

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Michael S. Smith
U.S. Patent No.: 10,656,755 Attorney Docket No. 50095-0167IP1
Issue Date: May 19, 2020
Appl. Serial No.: 16/558,022
Filing Date: August 30, 2019
Title: GESTURE-EQUIPPED TOUCH SCREEN SYSTEM, METHOD,
AND COMPUTER PROGRAM PRODUCT

DECLARATION OF DR. ANDREW COCKBURN

I currently hold the opinions set expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

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

Dated: 26th June, 2024

By: 
Andrew Cockburn

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I. QUALIFICATIONS AND BACKGROUND INFORMATION

1. My education and experience are described more fully in the attached curriculum vitae (Appendix A). I am a Professor at the Department of Computer Science and Software Engineering at the University of Canterbury, New Zealand. I also currently head the HCI (Human-Computer Interaction) and Multi-Media research group at the University of Canterbury.

2. In 1988, I was awarded a Bachelor of Science with Honors in Computer Science from the University of York, England.

3. In 1993, I was awarded a Ph.D. from the University of Stirling, Scotland. My thesis was on “Computer Supported Cooperative Work” which relates to forms of group interaction supported on computers.

4. In 1993, I joined the University of Canterbury as a Lecturer in the Department of Computer Science (now the Department of Computer Science and Software Engineering). I was subsequently promoted to a Senior Lecturer, and then an Associate Professor, before my appointment as a Professor in 2010. I currently hold the title of Professor.

5. I have over 30 years of experience in the area of HCI. The field of HCI is generally concerned with ways of understanding and improving the interaction between humans and computers, with a view to understanding, evaluating, designing, and building new styles of interactions that improve on one

or more of the end goals of making computers faster to learn, more intuitive, more efficient to use, and more subjectively satisfying.

6. Throughout my career, I have published the results of many research projects that have involved building new user interfaces or reviewing existing user interfaces for performing a particular task, and evaluating their effectiveness. This includes publications relating to:

- (a) investigating user experiences with web navigation interfaces, for example when using the “back” button on web browsers;
 - (b) reviewing and improving various interface schemes for traversing through documents and lists in desktop and mobile computer applications, including zooming, scrolling, and other techniques;
 - (c) analyzing new interfaces for text entry on mobile and touch-sensitive devices;
 - (d) addressing the problems arising from the small form factor of mobile devices with touch-sensitive displays, including wearable technologies;
 - (e) examining the influence of haptic feedback on user performance with mouse and touchscreen input devices;
 - (f) evaluating the importance of spatially stable displays in user interfaces;
- and

(g) designing, analyzing and evaluating gesture-based input techniques for various user activities, including music data entry, web navigation, text entry, and scrolling.

7. I also have extensive experience in designing and building new user interfaces and reviewing existing user interfaces. This includes a number of projects regarding the design, development and evaluation of user interfaces that I have undertaken with companies in the computing and HCI industry, such as:

(a) working with Airbus SAS in 2016 on methods to assist pilots' gesture-based interaction with touchscreens in turbulent environments;

(b) working with Hewlett-Packard Research Labs from 2010-2012 on the design and evaluation of gesture-based pointing techniques for remote displays, such as interactive TVs;

(c) a number of projects from 2006-2010 working with Logitech on the design, development, evaluation and improvement of user interfaces for next generation mice, including in relation to scrolling and window management tasks;

(d) working with IBM Almaden Research in 2006 on the design, development and evaluation of user interfaces for gesture-based text entry on mobile devices;

- (e) working with Digit Wireless in 2002 on the evaluation of user performance for user interfaces for digital text entry on mobile devices; and
- (f) working with Microsoft Research in 1999 on the development, evaluation and improvement of user interfaces for web browsing, in particular the mechanisms for revisiting pages (such as through the “back” button or bookmarks).

8. At the University of Canterbury, I currently teach a course on HCI for final year undergraduate students and a course on research methods in HCI for postgraduate students.

9. In the past, I have also taught introductory computer programming courses for first year students across disciplines, which included the implementation of graphical user interfaces.

10. I also manage an active research lab with a number of Ph.D. students. I have previously supervised fourteen students to successful completion of their Ph.D.s in the field of HCI.

11. The Association for Computing Machinery (ACM) is the world’s largest scientific and educational computing society. In 2015, I was elected to the ACM Special Interest Group on Computer-Human Interaction (CHI) Academy, which honors the principal leaders of the field of HCI.

12. I also annually attend conferences relating to the field of HCI and regularly read journals that cover research in the field of HCI.

13. To keep abreast with industry trends, I regularly read broader journals, magazines and websites related to computer science and technology, including Communications of the ACM, ACM TechNews, BBC Technology, and New York Times Technology.

14. A detailed list of my other professional activities, memberships, and speaking engagements is included in my CV.

15. I have been retained on behalf of Apple Inc. to offer technical opinions relating to U.S. Patent No. 10,656,755 (“the ’755 Patent”) and prior art references relating to its subject matter. I have reviewed the ’755 Patent, and relevant excerpts of the prosecution history of the ’755 Patent. I have also reviewed the following references:

- APPLE-1001 U.S. Patent No. 10,656,755 (“the ’755 Patent”)
- APPLE-1002 U.S. Patent No. 10,656,755 File History
- APPLE-1004 U.S. Patent Publication No. 2011/0119610 to Hackborn et al. (“Hackborn”)
- APPLE-1005 U.S. Patent Publication No. 2008/0316183 to Westerman et al. (“Westerman”)
- APPLE-1006 U.S. Patent Publication No. 2010/0103118 to Townsend et al. (“Townsend”)

- APPLE-1007 U.S. Patent Publication No. 2012/0319959 to Saponas et al. (“Saponas”)
- APPLE-1008 U.S. Patent No. 6,920,606 to Jablonski et al. (“Jablonski”)
- APPLE-1009 U.S. Patent Publication No. 2008/0122796 to Jobs et al. (“Jobs”)
- APPLE-1010 U.S. Patent Publication No. 2007/0150842 to Chaudhri et al. (“Chaudhri 842”)
- APPLE-1011 U.S. Patent No. 6,061,695 to Slivka et al. (“Slivka”)
- APPLE-1012 U.S. Patent No. 6,202,083 to Chrabaszcz (“Chrabaszcz”)
- APPLE-1013 U.S. Patent Publication No. 2005/0209923 to Jablonski et al. (“Jablonski II”)
- APPLE-1014 “Facebook Completes Rollout Of Haystack To Stem Losses From Massive Photo Uploads,” TechCrunch, April 6, 2009, <https://techcrunch.com/2009/04/06/facebook-completes-rollout-of-haystack-to-stem-losses-from-massive-photo-uploads/>
- APPLE-1015 U.S. Patent Publication No. 2006/0048059A1 to Etkin (“Etkin”)
- APPLE-1016 U.S. Patent Publication No. 2012/0246184A1 to Rothschild (“Rothschild”)
- APPLE-1017 U.S. Patent Publication No. 2008/0168404A1 to Ording (“Ording”)
- APPLE-1018 U.S. Patent Publication No. 2008/0062141A1 to Chaudhri (“Chaudhri 141”)
- APPLE-1019 U.S. Patent Publication No. 2011/0074699A1 to Marr (“Marr”)

- APPLE-1020 U.S. Patent Publication No. 2014/0232671A1 to Chaudhri (“Chaudhri 671”)
- APPLE-1021 U.S. Patent No. 6,323,846 to Westerman et al. (“Westerman2”)
- APPLE-1022 Hargrave’s Communications Dictionary, 1st Edition (2001)
- APPLE-1023 Dictionary of Computer and Internet Terms, Tenth Edition (2009)
- APPLE-1024 Van Nostrand’s Scientific Encyclopedia, Tenth Edition, Volume 2 (2008)
- APPLE-1025 Microsoft Computer Dictionary, 5th Edition (2002)
- APPLE-1026 U.S. Patent No. 6,061,532 to Bell
- APPLE-1027 U.S. Patent Publication No. 2008/0122796A1 to Jobs et al.

16. I have also reviewed various supporting references and other documentation as further noted in my opinions below.

17. Counsel has informed me that I should consider these materials through the lens of one of ordinary skill in the art related to the ’755 Patent at the time of the earliest possible priority date of the ’755 Patent, and I have done so during my review of these materials. The ’755 Patent claims the benefit of priority to a number of provisional applications, the earliest of which was filed on August 5, 2011 (“the Critical Date”). Counsel has informed me that the Critical Date represents the earliest possible priority date to which the challenged claims of ’755

Patent are entitled, and I have therefore used that Critical Date in my analysis below.

18. I have no financial interest in the parties or in the outcome of this proceeding. I am being compensated for my work as an expert on an hourly basis. My compensation is not dependent on the outcome of these proceedings or the content of my opinions.

19. In writing this declaration, I have considered the following: my own knowledge and experience, including my work experience in the field of HCI; my experience in teaching those subjects; and my experience in working with others involved in those fields. In addition, I have analyzed various publications and materials, in addition to other materials I cite in my declaration.

20. My opinions, as explained below, are based on my education, experience, and expertise in the fields relating to the '755 Patent. Unless otherwise stated, my testimony below refers to the knowledge of one of ordinary skill in the art as of the Critical Date, or before. Any figures that appear within this document have been prepared with the assistance of Counsel and reflect my understanding of the '755 Patent and the prior art discussed below.

II. LEGAL PRINCIPLES

A. Anticipation

21. I have been informed that a patent claim is invalid as anticipated under 35 U.S.C. § 102 if each and every element of a claim, as properly construed, is found either explicitly or inherently in a single prior art reference. Under the principles of inherency, if the prior art necessarily functions in accordance with, or includes the claimed limitations, it anticipates.

22. I have been informed that a claim is invalid under 35 U.S.C. § 102(a) if the claimed invention was known or used by others in the U.S., or was patented or published anywhere, before the applicant's invention. I further have been informed that a claim is invalid under 35 U.S.C. § 102(b) if the invention was patented or published anywhere, or was in public use, on sale, or offered for sale in this country, more than one year prior to the filing date of the patent application (critical date). And a claim is invalid, as I have been informed, under 35 U.S.C. § 102(e), if an invention described by that claim was described in a U.S. patent granted on an application for a patent by another that was filed in the U.S. before the date of invention for such a claim.

B. Obviousness

23. I have been informed that a patent claim is invalid as "obvious" under 35 U.S.C. § 103 in light of one or more prior art references if it would have been obvious to a POSITA, 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 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. For purposes of my analysis above and because I know of no indication from the patent owner or others to the contrary, I have applied a date of August 5, 2011, as the date of invention in my obviousness analyses, although in many cases the same analysis would hold true even at an earlier time than August 5, 2011.

24. 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 to modify the single prior art reference, or combine two or more references, in order to achieve the claimed invention. This reason may come from a teaching, suggestion, or motivation to combine, or may come from the reference or references themselves, the knowledge or “common sense” of one skilled in the art, or from the nature of the problem to be solved, and may be explicit or implicit from the prior art as a whole. I have been informed that 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.

III. OVERVIEW OF CONCLUSIONS FORMED

25. This declaration explains the conclusions that I have formed based on my analysis. To summarize those conclusions, based upon my knowledge and experience and my review of the prior art publications listed above, I believe that:

- Claims 1-3, 7, 10-11, 13, 15, 17, 20, 22-25, 29, 32-33, 35, 37-38, and 41-42 are obvious over Hackborn in view of Westerman (Ground 1A)
- Claims 4-5, 8-9, 21, 26-27, 30-31, and 43 are obvious over Hackborn in view of Westerman and Townsend (Ground 1B)
- Claim 16 is obvious in view of Hackborn in view of Westerman and Jablonski (Ground 1C)
- Claims 18-19 and 39-40 are obvious over Hackborn in view of Westerman and Jobs (Ground 1D)
- Claims 1, 4-8, 10-12, 15, 17-20, 22-23, 26-30, 32, 34, and 37-42 are obvious over Hackborn in view of Westerman and Jobs (Ground 2)

IV. LEVEL OF ORDINARY SKILL IN THE ART

26. In my opinion, a person of ordinary skill in the art (“POSITA”) relating to, and at the time of, the purported invention of the ’755 Patent would have had at least a bachelor’s degree in computer science, computer engineering, electrical engineering, human-computer interaction, or a related field, and would have had at least two years of relevant work experience in the design and

development of graphical user interfaces (GUIs), human-computer interfaces, or equivalents thereof. Less work experience may be compensated by a higher level of education and vice versa.

27. Based on my experiences, I have a good understanding of the capabilities of one of ordinary skill. Indeed, I have taught, participated in organizations, and worked closely with many such persons over the course of my career. Based on my knowledge, skill, and experience, I have an understanding of the capabilities of one of ordinary skill. Furthermore, I possess those capabilities myself.

V. INTERPRETATIONS OF THE '755 PATENT CLAIMS AT ISSUE

28. I have been informed by Counsel and understand that the best indicator of claim meaning is its usage in the context of the patent specification as understood by one of ordinary skill. I further understand that the words of the claims should be given their plain meaning unless that meaning is inconsistent with the patent specification or the patent's history of examination before the Patent Office. Counsel has also informed me, and I understand that, the words of the claims should be interpreted as they would have been interpreted by one of ordinary skill at the time of the invention was made (not today). I have been informed by Counsel that I should use August 5, 2011 as the point in time for claim interpretation purposes.

VI. OVERVIEW OF THE '755 PATENT

A. The '755 Patent

29. In a brief Background section, the '755 Patent states that “the present invention generally relate to touch screens.” APPLE-1001, 1:37-38.

30. In particular, the '755 Patent purports to provide an apparatus, “comprising: displaying a first user interface on a display, the first user interface including an object; while displaying the first user interface on the display, detecting a first input by a first contact on a touch-sensitive surface at a location in the first user interface that corresponds to the object of the first user interface; in response to detecting the first input by the first contact, in accordance with a determination that the first contact has a contact duration that is less than a duration threshold, displaying the object; and in response to detecting the first input by the first contact, in accordance with a determination that the first contact has a contact duration that is greater than the duration threshold, dynamically changing the appearance of the object, wherein the dynamic change in the appearance of the object is based at least in part on the duration of the first contact and wherein the dynamic change in the appearance of the object includes displaying, in sequence, at least some of a plurality of images based at least in part on the duration of the first contact.” APPLE-1001, 1:42-61.

31. Claim 1 of the '755 Patent, for example, recites “[a]n electronic device” comprising, among other components, “a touch-sensitive surface,” and “programs including instructions for:

in response to detecting [a] first input by [a] first contact, in accordance with a determination that the first contact has a magnitude that is above a threshold, *dynamically changing the appearance of the background of the first user interface without changing an appearance of the one or more foreground objects in the first user interface*, wherein the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact and wherein the dynamic change in the appearance of the background of the first user interface includes displaying in sequence at least some of a plurality of images based at least in part on the magnitude of the first contact.”

32. That is, claim 1 provides for a user interface that includes both a *background* and *foreground* objects and a dynamic change in appearance of only the *background* in response to detecting a first touch input (that has a magnitude above a threshold) on a portion of the display that corresponds to the *background*.

B. Prosecution History

33. On August 30, 2019, Application Serial No. 16/558,022, which later issued as the '755 Patent, was filed with 30 claims. APPLE-1002, 916-1089. On

September 18, 2019, Applicant canceled the original 30 claims and added claims 31-60. *Id.*, 891-910. Applicant then conducted an interview with the examiner discussing three sets of “proposed amendments” that Applicant asked the examiner to consider and enter “in exchange for an allowance”; Applicant then confirmed that the claims from the preliminary amendment should be examined. *Id.*, 354-356, 362-378, 414-429, 512, 586, 589, 598-612.

34. In a first Office action, the examiner objected to the drawings as not showing “dynamic change ... based at least in part on the duration of the first contact ... includes displaying, in sequence, at least some of a plurality of images based at least in part on the duration of the first contact” and rejected the claims as lacking written description support for “wherein the dynamic change in appearance of the object is based at least in part on the duration of the first contact and wherein the dynamic change in the appearance of the object includes displaying, in sequence, at least some of a plurality of images based at least in part on the duration of the first contact.” APPLE-1002, 347-351. The examiner further mentioned an IDS that Applicant filed on September 27, 2019, which included over 100 IDS pages “including numerous documents Applicant alleges to be pertinent prior art for consideration with no further discussion explaining the particular relevance of any documents. Any subsequent reviewing judiciary official is reminded to use careful discretion when applying the presumption of

administrative competence to grant deference to the fact finding of the examiner with respect to these documents as Examiner has made no factual finding with respect to their specific content.” *Id.* The examiner further included a warning to Applicant about intent to deceive. *Id.*

35. In a response to the Office action, Applicant amended the claims to indicate that the displayed object “includes one of a plurality of images, where the first user interface is displayed utilizing a photographic application and further includes at least one other object” and to indicate that the appearance of the object is dynamically changed “in a foreground while not dynamically changing an appearance of a background and not dynamically changing an appearance of the at least one other object.” APPLE-1002, 321-347. Applicant further amended the claims to change “duration of the first contact” to “magnitude of the first contact” and cited to portions of the specification in alleged support of written description. *Id.* In a final Office action, the examiner maintained the drawing objection and written description rejection, observing that the “support provided by Applicant appears to combine various features found in different embodiments.” *Id.*, 211-219.

36. In an after-final response, Applicant canceled all pending claims and added new claims 66-108, submitted a new replacement sheet for Figure 22, and cited portions of the specification that suggest that individual features described in

the specification can be implemented in combinations. APPLE-1002, 164-209.

Applicant then initiated an interview with the examiner “to explain support for the proposed claim amendment and expediate a [Notice of Allowance].” *Id.*, 129. The examiner then issued a Notice of Allowance. *Id.*, 121-128.

37. Notably, however, despite the hundreds of pages of references provided to the Office, the examiner did not issue a single prior art rejection before allowing the claims.

VII. PRIOR ART ANALYSIS

A. Ground 1A: Claims 1-3, 7, 10-11, 13, 15, 17, 20, 22-25, 29, 32-33, 35, 37-38, and 41-42 are obvious over Hackborn in view of Westerman

1. Hackborn¹

38. Hackborn explains that, in a mobile device, a GUI generated by an operating system includes a home screen where gadgets or widgets (e.g., a clock) provide information, and selectable controls (e.g., icons) allow users to launch applications associated with the icons. APPLE-1004, [0004]. The home screen “may be segregated into various display layers, with some layers appearing in front

¹ General descriptions provided for this and other references and combinations thereof are incorporated into each subsection and mapping of the claims that includes citations to these references.

of other layers.” *Id.*, [0005]. For example, the window for an active application can be visually in front of other objects and the homescreen can have a back-most layer, called a background or wallpaper, that typically fills the display. *Id.*, [0005].

39. In Hackborn, the wallpaper can be dynamic or “live,” where it can be “updated independently of other displayed graphics,” such as when “a user is swiping her finger across a touch-sensitive display screen of the computing device,” the blades of grass displayed in the background “are caused to bend or sway as if contacted by the user’s finger during the swipe,” as illustrated in Figure 1. APPLE-1004, [0027]-[0028]. Hackborn describes various components that can be included in live wallpaper, such as social network posts and images, a video stream “received from a digital camera on a device” and “real-time web content” such as “sports scores or stock prices.” *Id.*, [0035], [0045]. Hackborn teaches that multiple such components can be included simultaneously in the live wallpaper, e.g., the grass of FIG. 1 and the grass and weather of FIG. 5A. *Id.*, FIGS. 1, 5A.

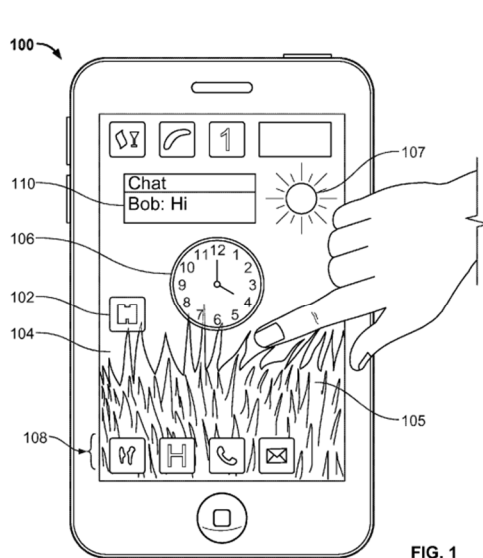


FIG. 1

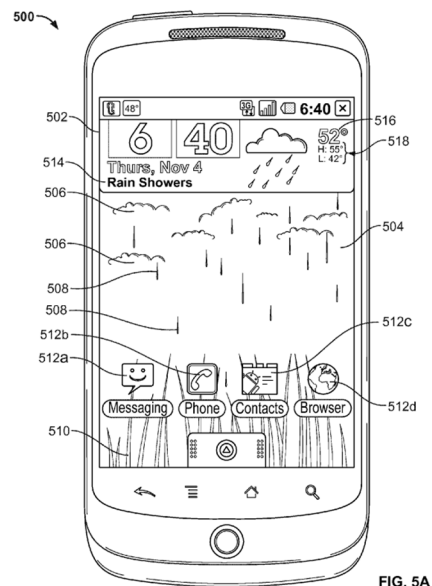


FIG. 5A

APPLE-1004 (Hackborn), FIGS. 1 and 5A.

40. Hackborn further explains that when “the user touches the screen, the live wallpaper receives a message, such as a vector representing the position, direction, and speed of the user’s dragging motion,” which can be used determine that the user’s finger contacted items on the wallpaper. APPLE-1004, [0033]. The device can use such input “to generate an animation that makes the grass blades look as if the finger is actually contacting them as it drags across the screen of the device.” *Id.*, [0033]. In some cases, the “live wallpaper may not be immediately responsive to user input on the screen of the device” and “may become responsive to direct user input only after a predetermined user input is received by the device.” *Id.*, [0028].

41. Hackborn includes alternative or additional forms of live wallpaper, such as “a video stream ... received from a digital camera on a device” and “real-time web content” such as “sports scores or stock prices.” APPLE-1004, [0035]. For example, Figure 4 (shown below) “shows an example of active content that includes information from a social [media] service being produced as live wallpaper.” *Id.*, [0018]. As shown in Figure 4, the “live wallpaper 404 displays images 406a-h fetched or received from one or more social services on the Internet,” such as “pictures posted to a social networking site (e.g., Google Buzz, Facebook, MySpace, Flickr, Twitter, and the like) by friends or acquaintances of the user.” *Id.*, [0040]. “Newly received images may be faded in over displayed images to take the place of the previously displayed images, for example, or may be scrolled in or otherwise assume a place in the display montage.” *Id.*, [0041].

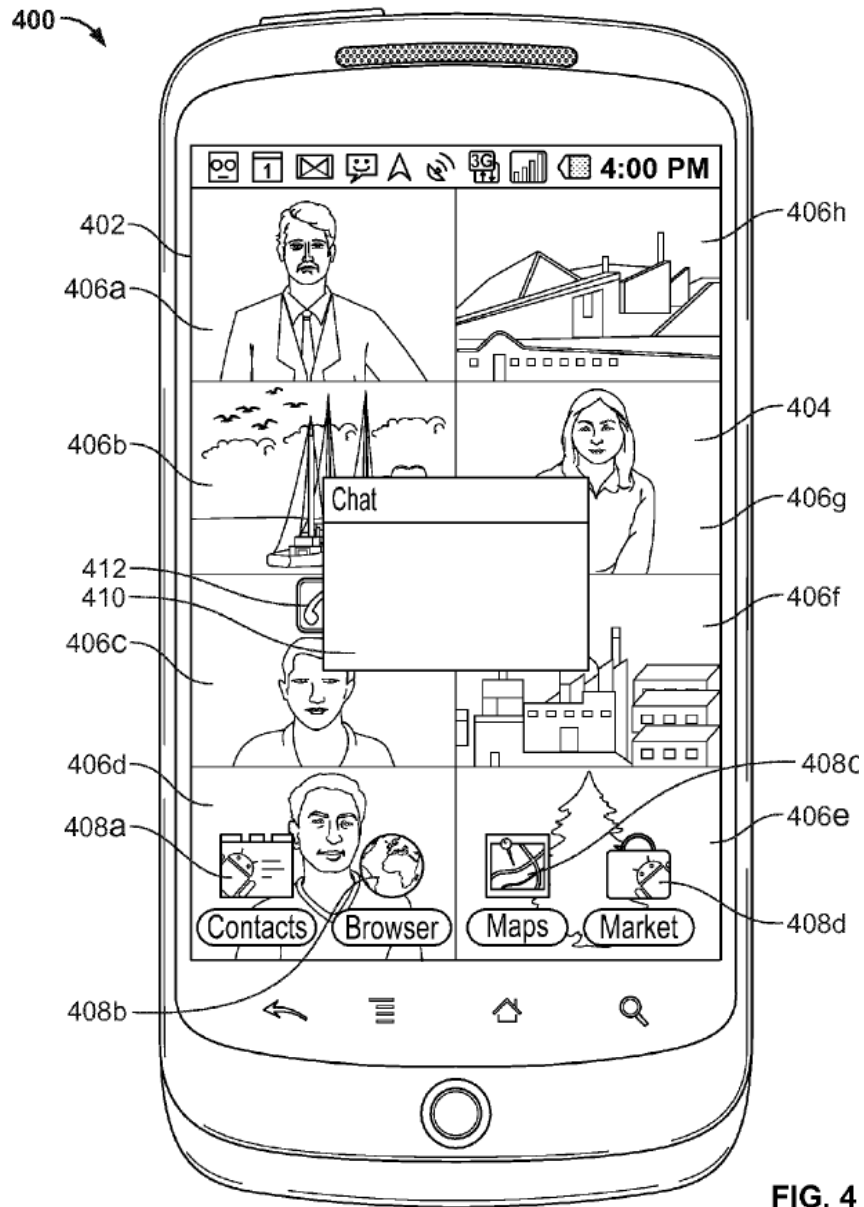


FIG. 4

APPLE-1004, FIG. 4

42. Figure 6 (shown below) “shows another example of active content that includes information from a social service being produced as live wallpaper.” APPLE-1004, [0020]. Like the example in Figure 4, the live wallpaper in Figure 6 can include images from one or more social networking sites. *Id.*, [0046], FIG. 6.

The images are part of “posts or tweets 606a-e” from the social networking sites.

Id. Hackborn explains that the “posts 606a-e may be displayed in various manners,” for example, “as new information is received, already displayed posts may be scrolled (e.g., downward) and the new post may be displayed in a predetermined position.” *Id.*, [0047].

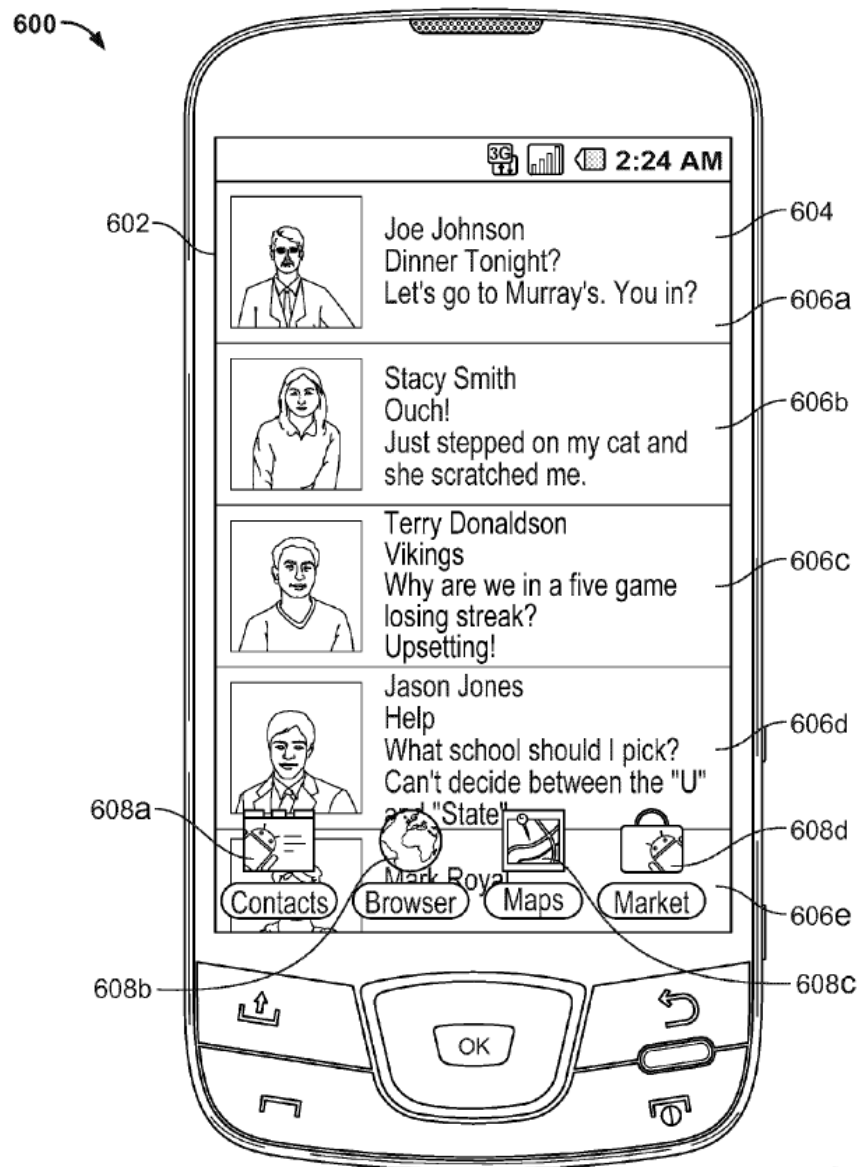


FIG. 6

APPLE-1004, FIG. 6

43. Hackborn explains:

For example, post 606*a* in the present example may be the most recently received message, and may be displayed near the top of the display 602. When post 606*a* is received, the previously displayed posts (e.g., posts 606*b*, 606*c*, 606*d*, 606*e*) may be shifted downward. As can be seen, post 606*e* is only partially displayed near the bottom of the display 602. Icons 608*a-d* are shown on a display layer above the wallpaper 604.

APPLE-1004, [0047].

2. Westerman

44. Westerman is directed to “interpreting manual swipe gestures as inputs in connection with touch-sensitive user interfaces,” such as those shown in Figure 13 below, that can receive both tap and swipe gestures. APPLE-1005, Abstract, [0018], [0040].

