the “pressure $z...$ has been reduced by an

amount greater than a predetermined pressure differential Δz .” Astala, 9:36-39 (emphasis added).

213. This meets limitation [1E2].



214. In IPR2017-01310, Immersion argued that Astala’s step 712 is part of determining a “drag” gesture rather than “a press.” EX1025, 21-27. That argument is not correct.

215. **First**, the claim defines a press by the criteria in [1E1]-[1E3]. The ’507 specification makes clear that gestures other than a press can be determined based on *other* criteria.

216. Unless certain criteria are met, contacting the touchpad is not recognized as a valid gesture at all. Under one set of criteria the ’507 construes contact as a “tapping” (step 310); under another set it construes contact as a “pressing” (step 326). EX1001, Fig. 3, 8:16-50.

217. Astala’s determination in steps 710-712 meets everything that claim 1 requires to interpret a contact as “press”—as discussed above §§IX.A.4.g-IX.A.4.h, and below at §IX.A.4.i. Nothing in the ’507 specification supports

injecting additional or different requirements in the claims for determining a “press” than recited in limitations [1E1]-[1E3].

218. **Second**, Astala refutes any suggestion that step 712 is part of Astala’s “drag” determination. A POSITA would have understood that Astala’s “dragging and dropping” gesture uses using three separate gestures: (1) “**pressing** a selected first item displayed on the touch screen” to grab the object, (2) “dragging the [selected item]” to a second displayed item (e.g., file folder), and (3) pressing the second item to drop the first item. Astala, 2:38-40.

219. Thus, Astala uses “dragging” in the conventional sense of “moving” (Astala, 2:45-47) an object and “determine[es] that a drag operation is occurring... by detecting **changes in the x and y coordinates.**” Astala, 9:43-46 (emphasis added).

220. Step 712’s pressure evaluation does not evaluate whether the object has been moved (changed x/y coordinates), and step 712 occurs **before “step 714** [where] the object is dragged[.]” Astala, 9:40-42 (emphasis added). Testing whether a pressure change exceeds a threshold does not determine changes in X/Y coordinates.

221. Astala discloses that comparing the pressure change to a threshold (meeting limitation [1E2]) happens **before** a drag action. “At **step 714** [e.g., **after**

step 712], the object is dragged[.]” Astala, 9:40-42 (emphasis added). The “drag” begins *after* the “press” determination in steps 710 and 712.

222. Moreover, in the summary of invention Astala discloses that “dragging the object or finger along the face” of a touchscreen *follows* “pressing a selected first item displayed on the touch screen” (Astala, 2:38-40). A POSITA would have understood that a “drag” gesture refers to stylus/finger movement across a screen (e.g., dragging) and not a change in pressure in step 712, thus meeting limitation [1E2].

223. Any “drag” gesture occurs only *after* the “press” determined in steps 710-712 selects the object to be moved.

ii. Obvious To Add A Pressure-Change Determination to Astala’s Step 710.

224. If the Board were to interpret [1E2] to require “pressure change” to mean *increasing* pressure, that would have been met by an obvious implementation of Astala’s “press” detection (steps 710-712) in Astala+Shahoian.

225. It was known to interpret a touchpad interaction as a gesture that selects a displayed object based on an increase in pressure from an initial contact. EX1016 (“Lee85”), 21 (“we can push a virtual button *by giving an extra bit of pressure* to signal a change in state.”) (emphasis added); Gillespie, 48:65-49:8 (push gesture requires increasing pressure); EX1002, 386 (citing Gillespie); *see*

below §IX.B.4.g (Ground 2 limitation [1E2], discussing Kolmykov-Zotov, 13:27-57, claims 1, 9).

226. A POSITA would have recognized that Astala’s “drag and drop” interprets a gesture that selects the object to be dragged and dropped, and would have benefitted from using this known pressure increase technique for interpreting a gesture that selects an object.

227. A POSITA would have known that using increasing pressure was a design choice for selecting a displayed object in Astala.

228. Furthermore, this Astala-Shahoian variation applies a known technique (interpreting a select gesture by requiring a pressure increase exceeding a threshold) to a known device (Astala-Shahoian) ready for improvement—ensuring that the user affirmatively selects the object—yielding predictable results.

i. [1E3]: “a first interval has elapsed”

229. Using Astala’s gesture-determination method, Astala+Shahoian meets [1E3].

i. Astala+Shahoian Meets [1E3] Under the Proper Construction.

230. Under the proper construction (*see* above §VIII.A), Astala's method meets [1E3] in two ways.

231. *First*, in step 710, Astala determines whether pressure exceeds pressure threshold Z_A (*see* above §IX.A.4.g (limitation [1E1])) “over the period of

time t_1 ” that the object touches the screen and that the period of time t_1 is “greater than a predetermined time t_A .” Astala, Fig. 6a (step 710), 9:26-35, 10:28-31 (claim 1). Astala therefore only determines a press when step 710 determines that a first interval (t_A) has “elapsed.”

232. **Second**, in step 712, Astala determines that “ $t_2 - t_1 > \Delta t$ ”. Astala, Fig. 6a (step 712); *see above* §IX.A.4.h (limitation [1E2]).

233. A POSITA would have understood that the pressure measurements (z_1 and z_2) are detected at times (t_1 and t_2) separated by a time interval exceeding Δt . This requires that a first interval (Δt) has “elapsed” between pressure measurements. Astala therefore determines a press only when step 712 determines that a first interval (Δt) has “elapsed,” because determining a press requires evaluating the change in pressure between pressure measurements z_1 and z_2 , which in turn requires that the time interval (Δt) has “elapsed” between those pressure measurements.

ii. An Obvious Modification of Astala+Shahoian Meets The IPR2016-01777 Construction

234. The construction from IPR2016-01777 is not a correct construction, as discussed above at §VIII.A. However, even if the Board were to adopt it, an obvious variant of Astala+Shahoian meets it.

235. A POSITA would have had motivation to modify Astala to require that both the pressure above a threshold ($z_1 > z_A$ in step 710) and pressure change

above a threshold ($z_2 - z_1 > \Delta z$ in step 712) persist through an interval to ensure that intermittent pressing is not misinterpreted as invoking a drag-and-drop.

236. A POSITA would have known this was a conventional gesture-determination design choice as demonstrated *see* below §§IX.B.4.e-IX.B.4.h (Ground 2 limitations [1E]-[1E3]).

237. A POSITA reasonably would have expected success implementing this variation because the programming to implement it was well-within the POSITA's ordinary skill and the software was predictable. *See* below §§IX.B.4.e-IX.B.4.h (Ground 2 limitations [1E]-[1E3]).

j. [1F]: “responsive to determining the gesture, outputting a haptic effect.”

238. Responsive to determining the gesture (a press that selects an object to be dragged in [1E]), Astala+Shahoian uses Shahoian's teaching to output a haptic effect to the touch-sensitive device. *See* above §IX.A.3 (discussing Astala+Shahoian); Shahoian, [0189] (“Haptic sensations can be associated with or dependent on particular gestures”), [0007], [00013], [0179].

239. Thus, Astala+Shahoian renders claim 1 obvious.

5. Claim 2

2	The method of claim 1, wherein the contact data comprises an actual pressure and a pseudo pressure.
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240. Astala+Shahoian renders claim 2 obvious because the combination uses Shahoian’s teachings to detect actual and pseudo pressure. *See* above §IX.A.3 (discussing Astala+Shahoian).

a. Pseudo pressure

241. The ’507 patent describes “pseudo pressure” as an indirect measure of pressure—e.g., “not a direct measure of pressure”—based on the “amount of capacitance resulting from the conductor touching the touchpad.” EX1001, 3:10-14 (the “amount of capacitance is *not a direct measure of pressure* but rather a pseudo pressure”) (emphasis added).

242. The ’507 patent explains “the “capacitance change” providing pseudo pressure varies with the “surface [area] of the conductor used on the touchpad” like a “user’s finger” (EX1001, 3:15-31).

243. A POSITA would have understood that Shahoian’s capacitive sensors (Shahoian, [0041]) provide contact data comprising “pseudo pressure” (claim 2) as claimed.

244. For example, Shahoian identifies Martinelli as disclosing the type of capacitive, resistive, and other touchpad sensing used in Shahoian (Shahoian,

[0041]). Martinelli’s capacitive sensors measure what the ’507 patent calls pseudo pressure. Martinelli, 2:1-3:1 (“capacitive touchpads *indirectly measure* the amount of *applied pressure* by measuring the surface area of the object applying the pressure”) (emphasis added). This is consistent with the discussion of pseudo-pressure that I provided above when discussing the technology (*see* §VI.A), and also meets the ITC construction of “pseudo pressure” as “an indirect measure of pressure.” *See* above §VIII.B; EX1015, 53.

b. Actual pressure

245. Shahoian also discloses “resistive” sensing and explains “[r]esistive touchpads are typically pressure-sensitive.” Shahoian, [0041]. A POSITA would have understood that resistive sensing as disclosed in Shahoian measured actual pressure or force.

246. Martinelli confirms this because Shahoian identifies Martinelli as an example of resistive sensing (Shahoian, [0041]), and Martinelli’s resistive touchpad “ha[s] the ability to measure the *actual pressure* applied by an object” and “the gradation of pressure applied to the touchpad and offer dynamic pressure-sensing features.” Martinelli, 4:40-53 (emphasis added); *id.*, 5:3-7.

