

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Michael S. Smith
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Filing Date: Oct. 24, 2018
Title: GESTURE-EQUIPPED TOUCH SCREEN SYSTEM,
METHOD, AND COMPUTER PROGRAM PRODUCT

DECLARATION OF DR. LOREN TERVEEN

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I, Loren Terveen, PhD, declare as follows:

I. INTRODUCTION

1. I have been retained as a technical expert by counsel on behalf of Apple Inc. (“**Apple**”/“**Petitioner**”). I understand that Apple is requesting that the Patent Trial and Appeal Board institute an *inter partes* review (“**IPR**”) proceeding with respect to U.S. Patent No. 10,642,413 (“**the ’413 patent**”) (EX1001).

2. I have been asked to provide my independent analysis of the ’413 patent in light of certain prior art publications, and I have done so based on my personal knowledge and experience.

3. I am not, and never have been, an employee of Apple. I received no compensation for this Declaration beyond my normal hourly compensation based on my time actually spent analyzing the ’413 patent, the prior art publications cited below, and various issues related thereto. I will not receive any added compensation based on the outcome of any IPR or other proceeding involving the ’413 patent.

II. QUALIFICATIONS

4. In formulating my opinions, I have relied on my knowledge, training, and experience in the relevant field. My education and experience are described more fully in the attached curriculum vitae (Appendix A). For ease of reference, I have highlighted certain information below.

5. I received a B.A. in Computer Science, Mathematics, and History from the University of South Dakota in 1984. I received an M.S. in Computer Sciences from the University of Texas in 1988. I further received a Ph.D. in Computer Sciences from the University of Texas in 1991.

6. I am a Distinguished McKnight University Professor at the University of Minnesota in the Department of Computer Science and Engineering, and I have substantial experience with human computer interaction and user interfaces, including well before August 5, 2011, the date I have been informed is the alleged invention date of the '413 patent at issue in this matter. I was a Member of Technical Staff at AT&T Bell Laboratories from 1991 to 1996, and then a Principal Member of Staff at AT&T Labs – Research from 1996 to 2002. I was honored by the Association for Computing Machinery (ACM) as a Distinguished Scientist in 2009 and served as the president of ACM's Special Interest Group on Computer-Human Interaction (ACM SIGCHI) from 2015-2018, was elected to the ACM SIGCHI Academy in 2019, and received the SIGCHI Lifetime Service Award in 2023.

7. I have taught numerous courses at the University of Minnesota related to human-computer interaction and user interface design. Additionally, I have published over 150 peer-reviewed articles, a book, contributed chapters in six additional books, and have given over 50 presentations all across the United States

and internationally. My published works revolve around the fields of human-computer interaction, user interface design, and social computing.

8. I am also a named inventor on ten U.S. patents related to user interfaces, interactive data analysis, and methods for selecting and displaying information to users. My publications and patents have addressed many aspects of searching for information on the World Wide Web, including algorithms to gather information from the World Wide Web, additional algorithms to parse and analyze the HTML content of web pages, data structures to represent this information, and user interfaces that allowed people to access the information my systems collected. Much of my research also involved graphical user interface techniques, for example: enabling users to navigate large information structures (including the World Wide Web), specify multimodal interfaces including for interactive voice systems, interact with online maps, and tailor the performance of recommender systems.

9. I have served as Chair of the leading conferences in Human-Computer Interaction, served on four different editorial boards, and have sat on well over 20 program committees, including well over a dozen times on the program committee for the ACM Conference on Human Factors in Computing Systems (the CHI Conference), the leading international conference in Human-Computer Interaction.

III. LEGAL PRINCIPLES

10. In forming my analysis and conclusions expressed in this Declaration, I have applied the legal principles described in the following paragraphs, which were provided to me by counsel for the Petitioner.

A. Person of Ordinary Skill in the Art

11. I understand that the factors considered in determining the ordinary level of skill in a field of art include: the level of education and experience of persons working in the field; the types of problems encountered in the field; the teachings of the prior art regarding solutions to such problems; and the sophistication of the technology at the time of the alleged invention. I understand that a person of ordinary skill in the art (“**POSITA**”) is not a specific real individual, but rather is a hypothetical individual having the qualities reflected by the factors above and knowledge of all relevant prior art references, including the references I cite below.

B. Obviousness

12. I have been informed that a patent claim is invalid as “obvious” in light of one or more prior art references if it would have been obvious to a POSITA at the time of the alleged invention, taking into account (1) the scope and content of the prior art, (2) the differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) any so called “secondary considerations” of non-obviousness, which include: (i) “long-felt but unresolved need” for the claimed

invention, (ii) commercial success attributable to the claimed invention, (iii) unexpected results of the claimed invention, and (iv) “copying” of the claimed invention by others.

13. While I do not know the exact date that the alleged invention of the ’413 patent was made, I do know that the ’413 patent’s earliest claimed priority date is August 5, 2011. For purposes of my obviousness analysis, I have applied a date of August 5, 2011 as the date of the alleged invention (“**Critical Date**”), although in many cases the same analysis would hold true even if the date of the alleged invention were earlier or later.¹

14. I have been informed that a claim can be obvious in light of a single prior art reference or multiple prior art references. To be obvious in light of a single prior art reference or multiple prior art references, there must be a reason that would have prompted a POSITA to modify or supplement the single prior art reference, or to combine two or more references, in a manner that provides the elements of the claimed invention. This reason may come from a teaching, suggestion, or motivation to combine, or may come from the reference(s) themselves, the knowledge or “common sense” of a POSITA, or from the nature of the problem to

¹ I am not a lawyer so I did not offer an opinion on whether the ’413 patent is entitled to its earliest claimed priority date.

be solved, and this reason may be explicit or implicit from the prior art as a whole. I have been informed that, under the law, the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. I also understand it is improper to rely on hindsight in making the obviousness determination.

15. I understand that an obviousness determination also requires that a POSITA would have had a reasonable expectation of success. This concept has been explained to me as relating to the relative likelihood or predictability—from the perspective of a POSITA—of successfully modifying the prior art in a manner that would meet the claimed limitations of the patent being challenged (here the '413 patent). I understand that the expectation of success need only be “reasonable” and, thus, does not require the absolute certainty gleaned from physically creating the proposed prior art modification.

C. Claim Interpretation

16. I understand that, for purposes of my analysis in this *inter partes* review proceeding, the terms appearing in the patent claims should be interpreted according to their “ordinary and customary meaning.” In determining the ordinary and customary meaning, I understand that the words of a claim are first given their plain meaning that those words would have had to a person of ordinary skill in the art at the time of the alleged invention. I also understand that the structure of the claims,

the specification and file history may be used to better construe a claim. Moreover, I understand that even treatises and dictionaries may be used, albeit under limited circumstances, to determine the meaning attributed by a person of ordinary skill in the art to a claim term.

IV. MATERIALS CONSIDERED

17. My analysis in this Declaration is based on my knowledge and experience. Based on my above-described qualifications in Section II, the Patent Trial and Appeal Board should consider me to be an expert in the field. Also, based on my experiences, I understand and know of the capabilities of persons of ordinary skill in this field.

18. As part of my independent analysis for this Declaration, I have considered the following: the '413 patent (EX1001) and its prosecution history (EX1002); the background knowledge/technologies that were commonly known to persons of ordinary skill; my own knowledge and experience gained from my work in the field; my experience in teaching and advising others in this field; and my experience working with others involved in this field. In addition, I have analyzed the following publications and materials:

EX1004	U.S. Appl. Pub. No. 2008/0207188 to Hye Sang Ahn <i>et al.</i> ("Ahn")
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EX1005	U.S. Appl. Pub. No. 2007/0150842 to Imran Chaudhri <i>et al.</i> (“Chaudhri ’842”)
EX1006	U.S. Appl. Pub. No. 2011/0209093 to Kenneth P. Hinckley and Koji Yatani (“Hinkley”)
EX1007	U.S. Appl. Pub. No. 2006/0015818 to Imran A. Chaudhri et al. (“Chaudhri ’818”)
EX1008	Robert Kosara <i>et al.</i> , “Semantic Depth of Field,” IEEE Symposium on Information Visualization 2001, pp. 97-104 (2001)
EX1009	NEW OXFORD AMERICAN DICTIONARY (3 rd Ed. 2010)
EX1010	U.S. Appl. Pub. No. 2012/0304133 to Jennifer Nan et al. (“Nan”)
EX1011	Certified translation of JP Published Patent Application No. 2002-55750 (“Hisatomi”), published February 20, 2002

19. Note that for my citations to patent literature, I’ve used the column/line numbers or paragraph numbers. Note also that, unless I’ve indicated otherwise, all emphasis (bold/italics/underline) in any quoted text are ones I have added.

20. Although I cite and quote to selected portions of various references in this Declaration, the reader should understand that these citations are representative examples. A POSITA would have viewed each reference in its entirety and in combination with other references. Accordingly, I intend the references identified in this Declaration to be viewed as incorporated in their entireties.

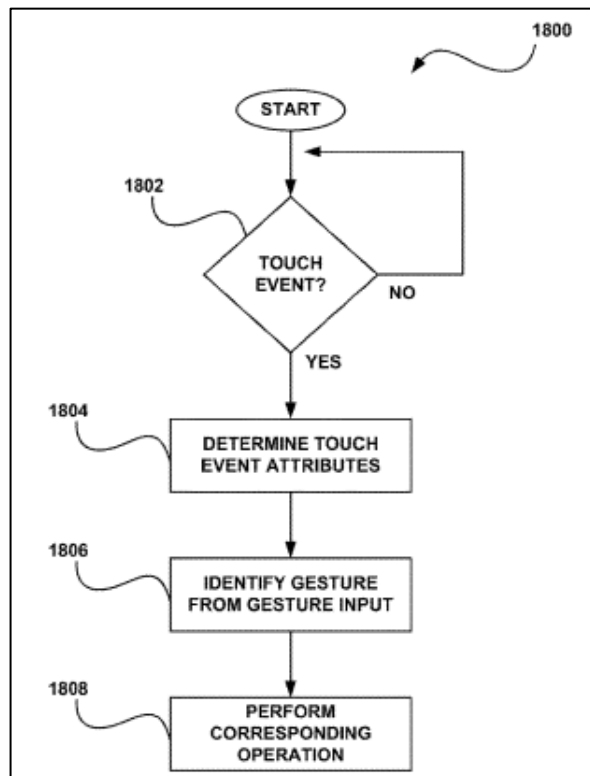
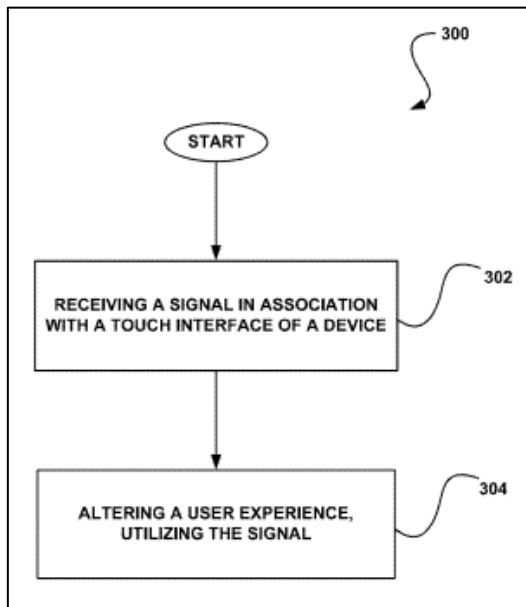
V. THE '413 PATENT

A. Pertinent Disclosure

21. The '413 Patent “generally relate[s] to touch screens” and describes embodiments where “a user experience [with a touch screen device] may be altered” based on a “touch signal.” EX1001, 1:32-33, 15:10-16:29, Figure 3 (reproduced below). The claims of the '413 Patent generally relate to opening menus based on gestures detected in connection with edges of the touch screen (*see, e.g.*, Elements [1.c], [1.d.i], [1.f], [1.g], [101.c], [101.d], [101.f], [101.g], *infra*), blurring a portion of a user interface as a function of the gesture that opens a menu (*see, e.g.*, Element [1.d.ii], *infra*), and performing one of two operations based on a duration of contact with a menu item (*see, e.g.*, Elements [1.e.ii], [1.e.iii], [101.e.ii], [101.e.iii], *infra*). However, as discussed below, the support for these claimed gestures and claimed user interface functions is scattered throughout the specification of the '413 Patent, often without explanation about any relationship between the disparate teachings or their utilization together in a single embodiment. Nonetheless, as I discuss in Section IX, *infra*, the claimed gestures and user interface functions were well-known well before the '413 Patent.

22. In one part of the specification, the '413 Patent describes a method that involves performing operations that correspond to identified gestures. *See* EX1001, 56:53-57:41. “If it is determined that a touch event has occurred, then the initial

touch event attributes are determined,” and “the gesture is identified from gesture input.” EX1001, 56:63-67, Figure 18 (reproduced below). According to the ’413 Patent, “gesture input refers to the collection of inputs, flags, and signals by which a gesture is identified and parameterized,” and is thus broadly defined. EX1001, 57:1-3. “For example, in one embodiment, a two-finger pinch gesture may be identified by two contact points combined with their motion with respect to each other, and parameterized by the extent of the motion.” EX1001, 57:3-7. “Once the gesture has been identified, the corresponding operation is performed.” EX1001, 57:38-39, Figure 18.



EX1001, FIG. 3 (left), FIG. 18 (right)

23. The '413 Patent describes that “[p]attern-based gestures may be simple to perform and easy for a user to remember.” EX1001, 66:1-3. One such gesture is a “pinch slide gesture.” *See* EX1001, 66:49-59. The pinch slide “gesture may be performed by pinching the device, then sliding the pinch across the interaction surfaces while maintaining contact.” EX1001, 66:53-56. In one embodiment, “a pinch slide gesture may be used to display menus of common operations or applications.” EX1001, 67:30-42. “For example, in one embodiment, a pinch slide gesture which begins near an edge of a display and then moves inward may cause a menu or window to slide in from that edge of the display.” EX1001, 67:32-35.

24. Separately, the '413 Patent describes embodiments that utilize a “3D layered user interface” in which “displayed objects may exist in one of a plurality of layers.” EX1001, 68:33-44. “[A] 3D layered user interface may be implemented in a device having single layer displays through the use of virtual display layers.” EX1001, 69:4-6. “[A] virtual display layer refers to a collection of display elements which have all been assigned the same apparent depth within the 3D layered user interface.” EX1001, 69:6-9. In some embodiment, “virtual display layers may be given the appearance of depth through the use of 3D depth cues.” EX1001, 69:25-27. “For example, in one embodiment, a 3D depth cue may be a blur operation, such that layers located at successively greater depths may appear blurrier than those closer to the user.” EX1001, 69:27-30.

25. Notably, the '413 Patent does not explicitly describe the aforementioned edge menus with respect to the virtual display layers, nor the manner in which such menus would operate with respect to the virtual display layers. Rather, the '413 Patent describes its 3D layered user interface more generically with respect to “objects” or “display elements” and collections thereof. *See generally* EX1001, 68:11-72:7. These “objects” are described as including, but not limited to, “digital objects (i.e. images, text boxes, UI control widgets, selections, etc.), subject matter objects (i.e. people within a photograph, letters and/or words within text, etc.), and/or any other type of identifiable visual object.” EX1001, 69:15-24. While the '413 Patent describes that these general “objects” or “elements” may be “located in a virtual display layer” (*see* EX1001, 69:22-24), there is sparse detail about how specific “objects” or “elements” are assigned to a particular virtual display layer, and no clear discussion of whether or how “objects” or “elements” may be reassigned or otherwise moved between virtual display layers. *See generally* EX1001, 68:11-72:7. Rather, the '413 Patent focuses on the ability of a user to “move” visually between layers and providing visual cues that provide the appearance of such “movement” (“i.e. magnifying and fading display layers as they are passed by, sharpening previously blurry display layers as they grow closer, etc.”). *See* EX1001, 71:32-44.

B. Prosecution History

26. On October 24, 2018, the Applicant (P4TENTS1, LLC) filed the '413 patent as U.S. Appl. No. 16/169,961 accompanied by a Request for Prioritized Examination under 37 C.F.R. §1.102(e). EX1002, 1353, 1668. In a Final Office Action dated May 22, 2019, the Examiner rejected the amended claims under 35 USC 112, first paragraph, because the specification did not enable the claim language as it was then written, because the claim language was said to introduce “a second gesture creating a second menu from the same at least one edge,” which was not supported by the specification. EX1002, 1136-1149. The Examiner objected to the drawings for failing to show the same unsupported feature. The Office Action listed Smith and U.S. 2004/0212617 as prior art “made of record,” but did not analyze this prior art with respect to the claim language or otherwise advance level any prior art rejections. EX1002, 1146. Through several more Office Actions on July 8, 2019, September 19, 2019, and December 19, 2019, the Examiner maintained the enablement rejection and drawing objection, while noting various “pertinent” prior art references, without significant discussion of those references’ disclosures with respect to the claims. EX1002, 1129-1131, 1070-1077, 553-560.

27. In a First Action Interview Pilot Program Pre-Interview Communication dated March 5, 2019, the Examiner indicated the pending claims were obvious over U.S. 2012/00060123 (Smith), U.S. 2012/0306788 (Chen), and

U.S. 2010/00127983 (Irani). EX1002, 1184-1187. Three days later, on March 8, 2019, Applicant amended the claims to include a second gesture that results in the display of a second menu. EX1002, 1166-1183.

28. In a Final Office Action dated May 22, 2019, the Examiner rejected the amended claims under 35 USC 112, first paragraph, because the specification did not enable the claim language as it was then written, because the claim language was said to introduce “a second gesture creating a second menu from the same at least one edge,” which was not supported by the specification. EX1002, 1136-1149. The Examiner objected to the drawings for failing to show the same unsupported feature. The Office Action listed Smith and U.S. 2004/0212617 as prior art “made of record,” but did not analyze this prior art with respect to the claim language or otherwise level any prior art rejections. EX1002, 1146. Through several more Office Actions on July 8, 2019, September 19, 2019, and December 19, 2019, the Examiner maintained the enablement rejection and drawing objection, while noting various “pertinent” prior art references, without significant discussion of those references’ disclosures with respect to the claims. EX1002, 1129-1131, 1070-1077, 553-560.

29. After an interview on February 3, 2020 in which the Examiner proposed an Examiner’s Amendment to “expedite a NOA,” that Examiner issued a Notice of Allowance (NOA) with an Examiner’s Amendment. EX1002, 217-315. In the

Notice of Allowance, the Examiner identified two features in distinct independent claims that were alleged to distinguish the prior art:

1. Increasing blur as a function of a “magnitude” of a gesture on a touch-screen, as reflected in issued independent claim 1: “blurring at least a portion of the graphical user interface such that a **magnitude of the blurring of the at least portion of the graphical user interface progressively increases as a function of an increase in a magnitude** of the first gesture being detected;” and
2. Using an edge gesture to bring up a menu and performing two different menu operations as a function of gestures on the touch-screen, as reflected in issued independent claim 101: “a first gesture that begins in connection with a first edge of the display and moves inward; . . . a first menu as sliding in and including one or more first menu items including a particular application icon; . . . **detecting**, utilizing the touch interface, **a first duration of contact on at least one of the one or more first menu items**; in response to the first duration of contact on the at least one of the one or more first menu items being detected to not surpass a threshold, performing a **first operation**; and in response to the first duration of contact on the at least one of the one or more first menu items being detected to surpass the threshold, performing a

second operation, where the second operation is performed in response to the first duration of contact on the particular application icon being detected to surpass the threshold, **and the first duration of contact being detected to include a slide gesture component after the first duration of contact on the particular application icon is detected to surpass the threshold”**

EX1002, 307-310 (emphasis in original).

VI. PERSON OF ORDINARY SKILL IN THE ART

A. A POSITA’s Ordinary Level of Skill

30. Based on my knowledge and experience in the field and my review of the ’413 patent and its file history, I believe that a POSITA would have included a Bachelor of Science degree in computer science, computer engineering, electrical engineering, human-computer interaction, or a comparable field and at least two years of professional experience in the design and development of graphical user interfaces (GUIs), human-computer interfaces, or equivalents thereof. Such experience could be obtained through research and study in a graduate program or through comparable exposure through industry employment, and additional years of experience could substitute for the advanced-level degree.

31. My analysis and conclusions expressed in this Declaration are based on the perspective of a POSITA having this level of knowledge and skill. My education, technical expertise and personal knowledge discussed in Section II shows that I meet the qualifications of a POSITA.

VII. OVERVIEW OF CONCLUSIONS FORMED

32. This Declaration explains the conclusions that I have formed based on my independent analysis. Based upon my knowledge and experience, and my review of the materials listed above, I believe that Claims 1-3, 7, 9, 10, and 101 of the '413 Patent are obvious in view of Ahn (EX1004), Chaudhri '842 (EX1005), and Hinkley (EX1006). *See* Sections VIII-IX.

VIII. OVERVIEW OF REFERENCES AND COMBINATIONS

A. Ahn (EX1004)

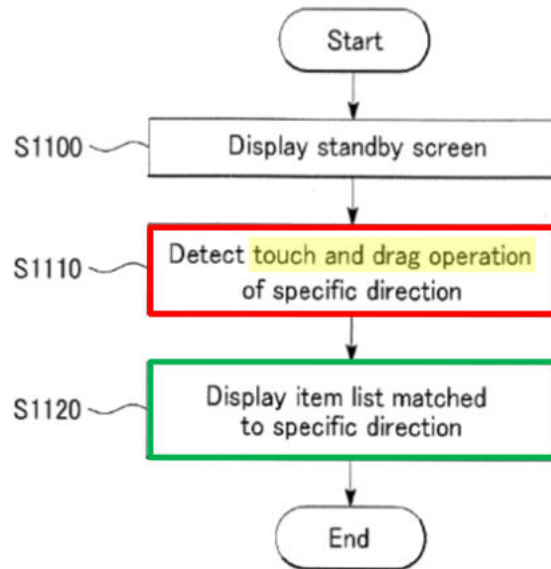
33. Ahn generally relates to a “method of displaying a menu in a mobile communication terminal.” EX1004, Abstract, [0004]. More specifically, Ahn describes a method of displaying different menus on a display of the mobile communication terminal based on a “selected direction” of user input. *See* EX1004, [0032]-[0033]. Ahn describes that the mobile communication terminal 100 illustrated in FIG. 1 includes touch input device 10 (*e.g.*, a “touch screen”) through

which “a user inputs various information or instruction with a touch method.” EX1004, [0027]-[0028].

34. With respect to FIGS. 3A-10, Ahn describes various methods for displaying menus on the mobile communication terminal including that “the user can select a direction using any input device that can select a direction, such as . . . a touch screen” EX1004, [0072]. EX1004, [0027]-[0028]. And Ahn provides several additional figures that focus on using a touch screen 10 as an input for the display of menus. *See generally* EX1004, [0095]-[0119].

35. Specifically, with respect to FIGS. 11-18, Ahn describes “a method of displaying a menu in a mobile communication terminal having a touch input device,” in which a menu is displayed in response to a “touch and drag operation.” EX1004, [0095]-[0099]. Initially, a controller 50 of the mobile communication terminal “detects a touch and drag operation of a specific direction on the touch screen 10 (S1110).” EX1004, [0098]. A POSITA would have understood and found obvious that Ahn’s touch and drag operation in a type of gesture performed by the user in relation to the touch screen. “As the touch and drag operation is detected, the controller 50 controls to display an item list matched to the specific direction in the display 40 (S1120).” EX1004, [0099]. The “item list” may be for example, a menu list or a file list. EX1004, [0099]. Each different direction of a touch and drag operation may be associated with a different menu or file list. EX1004, [0099].

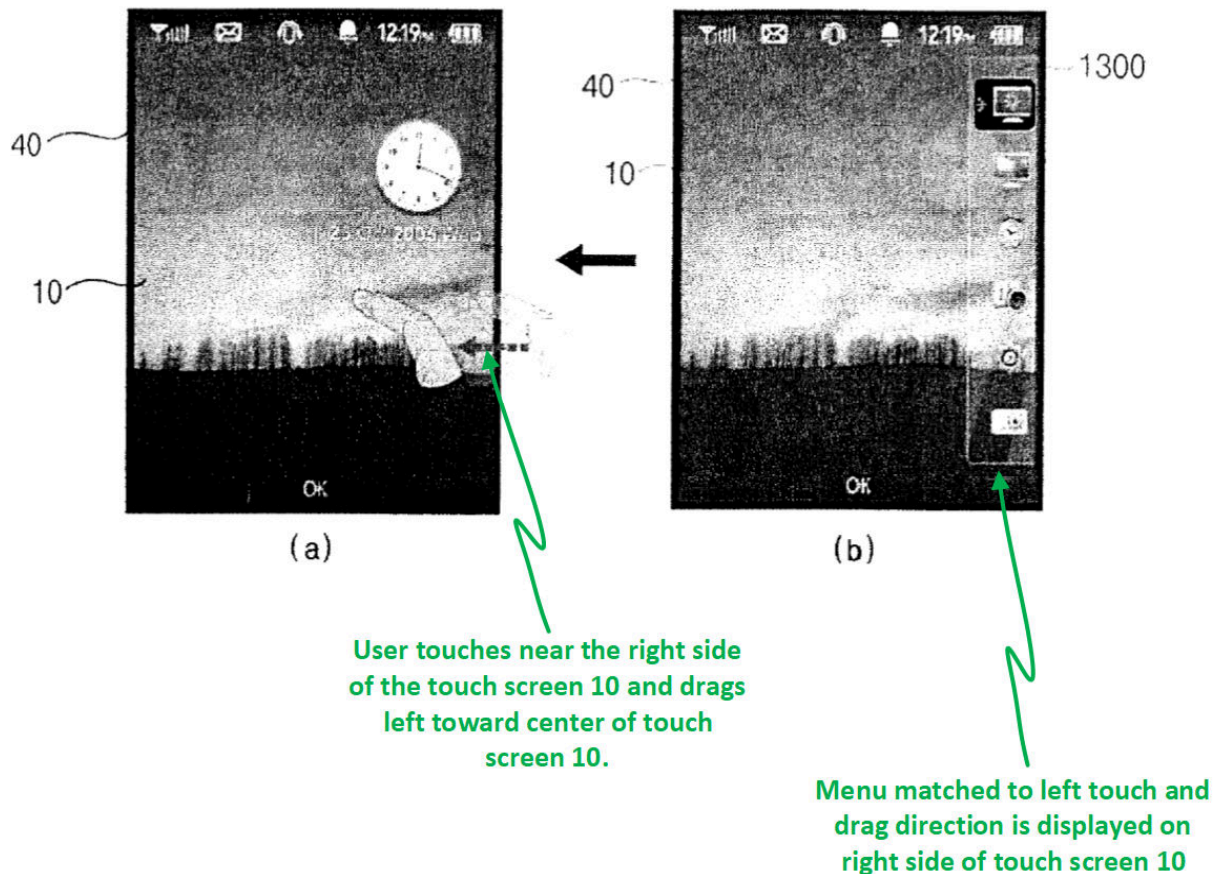
FIG. 11



EX1004, FIG. 11 (annotated).

36. In one example illustrated in FIGS. 13a and 13b, “if the user touches a specific position of the touch screen 10 and drags the touch in a left direction a menu list 1300 matched to a left direction is displayed in the display 40.” EX1004, [0102]. As can be seen in FIG. 13a, a user initially touches near the right side or edge of the touch screen 10 and initiates the drag gesture to open the menu. *See* EX1004, FIG. 13a, [0102]. As a result of controller 50 detecting the gesture, “a menu list matched to a left direction is set to be displayed at the right side of the display 40 (FIG. 13(b)).” EX1004, [0104].