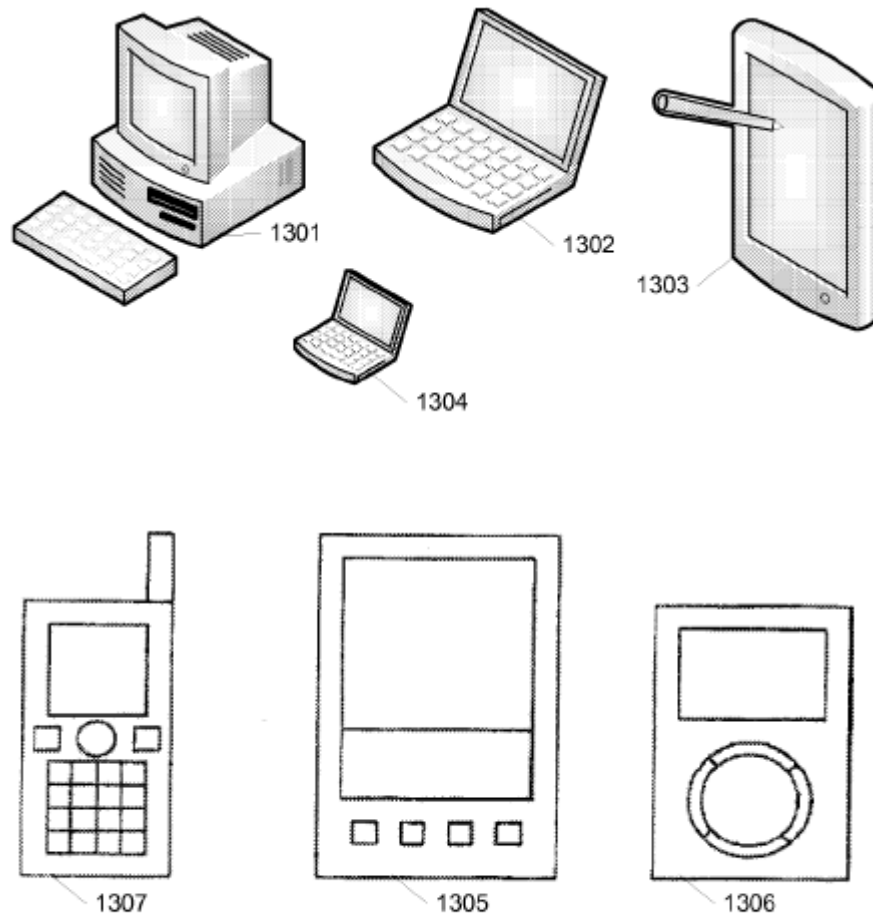


Fig. 13

APPLE-1005, FIG. 13

45. In particular, Westerman explains that a “swipe gesture” can be detected by “acquiring touch image data from the touch-sensitive device, processing the image to generate one or more finger path events, determining a displacement of the one or more finger path events, and detecting a swipe gesture if the displacement exceeds a predetermined threshold.” *Id.*, [0019]. “If the displacement does not exceed the threshold, the input can be interpreted as a

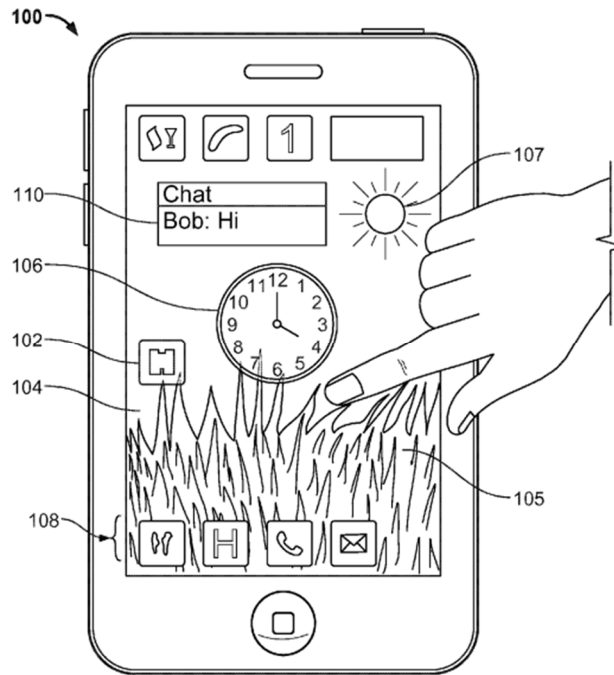
conventional tap.” *Id.* However, “If a swipe is detected, the tap that would have been recognized at the initial contact position of the swipe gesture must be cancelled.” *Id.* [0059]. In more detail, Westerman provides a “keyboard tap recognizer 904” and “keyboard slide recognizer 905.” *Id.*, [0060]. At 1001, “a finger path event is retrieved,” and at 1002, “it is determined if the new path event corresponds to a new touch, e.g., a finger that has just appeared on the surface.” *Id.* “If so, the touchdown location and time are captured (block 1003), and a path data structure 1004 containing this information is created.” *Id.* The “path data structure” is then “submitted to a displacement measurement process (block 1006),” which determines how much the path has moved in both horizontal and vertical directions. *Id.*, [0061]. The “displacement measurement process” determines “how much the path has moved in both horizontal direction ($D[i],x$), how much the path has moved in the vertical direction ($D[i],y$), and over what time ($T[i]$).” *Id.* “The total distance moved can then be compared to a minimum threshold of movement used to determine whether the touch event is a tap or a swipe (block 1007).” *Id.* “If there is little motion, i.e., less than the threshold, the event is interpreted as a key tap.” *Id.*

46. Additionally, Westerman teaches that “the system can [] look for an initial velocity at touchdown to distinguish a swipe from a tap,” thus taking into account both distance and time in identifying the type of input. APPLE-1005,

[0062]. A POSITA would have understood from Westerman's discussion that in using the "initial velocity," the system would compare the initial velocity to a threshold velocity. APPLE-1005, [0062] ("As an alternative to the time threshold, the system can instead look for an initial velocity at touchdown to distinguish a swipe from a tap.").

3. The Hackborn-Westerman Combination

47. Hackborn discloses a mobile device (e.g., a mobile phone) with a touch screen. APPLE-1004, [0025]-[0029], [0051]-[0057], FIGS. 1, 7. The device includes a display that shows content on a home screen, including, for example, a wallpaper 104, that "tends to appear to the user as though it were behind all icons, gadgets, images or other items that appear on the screen." *Id.*, [0026]-[0031]. Application 110 runs on a surface that appears on a "top level of the display." *Id.*, [0031]. An example of a mobile device with a touch screen that shows wallpaper and other components, such as widgets and icons, is shown below in Figure 1 of Hackborn.



APPLE-1004 (Hackborn), FIG. 1

48. As shown in Figure 1, the wallpaper 104 is “live” in that the wallpaper is “an object that includes executable code so that the wallpaper may be active, and in this example may respond to inputs from a user of the computing device or otherwise change in response to received information from the user.” APPLE-1004, [0026]. Hackborn further teaches that various content can be included in the live wallpaper, including, for example, animation of grass moving, “graphics that indicate current and predicted weather” and “information fetched or received from one or more social services on the Internet,” such as “Google Buzz, Facebook, MySpace, Flickr, Twitter, and the like.” *Id.*, [0028], [0033], [0043]-[0047]. Regarding the animation of moving grass, Hackborn explains that “executable

code of the object may cause the wallpaper 104 to change in appearance, perhaps at the direction of a display controller, following receipt of information, and such change in appearance may provide updated information, altered aesthetics, a change of theme, environment or pace, or a diversion from the status quo.” *Id.* In operation, as shown in Figure 1, “a user is swiping her finger across a touch-sensitive display screen of the computing device,” and “[i]n response, the blades of grass 105 displayed in the area of the screen swiped by the user are caused to bend or sway as if contacted by the user’s fingers during the swipe.” *Id.*, [0027]; *see also id.*, [0028], [0033]. Hackborn explains that touch input received by its device may be used to provide “a vector representing the position, direction, and speed of the user’s dragging motion,” which “may then be used by the process executing the wallpaper 104 to determine that the user’s finger contacted items on the wallpaper—here, the grass 105.” *Id.*, [0033]. “Such information may be used to generate an animation that makes the grass blades look as if the finger is actually contacting them as it drags across the screen of the device 100.” *Id.*

49. Hackborn explains that, “[i]n the example shown in FIG. 1, a user is swiping her finger across a touch-sensitive display screen,” and in response, “the blades of grass 105 displayed in the area of the screen swiped by the user are caused to bend or sway as if contacted by the user’s finger during the swipe.” APPLE-1004, [0028]; *see also id.*, [0033] (“Such information may then be used by

the process executing the wallpaper 104 to determine that the user's finger contacted items on the wallpaper—here, the grass 105. Such information may be used to generate an animation that makes the grass blades look as if the finger is actually contacting them as it drags across the screen of the device 100.”), [0034] (“Other various effects may also be achieved in a similar manner.”).

50. In addition to receiving swipe inputs on the touchscreen, Hackborn teaches that its device can receive other “predetermined inputs,” including “tapping on the display screen.” *Id.*, [0028]. In response, Hackborn states that “[t]he touch interface 706 may coordinate with the display controller 704 to identify what item or items on a display a user is selecting by touching at a particular location.” *Id.*, [0054]. To the extent Hackborn lacks details on how to distinguish tap from swipe inputs, a POSITA would have naturally looked to other prior art teachings that discuss “interpreting manual swipe gestures as input in connection with touch-screen keyboards,” such as Westerman. APPLE-1005, [0011].

51. Westerman discloses an “electronic device 100” with “a display 110 that also incorporates a touch screen.” APPLE-1005, [0041]. Westerman describes “interpreting swipe gesture input to a device having a touch-sensitive input.” *Id.*, [0018]. In particular, Westerman teaches detecting a swipe gesture by “acquiring touch image data from the touch-sensitive device, processing the image to generate one or more finger path events, determining a displacement of the one

or more finger path events, and detecting a swipe gesture if the displacement exceeds a predetermined threshold.” *Id.*, [0019]. “If the displacement does not exceed the threshold, the input can be interpreted as a conventional tap.” *Id.* Additionally, Westerman teaches using “an initial velocity at touchdown to distinguish a swipe from a tap,” by using the horizontal and vertical displacement and over what time.” *Id.*, [0061]-[0062].

52. A POSITA reviewing the device and methods of Hackborn would have naturally looked to Westerman to better understand the implementation details of Hackborn’s teachings, for example, as it relates to how to discern between different types of user inputs—namely, a tap or a swipe. Thus, given that Hackborn explains that its device can register both swipes and taps (APPLE-1004, [0028]), a POSITA would have found it obvious to implement Hackborn with methods of distinguishing between tap and swipe gestures (e.g., using “predetermined thresholds”), such as those disclosed or rendered obvious by Westerman, as indeed these and similar methods were well known by the Critical Date. *See* APPLE-1007, [0027] (defining user inputs based on threshold distances, times, etc.).

53. A POSITA would have understood that implementing Hackborn’s device to “determin[e] a displacement of one or more finger path events” and “detecting a swipe gesture if the displacement exceeds a predetermined threshold”

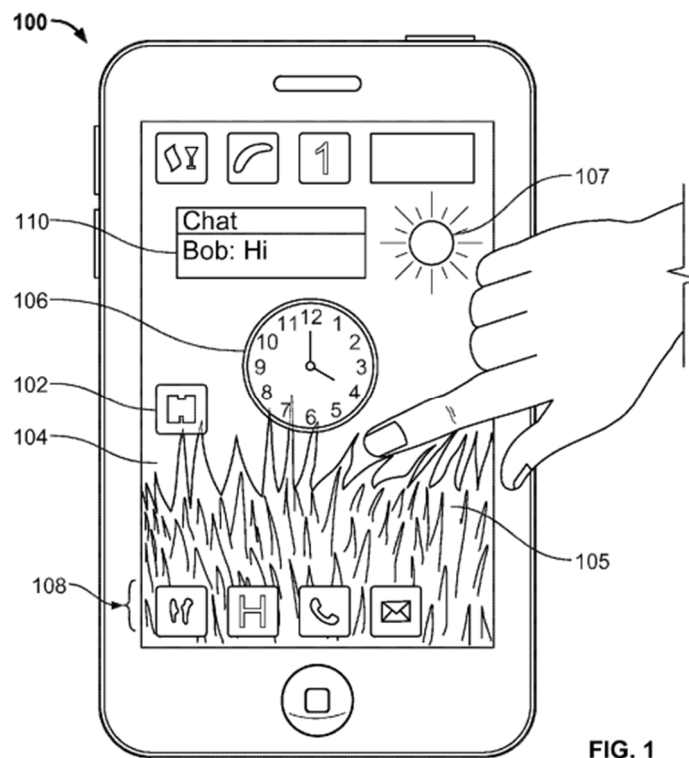
would provide a clear method for distinguishing between a tap gesture and a swipe gesture. APPLE-1005, [0019]; *see also* APPLE-1007, [0027] (“a stroke or moving contact/touch (a touch that in a substantially uninterrupted manner traverses at least a predetermined minimum portion of the touch element 112)”). Moreover, a POSITA would have further understood that implementing Hackborn’s device to use the “initial velocity at touchdown [of the input]” to compare with a particular threshold value would further provide Hackborn’s device with a method “to distinguish a swipe from a tap.” APPLE-1005, [0019], [0061]-[0062]. A POSITA would have recognized that applying Westerman’s teachings and using these thresholds (“predetermined threshold” and a threshold pertaining to velocity) for distinguishing between taps and swipes in Hackborn’s device would have led to predictable results without significantly altering or hindering the functions performed by Hackborn’s device, particularly because Hackborn already contemplates receiving both types of inputs (tap and swipe). A POSITA would have been motivated to implement Hackborn’s device with Westerman’s teachings in the Hackborn-Westerman device to achieve the predictable results offered by Westerman’s description of those thresholds. APPLE-1005, [0018]-[0019], [0025], [0059], [0061]-[0064]. Because recognizing predetermined touch inputs was known, and Hackborn and Westerman both describe the use of touchscreen devices and predetermined criteria for registering touches on the devices, a

POSITA would have reasonably understood the combination of Hackborn with Westerman to be successful with no unexpected results. APPLE-1004, [0028]; APPLE-1005, Abstract, [0018]-[0019], [0025], [0041], [0059], [0061]-[0064].

4. Claim 1

[1.pre] An electronic device, comprising:

54. To the extent the preamble is limiting, the Hackborn-Westerman device renders obvious an electronic device. APPLE-1004, [0026]-[0027], [0051], [0061]-[0062], FIGS. 1, 7, 8.



APPLE-1004 (Hackborn), FIG. 1.

[1.a] a display;

55. The Hackborn-Westerman device includes a display. APPLE-1004, [0026]-[0027], [0028] (“touch-sensitive display screen”), [0051]-[0054], [0061]-[0062], FIGS. 1, 3A-3B, 4, 5A-5B, 6-8. For example, Hackborn explains that computing device 100 of Figure 1 includes “a display screen.” APPLE-1004, [0026], FIG. 1.

[1.b] a touch-sensitive surface;

56. The Hackborn-Westerman device includes a touch-sensitive surface in the form of a touch screen. APPLE-1004, [0028] (“touch-sensitive display screen,” “touchscreen”), [0051]-[0052] (“touchscreen 702”), [0054] (“touch interface 706”), FIGS. 1, 7.

[1.c] one or more processors;

57. The Hackborn-Westerman device includes one or more processors. APPLE-1004, [0022], [0060]-[0062], [0064], [0067]-[0069], FIG. 8. In particular, Hackborn describes an example of “a generic mobile computer device 850, which can be used as the mobile device of Hackborn. APPLE-1004, [0060]-[0061], FIG. 8. “Computing device 850 includes a processor 852, memory 864, an input/output device such as a display 854, a communication interface 866, and a transceiver 868, among other components.” *Id.*, [0067].

[1.d] memory; and

58. The Hackborn-Westerman device includes memory. APPLE-1004, [0022], [0060]-[0062], [0064], [0067]-[0069], [0070]-[0071], FIG. 8. In particular, Hackborn's computing device "includes a processor 852, memory 864, an input/output device such as a display 854, a communication interface 866, and a transceiver 868, among other components." *Id.*, [0067]; *see also id.*, APPLE-1004, [0060]-[0061], [0070]-[0071], FIG. 8.

[1.e] 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, the one or more programs including instructions for:

59. The Hackborn-Westerman device includes programs stored in memory and configured to be executed by the processor. APPLE-1004, [0022], [0060]-[0062], [0064], [0067], [0068] ("processor 852 can execute instructions within the computing device 850, including instructions stored in the memory 864"), [0070]-[0071], FIG. 8. In particular, "a computer program product contains instructions that, when executed, perform one or more methods, such as those described" in Hackborn. APPLE-1004, [0071].

[1.f] displaying a first user interface on the display, wherein the first user interface includes:

60. The programs executed by the processor of the Hackborn-Westerman device display a first user interface on the display. APPLE-1004, [0009] ("method for generating a graphical user interface on a display of a computing device

includes generating a graphical wallpaper representation”), [0023], [0026], [0036] (“execute code so as to produce interesting and compelling user interface examples”), [0051], [0054], [0058], FIGS. 1, 7, 9. For example, Hackborn shows in Figure 1 and explains that the computing device 100 has a display screen that shows various objects and wallpaper 104. APPLE-1004, [0026]. Figure 9 further provides a “flow chart of an example method 900 for generating a graphical user interface on a display of a computing device.” *Id.*, [0058], FIG. 9.

[1.g] a background with an appearance, and

61. The first user interface displayed on the Hackborn-Westerman device includes a background with an appearance. APPLE-1004, [0009] (“method for generating a graphical user interface on a display of a computing device includes generating a graphical wallpaper representation”), [0011]-[0012] (“generating a graphical representation of a background wallpaper for a home screen of a computing device”), [0015], [0023], [0025], [0026], [0030], [0031], [0036], [0051], [0054], [0058], FIGS. 1, 2, 7, 9. Hackborn explains that, “[t]raditionally, a home screen includes a background, which may ... include an image in the form of wallpaper.” APPLE-1004, [0025]. For example, Hackborn shows in Figure 1 and explains that the computing device 100 has a display screen that shows various objects and wallpaper 104. *Id.*, [0026]. In the example of Figure 1, the wallpaper 104 has an appearance of “grass 105 below a sunny sky 107.” *Id.* Moreover,

Hackborn explains that the method 900 of Figure 9 is “for generating a graphical user interface on a display of a computing device,” where a “graphical wallpaper representation is generated in a first process on a first visual layer on a display of a computing device (910).” *Id.*, [0058], FIG. 9.

[1.h] one or more foreground objections;

62. The first user interface displayed on the Hackborn-Westerman device includes one or more foreground objects. APPLE-1004, [0009] (“generating one or more graphical objects in a second process on a second visual layer of the display, wherein the second visual layer is positioned visually on top of the first visual layer”), [0023], [0025], [0026], [0030] (“The four icons 108 shown near the bottom of the display in FIG. 1 illustrate this point, as the icons 108 appear on top of, or over, the grass 105 of the wallpaper 104. In the case of each of the four icons 108, the icons completely hide or obscure the portion of the wallpaper that is below or under the icons 108, as displayed.”), [0031], [0036], [0041], [0043] [0051], [0054], [0058], FIGS. 1, 2, 4, 5A-B, 7, 9. Hackborn explains that “[i]cons may be shown on a visual layer in front of the background/wallpaper, meaning that the icons can be moved independently of the wallpaper, and are displayed by the device visually on top of the wallpaper, so that when there is an overlap, the icons are shown and the wallpaper is obscured.” APPLE-1004, [0025]. For example, Figure 1 of Hackborn shows foreground objects in the form of “icon 102,” “gadget

106,” and “application 110,” each of which exist on a layer in front of the wallpaper 104, as shown in Figure 2 (below). *Id.*, [0031].

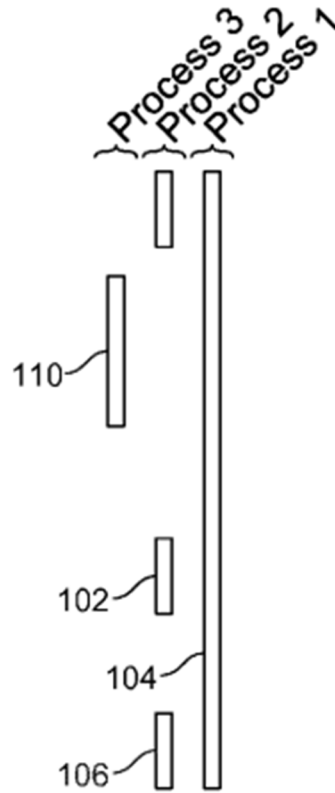


FIG. 2

APPLE-1004 (Hackborn), FIG. 2.

63. In the method 900 of Figure 9, “[o]ne or more graphical objects are generated in a second process on a second visual layer of the display (200), where the second visual layer may be positioned visually on top of the first visual layer.” *Id.*, [0058], FIG. 9.

[1.i] while displaying the first user interface on the display, detecting a first input by a first contact on the touch-sensitive surface at a location in the

first user interface that corresponds to the background of the first user interface; and

64. The programs executed by the processor of the Hackborn-Westerman device² detect a first input by a first contact on the touch-sensitive surface at a location in the first user interface that corresponds to the background of the first user interface while displaying the first user interface on the display. APPLE-1004, [0028], FIG. 1. For example, with reference to Figure 1, Hackborn explains that “a user is swiping her finger across a touch-sensitive display screen of the computing device”—providing a first input by a first contact on the touch-sensitive surface at a location in the first user interface that corresponds to the background of the first user interface while displaying the first user interface on the display—and, “[i]n response, the blades of grass 105 displayed in the area of the screen swiped by the user are caused to bend or sway as if contacted by the user’s finger during the swipe”—showing the detecting of the first input by the first contact by the Hackborn-Westerman device. APPLE-1004, [0028].

[1.j] in response to detecting the first input by the first contact, in accordance with a determination that the first contact has a magnitude that is above a

² Where the Declaration states that the device can perform particular tasks, a POSITA would have understood or found it obvious that the device performs the particular tasks using programs executed by the processor of the device where the programs include instructions for performing the particular task.

threshold, dynamically changing the appearance of the background of the first user interface without changing an appearance of the one or more foreground objects in the first user interface,

65. The programs executed by the processor of the Hackborn-Westerman device, in response to detecting the first input by the first contact, in accordance with a determination that the first contact has a magnitude above a threshold, dynamically change the appearance of the background of the first user interface without changing an appearance of the one or more foreground objects in the first user interface. APPLE-1004, [0025], [0028], [0033], [0043], [0054], FIGS. 1, 5A-5B, claim 18 (“change a manner in which the graphical wallpaper representation is displayed using the generated information”), claim 19; APPLE-1005, [0018]-[0019], [0060]-[0064]. For example, with reference to Figure 1, Hackborn explains that, in response to a user “swiping her finger across a touch-sensitive display screen” shown in Figure 1, “the blades of grass 105 displayed in the area of the screen swiped by the user are caused to bend or sway as if contacted by the user’s finger during the swipe.” APPLE-1004, [0028]. In response to the user input, the Hackborn-Westerman device dynamically changes the appearance of the wallpaper without changing the appearance, for example, of the icons and other objects displayed in the foreground layer(s). APPLE-1004, [0028], [0033], [0043], FIGS. 1, 5A-5B.

66. Hackborn further teaches or renders obvious that, while the live wallpaper changes (e.g., grass appears to sway) responsive to the user touch, the icons do not move. APPLE-1004, [0028], [0033], [0040]-[0043], [0046]-[0048], FIGS. 1, 4, 5A-5B, 6. For instance, Hackborn states that “the application area would be displayed above the wallpaper layer and the icon layer” such that the “live wallpaper 604 may continue to update in the background, whether the user is working on applications or not.” APPLE-1004, [0047]. “When wallpaper updates occur and the appearance of the wallpaper 604 is caused to change, the wallpaper may continue to occupy the bottom-most viewed display layer or plane of the display 602, for example below the icon or gadget layer and further below one or more application layers.” *Id.* Hackborn also explains that display updates to the background may occur independently of updates to other displayed items – “the wallpaper object may execute in its own separate environment, and the wallpaper 104 may be updated independently of other displayed graphics that are associated with the other objects, constructs, or applications.” *Id.*, [0027]. Hackborn also discloses that “[i]cons may be shown on a visual layer in front of the background/wallpaper, meaning that the icons can be moved independently of the wallpaper.” *Id.*, [0025]. Based at least on these disclosures of independence between background and foreground display updates, and on Hackborn’s discussion of different “layers” of appearance of the interface, a POSITA would

have understood that a user swipe on the grass would affect only the appearance of the wallpaper and not the appearance of any of the objects on layers above the wallpaper layer, or, at the least, they would have found this obvious from the cited disclosures of Hackborn. *See* APPLE-1004, [0029]-[0036], FIG. 2. Moreover, Hackborn only describes movement of the wallpaper (e.g., grass) when a user swipes across the grass and not movement of any of the application or icon objects. *Id.*

67. Moreover, as discussed above in §VII.A.3, a POSITA would have further found obvious that the Hackborn-Westerman device would be implemented such that if the user input “exceeds the minimum swipe length threshold” and/or if the “initial velocity at touchdown” is greater than a velocity threshold, the input is “interpreted as a swipe event.” APPLE-1005, [0018]-[0019], [0060]-[0061] (describing the use of distance and time magnitudes associated with the input), [0062] (explaining that “an initial velocity at touchdown” can be used “to distinguish a swipe from a tap”), [0063]-[0064]. Thus, the detection of the user input would be in accordance with a determination that the input has a magnitude (e.g., path length) that is above a threshold, or predetermined minimum. *Id.* For example, if the magnitude of the touch is large enough to be registered as a swipe because its “path has been determined to exceed the minimum length threshold for

a swipe gesture,” then the grass is displayed as swaying in response. APPLE-1005, [0064].

[1.k] wherein the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact and

68. The programs executed by the processor of the Hackborn-Westerman device dynamically change appearance based on the magnitude of the contact. APPLE-1004, [0026] (“wallpaper may be active, and in this example may respond to inputs from a user”), [0028] (“blades of grass 105 displayed in the area of the screen swiped by the user are caused to bend or sway as if contacted by the user’s finger during the swipe”), [0033] (“vector representing the position, direction, and speed of the user’s dragging motion”), [0043], [0054], FIGS. 1, 5A-5B; APPLE-1005, [0018]-[0019], [0060]-[0064]. For example, Hackborn explains that, as shown in Figure 1, when a user swipes on the grass in the “live” wallpaper, “the grass blades look as if the finger is actually contacting them as it drags across the screen of the device.” APPLE-1004, [0033]. Thus, the farther the swipe, the more extreme the grass movement expected from Hackborn. *Id.* The dynamic change in appearance of the background (e.g., grass moving) is based at least in part on the magnitude of the gesture because the grass movement effect only occurs in the Hackborn-Westerman device if the input is determined to be a swipe, in accordance with the magnitude (e.g., path length) of the input, per Westerman.

APPLE-1004, [0028] (describing “the blades of grass 105 displayed in the area of the screen swiped by the user” in response to the user swiping her finger across the screen); APPLE-1005, [0018]-[0019], [0060]-[0064].

[1.] wherein the dynamic change in the appearance of the background of the first user interface includes displaying in sequence at least some of a plurality of images based at least in part on the magnitude of the first contact.

69. The dynamic change in appearance of the background of the first user interface of the Hackborn-Westerman device includes displaying in sequence a plurality of images based in part on the magnitude of the first contact. APPLE-1004, [0008], [0028], [0033], [0040], [0046], [0050], FIGS. 1, 4, 6, claims 32-33; APPLE-1005, [0018]-[0019], [0060]-[0064]. In particular, Hackborn explains that the blades of grass in the “live” wallpaper are “displayed in the area of the screen swiped by the user are caused to bend or sway as if contacted by the user’s finger during the swipe.” APPLE-1004, [0028]. As discussed above, in response to a determination that a magnitude (e.g., path length) of the user input indicates the input to be a swipe, the device “generate[s] an animation that makes the grass blades look as if the finger is actually contacting them as it drags across the screen.” *Id.*, [0033]; APPLE-1005, [0018]-[0019], [0060]-[0064]. The ’755 Patent appears to have limited, if any, discussion of a dynamic change of appearance of a background and what is meant by this limitation. However, a POSITA would have understood or found obvious that such an “animation” showing the movement of

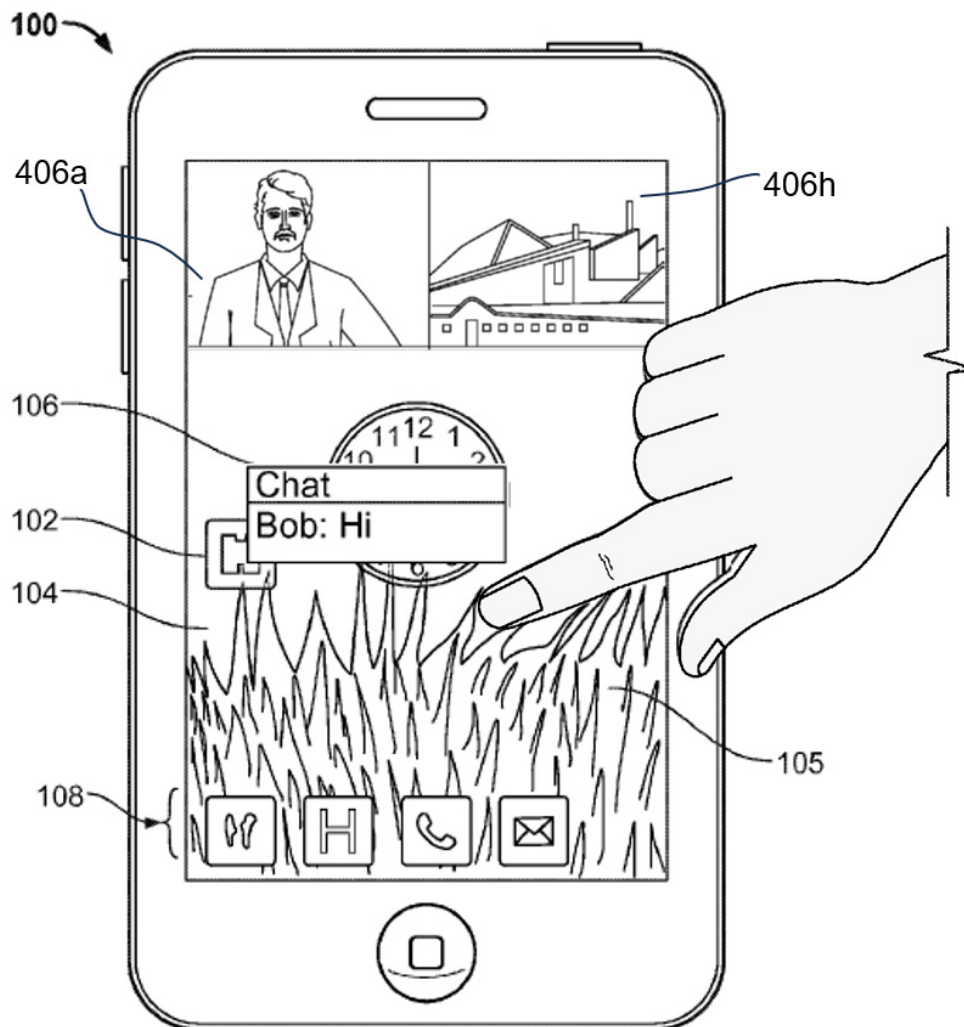
grass would comprise a plurality of images shown in succession that cause the user to see what appears to be the movement of grass, where each of the images are slightly different from one another but displayed in sequence so as to suggest movement as the images change. *See, e.g.*, APPLE-1026, 1:57-59 (“posing of a subject in a series of predefined poses corresponding to image objects to be incorporated into said animated image presentation”); APPLE-1027, [0296] (“an animation is a display of a sequence of images that gives the appearance of movement, and informs the user of an action that has been performed”). Indeed, Hackborn describes “produc[ing] an animated *sequence* coordinated with [a] user selection, at or near” a “location on the display at which the user interacts.” APPLE-1004, claims 32-33 (emphasis added). In this way, Hackborn teaches displaying in sequence *at least some* of a plurality of images. *Id.*

70. Hackborn further teaches other images (in addition to the “at least some”) of the plurality of images that are displayed in the live wallpaper. In addition to the live grass animation in the live wallpaper, Hackborn describes other “active content” that can be included in the live wallpaper. APPLE-1004, [0008]. Indeed, Hackborn states that “live wallpaper can include a *combination* of the described wallpaper examples.” *Id.*, [0050] (emphasis added).

71. For example, Hackborn explains that “active content being produced as wallpaper 404 for a display 402” can include “images 406a-h fetched or received from one or more social services on the internet,” including “pictures posted to a social networking site (e.g., Google Buzz, Facebook, MySpace, Flickr, Twitter, and the like).” APPLE-1004, [0040], FIG. 4; *see id.*, [0046], FIG. 6. “The images 406a-h may be arranged in any appropriate pattern, and more or fewer images may be displayed at a given time,” including having “new images may be added to the wallpaper or replace one or more images that had been displayed on the wallpaper 404.” *Id.*, [0040]. In some instances, “video, rather than still images, may be shown as part of the live wallpaper.” *Id.* In another example, Hackborn explains that “a live image being captured in real-time by a digital camera in the computing device” can be displayed “in the graphical wallpaper representation.” *Id.*, [0008]. A POSITA would have found obvious that “a live image” includes one or more photographs captured with the camera. Moreover, capturing more than one photograph for display in the live wallpaper produces no new and unexpected result as opposed to capturing and displaying just a single photograph for display in the live wallpaper.

72. In this way, the dynamic change in the appearance of the background of the first user interface in the Hackborn-Westerman device includes displaying in sequence the images that produce the appearance of the grass swaying in an

animation (i.e., *at least some of a plurality of images*), while the plurality of images includes the grass swaying sequence of images and any number of other images (e.g., photographs from the camera; social media images). APPLE-1004, [0008], [0040], [0046], [0050], FIGS. 1, 4, 6. A composite image is provided below that illustrates the “at least some of a plurality of images” as the swaying grass and other images of the plurality of images (406a, 406h). *See infra* discussion of Claim 11.