247. Shahoian’s sensors provide contact data comprising “actual pressure” meeting claim 2.

248. This renders obvious claim 2.

6. Claim 3

3	The method of claim 2, wherein the pseudo pressure is based on a change in capacitance resulting from the contact.
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249. Astala+Shahoian's capacitive sensors measure pseudo pressure based on a change in capacitance resulting from contact. *See* above §IX.A.5 (claim 2); Shahoian, [0041] (citing Martinelli's capacitive sensing); Martinelli, 2:13-16 (capacitance "[is] altered" by touching), 3:9-11 ("**capacitive** touchpad measures the area of contact") (emphasis added), 2:1-3:1.

250. This renders obvious claim 3.

7. Claim 4

4	The method of claim 3, wherein the contact data is based on a contact on a specific portion of a touch-sensitive input device.
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251. Astala+Shahoian renders obvious claim 4 because it uses Astala's method that reads "the x and y coordinates of the touch input 732." Astala, 9:16-27, Fig. 6 (706).

252. The x/y coordinates are based on the contact data and identify "a specific portion of a touch-sensitive input device."

8. Claim 5

5	The method of claim 4, wherein the contact information comprises position data, and further comprising determining whether a contact is made on a softkey based on the position data.
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253. Claim 5 does not require pressing a softkey as part of the claim 1 gesture determination, but adds a new requirement for determining contact on a

softkey. Astala+Shahoian renders obvious claim 5 because it uses Astala's method of detecting user interaction with a "virtual keyboard" (Astala, 7:6-10, 8:48-50) that implements keypad functions on a display screen (Astala, 2:14-18).

254. A POSITA would have understood that Astala's "virtual keypad" had virtual keys, e.g., softkeys. Astala, 7:6-10.

255. "Softkeys" (also referred in the art as "soft keyboards", "virtual keys", etc.) on touchscreens and touchpads would be well-known to a POSITA. For example, EX1062 ("Kikinis") teaches softkeys by name, both on a flat-panel display or a separate monitor. Kikinis, 11:35-40:

In other embodiments, the display may be a flat-panel display pivoted to the case, or a separate monitor in communication with case 223. The touch screen provides a "**softkey**" operation in conjunction with interactive control logic. (emphasis added)

256. EX1063 ("Martin") teaches that softkeys were known in the art, referring also to them being defined by an area on a transparent touchpad. Martin, 1:53-59:

Often, touchpads are combined with flat-panel display screens that display one or more graphically generated buttons or **softkeys**. Normally, the **softkeys** are visible through the touchpad. A user's contact with the touchpad in an area defined by a **softkey** provides the electronic device having the touchpad with the input associated with that **softkey**. (emphasis added)

9. Claim 6

6	The method of claim 1, wherein the determining a gesture comprises determining a tapping gesture.
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257. The '507 specification describes “tapping” (step 310) and “pressing” (step 326) as different gestures determined using different criteria. EX1001, Fig. 3, 8:16-40. Limitation [1E] concerns “determining a *press*” not criteria for “determining a *tapping* gesture.”

258. Claim 1 requires determining a pressure and pressure change and using them as criteria for “determining a press” (limitations [1E1]-[1E3]), which Astala+Shahoian meets as discussed above at §IX.A.4.e (limitation [1D]). Neither claim 1 nor claim 6 requires using that pressure or pressure change in “determining a tapping gesture.”

259. Claim 6 merely requires determining a tapping—without limiting how.

260. Astala+Shahoian renders obvious claim 6 because Shahoian teaches tapping gestures. Shahoian, [0189] (“a user can select a graphical object or menu item by ‘tapping’ the touchpad” and discussing other tap gestures); *see below* §IX.B.5 (claim 6).

261. A POSITA would have had reasons to configure Astala+Shahoian to provide a tapping gesture as taught by Shahoian and to provide haptic feedback for

the tapping gesture as taught by Shahoian. Shahoian, [0189] (“Haptic sensations can be associated with... particular gestures”). Tapping was a known design choice for “selecting” an object or menu item and would allow the user to select among the services Astala’s system provides. Astala, 3:45-50.

262. A POSITA reasonably would have expected success in implementing this known functionality because achieving it was well within the POSITA’s skill.

10. Claim 7

a. Preamble

7[PRE]	The method of claim 1, wherein determining the gesture further comprises:
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263. Astala+Shahoian meets 7[PRE] because it meets limitations [7A]-[7C] as discussed below at §§IX.A.10.b-IX.A.10.d.

b. Limitation [7A]

7A	calculating a first value associated with a speed of movement of a contact across the input device;
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264. Astala+Shahoian meets [7A] because it uses Astala’s method that “detect[s] changes in the x and y coordinates over a predetermined period of time” (Astala, 9:44-46) to determine whether “the location of the pressure between the object and the touch screen is changing at a rate greater than a predetermined rate” (Astala, 10:52-56) when determining a “drag and drop” gesture. A POSITA would have understood that the “rate” of change in x/y coordinates is “speed of movement” across the touchscreen surface.

265. Detecting the speed of contact movement across a touchpad/touchscreen was well-known. Shahoian, [0042] (disclosing detecting “the speed of the fingertip on the touchpad”); Rosenberg, 15:50-60.

266. Shahoian moves the cursor “a greater distance” if the user moves the finger faster than if the user moves the finger more slowly. Shahoian, [0042].

267. It would have been obvious to use this known technique in the Astala-Shahoian combination to determine how far to move the object responsive to the user dragging the object while performing Astala’s drag and drop. A POSITA would have expected success in implementing this known functionality which was within the skill and abilities of a POSITA.

c. Limitation [7B]

7B	comparing the first value to a speed threshold value; and
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268. Astala+Shahoian meets [7B] because Astala compares the rate of change (speed) of the pressure location to “a predetermined rate” (a speed threshold value). Astala, 10:52-56.

269. Additionally, a conventional and obvious way to implement Shahoian’s technique that “correlates” the “speed of the fingertip on the touchpad” to “the distance that the cursor is moved in the graphical environment” (Shahoian, [0042]) was to compare the speed to one or more thresholds, where each threshold specifies a distance the cursor is to be moved.

d. Limitation [7C]

7C	outputting a signal if the first value is less than the speed threshold value.
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270. The only thing the '507 specification describes as happening “if” the speed value is determined (step 320) to be less than the speed threshold is that the gesture-determining processor proceeds to a different next processing step in Fig. 3’s flowchart. EX1001, 8:32-42.

271. Thus, a POSITA would have understood that the claimed “signal” is a signal the processor generates that determines its next processing step. EX1001, 8:32-42. The conventional and obvious way to implement Astala+Shahoian’s speed determination is for the input device controller’s processor to output a signal when the speed is less than the threshold to control the speed of the cursor/object movement.

11. Claim 8

8	The method of claim 7, further comprising applying a speed filter to the first value before comparing the speed to the speed threshold value.
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272. Shahoian incorporates Rosenberg. Shahoian, [0049]. Rosenberg discloses filtering velocity calculated from sensor data (contact data) to suppress noise spikes to improve gesture recognition. Rosenberg, 21:8-52.

273. A velocity filter is a speed filter. Filtering speed data was conventional. E.g., Rosenberg, 21:8-52.

274. For one thing, it would simply be known as a mathematical effect that small variations or noise (including simple quantization noise) or variations result in much greater noise levels when the data is differentiated: velocity or speed values are the differentiation of sequential position data points over time. It was further known that position data from digitizers is generally quite noisy, relative to the (quantized) resolution of the digitizer. *See, e.g.,* EX1064, 31-32; generally EX1064 throughout.

275. EX1065 (“Rosenberg-373”) teaches that the computed velocity and acceleration data should be filtered. Rosenberg-373, 21:9-16:

In the preferred embodiment, this processing includes two steps: computing velocity and/or acceleration values from raw position data (if velocity and/or acceleration are needed to compute forces), **and filtering the computed velocity** and acceleration data. The velocity and acceleration values are computed from raw position data received in step 88 and stored position and time values. (emphasis added)

276. EX1066 (“Meadows”) similarly explains, at 4:9-14:

In this approach, the number of samples that are averaged is increased with a decreasing rate of movement. In still another embodiment of the invention, a variable analog filter is controlled by the processor to adjust the touch signal filtering in response to changes in the rate of movement. (emphasis added)

277. Based on Shahoian’s teachings and the POSITA’s background knowledge of the benefits of speed filtering to improve gesture recognition, a POSITA implementing Astala+Shahoian would have applied a speed filter to the first value (see [7A]) before comparing it to the speed threshold (see [7B]) with a reasonable expectation of success.

278. Therefore a POSITA would have understood that claim 8 was obvious over Astala+Shahoian.

12. Claim 9.

9[PRE]	A non-transitory computer-readable medium comprising program code for causing a processor to execute a method, the program code comprising:
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279. Claim 9 recites a non-transitory computer-readable medium (“CRM”) comprising program code for causing a processor to execute a method.

a. Astala+Shahoian Uses Non-Transitory CRM With Program Code Executed by a Processor.

280. Astala+Shahoian uses Astala’s gesture-determination method implemented via an “executable software program.” Astala, 6:10-30. Astala discloses “software for operating... terminal 20” where terminal 20 includes “a touch screen controller for controlling the input process for touch screen 70.” Astala, 6:29-32. A POSITA would have understood that Astala’s “touch screen controller” has a processor that executes the terminal’s software to perform gesture determination from touchscreen inputs. Astala, 8:54-56 (touchscreen controller

“monitors touch screen input-parameters for processing the touch inputs on the touch screen display”).