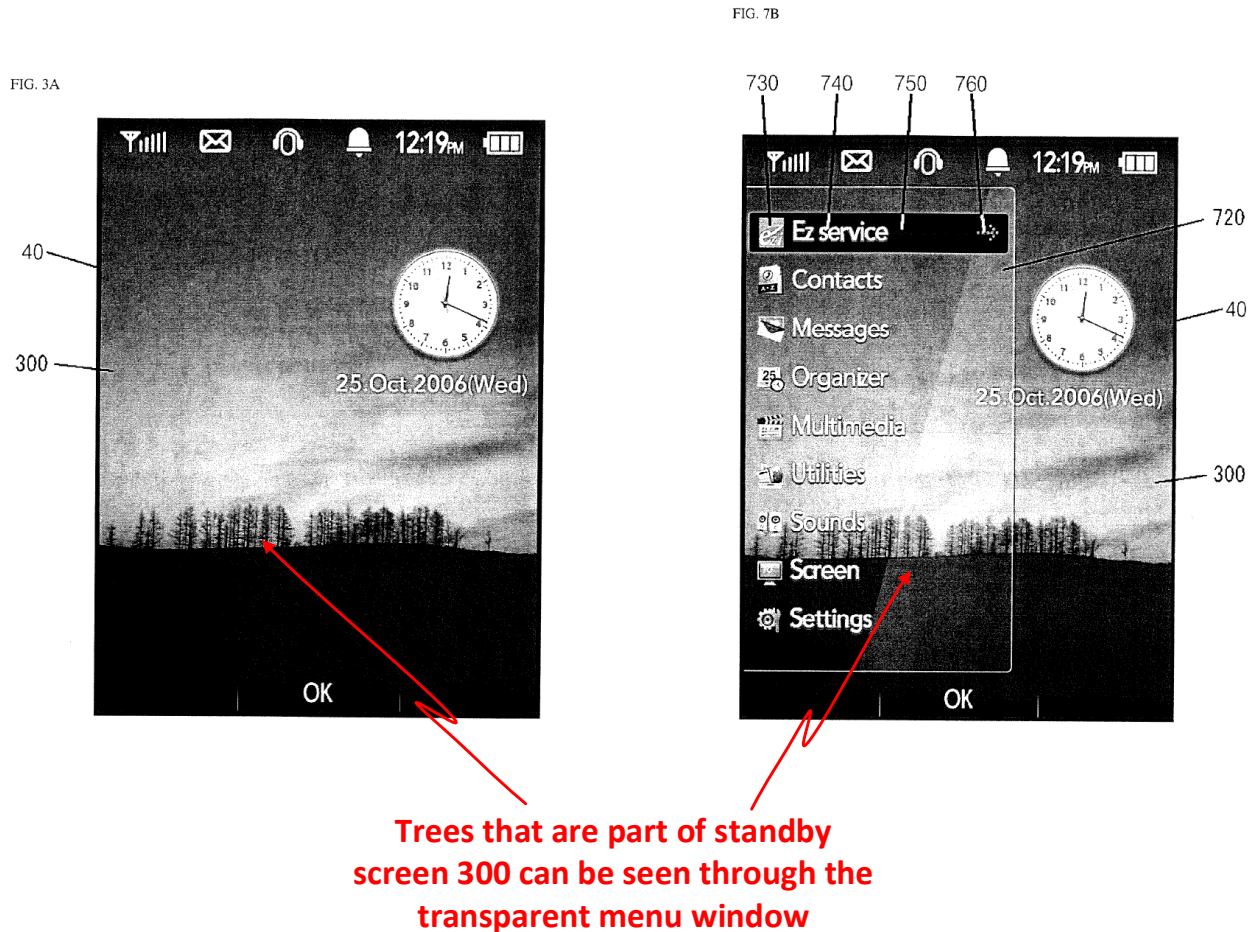
FIG. 13



EX1004, FIGS 13a and 13b (annotated).

37. Ahn describes that the displayed menus may be “transparently displayed on the standby screen 300.” EX1004, [0070]. This can be seen, for example, by comparing FIG. 3A, which shows standby screen 300 without any menus, and FIG. 7B, which shows the basic setting menu list 720 “displayed in a transparent window form in a left area of the standby screen 300.” EX1004, [0064]. Ahn describes that transparent menu windows ensure that “the preset standby screen

300 is not hidden by the pop-up menu window 340.” EX1004, [0039]. However, Ahn is not limited to these transparent menu windows.



EX1004, FIGS. 3A and 7B (annotated)

38. Ahn teaches at least two ways that its user interface may utilize blur. First, Ahn teaches that, instead of a transparent form, its menus “can be embodied in a translucent form or an opaque form, depending on implementation.” EX1004, [0070] (emphasis added). A POSITA would have known and found it obvious that, when differentiated from “transparent” and “opaque” in the manner they are used by

Ahn, the word “translucent” means “allowing light, but not detailed images, to pass through; semitransparent.” EX1009, 6. A POSITA would have understood not transmitting detail as a type of blurring, because the word “blur” means to “make or become unclear or less distinct.” EX1009, 3. In other words, a POSITA would have known and found it obvious that Ahn contemplates that, when embodied in translucent form, its menus would have blurred at least a portion of the background standby screen (*e.g.*, shown in FIG. 12).

FIG. 3A

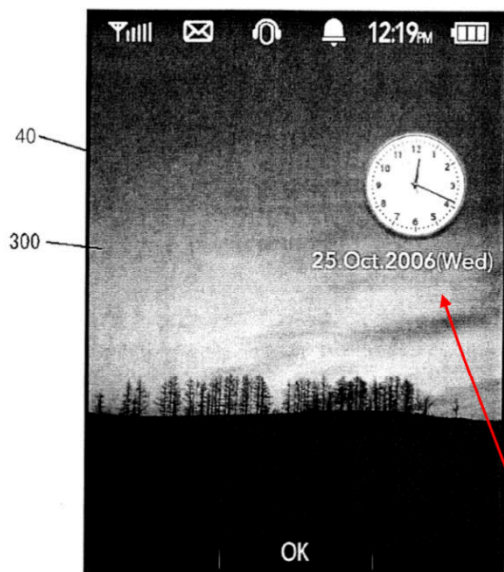
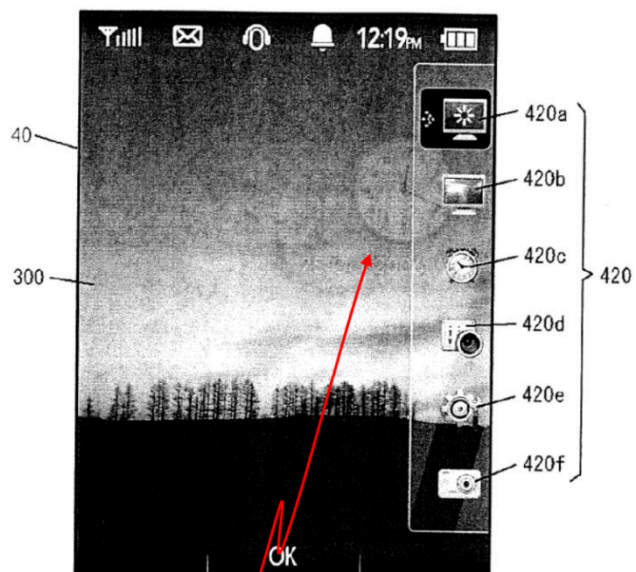


FIG. 4B



**Clock widget is blurred when user
menu 420 is opened**

EX1004, FIGS. 3A and 4B (annotated).

39. Second, Ahn explicitly shows that opening a menu can blur at least a portion of the standby screen 300. In FIG. 3A “a standby screen 300 set by a user is

displayed in the display 40 of the mobile communication terminal 100.” EX1004, [0036]. Ahn illustrates that a clock widget is part of the background standby screen 300. *See* EX1004, [0036], FIG. 3A. A similar clock widget is shown as part of the background standby screen 300 in FIGS. 12 and 13a. *See* EX1004, [0097], [0102], FIGS. 12, 13a. As can be seen in FIG. 4B, when the user menu 420 is opened, Ahn illustrates that the clock widget is blurred, which is pointed out with red arrows in the above annotation of FIGS. 3A and 4B. *See* EX1004, [0102], FIG. 13a. A similar blurring effect of the clock widget can also be seen in FIGS. 10 and 13B. *See* EX1004, FIGS. 10, 13B.

40. Ahn offers limited explanation or detail regarding the purpose of blurring the clock widget. Thus, a POSITA would have naturally turned to teachings like those provided by Chaudhri '842 when developing the blurring shown in FIGS. 4B, 10, and 13B.

B. Chaudhri '842 (EX1005)

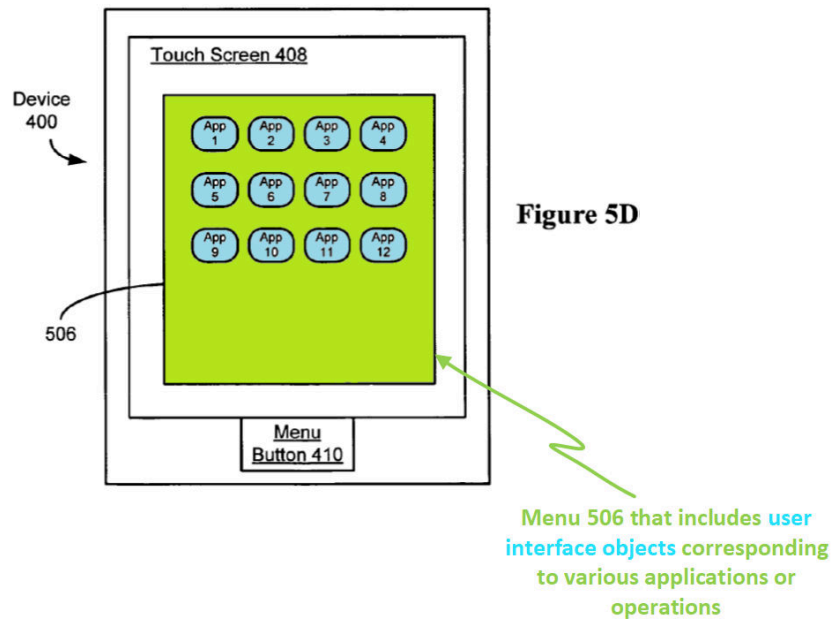
41. Like the '413 Patent and Ahn, Chaudhri '842 “relate[s] generally to user interfaces that employ touch-sensitive displays.” EX1005, [0002]. Chaudhri '842 recognized that “there is a need for more efficient, user-friendly procedures for transitioning such devices, touch screens, and/or applications between user interface states (*e.g.*, from a user interface state for a first application to a user interface state for a second application, between user interface states in the same application, or

between locked and unlocked states).” EX1005, [0006]. In one embodiment described in greater detail below, Chaudhri ’842 describes supplying visual feedback to a user who is transitioning between user interface states on a touch screen by providing “visual differentiation between the *user-interface object* and the *background*, based on color, hue, color saturation, brightness, contrast, transparency, and any combination thereof.” See EX1005, [0085]. Through this embodiment, Chaudhri ’842 provides at least one possible set of implementation details particularly relevant to the blurring shown in Ahn.

42. Like Ahn’s mobile communication terminal, Chaudhri ’842 describes a portable electronic device 100 that includes a touch screen 126. EX1005, [0026]. “The touch screen 126 provides both an output interface and an input interface between the device and a user.” EX1005, [0033]. The portable electronic device also includes “one or more processors 106 [that] run various software programs and/or sets of instructions stored in the memory 102 to perform various functions for the device 100 and to process data.” EX1005, [0028]. The “software components include an operating system 132, a communication module (or set of instructions) 134, a contact/motion module (or set of instructions) 138, a graphics module (or set of instructions) 140, a user interface state module (or set of instructions) 144, and one or more applications (or set of instructions) 146.” EX1005, [0037].

43. “The contact/motion module 138 includes various software components for performing various operations related to detection of contact with the touch screen 122, such as determining if contact has occurred, determining if there is movement of the contact and tracking the movement across the touch screen, and determining if the contact has been broken (i.e., if the contact has ceased).” EX1005, [0040]. “The graphics module 140 includes various known software components for rendering and displaying graphics on the touch screen 126.” EX1005, [0041]. The graphics module 140 may also include an optical intensity module 142 that “controls the optical intensity of graphical objects, such as user-interface objects, displayed on the touch screen 126.” EX1005, [0042]. “The user interface state module 144 controls the user interface state of the device 100.” EX1005, [0043].

44. “The device 100 may have a plurality of user interface states.” EX1005, [0048]. While many of the figures in Chaudhri ’842 focus on a transition between a locked and unlocked state, Chaudhri ’842 is clear that its disclosure applies more generally to any transitions between user interface states, such as states of a plurality of applications. *See* EX1005, [0006], [0048], [0079], [0081]. In at least one example, a user interface state transition described by Chaudhri ’842 involves the display of a menu that “includes interactive user-interface objects corresponding to various applications or operations.” EX1005, [0076], FIG. 5D.



EX1005, FIGS 5D (annotated).

45. With respect to FIG. 6 (reproduced below), Chaudhri '842 describes “a process 600 for indicating progress towards satisfaction of a user input condition.” EX1005, [0080]. “While an electronic device is in a first user-interface state, progress is detected (602) towards satisfaction of a user input condition needed to transition to a second user-interface state.” EX1005, [0081]. “While the device is in the first user-interface state, progress is indicated (604) towards satisfaction of the condition by transitioning an optical intensity of one or more user interface objects associated with the second user-interface state.” EX1005, [0082].

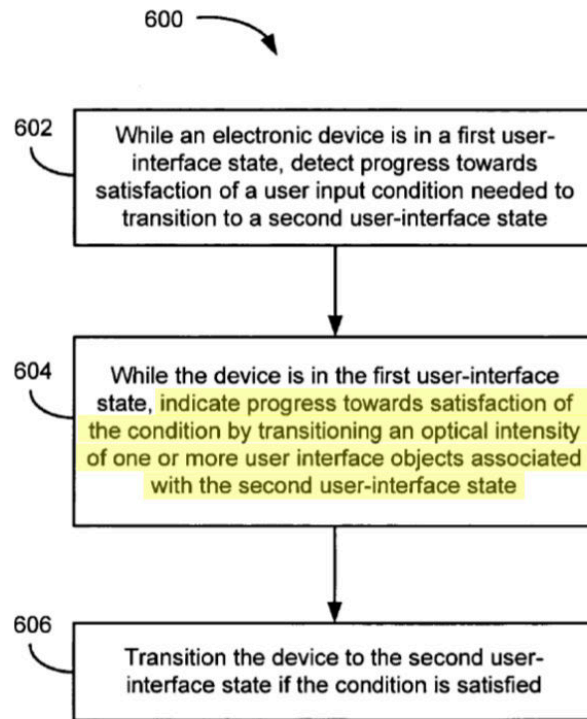


Figure 6

EX1005, FIGS 6 (annotated).

46. Chaudhri '842 describes that “the optical intensity may be the visual differentiation between the *user-interface object* and the *background*, based on color, hue, color saturation, brightness, contrast, transparency, and any combination thereof.” EX1005, [0085]. Among the various types of user-interface objects contemplated by Chaudhri '842 are, “without limitation, text, images, icons, soft keys (or ‘virtual button’), pull-down menus, radio buttons, check boxes, selectable lists, and so forth.” EX1005, [0060]. Accordingly, Chaudhri '842 explicitly

describes differentiating between a menu and a background displayed on the touch screen during its user interface state transition process.

47. The changes “in optical intensity of the user-interface objects provide[] a user with sensory feedback of the progress in transitioning between user interface states.” EX1005, [0082]. As shown above in FIG. 6, the transition between user interface states is dictated by “satisfaction” of a “user input condition.” EX1005, [0081]; *see also* EX1005 [0047] (“The predefined set of functions that are performed exclusively through the touch screen and the touchpad include navigation between user interfaces”). Chaudhri ’842 describes that this user input condition may include “a predefined gesture” and that “progress of the gesture may be defined in terms of how much of the gesture is completed.” EX1005, [0088]. The predefined gesture may include, for example, the user “dragging an image to a predefined location.” EX1005, [0089]. In these examples, as the user completes the predefined gesture (*e.g.*, dragging an image), Chaudhri ’842 teaches that changing the optical intensity of user interface objects helps the user see and understand that their gesture is causing a transition in user interface states and the progress they are making. *See* EX1005, [0082].

48. In one example, Chaudhri ’842 describes that “the optical intensity may be perceived by users as a transparency effect (or lack thereof) applied to the user-interface object,” such that the object transitions from “not perceptible to the user”

to being “completely materialized visually and [] perceptible to the user.” EX1005, [0085]. In other words, the transition may appear to a user as though objects associated with the second user interface state “fade in” while objects associated with the first user interface state “fade out.” *See* EX1005, [0079], [0087].

C. Hinkley (EX1006)

49. Like the ’413 Patent, Ahn, and Chaudhri ’842, Hinkley relates to user input for touch displays. *See* EX1006, [0001], [0003]. More specifically, Hinkley describes “bezel gestures for touch displays.” EX1006, [0003], [0039]. “The bezel is made up of the frame structure adjacent the device’s display” and “forms part of the device’s housing.” EX1006, [0044]. Hinkley seeks to utilize these bezel gestures in order to “provid[e] enhanced functionality for users, without necessarily permanently manifesting the functionality as part of the ‘chrome’² of a device’s user interface.” EX1006, [0001], [0003].

50. Hinkley describes its bezel gestures in the context of a computing device 102 that may take the form of a handheld device or wireless telephone that

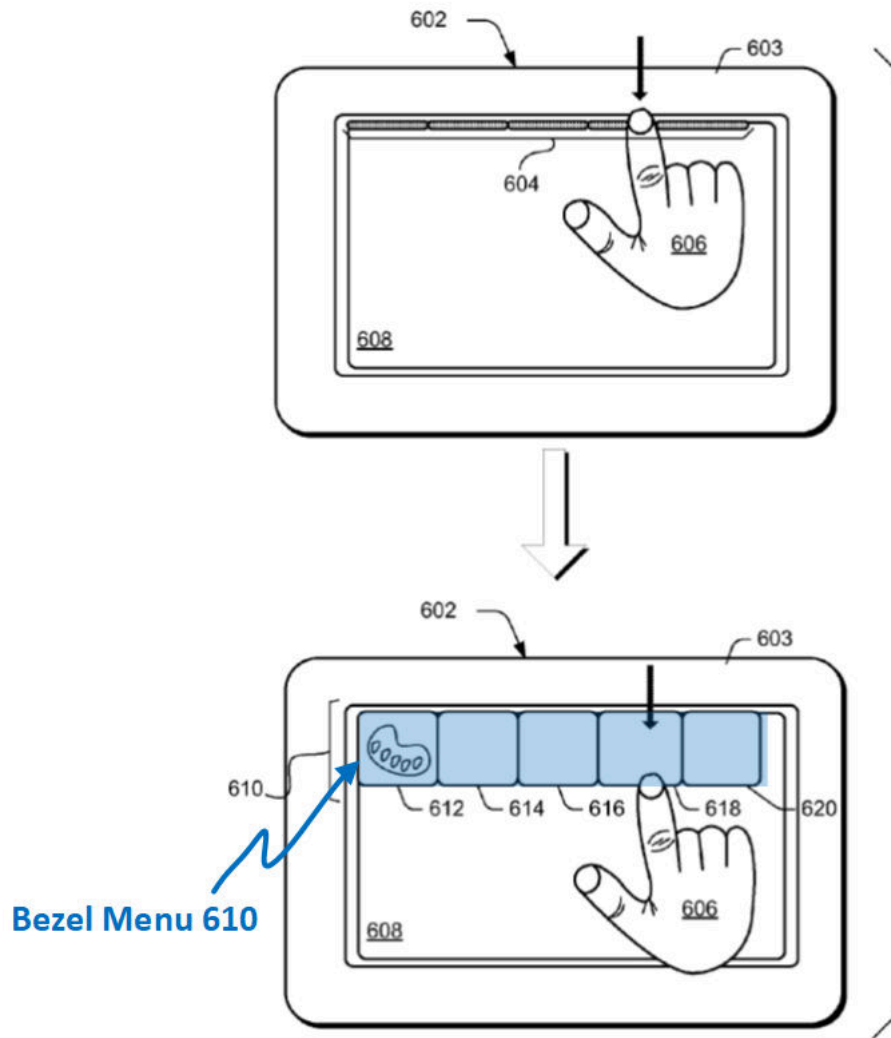
² In this context, a POSITA would have understood and found obvious that the “chrome” of a device’s user interface accounts for all of the visible graphical interface features of an application and/or the overall visible and usable display space.

utilizes a touchscreen display. *See* EX1006, [0043]-[0051]. The computing device 102 includes a “gesture module 104 [that] may be configured to recognize a touch input, such as a finger of a user's hand 106a as proximal to display device 108 of the computing device 102 using touchscreen functionality.” EX1006, [0045]. The computing device 102 also includes a “bezel gesture module 105 [that] can be configured to recognize a touch input, such as a finger of a user's hand 106b, that initiates a gesture on or adjacent bezel 103 and proceeds onto display device 108.” EX1006, [0045]. Hinkley describes that gesture modules 104 and 105 “are representative of functionality” and may be implemented in software. EX1006, [0044].

51. While Hinkley contemplates that the computing device 102 may include “sensing elements” that “extend underneath bezel 103,” Hinkley also recognizes an alternative embodiment in which the touchscreen “does not extend underneath bezel 103, but rather lies flush with the bezel,” and “bezel gesture module 105 can detect the changing contact profile of the user's finger as it emerges onto display device 108 from bezel 103.” EX1006, [0046]. In this regard, a POSITA would have recognized and found obvious that Hinkley's bezel gestures may be used with mobile devices that do not have special “bezel” hardware, and can instead utilize just a touch screen, like the one used in Ahn. *See* EX1006, [0046], [0057] (“The features of the gesture techniques described below are platform-independent,

meaning that the techniques may be implemented on a variety of commercial computing platforms having a variety of processors”).

52. Like Ahn, Hinkley describes associating inputs received on certain parts of the touchscreen of a computing device with different functionalities. *See* EX1006, [0061]. “For example, input received on the right side of the bezel might be mapped to a first functionality; input received on the left side of the bezel might be mapped to a second functionality and so on.” EX1006, [0061]. With respect to FIG. 6, for instance, Hinkley describes an embodiment in which a user utilizes a bezel gesture to access a bezel menu—a menu displayed along the side/edge/bezel of the display like the menus described in Ahn. *See* EX1006, [0072]-[0081].

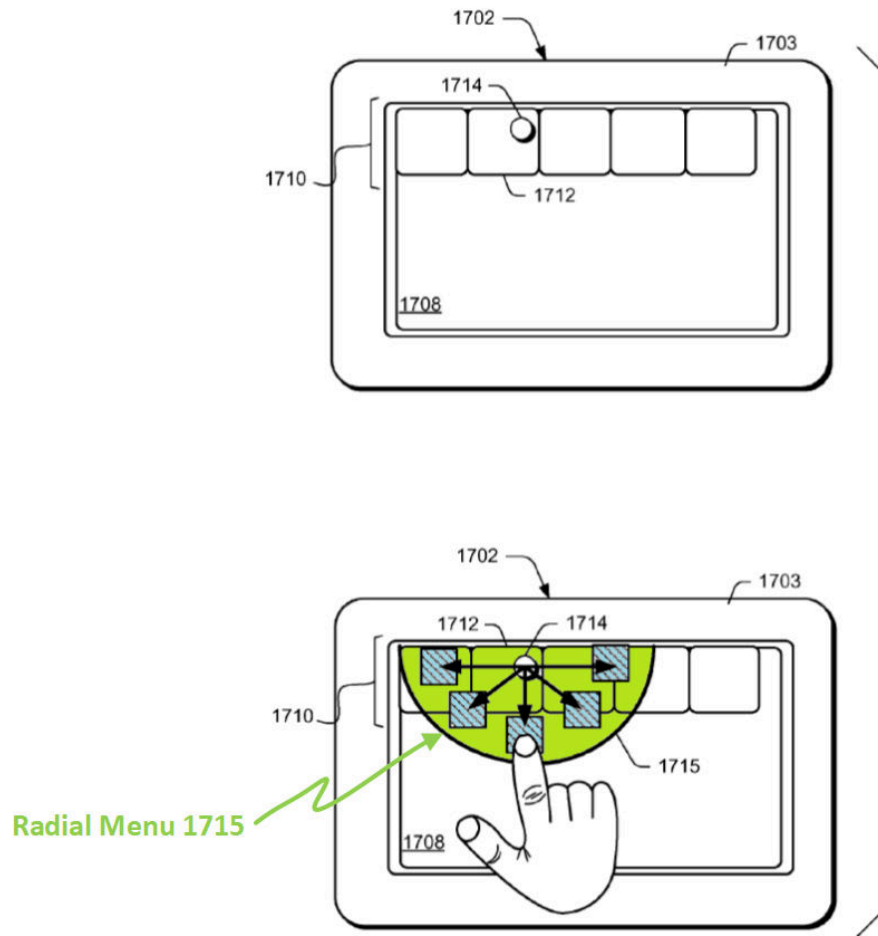


EX1006, FIG. 6 (annotated).

53. Specifically, “the bezel menu can be accessed through a bezel gesture in which a finger of user’s hand 606 touches the bezel and then moves across the bezel and onto the display device 608 in the direction of the illustrated arrow.” EX1006, [0073]. The “bezel menu 610 includes multiple selectable icons or slots 612, 614, 616, 618, and 620,” each of which is “associated with a different functionality.” EX1006, [0074]. “In the novice mode, after the user gestures to

reveal the bezel menu 610, the user can lift their finger, whereupon the bezel menu can remain open for a configurable interval (or indefinitely).” EX1006, [0077]. “The user may then tap on a desired item associated with one of the icons or slots 612, 614, 616, 618, and 620,” which causes “the functionality associated with a particular icon or slot can be accessed.” EX1006, [0077].

54. “In at least some embodiments, so-called radial menus can be utilized in connection with menus such as bezel menus.” EX1006, [0105]. An example of a bezel menu is shown in FIG. 17. EX1006, [0105], FIG. 17. In this example, “bezel menu 1710 includes multiple selectable icons or slots,” and “[e]ach of the icons or slots is associated with a different functionality.” EX1006, [0106].



EX1006, FIG. 17 (annotated).

55. “[I]con or slot 1712 includes a radial menu icon 1714 that gives a clue to the user that one or more radial menus, for example radial menu 1715, is associated with this particular icon or slot.” EX1006, [0107]. In some implementations, “[t]he radial menus 1715 can be accessed through a tap-and-hold of the pen or finger on or near the radial menu icon 1714.” EX1006, [0107]. “In some embodiments, tapping on the radial menu icon triggers a default action which may or may not be different than the action associated with tapping on the bezel

menu slot.” EX1006, [0107]. Thus, in at least one implementation, tapping the icon 1712 will trigger one action, while a tap-and-hold on the radial menu icon 1714 portion of icon 1712 will trigger a different action (i.e., opening the radial menu 1715).

D. The Combination, Reasons to Combine, & Expectation of Success

56. Like the ’413 patent, the respective disclosures of Ahn, Chaudhri ’842, and Hinkley all seek to improve the usability of mobile devices with relatively small display screens. Accordingly, the Ahn-Chaudhri-Hinkley combination represents the predictable and expected result of applying in the context of Ahn’s touch screen mobile device: [a] the user interface state transition techniques described by Chaudhri ’842; and [b] Hinkley’s bezel gestures and associated user interface elements, including the bezel menus and radial menus. From a POSITA’s perspective in 2011, integrating the supplemental teachings of Chaudhri ’842 and Hinkley with Ahn’s disclosure would have involved nothing more than applying known solutions to known problems in the field of computer interfaces and applications to achieve predictable outcomes. The fundamental aspects of Ahn’s disclosure would remain intact, bolstered by the well-known and beneficial teachings of Chaudhri ’842 and Hinkley to successfully arrive at the ’413 patent’s claimed invention.

1. Applying Chaudhri '842's teachings about user interface state transition in the context of Ahn's touch screen mobile device

57. A POSITA would have been motivated to use interface state transition techniques described by Chaudhri '842 in the context of Ahn's touch screen mobile device. The predictable result of this Ahn-Chaudhri combination is a mobile device that changes an optical intensity of one or more user interface objects as a function of progress towards satisfaction of a user's gesture input that transitions the mobile device from one user interface state to another. The following independent reasons support the Ahn-Chaudhri combination.

58. First, Chaudhri '842 provides one example of implementation details that are lacking for a feature otherwise disclosed in Ahn. As discussed in Section VIII.A, *supra*, Ahn already illustrates in FIGS. 3A and 4B that the process of opening the edge menus may cause user interface objects that are displayed as part of the standby screen 300 (*e.g.*, a clock widget) to be blurred when the edge menu is opened and displayed on the screen. However, Ahn does not provide further details about this blurring process and leaves the implementation details to POSITAs.

59. Chaudhri '842 provides one example of implementation details a POSITA would have found obvious to utilize when implementing the blurring already specifically taught in Ahn. Specifically, as discussed in Section VIII.B, *supra*, Chaudhri '842 provides details for utilizing transitions in optical intensity

during transitions in user interface state. A POSITA would have understood and found obvious that the opening of the edge menus described in Ahn are a form of transition in user interface state. Furthermore, a POSITA would have recognized that the touch and drag gesture described in Ahn for opening the edge menus is akin to the dragging gestures described in Chaudhri '842 for transitioning between user interface states. *See, e.g.*, EX1004, [0099] (“As the touch and drag operation is detected, the controller 50 controls to display an item list matched to the specific direction”); EX1005, [0075] (“performing the gesture by moving her finger, which is in continuous contact with the touch screen 408, in the direction of movement 504”). In the context of these related gestures and transitions, Chaudhri '842 provides additional details about the use of varying optical intensity for user interface objects that a POSITA would have found helpful to implement the optical effects shown but not otherwise described in Ahn (e.g., with respect to the clock widget in FIGS. 3A and 4B).

60. Second, Chaudhri '842 teaches that the “change in optical intensity of the user-interface objects provides a user with sensory feedback of the progress in transitioning between user interface states.” EX1005, [0082]. Based on these teachings a POSITA would have understood and found obvious that, as a user is performing a predefined gesture, for example, the changes in optical intensity provide the user a visual indication that they are performing a particular operation

(*e.g.*, the optical intensity changes help the user see more clearly that the user interface state is changing), what the operation is doing (*e.g.*, the optical intensity changes help the user visualize what is changing as a result of the gesture), and how far the user is in completing the gesture that will effectuate the change in user interface states. *See* EX1005, [0006], [0082], [0088]-[0089], [0108]. To help direct a user with respect to successfully performing the predefined gesture, Chaudhri '842 teaches that the user interface may additionally include “cues” to help the user know what gesture to utilize and whether they are correctly performing the gesture (*e.g.*, graphics such as movable images that, when combined with the transition in optical intensity, help the user visualize the correct gesture and how to complete it successfully). *See* EX1005, Abstract, [0054], [0062], [0073]. Furthermore, Chaudhri '842 teaches that changes in optical intensity help to create “visual differentiation between the user-interface object and the background,” which a POSITA would have understood and found obvious would have been visually helpful to a user both during the predefined gesture and after it is complete. *See* EX1005, [0085]. A POSITA would have understood and found obvious that these explicit benefits of Chaudhri '842's techniques would have been directly applicable to Ahn's mobile terminal and the opening of its edge menus.