Composite image based on APPLE-1004, FIGS. 1 and 4

73. Thus, a POSITA would have understood that the live wallpaper can include any combination, for example, of the moving grass images, photographs, and images from social network websites. APPLE-1004, [0050].

5. Claim 2

[2] The electronic device of claim 1, wherein the electronic device is configured such that the threshold is associated with an operating system of the electronic device, and respective operations of respective applications on the electronic device are activated in response to detecting respective inputs that satisfy the threshold.

74. The Hackborn-Westerman device renders obvious “wherein the electronic device is configured such that the threshold is associated with an operating system of the electronic device, and respective operations of respective applications on the electronic device are activated in response to detecting respective inputs that satisfy the threshold.” APPLE-1004, [0002]-[0004], [0006], [0028], [0031], [0042]-[0043], [0048], [0052], [0057]; APPLE-1005, [0018]-[0019], [0060]-[0064]; APPLE-1006, [0018], [0031], [0046]. Hackborn relates to “components of computer operating systems, including background desktop components commonly referred to as computer wallpaper” and “managing objects on a home screen for a computer operating system.” APPLE-1004, [0002], [0006]. Hackborn explains that “[c]omputer operating systems perform a number of functions, including serving as a bridge between computer hardware and computer

applications that run on the operating systems,” and “[m]odern computer operating systems also provide basic graphical user interfaces (GUIs) by which users can interact with components of the operating system in more intuitive manners,” such as by defining “basic graphical building blocks that applications can access so they can generate advanced and consistent user interfaces relatively easily.” *Id.*, [0003]. Operating systems can generate a GUI such as a desktop or homescreen with “various selectable controls,” such as icons, gadgets, and widgets “displayed over [the] home screen.” *Id.*, [0004]. Hackborn further explains that “each of the particular visual layers of objects runs on its own executing process or environment in an operating system that is separate and distinct from the processes or environments in which objects for other layers run.” *Id.*, [0031]. Additionally, an “objects/wallpapers 712 data store” stores “information about various entities needed to provide the functionality” described in Hackborn. *Id.*, [0057]; *see also id.*, [0052]. These and other “custom operating system elements” are stored in the data store. *Id.* A POSITA would have understood that Hackborn’s operating system provides the GUI, and a determination of tap versus swipe is a GUI function. Additionally, a POSITA would have understood that the threshold (e.g., path length) is associated with an operating system of the device, as the threshold (and other thresholds relating to “selectable controls” and functionality described

in Hackborn are stored in a data store and run on a particular operating system. *Id.*, [0002]-[0004], [0031], [0052], [0057].

75. Additionally, as discussed above in §VII.A.3, the Hackborn-Westerman device changes the appearance of its live wallpaper in response to detecting a swiping motion—that is, determining that a magnitude relating to a touch input is greater than a predetermined threshold (e.g., path length). APPLE-1005, [0018]-[0019], [0060]-[0064]. Westerman teaches if the “displacement measurement” of a gesture is less than a minimum threshold, that gesture is identified as a tap, and if it is greater than the minimum threshold, the gesture is identified as a swipe. *Id.* Hackborn teaches that “predetermined user inputs” can “cause the live wallpaper to become responsive to user input,” including selecting an icon, “making a particular movement on or across the display screen, or tapping on the display screen a predetermined number of times within a predetermined time period,” which may, in a first mode, be directed to icons displayed on the wallpaper. APPLE-1004, [0028]. A POSITA would have understood that the predetermined touches of Hackborn would be defined by threshold values that characterize the predetermined touches (e.g., predetermined threshold or minimum swipe length threshold of Westerman), and the threshold values would be associated with the operating system of the Hackborn-Westerman device. A POSITA would have further understood that these values are stored such that when

an input is received, the operating system can compare the magnitude of the input to the stored threshold value and perform a corresponding operation of respective applications. APPLE-1004, [0031], [0042] (“the user may select one of the images ... which may cause an application to launch or bring focus to the application”), [0043] (“Were the user to select one of the icons 512 ... an application may be launched or activated and an application window may appear on a plane, surface, or level of the display”), [0048], [0052], [0057]. Moreover, in corroboration, Townsend confirms, for example, that “the operating system may provide a common driver model for multi-touch hardware manufacturers to provide touch information for their particular hardware,” such that the “operating system” can “translate touch information” into “window messages” (e.g., comparing touch information with threshold values) and “pass these messages to the application.” APPLE-1006, [0018]; *see id.*, [0031], [0046].

6. Claim 3

[3] *The electronic device of claim 1, wherein the electronic device is configured such that a respective foreground object of the one or more foreground objects responds to an input by a contact having a magnitude below the threshold.*

76. The Hackborn-Westerman device renders obvious “wherein the electronic device is configured such that a respective foreground object of the one or more foreground objects responds to an input by a contact having a magnitude below the threshold.” APPLE-1004, [0004], [0025], [0043], FIGS. 5A-5B;

APPLE-1005, [0018]-[0019], [0060]-[0064]. As discussed above in §VII.A.3, the Hackborn-Westerman device uses values associated with a user gesture as compared to predetermined thresholds to identify the type of input (e.g., tap or swipe). APPLE-1005, [0018]-[0019], [0060]-[0064]. A POSITA would have understood that, in the Hackborn-Westerman device, if the magnitude of the touch is not large enough to be registered as a swipe because “there is little motion, i.e., less than the threshold,” then the Hackborn-Westerman device interprets “the event ... as a key tap.” APPLE-1005, [0061]. A POSITA would have understood that a tap on a foreground object (e.g., icon) displayed on the Hackborn-Westerman device would cause the “user to select one of the icons 512,” and “an application may be launched or activated,” as Hackborn teaches. APPLE-1004, [0043], FIGS. 5A-5B.

7. Claim 7

[7] The electronic device of claim 1, wherein the one or more programs include instructions for: in response to detecting the first input by the first contact on the touch-sensitive surface, in accordance with a determination that the first input does not have a magnitude above the threshold, maintaining the appearance of the background of the first user interface.

77. The Hackborn-Westerman device renders obvious “wherein the one or more programs include instructions for: in response to detecting the first input by the first contact on the touch-sensitive surface, in accordance with a determination that the first input does not have a magnitude above the threshold, maintaining the

appearance of the background of the first user interface.” APPLE-1004, [0028] (“making a particular movement on or across the screen”); APPLE-1005, [0018]-[0019], [0060]-[0064]. As discussed above in §VII.A.3, the Hackborn-Westerman device changes the display of the live wallpaper background when a swipe is detected, as taught by Hackborn. APPLE-1004, [0028]. In particular, Hackborn teaches that the live wallpaper is responsive to the particular input, for example, such that the “blades of grass 105 displayed in the area of the screen swiped by the user are caused to bend or sway as if contacted by the user’s finger during the swipe.” APPLE-1004, [0028]. In the discussion of the “blades of grass” live wallpaper, Hackborn describes the wallpaper as being responsive only to movement (e.g., swiping input, dragging input). *Id.*, [0008], [0028]. To the extent that Hackborn contemplates response to other user actions (e.g., “tapping on the display screen a predetermined number of times within a predetermined time period”), a POSITA would have understood that any such response was one of a finite number of options, including response-to-tap and no-response-to-tap. *See id.*, [0028].

78. In addition, given Hackborn’s clear disclosures that “the blades of grass ... are caused to bend or sway as if contacted by the user’s finger *during the swipe*,” a POSITA would have understood or found obvious that, in Hackborn, any movement by the grass is not displayed until the finger begins moving across the

display. APPLE-1004, [0028]. If the magnitude (e.g., path length) is below a threshold, the Hackborn-Westerman device identifies the user input as a tap, rather than a swipe, as taught by Westerman. APPLE-1005, [0061]. Thus, a POSITA would have understood that if the magnitude (e.g., path length) is not above the threshold, the Hackborn-Westerman device identifies the gesture as a tap, and not a swipe, so the background remains unchanged.

8. Claim 10

[10] The electronic device of claim 1, wherein the electronic device is configured such that the plurality of images is associated with the background.

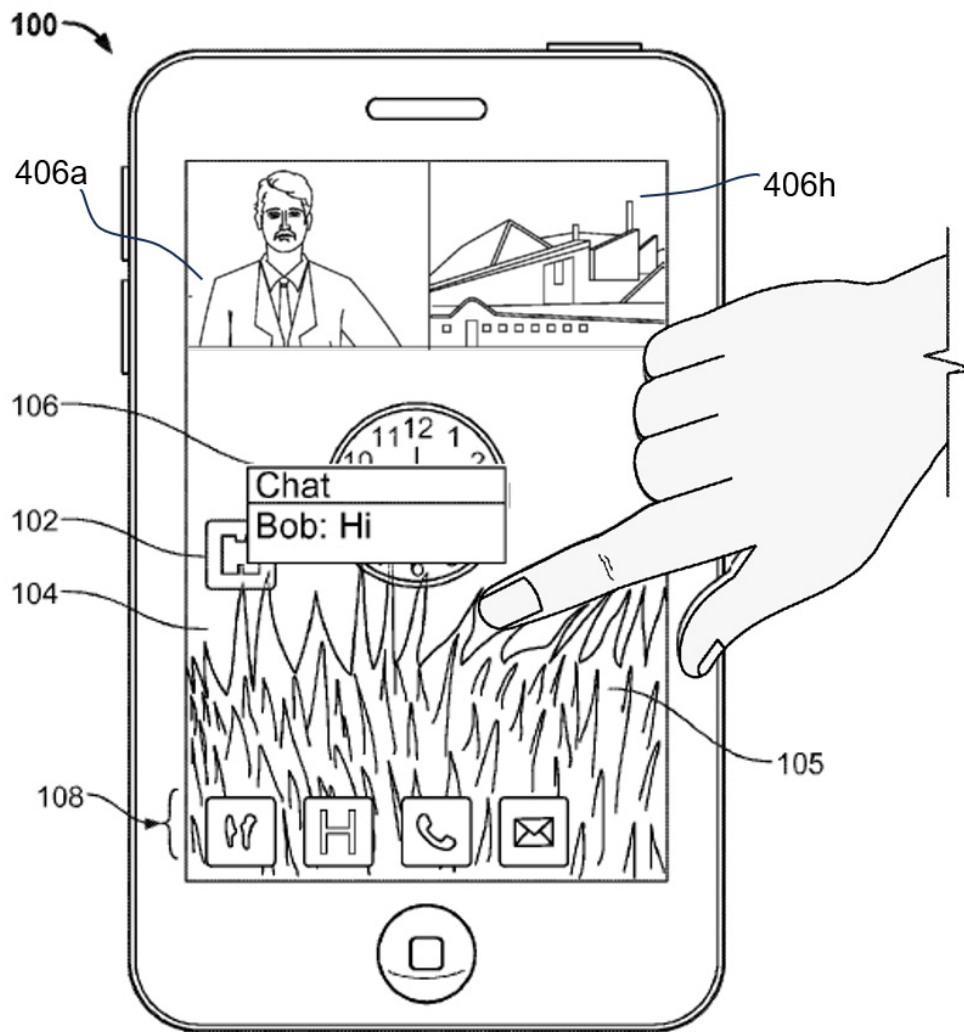
79. The Hackborn-Westerman device renders obvious “wherein the electronic device is configured such that the plurality of images is associated with the background.” APPLE-1004, [0005] (“wallpaper when the background is formed from a graphical image”), [0025], [0028], [0047] (“live wallpaper 604 may continue to update in the background”), claims 2 (“displaying a visual image that covers substantially an entirety of a display”) and 33 (“an animated sequence”), FIG. 1. In particular, the plurality of images—the images shown in sequence that show the movement of grass—is associated with the grass “live” wallpaper background. APPLE-1004, [0025] (“background wallpaper”), [0028], FIG. 1. This is consistent with a POSITA’s understanding of an “image” by the Critical Date. That is, a POSITA would have recognized an “image” to be “[a] graphic,

which may contain pictures and/or text.” APPLE-1022, 3; *see also* APPLE-1023, 3 (“a picture, represented in a computer’s memory”); APPLE-1024, 3 (“A two-dimensional array of data with values at each element of the array related to an intensity or a color.”); APPLE-1025, 3 (“A stored description of a graphic picture, either as a set of brightness and color values of pixels or as a set of instructions for reproducing the picture.”).

9. Claim 11

[11] The electronic device of claim 1, wherein the electronic device is configured such that the plurality of images includes photographs taken using a camera of the electronic device.

80. The Hackborn-Westerman device renders obvious “wherein the electronic device is configured such that the plurality of images includes photographs taken using a camera of the electronic device.” APPLE-1004, [0008], [0035], [0050], claims 9 and 24; *see* discussion of element [1.1]. As discussed with respect to element [1.1], Hackborn teaches that “live wallpaper can include a ***combination of the described wallpaper examples***,” including swaying grass and images from other sources, such as social networking sites or camera photographs. APPLE-1004, [0008], [0035], [0050] (emphasis added). An example of such a “combination of the described wallpaper examples” is shown below where the wallpaper includes both the swaying grass 105 from Figure 1 and images 406a and 406h from Figure 4.



Composite image based on APPLE-1004, FIGS. 1 and 4

81. A POSITA would have found it obvious that the images (e.g., 406a, 406h) shown in the composite image above could instead comprise an image captured by a camera in the computing device. APPLE-1004, [0008], claims 9 and 24. In particular, as discussed above for element [1.1], Hackborn teaches “displaying in the graphical wallpaper representation, a live image being captured in real-time by a digital camera in the computing device.” APPLE-1004, [0008],

claims 9 and 24; *see also id.*, [0035]. Thus, a POSITA would have found obvious that the “live wallpaper can include a combination” of the swaying grass and, as discussed above for element [1.1], images captured by a digital camera in the computing device. APPLE-1004, [0050]. Moreover, to the extent this discussion in Hackborn states displaying only a single live image (“*a* live image being captured in real-time by a digital camera in the computing device”), it would have been obvious to a POSITA to include more than just a single photograph and doing so would yield no new and unexpected result. Furthermore, a POSITA would understand that “a **live** image” includes a plurality of images displayed in sequence over time. Additionally, or alternatively, a POSITA would have found it obvious to use images (or a series of images captured by the device’s camera) as live wallpaper that responds to a user touch. Hackborn explains that “predetermined user inputs” may be “received by the device to cause the live wallpaper to become responsive,” such as “making a particular movement on or across the display screen, tapping on the display screen a predetermined number of times within a predetermined time period, and others.” APPLE-1004, [0028]. A POSITA would have found it obvious to provide an image (among a series of images captured by the device’s camera), and in response to a predetermined user input, cause the series of images to be displayed in sequence, much like animating grass. Indeed, a POSITA would have recognized that such a “live” wallpaper would provide a

more realistic live wallpaper, benefiting from the quality of images captured by the camera (as opposed to the grass animation), and as consistent with Hackborn's disclosure that the wallpaper may "change in appearance" to provide "altered aesthetics." APPLE-1004, [0026].

10. Claim 13

[13] The electronic device of claim 1, wherein the electronic device is configured such that the background includes a representative image in the plurality of images that is dynamically changed in response to detecting the first input by the first contact, in accordance with the determination that the first contact has the magnitude that is above the threshold.

82. The Hackborn-Westerman device renders obvious "wherein the electronic device is configured such that the background includes a representative image of a plurality of images" (e.g., the moving grass as described above in §VII.A.3) "that is dynamically changed in response to detecting the first input by the first contact, in accordance with the determination that the first contact has the magnitude that is above the threshold." APPLE-1004, [0028], [0033], FIG. 1; APPLE-1005, [0018]-[0019], [0060]-[0064]. In particular, in the Hackborn-Westerman device, the background includes an image of grass as a representative image, which dynamically changes when a user provides an input that is determined to be a swipe because it has a magnitude above a threshold (e.g., gesture with a path length greater than a minimum length threshold), as Westerman teaches and as Hackborn teaches or suggests. APPLE-1004, [0028], [0033], FIG.

1; APPLE-1005, [0018]-[0019], [0060]-[0064]; *see* discussion of element [1.j]; §VII.A.3.

11. Claim 15

[15] *The electronic device of claim 1, wherein the electronic device is configured such that the plurality of images is associated with the background, and the plurality of images includes photographs.*

83. The Hackborn-Westerman device renders obvious “wherein the electronic device is configured such that the plurality of images is associated with the background, and the plurality of images includes photographs.” APPLE-1004, [0008], [0040], FIGS. 4, 6. As discussed above in §VII.A.3, the Hackborn-Westerman device displays live wallpaper that “can include a combination of” various wallpapers, including, the moving grass wallpaper, social media images, and photographs captured with the device’s camera. APPLE-1004, [0050] (“For example, images (such as images 406*a-h* in FIG. 4) and information (such as posts 606*a-e* in FIG. 6) from social networking sites may be combined for presentation in a live wallpaper display.”). That is, the live wallpaper can include images from various example wallpapers that Hackborn describes. *Id.*

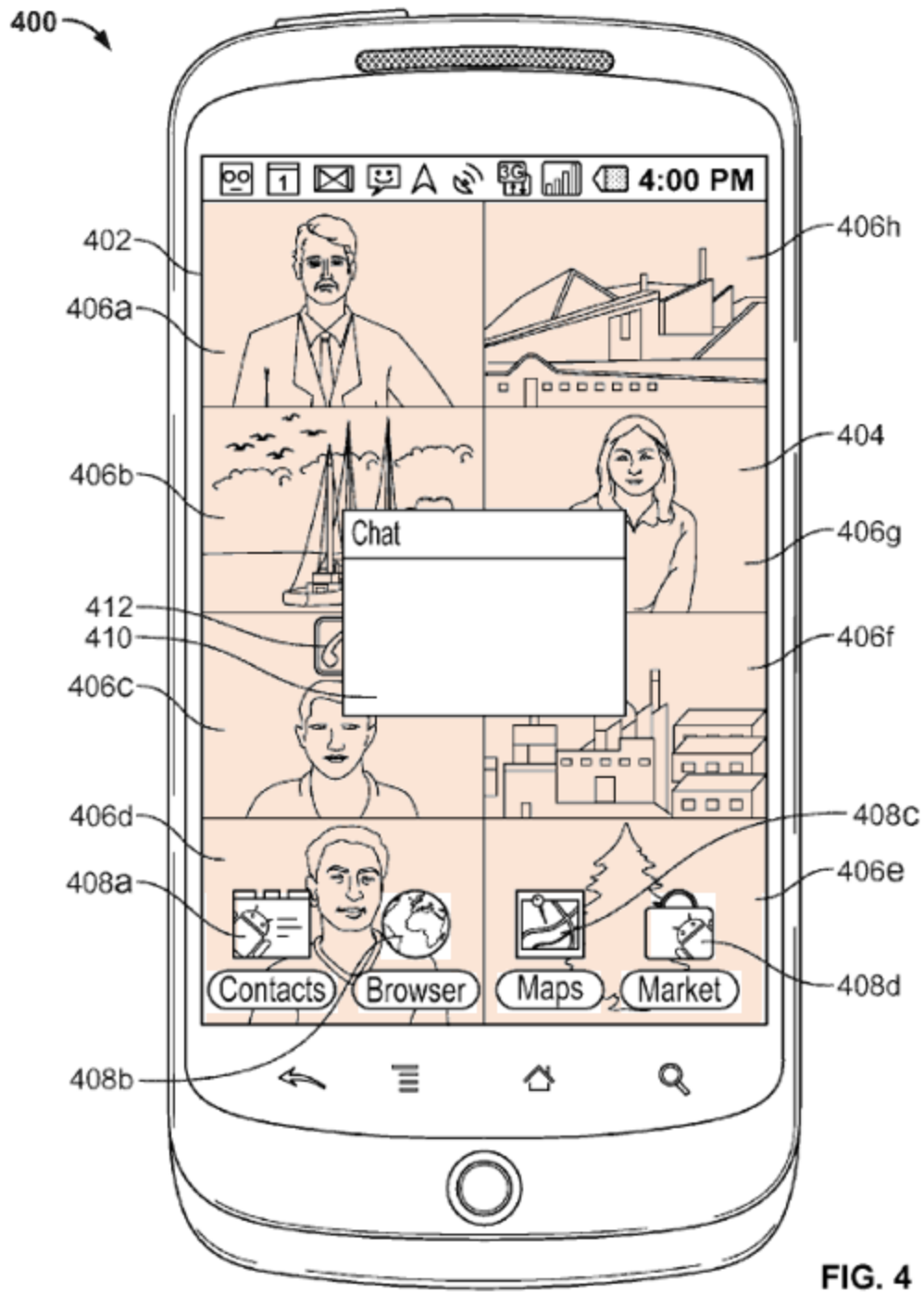
84. Where the plurality of images includes images captured using the device’s camera (*see* §VII.A.3 and discussion of claim 11), the plurality of images includes photographs, and because the photographs are “display[ed] in the graphical wallpaper representation,” a POSITA would have understood them to be

associated with the background (e.g., as part of wallpaper). APPLE-1004, [0008].

Where the plurality of images includes images for a social media site (*see* §VII.A.3), a POSITA would have understood that the images from the social media site includes photographs, and, further, because the social media images are “produced as wallpaper 404” (per Hackborn), a POSITA would have understood them to be associated with the background (e.g., as part of wallpaper). APPLE-1004, [0040]. For example, by the Critical Date, Facebook was well known for being a social media site that allowed members to share photographs. APPLE-1014, 2 (“As we noted in February [2006], Facebook is the largest photo application on the web (forgetting everything else they do). More than 850 million photos uploaded to the site each month, and these things chew up bandwidth and storage like crazy.”). Moreover, Facebook is not the only website for sharing photographs; digital photograph-sharing websites were popular and well known by the Critical Date. APPLE-1015, [0004] (“In recent years, the popularity of the Word Wide Web (WWW) coupled with incredible growth in availability and accessibility of high bandwidth Internet connections resulted in an unprecedented proliferation of ‘on-line communities.’ These phenomena include, but are not limited to, chat-rooms, on-line forums, groups, clubs, and **digital photograph-sharing websites**.”). Additionally, a POSITA would have readily understood the term “image” to include, for example, photographs, including photographs shared

via email, social media, or social network. APPLE-1016, [0023] (“As used herein, the term, “image,” includes a single captured image or a series of images, such as captured by a motion picture camera. ... At least one of the **multiple** communication options 26 may be selected by a user to communicate with a party associated with the image. Some of the communication options 26 available to communicate with a party associated with the image may include, but may not be limited to email, Short Message Service (SMS), blog, **social media**, video conference, Internet chat, Internet Protocol telephony, Internet forum, **social network**, virtual world gaming network and instant message.”).

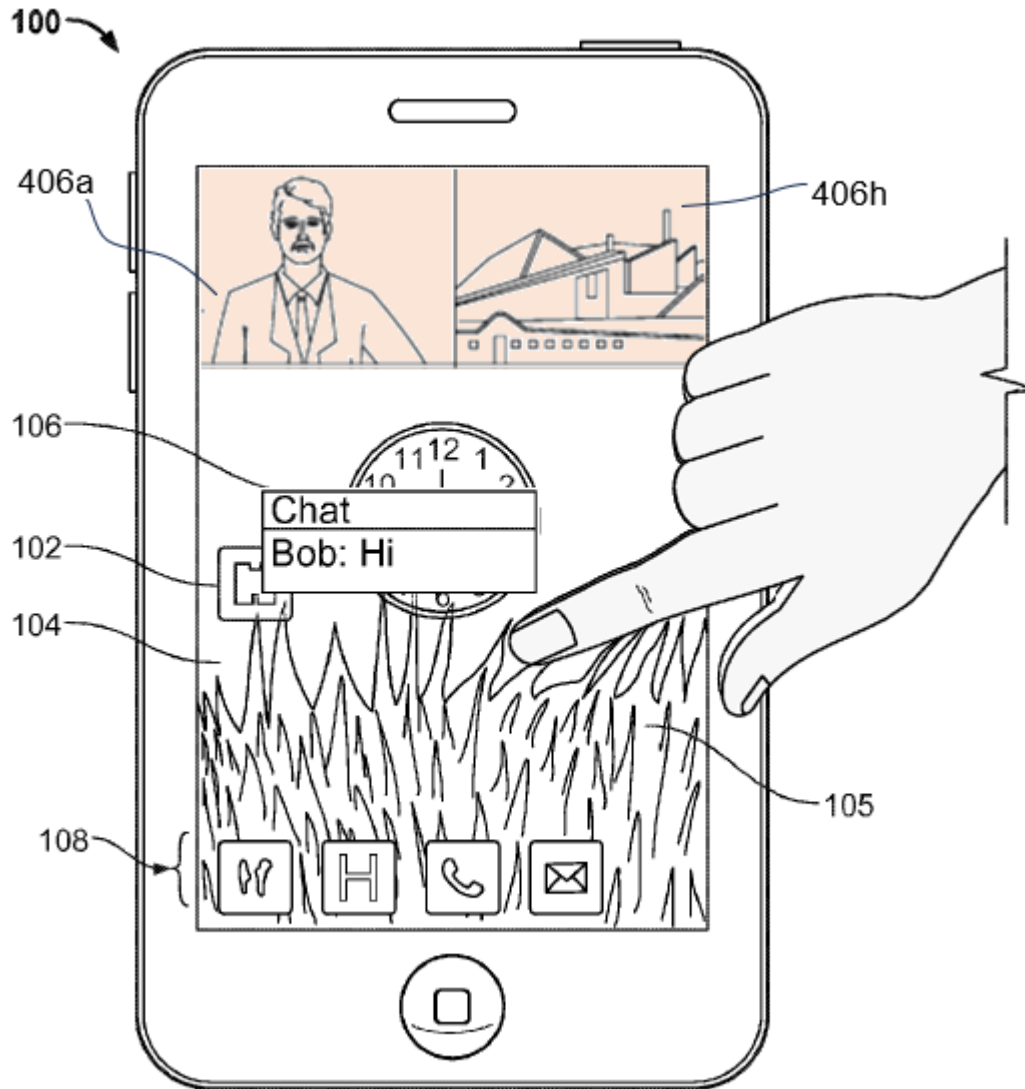
Figure 4 (below) of Hackborn shows an “example of active content being produced as wallpaper” where the wallpaper includes “images 406a-h fetched or received from one or more social services on the Internet,” including photographs (highlighted below). APPLE-1004, [0040]-[0042], FIG. 4; *see also id.*, [0046], FIG. 6.



APPLE-1004, FIG. 4 (highlighted)

85. An example of a “combination of the described wallpaper examples” is shown below where the wallpaper includes both the swaying grass 105 from

Figure 1 and photographs from a social media site (highlighted). *See* §VII.A.4 (discussion of element [1.1]).



Composite image based on APPLE-1004, FIGS. 1 and 4

12. Claim 17

[17] The electronic device of claim 1, wherein the electronic device is configured such that the at least some of the plurality of images is

displayed, in sequence, by automatically moving, one-by-one, through the at least some of the plurality of images.

86. The Hackborn-Westerman device renders obvious “wherein the electronic device is configured such that the at least some of the plurality of images is displayed, in sequence, by automatically moving, one-by-one, through the at least some of the plurality of images.” APPLE-1004, [0046]-[0047], FIG. 6. For example, where the plurality of images includes images from a social networking website, Hackborn teaches that, “as new information is received” (including information with images), “already displayed posts may be scrolled (e.g., downward).” APPLE-1004, [0046]. With reference to Figure 6 (below), Hackborn explains that, “[w]hen post 606a is received, the previously displayed posts (e.g., posts 606b, 606c, 606d, 606e) may be shifted downward.” *Id.*, [0047]. Thus, the images in the posts are displayed in sequence by automatically moving one-by-one through them as new posts are received. *Id.*

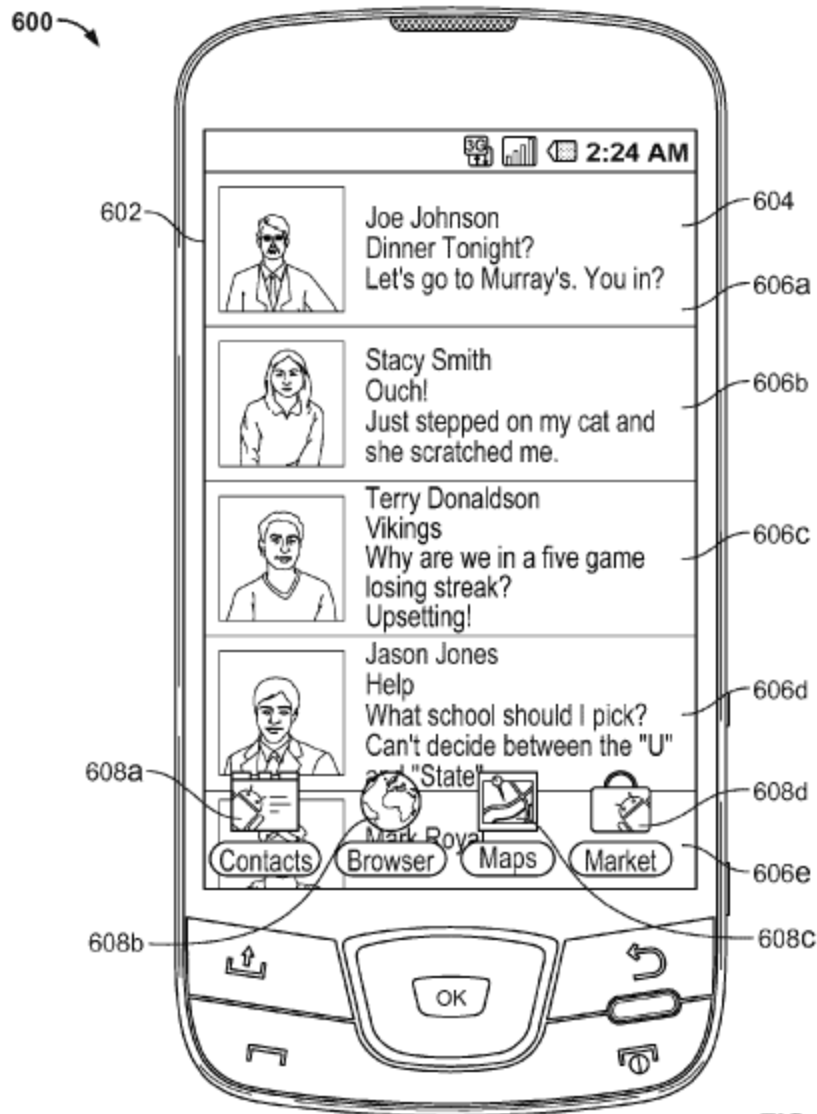


FIG. 6

APPLE-1004, FIG. 6

87. Furthermore, as discussed above in §VII.A.3, the Hackborn-Westerman device displays live wallpaper that “can include a combination of” various wallpapers, including, the moving grass wallpaper, social media images, and photographs captured with the device’s camera. A POSITA would therefore have understood that the automatically scrolled social media posts could form only

part of the background wallpaper display, where the wallpaper includes both the swaying grass 105 from Hackborn's Figure 1 and images from a social networking website. *See* §VII.A.4 (discussion of element [1.1]).

13. Claim 20

[20] *The electronic device of claim 1, wherein the electronic device is configured such that the magnitude includes a duration magnitude.*

88. The Hackborn-Westerman device renders obvious “wherein the electronic device is configured such that the magnitude includes a duration magnitude.” APPLE-1004, [0028]; APPLE-1005, [0018]-[0019], [0060]-[0064]. As discussed above in § VII.A.3, Westerman teaches analyzing both a length magnitude and a duration magnitude (e.g., to determine initial velocity) associated with a gesture to determine whether it is a swipe. APPLE-1005, [0018]-[0019], [0060]-[0064]. In particular, Westerman explains that the “displacement measurement process can determine how much the path has moved ... and over what time (T[i]),” and that “the system can look for an initial velocity at touchdown to distinguish a swipe from a tap.” *Id.*, [0061]-[0062].

89. Alternatively, or additionally, a POSITA would have understood that touch data is detected by a touch sensor as a series of one or more images that represent the proximity of one or more objects in contact with the touch sensor – “the touch screen detects touch events, which can be encoded in the form of touch image data 901.” APPLE-1005, [0057]. A POSITA would also have understood

that touch images are scanned at discrete time intervals, with each image representing the static proximity of any contact(s):

Electronic scanning hardware 6 controls and reads from each proximity sensor of a sensor array. A calibration module constructs a raw proximity image from a complete scan of the sensor array and subtracts of any background sensor offsets. The background sensor offsets can simply be a proximity image taken when nothing is touching the surface.