281. Shahoian confirms this was conventional. Shahoian, [0049] (incorporating Rosenberg); Rosenberg, 3:6-8 (microprocessor manages “force feedback control signals”), 11:2-5 (microprocessor uses “position value signals”).

282. A POSITA would have had additional reasons to implement Astala+Shahoian’s gesture determination using software (program code) executed by a processor because this was conventional and provided the well-known advantages of a software implementation, including the flexibility to be easily updated or changed. EX1014, 20:26-32 (position data processing implemented “as software running on a microprocessor”), 27:56-64 (gesture determination “could readily be made by performing one of a number of equivalent software routines... [which] are obvious and straightforward from the functions described herein.”), 29:53-58 (similar teachings).

283. The conventional and obvious way to implement the “software” implementation Astala discloses (Astala, 6:29-32) with a reasonable expectation of success was to store the software program code in a non-transitory CRM (e.g., memory) accessible to the processor so that the processor can execute the program code. Astala, 6:27-30 (hardware includes “memory for storing... the software for operating the terminal”).

b. Astala+Shahoia's Program Code Causes a Processor to Perform [9A]-[9F]'s Method Steps

284. Limitations [9A]-[9F] each recites “program code for” executing a method step, and those steps are substantively identical to limitations [1A]-[1F], respectively. EX1019.

285. Astala+Shahoian's program code implements claim 1's method and that program code meets elements [9A]-[9F] for the same reasons Astala+Shahoian meets limitations [1A]-[1F], as illustrated below.

Limitation	Corresponding	Analysis
[9A]	[1A]	§IX.A.4.b
[9B]	[1B]	§IX.A.4.c
[9C]	[1C]	§IX.A.4.d
[9D]	[1D]	§IX.A.4.e
[9E]	[1E]	§IX.A.4.f
[9E1]	[1E1]	§IX.A.4.g
[9E2]	[1E2]	§IX.A.4.h
[9E3]	[1E3]	§IX.A.4.i
[9F]	[1F]	§IX.A.4.j

13. Claims 10-13.

286. Claims 10-13 depend from claim 9 and recite limitations substantively identical to claims 2-4 and 6, respectively. EX1019. Astala+Shahoian meets and renders obvious claims 10-13 for the same reasons it meets claims 2-4 and 6 as illustrated below.

Claim	Corresponding	Analysis
10	2	§IX.A.5
11	3	§IX.A.6
12	4	§IX.A.7

13	6	§IX.A.9
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14. Claim 14.

a. Astala+Shahoian's System Has a Processor and CRM

287. Claim 14 recites a system comprising a processor communicating with CRM and configured to perform certain method steps. *See* 14[PRE]-14[B]. Astala+Shahoian uses Astala's gesture-determination method, implemented via a processor in communication with a CRM to run code stored thereon as described for claim 9. *See* above §IX.A.12.

b. Astala+Shahoia's Processor is Configured to Perform [14C]-[14H]

288. Limitations [14CA]-[14H] recite method steps substantively identical to limitations [1A]-[1F] as illustrated below. EX1019. Astala+Shahoian's processor is configured to meet limitations [14C]-[14H] for the same reasons Astala+Shahoian meets limitations [1A]-[1F].

Limitation	Corresponding	Analysis
[14C]	[1A]	§IX.A.4.b
[14D]	[1B]	§IX.A.4.c
[14E]	[1C]	§IX.A.4.d
[14F]	[1D]	§IX.A.4.e
[14G]	[1E]	§IX.A.4.f
[14G1]	[1E1]	§IX.A.4.g
[14G2]	[1E2]	§IX.A.4.h
[14G3]	[1E3]	§IX.A.4.i
[14H]	[1F]	§IX.A.4.j

15. Claims 15-18.

289. Claims 15-18 depend from claim 14 and recite limitations substantively identical to those in claims 2-4 and 6. EX1019. Astala+Shahoian's processor is configured to meet claims 15-18 for the same reasons Astala+Shahoian meets claims 2-4 and 6 as detailed below.

Claim	Corresponding	Analysis
15	2	§IX.A.5
16	3	§IX.A.6
17	4	§IX.A.7
18	6	§IX.A.9

B. Ground 2: Keely+Kolmykov-Zotov Renders Obvious Claims 1, 6-9, 13-14, and 18.

1. Keely

290. Keely is a patent application that published May 16, 2002, which issued as EX1011 ("Keely-536").

291. Like the '507 patent (EX1001, 1:49-51), Keely discloses techniques for simulating mouse gestures on a touchpad. Keely, Abstract. A mouse has a primary gesture ("left click") and a secondary gesture ("right click"). Keely, [0003]. Keely "simulat[es] mouse gestures with the stylus" on a touch-sensitive device. Keely, [0004]-[0005].

292. Keely's technique can be used with a tablet computer having a digitizing display. Keely, [0021], Fig. 2. When the tablet detects that a stylus has

touched the display (“placing the stylus down”), the tablet begins “counting time, e.g., by using a timer, up to at least a threshold amount of time.” Keely, [0023].

“A timeout condition is defined responsive to the threshold amount of time having passed.” *Id.* Keely detects a mouse click when the stylus touches the digitizing display and then is lifted from the display. Keely, [0024]-[0025].

293. In one embodiment, the tablet simulates a left-click if the stylus touches a location but is brought up before a timeout (Keely, [0024]), whereas raising the stylus after the timeout simulates a right-click (Keely, [0025]).

294. Keely describes a “need for providing helpful feedback” to the user to “indicate whether gestures made with the stylus are those that are intended by the user.” Keely, [0006]. Keely teaches confirming a gesture—like a mouse button click—with “tactile” feedback including “vibration of the computer 201 [tablet] and/or stylus.” Keely, [0031].

2. Kolmykov-Zotov

295. Kolmykov-Zotov (“KZ”), like Keely, discloses techniques for evaluating gestures on a pen-based computing system using a touchscreen (KZ, 3:18-22). Kolmykov-Zotov recognized that press-and-hold gestures simulating mouse clicks using techniques like Keely’s were imprecise because it could be difficult for a user to hold a stylus steady in one location for a fixed interval. KZ, 2:29-43.

296. Kolmykov-Zotov describes a more reliable technique for determining if a user intended a dwell gesture to be a “press-and-hold” action. KZ, 3:12-15, 5:53-6:7; 10:37-52. Kolmykov-Zotov teaches using “two different parameters”—also called “first” and “second” parameters—in making the gesture determination. KZ, Abstract, 3:19-45, 5:53-66, 7:25-27. Kolmykov-Zotov describes several different parameters that can provide the first and second parameters in determining a press-and-hold gesture (KZ, 6:8-43, 13:26-57), including pen pressure (KZ, 13:32-33) and change in pen pressure (KZ, 13:40-41).

297. Kolmykov-Zotov measures each parameter over a “predetermined time period” and compares a measured parameter to a respective “predetermined parameter value” (e.g., a threshold) “correspond[ing]” with a press-and-hold gesture. KZ, claim 1.

3. Keely+Kolmykov-Zotov

298. Keely and Kolmykov-Zotov are from the same field of endeavor as the '507 patent, identifying gestures on a touch-sensitive input device.

299. A POSITA would have had reasons to combine Keely and Kolmykov-Zotov with a reasonable expectation of success as explained below.

a. Reasons to combine

300. Keely describes gestures requiring holding a pen down for a time interval. Keely, [0024]-[0025], [0027]. Kolmykov-Zotov characterizes such

gestures as a “press-and-hold” action that “can be difficult... to perform because it can be difficult... to hold a pen perfectly steady for a predetermined time period[.]” KZ, 2:29-43; id., 10:37-52 (explaining problems arising from erroneous or delayed press-and-hold determinations); EX1027, [0010] (discussing difficulty in holding a stylus in place).

301. Kolmykov-Zotov criticizes prior techniques addressing the “holding pen steady” problem in “press-and-hold” systems like Keely’s. KZ, 2:43-3:1.

302. Kolmykov-Zotov teaches that evaluating other parameters—including pen pressure (KZ, 13:32-33) and change in pen pressure (KZ, 13:40-41)—to determine a press-and-hold simulating a mouse click made “press-and-hold processing easier, quicker, and more reliable.” KZ, 3:12-15; id., 10:37-52 (similar teachings).

303. A POSITA would have had reasons to use Kolmykov-Zotov’s gesture-determination techniques in Keely.

304. *First*, Kolmykov-Zotov teaches that its techniques determine a press-and-hold more accurately than techniques like Keely’s. KZ, 3:12-15 (“more reliable”); 10:37-52 (Kolmykov-Zotov’s techniques “improve the accuracy of a determination of whether a dwell gesture... is intended to constitute a press-and-hold... or some other action[.]”).

305. *Second*, using Kolmykov-Zotov's known technique to address known shortcomings with Keely's gesture determination simply uses prior art elements according to their established functions, which would have been obvious.

306. There were known problems with Keely's gesture analysis for which Kolmykov-Zotov provided an obvious solution.

307. A POSITA would have seen a benefit to using Kolmykov-Zotov's press-and-hold determination methods to remedy Keely's known shortcomings. KZ, 2:29-43, 10:37-52; EX1027, [0010].

308. Kolmykov-Zotov confirms this combination would have been "a suitable" option. KZ, 9:29-38. Indeed, a POSITA would have recognized that Keely and Kolmykov-Zotov's teachings fit together like pieces of a puzzle.

b. Reasonable expectation of success

309. A POSITA reasonably would have expected that using Kolmykov-Zotov's gesture-determining techniques in Keely would have succeeded. Keely and Kolmykov-Zotov both disclose techniques for determining user intent from interaction with a touchpad to simulate mouse gestures. Keely and Kolmykov-Zotov both describe a touch-sensitive input from the same touch-sensitive input devices that have a processor programmed by software to receive contact data and interpret user gestures. Keely, [0021]-[0022]; KZ, 9:19-55.