61. Third, a POSITA would have known that transparency, translucency/blurring, and other “focus and context” techniques may be utilized in

user interfaces to help draw a user's attention to the most relevant part of a user interface. *See* EX1008, 1-2. Focus and context “techniques enable the user to investigate specific details of the data while at the same time also providing an overview over the embedding of the data under investigation within the entire dataset.” EX1008, 1. One type of focus and context technique (called “cue methods”) allows a “user to select objects in terms of their features, not their spatial relations; usually by assigning a certain visual cue to them,” which “make it possible to query the data for information which is not immediately visible in the initial visualization, while keeping the original layout, and thus not destroying the user's mental map.” EX1008, 1. These focus and context techniques utilize, for example, blur, transparency, and/or color saturation to help a user navigate through complex and multi-layer user interfaces by drawing the user's attention to the most relevant layers. *See* EX1008, 1-2. A POSITA would have understood and found obvious that this focusing technique is at least one reason for blurring the clock widget in Ahn's standby screen 300 so as to focus the user's attention on and not distract from the open edge menu (*e.g.*, menu 1300 in FIG. 13b). By utilizing the optical intensity variation described in Chaudhri '842, a POSITA would have recognized that they would have been better focusing a user's attention on the most relevant object (*i.e.*, the now opened menu).

62. Fourth, a POSITA would have known that varying optical intensity for a user interface object (*e.g.*, the blurring of Ahn's clock widget) as a function of the magnitude of the user's touch and drag gesture would have been one of a limited number of ways of implementing the blurring effect that's explicitly shown in FIGS. 4B, 10, and 13B of Ahn. Either a POSITA could have implemented the blurring effect in a binary fashion (*e.g.*, toggling instantaneously between unblurred and blurred) or progressively varied the blur as a function of the user's gesture, as taught by Chaudhri '842.

2. Applying Hinkley's teachings about bezel gestures and associated user interface elements in the context of the Ahn-Chaudhri touch screen mobile device

63. A POSITA would have been motivated to integrate Hinkley's teachings about bezel gestures and associated user interface elements, including the bezel menus and radial menus, in conjunction with the Ahn-Chaudhri touch screen mobile device. The predictable result of this Ahn-Chaudhri-Hinkley combination is a mobile device that utilizes various gestures on a touchscreen and techniques for discerning between them to implement, among other user interface objects, bezel menus and radial menus. A POSITA would have recognized and found obvious that Ahn's touch input device 100, memory 20, display 40, and controller 50 would have been capable of implementing the gesture functionality and user interface objects described by Hinkley, because Hinkley describes its gestures in the context of a

similar computing device 102 (*see* EX1006, [0043]), and describes that the functionality can be embodied in software stored in memory (*see* EX1006, [0044]) using a touchscreen display that does not require special hardware under the bezel (*see* EX1006, [0046]). However, a POSITA would have found it equally obvious to integrate into Ahn's mobile communication terminal 100 any of the hardware or software described by Hinkley that better or more fully supports the gesture functionality and user interface objects described by Hinkley (*e.g.*, sensing elements that extend underneath bezel). *See* EX1006, [0045]. The following independent reasons support the Ahn-Chaudhri-Hinkley combination.

64. First, a POSITA would have recognized that the side menus described in Ahn and the bezel menus described in Hinkley are similar user interface objects, and therefore that the techniques described in Hinkley with respect to its bezel menus would have been equally beneficial in the context of Ahn's side menus, and would have provided beneficial implementation details otherwise left unspecified in Ahn. For example, Hinkley describes "different gestural modes can be utilized to access functionality associated with the bezel menu." EX1006, [0076]. In a novice mode, the gestures are "visually guided . . . based on direct manipulation of a widget." *See* EX1006, [0077]-[0080], [0110]. In an expert mode, as the user becomes more familiar with the interface, the same or a similar gesture can be performed "based on ballistic motion driven by procedural memory" to allow the user to more quickly

perform actions on the user interface without waiting for the visual guides to appear. *See* EX1006, [0077]-[0080], [0110]. “The concept succeeds because the novice way of using it helps to learn and encourage the expert way of working with it.” EX1006, [0079]. A POSITA would have recognized that implementing Hinkley’s different user interaction modes in the context of Ahn’s mobile communication terminal would have created a user interface that adapts to a user’s experience level and created a more intuitive, efficient, and pleasing experience for a user.

65. Furthermore, Hinkley describes that its techniques for identifying a user’s input relative to the bezel of the computing device “are usable to differentiate the touch input from other touch inputs recognized by the gesture modules 104, 105.” EX1006, [0046]. “This yields the general benefit that gestures that start from the bezel and enter onto the screen are, in general, distinguishable from other ostensibly similar gestures that access on-screen content.” EX1006, [0046]. “Hence, normal direct manipulative gestures, even for objects near the screen boundaries, are still possible and do not interfere with bezel gestures and vice versa.” EX1006, [0046]. A POSITA would have recognized that implementing Hinkley’s specific gesture recognition techniques in the context of Ahn’s mobile communication terminal would have yielded these same general benefits in gesture distinction described by Hinkley.

66. Additionally, Hinkley describes that its bezel gestures allow a user to “readily access enhanced functions of a computing device in an efficient and intuitive manner.” EX1006, [0040]. One efficiency gained through the use of such bezel gestures and associated menus is that a user gains access to enhanced functions “without necessarily permanently manifesting the functionality as part of the ‘chrome’ of a device’s user interface.” EX1006, [0001]. In other words, Hinkley’s techniques allow for the conservation of valuable screen real estate, particularly on mobile devices. Again, a POSITA would have recognized that these benefits would have been equally applicable to the similar context of Ahn’s mobile communication terminal.

67. Second, given the similarity of context and the problems being solved in each of Ahn and Hinkley (*e.g.*, intuitively and efficiently displaying user interface elements such as menus on a touch screen computing device), and the similar manner in which each of Ahn and Hinkley describe solving that problem (*e.g.*, touching and dragging/swiping a finger on the touch screen in a particular direction and/or from a particular location), a POSITA would have understood that utilizing the techniques described in Hinkley with respect to the gesture module 104 and bezel gesture module 105 (*e.g.*, the implementation and operation of the bezel menus and radial menus) would have been a simple substitution of one known element for another to obtain predictable results.

**IX. GROUND 1: AHN, CHAUDHRI '842, AND HINKLEY RENDER
CLAIMS 1-3, 7, 9, 10, AND 101 OBVIOUS**

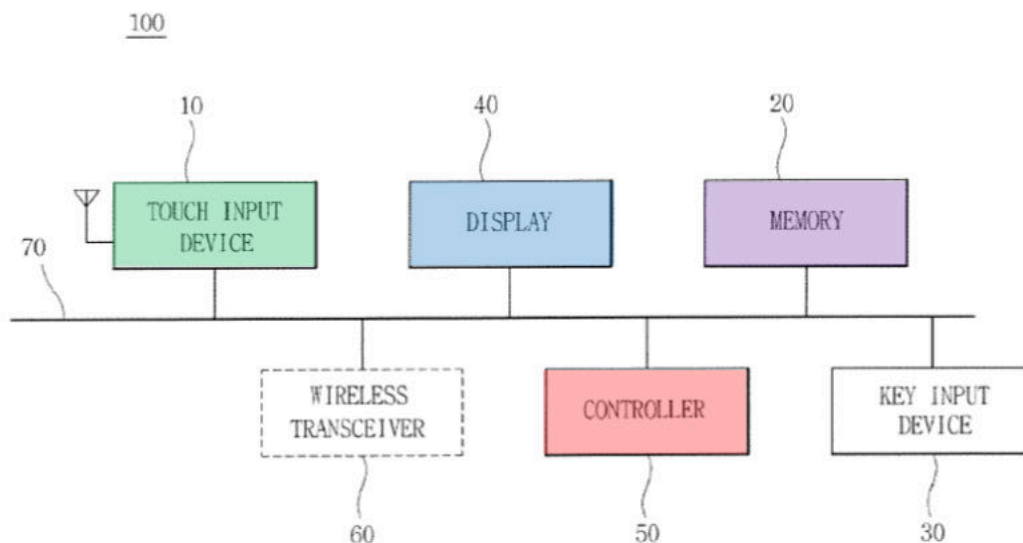
A. Claim Element Analysis

(a) Claim 1

Element [1.a] An electronic device, comprising: a display; a touch interface; one or more processors; memory; and one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors . . .

68. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.a]. For example, Ahn describes a mobile communication terminal 100 that comprises “a **touch input device 10**, a **memory 20**, a key input device 30, a **display 40**, a **controller 50**, and a wireless transceiver 60.” EX1004, [0027], FIG. 1.

FIG. 1



EX1004, FIG. 1 (highlighted).

69. “The **display 40** . . . outputs various display information and various menu screens 100, and may comprise a Liquid Crystal Display (LCD) or an Organic

Light Emitting Diode (OLED).” EX1004, [0031]. A POSITA would have understood or found obvious that Ahn’s **display 40** is a *display*, as recited in [1.a].

70. “The **touch input device 100** is a device in which a user inputs various information or instruction with a touch method. The touch input device 100 comprises, for example, a touch screen or a touch pad.” EX1004, [0028]. A POSITA would have understood or found obvious that Ahn’s **touch input device 100** is a *touch interface*, as recited in [1.a].

71. “The **controller 50** controls a general operation of the mobile communication terminal 100.” EX1004, [0032]. Controller 50 interfaces with memory 20 (*see* EX1004, [0099]-[0100]), controls the display 40 (*see* EX1004, [0099], [0106]. [0108]), and detects a touch and drag operation (*see* EX1004, [0099], [0107], [0109]). A POSITA would have understood and found obvious that Ahn’s description of controller 50 is indicative that at least one known hardware implementation for controller 50 would have been *one or more processors*, as recited in [1.a]. Indeed, each of Chaudhri ’842 and Hinkley address similar user interface problems for similar mobile touchscreen devices, and each of Chaudhri ’842 and Hinkley describe that their respective devices comprise *one or more processors*, as recited in [1.a]. *See* EX1005, [0026] (portable electronic device “includes a memory 102, a memory controller 104, one or more processing units (CPUs) 106, a peripherals interface 108, RF circuitry 112, audio circuitry 114, a

speaker 116, a microphone 118, an input/output (I/O) sub system 120, a touch screen 126, ...”); EX1006, [0150] (portable device 3300 “includes one or more processors 3310 (e.g., any of microprocessors, controllers, and the like) which process various computer-executable or readable instructions to control the operation of device 3300 and to implement the gesture embodiments described above.”).

72. “The **memory 20** comprises a program memory and a data memory. Programs for controlling a general operation of the mobile communication terminal 100 are stored in the program memory.” EX1004, [0029]. A POSITA would have understood or found obvious that Ahn’s **memory 20** is a *memory*, as recited in [1.a]. Furthermore, a POSITA would have understood or found obvious that Ahn’s “programs for controlling a general operation of the mobile communication terminal” are *one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors*, as recited in [1.a]. Indeed, each of Chaudhri ’842 and Hinkley address similar user interface problems for similar mobile touchscreen devices, and each of Chaudhri ’842 and Hinkley describe that their respective devices comprise *one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors*, as recited in [1.a]. See EX1005, [0028] (“The one or more processors 106 run various software programs and/or sets of instructions stored in the memory 102 to perform various functions for

the device 100 and to process data.”); EX1006, [0152] (“Computer-readable media 3314 provides data storage mechanisms to store the device data 3304, as well as various device applications 3318 and any other types of information and/or data related to operational aspects of device 3300,” and the “device applications 3318 can include a device manager (e.g., a control application, software application, signal processing and control module, code that is native to a particular device, a hardware abstraction layer for a particular device, etc.).”).

Element [1.b] the one or more programs including instructions for: displaying, utilizing the display, a graphical user interface;

73. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.b].

74. First, Ahn describes that ***the one or more programs including instructions for: displaying, utilizing the display***, as recited in [1.b]. See EX1004, [0029], [0031]-[0032], [0096], [0099], [0106], [0108]. As discussed above with respect to Element [1.a], Ahn describes memory 20 comprises a program memory, which stores “[p]rograms for controlling a general operation of the mobile communication terminal 100.” EX1004, [0029]. A POSITA would have understood that the controller 50 utilizes these programs to control, for example, the display 40. See EX1004, [0029], [0031]-[0032], [0096], [0099], [0106], [0108].

75. Ahn further describes that “[t]he display 40 . . . outputs various display information and various menu screens 100.” EX1004, [0031]. The “controller 50 determines when a standby screen is displayed in the display 40, if a specific direction is selected by the touch input device 10 or the key input device 30, to display a menu corresponding to the selected direction on the standby screen.” EX1004. [0032].

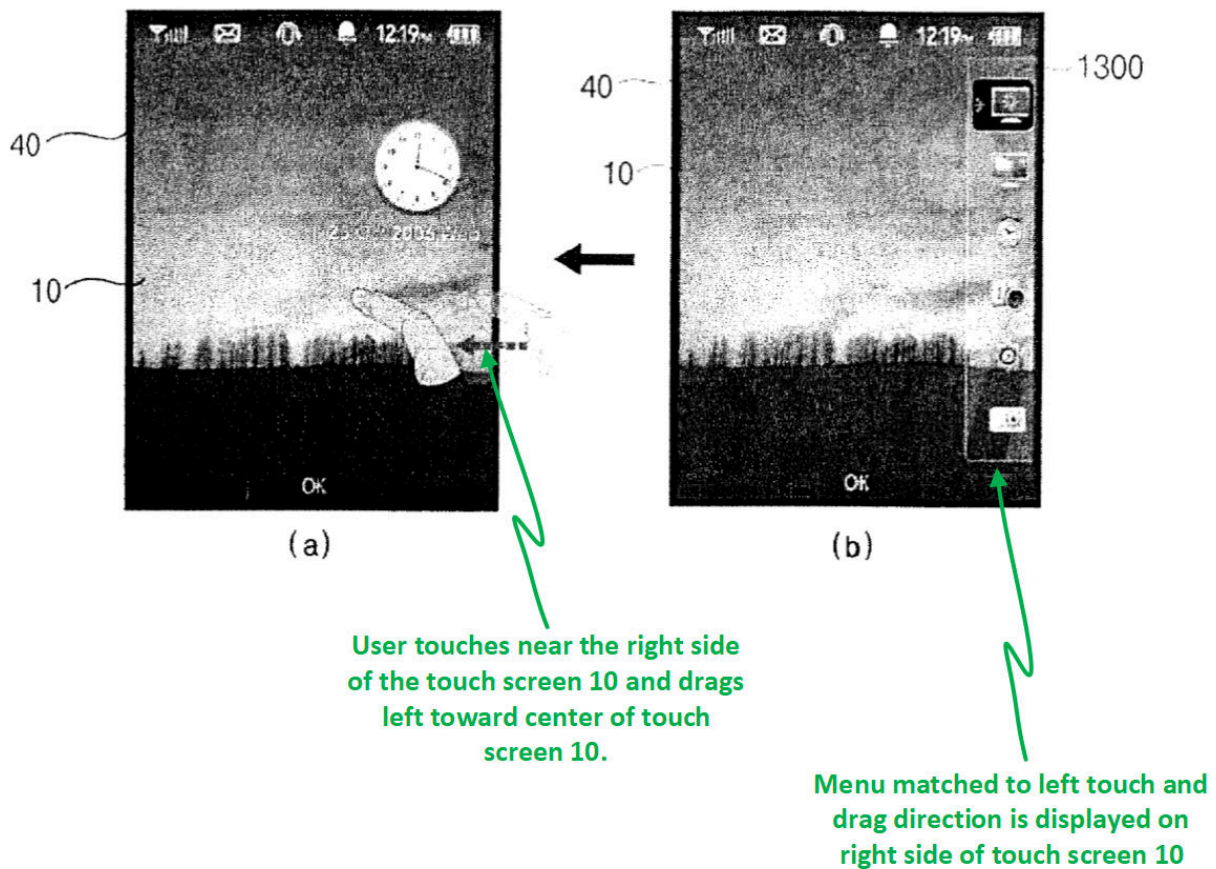
76. Second, a POSITA would have understood and found obvious that the standby screen and menus displayed on display 40 of Ahn’s mobile communication terminal 100 are elements of *a graphical user interface*, as recited in [1.b], because these elements are at least a part of “a visual way of interacting with a computer using items such as windows, icons, and menus.” See EX1009, 4. Ahn describes its menus as “a menu interface [] provided to the user.” See EX1004, [0085], [0089]. Moreover, each of Chaudhri ’842 and Hinkley address similar user interface problems for similar mobile touchscreen devices, and each of Chaudhri ’842 and Hinkley describe menus displayed on a touchscreen display as elements of a graphical user interface. See EX1005, [0003] (“A device may display one or more soft keys, menus, and other user-interface objects on the touch screen”), [0076] (“The menu 506 includes interactive user-interface objects corresponding to various applications or operations. A user may interact with the user-interface objects to activate an application or perform an operation.”); EX1006, [0056] (“the gesture

techniques supported by the gesture modules may be detected using touchscreen functionality in the mobile configuration 202, track pad functionality of the computer 204 configuration, detected by a camera as part of support of a natural user interface (NUI) that does not involve contact with a specific input device, and so on.”).

Element [1.c] when the graphical user interface is displayed, detecting, utilizing the touch interface, a first gesture that begins in connection with a first edge of the display and moves inward;

77. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.c]. For example, as discussed in Section VIII.A, *supra*, Ahn describes “a method of displaying a menu in a mobile communication terminal having a touch input device,” in which a menu is displayed in response to a “touch and drag operation.” EX1004, [0095]-[0099]. Initially, a controller 50 of the mobile communication terminal “detects a touch and drag operation of a specific direction on the touch screen 10 (S1110).” EX1004, [0098].

FIG. 13



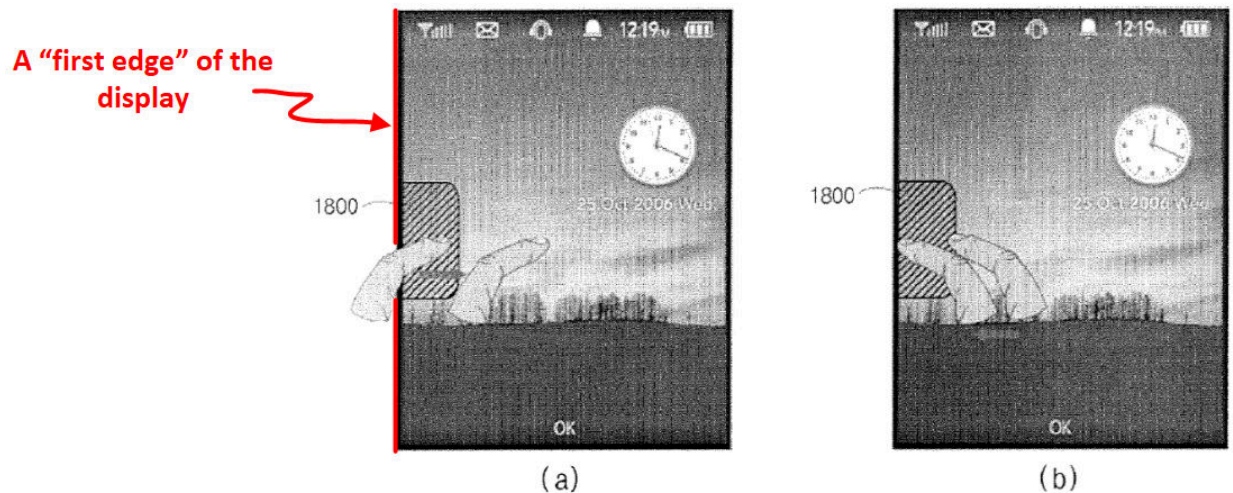
EX1004, FIGS. 13a and 13b (annotated).

78. In one example illustrated in FIGS. 13a and 13b, “if the user touches a specific position of the touch screen 10 and drags the touch in a left direction a menu list 1300 matched to a left direction is displayed in the display 40.” EX1004, [0102]. As can be seen in FIG. 13a, a user initially touches near the right side or edge of the touch screen 10 and initiates the drag gesture that moves inward toward the center of the display. *See* EX1004, FIG. 13a, [0102]. Thus, as shown in at least FIGS. 13a and 13b and described with respect thereto, Ahn explicitly teaches, *when the*

graphical user interface is displayed, detecting, utilizing the touch interface, a first gesture that begins in connection with a first edge of the display and moves inward, as recited in [1.c].

79. Though FIG. 13a clearly shows the user's finger beginning the "touch and drag" gesture in connection with a first edge of the display (*i.e.*, the right edge in this example), Ahn does not explicitly specify or otherwise limit the "specific position of the touch screen 10" at which the touch is initiated. *See* EX1004, [0102]. However, with respect to FIG. 18, Ahn describes that the display 40 may utilize "a graphical display for notifying a start position of a touch and drag operation to a user," and clearly shows "a graphical shadow 1800" displayed at a first edge of the display (*e.g.*, the left edge in this example) that indicates the start position of the touch is along the first edge. *See* EX1004, [0117]-[0119]. A POSITA would have at least found it obvious in light of these teachings that Ahn's mobile communication terminal 100, *when the graphical user interface is displayed, detect[s], utilizing the touch interface, a first gesture that begins in connection with a first edge of the display and moves inward*, as recited in [1.c].

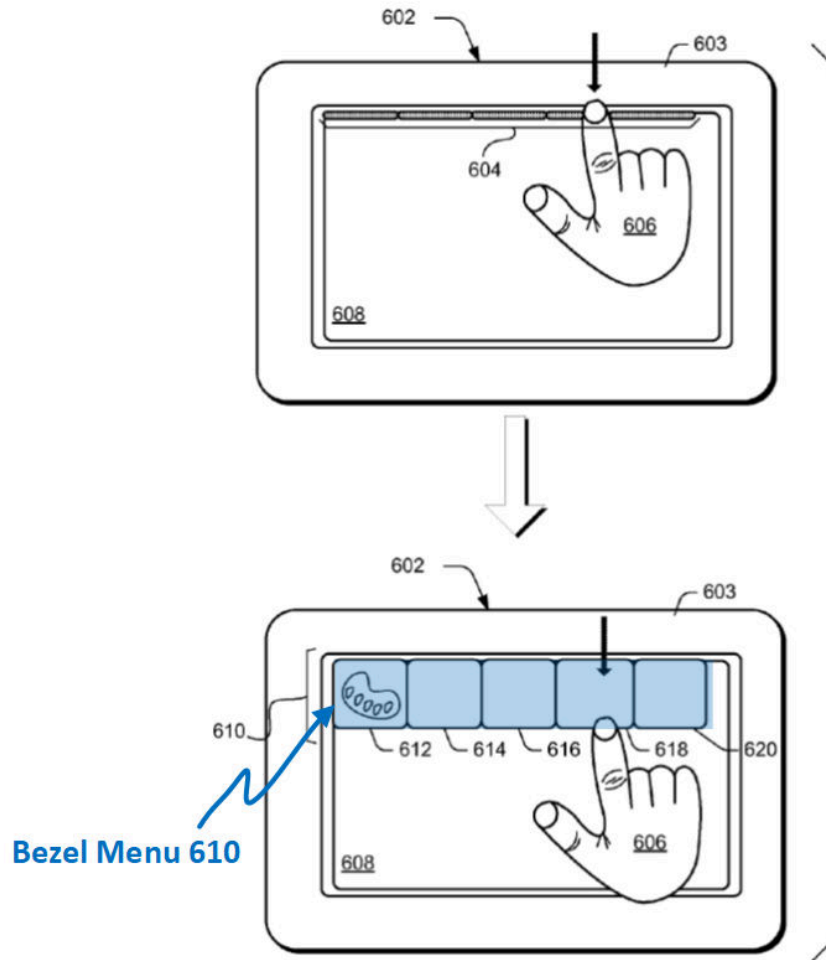
FIG. 18



EX1004, FIGS. 18a and 18b (annotated).

80. Alternatively, for the reasons described in Section VIII.D, *supra*, a POSITA would have found it obvious to apply Hinkley's bezel gestures and associated user interface elements, including the bezel menus and radial menus, in the context of Ahn's mobile communication terminal 100. Hinkley describes that software in the computing device "can be configured to recognize a touch input, such as a finger of a user's hand 106b, that initiates a gesture on or adjacent bezel 103 and proceeds onto display device 108." EX1006, [0045]. Because the "bezel is made up of the frame structure adjacent the device's display" (EX1006, [0044]) and therefore frames an edge of the display, a POSITA would have understood and found obvious that gestures initiated "on or adjacent bezel 103 and proceed[ing] onto display device 108" are *begun in connection with a first edge of the display and moves inward*, as recited in [1.c].

81. With respect to FIG. 6, for instance, Hinkley describes an embodiment in which a user utilizes a bezel gesture to access a bezel menu—a menu displayed along the side/edge/bezel of the display like the menus described in Ahn. *See* EX1006, [0072]-[0081]. The top portion of FIG. 6 clearly shows that the user's bezel gesture *begins in connection with a first edge of the display* and the bottom portion of FIG. 6 clearly shows that the user's bezel gesture then *moves inward*, as recited in [1.c]. *See* EX1006, [0072]-[0081], FIG. 6.



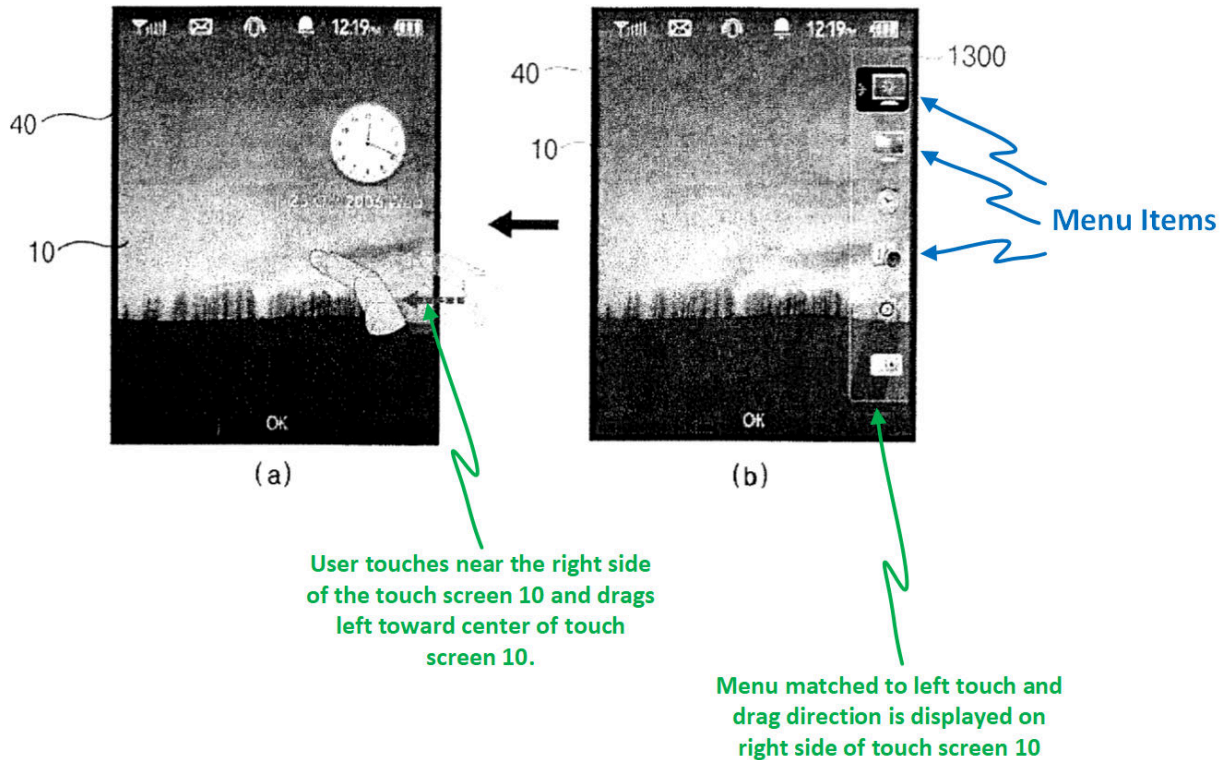
EX1006, FIG. 6 (annotated).

82. Specifically, “the bezel menu can be accessed through a bezel gesture in which a finger of user’s hand 606 touches the bezel and then moves across the bezel and onto the display device 608 in the direction of the illustrated arrow.” EX1006, [0073]. Based on at least these teachings, a POSITA would have at least found it obvious in the context of the Ahn-Chaudhri-Hinkley combination that, *when the graphical user interface is displayed, detect[s], utilizing the touch interface, a first gesture that begins in connection with a first edge of the display and moves inward*, as recited in [1.c].

Element [1.d.i] in response to the detection of the first gesture that begins in connection with the first edge and moves inward, displaying, utilizing the display, a first menu as sliding in and including one or more first menu items, and

83. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.d.i]. As discussed in Section VIII.A and with respect to Element [1.c], *supra*, Ahn describes “a method of displaying a menu in a mobile communication terminal having a touch input device,” in which a menu is displayed in response to a “touch and drag operation.” EX1004, [0095]-[0099].