The offset-corrected proximity image is then passed onto the contact tracking and identification module 10, which segments the image into distinguishable hand-surface contacts, tracks and identifies them **as they move through successive images.**

APPLE-1021, 13:14-25 (incorporated by reference in Westerman at APPLE-1005, [0057]).

90. Thus, a POSITA would have understood that, if a contact did **not** persist across at least two successive images (persisting for longer than a threshold time between two successive scans), it would not be possible to determine that any motion occurred. Therefore, a POSITA would have understood that discriminating between a swipe and a tap, as disclosed by Westerman, requires that the contact persist for longer than a threshold duration.

91. Thus, a POSITA would have recognized that the magnitude includes both a distance and a duration magnitude. APPLE-1005, [0061]-[0062]. It then follows that a POSITA would have understood that the Hackborn-Westerman

device analyzes a magnitude with two components, including a duration magnitude to distinguish between a tap and a swipe.

14. Claim 22

- [22] *The electronic device of claim 21, wherein the electronic device is configured such that at least one of:*
- the background includes a background image;*
 - the background is a background image;*
 - a representative image includes a background image;*
 - a representative image includes one of the sequence of images;*
 - the one or more foreground objects includes one or more application icons;*
 - the one or more foreground objects of a second user interface includes one or more application icons;*
 - the one or more foreground objects include at least one of a date, a time, a network type, a battery level, or status information;*
 - the one or more foreground objects of the first user interface include at least one of a date, a time, a network type, a battery level, or status information;*
 - the background of the first user interface is the same as the background of a second user interface;*
 - the background of the first user interface is different from the background of a second user interface;*
 - the first input by the first contact results from a press;*
 - the first input by the first contact results from a press gesture;*
 - the location in the first user interface that corresponds to the background of the first user interface includes a location that overlaps the background, at least in part;*
 - the location in the first user interface that corresponds to the background of the first user interface, includes a bounding box;*
 - the magnitude includes a pressure or force magnitude of the first contact;*

the threshold includes a threshold level of pressure or force of the first contact;

the threshold includes a predetermined level of pressure or force of the first contact;

the instructions include at least one of: computer code, computer software, software instructions, hardware code, or hardware instructions;

the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact, by the appearance of the background of the first user interface conditionally changing based on the determination that the first contact has the magnitude above the threshold;

the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact, by the appearance of the background of the first user interface changing only if it is determined that the first contact has the magnitude above the threshold;

the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact, by the dynamic changing of the appearance of the background of the first user interface altering dynamically based at least in part on the magnitude of the first contact;

the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact, by dynamically changing the appearance of the background in a first manner in response to a first magnitude, and dynamically changing the appearance of the background in a second manner in response to a second magnitude;

the dynamically changing the appearance of the background of the first user interface includes displaying in sequence at least some of the sequence of images based at least in part on the magnitude of the first contact;

the displaying in sequence the at least some of the sequence of images is based at least in part on the magnitude of the first contact, by starting to

scroll through the at least some of the sequence of images as a function of the magnitude of the first contact;

the displaying in sequence the at least some of the sequence of images is based at least in part on the magnitude of the first contact, by scrolling through the at least some of the sequence of images as a function of the magnitude of the first contact;

the displaying in sequence the at least some of the sequence of images is based at least in part on the magnitude of the first contact, by speeding a scrolling through the at least some of the sequence of images as a function of the magnitude of the first contact;

the threshold includes a predetermined level of duration of the first contact;

the magnitude includes a duration magnitude of the first contact;

the displaying in sequence the at least some of the sequence of images includes displaying the sequence of images as a video;

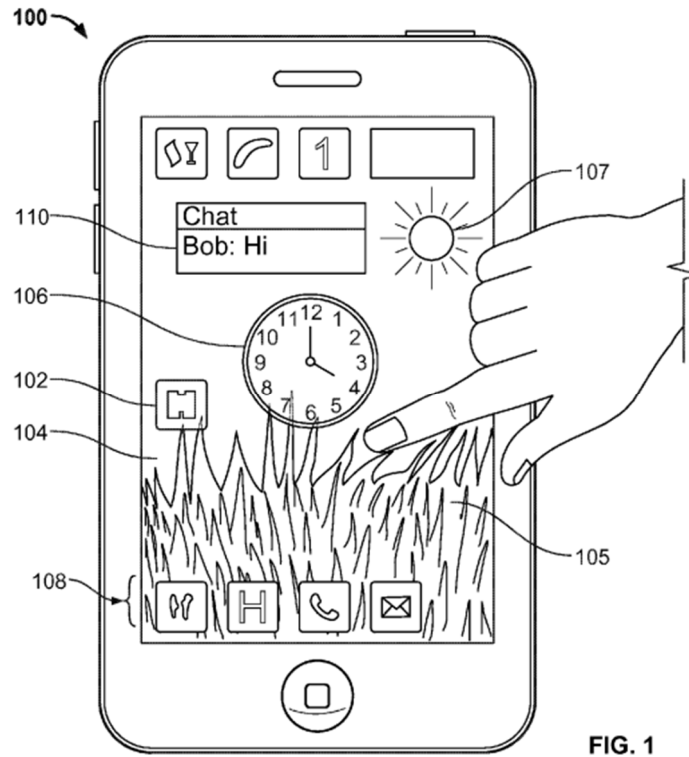
the displaying in sequence the at least some of the sequence of images includes displaying the sequence of images to appear as a video;

*the displaying in sequence the at least some of the sequence of images is based at least in part on the magnitude of the first contact, by adjusting a speed through which the at least some of the sequence of images are displayed in sequence as a function of the magnitude of the first contact;
or*

the displaying in sequence the at least some of the sequence of images is based at least in part on the magnitude of the first contact, by increasing a speed through which the at least some of the sequence of images are displayed in sequence as a function of the magnitude of the first contact.

92. The Hackborn-Westerman device renders obvious claim 22 (e.g., “the background includes [or is] a background image,” “the one or more foreground objects includes one or more application icons”). APPLE-1004, [0026] (“the

wallpaper shows grass 105 below a sunny sky 107”), [0028], [0030], FIG. 1 (showing, e.g., a phone application icon and a mail application icon).



APPLE-1004, FIG. 1

15. Claim 23

[23pre] A method, comprising: at an electronic device including

93. The Hackborn-Westerman device renders obvious “an electronic device.” *See* discussion of element [1.pre]. Additionally, the Hackborn-Westerman device performs various methods. APPLE-1004, [0007] (“a computer-implemented method for coordinating a display of on-screen elements on a

computing device...”), [0008]-[0009], [0013], [0023]-[0024], [0058]-[0059], FIGS. 9-10; *see, generally*, discussion of claim 1 (Ground 1A).

[23.a] a display,

94. The Hackborn-Westerman device renders obvious “a display.” *See* discussion of element [1.a] (Ground 1A).

[23.b] a touch-sensitive surface,

95. The Hackborn-Westerman device renders obvious “a touch-sensitive surface.” *See* discussion of element [1.b] (Ground 1A).

[23.c] one or more processors, and

96. The Hackborn-Westerman device renders obvious “one or more processors.” *See* discussion of element [1.c] (Ground 1A).

[23.d] memory:

97. The Hackborn-Westerman device renders obvious “memory.” *See* discussion of element [1.d] (Ground 1A).

[23.e] displaying a first user interface on the display, wherein the first user interface includes:

98. The Hackborn-Westerman device renders obvious “displaying a first user interface on the display.” *See* discussion of element [1.f] (Ground 1A).

[23.f] a background with an appearance, and

99. The Hackborn-Westerman device renders obvious “a background with an appearance.” *See* discussion of element [1.g] (Ground 1A).

[23.g] one or more foreground objects;

100. The Hackborn-Westerman device renders obvious “one or more foreground objects.” See discussion of element [1.h] (Ground 1A).

[23.h] with the first user interface displayed on the display, detecting a first input by a first contact on the touch-sensitive surface at a location in the first user interface that corresponds to the background of the first user interface; and

101. The Hackborn-Westerman device renders obvious “with the first user interface displayed on the display, detecting a first input by a first contact on the touch-sensitive surface at a location in the first user interface that corresponds to the background of the first user interface.” See discussion of element [1.i] (Ground 1A).

[23.i] in response to detecting the first input by the first contact, in accordance with a determination that the first contact has a magnitude that is above a threshold, dynamically changing the appearance of the background of the first user interface without changing an appearance of the one or more foreground objects in the first user interface,

102. The Hackborn-Westerman device renders obvious “in response to detecting the first input by the first contact, in accordance with a determination that the first contact has a magnitude that is above a threshold, dynamically changing the appearance of the background of the first user interface without changing an appearance of the one or more foreground objects in the first user interface.” See discussion of element [1.j] (Ground 1A).

[23.j] wherein the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact and

103. The Hackborn-Westerman device renders obvious “wherein the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact.” See discussion of element [1.k] (Ground 1A).

[23.k] wherein the dynamic change in the appearance of the background of the first user interface includes displaying in sequence at least some of a plurality of images based at least in part on the magnitude of the first contact.

104. The Hackborn-Westerman device renders obvious “wherein the dynamic change in the appearance of the background of the first user interface includes displaying in sequence at least some of a plurality of images based at least in part on the magnitude of the first contact.” See discussion of element [1.l] (Ground 1A).

16. Claim 24

[24] The method of claim 23, wherein the threshold is associated with an operating system of the electronic device, and respective operations of respective applications on the electronic device are activated in response to detecting respective inputs that satisfy the threshold.

105. For at least the same reasons as discussed above with respect to claim 2, the Hackborn-Westerman Combination renders obvious “wherein the threshold is associated with an operating system of the electronic device, and respective operations of respective applications on the electronic device are activated in

response to detecting respective inputs that satisfy the threshold.” See discussion of claim 2 (Ground 1A).

17. Claim 25

[25] The method of claim 23, wherein a respective foreground object of the one or more foreground objects responds to an input by a contact having a magnitude below the threshold.

106. The Hackborn-Westerman device renders obvious “wherein a respective foreground object of the one or more foreground objects responds to an input by a contact having a magnitude below the threshold.” See discussion of claim 3 (Ground 1A).

18. Claim 29

[29] The method of claim 23, and further comprising: in response to detecting the first input by the first contact on the touch-sensitive surface, in accordance with a determination that the first input does not have the magnitude that is above the threshold, maintaining the appearance of the background of the first user interface.

107. The Hackborn-Westerman device renders obvious “in response to detecting the first input by the first contact on the touch-sensitive surface, in accordance with a determination that the first input does not have the magnitude that is above the threshold, maintaining the appearance of the background of the first user interface.” See discussion of claim 7 (Ground 1A).

19. Claim 32

[32] The method of claim 23, wherein the plurality of images is associated with the background.

108. The Hackborn-Westerman device renders obvious “wherein the plurality of images is associated with the background.” See discussion of claim 10 (Ground 1A).

20. Claim 33

[33] The method of claim 23, wherein the plurality of images includes photographs taken using a camera of the electronic device.

109. The Hackborn-Westerman device renders obvious “wherein the plurality of images includes photographs taken using a camera of the electronic device.” See discussion of claim 11 (Ground 1A).

21. Claim 35

[35] The method of claim 23, wherein the background includes a representative image in the plurality of images that is dynamically changed in response to detecting the first input by the first contact, in accordance with the determination that the first contact has the magnitude that is above the threshold.

110. The Hackborn-Westerman device renders obvious “wherein the background includes a representative image in the plurality of images that is dynamically changed in response to detecting the first input by the first contact, in accordance with the determination that the first contact has the magnitude that is above the threshold.” See discussion of claim 13 (Ground 1A).

22. Claim 37

[37] The method of claim 23, wherein the at least some of the plurality of images is displayed, in sequence, by automatically displaying, one-by-one, the at least some of the plurality of images.

111. The Hackborn-Westerman device renders obvious “wherein the at least some of the plurality of images is displayed, in sequence, by automatically displaying, one-by-one, the at least some of the plurality of images.” *See* discussion of claim 17 (Ground 1A).

23. Claim 38

[38] The method of claim 23, wherein the at least some of the plurality of images is displayed, in sequence, by automatically moving, one-by-one, through the at least some of the plurality of images.

112. The Hackborn-Westerman device renders obvious “wherein the at least some of the plurality of images is displayed, in sequence, by automatically moving, one-by-one, through the at least some of the plurality of images.” *See* discussion of claim 17 (Ground 1A).

24. Claim 41

[41] The method of claim 23, wherein the magnitude includes a duration magnitude.

113. For at least the same reasons as discussed above with respect to claim 20 in Ground 1A, the Hackborn-Westerman Combination renders obvious “wherein the magnitude includes a duration magnitude.” *See* discussion of claim 20 (Ground 1A).

25. Claim 42

[42] The method of claim 23, wherein the plurality of images is associated with the background, and the plurality of images includes photographs.

114. For at least the same reasons as discussed above with respect to claim 15 in Ground 1A, the Hackborn-Westerman Combination renders obvious “wherein the plurality of images is associated with the background, and the plurality of images includes photographs.” *See* discussion of claim 15 (Ground 1A).

B. Ground 1B: Claims 4-5, 8-9, 21, 26-27, 30-31, and 43 are obvious over Hackborn in view of Westerman and Townsend

1. Townsend

115. Townsend explains that a tablet PC (mobile computer) equipped with a touch screen “allows the user to operate the computer with a stylus, digital pen, or fingertip instead of a keyboard or mouse” which “offer a more natural form of input, as sketching and handwriting are a much more familiar form of input than a keyboard and mouse.” APPLE-1006, [0001]. However, Townsend notes that applications must “determine a user’s intentions based on touch input received from multi-touch hardware” so each “application has to include software to interpret the coordinates and determine the user's intention,” which includes virtual objects behaving “how they do in the physical world.” *Id.*, [0004].

116. Townsend describes a system “that provides more realistic movement for application objects that a user manipulates using multi-touch hardware” and an

application programming interface (API) that “provides a consistent feel to manipulations across applications.” APPLE-1006, [0005]. Townsend’s API enables applications “to simulate real-world behavior of objects” in response to touch gestures. *Id.*, [0014]. For example, Townsend explains that “real world objects do not typically stop moving when a user stops pushing them, but rather exhibit some inertia and keep moving until friction slows them finally to a stop.” *Id.*, [0014]. Townsend describes a “a simulation engine that performs calculations based on physics to determine the behavior of an object based on the parameters,” e.g., “realistic deceleration or elasticity behavior for application objects set in motion by user touch input.” *Id.*, [0039].

2. The Hackborn-Westerman-Townsend Combination

117. To the extent that Hackborn does not describe specific techniques and implementation details animating the grass, a POSITA would have naturally looked to related prior art, such as Townsend, which teaches an API and simulation engine that enable applications “to simulate real-world behavior of objects” using “techniques based on physics to simulate the behavior of the object” in response to touch gestures (e.g., animating the movement of blades of grass). APPLE-1004, [0028]; APPLE-1006, [0014], [0021], [0039]. A POSITA would have understood that the Hackborn-Westerman-Townsend device includes “a simulation engine that performs calculations based on physics to determine the behavior of an object

based on [] parameters,” as taught by Townsend, for example, to “provide realistic deceleration or elasticity behavior for application objects set in motion by user touch input.” APPLE-1006, [0039]. For instance, Townsend describes the use of “initial simulation parameters,” such as “the final state of an application object when a user stopped touching the object.” APPLE-1006, [0039]. In this way, the Hackborn-Westerman-Townsend device would display the “live” wallpaper in a manner that is responsive to the particular user input, such that the changes in the display are dynamically responsive to changes in the user input, including changing the speed or direction of the touch.

118. A POSITA would have been motivated to employ an API and simulation engine that enable simulation of real-world behavior of objects based on physics using various parameters, as taught by Townsend, to implement the “live” wallpaper of Hackborn. In the combination, a POSITA would have understood that the device’s simulation engine would “perform[] calculations based on physics to determine the behavior of an object [grass] based on” parameters such as characteristics of the user input, as taught by Townsend, including the physical length (e.g., displacement) of the touch (as taught by Westerman), the duration of the touch (as taught by Westerman), direction of the touch (as taught by Hackborn and Townsend), and/or the speed of the touch (as taught by Hackborn), such that the wallpaper (grass blades) “look as if the finger is actually contacting them as it

drags across the screen of the device,” as Hackborn teaches. APPLE-1004, [0033]; APPLE-1005, [0018]-[0019], [0060]-[0063]; APPLE-1006, [0016], [0020], [0037], [0039].

119. A POSITA would have understood that including an API and simulation engine, such as the one described in Townsend, in Hackborn’s device would have served the purpose of providing a mechanism for displaying “live” wallpaper and doing so in a manner that would show the “live” wallpaper responding as if the displayed objects had actually been contacted by the user’s finger. It would have been obvious to a POSITA to use an API and simulation engine to implement the “live” wallpaper because these elements were well-known for providing graphical displays. *See* APPLE-1006, [0031], [0039], [0050]. Because APIs and simulation engines are so well-known, and Hackborn and Townsend both describe the use of touchscreen devices that simulate real-world behavior, a POSITA would have reasonably understood the combination of Hackborn with Townsend to be successful with no unexpected results.

3. Claim 4

[4] The electronic device of claim 1, wherein the electronic device is configured such that the dynamic change in the appearance of the background of the first user interface is based in part on a positive rate of change in the magnitude of the first contact.

120. The Hackborn-Westerman-Townsend Combination renders obvious “wherein the electronic device is configured such that the dynamic change in the

appearance of the background of the first user interface is based in part on a positive rate of change in the magnitude of the first contact,” as indicated by “the blades of grass 105 displayed in the area of the screen swiped by the user are caused to bend or sway as if contacted by the user’s finger during the swipe.” APPLE-1004, [0028], [0033]; APPLE-1006, [0039]. Hackborn explains that “a vector representing the position, direction, and speed of the user’s dragging motion” is used “to determine that the user’s finger contacted items on the wallpaper—here, the grass 105” and can be “used to generate an animation that makes the grass blades look as if the finger is actually contacting them as it drags across the screen of the device.” APPLE-1004, [0033]. Further, Townsend teaches a “simulation engine that performs calculations based on physics to determine the behavior of an object.” APPLE-1006, [0039]. From Townsend’s disclosure, a POSITA would have understood that an increased amount of movement in the finger across the device screen will yield an increased amount of movement in the grass blades, and thus, an increase amount of dynamic change in the appearance of the background. In addition, a positive speed or velocity is a positive rate of change of displacement on the touch screen, or “positive rate of change in the magnitude of the first contact.” Therefore, a POSITA would have recognized that Hackborn’s “vector representing the position, direction, and *speed*

of the user's dragging motion" indicates to Townsend's physics the rate of change in the magnitude of contact, including a positive rate of change.

4. Claim 5

[5] The electronic device of claim 1, wherein the electronic device is configured such that a magnitude of the dynamic change in the appearance of the background of the first user interface decays following detection of a cessation of the first contact.

121. The Hackborn-Westerman-Townsend device renders obvious "wherein the electronic device is configured such that a magnitude of the dynamic change in the appearance of the background of the first user interface decays following detection of a cessation of the first contact." APPLE-1004, [0008], [0028], claims 4 and 19; APPLE-1006, [0016], [0039]. For example, Hackborn teaches that "the blades of grass 105 displayed in the area of the screen swiped by the user are caused to bend or sway as if contacted by the user's finger during the swipe" and doing so "in a manner that simulates frictional dragging of elements." APPLE-1004, [0008], [0028]. A POSITA would have understood or found obvious that Hackborn's "simulate[d] frictional dragging" of grass movement results in the ceasing of grass movement (e.g., due to friction) after cessation of the user input. Additionally, Townsend teaches that "the simulation engine may provide realistic deceleration or elasticity behavior for application objects set in motion by user touch input," e.g., "if the user lifted the contacts while the object had a velocity in a particular direction, then inertia system continues sending

events that indicate that the object is moving in that direction, slowing down over time as the object decelerates,” or decays. APPLE-1006, [0016], [0039]. A POSITA would have recognized that the motion of grass decays (decelerates) once the swipe ceases, per Townsend. Moreover, Hackborn describes “changing the manner in which the graphical wallpaper representation is displayed” by “animating motion in the graphical wallpaper representation in a manner that simulates frictional dragging of elements of the graphical wallpaper representation.” APPLE-1004, [0008], claims 4-9. A POSITA would have understood that, by simulating “frictional dragging,” the animating motion of the wallpaper representation (e.g., blades of grass) would appear to slow down, or decay, over time as a result of a force (e.g., simulated friction) that opposes the “force” provided by the user input (e.g., simulated touching of grass).

5. Claim 8

[8] The electronic device of claim 1, wherein the one or more programs includes instructions for: in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background.

122. The Hackborn-Westerman-Townsend device renders obvious “wherein the one or more programs includes instructions for: in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background,” for at least the same reasons as discussed above with respect to [5]. APPLE-1004, [0028], FIG. 1; APPLE-1006, [0016], [0034],

[0039]. A POSITA would have understood, based on a basic level of Newtonian physics, that the decay in dynamic change to the background ultimately yields cessation of that dynamic change in time. Additionally, Townsend provides implementation details for such activity and a simulation engine/API to enable it for any GUI element (e.g., not limited to the grass in Hackborn). *See* APPLE-1006,[0016], [0034], [0039].

123. Townsend teaches that “the simulation engine may provide realistic deceleration or elasticity behavior for application objects set in motion by user touch input,” for example, “if the user lifted the contacts while the object had a velocity in a particular direction, then inertia system continues sending events that indicate that the object is moving in that direction, slowing down over time as the object decelerates.” APPLE-1006, [0016], [0039]. In addition, Townsend teaches that “the inertia system does not provide additional movement for objects with movement below a predefined threshold,” and “the inertia system may have a particular object linear or angular velocity below which the system will not continue movement of the object after the user releases the object.” *Id.*, [0034]. Thus, a POSITA would have found obvious that the HWT device would be implemented such that the dynamic changes responsive to a user input (e.g., display of grass in “live” wallpaper moving in response to a user swipe input on a touch screen), as taught by Hackborn, would be implemented such that the

responsive display would reflect changes in the user movements, including changing velocity (e.g., slowing down or stopping) or changing direction.

6. Claim 9

[9] The electronic device of claim 1, wherein the one or more programs includes instructions for: in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background and reverting to the display of the first user interface, including the background, on the display.

124. For at least the same reasons as discussed above with respect to claim 8 in Ground 1B, the Hackborn-Westerman-Townsend Combination renders obvious “wherein the one or more programs includes instructions for: in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background and reverting to the display of the first user interface, including the background, on the display.” APPLE-1004, [0028], FIG. 1; APPLE-1006, [0016], [0021], [0033], [0034], [0039]; *see* discussion of claim 8 (Ground 1B). Additionally, Townsend teaches that the simulation component “uses techniques based on physics to simulate the behavior of the object for a period after the user releases the object.” APPLE-1006, [0021]. A POSITA would have understood that, according to physics, the blades of grass, at least in some instances, would return to their initial positions upon cessation of contact, and therefore the background reverts to its original state. For example, Hackborn describes that “[i]n some examples, graphics displayed on a portion of the

wallpaper may generally indicate the particular season, such as flowers for ‘spring,’ grass for ‘summer,’ piles of leaves for ‘autumn,’ or snow banks for ‘winter.’” APPLE-1004, [0043]. A POSITA would have understood that traces of the user’s swiping across “snow banks for ‘winter’” would *not* revert (e.g., because prints left in snow are enduring). In contrast, frictional dragging across grass for ‘spring’ would revert (e.g., due to the elastic nature of growing grass). This disclosure and a POSITA’s understanding of it is consistent with Townsend, which states that “[t]hose of ordinary skill in the art will recognize numerous well-known techniques for simulating the equivalent physical behavior of virtual objects in software.” APPLE-1006, [0021].

7. Claim 21

[21] The electronic device of claim 1, wherein the electronic device is configured to, in response to detecting a cessation of the first input, revert to one of the plurality of images that is different from that which is displayed as the background prior to detecting the first input.

125. The Hackborn-Westerman-Townsend device renders obvious “wherein the electronic device is configured to, in response to detecting a cessation of the first input, revert to one of the plurality of images that is different from that which is displayed as the background prior to detecting the first input.” APPLE-1004, [0028]; APPLE-1006, [0039]. In particular, Hackborn teaches that the displayed grass moves as if contacted by a finger, and Townsend teaches that a “simulation engine performs calculations based on physics to determine the

behavior of an object” so that the simulation object can provide “realistic deceleration or elasticity behavior for application objections set in motion by user touch input.” *Id.* A POSITA would have recognized and/or found obvious that, in some scenarios, after the gesture ceases, the scene will not revert to the original image. For example, when frictional dragging across dry grass for ‘summer’, the grass would have less elasticity than that of grass in spring, and therefore would not revert to the original image. APPLE-1004, [0043]. Indeed, a decision among two choices, ceasing with the grass returned to its original position and ceasing with the grass in a position other than the returned position, is a design choice well within the grasp of a POSITA. Moreover, the ’755 Patent included no discussion of the importance of “reverting to one of the plurality of images that is different from that which is displayed as the background prior to detecting the first input.”

8. Claim 26

[26] The method of claim 23, wherein the dynamic change in the appearance of the background of the first user interface is based in part on a positive rate of change in the magnitude of the first contact.

126. For at least the same reasons as discussed above with respect to claim 4 in Ground 1B, the Hackborn-Westerman-Townsend Combination renders obvious “wherein the dynamic change in the appearance of the background of the first user interface is based in part on a positive rate of change in the magnitude of the first contact.” *See* discussion of claim 4 (Ground 1B).

9. Claim 27

[27] The method of claim 23, wherein a magnitude of the dynamic change in the appearance of the background of the first user interface decays following detection of a cessation of the first contact.

127. For at least the same reasons as discussed above with respect to claim 5 in Ground 1B, the Hackborn-Westerman-Townsend Combination renders obvious “wherein a magnitude of the dynamic change in the appearance of the background of the first user interface decays following detection of a cessation of the first contact.” See discussion of claim 5 (Ground 1B).

10. Claim 30

[30] The method of claim 23, and further comprising: in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background.

128. For at least the same reasons as discussed above with respect to claim 8 in Ground 1B, the Hackborn-Westerman-Townsend Combination renders obvious “in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background.” See discussion of claim 8 (Ground 1B).

11. Claim 31

[31] The method of claim 23, and further comprising: in response to detecting a cessation of the first input, ceasing the dynamically changing of the

appearance of the background and reverting to the display of the first user interface, including the background, on the display.

129. For at least the same reasons as discussed above with respect to claim 9 in Ground 1B, the Hackborn-Westerman-Townsend Combination renders obvious “in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background and reverting to the display of the first user interface, including the background, on the display.” *See* discussion of claim 9 (Ground 1B).

12. Claim 43

[43] The method of claim 23, and further comprising: in response to detecting a cessation of the first input, displaying an image that is different from that which is displayed as the background prior to detecting the first input.

130. For at least the same reasons as discussed above with respect to claim 21 in Ground 1B, the Hackborn-Westerman-Townsend Combination renders obvious “in response to detecting a cessation of the first input, displaying an image that is different from that which is displayed as the background prior to detecting the first input.” *See* discussion of claim 21 (Ground 1B).

C. Ground 1C: Claim 16 is obvious over Hackborn in view of Westerman and Jablonski

1. Jablonski

131. Jablonski describes “providing wallpaper or screen saver images for display on the background of a personal computer visual display.” APPLE-1008,

Abstract. Jablonski states that “[w]allpaper images are usually included as part of the computer’s operation system.” *Id.*, 1:34-40.

2. The Hackborn-Westerman-Jablonski Combination

132. Hackborn teaches that an “objects/wallpapers 712 data store may store information about various entities needed to provide the functionality described.” APPLE-1004, [0057]. Additionally, “custom operating system theme elements can be obtained and stored in the data store 712,” and are capable of being selected by a user. *Id.* Hackborn does not specifically address pre-installing wallpapers or theme elements. However, a POSITA would have recognized and/or found obvious that the background can be pre-installed in memory, as was well known by the Critical Date. *See* APPLE-1011, 2:35-52; APPLE-1012, 1:33-35; APPLE-1013, [0005]; §VII.C.2d. For instance, Slivka teaches that it was well known by the Critical Date for operating systems to have pre-installed “packaged enhancements called ‘themes,’” which include “substitute icons, mouse pointer graphics and animations, sounds, a wallpaper, and a screen saver.” APPLE-1011, 2:35-52. Chrabaszcz teaches that, by 1998 (the filing date), “most computer system users use[d] the default wallpaper bitmaps provided by operating systems such as Windows 95.” APPLE-1012, 1:33-35.

133. Jablonski explains that “[w]allpaper images are usually included as part of the computer’s operation system.” APPLE-1008, 1:34-40; *see also*

APPLE-1013, [0005]. In view of this well known teaching from Jablonski, a POSITA would have found it obvious for the background (e.g., grass wallpaper) to be one of a plurality of pre-installed wallpapers stored in memory of the Hackborn-Westerman-Jablonski device. Because the use of background wallpaper and computer operating systems was known, and Hackborn and Jablonski both describe the use of them, a POSITA would have reasonably understood the combination of Hackborn with Jablonski to be successful with no unexpected results. Moreover, storing wallpaper images in the operating system of a device, such as Hackborn's, per Jablonski would have required nothing more than routine programming knowledge well within the skill of a POSITA prior to the earliest effective filing date.

3. Claim 16

[16] The electronic device of claim 1, wherein the electronic device is configured such that the background is one of a plurality of pre-installed backgrounds stored in the memory and the background is capable of being selected by a user.

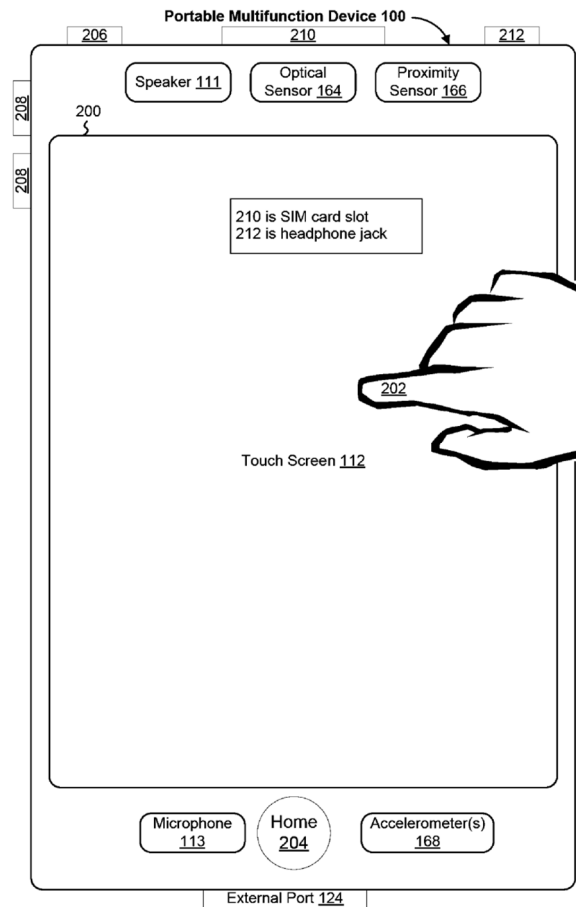
134. The Hackborn-Westerman-Jablonski renders obvious “wherein the electronic device is configured such that the background is one of a plurality of pre-installed backgrounds stored in the memory and the background is capable of being selected by a user.” APPLE-1004, [0025] (“Users may traditionally be allowed to select particular images for their wallpaper”), [0057]. In particular, Hackborn explains that wallpapers are stored in memory and can be obtained by a

user, while Jablonski explains that “[w]allpaper images are usually included as part of the computer’s operation system.” APPLE-1004, [0057]; APPLE-1008, 1:34-40; *see also* §VII.B.2; APPLE-1011, 2:35-52; APPLE-1012, 1:33-35; APPLE-1013, [0005]; §VII.C.2.