310. A POSITA would have known that it would have been simple and straightforward to modify Keely's gesture-determining software to use Kolmykov-Zotov's analysis techniques.

311. For those reasons a POSITA would have used Kolmykov-Zotov to improve Keely's gesture analysis.

c. Keely+Kolmykov-Zotov

312. The combination Keely+Kolmykov-Zotov is Keely's touchpad and haptic feedback system modified to incorporate Kolmykov-Zotov's gesture-determination techniques

4. Claim 1

a. Preamble

1[PRE]	A method comprising:
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313. Keely+Kolmykov-Zotov meets 1[PRE] because it implements a method for gesture determination as taught by Keely and modified by Kolmykov-Zotov. Keely, Abstract ("A method... for simulating at least one gesture of a pointing device such as a mouse."), [0008] (similar teachings), claims 1-13 (claiming methods); KZ, Abstract ("methods ... are used to determine whether specific electronic pen gestures ... should be processed as 'press-and-hold' gestures."), claims 1-10 (claiming methods).

b. Limitation [1A]

1A	receiving contact data from an input device;
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314. Keely+Kolmykov-Zotov uses Keely’s touch-sensitive display (also called a “digitizer” or touchscreen) which is an “input device” as claimed. Keely, [0004] (“systems utilize a touch-sensitive display screen with a stylus as an input device”), [0007] (“touch-sensitive display surface”), [0021] (discussing digitizing display panels providing touch-sensitive display surface 202); Fig. 1 (digitizer 165 connects to processing unit 110); *accord* KZ, 9:19-38 (system “interprets gestures made using stylus 204” on the same type of digitizer as Keely).

315. A POSITA would have understood that Keely’s digitizers (“touch-sensitive input devices”) (Keely, [0021]) worked by sensing user contact (e.g., via a pen, stylus, or finger) with the digitizer, generating data (“contact data”) representing that contact (e.g., x/y position on the digitizer, the pressure applied, etc.), and providing that contact data to a processor that interprets it. Keely, Abstract (computer detects stylus interaction with touchpad); *accord* KZ, Title (detects dwell gesture “by examining parameters associated with pen motion”), Abstract (“measuring” parameters “associated with pen interaction”), 10:8-18 (“input used to control the user interface is entered... using an electronic pen”).

316. A POSITA would have understood that a processor in Keely’s system “receives” contact data representing user input because Keely describes processing

the user input. Keely, [0009] (providing feedback “responsive to certain stylus gestures” including “pressing” the “display surface” for “at least” a “minimum... time”), [0021] (tablet PC 201 “interprets marks made using stylus 204” on the “pen digitizer”), [0023] (“computer 201 detect[s] the stylus being placed down”), claim 1 (detecting and responding to stylus interaction with touchscreen), claim 14 (computer comprising “a processor” configured to detect stylus contact); *accord* KZ, 7:8-15 (“processor for measuring... interaction parameters” and determining press-and-hold), 9:19-38, 10:8-18 (“input used to control the user interface is entered into the computer system using an electronic pen”).

c. Limitation [1B]

1B	determining an interaction with a displayed object on a screen based on the contact data;
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317. Keely+Kolmykov-Zotov uses Kolmykov-Zotov’s techniques to improve Keely’s technique for simulating mouse clicks in a system using a graphical user interface (“GUI”) and stylus. *See* above §IX.B.3 (describing combination); Keely, [0008] (“simulating gestures of a pointing device”), [0024] (left click), [0025] (right click), [0029] (invention usable with a “GUI operating system”), Fig. 2.

318. A POSITA would have understood that pointing devices and mouse clicks were conventionally used to interact with objects displayed in a GUI. E.g., Astala, 9:3-35.

319. Keely’s computer allows the user to interact (“edit, manipulate, and create”) with “*objects* through the use of the stylus.” Keely, [0007]; *id.*, [0004] (“user places the stylus tip upon the touch-sensitive display screen... to control *objects* displayed on the display screen”), [0030] (“A user can press and hold, then drag over ink, text, or other objects, within a document to *select those objects*.”).

320. Kolmykov-Zotov similarly explains that pen interaction with a digitizer may correspond to “tapping a *user interface element* (such as a toolbar item)” —which is a “displayed object on a screen”—to perform a gesture “to allow performance of the function(s) associated with that interface element.” KZ, 2:3-18; *id.*, 2:29-39 (defining “press-and-hold” gesture to signal mouse “right click” functionality), 5:11-14 (defining “press-and-hold”), 9:33-38 (system “interprets gestures made using stylus 204 in order to ... execute conventional... application tasks”), 10:8-13 (“input used to control the user interface is entered into the computing system using an electronic pen”).

321. As demonstrated above, both Kolmykov-Zotov and Keely use contact data from a digitizer (input device) to determine user interactions with, e.g., “user interface elements,” “toolbar[s]” (KZ, 2:3-28), “objects displayed,” data, “ink, text, or other objects” displayed on a screen (Keely, [0004], [0030]).

322. Thus, Keely+Kolmykov-Zotov determines an interaction with a displayed object on a screen based on the contact data meeting [1B].

d. Limitation [1C]

1C	responsive to determining the interaction, determining a gesture based on the contact data comprising:
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323. Keely+Kolmykov-Zotov meets [1C] because it responds to determining user interaction with the input device by analyzing the contact data to determine a press-and-hold gesture that simulates a right mouse click based on the contact data, as discussed below at §§IX.A.4.e-IX.A.4.i (limitations [1D]-[1E3]).

e. Limitation [1D]

1D	determining a pressure and a change in pressure based on the contact data, and
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324. Keely+Kolmykov-Zotov meets [1D] because it uses Kolmykov-Zotov's gesture-detection techniques that “determin[e] whether a specific gesture constitutes a press-and-hold action” (13:27-29) by “measuring” first and second “parameter[s] associated with pen interaction” with a digitizer (KZ, 5:57-66, 10:53-62, claim 1), where the first and second parameters can be “*pen pressure* normal to the digitizer” and “*change in pen pressure* normal to the digitizer.” KZ, 13:27-57, claims 1, 9.

325. Kolmykov-Zotov teaches that parameter selection from among the disclosed parameters was a design choice. KZ, 13:27-29 (“wide variety of parameters may be used in determining whether a specific gesture constitutes a press-and-hold”), 13:47-57 (“any suitable parameter” and “*any suitable* number of parameters and/or *combinations*” of parameters “may be used”).

326. A POSITA would have understood that evaluating pressure and change in pressure together was a known “suitable ... combination[]” (KZ, 13:47-57) for determining user intent. See, e.g., Astala, steps 710 and 712.

327. A POSITA would have understood Kolmykov-Zotov disclosed using pressure and change in pressure as the first and second (“two different”) parameters used to determine a press-and-hold gesture. KZ, Abstract, 6:8-43, 13:27-57, claims 1, 9.

328. Furthermore, it would have been an obvious design choice to use pressure and change in pressure together to determine a gesture because it was known to use them together in making gesture determinations. *See above* §§IX.A.4.e, IX.A.4.g-IX.A.4.h; Lee85, 21; Gillespie, 48:65-49:8. Requiring a user to press harder normal to the digitizer to provide a ***change in pressure*** exceeding a threshold (*see below* §IX.B.4.g) was a conventional way to force the user to signal a press-and-hold intent. Lee85, 21; Gillespie, 48:65-49:8.

329. A POSITA would have understood that Kolmykov-Zotov’s “measuring” the “pen pressure” and “change in pen pressure” parameters “determine[es]” them “based on the contact data” as claimed. KZ, 14:11-15 (using “underlying data” from pen interaction in parameter measurement). Kolmykov-Zotov explains that the “measurement values... are processed (if necessary) to

provide the various parameters needed.” KZ, 14:66-15:2, Fig. 7 (step S514 (calculate parameters)).

330. Kolmykov-Zotov further explains that a POSITA would recognize that “any suitable... combinations of the above parameters” including pressure and change in pressure “may be used in the” press-and-hold gesture determination. KZ, 13:26-57. Thus, Kolmykov-Zotov expressly discloses using pressure and change in pressure, based on user input data, for determining a gesture.

331. A POSITA would have understood that Kolmykov-Zotov’s “change in pressure” is “determin[ed]” by calculation from two or more pressure measurements.

332. If Kolmykov-Zotov is considered as not expressly disclosing this calculation, that would have been an obvious way to determine the “change in pressure” Kolmykov-Zotov describes.

333. A POSITA also would have known that it was pen pressure could be used to ascertain a user’s intent. For example EX1053 (“Negroponte”) teaches that pushing harder on a pencil (a stylus) on a digitizing tablet indicates that the user’s intent was to emphasize the input. Negroponte, 22-1-4:

We also associate intentions with the user's pressure upon the stylus.