FIG. 13



EX1004, FIGS. 13a and 13b (annotated).

84. “As the touch and drag operation is detected, the controller 50 controls to display an item list matched to the specific direction in the display 40 (S1120).” EX1004, [0099]. “The item list comprises, for example, a menu list or a file list.” EX1004, [0102]. In one example illustrated in FIGS. 13a and 13b, “if the user touches a specific position of the touch screen 10 and drags the touch in a left direction a menu list 1300 matched to a left direction is displayed in the display 40.” EX1004, [0102]. “A position in which the item list is displayed in the display 40 can be preset.” EX1004, [0104]. “For example, referring to FIGS. 13 to 15, a menu

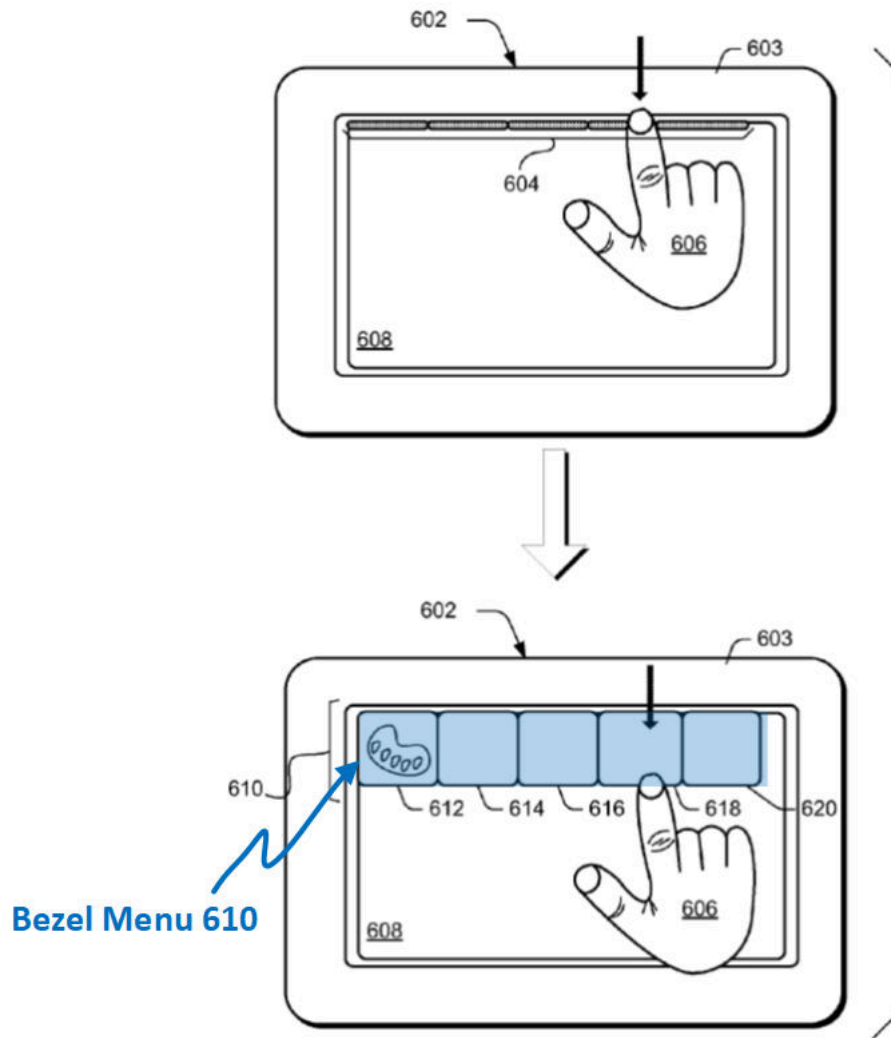
list matched to a left direction is set to be displayed at the right side of the display 40 (FIG. 13(b))” EX1004, [0104].

85. In the context of Ahn, a POSITA would have understood and found obvious that the term “drag” means that the menu is “stuck to” the user’s finger as the user moves his/her finger along the display, such that the menu moves and appears to slide in direct correspondence with the user’s finger. *See, e.g.*, EX1006, [0080] (describing a user interface object “following the user’s finger”); EX1010, ¶52 (permitting “user experience of dragging out the user interface from the edge as the gesture is performed with the user interface appearing to ‘stick’ to the gesture (*e.g.*, to a mouse point or person’s finger making the gesture).”); EX1011, [0051] (describing updating a display location of a user interface object in accordance with the touch input). Thus, a POSITA would have understood and found obvious that Ahn’s mobile communication terminal 100, *in response to the detection of the first gesture that begins in connection with the first edge and moves inward, display[s], utilizing the display, a first menu as sliding in and including one or more first menu items*, as recited in [1.d.i].

86. Moreover, with respect to FIG. 18, Ahn describes that the display 40 may utilize “a graphical display for notifying a start position of a touch and drag operation to a user,” and clearly shows “a graphical shadow 1800” displayed at a first edge of the display (*e.g.*, the left edge in this example) that indicates the start

position of the touch is along the first edge. *See* EX1004, [0118]-[0119]. Ahn explains that “as the user drags the graphic shadow 1800, the menu list 1500 can be displayed along the dragged graphic 1800.” EX1004, EX1004, [0118]. A POSITA would have understood and found obvious from these teachings that, in at least implementations like those described with respect to FIG. 18, the menu list 1500 is displayed *as sliding in*, as recited in [1.d.i].

87. Alternatively, for the reasons described in Section VIII.D, *supra*, a POSITA would have found it obvious to apply Hinkley’s bezel gestures and associated user interface elements, including the bezel menus and radial menus, in the context of Ahn’s mobile communication terminal 100. As part of the bezel gestures discussed in greater detail in Section VIII.C and with respect to Element [1.c], *supra*, Hinkley describes that “the bezel menu can be accessed through a bezel gesture in which a finger of user’s hand 606 touches the bezel and then moves across the bezel and onto the display device 608 in the direction of the illustrated arrow.” EX1006, [0073]. Thus, a POSITA would have understood and found obvious that the mobile device of the Ahn-Chaudhri-Hinkley combination, *in response to the detection of the first gesture that begins in connection with the first edge and moves inward, display[s], utilizing the display, a first menu as sliding in and including one or more first menu items*, as recited in [1.d.i].



EX1006, FIG. 6 (annotated).

88. The bezel gesture “can allow bezel menu 610 to be dropped down,” which a POSITA would have understood and found obvious could be implemented by *displaying, utilizing the display, a first menu as sliding in*, as recited in [1.d.i]. See EX1006, [0073]. Indeed, Hinkley teaches that the “user may close the bezel menu by sliding it back off of the screen (an on-screen-to-offscreen gesture),” which a POSITA would have understood and found obvious to mean that the bezel menus

are displayed as both sliding on and sliding “back off” the display. *See* EX1006, [0073]. Further, in other contexts, Hinkley describes user interface objects “following the user’s finger.” EX1006, [0080].

89. Accordingly, based on the combined teachings of the prior art, a POSITA would have at least found it obvious that the mobile device of the Ahn-Chaudhri-Hinkley combination, *in response to the detection of the first gesture that begins in connection with the first edge and moves inward, display[s], utilizing the display, a first menu as sliding in and including one or more first menu items*, as recited in [1.d.i].

Element [1.d.ii] blurring at least a portion of the graphical user interface such that a magnitude of the blurring of the at least portion of the graphical user interface progressively increases as a function of an increase in a magnitude of the first gesture being detected;

90. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.d.ii].

91. Ahn explicitly describes *blurring at least a portion of the graphical user interface*, as recited in [1.d.ii]. As discussed in Section VIII.A, *supra*, Ahn describes the use of blurring in at least two ways. First, Ahn describes that the displayed menus may be “displayed on the standby screen 300. . . in a translucent form” EX1004, [0070] (emphasis added). A POSITA would have known and found it obvious that, when differentiated from “transparent” and “opaque” in the

manner they are used by Ahn, the word “translucent” means “allowing light, but not detailed images, to pass through; semitransparent.” EX1009, 6. A POSITA would have understood not transmitting detail as a type of blurring, because the word “blur” means to “make or become unclear or less distinct.” EX1009, 3. This is consistent with the ’413 Patent’s use of the word “blur” in its claims, because dependent claim 49, for example, recites that “the blurring includes at least one of: dimming, displaying as indistinct, displaying as vague, displaying as cloudy, displaying as obscured, or displaying as smeared.” EX1001, 103:57-59. In other words, a POSITA would have known and found it obvious that Ahn contemplates that, when embodied in translucent form, its menus would have blurred at least a portion of the background standby screen (*e.g.*, shown in FIG. 12) by rendering the portion under which it is displayed as vague or less distinct.

92. A POSITA would have understood and found obvious that, as a user utilizes the dragging gesture to open a given translucent menu, the translucent menu would progressively slide onto the display as a function of the magnitude of the user’s dragging gesture (as described with respect to Element [1.d.i], *supra*), and the translucent menu would correspondingly progressively blur the portion of the background over which the menu is displayed as it slides onto the screen. Accordingly, when displayed as a translucent window (as opposed to a transparent window), Ahn’s menu would have ***blurr[ed] at least a portion of the graphical user***

interface such that a magnitude of the blurring of the at least portion of the graphical user interface progressively increases as a function of an increase in a magnitude of the first gesture being detected, as recited in [1.d.ii].

93. Second, Ahn additionally illustrates blurring at least a portion of background standby screen 300 (*e.g.*, a clock widget) as a result of a user opening one of the menus. *See* EX1004, FIGS. 4B, 10, 13B. In FIG. 3A, Ahn illustrates that a clock widget is part of the background standby screen 300. *See* EX1004, [0036], FIG. 3A. A similar clock widget is shown as part of the background standby screen 300 in FIGS. 12 and 13a. *See* EX1004, [0097], [0102], FIGS. 12, 13a. As can be seen in FIG. 4B, when the user menu 420 is opened, Ahn illustrates that the clock widget becomes blurred, which is pointed out with red arrows in the below annotation of FIGS. 3A and 4B. *See* EX1004, [0036], FIGS. 3A, 4B. A similar blurring effect of the clock widget can also be seen in FIGS. 10 and 13B. *See* EX1004, FIGS. 4B, 10. As above, a POSITA would have understood the illustration of the clock widget in FIGS. 4B, 10, and 13B as “blurred,” consistent with the usage of that word in the ’413 Patent, because it is displayed as “indistinct,” “vague,” “cloudy,” and/or “obscured,” consistent with dependent claim 49. *See* EX1001, 103:57-59.

FIG. 3A

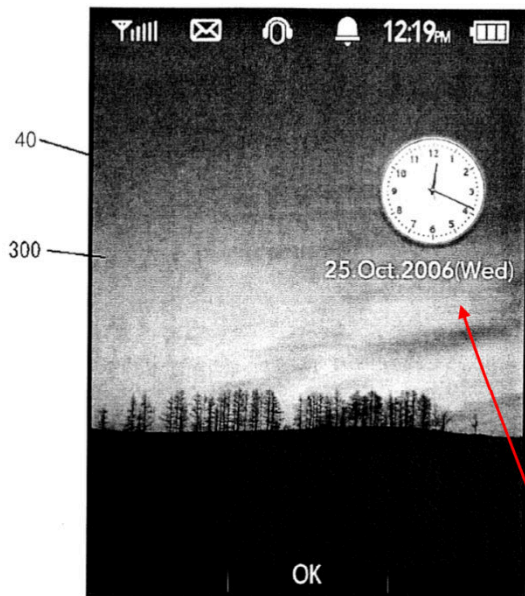
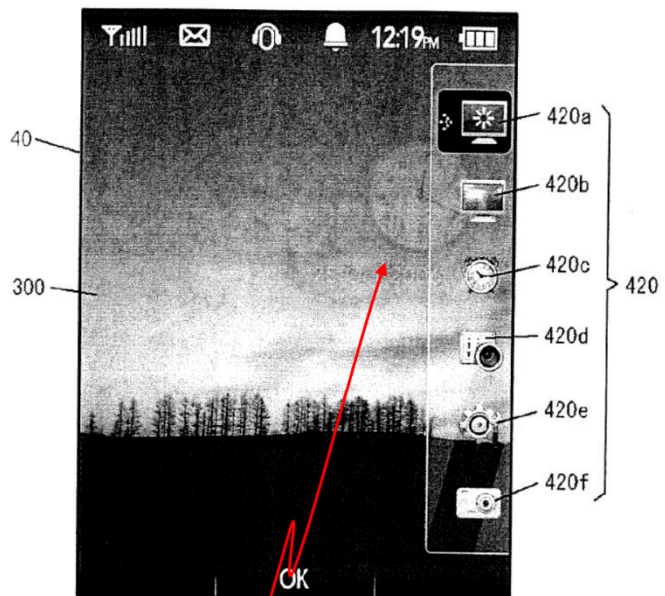


FIG. 4B



**Clock widget is blurred when user
menu 420 is opened**

EX1004, FIGS. 3A and 4B (annotated).

94. Ahn does not specify or otherwise limit the manner in which a POSITA would have implemented the above-described blurring of its user interface. For the reasons described in Section VIII.D, *supra*, a POSITA would have found it obvious to apply Chaudhri '842's user interface state transition techniques—particularly the use of transitioning optical intensity to provide visual feedback regarding the progress of a transition between user interface states as a result of detecting a user's input of a predefined gesture—in the context of Ahn's mobile communication terminal 100.

95. As discussed in Section VIII.B, *supra*, Chaudhri '842 describes “a process 600 for indicating progress towards satisfaction of a user input condition.” EX1005, [0080]. “While an electronic device is in a first user-interface state, progress is detected (602) towards satisfaction of a user input condition needed to transition to a second user-interface state,” and “progress is indicated (604) towards satisfaction of the condition by transitioning an optical intensity of one or more user interface objects associated with the second user-interface state.” EX1005, [0081]-[0082].

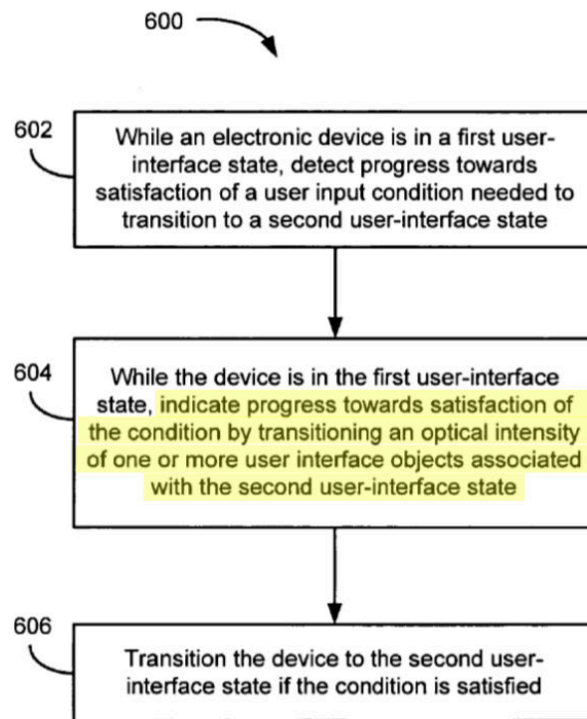


Figure 6

EX1005, FIG. 6 (annotated).

96. Chaudhri '842 describes that “the optical intensity may be the visual differentiation between the *user-interface object* and the *background*, based on color, hue, color saturation, brightness, contrast, transparency, and any combination thereof.” EX1005, [0085]. Among the various types of user-interface objects contemplated by Chaudhri '842 are, “without limitation, text, images, icons, soft keys (or ‘virtual button’), pull-down menus, radio buttons, check boxes, selectable lists, and so forth.” EX1005, [0060]. Accordingly, Chaudhri '842 explicitly describes differentiating between a menu and a background displayed on the touch screen during its user interface state transition process.

97. Chaudhri '842 describes that the optical intensity, and thus “the indication of progress towards completion of the user input condition[,] is a function of the user's satisfaction of the condition.” EX1005, [0087]. “If the user input condition includes a predefined gesture then the indication of progress of the gesture may be defined in terms of how much of the gesture is completed and how much of the gesture is remaining.” EX1005, [0088]. As the user input condition (*e.g.*, a gesture) progresses, the optical intensity can correspondingly vary in magnitude based on the magnitude of the progress toward gesture completion according to both linear and non-linear functions, such as those illustrated in FIGS. 8A-8C. *See* EX1005, [0087]-[0088].

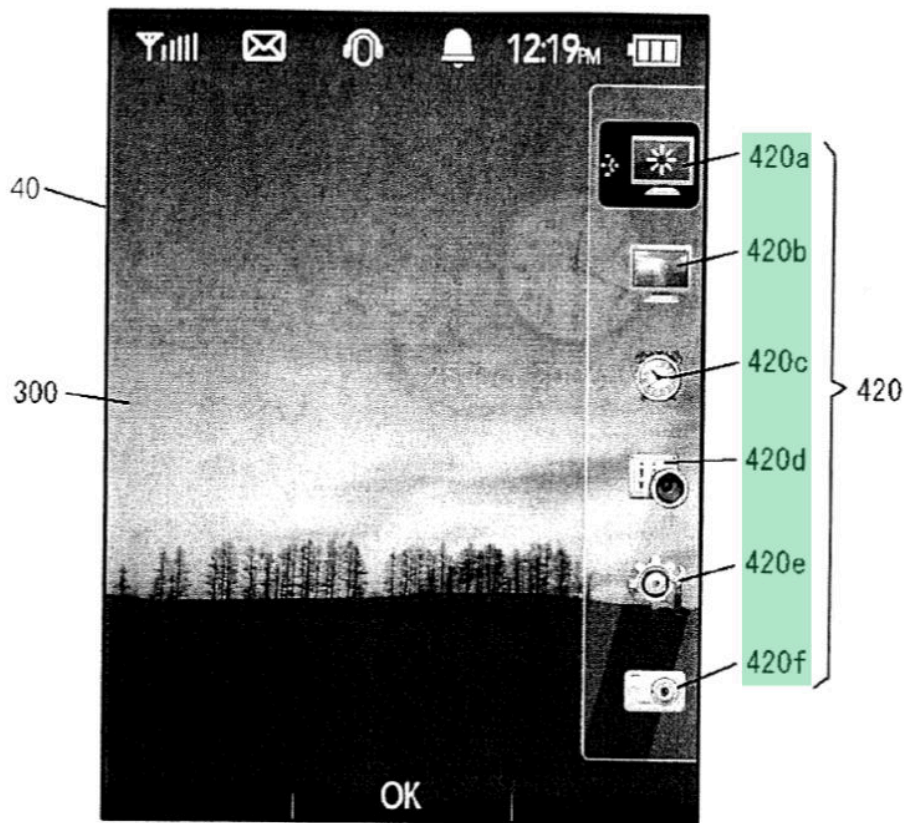
98. Applying at least the above teachings of Chaudhri '842 in the context of Ahn's "touch and drag" gesture and Ahn's corresponding transition between a user interface state where the standby screen is displayed (*see, e.g.*, EX1004, FIG. 13a) and a user interface state where a menu list 1300 is displayed above or on top of the standby screen (*see, e.g.*, EX1004, FIG. 4B, 10, and 13b), a POSITA would have at least found it obvious to vary, according to the teachings of Chaudhri '842, the optical intensity of the standby screen or at least portions thereof (*e.g.*, the blurring of the clock widget, as shown in FIGS. 4B, 10, and 13b) as a visual indication of a user's progress in completing Ahn's "touch and drag" gesture. *See* EX1005, [0080]-[0089]. In addition to providing a visual indication to the user of their progress in completing the gesture, utilizing this progressive translucency or blurring effect would have helped differentiate between the user-interface object (*e.g.*, the menu list 1300) and the background (*e.g.*, the standby screen and/or clock widget). *See* EX1005, [0085].

99. Implemented in this or a similarly obvious way, a POSITA would have thus found it obvious based on these combined teachings that the mobile device of the Ahn-Chaudhri-Hinkley combination would have ***blurr[ed] at least a portion of the graphical user interface such that a magnitude of the blurring of the at least portion of the graphical user interface progressively increases as a function of an increase in a magnitude of the first gesture being detected***, as recited in [1.d.ii].

Element [1.e.i] when the first menu is displayed including the one or more first menu items: detecting, utilizing the touch interface, a first duration of contact on at least one of the one or more first menu items,

100. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.e.i]. For example, Ahn describes that the menu lists displayed as a result of the “touch and drag operation” may include various sub-menus (*e.g.*, 420a-420f in FIG. 4B) that, when selected by a user, provide access to various functions. *See* EX1004, [0051], [0052]-[0057]. A POSITA would have understood and found obvious that each of these sub-menus is a ***menu item*** of the user menu 420.

FIG. 4B



EX1004, FIG. 4B (highlighted).

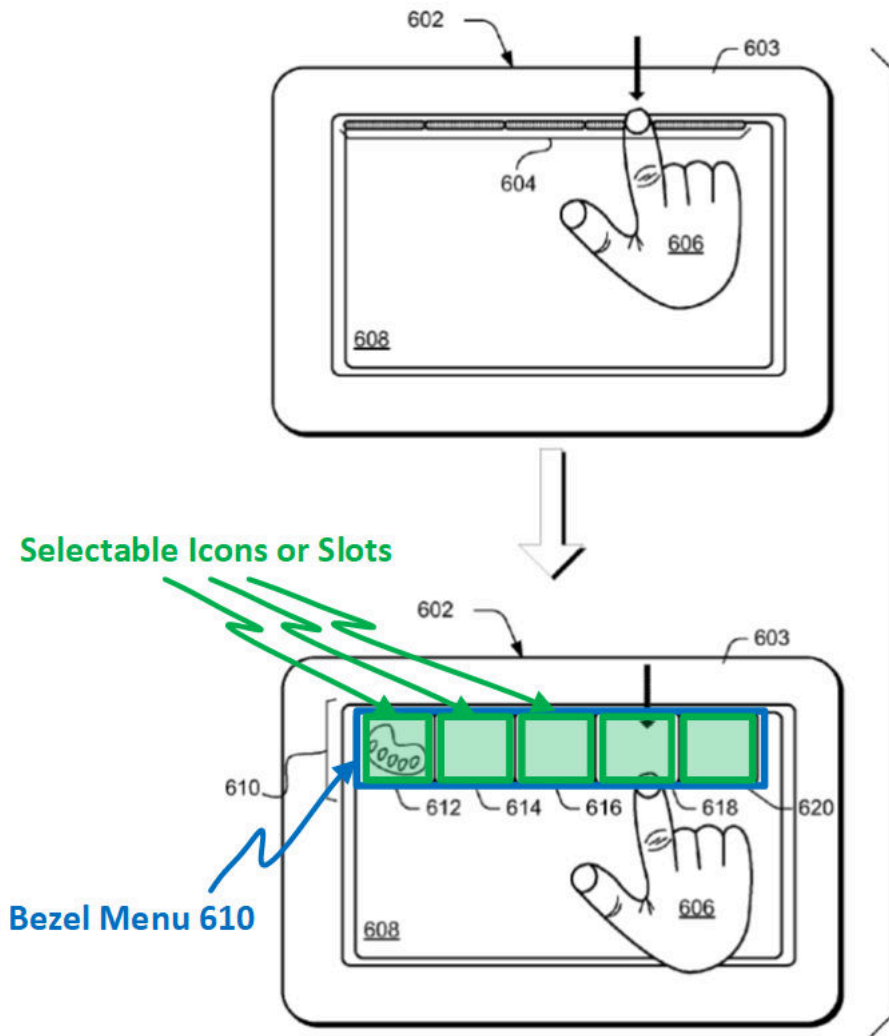
101. Ahn describes how the sub-menus of FIG. 4B are selected by a user with respect to FIGS. 5A-5D. EX1004, [0052]. For example, referring to FIG. 5D, “when the user selects the alarm setting menu 420c, an alarm setting window 540 for setting an alarm is displayed in a transparent window, for example, at the left side of the alarm setting menu 420c.” EX1004, [0057]. By opening a window through which a user may perform a function (*e.g.*, alarm setting window 540 for setting an alarm), each of the sub-menus would have been understood to act as an application, program, or widget launching icon.

102. Ahn also discloses that, in some embodiments, selection of one or more of the sub-menus may result in the display of a further list of functions from which to select. *See* EX1004, [0081]-[0087], [0105]-[0116]; FIGS. 9B, 16, 17. For example, with respect to FIG. 9B, selection of icon 830 in menu list 820 results in menu list 820 being reduced in size and sub-menu 870 being displayed with a further list of functions from which a user may select. *See* EX1004, [0081]-[0087]; FIGS. 9B.

103. While Ahn describes that the mobile communication terminal 100 may rely on key input device 30 for selection of menus and sub-menus in those implementations where the user provides input through physical keys, Ahn does not explicitly specify or otherwise limit how a POSITA would implement the selection of functions (*i.e.*, those sub-menus that are not themselves associated with further

menu lists, like the alarm setting menu 420c) in the context of using the touch input device described with respect to FIGS. 11-18. For the reasons described in Section VIII.D, *supra*, a POSITA would have found it obvious to utilize Hinkley's bezel gestures and associated user interface elements in the context of Ahn's mobile communication terminal 100. In this regard, Hinkley would provide at least one possible set of implementation details not otherwise specified in Ahn.

104. As discussed with respect to Elements [1.c] and [1.d.i] and in Section VIII.C, *supra*, Hinkley describes that “the bezel menu can be accessed through a bezel gesture in which a finger of user's hand 606 touches the bezel and then moves across the bezel and onto the display device 608 in the direction of the illustrated arrow.” EX1006, [0073]. The “bezel menu 610 includes multiple selectable icons or slots 612, 614, 616, 618, and 620,” each of which is “associated with a different functionality.” EX1006, [0074].

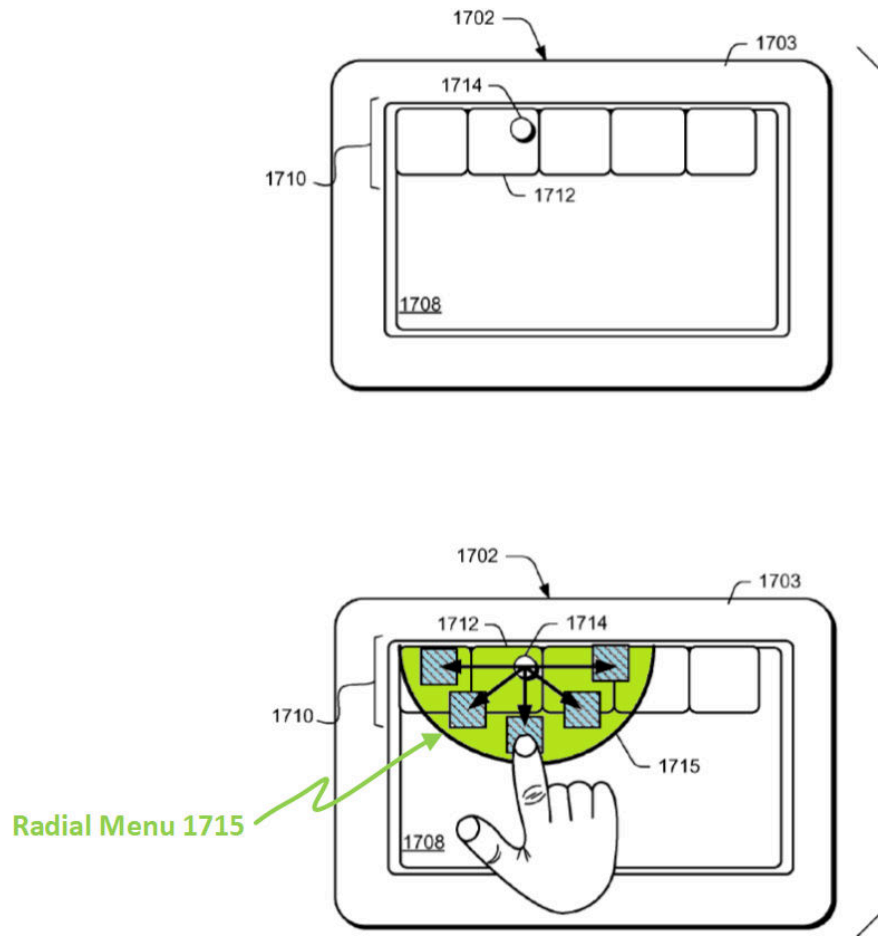


EX1006, FIG. 6 (annotated).

105. “In the novice mode, after the user gestures to reveal the bezel menu 610, the user can lift their finger, whereupon the bezel menu can remain open for a configurable interval (or indefinitely).” EX1006, [0077]. “The user may then tap on a desired item associated with one of the icons or slots 612, 614, 616, 618, and 620,” which causes “the functionality associated with a particular icon or slot can be accessed.” EX1006, [0077]. Through its teaching of this tap, Hinkley describes,

when the first menu is displayed including the one or more first menu items: detecting, utilizing the touch interface, a first duration of contact on at least one of the one or more first menu items, as recited in [1.e.i].

106. “In at least some embodiments, so-called radial menus can be utilized in connection with menus such as bezel menus.” EX1006, [0105]. An example of a bezel menu is shown in FIG. 17. EX1006, [0105], FIG. 17. In this example, “bezel menu 1710 includes multiple selectable icons or slots,” and “[e]ach of the icons or slots is associated with a different functionality,” just as in the example discussed above with respect to FIG. 6. EX1006, [0106].