D. Ground 1D: Claims 18-19 and 39-40 are obvious over Hackborn in view of Westerman and Jobs

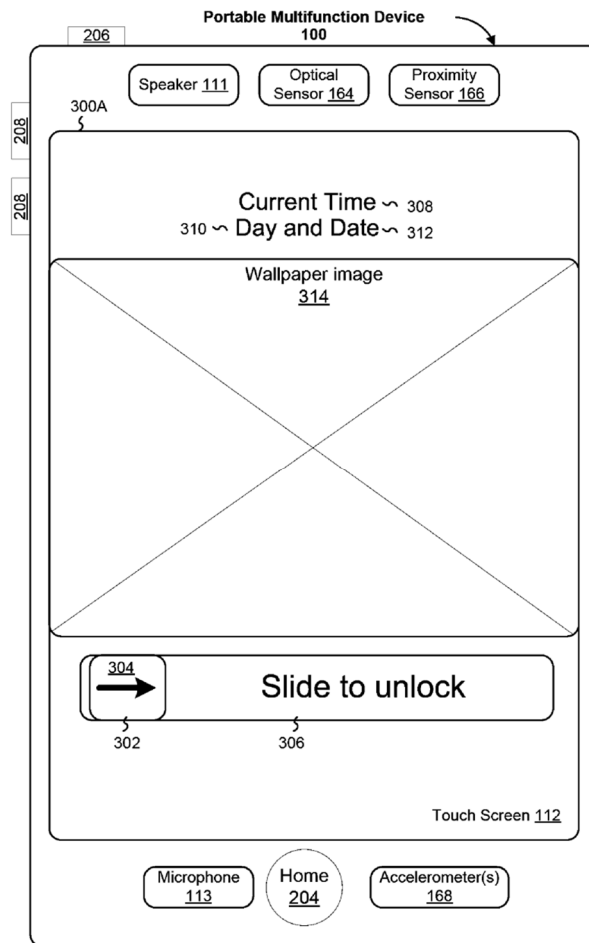
1. Jobs

135. Jobs describes touch screen devices in which the user interacts with a graphical user interface (GUI) primarily through finger contacts and gestures on the touch-sensitive display. APPLE-1009, [0008]. Functions provided by the device can include “telephoning, video conferencing, e-mailing, instant messaging, blogging, digital photographing, digital videoing, web browsing, digital music playing, and/or digital video playing.” *Id.* As exemplary device is shown in Figure 2 (below).



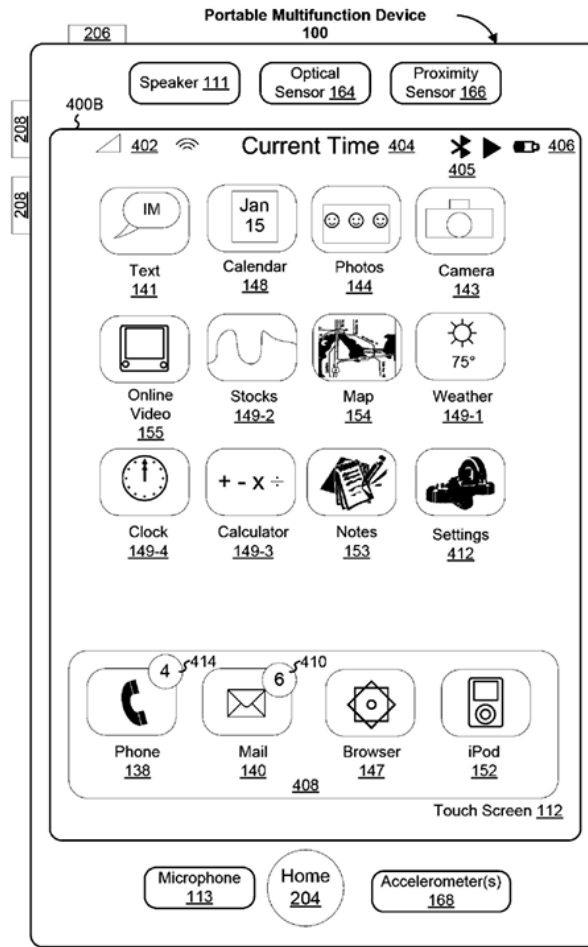
APPLE-1009, FIG. 2

136. When the Jobs device is locked, the user interface includes a wallpaper (background) image, an unlock slider, date, time, etc., as shown in Figure 3A (below). APPLE-1002, [0167]-[0178], FIG. 3A.



APPLE-1009, FIG. 3A

137. Once unlocked, the user interface can include icons that represent applications (e.g., camera, text, alarm, settings, etc.) residing on a device, as shown in Figure 4B (below). APPLE-1009, [0180]-[0214], FIG. 4B.



APPLE-1009, FIG. 4B

2. The Hackborn-Westerman-Jobs Combination

138. As discussed above, the Hackborn-Westerman device includes a touch screen that displays “live” wallpapers, as taught by Hackborn, and uses threshold values to distinguish between taps and swipes, as taught by Westerman. §VII.A.3. Jobs teaches a device that similarly includes wallpapers and additionally teaches the ability to lock and unlock the touch screen, as was well known by the Critical Date. APPLE-1009, [0102]. Jobs additionally teaches that the lock screen, like the

unlocked screen, includes a wallpaper image, as shown below. *Id.*, [0167]-[0175], FIG. 3A.

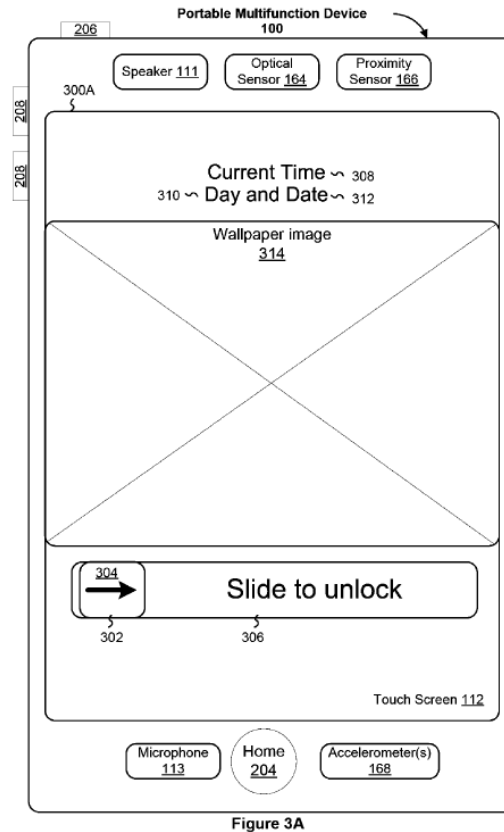


Figure 3A

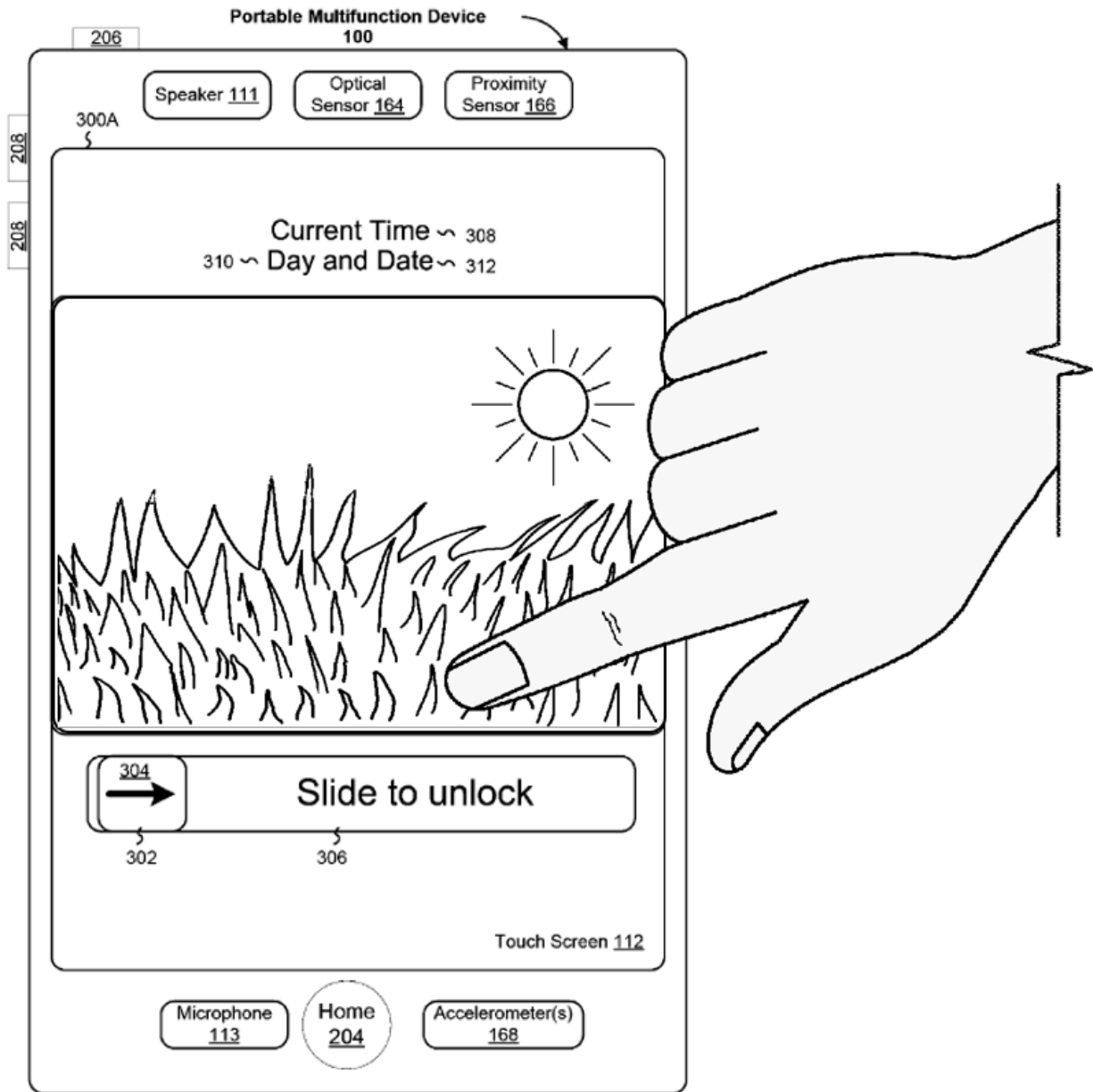
APPLE-1009, FIG. 3A.

139. It would have been obvious to a POSITA for the Hackborn-Westerman device to further include a lock screen with a wallpaper image, as taught in Jobs, and as was well known by the Critical Date. For example, Chaudhri explains that a “problem associated with using touch screens on portable device,” such as Hackborn’s device, “is the unintentional activation or deactivation of functions due to unintentional contact with the touch screen.” APPLE-1010, [0004]. As such, “portable devices, touch screens on such devices, and/or

applications running on such devices may be locked upon satisfaction of predefined lock conditions, such as upon entering an active call, after a predetermined time of idleness has elapsed, or upon manual locking by a user.” *Id.*; *see id.*, FIGS. 4A-4B, 5A-5B. Moreover, it would have been further obvious and desirable to a POSITA to provide means by which “unintentional activation or deactivation of functions” can be avoided, such Jobs’ lock screen with a wallpaper image.

140. Additionally, given Hackborn’s teaching of using live wallpaper, it would have been obvious to a POSITA to implement the Hackborn-Westerman-Jobs device to include a lock screen with a wallpaper, as taught by Jobs, such that the lock screen wallpaper is “live” like the unlocked screen, as taught by Hackborn. Such a modification would “provide updated information, altered aesthetics, a change of theme, environment or pace, or a diversion from the status quo,” as taught by Hackborn. APPLE-1004, [0026]. In this way, “the [lock screen] wallpaper need not be a static image, but can be active and may execute code so as to produce interesting and compelling user interface examples,” as Hackborn teaches. APPLE-1004, [0036]. This would have motivated a POSITA to implement the Hackborn-Westerman-Jobs device to include a lock screen with live wallpaper, thereby improving the device by preventing “unintentional activation or deactivation of functions” while still producing an “interesting and

compelling user interface” in the lock screen. In the Hackborn-Westerman-Jobs device (as shown below), a user could lock the device with a lock screen having a wallpaper, as taught by Jobs, and the wallpaper is a “live” wallpaper, as taught by Hackborn, such that user touch on the background (grass) causes the grass to move but does not cause foreground objects, such as the “unlock image 302” to change appearance. APPLE-1004, [0028], FIG. 1; APPLE-1009, FIG. 3A. Moreover, because swiping inputs were known (as described in Hackborn, Westerman, and Jobs), lock screens were known (as described in Jobs), and interacting with live backgrounds was known, a POSITA would have reasonably understood the combination of Hackborn, Westerman, and Jobs to be successful with no unexpected results.



APPLE-1009, FIG. 3A (modified with APPLE-1004, FIG. 1)

3. Claim 18

[18] *The electronic device of claim 1, wherein the electronic device is configured such that the first user interface includes a lock screen.*

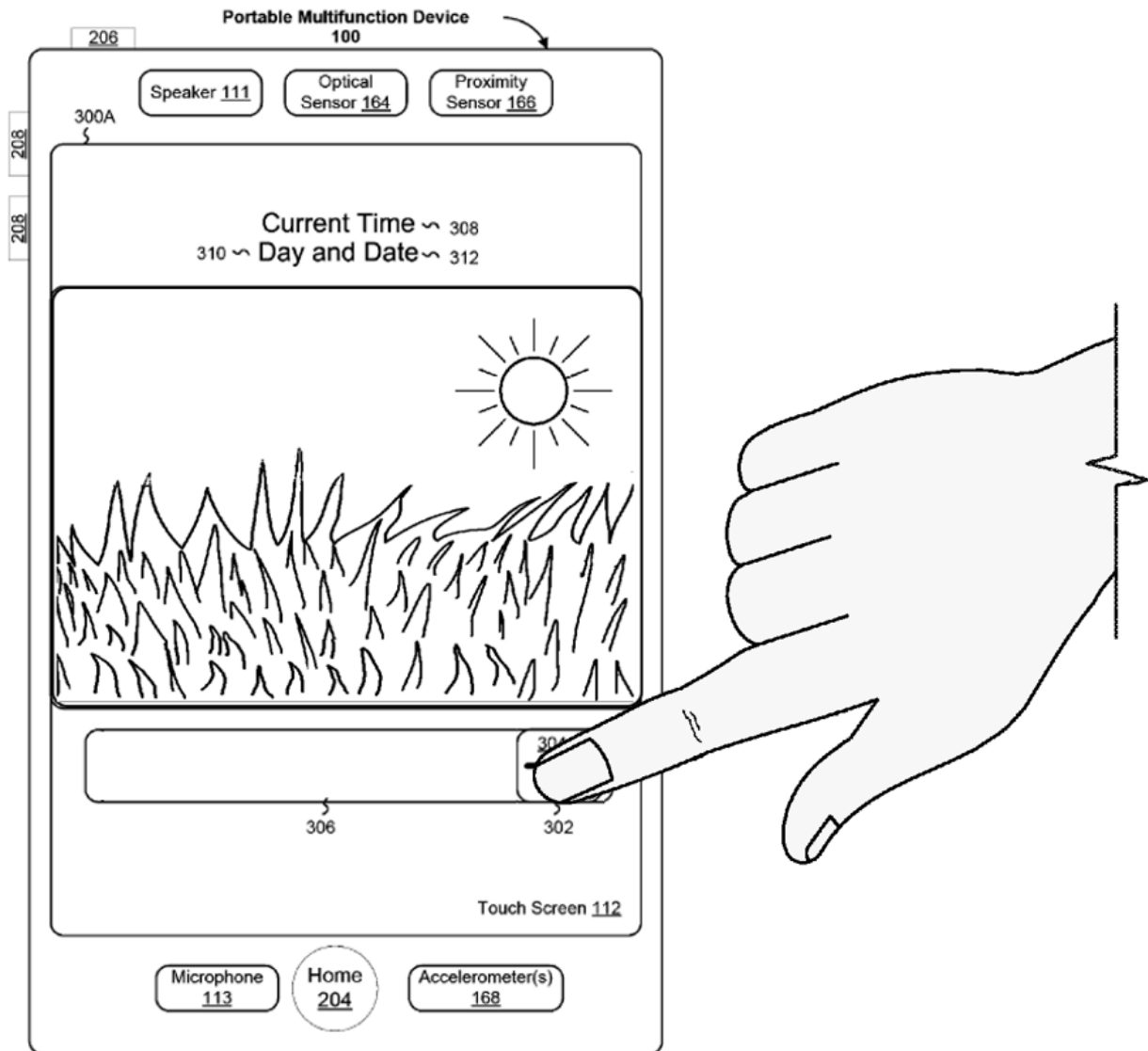
141. The Hackborn-Westerman-Jobs device renders obvious “wherein the electronic device is configured such that the first user interface includes a lock

screen.” APPLE-1004, [0028], FIG. 1; APPLE-1009, FIG. 3A; §VII.D.2. In particular, the Hackborn-Westerman-Jobs device has a lock screen as a first interface and the lock screen includes a wallpaper, as taught by Jobs, which is “live” as taught by Hackborn. APPLE-1004, [0028], FIG. 1; APPLE-1009, FIG. 3A; §VII.D.2.

4. Claim 19

[19] The electronic device of claim 1, wherein the electronic device is configured such that the first user interface includes a lock screen that is unlocked.

142. The Hackborn-Westerman-Jobs device renders obvious “wherein the electronic device is configured such that the first user interface includes a lock screen that is unlocked.” APPLE-1004, [0028], FIG. 1; APPLE-1009, [0177], FIG. 3A; §VII.D.2. Specifically, Jobs explains that the lock screen can be unlocked where the “device detects contact with the touch sensitive display (e.g., a user’s finger making contact on or near the unlock image 302) while the device is in a user-interface lock state,” and the “device moves the unlock image 302 in accordance with the contact.” APPLE-1009, [0168]-[0177]. Jobs explains that “[t]he device transitions to a user-interface unlock state if the detected contact corresponds to a predefined feature, such as moving the unlock image across channel 306.” *Id.*, [0177]. This is illustrated in the Hackborn-Westerman-Jobs device below.



APPLE-1009, FIG. 3A (modified with APPLE-1004, FIG. 1)

5. Claim 39

[39] *The method of claim 23, wherein the first user interface includes a lock screen.*

143. For at least the same reasons as discussed above with respect to claim 18 in Ground 1D, the Hackborn-Westerman-Jobs Combination renders obvious

“wherein the first user interface includes a lock screen.” *See* discussion of claim 18 (Ground 1D).

6. Claim 40

[40] *The method of claim 23, wherein the first user interface includes a lock screen that is unlocked.*

144. For at least the same reasons as discussed above with respect to claim 19 in Ground 1D, the Hackborn-Westerman-Jobs Combination renders obvious “wherein the first user interface includes a lock screen that is unlocked.” *See* discussion of claim 19 (Ground 1D).

E. Ground 2: Claims 1, 4-8, 10-12, 15, 17-20, 22-23, 26-30, 32, 34, and 37-42 are obvious over Hackborn in view of Westerman and Jobs

1. The Hackborn2-Westerman-Jobs³ Combination

³ Ground 2’s combination of Hackborn, Westerman, and Jobs, which focuses on a specific embodiment of live wallpaper in Hackborn is referred to in my Declaration as Hackborn2-Westerman-Jobs, or the Hackborn2-Westerman-Jobs device to avoid confusion with Ground 1D (Hackborn-Westerman-Jobs). The Hackborn2-Westerman-Jobs device at least displays live wallpaper that includes posts from a social media page, while the Hackborn-Westerman-Jobs device at least displays live wallpaper that includes swaying grass.

145. As discussed above in Ground 1A, Hackborn teaches the use of live wallpapers that can be caused to change their appearance in response to a user input (e.g., swipe) but does not describe the implementation details of distinguishing between tap and swipe inputs. §VII.A.3. For at least the same reasons as discussed above in Ground 1A, a POSITA would have looked to Westerman for implementation details for how to discern between different types of user inputs—namely, a tap or a swipe. *Id.* In particular, since Hackborn explains that its device can register both swipes and taps (APPLE-1004, [0028]), a POSITA would have found it obvious to implement Hackborn with Westerman’s methods of distinguishing between tap and swipe gestures (e.g., using “predetermined thresholds”). Thus, a POSITA would have found obvious that the Hackborn-Westerman device would be implemented such that if the user input “exceeds the minimum swipe length threshold” and/or if the “initial velocity at touchdown” is greater than a velocity threshold, the input is “interpreted as a swipe event.” APPLE-1005, [0018]-[0019], [0060]-[0061], [0062] (explaining that “an initial velocity at touchdown” can be used “to distinguish a swipe from a tap” as an alternative to time threshold), [0063]-[0064].

146. With respect to Figure 6 (below), Hackborn additionally describes live wallpapers that can include, for example, “information fetched or received from one or more social services on the Internet,” such as Facebook or MySpace.

APPLE-1004, [0046], FIG. 6. In describing Figure 1, Hackborn explains that “a user is swiping her finger across a touch-sensitive display screen of the computing device” can cause the displayed background to change. APPLE-1004, [0028]. A POSITA would have found obvious that the Hackborn device can similarly detect the first input with the live wallpaper shown in Hackborn’s Figure 6. *Id.*; *see also id.*, [0040]-[0041], [0042] (“the user may select one of the images [of the live wallpaper]”).

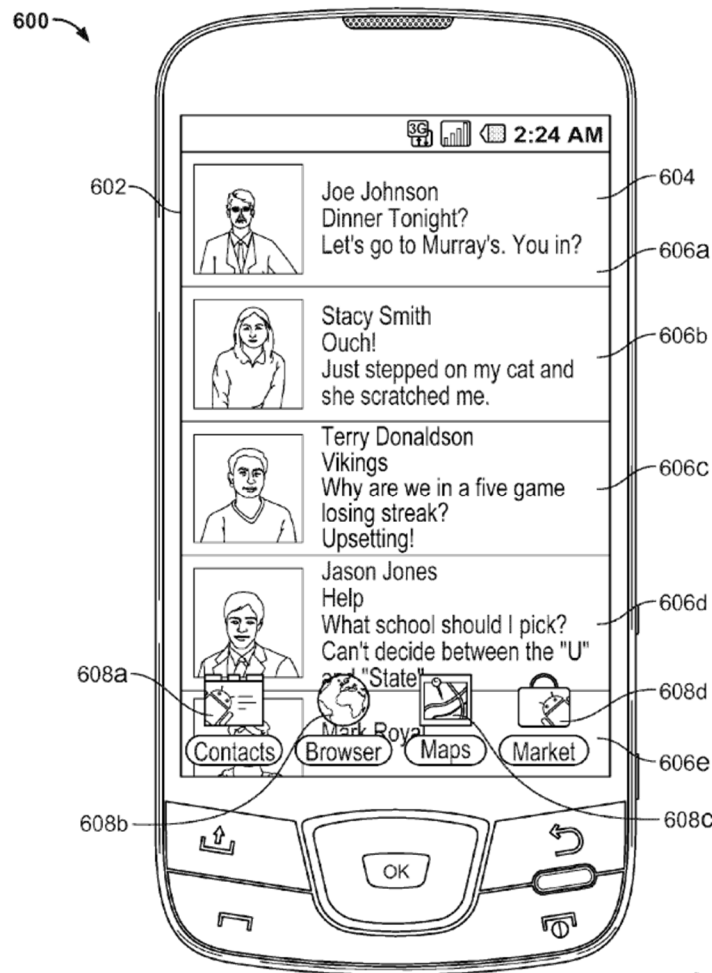


FIG. 6

APPLE-1004, FIG. 6

147. With reference to Figure 6, Hackborn explains that social media “posts 606a-e may be displayed in various manners”: “For example, as new information is received, already displayed posts may be scrolled (e.g., downward) and the new post may be displayed in a predetermined position.” APPLE-1004, [0047]. “When post 606a is received, the previously displayed posts ... may be shifted downward. As can be seen, post 606e is only partially displayed near the bottom of the display 602.” *Id.* Hackborn further teaches that “the wallpaper or a portion of the wallpaper [can] be selected, or a particular input may be provided,” to cause a change an appearance of the wallpaper, including causing the wallpaper (or portion thereof) to “assume a more prominent display position or status.” *Id.*, [0048]. In another example, “the user may view Terry Donaldson’s post 606c and select the post to provide an opinion to the question posed.” *Id.*

148. Given that Hackborn teaches (1) receiving a user input on the background (live wallpaper), (2) causing the background to change appearance in response to the user input, (3) causing a portion of the background wallpaper to assume a more prominent display position. and (4) scrolling in new images or posts, a POSITA would have found it obvious for the device to receive a user input on the live wallpaper 604 of Figure 4, determine that input to be a swipe (as Westerman teaches), and in response, cause the live wallpaper 604 to change its appearance by scrolling through the social media posts—or more particularly,

scrolling to older posts (e.g., to permit a user to view a post that was automatically scrolled out, or partially out, of view). Indeed, a POSITA reviewing Hackborn's teaching of scrolling social media posts in relation to Figure 6 would have understood that it would have been obvious to provide a way for the user to view and read older posts (including, e.g., partially-displayed post 606e), in particular to allow a user to view older posts that s/he may not have already read before the posts were moved downward and less (or not) visible. In particular, a POSITA would have found it obvious to allow for manual scrolling through the posts by the user. Failure to support manual scrolling would be infuriating to a user—the user might be about to read a message when it is automatically scrolled out of view by the arrival of a new message; manual scrolling would allow the user to bring the automatically scrolled-out message back into view.

149. The use of swiping motions to scroll through lists (including posts/messages/photos) was well known at least by the Critical Date, as evidenced Jobs. APPLE-1009, [0243], [0245], [1133]-[1140], [1251]-[1254], FIGS. 6A, 12A, 16A, 43CC; APPLE-1017, [0156], [0182]-[0199]; APPLE-1018, [0187], [0197], FIGS. 23F and 24F; APPLE-1019, [0157], [0172], FIGS. 5A-5O; APPLE-1020, [0201], [0212], [0242]. For instance, Ording describes a user interface, where, in response to movement on a touch-sensitive display, a list (e.g., an email inbox displaying messages) may be caused to scroll. APPLE-1017, [0156],

[0182]-[0199]. Chaudhri 141 teaches examples where a user can navigate through a list of songs or through contact information with a “vertical swipe that initiates vertical scrolling.” APPLE-1018, [0187], [0197], FIGS. 23F and 24F; *see also* APPLE-1020, [0201] (“contact 511 moves across the touch screen 112 to a different location (e.g., 511-B), and application icons in application icon area 5006 are scrolled in accordance with the movement of contact 511”), [0212] (“FIG. 5P also illustrates that gesture 519 (e.g., a swipe gesture) is detected on touch screen 112. FIG. 5Q illustrates that, in response to detecting gesture 519, open application icons 5002 displayed on touch screen 112 in FIG. 5P are scrolled off the display, and a different set of open application icons 5002 (e.g., 5002-10 through 5002-18) are displayed on touch screen 112”), [0242] (“In FIG. 5PP, in response to detecting swipe gesture 565 (FIG. 5NN), images 5008-12, 5008-10, and 5008-6 are scrolled so that image 5008-12 is scrolled off touch screen 112 and a portion of image 5008-11 is scrolled in onto touch screen 112, as shown in FIG. 5OO.”). Marr teaches that various gestures, including swipe gestures, can be used “in construction with scrolling of [an] electronic device.” APPLE-1019, [0157], [0172], FIGS. 5A-5O.

150. With reference to Figure 6A, Jobs describes precisely the same manual scrolling of messages as discussed above, describing that “a user can scroll through the message conversation ... by applying a vertical swipe gesture 610 to

the area displaying the conversation.” APPLE-1009, [0243], FIG. 6A; *see id.*, [0245]. With respect to Jobs’ scrolling disclosures (e.g., Figure 6A), Jobs describes friction-based scrolling inertia, such that, “scrolling the list has an associated speed of translation that corresponds to a speed of movement of the object,” and “scrolling the list is in accordance with a simulation of an equation of motion having friction.” APPLE-1009, [1138].

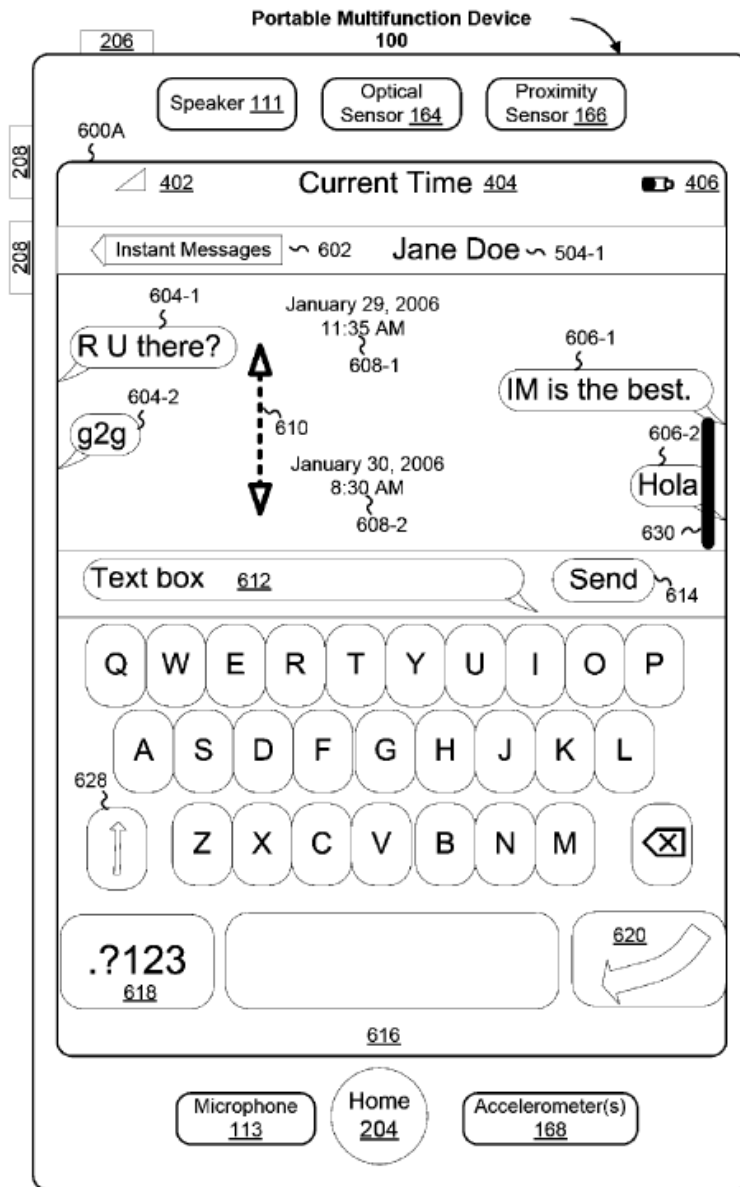


Figure 6A

APPLE-1009, FIG. 6A

151. More generally, Jobs explains that while its device displays “a photo album application (e.g., UI 1200A, FIG. 12A; UI 1600A, FIG. 16A; or UI 4300CC, FIG. 43CC), one or more second finger contacts with the touch screen display are detected (6448).” APPLE-1009, [1251]. When the device determines

the one or more second finger contacts “correspond to a command to transition from displaying a first image in a set of images to display a next image in the second of images 6452,” the command to transition the display of images is executed. *Id.*, [1251]-[1252]. Jobs explains that the finger contacts can correspond, for example, to vertical or horizontal scrolling commands. *Id.*, [1256].