This feature has been added to the Sylvania Tablet by Wade Shaw as part of his Electrical Engineering Thesis, Textural Input and Definition for Graphic Display. A pressure sensing gage (sic) placed

within the shaft of the pen measures how hard the user is pressing down. When connected with the focus control of the display, this feature simulates **pushing harder on a pencil to get a blacker line.** We believe that this is particularly important to sketching because it is quite common to overtrace lines, and thus without erasing, to make the most **up-to-date lines emphatically dark.** (emphasis added)

334. EX1067 (“Taggart”) taught that the user’s intent to emphasize detail can be inferred from the user pushing (pressing) harder. Taggart also taught to use a quantum change in pressure for making the inference, and not small variations. E.g., Taggart, 15-16:

Pressure can also be sensed to provide cues to the intentions of the user. Here, the role variations of pressure in a sketch is not so clear. It appears, however that pressure variations occur in quanta; a user typically draws in no more than three or four pressure ranges. An initial inference is that pressure behaves something like inverse rate—that is, **the harder a person pushes, the greater the detail implied.** The cue to look for, however, **is the quantum pressure change, not the small variations across a line.** (emphasis added)

f. Limitation [1E]

1.e	determining a press if:
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335. Limitations [1E1]-[1E3] list conditions for determining a “press” in [1E].

336. Keely+Kolmykov-Zotov meets [1E] because it uses use Kolmykov-Zotov’s gesture-detection that determines a “press-and-hold” gesture if the criteria recited in limitations [1E1]-[1E3] are met. *See* below §§IX.B.4.g-IX.B.4.h.

g. Limitations [1E1]-[1E2]

1E1	the pressure is greater than a pressure threshold,
1E2	the change in pressure is greater than a change in pressure threshold, and

337. Keely+Kolmykov-Zotov meets [1E1] and [1E2] because Kolmykov-Zotov discloses determining a press-and-hold gesture by measuring “pen pressure normal to the digitizer” ([1E1]) and “change in pen pressure normal to the digitizer” ([1E2]). KZ, 13:27-57, claims 1 and 9.

338. Kolmykov-Zotov discloses using pressure and pressure change together as the “two different parameters” Kolmykov-Zotov describes for making a press-and-hold determination (KZ, Abstract, 6:8-43, 13:27-57, claims 1, 9). In the alternative, this would also have been an obvious implementation for the reasons explained above at §IX.B.4.e (limitation [1D]).

339. Kolmykov-Zotov discloses “comparing” the measured first and second parameter values—which can be pressure and change in pressure (KZ, 13:27-57)—to “predetermined parameter values corresponding to a press-and-hold gesture” (KZ, 19:41-43, claim 1).

340. A POSITA would have understood that Kolmykov-Zotov's "predetermined parameter values" are "threshold" values.

341. Kolmykov-Zotov does not expressly state that its "comparing" requires a parameter to be "greater" than a "predetermined" value.

i. Pressure

342. A POSITA would have known that requiring pressure to be "greater" than a threshold was conventional to exclude inadvertent digitizer interactions. Lee85, 23 ("a threshold... must be overcome in order for a touch to be detected").

343. Such minimum pressure requirements were known for triggering a press-and-hold gesture. For example, Kent describes requiring pressure above a threshold before recognizing a gesture. Kent, 3:14-31:

In one embodiment of the invention, projective-capacitive sensors are used as the primary sensor and one or more force 15 sensors are used to obtain touch validation. In this embodiment the force sensor is used to determine when an object makes contact with the touch surface. Preferably the system is set-up to require that a certain pressure must be applied to the touchscreen in order to register a touch. **Once the pressure on the touchscreen exceeds a predetermined threshold,** the projective-capacitive sensor is queried to determine if it also detects a touch. If the projective capacitive sensor does not detect a touch, the touch is invalidated and the system is placed back into a stand-by mode. If the projective-capacitive sensor does detect a touch, then position coordinates are determined. Additionally, in the

preferred embodiment an untouch threshold is set. This threshold can be, for example, equal to a percentage of the projective-capacitive signal amplitude when the touch was first detected by the force sensor. (emphasis added)

344. Kolmykov-Zotov describes “adjust[ing] standards for activating press-and-hold processing” to exclude erroneous activation (KZ, 6:65-7:7), which a POSITA would have known could include setting such pressure thresholds.

345. Thus, a conventional and obvious way to implement Kolmykov-Zotov’s pressure determination was to determine whether the pressure is greater than a pressure threshold as required by [1E1].

346. A POSITA would have had several reasons to require pressure above a threshold. This would exclude inadvertent digitizer interactions and thus reduce false gesture recognitions. EX1016, 23 (“In order to account for time and other variations... a threshold is included which must be overcome in order for a touch to be detected.... [using] ranges from 2 to 7 counts[.]”)

347. This teaching would already be known or obvious to a POSITA from the prior art. A POSITA would have known that contact data, especially at a light touch, could be noisy and unreliable. Both this problem and the requirement that points have sufficient pressure are taught, for example, in EX1068 (“Protheroe”) at Abstract, 3:57-61:

An apparatus and method for digitizer sampled point validation which determines the contact resistance at a point of contact between the upper and lower layers of the digitizer and compares the contact resistance with a valid range of contact resistances to either accept or reject the sampled point.

* * *

If contact resistance R_c is above the valid range, then there is insufficient pressure being applied at the point of contact and spiking has occurred. If contact resistance is below the valid range, then more than one point of contact exists at the same time. (emphasis added)

348. In this same passage, Protheroe also teaches sensing pressure by measuring the contact resistance.

349. Requiring *pressure* to be “greater” than a threshold was a conventional method for setting adaptable lower pressure requirements for press-and-hold tailored to particular users. KZ, 3:41-45 (“adjusting” and “customizing” gesture determination standards “based on user input”).

350. A POSITA already would have understood tailoring lower thresholds to suit the preferences of an individual user from other prior art as taught in EX1069 (“Gillespie-591”) at 23:5-12:

The finger pressure is obtained by summing the capacitances measured on the sense lines. This value is already present in the

denominator accumulator after subtracting the offset O_p . A finger is present if the pressure exceeds a suitable threshold value. This threshold may be chosen experimentally and is a function of surface material and circuit timing. The threshold may be adjusted to suit the tastes of the individual user. (emphasis added)

ii. Pressure change

351. A POSITA would have known that requiring a pressure change to be “greater” than a threshold was a conventional way to determine user intent by requiring that the pressure change be large enough to signify a purposeful user action rather than an unintended minor pressure variation. Lee85, 21 (“If... the tablet has pressure sensing, we can push a virtual button *by giving an extra bit of pressure* to signal a change in state.”); Astala, Fig. 6a (step 712), 9:36-39.

352. A POSITA would have known that requiring a *change in pressure* (normal to the digitizer) to be “greater” than a threshold would have provided a useful mechanism to distinguish press-and-hold from other gestures requiring a pressure. A POSITA would have understood this, for example, from EX1070, 48 (emphasis added):

There are many different types of input events that could be used to signal selection confirmation: * * *

Events distinct from pen movement: This includes things like a button press or an increase in pressure with a pressure sensing pen.

353. Thus, a conventional and obvious way to implement Kolmykov-Zotov’s pressure change determination was to determine whether the pressure change is greater than a pressure change threshold as required by [1E2].

354. Based on this analysis Keely+Kolmykov-Zotov meets [1E1] and [1E2].

h. Limitation [1E3]

1E3	a first interval has elapsed; and
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355. Keely+Kolmykov-Zotov meets [1E3] because it uses Kolmykov-Zotov’s technique that measures first and second parameters values—which can be pressure and change in pressure (KZ, 13:27-57, *see above* §IX.B.4.g)—“over a first predetermined time period” (KZ, 19:32-40) and compares the measured values to the “predetermined parameter values” (e.g., thresholds) (*see above* §IX.B.4.g; KZ, 13:41-43, 19:42-44). “[A]t the end of the first *predetermined time period*,” based on the comparison of the measured parameters and their thresholds, a “press-and-hold gesture” determination is made. KZ, 19:45-52; *see also* KZ, 2:29-33 (known mouse click emulation required pen pressure “for a predetermined amount of time”).

356. A POSITA would have understood that “the end of the first predetermined time period” (KZ, 19:45-52) indicates that “a first time interval [the first predetermined time period] has elapsed as claimed.

357. This meets [1E3].

i. Determining a Press ([1E]-[1E3])

358. As explained below, the Keely+Kolmykov-Zotov technique that meets [1E1]-[1E3] (*see* above §§IX.B.4.g-IX.B.4.h) also meets “determining a press” in [1E] under any reasonable construction.

359. A POSITA also would have understood that determining a “press-and-hold gesture” (KZ, 19:45-52) is “determining a press” in [1E] because a press-and-hold is an example of a press, and meets the criteria [1E1]-[1E3] defining a press. E.g., KZ, 2:29-39 (press-and-hold emulates mouse click), 5:11-14 (press-and-hold “pen-down event... activate[s] predetermined processing”), 6:44-46 (press-and-hold is a “dwell gesture”).

(1) Keely+Kolmykov-Zotov Meets the Proper Construction

360. The proper construction of claim 1 does not require that either pressure greater than a pressure threshold ([1E1]), or pressure change greater than a pressure change threshold ([1E2]), persist throughout a first interval ([1E3]). *See* above §VIII.A. Under the proper construction, a Keely+Kolmykov-Zotov press-and-hold gesture meeting [1E1]-[1E3] (*see* above §§IX.B.4.g-IX.B.4.h) meets “determining a press” in [1E].

(2) Keely+Kolmykov-Zotov Meets a Narrower Construction

361. Even if the Board were to adopt the IPR2016-01777 construction for “determining a press” that requires that the conditions in [1E1] and [1E2] “*be maintained for the duration of the first interval* before a press is determined” (EX1023, 14-15), Keely+Kolmykov-Zotov meets it.