EX1006, FIG. 17 (annotated).

107. “[I]con or slot 1712 includes a radial menu icon 1714 that gives a clue to the user that one or more radial menus, for example radial menu 1715, is associated with this particular icon or slot.” EX1006, [0107]. In some implementations, “[t]he radial menus 1715 can be accessed through a tap-and-hold of the pen or finger on or near the radial menu icon 1714.” EX1006, [0107]. Additionally, selecting “the radial menu icon [1714] triggers a default action which may . . . be different than the action associated with tapping on the bezel menu slot

[1712].” EX1006, [0107]. From at least these teachings, a POSITA would have understood and found obvious that, in at least one implementation of Hinkley’s menus and gestures, tapping³ the icon 1712 would have triggered one action, while a tap-and-hold gesture on the radial menu icon 1714 portion of icon 1712 would have triggered a different action (*i.e.*, opening the radial menu 1715). *See* EX1006, [0107].

108. Hinkley explains that, “[b]y virtue of providing a variety of different types of recognizable inputs (*e.g.*, taps, tap combinations, tap/hold combinations, slides, etc), and mapping those recognizable inputs to different types of functionalities, a robust collection of user input mechanisms can be provided.” EX1006, [0066]. And Hinkley describes details with respect to gesture module 104 and bezel gesture module 105 that allow these modules to recognize a “variety of different types of gestures.” *See* EX1006, [0045]-[0051]. Thus, Hinkley provides

³ In the context of Hinkley, where a “tap” is distinguished clearly from a “tap and hold,” a POSITA would have understood that a “tap” is relatively quick engagement and disengagement of the touchscreen, whereas a “tap and hold” is an engagement of the touchscreen that lasts beyond a particular threshold amount of time set by the designer of the user interface.

implementation details for a POSITA to implement these functionalities, and a POSITA would have enjoyed a reasonable expectation of success in doing so.

109. Moreover, Hinkley's teachings about bezel menus and radial sub-menus are largely consistent with the menus and sub-menus described by Ahn. That is, a POSITA would have recognized the parallel between the first menu list 1700 and second menu list 1710 described by Ahn with respect to its FIG. 17, and the bezel menu 1710 and radial menu 1715 described by Hinkley with respect to its FIG. 17. In fact, both menus include visual affordances (*i.e.*, an arrow icon 860 in the case of Ahn and the radial menu icon 1714 in the case of Hinkley) that identify for the user the presence of a sub-menu. *See* EX1004, [0085]; EX1006, [0107]. To the extent that the techniques for accessing these sub-menus diverge between the teachings of Ahn and Hinkley, a POSITA would have recognized that either Hinkley's techniques could be utilized as a known alternative to Ahn's techniques or both techniques could be implemented together through the use of multiple modes, like the novice and expert modes described by Hinkley. *See* EX1006, [0110] ("In at least some embodiments, radial menus can be implemented to include both a novice mode and an expert mode").

110. Applying these teachings to the context of Ahn discussed above, a POSITA would have at least found it obvious to implement Ahn's mobile communication terminal 100 such that Ahn's menus would include the multiple

selectable icons or slots described by Hinkley and that at least one of the selectable icons or slots would be associated with a radial menu icon as described by Hinkley. EX1006, [0105]-[0107]. Further, it would have at least been obvious to implement Ahn's mobile communication terminal 100 such that tapping the icon would have triggered one action, while tapping and holding the radial menu icon portion of that same icon would have triggered a different action (*i.e.*, opening the radial menu 1715). *See* EX1006, [0107]. Implemented in this fashion, it would have been at least obvious to the POSITA that the mobile device of the Ahn-Chaudhri-Hinkley combination would have, ***when the first menu*** (*e.g.*, bezel menu 1710) ***is displayed including the one or more first menu items: detect[ed], utilizing the touch interface, a first duration of contact*** (*e.g.*, either the tap or the tap and hold described by Hinkley) ***on at least one of the one or more first menu items*** (*e.g.*, the icon 1712 with the radial menu icon 1714), as recited in [1.e.i]. *See also* Sections [1.e.ii], [1.e.iii], *infra* (providing additional explanation with respect to the first duration of contact).

Element [1.e.ii] in response to the first duration of contact on the at least one of the one or more first menu items being detected to not surpass a threshold, performing a first operation, and

111. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.e.ii]. As discussed with respect to Element [1.e.i], *supra*, a POSITA would have at least found it obvious to implement Ahn's mobile communication terminal 100

such that Ahn's menus would include the multiple selectable icons or slots described by Hinkley and that at least one of the selectable icons or slots would be associated with a radial menu icon as described by Hinkley. *See* EX1006, [0105]-[0107]. Further, it would have at least been obvious to implement Ahn's mobile communication terminal 100 such that tapping the icon would have triggered one action, while a tap-and-hold on the radial menu icon portion of that same icon would have triggered a different action (i.e., opening the radial menu 1715). *See* EX1006, [0107] ("selecting "the radial menu icon [1714] triggers a default action which may . . . be different than the action associated with tapping on the bezel menu slot [1712]).

112. Implemented in this fashion, it would have been at least obvious to the POSITA that the mobile device of the Ahn-Chaudhri-Hinkley combination would have, *in response to the first duration of contact on the at least one of the one or more first menu items being detected to not surpass a threshold* (e.g., Hinkley's software distinguishing between a tap and a tap and hold), *performing a first operation* (e.g., performing a function associated with icon 1712 that is "different" than opening the radial menu 1715 that results from tapping and holding the radial menu icon 1714), as recited in [1.e.ii].

113. A POSITA would have understood and found obvious that, one way to distinguish between a tap and tap-and-hold per the teachings of Hinkley (*see*

EX1006, [0066], [0107]) would have been to utilize thresholds associated with the duration of the user's contact. *See* EX1006, [0080] (describing the use of timers in other contexts to determine the duration of a touch input); EX1010, [0053]-[0057] (describing how to determine "an interface to present based on some factor of the gesture," including "based on a final or intermediate length of the gesture, whether the gesture is single or multi-point (e.g., single-finger or multi-finger), [] a speed of the gesture," or a "hold time" of the gesture).

Element [1.e.iii] in response to the first duration of contact on the at least one of the one or more first menu items being detected to surpass the threshold, performing a second operation;

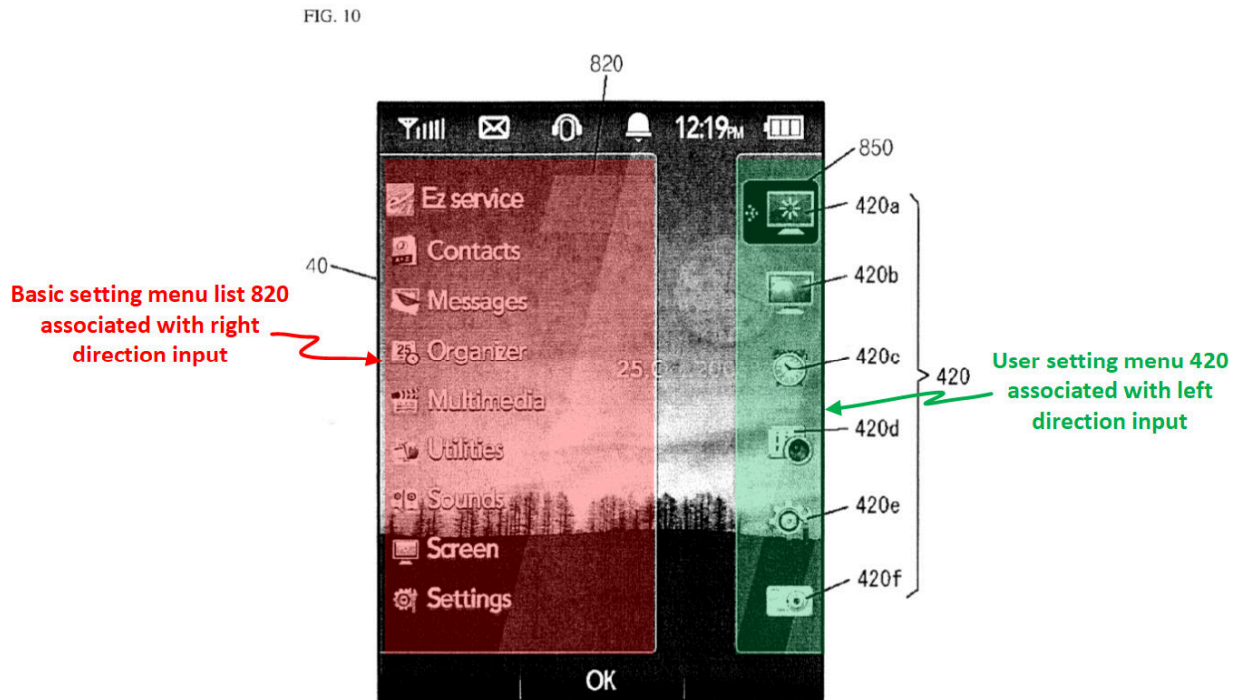
114. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.e.iii]. As discussed with respect to Element [1.e.i], *supra*, a POSITA would have at least found it obvious to implement Ahn's mobile communication terminal 100 such that Ahn's menus would include the multiple selectable icons or slots described by Hinkley and that at least one of the selectable icons or slots would be associated with a radial menu icon as described by Hinkley. *See* EX1006, [0105]-[0107]. Further, it would have at least been obvious to implement Ahn's mobile communication terminal 100 such that tapping the icon would have triggered one action, while a tap-and-hold on the radial menu icon portion of that same icon would have triggered a different action (i.e., opening the radial menu 1715). *See* EX1006, [0107] ("selecting "the radial menu icon [1714] triggers a default action which may

. . . be different than the action associated with tapping on the bezel menu slot [1712]).

115. Implemented in this fashion, it would have been at least obvious to the POSITA that the mobile device of the Ahn-Chaudhri-Hinkley combination would have, *in response to the first duration of contact on the at least one of the one or more first menu items being detected to surpass the threshold* (e.g., Hinkley’s software distinguishing between a tap and a tap and hold), *performing a second operation* (e.g., opening the radial menu 1715 that results from tapping and holding the radial menu icon 1714), as recited in [1.e.i].

Element [1.f] when the graphical user interface is displayed, detecting, utilizing the touch interface, a second gesture that begins in connection with a second edge of the display and moves inward;

116. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.f]. As discussed with respect to [1.c] and in Section VIII.A, *supra*, Ahn describes “a method of displaying a menu in a mobile communication terminal having a touch input device,” in which a menu is displayed in response to a “touch and drag operation.” EX1004, [0095]-[0099]. Ahn’s controller 50 of the mobile communication terminal 100 “detects a touch and drag operation of a specific direction on the touch screen 10 (S1110),” and various different possible menus associated with different edges of the display 40 are associated with different directions of the touch and drag input. EX1004, [0098]-[0099].



EX1004, FIG. 10 (annotated).

117. In one example illustrated in FIGS. 13a and 13b, “if the user touches a specific position of the touch screen 10 and drags the touch in a left direction a menu list 1300 matched to a left direction is displayed in the display 40.” EX1004, [0102]. As can be seen in FIG. 13a, a user initially touches near the right side or edge of the touch screen 10 and initiates the drag gesture that moves inward toward the center of the display. *See* EX1004, FIG. 13a, [0102]. In yet another example, illustrated in FIGS. 15a and 15b, “if the user touches screen 10 and drags the touch in a rightward direction, a menu list 1500 matched to a right direction is displayed in the display 40.” EX1004, [0103]. As can be seen in FIG. 15a, a user initially touches near the left side or edge of the touch screen 10 and initiates the drag gesture that

moves inward toward the center of the display. *See* EX1004, FIG. 15a, [0103]. And, as shown in FIG. 10 (reproduced above), Ahn describes that multiple menus can be opened in serial and displayed at the same time. *See* EX1004, [0090]-[0094], FIG. 10.

118. Thus, as shown in at least FIGS. 15a and 15b and described with respect thereto, Ahn explicitly teaches, ***when the graphical user interface is displayed, detecting, utilizing the touch interface, a second gesture that begins in connection with a second edge of the display and moves inward***, as recited in [1.f].

119. Alternatively, as discussed with respect to Element [1.c] and for the reasons described in Section VIII.D, *supra*, a POSITA would have found it obvious to utilize Hinkley's bezel gestures and associated user interface elements, including the bezel menus and radial menus, in the context of Ahn's mobile communication terminal 100. Hinkley describes that its mobile device "can be configured to recognize a touch input, such as a finger of a user's hand 106b, that initiates a gesture on or adjacent bezel 103 and proceeds onto display device 108." EX1006, [0045]. Because the "bezel is made up of the frame structure adjacent the device's display" (EX1006, [0044]) and therefore frames an edge of the display, a POSITA would have understood and found obvious that gestures initiated "on or adjacent bezel 103 and proceed[ing] onto display device 108" are ***begun in connection with a second edge of the display and moves inward***, as recited in [1.c].

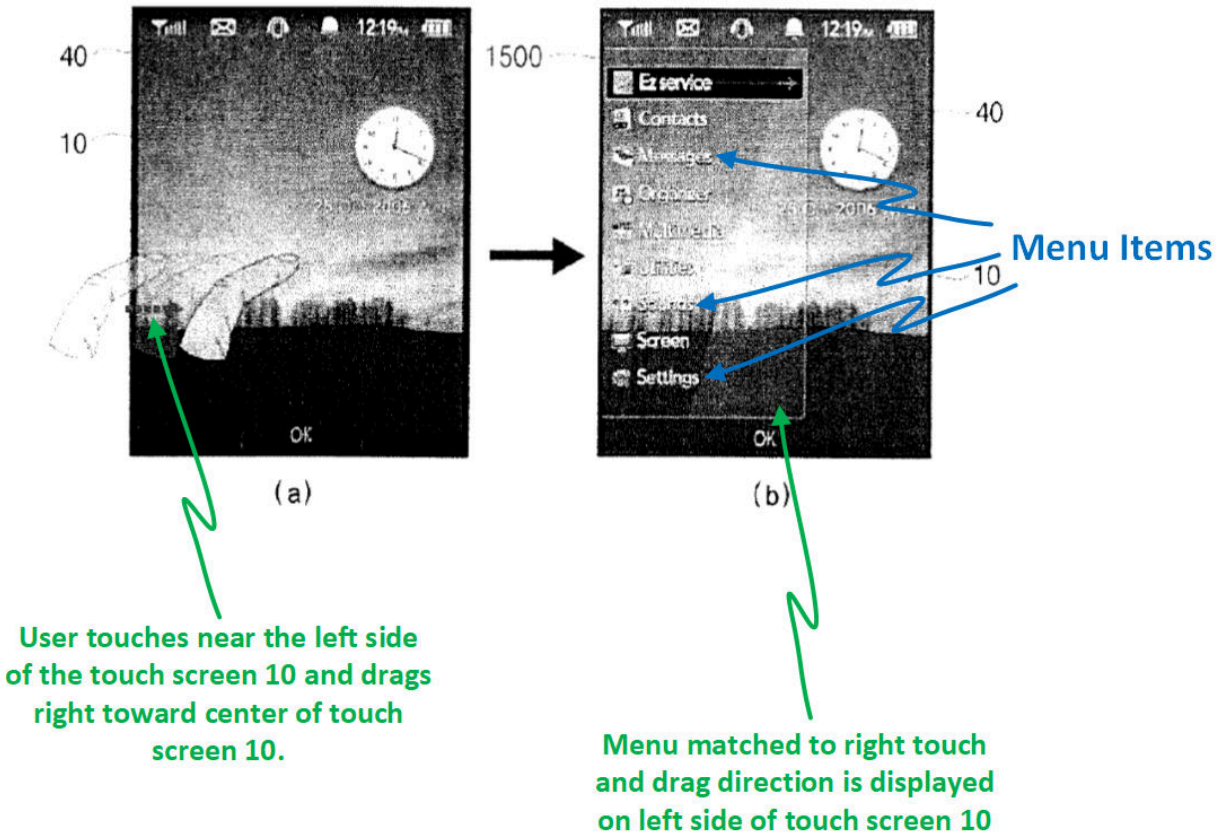
120. Indeed, like Ahn, Hinkley suggests that bezel menus may be associated with multiple bezels and associated edges of the device's display. See EX1006, [0113] (describing "support[ing] the same number of bezel menu slots on all four edges of the screen"), [0114] (teaching that "the left and bottom edges, for a right-handed individual, may be more likely to be swiped by accident, and may be left without bezel menus if desired," suggesting that the right and top edges may still be associated with bezel menus). From at least these teachings, a POSITA would have understood and found obvious that the bezel gesture Hinkley describes in FIG. 6 would have been applied to more than one bezel edge and allow for the opening of multiple bezel menus. Considering the combined teachings of Ahn and Hinkley, a POSITA would have at least found it obvious in the context of the Ahn-Chaudhri-Hinkley combination that, *when the graphical user interface is displayed, detecting, utilizing the touch interface, a second gesture that begins in connection with a second edge of the display and moves inward*, as recited in [1.f].

Element [1.g] in response to the detection of the second gesture that begins in connection with the second edge and moves inward, displaying, utilizing the display, a second menu including one or more second menu items;

121. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.g]. As discussed in Section VIII.A and with respect to Element [1.c], *supra*, Ahn describes "a method of displaying a menu in a mobile communication terminal

having a touch input device,” in which a menu is displayed in response to a “touch and drag operation.” EX1004, [0095]-[0099].

FIG. 15



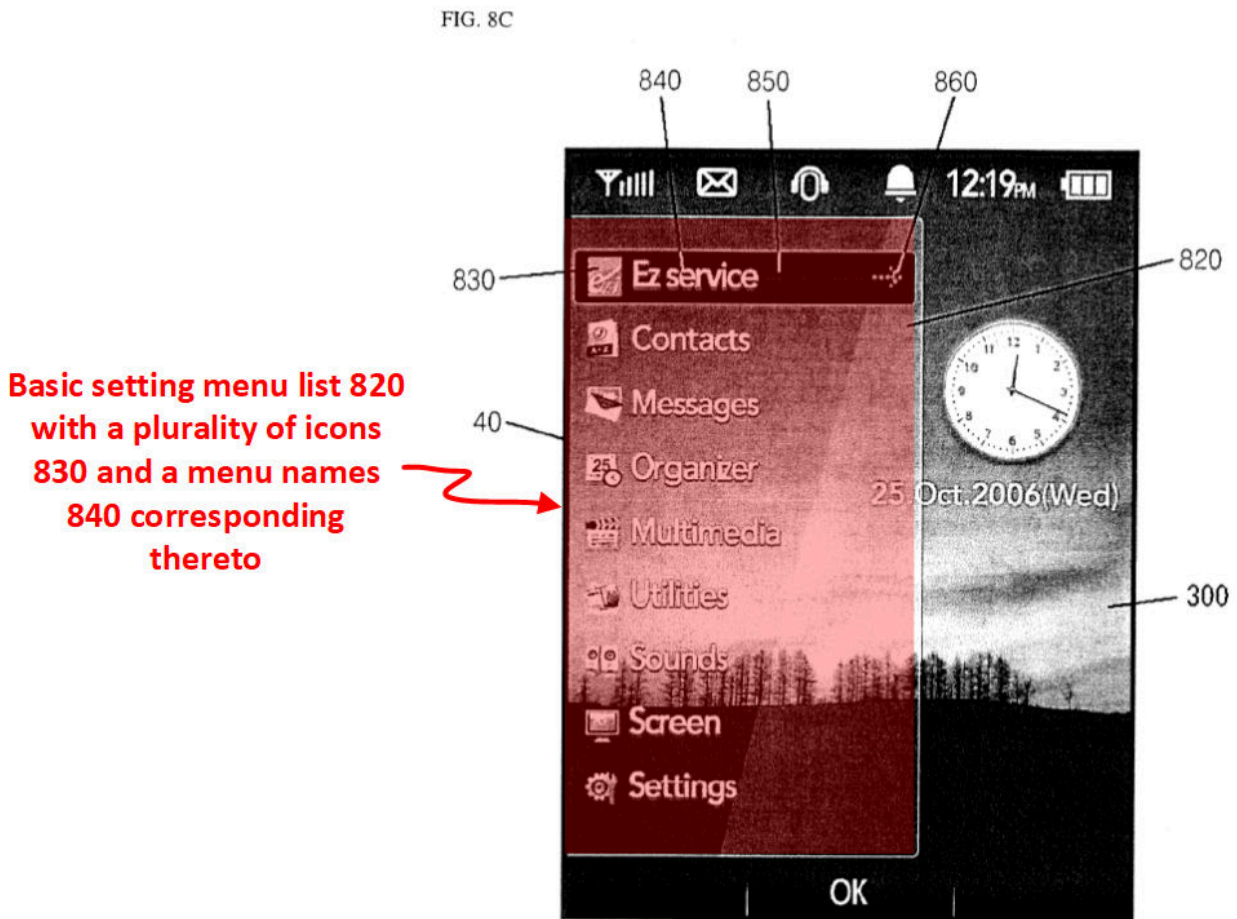
EX1004, FIGS. 15a and 15b (annotated).

122. “As the touch and drag operation is detected, the controller 50 controls to display an item list matched to the specific direction in the display 40 (S1120).” EX1004, [0099]. “The item list comprises, for example, a menu list or a file list.” EX1004, [0102]. In one example illustrated in FIGS. 15a and 15b, “if the user touches screen 10 and drags the touch in a rightward direction, a menu list 1500

matched to a right direction is displayed in the display 40.” EX1004, [0103]. “A position in which the item list is displayed in the display 40 can be preset.” EX1004, [0104]. “For example, referring to FIGS. 13 to 15, . . . a menu list matched to a right direction is set to be displayed at the left side of the display 40 (FIG. 15(b)).” EX1004, [0104]. Thus, a POSITA would have understood and found obvious that Ahn’s mobile communication terminal 100, *in response to the detection of the second gesture that begins in connection with the second edge and moves inward, displaying, utilizing the display, a second menu including one or more second menu items*, as recited in [1.g].

Element [1.h.i] when the second menu is displayed including the one or more second menu items: detecting, utilizing the touch interface, a selection contact on at least one of the one or more second menu items, and

123. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.h.i]. For example, Ahn describes that the menu lists displayed as a result of the “touch and drag operation” may include various icons and menu names (e.g., “an icon 830 and a menu name 840 corresponding thereto” in FIG. 9A) that, when selected by a user, provide access to various functions. *See* EX1004, [0073]-[0078] (“The basic setting menu list 820 comprises a plurality of menus, and each menu comprises an icon 830 and a menu name 840 corresponding thereto”). A POSITA would have understood and found obvious that each of these icons and menu names is a *menu item* of the user menu 420.

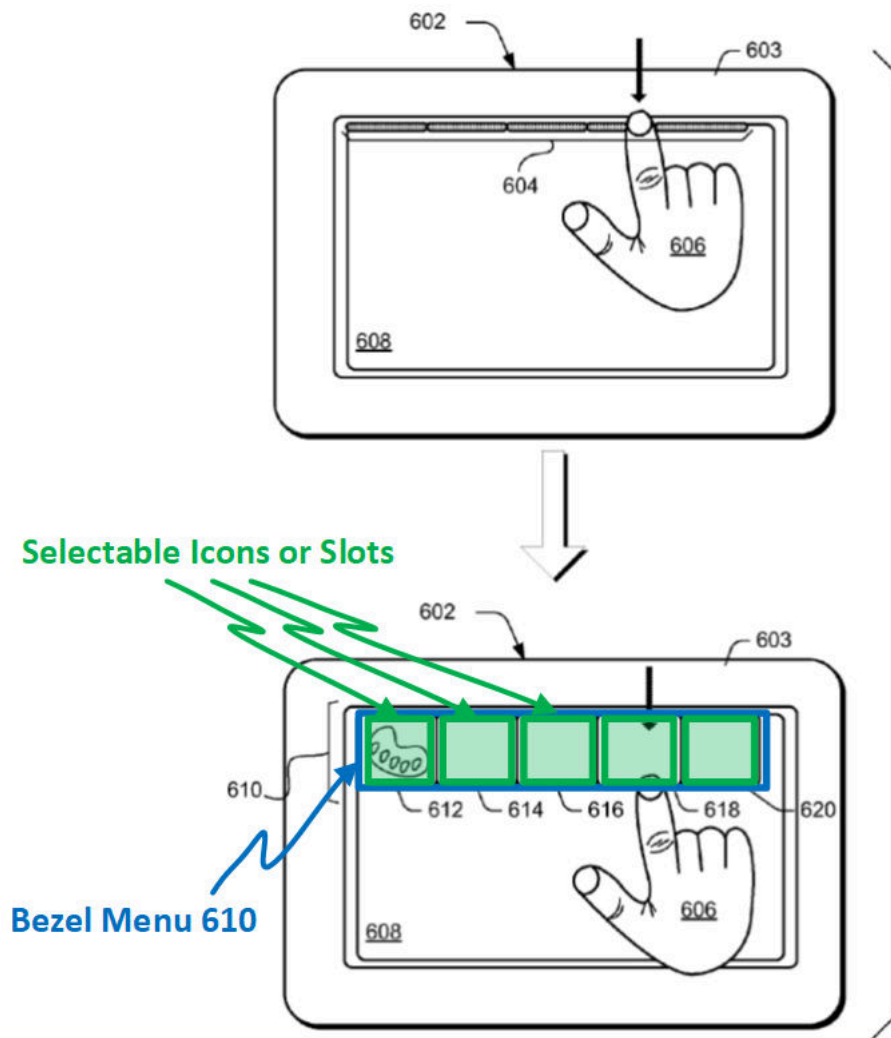


EX1004, FIG. 9A (annotated).

124. Ahn describes how the menus/sub-menus of FIG. 8C are selected by a user with respect to FIGS. 9A and 9B. EX1004, [0052]. For example, referring to FIG. 9A, “when the rightward direction key 34 corresponding to a direction of the arrow 860 is pressed, a specific menu is selected and a sub-menu [870] of the selected menu is displayed, whereby a menu interface is provided to the user.” EX1004, [0085].

125. While Ahn describes that the mobile communication terminal 100 may rely on key input device 30 for selection of menus and sub-menus in those implementations where the user provides input through physical keys, Ahn does not explicitly specify or otherwise limit how a POSITA would implement the selection of functions (*i.e.*, those sub-menus that are not themselves associated with further menu lists) in the context of using the touch input device described with respect to FIGS. 11-18. For the reasons described in Section VIII.D, *supra*, a POSITA would have found it obvious to utilize Hinkley's bezel gestures and associated user interface elements in the context of Ahn's mobile communication terminal 100. In this regard, Hinkley would provide at least one possible set of implementation details not otherwise specified in Ahn.

126. As discussed with respect to Elements [1.c], [1.d.i], [1.e.i] and in Section VIII.C, *supra*, Hinkley describes that "the bezel menu can be accessed through a bezel gesture in which a finger of user's hand 606 touches the bezel and then moves across the bezel and onto the display device 608 in the direction of the illustrated arrow." EX1006, [0073]. The "bezel menu 610 includes multiple selectable icons or slots 612, 614, 616, 618, and 620," each of which is "associated with a different functionality." EX1006, [0074].



EX1006, FIG. 6 (annotated).

127. “In the novice mode, after the user gestures to reveal the bezel menu 610, the user can lift their finger, whereupon the bezel menu can remain open for a configurable interval (or indefinitely).” EX1006, [0077]. “The user may then tap on a desired item associated with one of the icons or slots 612, 614, 616, 618, and 620,” which causes “the functionality associated with a particular icon or slot can be accessed.” EX1006, [0077]. A POSITA would have understood and found obvious

that the “tap” described by Hinkley is a *selection contact on at least one of the one or more menu items*, as recited in [1.h.i].

128. Applying these teachings to the context of Ahn discussed above, a POSITA would have at least found it obvious to implement Ahn’s mobile communication terminal 100 such that Ahn’s menus would include the multiple selectable icons or slots described by Hinkley. Implemented in this fashion, it would have been at least obvious to the POSITA that the mobile device of the Ahn-Chaudhri-Hinkley combination would have, *when the second menu is displayed including the one or more second menu items: detecting, utilizing the touch interface, a selection contact on at least one of the one or more second menu items*, as recited in [1.h.i].

Element [1.h.ii] in response to the selection contact being detected on the at least one of the one or more second menu items, performing a third operation;

129. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.h.ii]. As discussed with respect to Elements [1.e.i], [1.e.ii] and [1.h.i], *supra*, a POSITA would have at least found it obvious to implement Ahn’s mobile communication terminal 100 such that Ahn’s menus would include the multiple selectable icons or slots described by Hinkley and that these icons and slots could be selected based on at least a tap gesture, as described by Hinkley. EX1006, [0072]-[0077] (“The user may then tap on a desired item associated with one of the icons or

slots 612, 614, 616, 618, and 620,” and through “this gesture, the functionality associated with a particular icon or slot can be accessed.”). Indeed, Hinkley’s “gesture modules 104, 105 may support a variety of different gestures.” EX1006, [0051]. According to Hinkley, “[a]ny suitable type of input can be received” and “[a]ny suitable type of functionality can be accessed” in association with the received input. EX1006, [0066].