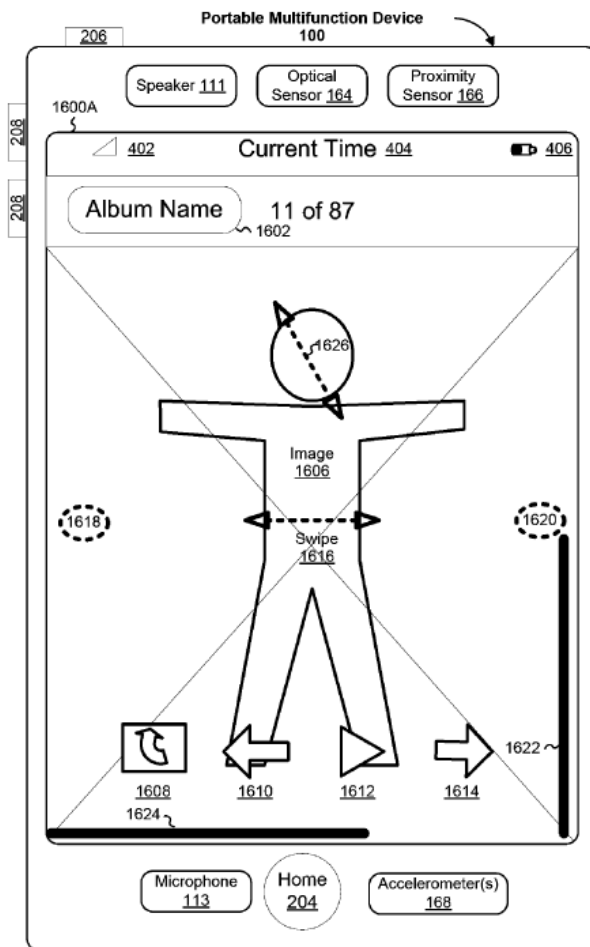


Figure 16A

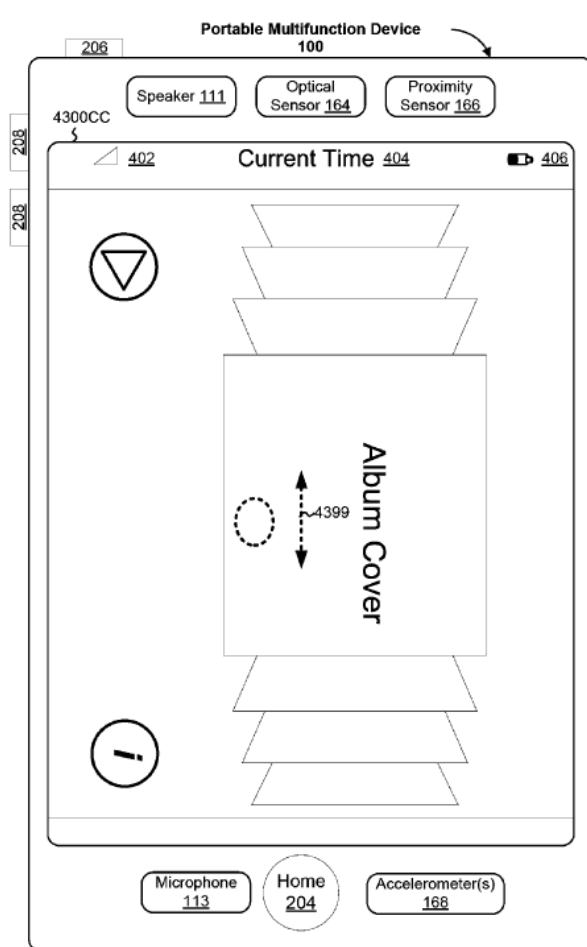


Figure 43CC

APPLE-1009, FIGS. 16A and 43CC

152. With reference to Figure 15, Jobs further shows “an exemplary user interface for viewing an album,” where the user may scroll through the

thumbnails 1506 using vertically upward and/or vertically downward gestures 1510 on the touch screen.” APPLE-1009, [0395]-[0401], FIG. 15.

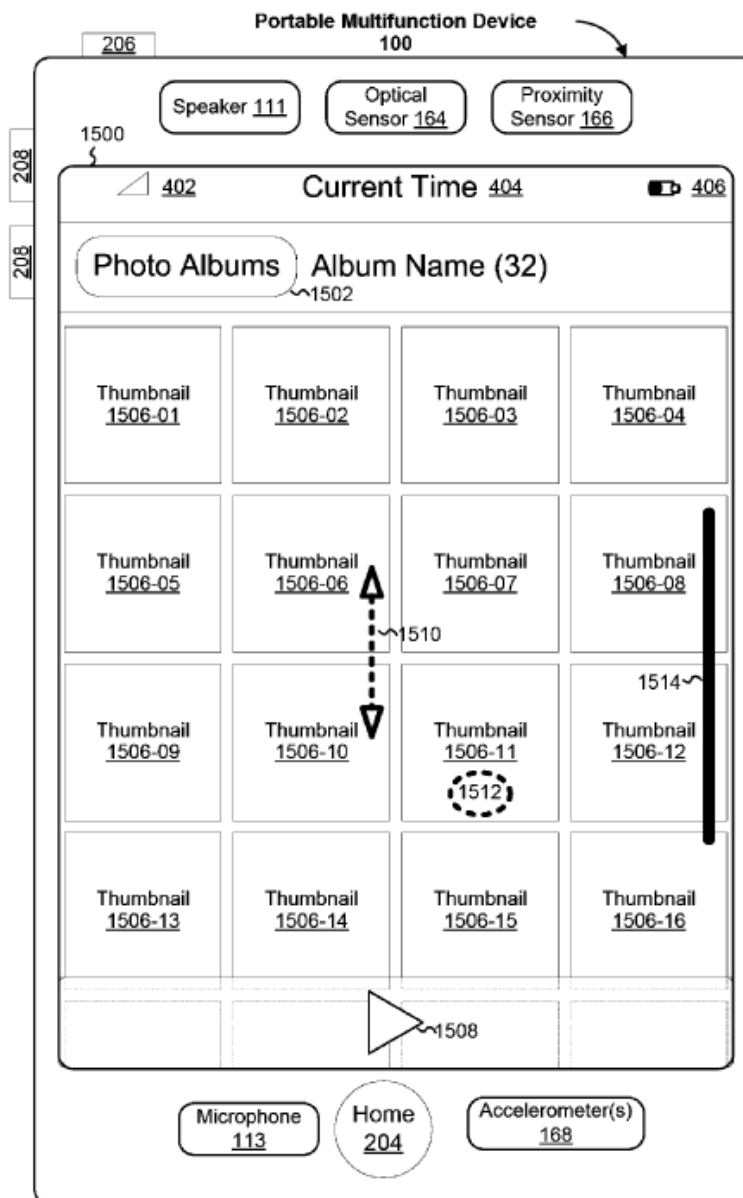
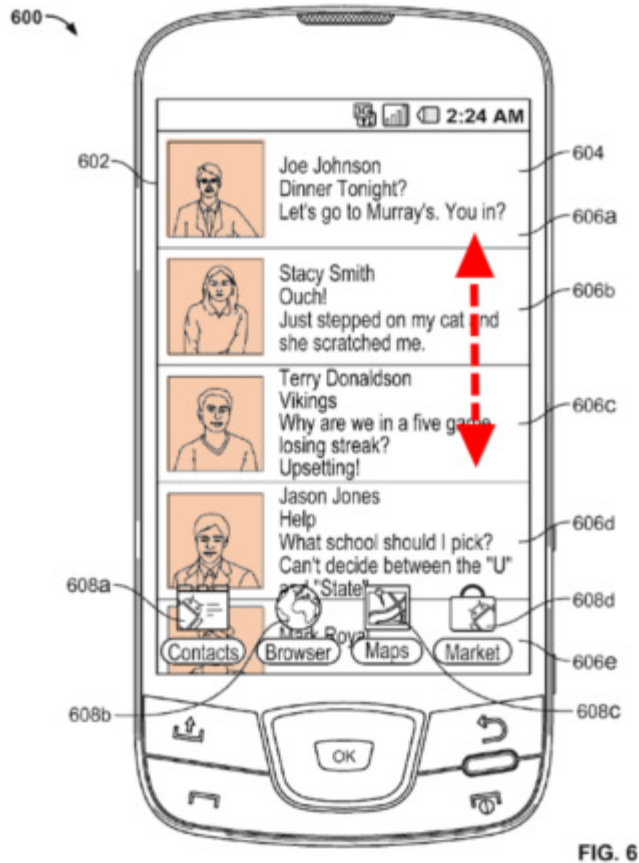


Figure 15

APPLE-1009, FIG. 15

153. A POSITA would have found it obvious to modify Hackborn’s live wallpaper 604 such that a user could scroll through the images/posts of the

wallpaper “using vertically upward and/or vertically downward gestures” (i.e., swipes, detected as Westerman teaches) “on the touch screen,” as Jobs teaches, instead of or in addition to new images/posts being scrolled in, as Hackborn teaches. APPLE-1004, [0041], [0046]-[0048], FIGS. 4, 6; APPLE-1009, [0243], [0245], [0401], FIGS. 6A, 15. The modification of Hackborn’s live wallpaper (which includes social media posts with photographs of the poster, highlighted) with Jobs’ manual scrolling (shown in Jobs’ Figures 6A and 15) is illustrated below in modified Figure 6 of Hackborn. A POSITA would have understood that Jobs’ disclosure of scrolling offers two alternatives on cessation of contact: decay velocity with friction or stopping immediately such that, in Ground 2’s combination of Hackborn2-Westerman-Jobs, cessation of the swiping motion would cause the resulting scrolling to either slow down or stop immediately.



APPLE-1004, FIG. 6 (highlighted, modified in red)

154. A POSITA reviewing the device and methods of Hackborn would have naturally looked to Jobs' disclosure of manual scrolling through images/messages, especially in light of Hackborn's emphasis on live wallpapers with which a user can interact and teaching of live wallpapers that include images/posts from sources that are constantly receiving new images/posts.

155. A POSITA would have understood that implementing Hackborn's device to associate a user swipe on its live wallpaper background with the resulting action of "scroll[ing] through the [images of the wallpaper] using vertical upward

and/or vertically downward gestures [] on the touch screen” with friction-based scrolling inertia would serve the purpose of providing an intuitive method for allowing a user to interact with the live wallpaper and view new images when the user wishes to see them, or view older posts that may have been automatically scrolled out of view. APPLE-1009, [0253], [0401], FIG. 6A, 15. A POSITA would have recognized that applying Jobs’ disclosure of associating swipes (e.g., vertically downward or upward motions) with manual scrolling through images in Hackborn’s device would have led to predictable results without significantly altering or hindering the functions performed by Hackborn’s device, particularly because Hackborn already contemplates receiving swipes, displaying images/posts in a live background, allowing a user to interact with a live background to change its appearance, and scrolling through images/posts in the live background. A POSITA would have been motivated to implement Hackborn’s device with Jobs’ teachings to achieve the predictable results offered by Jobs’ description allowing a user to *manually* scroll through the images/posts, viewing the images/posts at his/her leisure. APPLE-1005, [0395]-[0401], FIG. 15. Moreover, because swiping inputs were known (as described in Hackborn, Westerman, and Jobs), scrolling through images/posts was known (as described in both Hackborn and Jobs), scrolling through content with a resulting friction-based simulation was known (as described in Jobs), and interacting with live backgrounds was known, a POSITA

would have reasonably understood the combination of Hackborn, Westerman, and Jobs to be successful with no unexpected results.

2. Claim 1⁴

[1.pre] An electronic device, comprising:

156. For at least the same reasons as discussed above with respect to element [1.pre] in Ground 1A (as discussed with respect to Hackborn), the Hackborn2-Westerman-Jobs Combination renders obvious an “electronic device.” *See* discussion of element [1.pre] (Ground 1A).

[1.a] a display;

157. For at least the same reasons as discussed above with respect to element [1.a] in Ground 1A (as discussed with respect to Hackborn), the Hackborn2-Westerman-Jobs Combination renders obvious “a display.” *See* discussion of element [1.a] (Ground 1A).

[1.b] a touch-sensitive surface;

158. For at least the same reasons as discussed above with respect to element [1.b] in Ground 1A (as discussed with respect to Hackborn), the Hackborn2-Westerman-Jobs Combination renders obvious “a touch-sensitive surface.” *See* discussion of element [1.b] (Ground 1A).

⁴ For each element of claim 1 in Ground 2, *see also* discussion of claim 1 in Ground 1A as they relate to Hackborn and Westerman. §VII.A.3-4.

[1.c] one or more processors;

159. For at least the same reasons as discussed above with respect to element [1.c] in Ground 1A (as discussed with respect to Hackborn), the Hackborn2-Westerman-Jobs Combination renders obvious “one or more processors.” *See* discussion of element [1.c] (Ground 1A).

[1.d] memory; and

160. For at least the same reasons as discussed above with respect to element [1.d] in Ground 1A (as discussed with respect to Hackborn), the Hackborn2-Westerman-Jobs Combination renders obvious “a memory.” *See* discussion of element [1.d] (Ground 1A).

[1.e] 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, the one or more programs including instructions for:

161. For at least the same reasons as discussed above with respect to element [1.e] in Ground 1A (as discussed with respect to Hackborn), the Hackborn2-Westerman-Jobs Combination renders obvious “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, the one or more programs including instructions.” *See* discussion of element [1.e] (Ground 1A).

[1.f] displaying a first user interface on the display, wherein the first user interface includes:

162. For at least the same reasons as discussed above with respect to element [1.f] in Ground 1A (as discussed with respect to Hackborn), the Hackborn2-Westerman-Jobs Combination renders obvious “displaying a first user interface on the display.” See discussion of element [1.f] (Ground 1A).

[1.g] a background with an appearance, and

163. The Hackborn2-Westerman-Jobs device renders obvious “a background with an appearance.” APPLE-1004, [0009], [0011]-[0012], [0015], [0023], [0025], [0026], [0030], [0031], [0035], [0036], [0040]-[0042], [0046]-[0050], [0051], [0054], [0058], FIGS. 4, 6, 9. Hackborn explains that, “[t]raditionally, a home screen includes a background, which may ... include an image in the form of wallpaper.” APPLE-1004, [0025]. For example, with reference to Figure 6 (below), Hackborn explains that “active content ... produced as live wallpaper on a computing device” can include “information fetched or received from one or more social services on the internet,” such as “posts or tweets 606a-e from a social networking site,” including images. *Id.*, [0046]. The live wallpaper 604 is in the background, as evidenced at least by the “[i]cons 608a-d [] shown on a display layer above the wallpaper 604.” *Id.*, [0046].

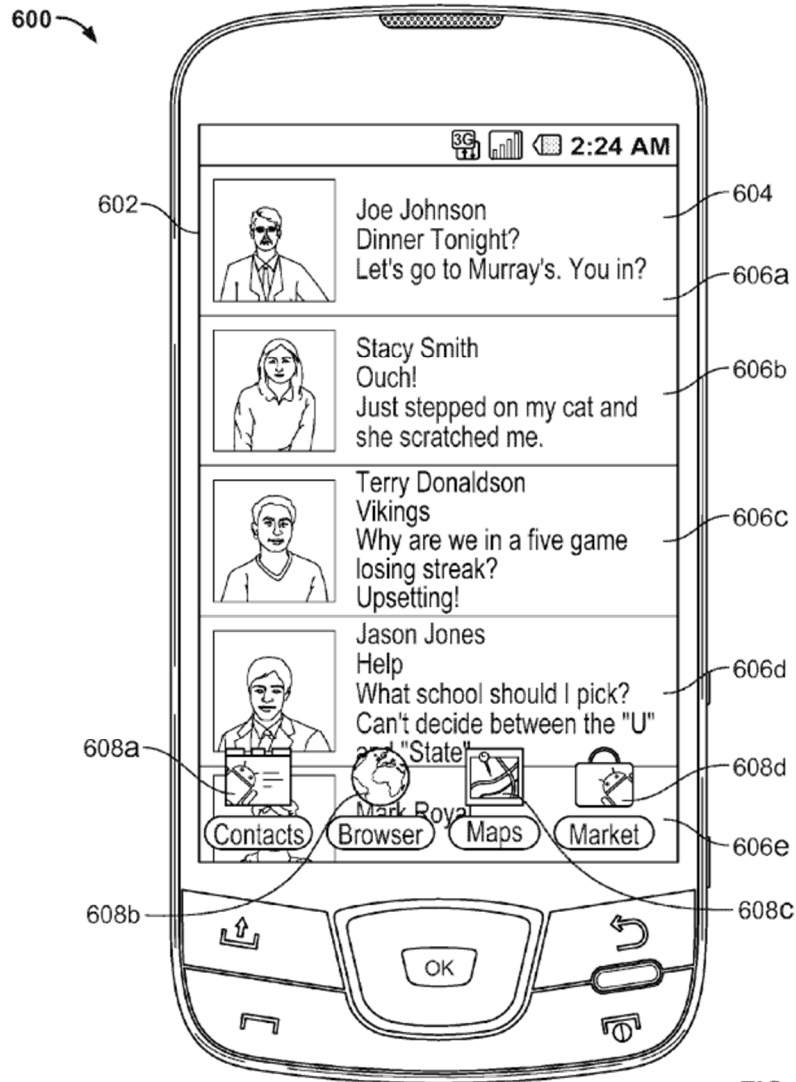


FIG. 6

APPLE-1004, FIG. 6

164. Moreover, Hackborn explains that the method 900 of Figure 9 is “for generating a graphical user interface on a display of a computing device,” where a “graphical wallpaper representation is generated in a first process on a first visual layer on a display of a computing device (910).” *Id.*, [0058], FIG. 9.

[1.h] one or more foreground objects;

165. The Hackborn2-Westerman-Jobs device renders obvious “one or more foreground objects.” APPLE-1004, [0009] (“generating one or more graphical objects in a second process on a second visual layer of the display, wherein the second visual layer is positioned visually on top of the first visual layer”), [0023], [0025], [0026], [0030]-[0031], [0036], [0040]-[0042], [0043], [0047], [0051], [0054], [0058], FIGS. 1, 2, 4, 5A-B, 6, 7, 9. Hackborn explains that “[i]cons may be shown on a visual layer in front of the background/wallpaper, meaning that the icons can be moved independently of the wallpaper, and are displayed by the device visually on top of the wallpaper, so that when there is an overlap, the icons are shown and the wallpaper is obscured.” APPLE-1004, [0025]. For example, Figure 6 shows foreground objects “[i]cons 608a-d [] shown on a display layer above the wallpaper 604.” *Id.*, [0046].

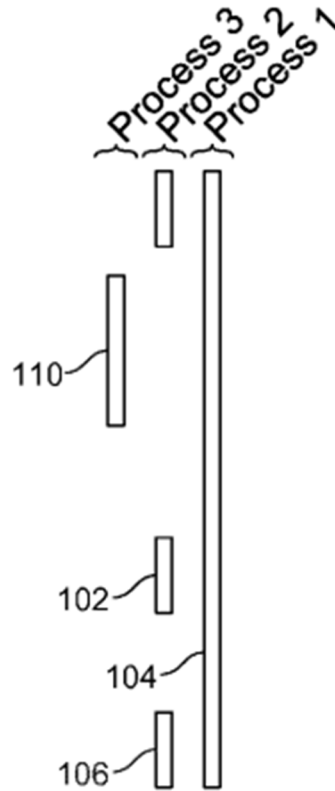


FIG. 2

APPLE-1004 (Hackborn), FIG. 2.

166. In the method 900 of Figure 9, “[o]ne or more graphical objects are generated in a second process on a second visual layer of the display (200), where the second visual layer may be positioned visually on top of the first visual layer.”

Id., [0058], FIG. 9.

[1.i] while displaying the first user interface on the display, detecting a first input by a first contact on the touch-sensitive surface at a location in the

first user interface that corresponds to the background of the first user interface; and

167. The Hackborn2-Westerman-Jobs device renders obvious “while displaying the first user interface on the display, detecting a first input by a first contact on the touch-sensitive surface at a location in the first user interface that corresponds to the background of the first user interface.” APPLE-1004, [0028], FIG. 1. For example, with reference to Figure 1, Hackborn explains that “a user is swiping her finger across a touch-sensitive display screen of the computing device” can cause the displayed background to change—showing the detecting of the first input by the first contact by the Hackborn2-Westerman-Jobs device. APPLE-1004, [0028]. A POSITA would have found obvious that the Hackborn2-Westerman-Jobs device can similarly detect the first input with the live wallpaper 604 shown in Hackborn’s Figure 6. *Id.*; *see also id.*, [0040]-[0041], [0042] (“the user may select one of the images [of the live wallpaper]”), [0048] (“the wallpaper or a portion of the wallpaper [may] be selected, or a particular input may be provided”).

[1.j] in response to detecting the first input by the first contact, in accordance with a determination that the first contact has a magnitude that is above a threshold, dynamically changing the appearance of the background of the first user interface without changing an appearance of the one or more foreground objects in the first user interface,

168. The Hackborn2-Westerman-Jobs device renders obvious “in response to detecting the first input by the first contact, in accordance with a determination

that the first contact has a magnitude that is above a threshold, dynamically changing the appearance of the background of the first user interface without changing an appearance of the one or more foreground objects in the first user interface.” APPLE-1004, [0025], [0028], [0033], [0040]-[0042], [0043], [0048], [0054], FIGS. 4, 5A-5B, claim 18 (“change a manner in which the graphical wallpaper representation is displayed using the generated information”), claim 19; APPLE-1005, [0018]-[0019], [0060]-[0064]. As discussed above in §VII.E.1, a POSITA would have found it obvious to implement the Hackborn2-Westerman-Jobs device such that a swiping gesture, as determined using the methods of Westerman, on the wallpaper 604 of Hackborn would cause the images/posts of the wallpaper 604 to scroll, as taught by Jobs. APPLE-1004, [0040]-[0041], [0046]-[0048], FIGS. 4, 6; APPLE-1005, [0059]-[0064]; APPLE-1009, [0243], [0401], FIGS. 6A, 15. The modification of Hackborn’s live wallpaper with Jobs’ manual scrolling (shown in Jobs’ Figures 6A and 15) is illustrated below in modified Figure 6 of Hackborn.

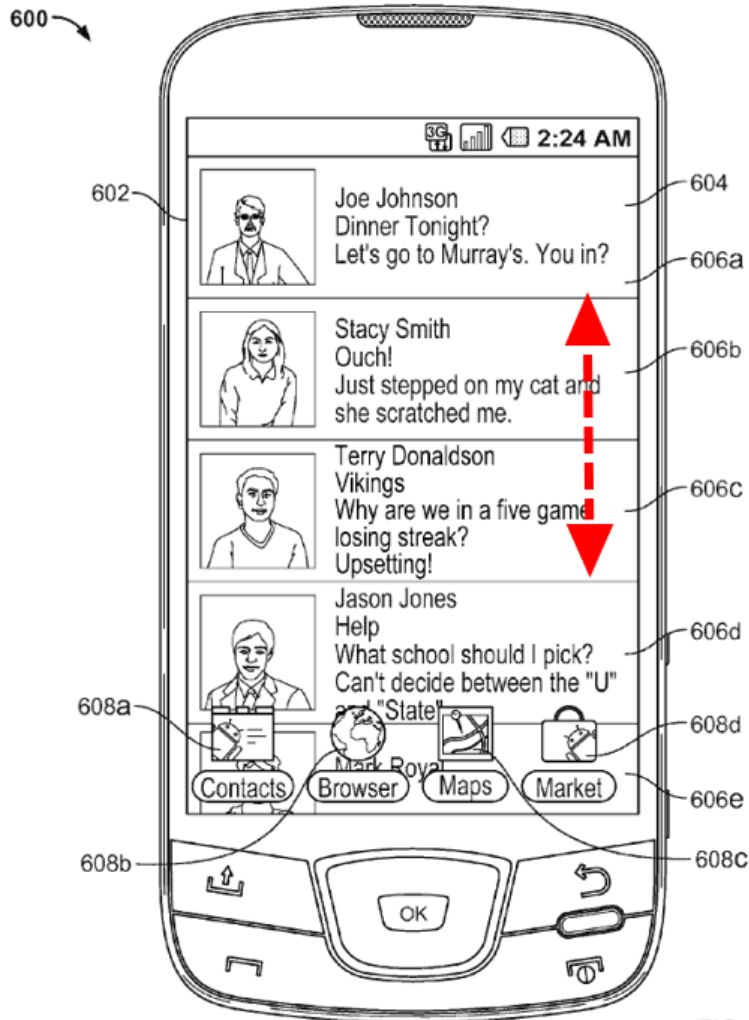


FIG. 6

APPLE-1004, FIG. 6 (modified in red)

169. Additionally, in response to the user input, the Hackborn2-Westerman-Jobs device dynamically changes the appearance of the wallpaper without changing the appearance, for example, of the icons displayed in the foreground. APPLE-1004, [0028], [0033], [0040]-[0042], [0043], [0046]-[0048], FIGS. 1, 4, 5A-5B, 6. Hackborn further teaches or renders obvious that, while the live wallpaper changes responsive to the user touch, the icons do not move. *Id.*,

[0028], [0047]. For instance, Hackborn states that “the application area would be displayed above the wallpaper layer and the icon layer” such that the “live wallpaper 604 may continue to update in the background, whether the user is working on applications or not.” *Id.*, [0047]. “When wallpaper updates occur and the appearance of the wallpaper 604 is caused to change, the wallpaper may continue to occupy the bottom-most viewed display layer or plane of the display 602, for example below the icon or gadget layer and further below one or more application layers.” Hackborn also explains that display updates to the background may occur independently of updates to other displayed items – “the wallpaper object may execute in its own separate environment, and the wallpaper 104 may be updated independently of other displayed graphics that are associated with the other objects, constructs, or applications.” *Id.*, [0027]. Hackborn also discloses that “[i]cons 608a-d are shown on a display layer above the wallpaper 604.” *Id.*, [0047]; *see also id.*, [0025] (“in front of the background/wallpaper, meaning that the icons can be moved independently of the wallpaper”). Based at least on these disclosures of independence between background and foreground display updates, and on Hackborn’s discussion of different “layers” of appearance of the interface, a POSITA would have understood that a user swipe on the background would affect only the appearance of the wallpaper and not the appearance of any of the objects on layers above the wallpaper layer. *Id.*, [0029]-[0036], FIG. 2.

170. As discussed above in §VII.E.1, a POSITA would have further found obvious that the Hackborn2-Westerman-Jobs device would be implemented such that if the user input “exceeds the minimum swipe length threshold” and/or if the “initial velocity at touchdown” is greater than a velocity threshold, the input is “interpreted as a swipe event.” APPLE-1005, [0018]-[0019], [0060]-[0064]. Thus, the detection of the user input would be in accordance with a determination that the input has a magnitude (e.g., path length) that is above a threshold, or predetermined minimum. *Id.* For example, if the magnitude of the touch is large enough to be registered as a swipe because its “path has been determined to exceed the minimum length threshold for a swipe gesture,” then images that are part of the live wallpaper 404 are caused to scroll and show new images. *Id.*, [0040]-[0041], [0064].

[1.k] wherein the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact and

171. The Hackborn2-Westerman-Jobs device renders obvious “wherein the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact.” APPLE-1004, [0026] (“wallpaper may be active, and in this example may respond to inputs from a user”), [0028], [0033] (“vector representing the position, direction, and speed of the user’s dragging motion”), [0040]-[0042], [0043], [0054], FIGS. 1, 5A-5B;

APPLE-1005, [0018]-[0019], [0060]-[0064]. For example, as discussed above, when the magnitude of a user touch is such that the touch is determined to be a swipe, the live wallpaper 404 changes its appearance (e.g., by scrolling through images). *See* discussion of element [1.j]. However, if the magnitude is such that the input is determined to be a tap, for example, Hackborn provides other actions unrelated to changing the background appearance. APPLE-1004, [0042].

[1.l] wherein the dynamic change in the appearance of the background of the first user interface includes displaying in sequence at least some of a plurality of images based at least in part on the magnitude of the first contact.

172. The Hackborn2-Westerman-Jobs device renders obvious “wherein the dynamic change in the appearance of the background of the first user interface includes displaying in sequence at least some of a plurality of images based at least in part on the magnitude of the first contact.” APPLE-1004, [0008], [0028], [0033], [0040]-[0042], [0046], [0050], FIGS. 1, 4, 6, claims 32-33; APPLE-1005, [0018]-[0019], [0060]-[0064]. In particular, as discussed above, in response to a determination that a magnitude (e.g., path length, initial velocity) of the user input indicates the input to be a swipe, the Hackborn2-Westerman-Jobs device causes the display to scroll and show other images/posts of the live wallpaper (e.g., in the direction of the swipe), thus providing a “sequence of at least some of a plurality of images” based on the input determined to be a swipe. APPLE-1004, [0041].

3. Claim 4

[4] The electronic device of claim 1, wherein the electronic device is configured such that the dynamic change in the appearance of the background of the first user interface is based in part on a positive rate of change in the magnitude of the first contact.

173. The Hackborn2-Westerman-Jobs device renders obvious “wherein the electronic device is configured such that the dynamic change in the appearance of the background of the first user interface is based in part on a positive rate of change in the magnitude of the first contact.” APPLE-1009, [1135], [1138]. Regarding its scrolling list, Jobs states that “scrolling the list has an associated speed of translation that corresponds to a speed of movement of [a finger].” *Id.* A positive speed or velocity is a positive rate of change of displacement on the touch screen, or “positive rate of change in the magnitude of the first contact.” In other words, in the Hackborn2-Westerman-Jobs device, the dynamic change in the appearance of the background (e.g., the scrolling velocity of the items in the wallpaper) is based on a rate of change in the magnitude, or displacement, of the contact. *Id.*

4. Claim 5

[5] The electronic device of claim 1, wherein the electronic device is configured such that a magnitude of the dynamic change in the appearance of the background of the first user interface decays following detection of a cessation of the first contact.

174. The Hackborn2-Westerman-Jobs device renders obvious “wherein the electronic device is configured such that a magnitude of the dynamic change in the appearance of the background of the first user interface decays following detection

of a cessation of the first contact.” APPLE-1009, [1134]-[1140], FIG. 6A. As discussed above, the Hackborn2-Westerman-Jobs device includes Jobs’ friction-based scrolling inertia. §VII.D.1; APPLE-1009, [1138]. A POSITA would have understood that the alternative to a decaying approach would be to stop immediately. While Jobs is not explicit that scrolling speed decays after cessation of the contact, a POSITA would have understood that one way to satisfy a “speed of translation that corresponds to a speed of movement of [a finger]” or “a simulation of an equation of motion having friction” would be to initiate the decay of the scrolling velocity when the finger is lifted from the touch screen. Indeed, this approach was well-known by the Critical Date. *Id.* For instance, in Steve Jobs’ MacWorld keynote in 2007 (available on YouTube at <https://www.youtube.com/watch?v=VQKMoT-6XSg&t=1508s>, posted 11 years ago with over 13 million views), the iPhone 1 was demonstrated. In that video, Steve Jobs demonstrated how a user could easily browse contacts on his or her phone by simply swiping up or down on the touch screen. While swiping up on the screen, Steve Jobs stated, “I’m in Contacts right now. And, again, how do I move around in Contacts? I just scroll through them.” In response to the swipe up motion, the Contacts list scrolled down to show additional names, with a simulation of friction after the finger was lifted from the display.

5. Claim 6

[6] The electronic device of claim 1, wherein the electronic device is configured such that the dynamic change in the appearance of the background of the first user interface is independent of a position of a focus selector on the background.

175. The Hackborn2-Westerman-Jobs device renders [6] obvious. APPLE-1009, [1137]-[1138]. Jobs states that “movement of [a finger] is detected on or near the displayed portion of the list” of Figure 6A or simply “on the touch screen display.” APPLE-1009, [1137], FIG. 6A. “In response to detecting the movement, the list of items displayed on the touch screen display is scrolled.” *Id.*, [1138]. Thus, a POSITA would have understood that the scrolling gesture 610 in Figure 6A of Jobs can occur at *any* location within the message list, and similarly that the scrolling gesture (or a “focus selector,” to the extent one exists in the Hackborn2-Westerman-Jobs device) in the Hackborn2-Westerman-Jobs device can occur at any location on the live wallpaper. APPLE-1009, [1137]-[1138].

6. Claim 7

[7] The electronic device of claim 1, wherein the one or more programs include instructions for: in response to detecting the first input by the first contact on the touch-sensitive surface, in accordance with a determination that the first input does not have a magnitude above the threshold, maintaining the appearance of the background of the first user interface.

176. The Hackborn2-Westerman-Jobs device renders obvious “wherein the one or more programs include instructions for: in response to detecting the first input by the first contact on the touch-sensitive surface, in accordance with a determination that the first input does not have a magnitude above the threshold,

maintaining the appearance of the background of the first user interface.” APPLE-1004, [0046]-[0048], FIG. 6; APPLE-1005, [0018]-[0019], [0060]-[0064]. As discussed above in §VII.E.1, in the Hackborn2-Westerman-Jobs device, when a user input received on the wallpaper 604 is determined to be a swipe, in response the wallpaper 604 is caused to change its appearance by scrolling images/posts from the social media services (e.g., older social media posts that had been automatically scrolled out of view). *See* §VII.E.1; *see also* §VII.E.2 (discussion of element [1.j]). A POSITA would have found obvious that the responsive scrolling of images in the Hackborn2-Westerman-Jobs device is only in response to a swipe and not responsive to a tap, for example, which does not suggest the same scrolling output. As such, if the user input does not have a magnitude above the swipe threshold, the background remains unchanged.