362. Keely+Kolmykov-Zotov uses Kolmykov-Zotov’s technique that measures “values” (plural) of the first and second parameters—which can be pressure and change in pressure (KZ, 13:27-57, *see* above §IX.B.4.g)—“over a first predetermined time period” (KZ, 19:32-40), compares the measured “values” (plural) of the first and second parameters to “predetermined parameter values” (KZ, 19:40-44), and determines a “press-and-hold gesture” based on comparisons “at the end of the first predetermined time period” (KZ, 19:44-52).

363. A POSITA would have understood this meant that if predetermined parameter values specifying a press-and-hold gesture are not maintained over the first predetermined time period, the system will determine that the event was not a press-and-hold gesture.

364. In addition to those express teachings in Kolmykov-Zotov, a POSITA would have understood that “press-and-hold” gestures conventionally required the user press for a period of time.

365. A POSITA's background knowledge would have included Keely's teaching of determining a press-and-hold gesture only after the user holds a stylus down for "at least the threshold amount of time." Keely, [0008], [0025], claim 1. This informs how a POSITA would interpret Kolmykov-Zotov's teachings and confirms the above understanding.

366. If the Board disagrees that Kolmykov-Zotov expressly discloses that the threshold pressure and pressure change must be maintained for the predetermined time interval to determine a press-and-hold gesture, nonetheless that would have been an obvious way to implement Keely+Kolmykov-Zotov with a reasonable expectation of success.

367. Keely discloses that a parameter measured to determine a press-and-hold gesture must be maintained for "at least the threshold amount of time." Keely, [0008], [0025], claim 1. Kolmykov-Zotov compares multiple "values" (plural) of each parameter to its corresponding threshold during the "first predetermined time period." KZ, 19:32-52. A POSITA would have understood that the most desirable way for Kolmykov-Zotov to determine the "press-and-hold gesture" based on multiple values measured during the "first predetermined time period" is to ensure that all values measured during the "first predetermined time period" meet the threshold. This would facilitate ensuring that the detected gesture was the user-

intended gesture by requiring the user to maintain the gesture for “at least” a “threshold amount of time.” Keely, [0008], [0025], claim 1.

j. Limitation [1F]

1F	responsive to determining the gesture, outputting a haptic effect.
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368. A POSITA would have understood that “outputting a haptic effect” included providing a tactile sensation. EX1018, 245.

369. Keely+Kolmykov-Zotov meets [1F] because it provides Keely’s tactile feedback, responsive to the press-and-hold gesture, indicating “that the intended gesture has been made properly.” Keely, [0030]; *see* above §IX.B.3 (discussing combination).

370. Providing tactile feedback is “outputting a haptic effect” and is performed “responsive to determining the gesture” as claimed. Keely, [0006] (“providing helpful feedback to the user... to indicate whether gestures made with the stylus are those that are intended... is even more useful when provided in conjunction with various gesture simulation techniques[.]”), [0009] (“[U]ser may... be given some indication that the user has performed a particular stylus gesture[.]”), [0031] (“feedback may be in the form of... tactile (e.g., vibration of the computer 201 and/or stylus 204).”).

5. Claim 6

6	The method of claim 1, wherein the determining a gesture comprises determining a tapping gesture.
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371. “Tapping” (step 310) and “pressing” (step 326) are different gestures determined using different criteria. EX1001, 8:16-25, Fig. 3. Claim 1 requires determining a pressure and pressure change, which Keely+Kolmykov-Zotov meets as discussed *see* above §§IX.B.4.e, IX.B.4.g for limitations [1D] and [1E1]-[1E2]. Neither claim 1 nor claim 6 requires that pressure or pressure change be used in “determining a tapping gesture.” Claim 6 merely requires that a tapping be determined—without limiting how.

372. Keely incorporates U.S. Prov. App. No. 60/247,841, “High Level Active Pen Matrix” (EX1012, “Keely-841”), in its entirety. Keely, [0001]; Keely-536, 1:15-16, 35-36.

373. Keely+Kolmykov-Zotov meets claim 6 because Keely—via incorporated Keely-841—determines a tapping on a GUI to select an item using a different gesture than the Keely+Kolmykov-Zotov press-and-hold gesture determined using Kolmykov-Zotov’s technique. Keely-841, 2:19-21, 4:1-4, 9-10 (stylus tap operation), 9:15-20 (describing user gestures), 10:17-22, Fig. 3 (tap 307), 12:10-13:20 (tap 502), Figs. 5A-5B.

374. Kolmykov-Zotov ***confirms*** that this was conventional in a press-and-hold system to select items via a tap. KZ, 10:8-13 (entering “user input... to

control the user interface... by tapping the pen tip on the screen and... activating functions with the pen using a ‘press-and-hold’”), 18:11-19 (“tapping” to close menu).

6. Claim 7

a. Preamble

7[PRE]	The method of claim 1, wherein determining the gesture further comprises:
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375. Keely+Kolmykov-Zotov meets 7[PRE] because, as detailed below, it determines claim 1’s press-and-hold gesture in a manner meeting claim 7’s other limitations.

376. Claim 1 requires that determining “a gesture” ([1C]) comprises determining a press “if” three conditions are met ([1E]). Claim 7 imposes an additional requirement (“further comprises”) on “determining *the* gesture,” including evaluating “speed of movement” and “outputting a signal if” the speed value is less than a threshold. The specification uses “speed” below a threshold as a requirement (step 320) for determining a “pressing” (step 326). EX1001, 8:31-41, Fig. 3 (step 320).

377. Claim 7 must be construed to cover using speed below a threshold as an additional requirement for determining a pressing gesture because that is the only use of a speed determination that the specification discloses.

b. Limitation [7A]

7A	calculating a first value associated with a speed of movement of a contact across the input device;
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378. Keely+Kolmykov-Zotov meets [7A] because it uses Kolmykov-Zotov’s technique that includes “pen movement... velocity” in the x/y directions of the digitizer (KZ, 6:8-35, 11:12-20) as a parameter in determining the press-and-hold gesture that meets claim 1 (*see* above §IX.B.4.d (limitation [1C])).

379. Kolmykov-Zotov explains “systems and methods according to the invention could measure the pen tip movement distance between readings and use this value (e.g., average or median tip movement) as a steadiness parameter.” KZ, 12:28-31, Fig. 7 (step S508). Movement distance in a time interval (“between readings”) is speed.

380. Kolmykov-Zotov teaches that any suitable number and combination of disclosed parameters can be used together (KZ, 13:47-57) and a POSITA would have understood that evaluating pressure, change in pressure and pen movement velocity (e.g., speed) was a suitable combination because pen velocity was known to be used in determining pen stability as discussed below at §IX.B.6.c. KZ, 11:12-42 (describing steadiness and pen movement), 14:35-56 (same).

381. A POSITA would have understood that pen velocity across the digitizer represents “speed of movement of a contact across” the “input device” ([7A]).

c. Limitations [7B]-[7C]

7B	comparing the first value to a speed threshold value; and
7C	outputting a signal if the first value is less than the speed threshold value.

382. Keely+Kolmykov-Zotov meets [7B] because Kolmykov-Zotov’s technique compares each parameter (including pen velocity) to a corresponding predetermined value (threshold) as explained above at §IX.B.4.g (limitations [1E1]-[1E2]).

383. Kolmykov-Zotov uses pen velocity as a steadiness measure indicating user intent to hold the pen steady by ensuring that pen velocity is below a threshold value during a press-and-hold gesture. KZ, 11:12-39.

384. Because pen velocity magnitude is speed, Kolmykov-Zotov describes comparing pen speed to a threshold speed value, meeting [7B].

385. Keely+Kolmykov-Zotov meets [7C] because a POSITA would have understood that Kolmykov-Zotov’s use of steadiness as a measure of user intent to hold a pen in position determines whether pen velocity magnitude was *below* (e.g., “less than” ([7C])) the predetermined “speed threshold” value to indicate a press-and-hold (KZ, 11:12-39, 14:35-47, 15:49-55 (“rapid movement” can exclude press-and-hold)) rather than “some other action” like “an ink stroke” (KZ, 16:6-16).

7. Claim 8

8	The method of claim 7, further comprising applying a speed filter to the first value before comparing the speed to the speed threshold value.
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a. “filter”

386. The '507 patent describes filtering as performing “numerical calculation[s]” on received data to reduce the effects of unwanted noise from extraneous contact with the touchpad (EX1001, 7:29-37) and describes an averaged measurement (i.e., a pressure measurement) as “filtered” (EX1001, 9:24-27).

387. A POSITA would have understood that averaging data was a form of filtering that meets claim 8.

b. Keely+Kolmykov-Zotov meets claim 8.

388. Keely+Kolmykov-Zotov uses Kolmykov-Zotov’s technique that analyzes pen velocity (e.g., speed) in determining a “steadiness factor.” *See* above §IX.B.6 (claim 7). The steadiness factor can be determined “from the data in any suitable manner,” including using “an average and/or median steadiness factor.” KZ, 11:58-12:4, 12:13-21 (using average as steadiness parameter), 12:27-31 (using “average... tip movement” as steadiness parameter); 14:65-15:8 (processing measurements to develop average used in gesture determination, e.g., threshold comparison).

389. Kolmykov-Zotov's averaging is a type of filtering consistent with the '507 patent's description.

390. Averaging the pen velocity magnitude constitutes applying a "speed filter" to pen speed before comparing the filtered pen speed to the speed threshold discussed in connection with claim 7. *See* above §IX.B.6.c (limitation [7C]).