130. Implemented in this fashion, it would have been at least obvious to the POSITA that the mobile device of the Ahn-Chaudhri-Hinkley combination would have, *in response to the selection contact being detected on the at least one of the one or more second menu items* (e.g., the icons and icon names listed with respect to menu 820 or 1500), *performing a third operation* (e.g., performing a function associated with selection of one of the distinct icons and icon names listed with respect to menu 820 or 1500, such as displaying a sub-menu 870 of the setting menu or invoking the functionality of the Messages icon shown in menu 820), as recited in [1.h.ii].

Element [1.i] wherein the electronic device is configured such that the graphical user interface is displayed in at least one virtual display layer, and at least one of the first menu or the second menu is displayed in at least one other virtual display layer.

131. The Ahn-Chaudhri-Hinkley combination renders obvious Element [1.i].

132. As discussed in Section V.A, *supra*, the '413 Patent describes that “virtual display layer refers to a collection of display elements which have all been assigned the same apparent depth within the 3D layered user interface.” EX1001, 69:6-9. “For example, in one embodiment, a 3D layered user interface may have a virtual foreground display layer and a virtual background display layer.” EX1001, 69:11-14. In some embodiments, “virtual display layers may be given the appearance of depth through the use of 3D depth cues.” EX1001, 69:25-30. However, the '413 Patent does not teach specific software and or hardware implementation details for achieving these “apparent” visual effects, and instead acknowledges that they “may be implemented in any desired environment.” EX1001, 68:33-70:44. In light of these teachings, a POSITA would have understood a “virtual display layer” to be present whenever one or more display elements appear at “the same apparent depth” of display, regardless of the software and/or hardware mechanisms used to achieve this visual appearance.

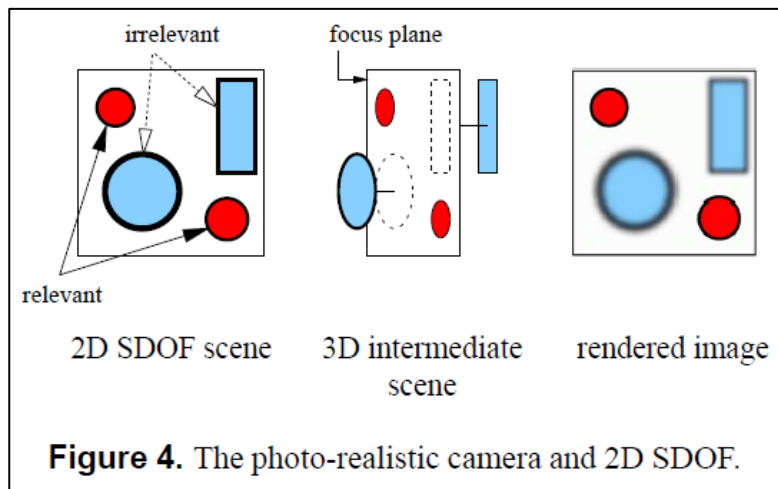
133. Ahn describes that the various menus may be “transparently displayed on the standby screen 300,” such that preset standby screen 300 is not completely “hidden” by the menus. EX1004, [0039]; *see also* EX1004, [0070] (“menus displayed on the standby screen 300 can be embodied in a translucent form or an opaque form”). Similarly, Ahn describes menus “displayed in a transparent window form” in various areas “of the standby screen 300.” EX1004, [0064]. In order to

display the menus “on” the standby screen 300 using “window forms,” a POSITA would have understood and found obvious that the menu window is and would be displayed in a “virtual display layer,” as that term is broadly used in the ’413 Patent, and that the virtual display layer containing the menu is displayed “on” at least one other virtual display layer that contain(s) the various elements of the standby screen 300. *See* EX1004, FIGS. 3A, 4B, [0064], [0070].

134. Indeed, it was known that, “[w]hen several 2D layers of information are put on top of each other, it is possible to provide the user with an intuitive way of choosing how much and which information to display crisply.” EX1008, 3-4. Indeed, there were user interface systems going back as early as 1991 where “up to 26 layers of information can be displayed at the same time” and where “[e]ach layer has an interest level associated with it that the user can change,” and “[t]he interest level is [visualized as] a combination of blur and transparency.” EX1008, 2, 8. When a user interface object was displayed in a layer on top of another layer with other user interface objects, the top layer could be made transparent and therefore not necessarily visible beyond its constituent objects, so that components on the lower layer (e.g., a desktop) can still be seen. *See* EX1007, [0082].

135. Furthermore, at least one known technique for determining which objects to blur and which objects to display sharply—known as Semantic Depth of Field (SDOF)—was to assign each object a semantic depth (e.g., related to the virtual

layer in which the object is associated) and a relevance value that depends on the level of display on which the user is currently focused, such that objects within the current layer of focus are assigned the highest relevance and displayed sharply, and objects within layers at progressively different layers of depth are assigned progressively lower relevance and displayed with greater blur. *See* EX1008, 2-7. The relevance of any object or set of objects (and thus the extent to which each object or set of objects is blurred or displayed sharply in focus) was a known design choice, and was known to be settable by the system in accordance with a designers programming or even by the user. *See* EX1008, 3-4. This is illustrated in the following figure, in which the red objects are assigned to the layer on which a user is currently focused and the light blue objects are assigned to “lower” or “higher” layers of semantic depth from the focus layer, and are therefore assigned a lower relevance value based on their semantic distance from focus layer and blurred based on this lower relevance value. *See* EX1008, 3-4.



EX1008, FIG. 4

136. Applying this known technique for determining the degree of blur utilized in displaying user interface objects to the teachings of Ahn, a POSITA would have found it obvious that where in Ahn objects are displayed with the same apparent depth, they are assigned the same semantic depth (*e.g.*, virtual display layer) and the same associated relevance and blur values. *See* EX1008, 2-7. Thus, in FIGS. 3A and 4B, for example, it would have at least been obvious to a POSITA that all elements of the standby screen 300 that appear at the same apparent depth are part of a virtual layer at the same semantic level of depth and assigned the same relevance and sharpness/blur level (*e.g.*, the background and icons displayed as part of indicator area 320), whereas elements having different apparent depths (*i.e.*, foreground vs. background) are in one or more other, different display layers (*e.g.*, the menu 420 appearing in the foreground and above the blurred clock screen widget). *See* EX1004, FIGS. 3A, 4B.

137. Accordingly, based on the teachings of Ahn and his/her own knowledge of the user interface art, a POSITA would have at least found it obvious to implement the mobile device of the Ahn-Chaudhri-Hinkley combination such that *the electronic device is configured such that the graphical user interface* (e.g., Ahn's standby screen 300 with the clock widget) *is displayed in at least one virtual display layer, and at least one of the first menu or the second menu* (e.g., Ahn's menus 1300 and 1500) *is displayed in at least one other virtual display layer*, as recited in [1.i].

(b) Claim 2

The electronic device of claim 1, wherein the electronic device is configured such that at least a portion of the at least one other virtual display layer is at least partially translucent such that at least a portion of the at least one virtual display layer is visible through the at least one other virtual display layer.

138. The Ahn-Chaudhri-Hinkley combination renders obvious Claim 2 including the limitations of Claim 1 from which it depends.

139. As discussed with respect to Element [1.i], *supra*, a POSITA would have at least found it obvious to implement the mobile device of the Ahn-Chaudhri-Hinkley combination such that *the electronic device is configured such that the graphical user interface* (e.g., Ahn's standby screen 300 with the clock widget) *is displayed in at least one virtual display layer, and at least one of the first menu or*

the second menu (e.g., Ahn’s menus 1300 and 1500) *is displayed in at least one other virtual display layer*.

140. As further described in Section VIII.A and with respect to Element [1.d.ii], *supra*, Ahn describes that the displayed menus may be “transparently displayed on the standby screen 300.” EX1004, [0070]. This can be seen, for example, by comparing FIG. 3A, which shows standby screen 300 without any menus, and FIG. 7B, which shows the basic setting menu list 720 is “displayed in a transparent window form in a left area of the standby screen 300.” EX1004, [0064]. Ahn describes that transparent menu windows ensure that “the preset standby screen 300 is not hidden by the pop-up menu window 340.” EX1004, [0039]. Based on these teachings, a POSITA would have understood and found obvious that *the electronic device is configured such that at least a portion of the at least one other virtual display layer is at least partially translucent such that at least a portion of the at least one virtual display layer is visible through the at least one other virtual display layer*, as recited in claim 2.

FIG. 3A

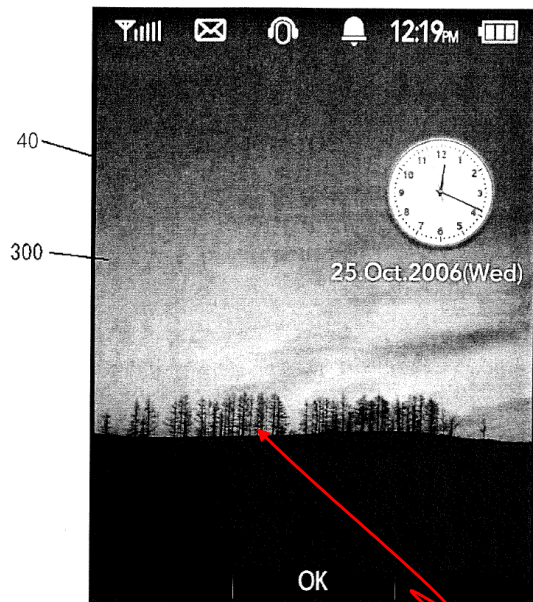


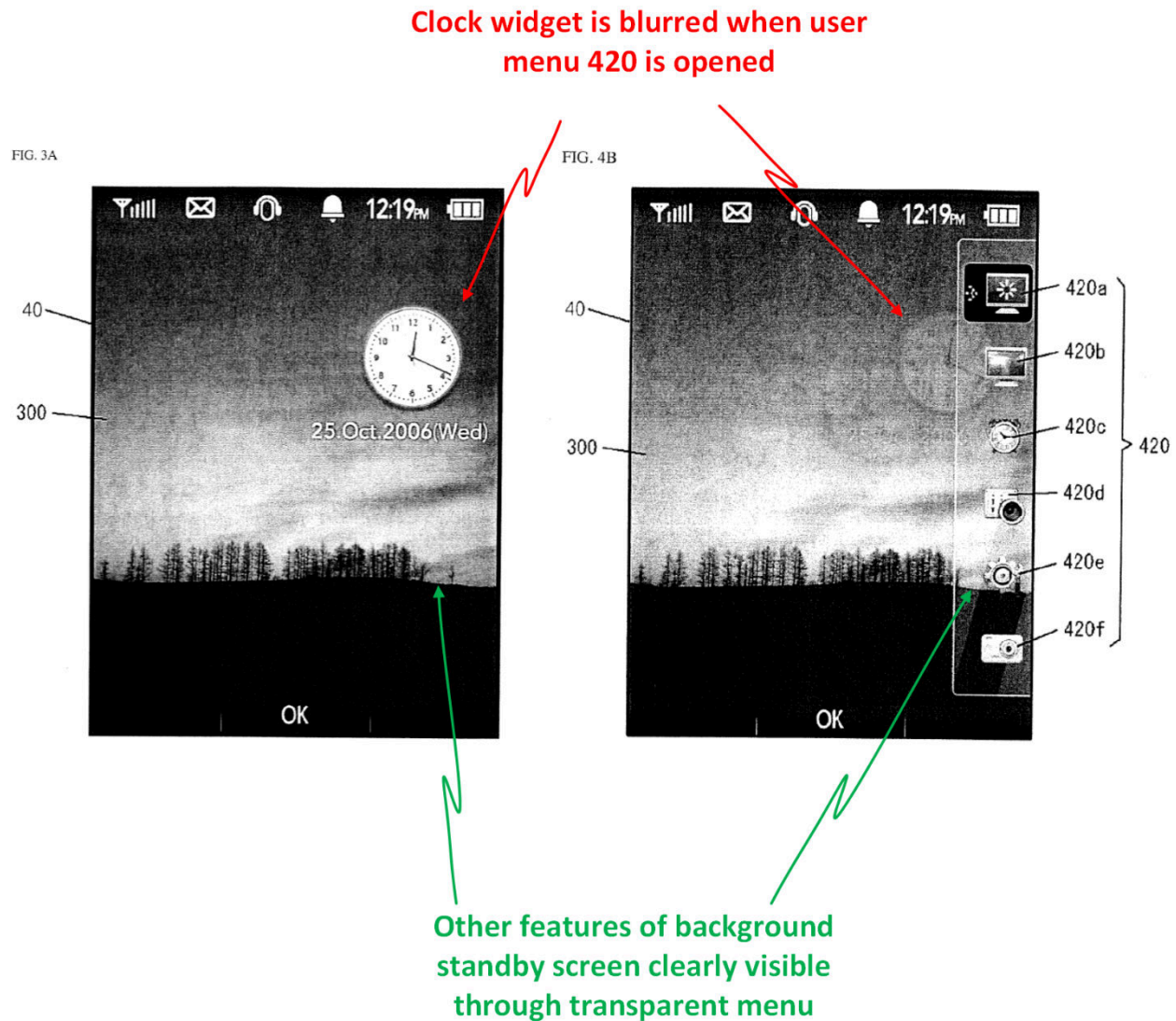
FIG. 7B



**Trees that are part of standby
screen 300 can be seen through the
transparent menu window**

EX1004, FIGS. 3A and 7B (annotated).

141. Even where Ahn utilizes transparent windows to display the menus, Ahn illustrates that the clock widget that is part of the background is blurred. *See* EX1004, FIGS. 4B, 10, 13B. Thus, even where Ahn utilizes a transparent menu instead of a translucent menu, Ahn teaches the blurring required for Element [1.d.ii].



EX1004, FIG. 3A and 4B (annotated)

(c) Claim 3

The electronic device of claim 2, wherein the electronic device is configured such that the at least portion of the at least one virtual display layer that is visible through the at least one other virtual display layer, includes at least a portion of a background image.

142. The Ahn-Chaudhri-Hinkley combination renders obvious Claim 3 including the limitations of Claim 1 from which it depends. As discussed with

respect to Claim 2, Ahn describes that the displayed menus may be “transparently displayed on the standby screen 300.” EX1004, [0070]. This can be seen, for example, by comparing FIG. 3A, which shows standby screen 300 (including a background image of a sky and trees) without any menus, and FIG. 7B, which shows the basic setting menu list 720 is “displayed in a transparent window form in a left area of the standby screen 300.” EX1004, [0064]. Ahn describes that transparent menu windows ensure that “the preset standby screen 300 is not hidden by the pop-up menu window 340.” EX1004, [0039]. Based on these teachings, a POSITA would have understood and found obvious that *the electronic device is configured such that the at least portion of the at least one virtual display layer that is visible through the at least one other virtual display layer, includes at least a portion of a background image*, as recited in claim 2.

FIG. 3A

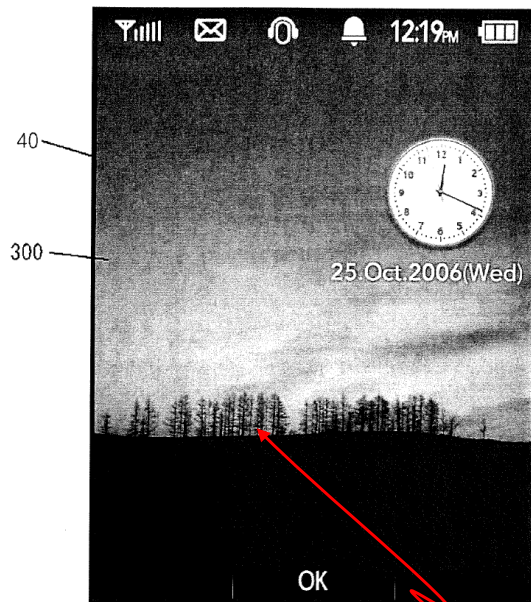


FIG. 7B



Trees that are part of standby
screen 300 can be seen through the
transparent menu window

EX1004, FIGS. 3A and 7B (annotated).

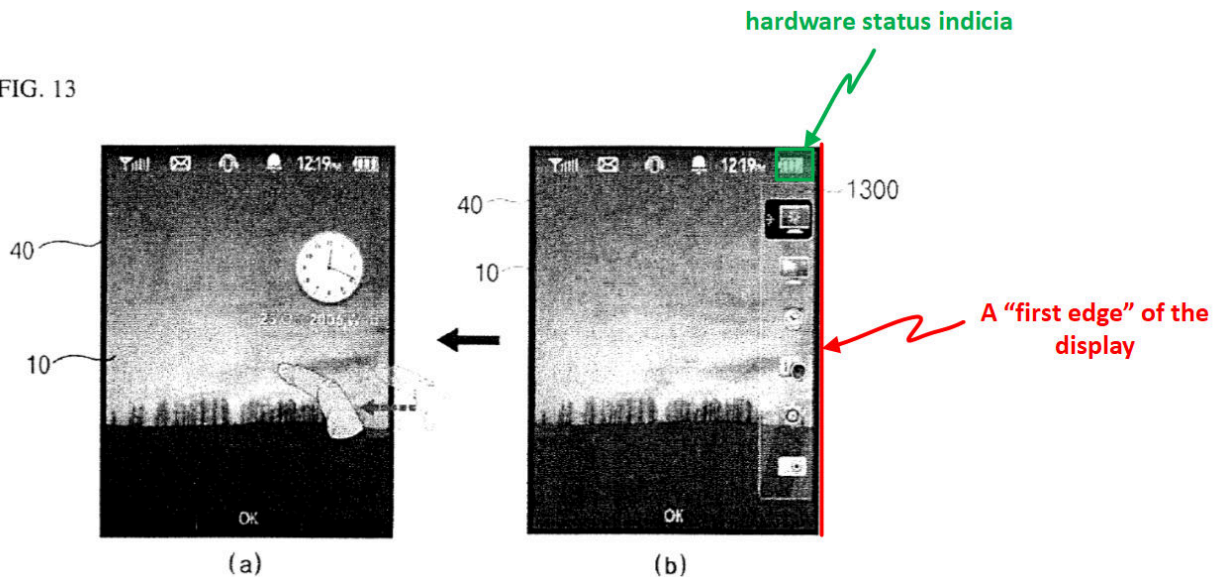
(d) Claim 7

The electronic device of claim 1, wherein the electronic device is configured such that hardware status indicia is displayed adjacent to the first edge.

143. The Ahn-Chaudhri-Hinkley combination renders obvious Claim 7 including the limitations of Claim 1 from which it depends. As discussed with respect to Element [1.c], *supra*, a menu matched with to the left touch direction is an example of a *first menu*, and the right side of the display with respect to which this menu is displayed is an example of a *first edge*. See EX1004, [0101]-[0104] (“a

menu list matched to a left direction is set to be displayed at the right side of the display 40 (FIG. 13(b))”).

FIG. 13



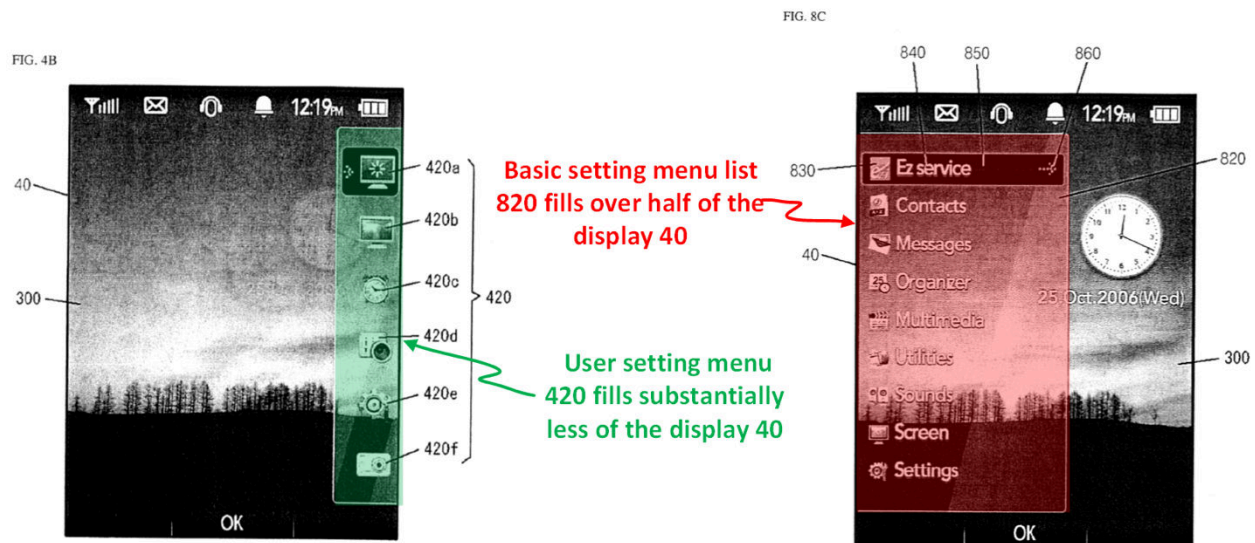
EX1004, FIGS. 13a and 13b (annotated).

144. In FIG. 13b, Ahn illustrates that a *hardware status indicia* is displayed in the upper right corner of display 40, which makes it adjacent to each of the top and right edges of the display. See EX1004, FIG. 13b, [0040] (“the icon 330 displayed in the indicator area 320 comprises . . . a battery residual quantity display icon 300f”). Based on at least these teachings a POSITA would have understood and found obvious that, in Ahn-Chaudhri-Hinkley combination, *the electronic device is configured such that hardware status indicia is displayed adjacent to the first edge*, as recited in Claim 7.

(e) Claim 9

The electronic device of claim 1, wherein the electronic device is configured such that at least one of the first menu or the second menu substantially fills the display.

145. The Ahn-Chaudhri-Hinkley combination renders obvious Claim 9 including the limitations of Claim 1 from which it depends. For example, throughout its figures, Ahn illustrates that the various menus associated with the edges of the device can have different sizes. *See, e.g.*, EX1004, FIGS. 4B, 8C, and 9C. For example, in FIG. 8C, Ahn illustrates that basic setting menu list 820 fills over half of the display 40, whereas, in FIG. 4B, Ahn illustrates that user setting menu 420 fills far less of the display 40. With respect to FIG. 10, Ahn illustrates the user setting menu 420 and basic setting menu list 820 displayed at the same time such that, together, the menus fill almost all of the display 40. *See* EX1004, FIG. 10.



EX1004, FIGS. 4B and 8C (annotated).

146. From at least these teachings, a POSITA would have understood and found obvious that the size of the menus displayed on the display are an implementation choice of the user interface designer, and that the amount of the display that any given menu fills is a design choice dependent on, for example, the type and amount of information being conveyed to the user. For example, there were known edge pull-out menu systems, like those described in Ahn and Hinkley, where a menu was configured to fill the entire display. *See, e.g.*, EX1011, FIG. 26, [0098]-[0108] (“the pull-out menu will be displayed by maximally using the entire display area of the image display screen 09, and more functional items will be displayed”); It was known that by utilizing more of the display for the pull-out menu, “more functional items will be displayed.” *See* EX1011, [0099].

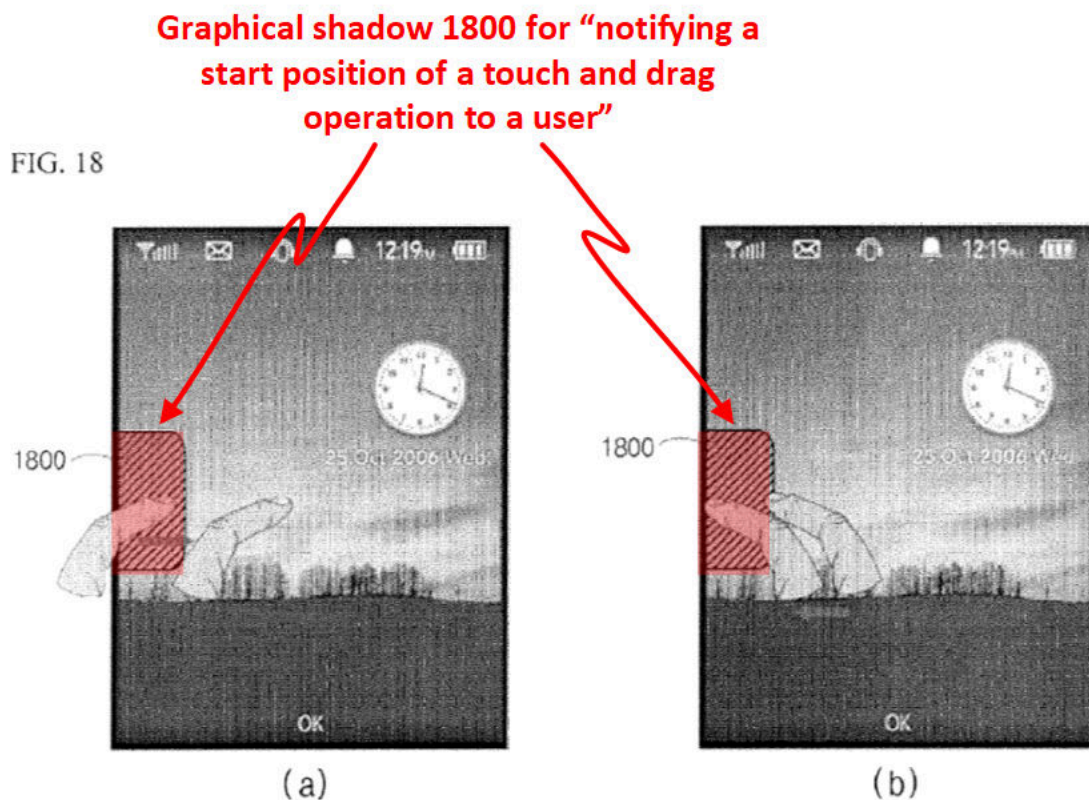
147. Based on these teachings and his/her knowledge of the art, a POSITA would have at least found it obvious that, in Ahn-Chaudhri-Hinkley combination, ***the electronic device is configured such that at least one of the first menu or the second menu substantially fills the display***, as recited in Claim 9.

(f) Claim 10

The electronic device of claim 1, wherein the electronic device is configured such that indicia is displayed via the graphical user interface for prompting a user as to an accessibility of at least one of the first menu or the second menu.

148. The Ahn-Chaudhri-Hinkley combination renders obvious Claim 10 including the limitations of Claim 1 from which it depends. As discussed with

respect to Element [1.c], *supra*, Ahn describes that the display 40 may utilize “a graphical display for notifying a start position of a touch and drag operation to a user,” and clearly shows “a graphical shadow 1800” displayed at a first edge of the display (e.g., the left edge in this example) that indicates the start position of the touch is along the first edge. See EX1004, [0118]-[0119].



EX1004, FIGS. 18a and 18b (annotated).

149. “For example, referring to FIG. 18(a), if the user drags in a right direction after touching the screen, a graphical shadow 1800 is displayed in the display 40, and the menu list 1500 shown in FIG. 15(b) can be displayed in the display 40.” EX1004, [0118]. Similarly, Chaudhri ’842 describes moving displayed

graphics in correspondence with the magnitude of gestures associated with those graphics in order to provide the user who is performing the gesture a visual confirmation of the gesture and help direct them on how to complete the gesture. *See* EX1005, [0054] (describing the display of “visual cue(s)” to provide “hints or reminders” regarding the action necessary to transition between user interface states), [0060] (describing that the “user may interact with the user-interface objects by making contact with the touch screen at one or more touch screen locations corresponding to the interactive objects with which she wishes to interact” and the “device detects the contact and responds to the detected contact by performing the operation(s) corresponding to the interaction with the interactive object(s)”), [0062] (describing that a visual cue, such as an image, may move along with the gesture as the gesture is detected). And Hinkley describes the use of “visual affordance(s),” such as a semi-transparent strip, to “provide a hint or indication of accessible functionality associated with the bezel.” *See* EX1006 [0062], [0068], [0072], [0079], [0088], [0092].

150. Based on at least these teachings a POSITA would have understood and found obvious that, in Ahn-Chaudhri-Hinkley combination, ***the electronic device is configured such that indicia is displayed via the graphical user interface*** (e.g., graphical shadow 1800) ***for prompting a user as to an accessibility of at least one of the first menu or the second menu***, as recited in Claim 7.

(g) Claim 101

Element [101.a] An electronic device, comprising: a display; a touch interface; one or more processors; memory; and one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors . . .

151. Element [101.a] is substantially the same as Element [1.a]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.a] for at least the same reasons described above with respect to Element [1.a]. *See* Element [1.a], *supra*.

Element [101.b] the one or more programs including instructions for: displaying, utilizing the display, a graphical user interface;

152. Element [101.b] is substantially the same as Element [1.b]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.b] for at least the same reasons described above with respect to Element [1.b]. *See* Element [1.b], *supra*.