7. Claim 8

[8] *The electronic device of claim 1, wherein the one or more programs includes instructions for: in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background.*

177. The Hackborn2-Westerman-Jobs device renders obvious “wherein the one or more programs includes instructions for: in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background” for at least the same reasons as discussed above with respect to claim 5. APPLE-1009, [1134]-[1140], FIG. 6A. As per claim 5, a POSITA would have

understood that Jobs' disclosure of scrolling offers two alternatives on cessation of contact: decay velocity with friction or stopping immediately. §VII.E.4. Thus, it would have been obvious for the Hackborn2-Westerman-Jobs device to employ either one of these approaches.

178. Alternatively, Jobs' disclosure of its friction scrolling also satisfies claim 8, which does not require immediate cessation of the dynamic change. Rather, it merely recites "in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background." Thus, Jobs' friction scrolling, included in the Hackborn2-Westerman-Jobs device, which initiates a friction decay function (that eventually ceases the dynamic change in the appearance of the background) in response to cessation of contact, satisfies this claim.

8. Claim 10

[10] The electronic device of claim 1, wherein the electronic device is configured such that the plurality of images is associated with the background.

179. The Hackborn2-Westerman-Jobs device renders obvious "wherein the electronic device is configured such that the plurality of images is associated with the background." APPLE-1004, [0005] ("wallpaper when the background is formed from a graphical image"), [0025], [0043], [0047], claims 2 and 33, FIG. 6. In particular, the plurality of images are provided in "live wallpaper 604" that

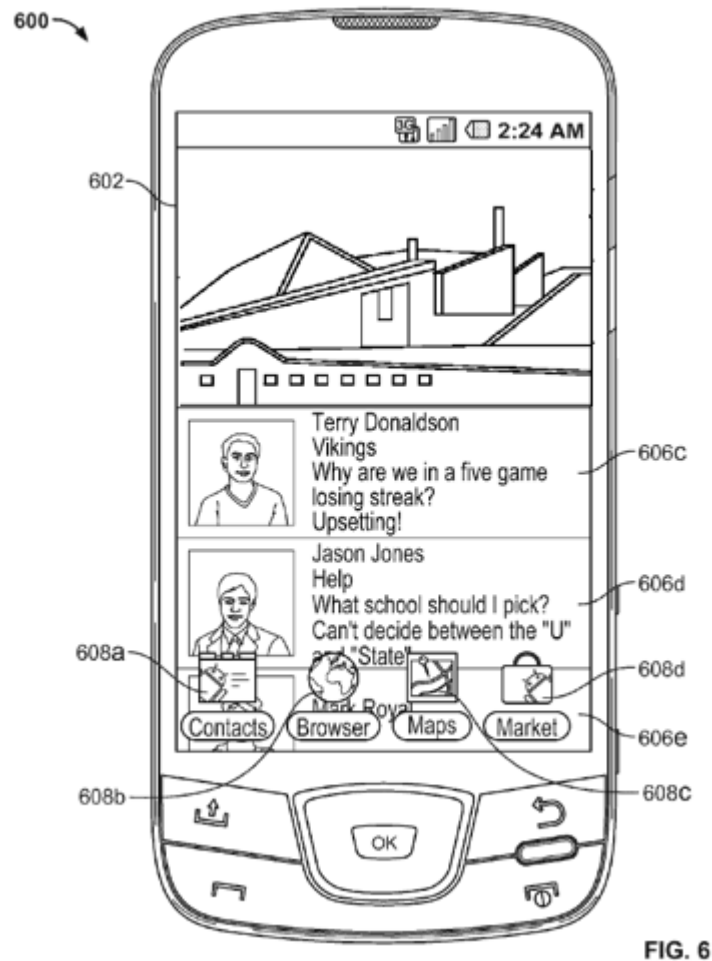
“continue[s] to update in the background.” APPLE-1004, [0047], FIG. 6. This is consistent with a POSITA’s understanding of an “image” by the Critical Date. That is, a POSITA would have recognized an “image” to be “[a] graphic, which may contain pictures and/or text.” APPLE-1022, 3; *see also* APPLE-1023, 3 (“a picture, represented in a computer’s memory”); APPLE-1024, 3 (“A two-dimensional array of data with values at each element of the array related to an intensity or a color.”); APPLE-1025, 3 (“A stored description of a graphic picture, either as a set of brightness and color values of pixels or as a set of instructions for reproducing the picture.”).

9. Claim 11

[11] *The electronic device of claim 1, wherein the electronic device is configured such that the plurality of images includes photographs taken using a camera of the electronic device.*

180. The Hackborn2-Westerman-Jobs device renders obvious “wherein the electronic device is configured such that the plurality of images includes photographs taken using a camera of the electronic device.” APPLE-1004, [0008], [0035], [0050], claims 9 and 24; *see* discussion of element [1.1]. As discussed with respect to element [1.1], Hackborn teaches that “live wallpaper can include a ***combination of the described wallpaper examples,***” including, for example, images from social networking sites or photographs captured live by the device’s camera. APPLE-1004, [0008], [0035], [0050] (emphasis added), claims 9 and 24.

An example of such a “combination of the described wallpaper examples” is shown below where the wallpaper includes a live image from the device’s camera (top) and images from posts 606c, 606d, and 606e (bottom) from Figure 6.



Composite image based on APPLE-1004, FIG. 6

181. To the extent this discussion in Hackborn states displaying only “a live image being captured in real-time by a digital camera in the computing device,” it would have been obvious to include more than just a single photograph and doing so would yield no new and unexpected results. APPLE-1004, [0008].

182. Additionally or alternatively, a POSITA would have found obvious for the images from the social media web site to be captured using the camera of the electronic device, as was well known and common practice by the Critical Date. Indeed, it was well-known at least by the Critical Date for a user to use his/her device to capture a photograph of a friend and associate that photo with the friend/contact on his/her device. Thus, it would have been obvious that, for example, the photographs of Terry Donaldson and Jason Jones, shown in Figure 6 would have been taken using a camera of the Hackborn2-Westerman-Jobs device.

10. Claim 12

[12] The electronic device of claim 1, wherein the electronic device is configured such that the at least some of the plurality of images is displayed, in sequence, by automatically scrolling through the at least some of the plurality of images.

183. The Hackborn2-Westerman-Jobs device renders obvious “wherein the electronic device is configured such that the at least some of the plurality of images is displayed, in sequence, by automatically scrolling through the at least some of the plurality of images.” APPLE-1004, [0040]-[0042], [0046]-[0048], FIGS. 4, 6; APPLE-1005, [0059]-[0064]; APPLE-1009, [0243], [0401], FIGS. 6A, 15; §VII.E.1; *see* discussion of element [1.j]. As discussed with respect to element [1.j], POSITA would have found it obvious to implement the Hackborn2-Westerman-Jobs device such that a swiping gesture, as determined using the methods of Westerman, on the wallpaper 604 of Hackborn would cause the

images/posts of the wallpaper 604 to scroll in sequence, as taught by Jobs.

APPLE-1004, [0040]-[0041], FIG. 4; APPLE-1005, [0059]-[0064]; APPLE-1009, [0401], FIG. 15.

11. Claim 15

[15] The electronic device of claim 1, wherein the electronic device is configured such that the plurality of images is associated with the background, and the plurality of images includes photographs.

184. The Hackborn2-Westerman-Jobs device renders obvious “wherein the electronic device is configured such that the plurality of images is associated with the background, and the plurality of images includes photographs.” APPLE-1004, [0008], [0040]-[0042], FIG. 4. As discussed above for element [1.g], the plurality of images includes images for a social media site (*see* §VII.E.1). APPLE-1004, [0040], [0046]-[0048], FIGS. 4, 6. A POSITA would have understood that the images from the social media site includes photographs, and, further, because the social media images are “produced as wallpaper 404,” a POSITA would have understood them to be associated with the background (e.g., as part of wallpaper). APPLE-1014, 2; APPLE-1015, [0004] (describing the popularity of “photograph-sharing websites”); APPLE-1016, [0023] (explaining that the term “image” includes, for example, photographs, including photographs shared via email, social media, or social network).

12. Claim 17

[17] The electronic device of claim 1, wherein the electronic device is configured such that the at least some of the plurality of images is displayed, in sequence, by automatically moving, one-by-one, through the at least some of the plurality of images.

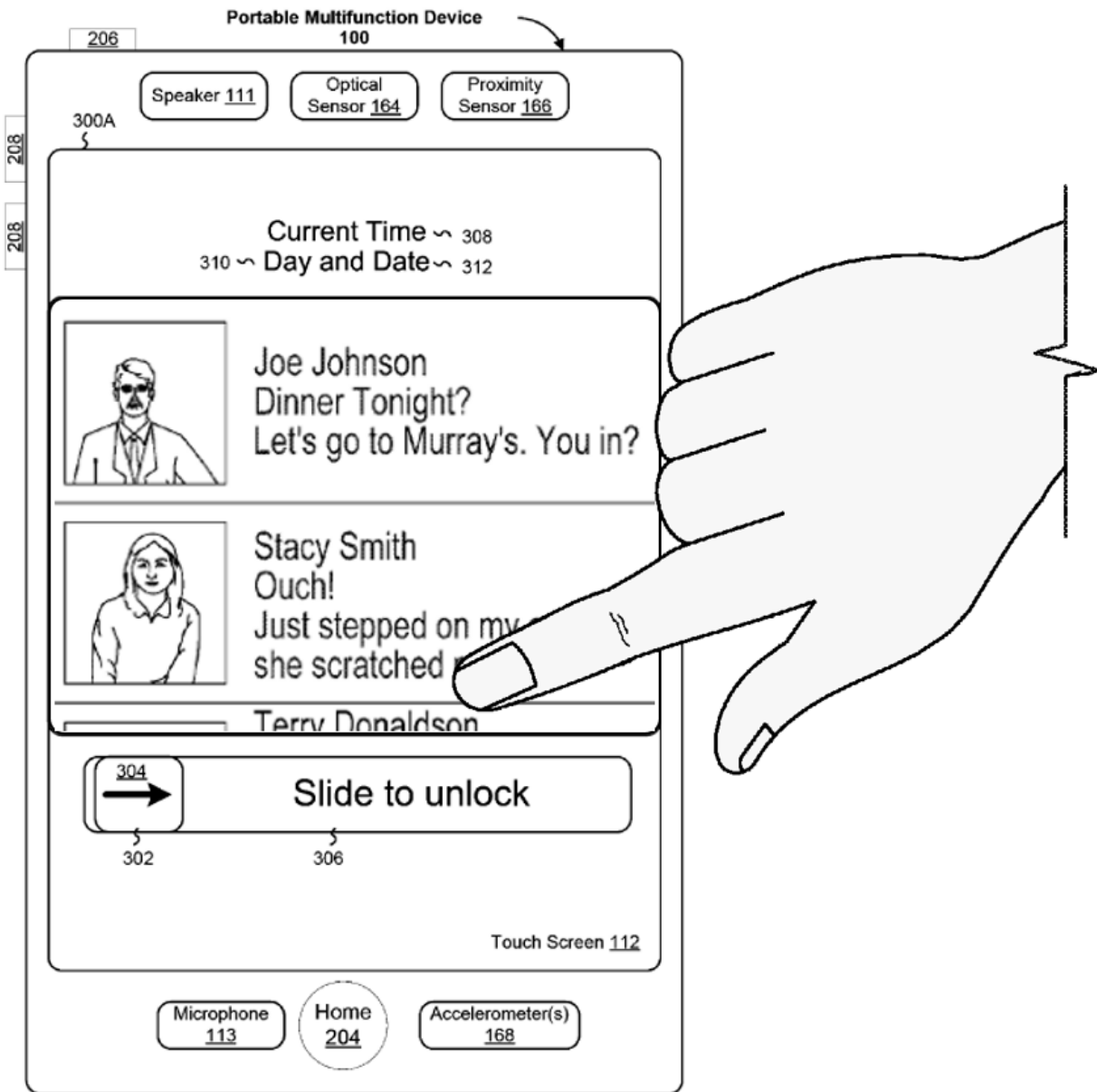
185. The Hackborn2-Westerman-Jobs device renders obvious “wherein the electronic device is configured such that the at least some of the plurality of images is displayed, in sequence, by automatically moving, one-by-one, through the at least some of the plurality of images.” APPLE-1009, [1135], [1138]. As discussed above, Hackborn discloses images displayed within its automatically scrolling list of social media posts. APPLE-1004, [0046]-[0048], FIG. 6; §VII.E.1. As discussed above regarding claim 5, Jobs teaches scrolling at the velocity of the finger movement. APPLE-1009, [1134]-[1140]; §VII.E.4. Thus, a POSITA would have understood that in the Hackborn2-Westerman-Jobs device, the images in Hackborn’s list of social media posts are displayed *in sequence by automatically moving, one-by-one* through the images, with new images entering the displayed portion of the scrolled list one-by-one.

13. Claim 18

[18] The electronic device of claim 1, wherein the electronic device is configured such that the first user interface includes a lock screen.

186. The Hackborn2-Westerman-Jobs device renders obvious “wherein the electronic device is configured such that the first user interface includes a lock screen.” APPLE-1004, FIG. 6; APPLE-1009, FIG. 3A. In particular, for at least the same reasons discussed above in Ground 1D, it would have been obvious to a

POSITA to configure the Hackborn2-Westerman-Jobs device with a lock screen, as shown in the composite image below. §VII.D.2-3.



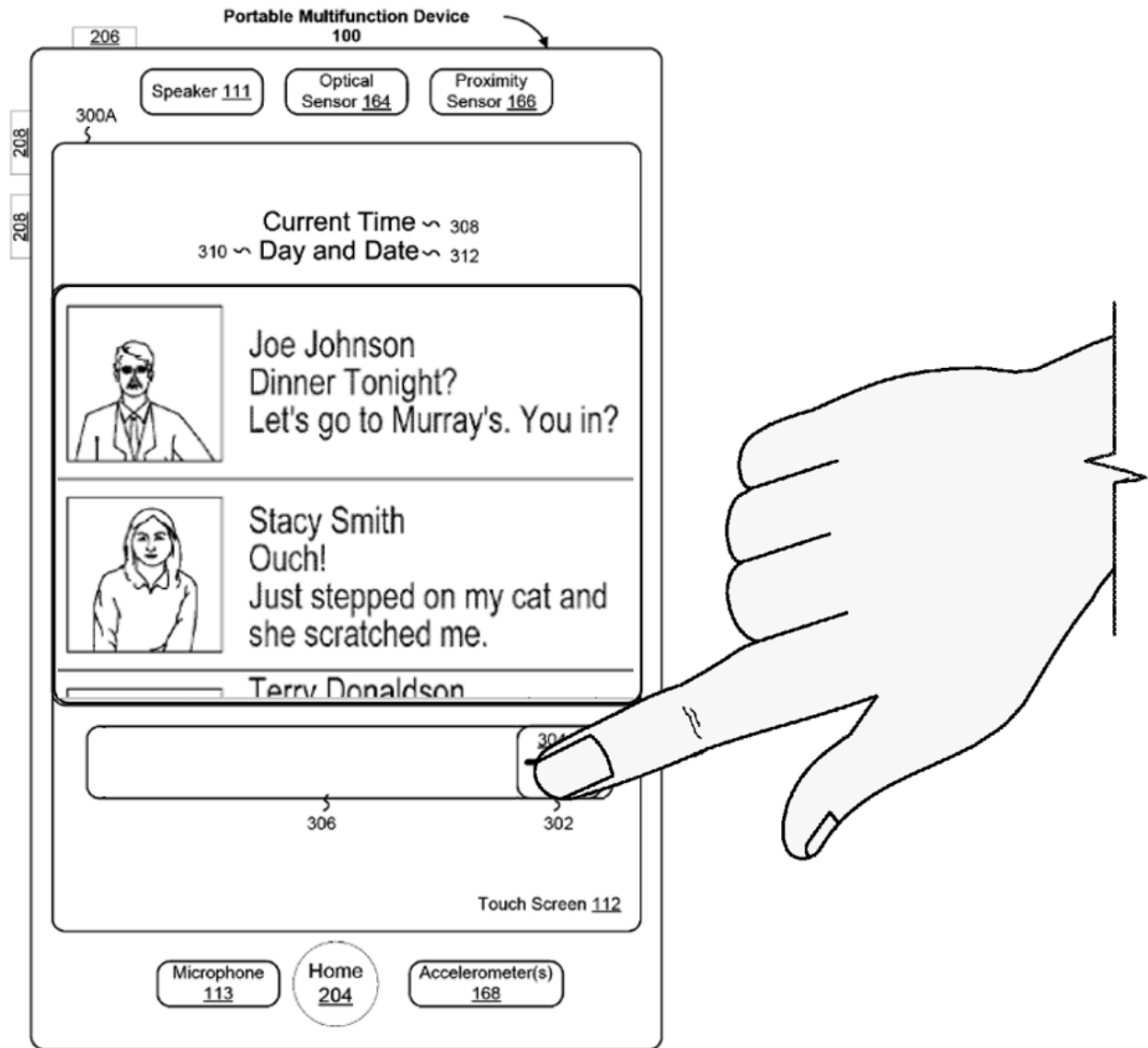
Composite image based on Job's FIG. 3A and Hackborn's FIG. 6

14. Claim 19

[19] The electronic device of claim 1, wherein the electronic device is configured such that the first user interface includes a lock screen that is unlocked.

187. The Hackborn2-Westerman-Jobs device renders obvious “wherein the electronic device is configured such that the first user interface includes a lock screen that is unlocked.” APPLE-1004, FIG. 6; APPLE-1009, [0177], FIG. 3A. In particular, for at least the same reasons discussed above in Ground 1D, it would have been obvious to a POSITA to configure the Hackborn2-Westerman-Jobs device with a lock screen that is unlocked, as shown in the composite image below.

§VII.D.2-4.



Composite image based on Job's FIG. 3A and Hackborn's FIG. 6

15. Claim 20

[20] *The electronic device of claim 1, wherein the electronic device is configured such that the magnitude includes a duration magnitude.*

188. For at least the same reasons as discussed above with respect to claim 20 in Ground 1A (as discussed with respect to Westerman), the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the electronic device is

configured such that the magnitude includes a duration magnitude.” *See* discussion of claim 20 (Ground 1A).

16. Claim 22

- [22] *The electronic device of claim 21, wherein the electronic device is configured such that at least one of:*
- the background includes a background image;*
 - the background is a background image;*
 - a representative image includes a background image;*
 - a representative image includes one of the sequence of images;*
 - the one or more foreground objects includes one or more application icons;*
 - the one or more foreground objects of a second user interface includes one or more application icons;*
 - the one or more foreground objects include at least one of a date, a time, a network type, a battery level, or status information;*
 - the one or more foreground objects of the first user interface include at least one of a date, a time, a network type, a battery level, or status information;*
 - the background of the first user interface is the same as the background of a second user interface;*
 - the background of the first user interface is different from the background of a second user interface;*
 - the first input by the first contact results from a press;*
 - the first input by the first contact results from a press gesture;*
 - the location in the first user interface that corresponds to the background of the first user interface includes a location that overlaps the background, at least in part;*
 - the location in the first user interface that corresponds to the background of the first user interface, includes a bounding box;*
 - the magnitude includes a pressure or force magnitude of the first contact;*

the threshold includes a threshold level of pressure or force of the first contact;

the threshold includes a predetermined level of pressure or force of the first contact;

the instructions include at least one of: computer code, computer software, software instructions, hardware code, or hardware instructions;

the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact, by the appearance of the background of the first user interface conditionally changing based on the determination that the first contact has the magnitude above the threshold;

the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact, by the appearance of the background of the first user interface changing only if it is determined that the first contact has the magnitude above the threshold;

the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact, by the dynamic changing of the appearance of the background of the first user interface altering dynamically based at least in part on the magnitude of the first contact;

the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact, by dynamically changing the appearance of the background in a first manner in response to a first magnitude, and dynamically changing the appearance of the background in a second manner in response to a second magnitude;

the dynamically changing the appearance of the background of the first user interface includes displaying in sequence at least some of the sequence of images based at least in part on the magnitude of the first contact;

the displaying in sequence the at least some of the sequence of images is based at least in part on the magnitude of the first contact, by starting to

scroll through the at least some of the sequence of images as a function of the magnitude of the first contact;

the displaying in sequence the at least some of the sequence of images is based at least in part on the magnitude of the first contact, by scrolling through the at least some of the sequence of images as a function of the magnitude of the first contact;

the displaying in sequence the at least some of the sequence of images is based at least in part on the magnitude of the first contact, by speeding a scrolling through the at least some of the sequence of images as a function of the magnitude of the first contact;

the threshold includes a predetermined level of duration of the first contact;

the magnitude includes a duration magnitude of the first contact;

the displaying in sequence the at least some of the sequence of images includes displaying the sequence of images as a video;

the displaying in sequence the at least some of the sequence of images includes displaying the sequence of images to appear as a video;

the displaying in sequence the at least some of the sequence of images is based at least in part on the magnitude of the first contact, by adjusting a speed through which the at least some of the sequence of images are displayed in sequence as a function of the magnitude of the first contact;
or

the displaying in sequence the at least some of the sequence of images is based at least in part on the magnitude of the first contact, by increasing a speed through which the at least some of the sequence of images are displayed in sequence as a function of the magnitude of the first contact.

189. The Hackborn2-Westerman-Jobs device renders obvious claim 22

(e.g., “the one or more foreground objects includes one or more application icons”). APPLE-1004, [0047], FIGS. 4, 6. In particular, Figure 6 shows

foreground objects including application icons for contacts 608a, browser 608b, maps 608c, and market 608d. *Id.*

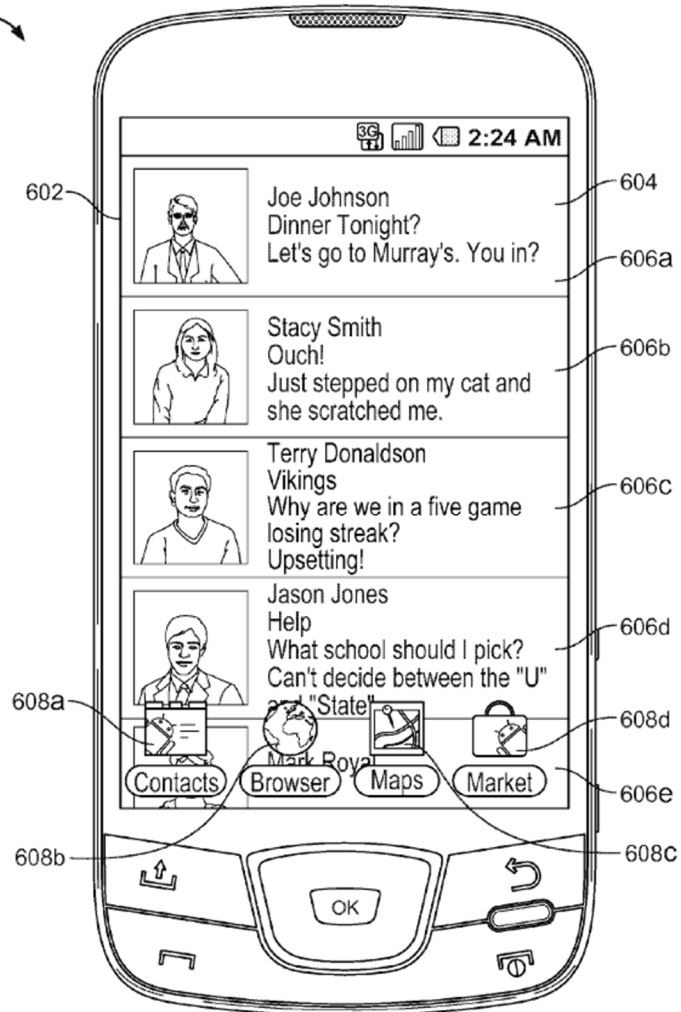


FIG. 6

APPLE-1004, FIG. 6

17. Claim 23⁵

[23.pre] A method, comprising: at an electronic device including

190. For at least the same reasons as discussed above with respect to element [1.pre] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “[a] method, comprising: at an electronic device.” *See* discussion of element [1.pre].

[23.a] a display,

191. For at least the same reasons as discussed above with respect to element [1.a] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “a display.” *See* discussion of element [1.a].

[23.b] a touch-sensitive surface,

192. For at least the same reasons as discussed above with respect to element [1.b] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “a touch-sensitive surface.” *See* discussion of element [1.b].

⁵ For each element of claim 23 in Ground 2, *see also* discussion of claims 1 and 23 in Ground 1A as they relate to Hackborn and Westerman. §§VII.A.3-4 and VII.A.14.

[23.c] one or more processors, and

193. For at least the same reasons as discussed above with respect to element [1.c] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “one or more processors.” *See* discussion of element [1.c].

[23.d] memory:

194. For at least the same reasons as discussed above with respect to element [1.d] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “memory.” *See* discussion of element [1.d].

[23.e] displaying a first user interface on the display, wherein the first user interface includes:

195. For at least the same reasons as discussed above with respect to element [1.f] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “displaying a first user interface on the display.” *See* discussion of element [1.f].

[23.f] a background with an appearance, and

196. For at least the same reasons as discussed above with respect to element [1.g] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “a background with an appearance.” *See* discussion of element [1.g].

[23.g] one or more foreground objects;

197. For at least the same reasons as discussed above with respect to element [1.h] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “one or more foreground objects.” See discussion of element [1.h].

[23.h] with the first user interface displayed on the display, detecting a first input by a first contact on the touch-sensitive surface at a location in the first user interface that corresponds to the background of the first user interface; and

198. For at least the same reasons as discussed above with respect to element [1.i] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “with the first user interface displayed on the display, detecting a first input by a first contact on the touch-sensitive surface at a location in the first user interface that corresponds to the background of the first user interface.” See discussion of element [1.i].

[23.i] in response to detecting the first input by the first contact, in accordance with a determination that the first contact has a magnitude that is above a threshold, dynamically changing the appearance of the background of the first user interface without changing an appearance of the one or more foreground objects in the first user interface,

199. For at least the same reasons as discussed above with respect to element [1.j] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “in response to detecting the first input by the first contact, in accordance with a determination that the first contact has a magnitude that is above a threshold, dynamically changing the appearance of the background of the first user

interface without changing an appearance of the one or more foreground objects in the first user interface.” See discussion of element [1.j].

[23.j] wherein the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact and

200. For at least the same reasons as discussed above with respect to element [1.k] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the dynamic change in the appearance of the background of the first user interface is based at least in part on the magnitude of the first contact.”

See discussion of element [1.k].

[23.k] wherein the dynamic change in the appearance of the background of the first user interface includes displaying in sequence at least some of a plurality of images based at least in part on the magnitude of the first contact.

201. For at least the same reasons as discussed above with respect to element [1.l] in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the dynamic change in the appearance of the background of the first user interface includes displaying in sequence at least some of a plurality of images based at least in part on the magnitude of the first contact.” See discussion of element [1.l].

18. Claim 26

[26] The method of claim 23, wherein the dynamic change in the appearance of the background of the first user interface is based in part on a positive rate of change in the magnitude of the first contact.

202. For at least the same reasons as discussed above with respect to claim 4 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the dynamic change in the appearance of the background of the first user interface is based in part on a positive rate of change in the magnitude of the first contact.” See discussion of claim 4 (Ground 2).

19. Claim 27

[27] The method of claim 23, wherein a magnitude of the dynamic change in the appearance of the background of the first user interface decays following detection of a cessation of the first contact.

203. For at least the same reasons as discussed above with respect to claim 5 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein a magnitude of the dynamic change in the appearance of the background of the first user interface decays following detection of a cessation of the first contact.” See discussion of claim 5 (Ground 2).

20. Claim 28

[28] The method of claim 23, wherein the dynamic change in the appearance of the background of the first user interface is independent of the location that corresponds to the background.

204. For at least the same reasons as discussed above with respect to claim 6 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the dynamic change in the appearance of the background of the first user

interface is independent of the location that corresponds to the background.” *See* discussion of claim 6 (Ground 2).

21. Claim 29

[29] *The method of claim 23, and further comprising: in response to detecting the first input by the first contact on the touch-sensitive surface, in accordance with a determination that the first input does not have the magnitude that is above the threshold, maintaining the appearance of the background of the first user interface.*

205. For at least the same reasons as discussed above with respect to claim 7 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “in response to detecting the first input by the first contact on the touch-sensitive surface, in accordance with a determination that the first input does not have the magnitude that is above the threshold, maintaining the appearance of the background of the first user interface.” *See* discussion of claim 7 (Ground 2).

22. Claim 30

[30] *The method of claim 23, and further comprising: in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background.*

206. For at least the same reasons as discussed above with respect to claim 8 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “in response to detecting a cessation of the first input, ceasing the dynamically changing of the appearance of the background.” *See* discussion of claim 8 (Ground 2).

23. Claim 32

[32] The method of claim 23, wherein the plurality of images is associated with the background.

207. For at least the same reasons as discussed above with respect to claim 10 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the plurality of images is associated with the background.” *See* discussion of claim 10 (Ground 2).

24. Claim 34

[34] The method of claim 23, wherein the at least some of the plurality of images is displayed, in sequence, by automatically scrolling through the at least some of the plurality of images.

208. For at least the same reasons as discussed above with respect to claim 12 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the at least some of the plurality of images is displayed, in sequence, by automatically scrolling through the at least some of the plurality of images.” *See* discussion of claim 12 (Ground 2).

25. Claim 37

[37] The method of claim 23, wherein the at least some of the plurality of images is displayed, in sequence, by automatically displaying, one-by-one, the at least some of the plurality of images.

209. For at least the same reasons as discussed above with respect to claim 17 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the at least some of the plurality of images is displayed, in sequence, by

automatically displaying, one-by-one, the at least some of the plurality of images.”

See discussion of claim 17 (Ground 2).

26. Claim 38

[38] The method of claim 23, wherein the at least some of the plurality of images is displayed, in sequence, by automatically moving, one-by-one, through the at least some of the plurality of images.

210. For at least the same reasons as discussed above with respect to claim 17 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the at least some of the plurality of images is displayed, in sequence, by automatically moving, one-by-one, through the at least some of the plurality of images.” See discussion of claim 17 (Ground 2).

27. Claim 39

[39] The method of claim 23, wherein the first user interface includes a lock screen.

211. For at least the same reasons as discussed above with respect to claim 18 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the first user interface includes a lock screen.” See discussion of claim 18 (Ground 2).

28. Claim 40

[40] The method of claim 23, wherein the first user interface includes a lock screen that is unlocked.

212. For at least the same reasons as discussed above with respect to claim 19 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious

“wherein the first user interface includes a lock screen that is unlocked.” *See* discussion of claim 19 (Ground 2).

29. Claim 41

[41] The method of claim 23, wherein the magnitude includes a duration magnitude.

213. For at least the same reasons as discussed above with respect to claim 20 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the magnitude includes a duration magnitude.” *See* discussion of claim 20 (Ground 2).

30. Claim 42

[42] The method of claim 23, wherein the plurality of images is associated with the background, and the plurality of images includes photographs.

214. For at least the same reasons as discussed above with respect to claim 15 in Ground 2, the Hackborn2-Westerman-Jobs Combination renders obvious “wherein the plurality of images is associated with the background, and the plurality of images includes photographs.” *See* discussion of claim 15 (Ground 2).

APPENDIX A

Andy Cockburn

B.Sc.(Hons) Ph.D.

Curriculum Vitae

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Date	June 24, 2024

Brief Summary

International research reputation

- Over one hundred and ninety publications in international journals and conferences.
- Elected to the CHI Academy (2015), which is an honorary group of individuals who have made substantial contributions to the field of human-computer interaction.
- Recipient of the 2009 Chris Wallace award for the outstanding research contribution to Computer Science (2005-2007) in Australasia.
- Deputy Chair of the national panel for assessing Computer Science and Mathematics research quality (MIST PBRF panel, 2016-2019).
- Technical programme committee chair for ACM CHI 2020; Papers co-chair for ACM CHI 2014 and 2015.
- Editorial Board Member for: ACM Transactions on Computer-Human Interaction (2012-2021); Human-Computer Interaction Journal (2015-); Foundations and Trends in HCI (2015-2023); International Journal of Human-Computer Studies (2004-2013); Interacting with Computers (2003-2013).
- Best paper awards at CHI 2018, 2013, 2012, 2011 (awarded to the top 1% of submissions) and 13 Honourable Mention awards (top 5%) at ACM CHI.
- H-index impact factor of 56 (Google Scholar).