8. Claims 9 and 13

391. Claim 9 recites "a non-transitory [CRM] comprising program code for causing a processor to execute a method." *See* 9[PRE]. Keely+Kolmykov-Zotov uses Kolmykov-Zotov's technique implemented by a CRM comprising program code for causing Keely's processor to execute a method of detecting a press-and-hold gesture. *See* above §IX.B.4.b (limitation [1A], discussing Keely's processor); KZ, Abstract (CRM "used to determine whether specific electronic pen gestures should be processed as 'press-and-hold' gestures."), 16:6-8, 19:10-16, claims 21 and 29 (CRM); Keely, [0021] (tablet PC 201 "interprets marks made using stylus 204" on the "pen digitizer"), [0023] ("computer 201 detect[s] the stylus being placed down"), claim 1 (detecting and responding to stylus interaction with touchscreen), claim 14 (computer comprising "a processor" configured to detect stylus contact). Executing code stored on a CRM on a processor was conventional. A POSITA would have understood that this was how Keely and Kolmykov-Zotov worked. KZ, Fig. 3 (processing unit 110), 3:58-60 ("general-purpose computer...

may be used”); 7:8-15 (“processor for measuring... interaction parameters” and determining press-and-hold).

392. Elements [9A]-[9F] each recites “program code for” executing a method step and those steps are substantively identical to limitations [1A]-[1F], respectively. EX1019.

393. The program code in Keely+Kolmykov-Zotov implements the method discussed in connection with claim 1 and that program code meets elements [9A]-[9F] for the same reasons Keely+Kolmykov-Zotov meets limitations [1A]-[1F] as illustrated below.

Element	Corresponding	Analysis
[9A]	[1A]	§IX.B.4.b
[9B]	[1B]	§IX.B.4.c
[9C]	[1C]	§IX.B.4.d
[9D]	[1D]	§IX.B.4.e
[9E]	[1E]	§IX.B.4.f
[9E1]	[1E1]	§IX.B.4.g
[9E2]	[1E2]	§IX.B.4.g
[9E3]	[1E3]	§IX.B.4.h
[9F]	[1F]	§IX.B.4.j

394. Claim 13 depends from claim 9 and recites the program code as comprising code for determining a tapping. Keely+Kolmykov-Zotov’s program code detects a tapping as discussed *See* above §IX.B.5 (claim 6).

9. Claims 14 and 18

395. Claim 14 recites a system comprising a CRM and processor configured to perform certain method steps. *See* 14[PRE]-14[B].

Keely+Kolmykov-Zotov uses Kolmykov-Zotov's gesture-determination method implemented via a processor in communication with a CRM to run code stored thereon as described for claim 9. *See* above §IX.B.8.

396. Limitations [14C]-[14H] recite the processor as configured to perform steps identical to [1A]-[1F], respectively. EX1019. Keely+Kolmykov-Zotov's processor meets limitations [14C]-[14H] in implementing Kolmykov-Zotov's gesture-determination method for the same reasons Kolmykov-Zotov's method meets [1A]-[1F].

Element	Corresponding	Analysis
[14C]	[1A]	§IX.B.4.b
[14D]	[1B]	§IX.B.4.c
[14E]	[1C]	§IX.B.4.d
[14F]	[1D]	§IX.B.4.e
[14G]	[1E]	§IX.B.4.f
[14G1]	[1E1]	§IX.B.4.g
[14G2]	[1E2]	§IX.B.4.g
[14G3]	[1E3]	§IX.B.4.h
[14H]	[1F]	§IX.B.4.j

397. Claim 18 depends from claim 14 and requires that the processor be configured to determine a tapping. Keely+Kolmykov-Zotov's processor detects a tapping. *See* above §IX.B.5 (claim 6).

C. Ground 3: Keely+Kolmykov-Zotov+Shahoian Renders Obvious Claims 2-5, 10-12, and 15-17.

398. Keely and Kolmykov-Zotov do not disclose particular types of pressure sensors that their systems use. Thus, choosing particular sensors to implement Keely+Kolmykov-Zotov is a design choice for the same reasons as choosing sensors to implement Astala. *See* above §IX.A.3. Shahoian discloses pressure sensors. Shahoian, [0040]-[0043]; *see* above §IX.A.2.

399. A POSITA would have used both Shahoian's capacitive pseudo pressure sensors and Shahoian's resistive actual pressure sensors (discussed above at §IX.A.5) in implementing Keely+Kolmykov-Zotov for the same reasons a POSITA would have done so in implementing Astala with the same reasonable expectation of success (discussed above at §IX.A.3), because just like Astala, Keely+Kolmykov-Zotov is a system with a touch-sensitive input device that uses sensors to determine touches and would benefit in the same way as Astala's system from using Shahoian's sensors.

1. Claim 2

400. Keely+Kolmykov-Zotov+Shahoian meets claim 1 for the reasons Keely+Kolmykov-Zotov meets claim 1. *See* above §IX.B.4.

401. Shahoian's sensors generate contact data comprising actual and pseudo pressure as required by claim 2. *See* above §IX.A.5 (Ground 1, claim 2). Thus Keely+Kolmykov-Zotov+Shahoian renders claim 2 obvious.

2. Claim 3

402. Shahoian's sensors, used in Keely+Kolmykov-Zotov+Shahoian, base the pseudo pressure in the contact data (claim 2) on a change in capacitance as required by claim 3. *See* above §IX.A.6 (Ground 1, claim 3). Thus, Keely+Kolmykov-Zotov+Shahoian renders claim 3 obvious.

3. Claims 4- 5

403. Keely+Kolmykov-Zotov+Shahoian uses Kolmykov-Zotov's technique to determine a press-and-hold with a displayed object, which involves determining the x/y coordinates of the contact with the touch-sensitive input device to determine which object is contacted. *See* above §IX.B.4.c (limitation [1B]).

404. This meets claim 4's requirement that the contact data being based on a specific portion of the touch-sensitive input device, and claim 5's requirement that the contact information comprise position data.

405. With respect to claim 5's remaining requirement of "determining whether a contact is made on a softkey based on the position data," Keely+Kolmykov-Zotov+Shahoian is a modified implementation of Keely's system.

406. Keely incorporates EX1013 ("Keely-400"). Keely, [0001]; Keely-536, 1:20-22, 35-36. In Keely, a "user brings up the soft keyboard and actuates it by tapping on keys with the user's pen. On screen presses are translated into actual

key stroke commands that an operating system understands.” Keely-400, 10:8-10. Keely determines “what lies beneath the contact position,” e.g., a softkey. Keely-841, 10:8-12, Fig. 3 (step 302).

407. This is consistent with how Shahoian’s sensors work as they allow a user to interact with “regions” of the touch-sensitive input device such as “a small rectangular area, like a button, which the user can point to in order to initiate” an associated function. Shahoian, [0193].

408. Thus, Keely+Kolmykov-Zotov+Shahoian renders obvious claims 4-5.

4. Claims 10-12, 15-17

409. Claims 10-12 depend from claim 9, which Keely+Kolmykov-Zotov+Shahoian meets for the reasons Keely+Kolmykov-Zotov meets claim 9. *See above §IX.B.8.*

410. Claims 15-17 depend from claim 14, which Keely+Kolmykov-Zotov+Shahoian meets for the reasons Keely+Kolmykov-Zotov meets claim 14. *See above §IX.B.9.*

411. Claims 10-12 and 15-17 recite limitations substantively identical to those in claims 2-4. EX1019.

412. Keely+Kolmykov-Zotov+Shahoian meets claims 10-12 and 15-17 for the same reasons Keely+Kolmykov-Zotov meets claims 2-4.

Claim	Corresponding	Analysis
10, 15	2	§IX.C.1
11, 16	3	§IX.C.2
12, 17	4	§IX.C.3

X. CONCLUSION

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

* * *

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

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

Dated:

2 Feb 2024

Jean Renard Ward

Jean Renard Ward

APPENDIX A: MATERIALS CONSIDERED

Exhibit	Description
1001	U.S. Patent No. 8,749,507
1002	Prosecution History of U.S. Patent No. 8,749,507
1005	U.S. Patent No. 6,590,568, “Touch Screen Drag And Drop Input Technique” (“Astala”)
1006	U.S. Patent Pub. No. US 2002/0033795, “Haptic Interface For Laptop Computers And Other Portable Devices” (“Shahoian”)
1007	U.S. Patent Pub. No. 2002/0057263, “Simulating Gestures of A Pointing Device Using A Stylus And Providing Feedback Thereto” (“Keely”)
1008	U.S. Patent No. 7,256,773, “Detection of A Dwell Gesture By Examining Parameters Associated With Pen Motion” (“Kolmykov-Zotov” or “KZ”)
1009	U.S. Patent No. 5,943,044, “Force Sensing Semiconductive Touchpad” (“Martinelli”)
1010	U.S. Patent No. 5,734,373, “Method And Apparatus For Controlling Force Feedback Interface Systems Utilizing A Host Computer” (“Rosenberg”)
1011	U.S. Patent No. 6,791,536, “Simulating Gestures of A Pointing Device Using A Stylus And Providing Feedback Thereto” (“Keely-536”)
1012	U.S. Prov. App. No. 60/247,841, “High Level Active Pen Matrix” (“Keely-841”)
1013	U.S. Prov. App. No. 60/247,400, “System and Method For Accepting Disparate Types Of User Input” (“Keely-400”)
1014	U.S. Patent No. 5,880,411, “Object Position Detector With Edge Motion Feature And Gesture Recognition” (“Gillespie”)
1015	Order 27, Construing the Terms of the Asserted Claims of the Patent At Issue, <i>In the Matter of Certain Mobile and Portable Electronic Devices Incorporating Haptics (Including Smartphones and Laptops) and Components Thereof</i> , Inv. Nos. 337-TA-1004, 337-TA-990 (Feb. 2, 2017)
1016	S.K. Lee et al., “A Multi-Touch Three Dimensional Touch-Sensitive Tablet,” <i>ACM Sigchi Bulletin</i> , vol. 16, no. 4, pp. 21-25 (1985) (“Lee85”)
1017	<i>The New Oxford American Dictionary</i> (Oxford University Press 2001)
1018	<i>Microsoft Computer Dictionary</i> (5th ed. 2002)
1019	Chart comparing ’507 patent claim language