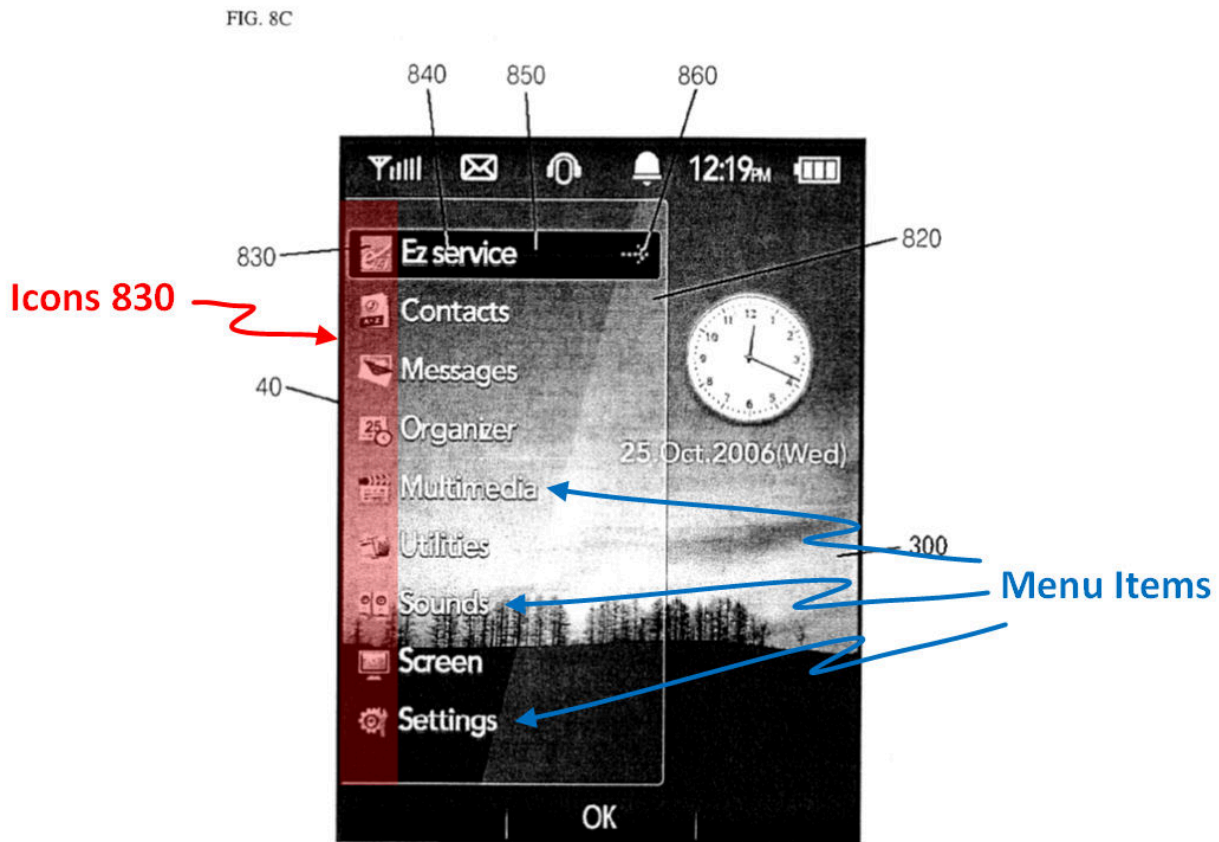
Element [101.c] when the graphical user interface is displayed, detecting, utilizing the touch interface, a first gesture that begins in connection with a first edge of the display and moves inward;

153. Element [101.c] is substantially the same as Element [1.c]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.c] for at least the same reasons described above with respect to Element [1.c]. *See* Element [1.c], *supra*.

Element [101.d] in response to the detection of the first gesture that begins in connection with the first edge and moves inward, displaying, utilizing the display, a first menu as sliding in and including one or more first menu items including a particular application icon;

154. Element [101.d] is substantially the same as Element [1.d.i]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.d] for at least the same reasons described above with respect to Element [1.d.i]. See Element [1.d.i], *supra*.

155. Additionally, Element [101.d] recites that the ***one or more first menu items includ[e] a particular application icon***. The Ahn-Chaudhri-Hinkley combination renders this limitation obvious. For example, with respect to FIG. 8C, Ahn describes that the “basic setting menu list 820 comprises a plurality of menus, and each menu comprises an icon 830 and a menu name 840 corresponding thereto.” EX1004, [0076]. Ahn shows similar icons associated with the menus and sub-menus in at least FIGS. 4B, 5A-5D, 6B, 7B, 7C, 9A-9C, 10, 13-15, and 17.



EX1004, FIG. 8C (annotated).

156. While Ahn describes a “program memory” and “[p]rograms for controlling a general operation of the mobile communication terminal 100,” Ahn does not explicitly describe the “menus” and “sub-menus” with which it associates the icons as “applications.” *See, e.g.*, EX1004, [0051], [0064], [0067], [0076]. However, a POSITA would have understood and found obvious that at least some of the functions that Ahn refers to as “menus” and/or “sub-menus” would have been implemented as applications.

157. For example, in FIG. 8C, Ahn illustrates that the basic setting menu list 820 “comprises a plurality of menus,” which include a “menu” named “Contacts” and a “menu” named “Messages.” *See* EX1004, [0076], FIG. 8C. A POSITA would have understood and found obvious that selecting the “Contacts” and “Messages” menus would have launched an application associated with that functionality. For example, Chaudhri ’842 describes that its device 100 includes software components such as “one or more applications (or set of instructions) 146,” which “include any applications installed on the device 100, including without limitation, a browser, address book, contact list, email, instant messaging, word processing, keyboard emulation, widgets, JAVA-enabled applications, encryption, digital rights management, voice recognition, voice replication, location determination capability (such as that provided by the global positioning system (GPS)), a music player (which plays back recorded music stored in one or more files, such as MP3 or AAC files), etc.” EX1005, [0037], [0044]. Similarly, Hinkley describes that “[c]omputer-readable media 3314 provides data storage mechanisms to store the device data 3304, as well as various device applications 3318 and any other types of information and/or data related to operational aspects of device 3300,” and describes various types of applications run on its device. EX1005, [0152]. Based at least on these teachings, a POSITA would have at least found it obvious that, in the Ahn-Chaudhri-

Hinkley combination, the *one or more first menu items includ[e] a particular application icon*, as recited in [101.d].

Element [101.e.i] when the first menu is displayed including the one or more first menu items: detecting, utilizing the touch interface, a first duration of contact on at least one of the one or more first menu items,

158. Element [101.e.i] is substantially the same as Element [1.e.i]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.e.i] for at least the same reasons described above with respect to Element [1.e.i]. *See* Element [1.e.i], *supra*.

Element [101.e.ii] in response to the first duration of contact on the at least one of the one or more first menu items being detected to not surpass a threshold, performing a first operation, and

159. Element [101.e.ii] is substantially the same as Element [1.e.ii]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.e.ii] for at least the same reasons described above with respect to Element [1.e.ii]. *See* Element [1.e.ii], *supra*.

Element [101.e.iii] in response to the first duration of contact on the at least one of the one or more first menu items being detected to surpass the threshold, performing a second operation,

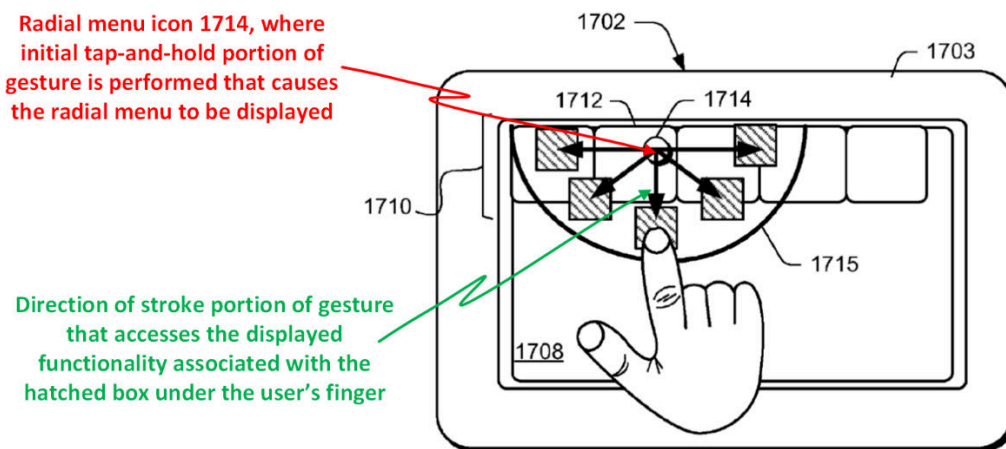
160. Element [101.e.iii] is substantially the same as Element [1.e.iii]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.e.iii] for at least the same reasons described above with respect to Element [1.e.iii]. *See* Element [1.e.iii], *supra*.

Element [101.e.iv] where the second operation is performed in response to the first duration of contact on the particular application icon being detected to surpass the threshold, and the first duration of contact being detected to include a slide gesture component after the first duration of contact on the particular application icon is detected to surpass the threshold;

161. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.e.iv]. As discussed with respect to Elements [1.e.i] and [1.e.iii], *supra*, a POSITA would have at least found it obvious to implement Ahn's mobile communication terminal 100 such that Ahn's menus would include the multiple selectable icons or slots described by Hinkley and that at least one of the selectable icons or slots would be associated with a radial menu icon as described by Hinkley. EX1006, [0105]-[0107]. Further, it would have at least been obvious to implement Ahn's mobile communication terminal 100 such that tapping the icon would have triggered one action, while a tap-and-hold on the radial menu icon portion of that same icon would have triggered a different action (i.e., opening the radial menu 1715). *See* EX1006, [0107] ("selecting "the radial menu icon [1714] triggers a default action which may . . . be different than the action associated with tapping on the bezel menu slot [1712]).

162. With respect to the radial menus, Hinkley describes that "[o]ne of the general ideas associated with radial menus is that a user can touch down at a certain location and stroke or slide their finger a certain direction to access and implement a particular functionality or menu command." EX1006, [0105]. "Once the radial

menu 1715 is exposed, the user can access various functionalities or commands by touching down on or near radial menu icon 1714 and stroking in a particular direction.” EX1006, [0108]. In other words, a POSITA would have at least found it obvious to implement Hinkley’s computing device 102 such that, to access a functionality associated with a radial menu, a user would: (1) tap-and-hold on the radial menu icon portion of an icon within a bezel menu; and (2) after the radial menu is displayed and while his/her finger is still in contact with the display, slide the finger in the direction of a displayed functionality. *See* EX1006, [0105]-[0110]; *see also* EX1006, [0066] (proposing gesture “combinations” including “tap/hold combinations, slides, etc.”), [0078] (describing an embodiment where functionality is selected from a menu in response to the user performing a gesture “in a single transaction” that is “continuous”), [0110] (discussing a combined “touch-and-stroke” gesture).



EX1006, FIG. 17 (annotated).

163. Based at least one these teachings, that, in the mobile device of the Ahn-Chaudhri-Hinkley combination, the second operation is performed in response to the first duration of contact on the particular application icon being detected to surpass the threshold (e.g., the tap-and-hold gesture being detected), and the first duration of contact being detected to include a slide gesture component after the first duration of contact on the particular application icon is detected to surpass the threshold (e.g., the “stroke” component that accesses one of the various functionalities that are included in the displayed radial menu), as recited in [101.e.iv].

Element [101.f] when the graphical user interface is displayed, detecting, utilizing the touch interface, a second gesture that begins in connection with a second edge of the display and moves inward;

164. Element [101.f] is substantially the same as Element [1.f]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.f] for at least the same reasons described above with respect to Element [1.f]. *See* Element [1.f], *supra*.

Element [101.g] in response to the detection of the second gesture that begins in connection with the second edge and moves inward, displaying, utilizing the display, a second menu including one or more second menu items;

165. Element [101.g] is substantially the same as Element [1.g]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.g] for at least the same reasons described above with respect to Element [1.g]. *See* Element [1.g], *supra*.

Element [101.h.i] when the second menu is displayed including the one or more second menu items: detecting, utilizing the touch interface, a selection contact on at least one of the one or more second menu items, and

166. Element [101.h.i] is substantially the same as Element [1.h.i]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.h.i] for at least the same reasons described above with respect to Element [1.h.i]. *See* Element [1.h.i], *supra*.

Element [101.h.ii] in response to the selection contact being detected on the at least one of the one or more second menu items, performing a third operation;

167. Element [101.h.ii] is substantially the same as Element [1.h.ii]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.h.ii] for at least the same reasons described above with respect to Element [1.h.ii]. *See* Element [1.h.ii], *supra*.

Element [101.i] wherein the electronic device is configured such that the graphical user interface is displayed in at least one virtual display layer, and at least one of the first menu or the second menu is displayed in at least one other virtual display layer.

168. Element [101.i] is substantially the same as Element [1.i]. The Ahn-Chaudhri-Hinkley combination renders obvious Element [101.i] for at least the same reasons described above with respect to Element [1.i]. *See* Element [1.i], *supra*.

X. CONCLUSION

169. I declare that all statements made in this Declaration of my own knowledge are true and that all statements made on information and belief are

believed to be true. I further declare that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both (under Section 1001 of Title 18 of the United States Code).

Executed this 28th day of June, 2024.

A handwritten signature in cursive script, appearing to read "Loren Terveen", written in black ink.

Loren Terveen, PhD

APPENDIX A

Loren G. Terveen

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Address Department of Computer Science and Engineering
University of Minnesota
Minneapolis, MN 55455

Education

Ph.D. in Computer Sciences	University of Texas	1991
M.S. in Computer Sciences	University of Texas	1988
B.A. in Computer Science, Mathematics, History	University of South Dakota	1984

Affiliations Member of ACM, ACM/SIGCHI

**Research
Interests** Human-Computer Interaction, Social Computing

**Professional
Experience**

Professor	University of Minnesota	2002 --
Distinguished McKnight University Professor		2017 --
Principal Member of Technical Staff	AT&T Labs - Research	1996-2002
Member of Technical Staff	AT&T Bell Labs	1991-1996
Graduate Research Intern	Microelectronics and Computer Corporation	1986-19991
Teaching Assistant	University of Texas at Austin	1985

AWARDS AND MAJOR ROLES

ACM Distinguished Scientist (awarded 2009)

ACM SIGCHI Academy (2019)

ACM SIGCHI Lifetime Service Award (2023)

ACM SIGCHI President (2015-2018)

ACM Council, SIG Governing Board Representative (2016 – 2018)

RESEARCH

External Funding

NSF:CISE: Community-Engaged Design and Implementation of a Framework for Ethical Online Communities Research (**Co-PI**, with Svetlana Yarosh PI, Stevie Chancellor Co-PI, Joseph Konstan Co-PI, Kangjie Lu Co-PI), \$400,000 for 01/01/2023 to 12/31/2025.

Cisco: Detecting and Reducing Bias in Collaborative Virtual Meetings (**Co-PI**, with Stevie Chancellor PI). **\$177,915** for 9/1/2021 to 12/31/2022.

NSF:CHS:Small: Incorporating and Balancing Stakeholder Values in Algorithm Design (UMN **PI**), Award Total \$500,000, UMN Share \$243,941 for 8/1/2019 to 7/31/2022.

NSF: EAGER: AI-DCL: Capture, Explain and Negotiate the Inherent Trade-offs in Machine Learning Algorithms (UMN **co-PI**), Award Total \$295,713, UMN Share \$103,267 for 10/1/2019 to 9/30/2022.

NSF:CHS: Small: Collaborative Research: Structured Data Peer Production: Addressing Challenges and Leveraging Opportunities (**PI**), \$249,738 for 9/1/2018 - 8/31/2021.

National Cancer Institute (NCI): Restore: Improving sexual outcomes of gay and bisexual prostate cancer survivors (R. Simon Rosser **PI**; my role: **Co-PI**); \$2,039,220 (directs) \$3,039,541 (total), 2017-2022.

NSF: “PFI:BIC: Smart Human-Centered Collision Warning System: sensors, intelligent algorithms and human-computer interfaces for safe and minimally intrusive car-bicycle interactions” (Co-PI, with Rajesh Rajamani (PI), Max Donath, and Nichole Morris), \$999,773 for September 1, 2016 to August 31, 2019.

NSF: “Computer-Supported Cooperative Work Doctoral Colloquium” (**PI**), \$25,000 for 03/01/2016 to 02/28/2017.

National Institute on Drug Abuse: “A Technology-Delivered Peer-to-Peer Support ARB Adherence Intervention for HIV+ Adults”, (Co-PI, with Keith Horvath (PI) and Darin Erickson), \$3,302,62 for 07/01-2015 to 05/31/2020.

NSF: “HCC: Tools and Mechanisms to Support Social Participation Efforts”, (**PI**), \$499,399 for 10/01/2012 to 09/30/2015.

NSF: “SoCS: Collaborative Research: Novel Algorithms and Interaction Mechanisms to Enhance Social Production”, (**PI**), \$527,140, for 7/01/2012 to 06/30/2015.

NSF: “Collaborative Research: Supporting Newcomer Socialization in Online Production Communities”, (**PI**), \$301,135.00 for 08/2011 to 08/31/2015.

Minnesota Department of Transportation: “Statewide Cycloplan: A Bicycle Planning Tool with Participatory GIS”, **(PI)**, \$130,000, for 10/01/2011 to 06/30/2013.

Metropolitan Council: “Cycloplan II”, **(PI)**, \$71,350, for 08/15/2011 to 05/31/2012.

NSF: “Wikisym Doctoral Consortium”, **(PI)**, \$13,163, for 05/01/2011 to 04/30/2012.

IBM: “Mobile Crowdsensing”, **(PI)**, \$100,000 awarded 04/01/2011

NSF: “Social-Computational Systems (SoCS) Community Meeting” **(PI)**, \$48,801 for 09/01/2010 to 08/31/2011

NSF: “SoCS: Collaborative Research: Information Framing: Intelligent Interfaces for an Online Production Community”, **(PI)**, \$375,000 for 09/15/2010 to 08/31/2015.

NSF: “Collaborative Research: Guiding Folksonomy Development to Enable Novel Tagging Applications” **(PI)**, with J. Riedl and S. Sen (Macalester College)). \$949, 788 for 04/1/2010 to 03/31/2014 (UMN Share).

Minnesota Department of Transportation: Bike, Bus, and Beyond: Extending Cyclopath to Enable MultiModal Routing **(PI)**, \$60,627, for 07/08/2010 to 01/31/2012

NIH: An Interactive Website to Promote Communication about Sexual Health and Dating Relationships between Parents and Teens **(Co-PI)**, with Sonya Brady (PI), Simon Rosser, and Renee Sieving), \$679,500 for 09/30/2009 to 08/31/2011.

Metropolitan Council: “Cycloplan” **(PI)**, \$185,000, October 2009 – March 2011.

NSF “Collaborative Research: Understanding Online Volunteer Communities: Toward Theory-Based Design” **(co-PI)**, with J. Riedl, J. Konstan, M. Snyder, & Y. Ren; R. Kraut (CMU) \$2,400,000 for 08/01/2008 to 07/31/2013.

NSF: “Recommender Systems Doctoral Consortium” **(PI)** \$15,415, 2007-2008.

NSF: “Mining Spatiotemporal Data: From Personal Use to Community Knowledge” **(PI)** \$449,570 for 12/1/2005 to 11/30/2009.

NSF: “Collaborative Research: Mark This! - Operationalizing the notion of "place" for interactive community systems” **(PI)**, with Q. Jones (NJIT) and S. Whittaker (Univ. of Sheffield)). \$173,411 for 6/1/2003 to 5/31/2007 (UMN share).

NSF: “Being There: Mobile Devices for Community and Commerce” **(PI)**, with J. Konstan, J. Riedl, and S. Shekhar). \$120,000 for 9/1/2002 to 8/31/2005.

NSF: “ITR: Collaborative Research: Designing On-Line Communities to Enhance Participation” (co-PI, with J. Konstan & J. Riedl, R. Kraut & S. Kiesler (CMU), P. Resnick and Y. Chen (Univ. of Michigan)). \$1,246,017 for 9/1/2003 to 8/31/2009 (UMN share).

AT&T: “VURI: Collaborative Filtering and Intelligent Interface Design for Enhanced TV Applications” (PI). \$35,000 for November 1, 2008 to October 31, 2009.

AT&T: “VURI: Collaborative Filtering and Intelligent Interface Design for Enhanced TV Applications” (PI). \$35,000 for June 1, 2007 to May 31, 2008.

Internal Funding

Minnesota/China Collaborative Research Grant: "Expertise Oriented Mining for Web Community". \$10,000 for July 1, 2007 to June 30, 2008 (PI, with Jie Tang, Tsinghua University, Beijing China).

University of Minnesota TEL grant: “The Next Generation Online Learning Environment: Designing for Community and Collaboration”. \$10,000 for September 2006 to May 2007. (co-PI, with Joan Hughes, David Ernst, and Ann Ooms, College of Education and Human Development).

University of Minnesota Digital Technology Center: “Indoor Navigation Aids for Visually Impaired People”. \$25,670 for June 2005 to December 2006. (co-PI, with S. Shekhar and G. Legge).

University of Minnesota Digital Technology Center: “Eye-Tracking Research on Community Websites: Photo Directories and Building Social Networks”. \$19,300 for June 2004 to June 2005. (co-PI, with J. Konstan).

University of Minnesota Grant-In-Aid: “Facilitating Participation in Online Communities”. \$20,397 for 1/1/2003 to 6/30/2004.

Books

1. Bickhard, M.H. and Terveen, L.G. Foundational Issues in Artificial Intelligence and Cognitive Science: Impasse and Solution, (1995), Elsevier Science.

Refereed Journal Papers

2. Mo Houtti, Moyan Zhou, Loren Terveen, and Stevie Chancellor. “All of the White People Went First”: How Video Conferencing Consolidates Control and Exacerbates Workplace Bias. *PACM Human-Computer Interaction* (2023).
3. Mo Houtti, Isaac Johnson, Joel Cepeda, Soumya Khandelwal, Aviral Bhatnagar, and Loren Terveen. 2022. “We Need a Woman in Music”: Exploring Wikipedia’s Values on Article Priority. *PACM Human-Computer Interaction* 7, (2022).
4. Charles Chunkai Zhang*, Mo Houtti*, C, Estelle Smith, Ruoyan Kong, and Loren Terveen. Working for Invisible Machines or Pumping Information into an Empty Void? An Exploration of Wikidata Contributors’ Motivations. In *Proceedings of the ACM on Human-Computer Interaction*, Vol. 6 (2022). (* co-first authors)
5. C. Estelle Smith, William Lane, Hannah Miller Hillberg, Daniel Kluver, Loren Terveen, and Svetlana Yarosh. Effective Strategies for Crowd-Powered Cognitive Reappraisal Systems: A

- Field Deployment of the Flip*Doubt Web Application for Mental Health. In *Proceedings of the ACM on Human-Computer Interaction*, Vol. 5 (2021). **Best Paper Honorable Mention.**
6. C. Estelle Smith, Avleen Kaur, Katie Z. Gach, Loren Terveen, Mary Jo Kreitzer, and Susan O’Conner-Von. What is Spiritual Support and How Might It Impact the Design of Online Health Communities? In *Proceedings of the ACM on Human-Computer Interaction*, Vol. 5 (2021).
 7. Levonian, Z., Dow, M., Erickson, D.R., Ghosh, S., Miller Hillberg, H., Narayanan, S., Terveen, L. and Yarosh, L. Patterns of Patient and Caregiver Mutual Support Connections in an Online Health Community. In *Proceedings of the ACM on Human-Computer Interaction*, Vol. 4 (2020).
 8. Zhu, H., Yu, B., Halfaker, A., and Terveen, L. Value-Sensitive Algorithm Design: Method, Case Study, and Lessons. In *Proceedings of the ACM on Human-Computer Interaction*, Vol. 2, No. 2 (2018).
 9. Miller Hillberg, H., Levonian, Z., Terveen, L., and Hecht, B. What I See is What You Don’t Get: Effects of Seeing Emoji Rendering Differences Across Platforms. In *Proceedings of the ACM on Human-Computer Interaction*, Vol. 2, No. 2 (2018).
 10. Hall, A., Terveen, L., and Halfaker, A. Bot Detection in Wikidata Using Behavioral Cues. In *Proceedings of the ACM on Human-Computer Interaction*, Vol. 2, No. 2 (2018).
 11. Sheppard, S.A., Turner, J., Thebault-Spieker, J., Zhu, H., and Terveen, L. Never Too Old, Cold or Dry to Watch the Sky: A Survival Analysis of Citizen Science Volunteerism. In *Proceedings of the ACM on Human-Computer Interaction*, Vol. 1, No. 2 (2017).
 12. Thebault-Spieker, J., Kluver, D., Klein, M., Halfaker, A., Hecht, B., Terveen, L., and Konstan, J. Simulation Experiments On (The Absence of) Ratings Bias in Reputation Systems. In *Proceedings of the ACM on Human-Computer Interaction*, Vol. 1, No. 2 (2017).
 13. Yu, B., Wang, X., Lin, A.Y., Ren, Y., Terveen, L., and Zhu, H. Out With The Old, In With The New? Unpacking Member Turnover in Online Production Groups. In *Proceedings of the ACM on Human-Computer Interaction*, Vol. 1, No. 2 (2017).
 14. Nguyen, T.T., Harper, F.M., Terveen, L., and Konstan, J. User Personality and User Satisfaction with Recommender Systems. In *Information Systems Frontiers* (2017).
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 16. Thebault-Spieker, J., Terveen, L., and Hecht, B. Towards a Geographic Understanding of the Sharing economy: Systemic Biases in UberX and TaskRabbit. In *ACM Transactions on Computer-Human Interaction* (2017).
 17. Brady, S.S., Sieving, R.E., Terveen, L.G., Rosser, R. S., Kodet, A.J., and Rothberg, V.D. An Interactive Website to Reduce Sexual Risk Behavior: Process Evaluation of TeensTalkHealth, JMIR Research Protocols (2015).
 18. Ren, Y., Harper, F.M., Drenner, S., Terveen, L., Kiesler, S., Riedl, J., and Kraut, R.E. (2012). Building Member Attachment in Online Communities: Applying Theories of Group Identity and Interpersonal Bonds. *Management Information Systems Quarterly*.
 19. Jones, Q., Grandhi, S., Karam, S., Whittaker, S., Zhou, C., and Terveen, L. Geographic ‘Place’ and Community Information Preferences, in *Computer-Supported Cooperative Work*.
 20. Zhou, C., Frankowski, D., Ludford, P., Shekhar, S., Terveen, L., Discovering Personally Meaningful Places from Location Data: An Interactive Clustering Approach. *ACM Transactions on Information System*, 25, 3 (July 2007).

21. Ling, K., Beenen, G., Ludford, P.J., Wang, X., Chang, K., Li, X., Cosley, D., Frankowski, D., Terveen, L., Rashid, A.M., Resnick, P., and Kraut, R.E. Using Psychology to Motivate Contributions to Online Communities. *Journal of Computer-Mediated Communication*, 10, 4 (June 2005).
22. Terveen, L. and McDonald, D. Social Matching: A Framework and Research Agenda. *ACM Transactions on Computer-Human Interaction*, 12, 3 (2005), 401-434.
23. Whittaker, S., Jones, Q., Nardi, B., Creech, M., Terveen, L., Isaacs, E., and Hainsworth, J. ContactMap: organizing communication in a social desktop, in *ACM Transactions on Computer-Human Interaction*, 11, 4 (December 2004), 445-471.
24. Jones, Q., Grandhi, S., Terveen, L., and Whittaker, S. People-To-People-to-Geographical-Places: The P3 Framework for Location-Based Community Systems. in *Computer-Supported Cooperative Work*, 13, 3-4 (August 2004), 249-282.
25. Herlocker, J.L., Konstan, J.A., Terveen, L.G., and Riedl, J.T. Evaluating Collaborative Filtering Recommender Systems, *ACM Transactions on Information Systems* (2004).
26. Amento, B., Terveen, L., Hill, W., Hix, D., and Schulman, R. Experiments in Social Data Mining: The TopicShop System, in *ACM Transactions on Computer-Human Interaction*, 10, 1 (March 2003), 54-85.
27. Whittaker, S., Terveen, L.G., and Nardi, B.A. Let's stop pushing the envelope and start addressing it, in *Human-Computer Interaction*, 15, 2-3 (Sep 2000), 75-106.
28. Terveen, L.G., Hill, W.C., and Amento, B. Constructing, Organizing, and Visualizing Collections of Topically Related Web Resources, in *ACM Transactions on Computer-Human Interaction*, 6, 1 (Mar. 1999), 67-94.
29. Selfridge, P.G. and Terveen, L.G. Knowledge Management Tools for Business Process Support and Reengineering, in *Journal of Intelligent Systems in Accounting, Finance, and Management* (Jan. 1996).
30. Terveen, L.G. An Overview of Human-Computer Collaboration, in *Knowledge-Based Systems*, 8, 2-3 (1995), 67-81.
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Refereed Conference Papers

34. Zhang, C and Terveen, L. Quantifying the Gap: A Case Study of Wikidata Gender Disparities. In *Proceedings of OpenSym 2021*, the 17th International Symposium on Open Collaboration
35. Yu, B., Ye, Y., Terveen, L., Wu, Z.S., Forlizzi, J., and Zhu, H. Keeping Designers in the Loop: Communicating Inherent Algorithmic Trade-offs Across Multiple Objectives. In *Proceedings of DIS 2020*, the ACM Conference on Designing Interactive Systems.
36. Smith, C.E., Yu, B., Srivastava, A., Halfaker, A., Terveen, L., and Zhu, H. Keeping Community in the Loop: Understanding Wikipedia Stakeholder Values for Machine

- Learning-Based Systems. In *Proceedings of CHI 2020, the ACM Conference on Human Factors in Computing Systems*. **Best Paper Honorable Mention.**
37. Levonian, Z., Erikson, D., Luo, W., Narayanan, S., Rubya, S., Vachher, P., Terveen, L. and Yarosh, S. Bridging Qualitative and Quantitative Methods for User Modeling: Tracing Cancer Patient Behavior in an Online Health Community. In *Proceedings of ICWSM 2020, AAAI Conference on the Web and Social Media*.
 38. Cheng, H.F., Yu, B., Fu, S., Zhao, J., Hecht, B., Konstan, J., Terveen, L., Yarosh, S., and Zhu, H. Teaching UI Design at Global Scales: A Case Study of Designing Collaborative Capstone Projects for MOOC Students, in *Proceedings of ACM Learning at Scale 2019*.
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112. Amento, B., Hill, W., Terveen, L., Hix, D., and Ju, P. An Empirical Evaluation of User Interfaces for Topic Management of Web Sites, *Proceedings of CHI 1999*, 552-559. 25% acceptance rate.
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117. Terveen, L.G., Hill, W.C., Amento, B., McDonald, D., and Creter, J. Building Task-Specific Interfaces to High Volume Conversational Data, *Proceedings of CHI 1997*, 226-233. 23% acceptance rate.
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119. Terveen, L.G. and Murray, L. Helping Users Program Their Personal Agents, *Proceedings of CHI 1996*, 355-361. 23% acceptance rate.
120. Terveen, L.G. and Tuomenoksa, M.L. DynaDesigner: A Tool for Rapid Creation of Device-Independent, *Proceedings of INTERACT 1995*, 386-389.
121. Terveen, L.G. and Selfridge, P.G. Intelligent Assistance for Software Construction: A Case Study, *Proceedings of Knowledge-Based Software Engineering 1994*, 14-21.
122. Terveen, L.G., Selfridge, P.G., and Long, M.D. From 'Folklore' to 'Living Design Memory', in *Proceedings of INTERCHI 1993*, 15-22. 19% Acceptance Rate.