Exhibit	Description
1020	U.S. Patent No. 8,164,573, “Systems And Methods For Adaptive Interpretations Of Input From A Touch-Sensitive Input Device”
1021	Prosecution History of U.S. Patent No. 8,164,573
1022	<i>Apple, Inc. v. Immersion Corporation</i> , IPR2016-01777, Paper 1 (Sep. 12, 2016)
1023	<i>Apple, Inc. v. Immersion Corporation</i> , IPR2016-01777, Paper 7 (Mar. 23, 2017)
1024	<i>Apple, Inc. v. Immersion, Inc.</i> , IPR2017-01310, Paper 1 (Apr. 21, 2017)
1025	<i>Apple, Inc. v. Immersion, Inc.</i> , IPR2017-01310, Paper 7 (Aug. 9, 2017)
1026	<i>Apple, Inc. v. Immersion Corporation</i> , IPR2017-01310, Paper 8 (Nov., 2, 2017)
1027	U.S. Patent Pub. No. U.S. 2004/0150631, “Method Of Triggering Functions In A Computer Application Using A Digitizer Having A Stylus And A Digitizer System” (“Fleck”)
1028	<i>Ex parte DaCosta</i> , No. 2009-015440 (PTAB Dec. 14, 2011)
1030	Davis, “The RAND Tablet: A Man-Machine Graphical Communication Device” in Proceedings-Fall Joint Computer Conference (1964)
1031	U.S. Patent No. 3,482,241
1032	U.S. Patent No. 5,708,460
1033	U.S. Patent No. 6,492,979
1034	U.S. Patent No. 5,510,813
1035	Buxton, “Touch Gesture and Marking,” ch. 7 in Baecker, ed., Readings in Human-Computer Interaction (1995)
1036	U.S. Patent No. 6,160,489
1037	Strong, “An Electrotactile Display,” IEEE, Trans. On Man-Machine Sys., mms-11:1 (Mar. 1970)
1038	Massie, “Initial Haptic Explorations with the Phantom: Virtual Touch Through Point Interaction” MIT Thesis (1996)
1039	Bliss, “Optical-to-Tactile Image Conversion for the Blind,” IEEE, Trans. On Man-Machine Sys., mms-11:1 (Mar. 1970)
1040	European Patent Publication No. EP0265011A1
1041	U.S. Patent No. 5,388,992
1042	IBM, “Mouse Ball-Actuating Device with Force and Tactile Feedback,” IBM Technical Disclosure Bulletin 32:9B (Feb. 1990)
1043	Fukumoto, “Active Click Tactile Feedback for Touch Panels,” CHI 2001 Interactive Posters (2001)

Exhibit	Description
1044	PCT Publication No. WO9200559A1
1045	Massie, “The Phantom Haptic Interface—A Device for Probing Virtual Objects” in ASME, Dynamic Systems and Control (1994)
1046	U.S. Patent No. 5,982,352
1046	U.S. Patent No. 5,982,352
1047	U.S. Patent No. 6,131,097
1048	U.S. Patent No. 6,337,678
1049	U.S. Patent No. 6,219,034
1050	U.S. Patent No. 6,219,032
1051	U.S. Patent No. 4,885,565
1052	U.S. Patent No. 6,424,333
1053	Negroponte, “HUNCH An Experiment in Sketch Recognition” in UCLA, Environmental Design: Research and Practice, Proceedings of the EDRA 3/ar 8 Conference (1972)
1054	Foley, Fundamentals of Interactive Computer Graphics (1982) (excerpts)
1055	Buxton, “There’s More to Interaction than Meets the Eye” in Norman, ed., User Centered Systems Design (1986)
1056	Rosch, “Alternative Input-Digitizing Tablets-Pointing the Way to Easier Input,” PC Magazine, p. 227 (Nov. 28, 1989)
1057	U.S. Patent No. 5,491,495
1058	Buxton, “Issues and Techniques in Touch-Sensitive Tablet Input,” SIGGRAPH ‘85, 19:3, 215 (1985)
1059	U.S. Patent No. 4,202,041
1060	U.S. Patent No. 494,562
1061	U.S. Patent No. 5,673,066
1062	U.S. Patent No. 5,680,126 (“Kikinis”)
1063	U.S. Patent No. 7,336,260 (“Martin”)
1064	J. R. Ward and M. J. Phillips, “Digitizer Technology: Performance Characteristics and the Effects on the User Interface,” in <i>IEEE Computer Graphics and Applications</i> , vol. 7, no. 4, pp. 31-44, April 1987.
1065	U.S. Patent No. 5,734,373 (“Rosenberg-373”)
1066	U.S. Patent No. 5,053,757 (“Meadows”)
1067	James R. Taggart, M.S. Thesis. “Reading a Sketch by Hunch” (MIT, 1973).
1068	U.S. Patent No. 5,245,139 (“Protheroe”)
1069	U.S. Patent No. 5,543,591 (“Gillespie-591”)

Exhibit	Description
1070	G.P. Kurtenbach, Dissertation. “The Design and Evaluation of Marking Menus,” University of Toronto, 1993.
1071	U.S. Patent Pub. No. 2005/0162411 (“VanBerkel”)
1072	U.S. Patent No. 5,231,381 (“Duwaer”)
1073	U.S. Patent No. 5,117,071 (“Greanias”)
1074	U.S. Patent No. 6,128,007 (“Seybold”)
1075	U.S. Patent No. 5,365,461 (“Stein”)
1076	U.S. Patent No. 6,762,752 (“Perski”)

APPENDIX B: U.S. PATENT NO. 8,749,507 CLAIM LIST

#	Limitation
1[PRE]	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 a haptic effect.
2	The method of claim 1, wherein the contact data comprises an actual pressure and a pseudo pressure.
3	The method of claim 2, wherein the pseudo pressure is based on a change in capacitance resulting from the contact.
4	The method of claim 3, wherein the contact data is based on a contact on a specific portion of a touch-sensitive input device.
5	The method of claim 4, wherein the contact information comprises position data, and further comprising determining whether a contact is made on a softkey based on the position data.
6	The method of claim 1, wherein the determining a gesture comprises determining a tapping gesture.
7[PRE]	The method of claim 1, wherein determining the gesture further comprises:
7A	calculating a first value associated with a speed of movement of a contact across the input device;
7B	comparing the first value to a speed threshold value; and
7C	outputting a signal if the first value is less than the speed threshold value.
8	The method of claim 7, further comprising applying a speed filter to the first value before comparing the speed to the speed threshold value.

#	Limitation
9[PRE]	A non-transitory computer-readable medium comprising program code for causing a processor to execute a method, the program code comprising:
9A	program code for receiving contact data from an input device;
9B	program code for determining an interaction with a displayed object on a screen based on the contact data;
9C	program code for, responsive to determining the interaction, determining a gesture based on the contact data comprising:
9D	program code for determining a pressure and a change in pressure based on the contact data, and
9E	program code for determining a press if:
9E1	the pressure is greater than a pressure threshold,
9E2	the change in pressure is greater than a change in pressure threshold, and
9E3	a first interval has elapsed; and
9F	program code for, responsive to determining the gesture, outputting a haptic effect.
10	The non-transitory computer-readable medium of claim 9, wherein the contact data comprises an actual pressure and a pseudo pressure.
11	The non-transitory computer-readable medium of claim 10, wherein the pseudo pressure is based on a change in capacitance resulting from the contact.
12	The non-transitory computer-readable medium of claim 11, wherein the contact data is based on a contact on a specific portion of a touch-sensitive input device.
13	The non-transitory computer-readable medium of claim 9, wherein the program code for determining a gesture comprises program code for determining a tapping gesture.
14[PRE] 1	A system comprising:
14A	a computer-readable medium; and
14B	a processor in communication with the computer-readable medium, the processor configured to:
14C	receive contact data from an input device;
14D	determine an interaction with a displayed object on a screen based on the contact data;
14E	responsive to determining the interaction, determine a gesture based on the contact data comprising:

#	Limitation
14F	determining a pressure and a change in pressure based on the contact data, and
14.g	determining a press if:
14G1	the pressure is greater than a pressure threshold,
14G2	the change in pressure is greater than a change in pressure threshold, and
14G3	a first interval has elapsed; and
14H	responsive to determining the gesture, output a haptic effect.
15	The system of claim 14, wherein the contact data comprises an actual pressure and a pseudo pressure.
16	The system of claim 15, wherein the pseudo pressure is based on a change in capacitance resulting from the contact.
17	The system of claim 16, wherein the contact data is based on a contact on a specific portion of a touch-sensitive input device.
18	The system of claim 14, wherein the processor is configured to determine a gesture by determining a tapping gesture.