123. Terveen, L.G. Interface Support for Data Archaeology, *ISMM International Conference on Information and Knowledge Management (CIKM'93)*. (acceptance rate for 1992 unknown; average is 24%).
124. Brachman, R. J., Selfridge, P.G., Terveen, L.G., Altman, B., Borgida, A., Helper, F., Kirk, T., Lazar, A., McGuinness, D.L., and Resnick, L. A., Knowledge Representation Support for Data Archaeology, *ISMM International Conference on Information and Knowledge Management (CIKM'92)*. (acceptance rate for 1992 unknown; average is 24%).
125. Selfridge, P.G., Terveen, L.G., and Long, M.D. Managing Design Knowledge to Provide Assistance to Large-Scale Software Development, *Proceedings of Knowledge-Based Software Engineering 1992*, 154-162.
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128. Terveen, L.G. and Wroblewski, D.A. A Collaborative Interface for Browsing and Editing Large Knowledge Bases, *Proceedings of AAAI 1990*, 491-496. 18% acceptance rate.

Book Chapters

129. Terveen, L., Riedl, J., Konstan, J., and Lampe, C. (2014) "Study, Build, Repeat: Using Online Communities as a Research Platform", in *Human Computer Interaction Ways of Knowing*, edited by Judith S. Olson and Wendy Kellogg, New York: Springer.
130. Amento, B., Harrison, C., Nathan, M., and Terveen, L. (2009), Asynchronous Communication – Fostering Social Interaction with CollaboraTV, in Cesar, P., Geerts, D., and Chorianopoulos, K. (ed.), *Social Interactive Television: Immersive Shared Experiences and Perspectives* (2009), Information Science Reference.
131. Amento, B., Terveen, L.G and Hill, W. From PHOAKS to TopicShop: Experiments in Social Data Mining, in Lueg, C. and Fisher, D. (ed.), *From Usenet to CoWebs: Interacting with Social Information Spaces* (2002), Springer.
132. Whittaker, S., Terveen, L.G, Hill, W.C., and Cherny, L. The Dynamics of Mass Interaction, in Lueg, C. and Fisher, D. (ed.), *From Usenet to CoWebs: Interacting with Social Information Spaces* (2002), (this chapter is a reprint of Whittaker et al 1998), Springer.
133. Terveen, L.G and Hill, W. Beyond Recommender Systems: Helping People Help Each Other, in Carroll, J. (ed.), *HCI in the New Millennium* (2001), Addison Wesley.
134. Terveen, L.G. Computer-Mediated Collaboration, in *More than Screen Deep: Toward Every-Citizen Interfaces to the Nation's Information Infrastructure* (1997), National Academy Press.

Other Publications

135. Konstan, J.A., and Terveen, L.G. Human-centered recommender systems: Origins, advances, challenges, and opportunities. *AI Magazine*, 2021.
136. Terveen, L. "Autonomous" agents? What should we worry about? What should we do? *Human-Computer Interaction*.
137. Kaur, A., Smith, C. E., and Terveen, L. Sway Together, Stay Together: Visualizing Spiritual Support Networks Through the SoulGarden Prototype. In *Extended Abstracts of CSCW 2021*.

138. Kaur, H., Johnson, I., Miller, H., Terveen, L., Lampe, C., Hecht, b., and Lasecki, W. Oh The Places You'll Share: An Affordances-Based Model of Social Media Posting Behaviors. In *Extended Abstracts of CHI 2017* (ACM Conference on Human Factors in Computing Systems). 40% acceptance rate.
139. Masli, M. and Terveen, L. Geographical Social Production: Lessons from Cyclopath, in CHI 2013 GeoHCI Workshop.
140. Masli, M., Bouman, L., Owen, A., and Terveen, L. Geowiki + route analysis = improved transportation planning, CSCW 2013 Interactive Poster.
141. Brady, S. S., Sieving, R. E., Terveen, L. G., Rosser, B. R. S., Kodet, A. J., & Rothberg, V. D. (2012, October). *TeensTalkHealth: An interactive website to promote healthy relationships and prevent STIs*. Paper presented at the annual meeting of the American Public Health Association, San Francisco, CA.
142. Society for Personality and Social Psychology, San Antonio, TX. January, 2011. "The role of community orientation in promoting online participation" (with J. S. Kim, P. C. Dwyer, J. Filson Moses, P. T. Fuglestad, C. A. Mannino, R Davies, & M. Snyder)
143. Society for Personality and Social Psychology, San Antonio, TX. January, 2011. "Applying a functional approach to participation in online groups" (with P. T. Fuglestad, P. C. Dwyer, J. Filson Moses, J. S. Kim, C. A. Mannino, R Davies, & M. Snyder)
144. Society for Personality and Social Psychology, San Antonio, TX. January, 2011. "Past volunteerism predicts amount of content contributed in an online community" (with P. C. Dwyer, J. Filson Moses, P. T. Fuglestad, J. S. Kim, C. A. Mannino, R Davies, & M. Snyder)
145. Society for Personality and Social Psychology, San Antonio, TX. January, 2011. "Social motives and personality as predictors of online participation" (with J. Filson Moses, P. C. Dwyer, P. T. Fuglestad, J. S. Kim, C. A. Mannino, R Davies, & M. Snyder)
146. Kapoor, N., Frankowski, D., Konstan, J., and Terveen, L. Lessons Learned in Implementing the CHIplace Online Community, in *Proceedings of Human-Computer Interaction International 2005*.
147. Zhou, C., Ludford, P., Frankowski, D., and Terveen, L. An Experiment in Exploring How People Describe Places, Short Paper in *Proceedings of Pervasive 2005*.
148. Zhou, C., Ludford, P., Frankowski, D., and Terveen, L. An Experiment in Discovering Personally Meaningful Places from Location Data, Short Paper in *Proceedings of CHI 2005*.
149. Kapoor, N., Konstan, J., and Terveen, L. How Peer Photos Influence Member Participation in Online Communities, Short Paper in *Proceedings of CHI 2005*.
150. Amento, B., Hill, W., and Terveen, L. The Sound of One Hand: A Wrist-mounted Bio-acoustic Fingertip Gesture Interface, Short Paper in *Proceedings of CHI 2002*, 724-725. 33% acceptance rate.
151. Terveen, L., Hill, W., and Amento, B. Collaborative Filtering to Locate, Comprehend, and Organize Collections of Websites, in SIGART Bulletin, 9, 3&4 (1998), 10-17.
152. Terveen, L., Hill, W., Amento, B., McDonald, D., and Creter, J. 1997. PHOAKS: a system for sharing recommendations. *Commun. ACM* 40, 3 (Mar. 1997), 59-62.
153. Terveen, L.G., Stolze, M., and Hill, W. From 'Model World' to 'Magic World', in *SIGCHI Bulletin*, 27, 4 (1995), 31-34.
154. Terveen, L.G., Papavero, E., and Tuomenoksa, M. DynaDesigner: A Tool for Rapid Design and Deployment of Device-Independent Interactive Services, Refereed Formal Demonstration in *Adjunct Proceedings of CHI'95*, 29-30.

155. Terveen, L.G. Person-Computer Cooperation through Collaborative Manipulation. Ph.D. Thesis, University of Texas Department of Computer Sciences, 1991.

Invited Presentations

Carnegie Mellon University

Northwestern University

The University of California Irvine

Carleton College

Twin Cities MetroGIS Policy Board

Hennepin County Bicycle Advisory Committee

University of Minnesota Digital Humanities Collaborative

University of Minnesota Advanced Transportation Technologies Seminar Series

Georgia Tech

University of Minnesota Urban Ecosystems Symposium

University of Minnesota New Media

IBM T.J. Watson Research

University of Illinois

University of Maryland

University of Washington

Carnegie-Mellon University

Swedish Institute of Computer Science / Royal Institute of Technology

Uppsala University, Sweden

New Jersey Institute of Technology

Microsoft Research

Vassar University

Rensselaer Polytechnic Institute

University of Colorado

Virginia Tech

University of Nebraska

Conference Presentations

- ACM Conference on Computer-Supported Cooperative Work (CSCW), 2014.
- ACM Conference on Computer-Supported Cooperative Work (CSCW), 2012.
- ACM Conference on Computer-Supported Cooperative Work (CSCW), 2002.
- ACM Conference on Computer-Supported Cooperative Work (CSCW), 1998.
- ACM Conference on Human Factors in Computing Systems (CHI), 1998.
- ACM Conference on Design of Interactive Systems, 1997.

- ACM Conference on Human Factors in Computing Systems (CHI), 1997.
- ACM Conference on Human Factors in Computing Systems (CHI), 1996.
- IFIP TC13 International Conference on Human-Computer Interaction (INTERACT), 1995.
- IEEE Conference on Knowledge-Based Software Engineering, 1994.
- ACM Conference on Human Factors in Computing Systems (CHI), 1993.
- Conference on Information and Knowledge Management, 1993.
- Conference on Information and Knowledge Management, 1992.
- National Conference on Artificial Intelligence (AAAI), 1991.
- International Joint Conference on Artificial Intelligence (IJCAI), 1991.
- National Conference on Artificial Intelligence (AAAI), 1990.

Workshop Presentations

- CHI 2013 GeoHCI Workshop
 - “Geographical Social Production: Lessons from Cyclopath”
- CSCW 2002 Workshop on “The Role of Place in Shaping Virtual Communities”:
 - “Place-Based Community Information Systems”.
- CHI 99 Workshop on “Interacting with Recommender Systems”:
 - “Visualization Interfaces for Recommender Systems”.
- 1999 Human-Computer Interaction Consortium Workshop:
 - “A Reference Task Agenda for Human-Computer Interaction”.
- 1998 AAI Workshop on “Recommender Systems”:
 - “The PHOAKS Recommender System”.
- 1997 Human-Computer Interaction Consortium Workshop:
 - “The PHOAKS Recommender System”.
- 1995 Lifelike Computer Characters Workshop:
 - “Hidden Hands, not Talking Heads: The Magic World Interaction Paradigm”.
- 1995 Lifelike Computer Characters Workshop:
 - “Moving Agent-User Voice Dialogue towards Natural Conversation”.
- CHI 95 Workshop on “‘Model World’ to ‘Magic World’: Making Visual Objects the Medium for Intelligent Design Assistance”:
 - “The ‘Magic World’ Approach to Human-Computer Collaboration”.
- 1993 AAAI Fall Symposium: “Human-Computer Collaboration: Reconciling Theory, Synthesizing Practice”:
 - “A Framework for Human-Computer Collaboration”
- 1993 AI-ED Workshop on “Collaborative Problem Solving: Theoretical Frameworks and Innovative Systems”:

- “Collaborative Problem Solving in Interactive Systems”.
- 1992 CAIA Workshop on “Applying AI To Software Problems: Assessing Promises and Pitfalls”:
 - “Representing and Disseminating Software Design Knowledge”.
- 1992 AAAI Spring Symposium on “Cognitive Aspects of Knowledge Acquisition”:
 - “In The Footprints of The Masters: Embedding Knowledge Acquisition in Organizational Activity”.
- AAAI 90 Workshop on “Complex Systems, Ethnomethodology, and Interaction Analysis”:
 - “Resources for Person-Computer Collaboration”.
- 1990 AAAI Spring Symposium on “Knowledge-Based Human-Computer Communication”:
 - “Tools for Human-Computer Collaboration”.

Patents

U.S. Patent # 5,388,188. Apparatus and methods for providing design advice. (with P. Selfridge). Issued February 7, 1995.

U.S. Patent #5,659,724. Interactive data analysis apparatus employing a knowledge base. (with A. Borgida, R.J. Brachman, T. Kirk, and P. Selfridge). Issued August 19, 1997.

U.S. Patent #5,680,530. Graphical environment for interactively specifying a target system (with P. Selfridge). Issued October 21, 1997.

U.S. Patent #5,806,060. Interactive data analysis employing a knowledge base. (with A. Borgida, R.J. Brachman, T. Kirk, and P. Selfridge). Issued September 8, 1998.

U.S. Patent # 5,809,492. Apparatus and method for defining rules for personal agents. (with L. Murray). Issued September 15, 1998.

U.S. Patent # 5,953,393. Personal Telephone Agent. (With P. Culbreth, P. Danielsen, R.J. Hall, E. Papavero, and M. Tuomenoksa). Issued September 14, 1999.

U.S. Patent #6,029,192. System and method for locating resources on a network using resource evaluations derived from electronic messages. (with W.C. Hill). Issued February 22, 2000.

U.S. Patent #6,244,873. Wireless myoelectric control apparatus and methods. (with W.C. Hill, F.C. Pereira, and Y. Singer). Issued June 12, 2001.

U.S. Patent #6,256,648. System and method for selecting and displaying hyperlinked information resources. (with W.C. Hill). Issued July 3, 2001.

U.S. Patent #9,430,043. Bioacoustic Control System, Method, and Apparatus. (with B. Amento and W.C. Hill). Issued August 30, 2016.

CONSULTING

This is my consulting record for the years 2019-2023. I have received compensation for the patent litigation cases listed below in these years. I provide details for the cases where my role unless the client requested I do not do so; in the latter case I provide general descriptions.

- (2023) Retained on behalf a consumer and information technology company. General technology area: graphical and touch-based user interfaces. Writing declaration in support of inter partes review petitions.
- (2023) Retained on behalf of a computer software, hardware, and consumer electronics company. General technology areas: graphical user interfaces for web information access. Writing declaration in support of inter partes review petitions.
- (2022) Retained on behalf of a computer software company. General technology areas: map-based user interfaces, mobile computing, messaging. Writing declarations in inter partes review proceedings involving patents owned by the company.
- (2022) Retained as expert witness on behalf of a computer software and hardware company. General technology area: group collaboration systems. Writing declaration in support of inter partes review petitions.
- (2022) Retained as expert witness on behalf of a consumer electronics company. General technology area: graphical user interfaces. Analyzed possible infringements of the company's patents.
- (2022) Retained as expert witness on behalf of a computer software company. General technology areas: Web-based and mobile user interfaces.
- (2022) Retained as expert witness on behalf of a computer software company. General technology areas: Web-based and mobile user interfaces.
- (2021) Retained to write declaration in support of inter partes review petitions. General technology area: information discovery.
- (2021) Retained on behalf of a computer software and hardware company. General technology area: graphical user interfaces. Writing declaration in support of inter partes review petitions.

- **Deposed: September 2022**

- (2021) Retained on behalf of a computer software and hardware company. General technology areas: web information access, voice interaction, home automation. Writing declaration in support of inter partes review petitions.
- (2021) Retained on behalf of a computer software company. General technology area: multimedia messaging. Analyzing potential infringement of company's patents.
- (2021) Retained on behalf of a computer software company. General technology areas: map-based user interfaces, mobile computing, messaging. Writing declarations in support of patent holder's position in *ex parte* reexaminations.

- (2020) Retained on behalf of a computer software and hardware company. General technology area: information processing, hypertext, inference. Writing expert reports.
- (2020) Retained on behalf of a computer software and hardware company. General technology area: graphical user interfaces. Analyzed potential invalidity of patents.
- (2020) Retained by on behalf of a consumer electronics company. General technology area: graphical user interfaces. Analyzed possible infringements of the company's patents.
- (2020) Retained by Erise IP on behalf of Apple
 - Worked on *Inter Partes* review declaration
 - **Deposed: December 2020**
- (2019) Retained on behalf of Comcast. General technology area: interactive program guide systems. Writing expert reports.
 - **Deposed July 2021**
 - **Testified July 2022**
 - **Testified at jury trial April 2022:** Judge William Jung of the U.S. District Court for the Middle District of Florida granted judgment as a matter of law of no infringement for Comcast.
- (2019) Retained on behalf of a computer and internet software company. General technology area: information search. Did not write expert reports.

SERVICE

University of Minnesota Committees

- College of Science & Engineering Consultative Committee: 2015-2018
- College of Science & Engineering Honors & Awards Committee, 2017-2020

External Professional Activities

ACM Special Interest Group on Computer Human Interaction

- President: 2015-2018
- Executive Committee: Adjunct Chair for Awards, 2012 – 2015.
- Executive Committee: Vice President for Membership and Communication, 2009 – 2012.

Conference Chair

- CHI 2002: ACM Conference on Human Factors in Computing Systems
- IUI 1998: ACM Conference on Intelligent User Interfaces.

Program Committee Chair

- CSCW 2004: ACM Conference on Computer-Supported Cooperative Work.
- CSCW 2013: ACM Conference on Computer-Supported Cooperative Work.

Computer Supported Cooperative Work (CSCW) Steering Committee

- Chair, 2012-2014 (First elected Chair of the committee that oversees the CSCW Conference and the general CSCW and Social Computing research community.)

Awards Committee Chair

- CSCW 2008: ACM Conference on Computer-Supported Cooperative Work.

Journals Edited

- Special Issue of *Knowledge-Based Systems* on Human-Computer Collaboration, Vol. 8, No. 2-3, 1995.

Proceedings Edited

- Proceedings of the 2002 ACM Conference on Human Factors in Computing Systems (CHI 2002).
- Proceedings of the 1998 ACM Conference on Intelligent User Interfaces (IUI 1998).

Editorial Boards

- Communications of the ACM, 2009-present.
- ACM Transactions on CHI, 2000-2006.
- Knowledge-Based Systems, 1993-2009.
- ACM *intelligence*, 1998-2001.

Program Committees

- ACM Conference on Human Factors in Computing Systems (CHI): 1999-2004, 2006, 2016.
- ACM Conference on Computer-Supported Cooperative Work (CSCW): 2000, 2006, 2008, 2010, 2011, 2012, 2015.
- ACM Conference on Intelligent User Interfaces (IUI): 1997-2000, 2004.
- ACM Recommender Systems Conference: 2007, 2008, 2009, 2010, 2013.
- ACM GROUP Conference: 2007, 2009, 2010.
- ACM SIGIR Conference: 2008.
- AAAI Conference on the Web and Social Media: 2011, 2012, 2016.
- User Modeling, Adaptation, and Personalization: 2011, 2016.
- NordiCHI 2008, 2010.
- Communities and Technology: 2009.

- Computer-Supported Cooperative Learning 2002.
- User Modeling: 2001.
- International Conference on Knowledge Capture 2001.
- Knowledge-Based Software Engineering (KBSE): 1994-1999.
- Intelligent Data Analysis: 1997.
- National Conference on Artificial Intelligence (AAAI): 1996-1997.
- IEEE Conference on Artificial Intelligence for Applications (CAIA): 1994.
- International Workshop on Privacy-Aware Location-based Mobile Services: 2007.
- SIGIR Workshop on Future Challenges in Expertise Retrieval: 2008.

Other conference leadership positions

- ACM Conference on Computer-Supported Cooperative Work Doctoral Consortium Co-Chair, 2016 and 2011.
- The 2nd AAAI Conference on Human Computation and Crowdsourcing (HCOMP 2014) Doctoral Consortium Co-Chair.
- International Symposium on Wikis and Open Collaboration Doctoral Symposium Chair, 2011.
- ACM Conference on Recommender Systems Doctoral Consortium, Co-Chair, 2007.
- International Joint Conference for Artificial Intelligence Doctoral Consortium, Co-Chair, 1997.
- American Association for Artificial Intelligence Doctoral Consortium, Co-Chair, 1997.
- American Association for Artificial Intelligence Doctoral Consortium, Co-Chair, 1996.

Reviewer

Journals

- ACM Computing Surveys.
- IEEE Transactions on Data and Knowledge Engineering.
- IEEE Expert.
- Information Systems.
- International Journal of Human-Computer Studies.
- Journal of Computer-Supported Cooperative Work.

Conferences

- Ninth IFIP International Conference on Human-Computer Interaction (INTERACT): 2003.
- ACM Conference on Human Factors in Computing Systems (CHI): 1995-1998.
- ACM Conference on Computer-Supported Cooperative Work (CSCW): 1998.
- ACM Symposium on User Interface Software and Technology (UIST): 1996.

- ISSM Conference on Information and Knowledge Management: 1993.

National Science Foundations Panels

Served on panels in 1996, 1998, 2001, 2003, 2005, 2010, 2012, 2013.

Workshops Organized

- ACM Wikis and Open Collaboration Doctoral Symposium, 2011.
- Social Computational Systems Community Workshop, 2011.
- ACM Computer Supported Cooperative Work Doctoral Consortium, 2011.
- International Conference on Ubiquitous Computing (UbiComp): “Multi-device Interfaces for Ubiquitous Peripheral Interaction”, 2003.
- ACM Conference on Human Factors in Computer Systems (CHI): “Interacting with Recommender Systems”, 1999.
- International Joint Conference for Artificial Intelligence Doctoral Consortium, 1997.
- American Association for Artificial Intelligence Doctoral Consortium, 1997.
- American Association for Artificial Intelligence Doctoral Consortium, 1996.
- ACM Conference on Human Factors in Computer Systems (CHI): “‘Model World’ to ‘Magic World’: Making Visual Objects the Medium for Intelligent Design Assistance”, 1995.
- ACM Conference on Human Factors in Computer Systems (CHI): “New Uses and Abuses of Interaction History”, 1994.
- AAAI Fall Symposium: “Human-Computer Collaboration: Reconciling Theory, Synthesizing Practice”, 1993.
- World Conference on Artificial Intelligence and Education: “Collaborative Problem Solving: Theoretical Frameworks and Innovative Systems”, 1993.
- Conference on AI for Applications: “Applying AI To Software Problems: Assessing Promises and Pitfalls”, 1992.

Other Professional Service

- Member of SIGCHI Publications Board and Conference Management Committee, 2002-2004.
- ACM Special Interest Group on Artificial Intelligence Conference Chair (1995-1999); originated and co-organized Doctoral Consortia held in conjunction with AAAI and IJCAI.

Internal Service

- Associate Department Head, 2019-
- Chair, Department Head Search Committee, 2015.
- Chair, Strategic Planning Committee, 2013-2014.
- Chair, Social Computing Faculty Search Committee, 2013-2014.
- Curriculum Committee, 2012-2013.

- Chair, Strategic Planning Committee / Faculty Recruiting Committee, 2011-2012.
- Director of Graduate Studies: 2007-2010.
- Communications Committee: 2007
- Newsletter/Brochure Committee (chair): 2006-2007
- Research Opportunities Committee: 2005-2007
- Curriculum Committee: 2003-2005.
- Hosted Robert Kraut, Cray Colloquium speaker: October 2003.
- Participated in recruiting and admission activities.
- Information, Technology, and Everyday Life Initiative: Committee Member.

TEACHING AND ADVISING

Ph.D. Students Advised

- Dan Cosley (co-advised with John Riedl): completed PhD July 2006, currently an Associate Professor at Cornell University; on leave as Program Director at NSF.
- Pamela Ludford: completed PhD September 2007, currently an independent consultant.
- Reid Priedhorksy: completed PhD August 2010, currently employed at Los Alamos National Laboratories.
- Colin Delong: completed PhD October 2013 (co-advised with Jaideep Srivastava)
- Mikhil Masli: completed PhD July 2013, currently employed at IBM.
- Aaron Halfaker (co-advised with John Riedl): completed PhD September 2013, currently employed at Microsoft.
- Katie Panciera: completed PhD August 2014; currently Assistant Professor at Milwaukee School of Engineering.
- Fernando Torre: completed PhD September 2014; founder of a startup.
- Shuo (Steven) Chang: completed PhD August 2016; currently employed at Facebook.
- Tien Nguyen (co-advised with Joe Konstan): completed PhD August 2016; currently employed at Facebook.
- Morten Warncke-Wang (co-advised with Brent Hecht): completed PhD December 2016, currently employed at the Wikimedia Foundation.
- Andrew Sheppard: completed PhD December 2017, currently employed at Houston Engineering.
- Jacob Thebault-Spieker (co-advised with Brent Hecht): completed PhD December 2017; currently Assistant Professor at The University of Wisconsin.
- Hannah Miller (co-advised with Brent Hecht): completed PhD August 2018; currently Assistant Professor at University of Wisconsin Oshkosh.
- Vikas Kumar (co-advised with Joe Konstan), completed PhD August 2018, currently employed at KenSci.

- Andrew Hall: completed PhD August 2019; currently employed at 3M.
- Bowen Yu (co-advised with Haiyi Zhu), completed PhD December 2018, currently employed at Facebook.
- C. Estelle Smith: completed PhD December 2020; currently Assistant Professor at the Colorado School of Mines.
- Zach Levonian (co-advised with Lana Yarosh): completed PhD July 2022.
- Charles Chuankai Zhang (entered program Fall 2019).
- Mohammed (Mo) Houtti (entered program Fall 2019)
- Moyan Zhou (entered program Fall 2021)
- Ava Bartolome (entered program Fall 2022; co-advised with Stevie Chancellor)

M.S. Students Advised

- Tyler Danielsen – received degree in 2016
- Jie Kang – received degree in 2016
- Zahra Eslami – received degree in 2015
- Yanjie Liu – received degree in 2013
- Renji Yu – received degree in 2012
- Carol Drysdale – received degree in 2011
- Jingwen Zhang – received degree in 2011
- Jisu Oh – received degree in 2010
- Sara Drenner – received degree in 2008
- Anna Rouben – received degree in 2006
- Arjun Sundararajan – received degree in 2006
- Pamela Ludford – received degree in 2005
- Rahul Akolkar – graduated May 2004

Undergraduate Honors / Senior Thesis Students Advised

- Moyan Zhou 2021
- Avleen Kaur 2020
- Harmanpreet Kaur, 2016
- Arlo Siemsen, 2014
- Johnathan Frenz, 2013
- David Pitchford - 2012
- Michael Ludwig - 2010
- Jordan Focht – 2010

- Kurt Wilms - 2005
- John Murphy – 2004

Other Committees

- Hanlin Li, PhD: Member of final examination committee (Northwestern University).
- Matheus Araújo, PhD: Member of preliminary and final examination committees
- Hao-Fei Cheng, PhD: Member of preliminary and final examination committees
- Catherine Grevet, PhD: member of preliminary and final examination committees (Georgia Tech).
- Loxley Wang, PhD: member of preliminary and final examination committees.
- Abigail Bakke, PhD: member of preliminary and final examination committees
- Tahir Sousa, MS: member of final examination committee
- Tony Lam, PhD: member of preliminary examination committee.
- Michael Janseen, PhD: member of preliminary examination committee.
- Haleh Hagh Shenass, PhD: member of preliminary & final examination committees.
- Julie Beilfuss, MS: member of final examination committee.
- Liv Knatterud, MS: member of final examination committee.
- Sean McNee, MS: member of final examination committee.
- Shankar Subrahmanian, MS: member of final examination committee.
- Vamsee Venuturumilli, MS: member of final examination committee.
- Eric Gilbert, Ph.D. Preliminary and Final Examination Committees (UIUC, 2009/2010): member of thesis committee.
- Yi (Jenny) Zhang, Ph.D. (New Jersey Institute of Technology, 2004): member of thesis committee.
- Brian Amento, Ph.D. (Virginia Tech, 2001): member of thesis committee.
- David McDonald, Ph.D. (UC Irvine, 2000): member of thesis committee.

Courses taught

A list of all the classes I have taught, in most cases multiple times.

- CSCI 8115: Human-Computer Interaction and UI Technology
- CSCI 5125: Collaborative and Social Computing
- CSCI 5116: GUI Toolkits and Their Implementation
- CSCI 5115: User Interface Design, Implementation, and Evaluation
- HSEM 2519H: Honors Seminar on Crowdsourcing
- CSCI 1902: Structure of Computer Programming II

- CSCI 1901H: Introduction to Computer Science (Honors)

Tutorials

“Intelligent User Interfaces: Issues, Approaches, Evaluation”, offered at 1993 Conference on Artificial Intelligence for Applications.