Excellent educator and public speaker

- Long track record of outstanding student evaluations.
- Nominated for the New Zealand National Tertiary Teaching Award, 2010. Recipient of a University of Canterbury Teaching Award (2004) and many nominations for student-elected 'lecturer of the year' award.

Experienced expert witness and consultant

- Testifying expert witness on behalf of industry leaders in various jurisdictions, including the Federal Court of Australia, US Federal Court, US Patent Trial and Appeal Board, and the US International Trade Commission.

Education

Degree	PhD (June 1993)
Discipline	Computer Science — Computer Supported Cooperative Work
Location	University of Stirling, Scotland
Thesis Title	Groupware Design: Principles, Prototypes, and Systems

Degree	BSc(Hons) (July 1988)
Discipline	Computer Science
Location	University of York, England

Employment History

Position	Professor (promoted through lecturer, senior lecturer, associate professor)
Location	University of Canterbury Christchurch New Zealand
Period	June 1993 — current

Research Student Supervision

PhD candidates

Stewart Dowding	2021–	Interaction Pace and User Preferences
Pang Suwanaposee	2020–	Cognitive Biases and the Subjective Experience of Interaction
Sarmad Soomro	2017–2021	Interaction with In-Vehicle Touchscreens
Joshua Leung	2013–2017	Understanding the Noticeability and Distraction of Interactive Highlighting Techniques
Philip Quinn	2012–2016	Economic Behaviour & Psychological Biases in Human-Computer Interaction
Tham Piumsomboon	2011–2015	Adaptive and Multimodal Interfaces for Collaborative Augmented Reality
Joey Scarr	2011–2014	Improving Interaction with Spatial User Interfaces
Stephen Fitchett	2010–2013	Understanding and Improving Personal File Retrieval
Susanne Tak	2008–2011	Improving Interfaces for Window/Task Switching
Jason Alexander	2006–2009	Improving Interfaces for Document Navigation
Joerg Hauber	2004–2008	Understanding Remote Collaboration in Video Collaborative Virtual Environments
Julian Looser	2003–2007	AR Magic Lenses: Addressing the Challenge of Focus and Context in Augmented Reality
Volkert Buchmann (A. sup.)	2004–2008	Haptic Feedback in Augmented Reality
Carl Cook (A. sup.)	2002–2006	Collaborative Software Engineering
Tim Wright	2000–2004	Collaborative and Multiple-Notation Programming Environments for Children
Michael JasonSmith	2000–2006	User Interfaces for Temporal Awareness

M.Sc. candidates

Ben McDonald	2010–2011	Multiuser interaction with large public displays
Dominic Winkler	2009–2011	Interaction Techniques for Cross Context Activities
Taher Amer	2005–2006	Evaluating SwiftPoint
Trond Nilsen	2004–2006	Hybrid Interfaces in Augmented Reality
Joshua Savage	2003–2004	The Calibration and Evaluation of Speed-Dependent Automatic Zooming Interfaces
Ben Schmidt	2001–2002	A Study of Bimanual Interaction
Elizabeth Ng (A. sup.)	1997–1998	Pen-based music input
Aaron Tay	1994–5	End-User Tailorability in Workflow Design

Honours candidates and Honours-level interns

Joel Harrison	2012	Improving Command Selection
Joshua Leung	2012	Improving File Access
Jerome Delamarche	2010	Multiple Trajectory Pointing Methods
Joey Scarr	2010	Improving Expertise Development in User Interfaces
Stephen Fitchett	2009	Improved Mobile Scrolling Interfaces
Philip Quinn	2007	Improving Command Interfaces
Keith Humm	2007	Improving Interfaces for Task Switching
Jason Alexander	2005	Improving Document Navigation with Space-Filling Thumbnails
Philip Brock	2005	An Investigation of Target Acquisition with Visually Expanding Targets in Constant Motor-Space
David Mitchell	2003	Evaluating Focus+Context Screens
Andrew Wallace	2003	Calibrating Speed-Dependent Automatic Zooming
Andrew Barrett	2002	Implementing RSVP as an Image Browser
Julian Looser	2002	3D Games as Motivation in Fitts' Law Experiments
Joshua Savage	2002	Implementing and Evaluating Speed-Coupled Scrolling
Amal Siresena	2002	Mobile Text Entry
Michael Moyle	2001	An Evaluation of Simple Gesture Based Controls
Lee Butts	2001	Mobile Phone Text Entry
Eddie Edwards	2001	Towards Scalable Interfaces Using Spatial Cues
Gene Thomas	1997	Smart Desktop
Olof Eilert	1997	User Interfaces for Object Oriented Literate Programming
Philip Weir	1996	Distortion Oriented Workspace Awareness
Carey Evans	1996	Assisting World Wide Web Navigation
Justin Macfarlane	1995	Mawd: A Collaborative Analysis Tool
Carl Cerecke	1995	TRAIL: An Email Based CSCW Toolkit
Andrew Bryant	1995	Leogo: An Equal Opportunity Programming Environment
Ian Bosely	1994	SPI: A Social Presence Indicator

Postgraduate Thesis Examinations

Katherine Fennedy	PhD	External Examiner	Singapore University of Tech. & Design	2021
Praveenkumar Kanithi	PhD	Chair	University of Canterbury	2020
Ori Gagoni	PhD	Chair	University of Canterbury	2019
Alaeddin Nassani	PhD	Chair	University of Canterbury	2019
Veera Mandalika	PhD	Chair	University of Canterbury	2018
Jessalyn Alvina	PhD	Examiner	Université Paris Sud	2017
Hyungon Kim	PhD	Chair	University of Canterbury	2017
Thomas Young	PhD	Chair	University of Canterbury	2017
Craig Sutherland	PhD	Examiner	University of Auckland	2016
David Thompson	PhD	Chair	University of Canterbury	2016
Philip Quinn	PhD	Supervisor	University of Canterbury	2016
Daniel Bradley	PhD	Examiner	University of Queensland	2016
David Altimera	PhD	Chair	University of Canterbury	2015
Jakub Zlotowsky	PhD	Chair	University of Canterbury	2015
Thammathip Piumsomboon	PhD	Supervisor	University of Canterbury	2015
Robert Schattschnieder	PhD	Chair	University of Canterbury	2014
Hazel Bradshaw	PhD	Chair	University of Canterbury	2014
Amur Al Manji	PhD	Examiner	University of Auckland	2014
Amir Shareghi Najar	PhD	Chair	University of Canterbury	2014
Joey Scarr	PhD	Supervisor	University of Canterbury	2014
Stephen Fitchett	PhD	Supervisor	University of Canterbury	2014
Amali Weeseringhe	PhD	Chair	University of Canterbury	2012
Sayan Ray	PhD	Chair	University of Canterbury	2012
Christina Dicke	PhD	Chair	University of Canterbury	2012
Minkyung Lee	PhD	Chair	University of Canterbury	2010
Jason Alexander	PhD	Supervisor	University of Canterbury	2009
Leah Findlater	PhD	Examiner	University of British Columbia	2009
Judy Bowen	PhD	Examiner	University of Waikato	2008
Joerg Hauber	PhD	Supervisor	University of Canterbury	2008
Julian Looser	PhD	Supervisor	University of Canterbury	2008
Michael JasonSmith	PhD	Supervisor	University of Canterbury	2006
Tim Wright	PhD	Supervisor	University of Canterbury	2005
Beryl Plimmer	PhD	Examiner	University of Waikato	2003
Gorden Paynter	PhD	Examiner	University of Waikato	2000
Gitesh K Raikundalia	PhD	Examiner	Bond University	1997
Ramon Craig Standing	PhD	Examiner	University of Western Australia	1997
Ying Leung	PhD	Examiner	Massey University	1995
Qi Min Ser	Masters	Examiner	University of Canterbury	2016
Taher Amer	Masters	Supervisor	University of Canterbury	2006
Trond Nilsen	Masters	Supervisor	University of Canterbury	2006
Akhil Mehra	Masters	Examiner	University of Auckland	2005
Aparna Krishnan	Masters	Examiner	University of Waikato	2003
Shaun Kaasten	Masters	Examiner	University of Calgary	2001
Boyd Ludlow	Masters	Examiner	University of Waikato	1999
Donald Cox	Masters	Examiner	University of Calgary	1998
Wallace Chigona	Masters	Examiner	Waikato University	1997
Simon Gianoutsos	Masters	Examiner	Waikato University	1997
Jing Deng	Masters	Examiner	Waikato University	1996 and 1997
Aaron Tay	Masters	Examiner	University of Canterbury	1996

Student glory

Pang Suwanaposee	PhD	2022	Google PhD Fellowship Award AUD\$15,000.
Pang Suwanaposee	PhD	2021	CHI Honourable Mention award.
Joey Scarr	PhD	2016	John Makepeace Bennett Award for the Distinguished Computer Science PhD thesis in Australasia.
Philip Quinn	PhD	2015	US Patent Awarded (Google Assignee).
Philip Quinn	PhD	2014	US Patent Awarded (Google Assignee).
Stephen Fitchett	PhD	2014	CHI Honourable Mention award.
Philip Quinn	PhD	2013	Google Mountain View Internship.
Stephen Fitchett	PhD	2013	CHI Best Paper award.
Joey Scarr	PhD	2013	CHI Honourable Mention award.
Joey Scarr	PhD	2013	CHI ReplicCHI award.
Joey Scarr	PhD	2012	CHI Best Paper award.
Stephen Fitchett	PhD	2012	CHI Honourable Mention award.
Philip Quinn	PhD	2012	Google Mountainview Internship.
Joey Scarr	PhD	2012	Google Sydney Internship.
Stephen Fitchett	PhD	2011	Outstanding reference from Darren Edge, Microsoft Research Asia.
Joey Scarr	PhD	2012	\$3K for 2nd place in University 'PhD in 3' competition.
Joey Scarr	PhD	2012	\$1K for 1st place in College 'PhD in 3' competition.
Stephen Fitchett	PhD	2012	\$1K for 3rd place in College 'PhD in 3' competition.
Philip Quinn	PhD	2011	Honourable Mention award ACM CHI'11.
Joey Scarr	PhD	2011	Google Sydney Internship.
Susanne Tak	PhD	2010	\$5K Google Anita Borg Scholarship
Susanne Tak	PhD	2010	\$3K from ACM for participation at CHI's Doctoral Consortium
Jason Alexander	PhD	2010	PhD Thesis placed on "Dean's list for excellence" (top 10%)
Susanne Tak	PhD	2009	\$2K award for 1st place in College Research Poster competition
Jason Alexander	PhD	2008	\$1K award for 2nd place in College Research Poster competition
Jason Alexander	PhD	2008	Michael Sweeney award for best student paper, Graphics Interface '08.
Mark Hancock	PhD	2007	Best paper nomination at ACM CHI'07.
Josh Savage and Andrew Wallace	M.Sc. Hons	2005	Best paper nomination at ACM CHI'05.
Mike Moyle	Hons	2005	NZ Hi-Tech Young Achiever of the Year Award

Publications

Edited Volumes

- EV1 J McGrenere and A Cockburn (Eds.) Proceedings of ACM CHI 2020 Conference on Human Factors in Computing Systems.
- EV2 J McGrenere and A Cockburn (Eds.) Extended Abstracts of ACM CHI 2020 Conference on Human Factors in Computing Systems.
- EV3 M Billinghamurst and A Cockburn (Eds.) Proceedings of the Sixth Australasian User Interface Conference (AUI2005). Volume 40 of the Conferences in Research and Practice in Information Technology, Australian Computer Society.
- EV4 A Cockburn (Ed.) Proceedings of the Fifth Australasian User Interface Conference (AUI2004). Volume 28 of the Conferences in Research and Practice in Information Technology, Australian Computer Society.

Papers in Refereed Journals and Collections

- J1 A Cockburn, D Hills, Z Che, and C Gutwin. User Interface Evaluation Through Implicit-Association Tests. *Proceedings of the ACM on Human-Computer Interaction*. EICS, Article v8eics262. 2024.
- J2 A Cockburn, A Goguey, C Gutwin, Z Chen, P Suwanaposee, and S Dowding. Automatically Adapting System Pace Towards User Pace – Empirical Studies. *International Journal of Human-Computer Studies*. 185:103228. May. 2024.
- J3 S Dowding, C Gutwin, and A Cockburn. User Speech Rates and Preferences for System Speech Rates. *International Journal of Human-Computer Studies*. 184:103222. April. 2024.
- J4 P Suwanaposee, C Gutwin, and A Cockburn. The Influence of Audio Effects and Attention on the Perceived Duration of Interaction. *International Journal of Human-Computer Studies*. 159:102756. March. 2022.
- J5 J Leung and A Cockburn. Design Framework for Interactive Highlighting Techniques. *Foundations and Trends in Human-Computer Interaction*. 14(2-3):96-271. 2021.
- J6 AF Mairena, C Gutwin, and A Cockburn. Which Emphasis Technique to Use? Perception of Emphasis Techniques with Varying Distractors, Backgrounds, and Visualization Types. *Information Visualization*. 21(2):95-129. 2022.
- J7 A Cockburn, P Dragicevic, L Besançon and C Gutwin. Threats of a Replication Crisis in Empirical Computer Science. *Communications of the ACM*. 63(8):70-79. August 2020.
- J8 M Claypool, A Cockburn and C Gutwin. The Impact of Motion and Delay on Selecting Game Targets with a Mouse. *ACM Transactions on Multimedia Computing, Communications, and Applications*. 16(2s):73, 1-14. June 2020.
- J9 P Quinn and A Cockburn. Loss Aversion and Preference in Interaction. *Human-Computer Interaction Journal*. 35(2):143-190. 2020. (Online from 2018).

- J10 A Cockburn, D Masson, C Gutwin, P Palanque, A Goguet, M Yung, C Gris and C Trask. Design and Evaluation of Braced Touch for Touchscreen Input Stabilisation. *International Journal of Human-Computer Studies*. 122:21-37. 2018.
- J11 B Lafreniere, C Gutwin, and A Cockburn. Investigating the Post-Training Persistence of Expert Interaction Techniques. *ACM Transactions on Human-Computer Interaction*. 24(4): Article 29 (46 pages). 2017.
- J12 A Cockburn, P Quinn and C Gutwin. The Effects of Interaction Sequencing on User Experience and Preference. *International Journal of Human-Computer Studies*. 108:89-104. 2017.
- J13 J Aceituno, S Malacria, P Quinn, N Roussel, A Cockburn and G Casiez. The Design, Use, and Performance of Edge-Scrolling Techniques. *International Journal of Human-Computer Studies*. 97:58-76. 2017.
- J14 J Scarr, C Gutwin, A Cockburn and A Bunt. StencilMaps and EphemeralMaps: Spatially Stable Interfaces that Highlight Command Subsets. *Behaviour and Information Technology*. 34(11):1092-1106. 2015.
- J15 S Fitchett and A Cockburn. An Empirical Characterisation of File Retrieval. *International Journal of Human-Computer Studies*. 74:1-13. 2015.
- J16 A Cockburn, C Gutwin, J Scarr and S Malacria. Supporting Novice to Expert Transitions in User Interfaces. *ACM Computing Surveys*. 47(2):31:1-36. 2014.
- J17 J Scarr, A Cockburn and C Gutwin. Supporting and Exploiting Spatial Memory in User Interfaces. *Foundations and Trends in Human-Computer Interaction*. 6(1):1-84. 2013.
- J18 P Quinn, A Cockburn and J Delamarche. Examining the Costs of Multiple Trajectory Pointing Techniques. *International Journal of Human-Computer Studies*. 71(4):492-509. 2013.
- J19 S Tak and A Cockburn. Enhanced Spatial Stability with Hilbert and Moore Treemaps. *Transactions on Visualization and Computer Graphics*. 19(1):141-148. 2013.
- J20 A Cockburn, D Ahlstrom and C Gutwin. Understanding Performance in Touch Selections: Tap, Drag, and Radial Pointing Drag with Finger, Stylus and Mouse. *International Journal of Human-Computer Studies*. 70(3):218-233. 2012.
- J21 J Hauber, A Cockburn, M Billinghamurst and H Regenbrecht. The Impact of Collaborative Style on the Perception of 2D and 3D Videoconferencing Interfaces. *Open Software Engineering Journal*. 6:1-20. 2012.
- J22 A Cockburn, P Quinn, C Gutwin, G Ramos and J Looser. Air Pointing: Design and Evaluation of Spatial Target Acquisition with and without Visual Feedback. *International Journal of Human-Computer Studies*. 69:401-414. 2011.
- J23 E Tanvir, A Bunt, A Cockburn and P Irani. Improving Cascading Menu Selections with Adaptive Activation Areas. *International Journal of Human-Computer Studies*. 69:769-785. 2011.
- J24 A Cockburn and C Gutwin. A Model of Novice and Expert Navigation Performance in Constrained Input Interfaces. *ACM Transactions on Computer-Human Interaction*. ACM Press. 7(3):1-38. 2010.

- J25 A Cockburn and C Gutwin. A Predictive Model of Human Performance with Scrolling and Hierarchical Lists. *Human-Computer Interaction Journal*. Taylor and Francis. 24(3): 273-314. 2009.
- J26 A Cockburn, A Karlson and B Bederson. A Review of Overview+Detail, Zooming, and Focus+Context Interfaces. *ACM Computing Surveys*. ACM Press. 41(1): 1-31. 2008.
- J27 J Alexander, A Cockburn and R Lobb. AppMonitor: A Tool for Recording User Actions in Unmodified Windows Applications. *Behavior Research Methods*. Psychonomic Society. 40(2): 413-421. 2008.
- J28 G Casiez, D Vogel, R Balakrishnan and A Cockburn. The Impact of Control-Display Gain on User Performance in Pointing Tasks. *Human-Computer Interaction Journal*. Taylor and Francis. 23(3): 215-250. 2008.
- J29 S Jones, M Jones, G Marsden, D Patel and A Cockburn. An Evaluation Of Integrated Zooming and Scrolling On Small Screens *International Journal of Human-Computer Studies*. 63(3): 271–303. Elsevier Science. 2005.
- J30 A Cockburn and S Brewster. Multimodal Feedback for the Acquisition of Small Targets *Ergonomics*. Taylor & Francis. 48(9): 1129–1150. 2005.
- J31 M Moyle and A Cockburn. A Flick in the Right Direction: A Case Study of Gestural Input *Behaviour and Information Technology*. 24(4): 275–288. Taylor & Francis. 2005.
- J32 A Cockburn. Web Browsers *Berkshire Encyclopedia of Human-Computer Interaction*. Bainbridge, WS (Editor). Volume 1: 80–83. Berkshire Publishing. 2004.
- J33 A Cockburn and B McKenzie. Evaluating Spatial Memory in Two and Three Dimensions *International Journal of Human-Computer Studies*. 61(3): 359–373. Elsevier Science. 2004.
- J34 A Cockburn and M Smith. Hidden Messages: Evaluating the Efficiency of Code Elision in Program Navigation *Interacting with Computers: The Interdisciplinary Journal of Human-Computer Interaction*. 15(3): 387–407. 2003.
- J35 A Cockburn, S Greenberg, S Jones, B McKenzie and M Moyle. Improving Web Page Revisitation: Analysis, Design, and Evaluation *Information Technology and Society: Special Issue on Web Navigation*, editors B Shneiderman, J Lazar, M Ivory. 3(1): 159–183. 2003.
- J36 A Cockburn, B McKenzie and M JasonSmith. Pushing Back: Evaluating a New Behaviour for the Back and Forward Buttons in Web Browsers *International Journal of Human-Computer Studies*. 57(5):397–414. Elsevier Science. 2002.
- J37 T Bell, A Cockburn, B McKenzie and J Vargo. Digital Lectures: If You Make Them, Will Students Use Them? Constraints on Effective Delivery of Flexible Learning Systems *International Multimedia Electronic Journal of Computer-Enhanced Learning*. 3(2). Association for the Advancement of Computing in Education. 2001 This paper was one of 25 (from 115 full papers) selected from the proceedings of ED-MEDIA 2001 for adaptation and inclusion in the journal.
- J38 A Cockburn. Supporting Tailorable Program Visualisations with Literate Programming and Fish-eye Views. *Information and Software Technology*. 43(13):745–758. Elsevier Science. 2001.

- J39 A Cockburn, T Bell and B McKenzie. Death to the Office of the Nineties: An HCI Perspective on Some Problems in Modern Office Information Systems *Journal of Research and Practice in Information Technology, Special Issue on Human-Computer Interaction (HCI)*., 33(1):68–82. Australian Computer Society. 2001.
- J40 A Cockburn and B McKenzie. What Do Web Users Do? An Empirical Analysis of Web Use. *International Journal of Human-Computer Studies*, 54(6):903–922. Academic Press. 2001.
- J41 A Cockburn and S Greenberg. Issues of Page Representation and Organisation in Web Browser’s Revisitation Tools. *Australian Journal of Information Systems*, 7(2):120–127. 2000.
- J42 A Cockburn and P Weir. An Investigation of Groupware Support for Collaborative Awareness Through Distortion-Oriented Views. *International Journal of Human Computer Interaction*, 11(3):231–255. Lawrence Erlbaum Associates. 1999.
- J43 A Cockburn and S Greenberg. The Design and Evolution of TurboTurtle, a Collaborative Microworld for Exploring Newtonian Physics. *International Journal of Human-Computer Studies*, 48(6):777–801. Academic Press. 1998.
- J44 A Cockburn and A Bryant. Leogo: An Equal Opportunity User Interface for Programming. *Journal of Visual Languages and Computing*, 8(5–6):601–619. Academic Press. 1997.
- J45 A Cockburn and S Jones. Which way now? Analysing and Easing Inadequacies in WWW Navigation. *International Journal of Human-Computer Studies*, 45(1):105–129. Academic Press. 1996.
- J46 A Cockburn and S Jones. Four Principles for Groupware Design. *Interacting with Computers: The Interdisciplinary Journal of Human-Computer Interaction*, 7(2):195–210. Elsevier. 1995.
- J47 HW Thimbleby, SP Marsh, SR Jones, and AG Cockburn. Trust in CSCW. In S Scrivener, editor, *Computer-Supported Cooperative Work*, pages 253–271. Ashgate Publishing, 1994.
- J48 H Thimbleby, A Cockburn, and S Jones. Hypercard: An Object-Oriented Disappointment. In P Gray and R Took, editors, *Building Interactive Systems: Architectures and Tools*, pages 35–55. Springer-Verlag, 1992.

Papers in Refereed Conference Proceedings

- C1 K Kargut, C Gutwin, A Cockburn. Effects of Device Environment and Information Layout on Spatial Memory and Performance in VR Selection Tasks. *Proceedings of ACM CHI 2024*. Hawai’i. 2024.
- C2 P Suwanaposee, C Gutwin, Z Chen, A Cockburn. ‘Specially For You’ – Examining the Barnum Effect’s Influence on the Perceived Quality of System Recommendations. *Proceedings of ACM CHI 2023*. Hamburg, Germany. 2023.
- C3 A Cockburn, P Quinn, C Gutwin, Z Chen, P Suwanaposee. Probability Weighting in Interactive Decisions: Evidence for Overuse of Bad Assistance, Underuse of Good Assistance. *Proceedings of ACM CHI 2022*. New Orleans, USA. 2022.
- C4 K Lam, C Gutwin, M Klarkowski, and A Cockburn. More Errors vs. Longer Commands: The Effects of Repetition and Reduced Expressiveness on Input Interpretation Error, Learning, and User Preference. *Proceedings of ACM CHI 2022*. New Orleans, USA. 2022.

- c5 A Goguey, C Gutwin, Z Chen, P Suwanaposee, and A Cockburn. Interaction Pace and User Preferences. *Proceedings of ACM CHI 2021*. Yokohama, Japan. 2021. **Honourable mention award**
- c6 K Lam, C Gutwin, M Klarkowski, and A Cockburn. The Effects of System Interpretation Errors on Learning New Input Mechanisms. *Proceedings of ACM CHI 2021*. Yokohama, Japan. 2021. **Honourable mention award**
- c7 S Liu, M Claypool, A Cockburn, R Eg, C Gutwin, and K Raaen. Datasets – Moving Target Selection with Delay. *Proceedings of the 12th ACM Multimedia Systems Conference (MMSys '21)*, Istanbul, Turkey. 2021.
- c8 N Bandeira Romao Tome, M Klarkowski, C Phillips, RL Mandryk, A Cockburn, and C Gutwin. Risking Treasure: Testing Loss Aversion in an Adventure Game. *Proceedings of ACM CHI PLAY 2020 Symposium on Computer-Human Interaction in Play*. Ottawa, Canada. 2020.
- c9 P Schmid, S Malacria, A Cockburn and M Nancel. Interaction Interferences: Implications of Last-Instant System State Changes. *Proceedings of ACM UIST'2020 Symposium on User Interface Software and Technology*. Minneapolis, USA. 2020.
- c10 P Palanque, A Cockburn and C Gutwin. A Classification of Faults Covering the Human-Computer Interaction Loop. *Proceedings of SafeComp 2020: 39th International Conference on Computer Safety, Reliability and Security*. Lisbon, Portugal. 2020.
- c11 A Mairena, M Dechant, C Gutwin and A Cockburn. A Baseline Study of Emphasis Effects in Information Visualization. *Proceedings of Graphics Interface 2020*. Toronto, Canada. 2020.
- c12 C Gutwin, A Cockburn, M van der Kamp, J Storrington and C Philips. Testing the Limits of the Spatial Approach: Comparing Retrieval and Revisitation Performance of Spatial and Paged Data Organizations for Large Item Sets. *Proceedings of Graphics Interface 2020*. Toronto, Canada. 2020.
- c13 A Cockburn, B Lewis, P Quinn and C Gutwin. Framing Effects Influence Interface Feature Decisions. *Proceedings of ACM CHI 2020*. Hawai'i. 2020.
- c14 B Lewis, G d'Eon, A Cockburn and D Vogel. KeyMap: Improving Keyboard Shortcut Vocabulary Using Norman's Mapping. *Proceedings of ACM CHI 2020*. Hawai'i. 2020.
- c15 A Goguey, S Malacria, A Cockburn, and C Gutwin. Reducing Error Aversion to Support Novice-to-Expert Transitions with FastTap. *Proceedings of the 31st Francophone Conference on Human-Computer Interaction – IHM 2019*. Grenoble, France. 2019. **Best paper award**
- c16 P Palanque, A Cockburn, L Désert-Legendre, C Gutwin and Y Délérès. Brace Touch: a Dependable, Turbulence-Tolerant, Multi-Touch Interaction Technique for Interactive Cockpits. *Proceedings of the 38th International Conference on Computer Safety, Reliability and Security - SafeComp 2019*. Turku, Finland. 2019.
- c17 C Martinie, P Palanque, E Bouzekri, A Cockburn, A Canny and E Barboni. Analysing and Demonstrating Tool-Supported Customizable Task Notations. *Proceedings of the 11th ACM SIGCHI Symposium on Engineering Interactive Computing Systems*. Valencia, Spain. 2019.

- c18 Q Roy, C Zakaria, W Kim, M Nancel, ST Perrault, A Misra and A Cockburn. A Comparative Study of Pointing Techniques for Eyewear Using a Simulated Pedestrian Environment. *Proceedings of the 17th IFIP TC.13 International Conference on Human-Computer Interaction*. Cyprus. 2019.
- c19 A Cockburn and C Gutwin. Anchoring Effects and Troublesome Asymmetric Transfer in Subjective Ratings. *Proceedings of ACM CHI 2019*. Glasgow, Scotland. 2019.
- c20 AF Mairena, C Gutwin, A Cockburn and LJ Elias The Effects of Feature Combination and Task Demands on Peripheral Notifications in Large Displays. *Proceedings of ACM CHI 2019*. Glasgow, Scotland. 2019.
- c21 M Claypool, A Cockburn and C Gutwin. Game Input with Delay – Moving Target Selection Parameters. *Proceedings of ACM Multimedia Systems Conference 2019*. Amhurst, MA. 2019.
- c22 A Cockburn, D Woolley, K Tran Pham Thai, D Clucas, S Hoermann, and C Gutwin. Reducing the Attentional Demands of In-Vehicle Touchscreens with Stencil Overlays. *Proceedings of ACM Automotive UI 2018*. Toronto, Canada. 2018.
- c23 A Cockburn, C Gutwin and A Dix. HARK No More: On the Preregistration of CHI Experiments. *Proceedings of ACM CHI 2018*. Montreal, Canada. 2018. Paper 141. **Best paper award**
- c24 A Goguet, G Casiez, A Cockburn and C Gutwin. Storyboard-Based Empirical Modelling of Touch Interface Performance. *Proceedings of ACM CHI 2018*. Montreal, Canada. 2018. Paper 445. **Honourable mention award**
- c25 A Cockburn, C Gutwin, P Palanque, Y Deleris, C Trask, A Coveney, M Yung and K MacLean. Turbulent Touch: Touchscreen Input for Cockpit Flight Displays. *Proceedings of ACM CHI 2017*. Denver, CO. 2017. 6742-6753.
- c26 C Gutwin, A Cockburn and N Gough. A Field Experiment of Spatially-Stable Overviews for Document Navigation. *Proceedings of ACM CHI 2017*. Denver, CO. 2017. 5905-5916.
- c27 C Gutwin, A Cockburn and A Coveney. Peripheral Popout: The Influence of Visual Angle on Popout Effects. *Proceedings of ACM CHI 2017*. Denver, CO. 2017. 208-219.
- c28 S Uddin, C Gutwin and A Cockburn. The Effects of Artificial Landmarks on Learning and Performance in Spatial-Memory Interfaces. *Proceedings of ACM CHI 2017*. Denver, CO. 2017. 3843-3855.
- c29 P Quinn and A Cockburn. When Bad Feels Good: Assistance Failures and Interface Preferences. *Proceedings of CHI'2016*. San Jose, California. 2016. 4005-4010.
- c30 B Lafreniere, C Gutwin, A Cockburn and T Grossman. Faster Command Selection on Touchscreen Watches *Proceedings of CHI'2016*. San Jose, California. 2016. 4663-4674.
- c31 K Schramm, C Gutwin and A Cockburn. Supporting Transitions to Expertise in Hidden Toolbars *Proceedings of CHI'2016*. San Jose, California. 2016. 4687-4698.
- c32 C Gutwin, C Rooke, A Cockburn, R Mandryk and B Lafreniere. Peak-End Effects on Player Experience in Casual Games *Proceedings of CHI'2016*. San Jose, California. 2016. 5608-5619. **Honourable mention award**

- c33 C Gutwin, A Cockburn and B Lafreniere. Testing the Rehearsal Hypothesis with Two FastTap Interfaces. *Proceedings of GI'2015*. Halifax, Canada. 2015. 223-231.
- c34 A Cockburn, C Gutwin and P Quinn. Examining the Peak-End Effects of Subjective Experience. *Proceedings of CHI'2015*. Seoul, S. Korea. 2015. 357-366.
- c35 S Malacria, J Acetuno, P Quinn, G Casiez, A Cockburn, and N Roussel. Push-Edge and Slide-Edge: Scrolling by Pushing Against the Viewport Edge. *Proceedings of CHI'2015*. Seoul, S. Korea. 2015. 2773-2776.
- c36 S Fitchett, A Cockburn and C Gutwin. Finder Highlights: Field Evaluation and Design of an Augmented File Browser. *Proceedings of CHI'2014*. Toronto, Canada. 2014. 3685-3694. **Honourable mention award**
- c37 C Gutwin, A Cockburn, J Scarr and S Malacria. Faster Command Selection on Tablets with FastTap. *Proceedings of CHI'2014*. Toronto, Canada. 2014. 2617-2626.
- c38 M Nancel and A Cockburn. Causality: A Conceptual Model of Interaction History. *Proceedings of CHI'2014*. Toronto, Canada. 2014. 1777-1786. **Honourable mention award**
- c39 J Scarr, A Cockburn, C Gutwin, A Bunt, and J Cechanowicz. The Usability of CommandMaps in Realistic Tasks. *Proceedings of CHI'2014*. Toronto, Canada. 2014. 2241-2250.
- c40 SA Seah, DM Plasencia, P Bennet, A Karnik, V Ortoloc, J Knibbe, A Cockburn, and S Subramanian. SensaBubble: A Chrono-Sensory Mid-Air Display of Sight and Smell. *Proceedings of CHI'2014*. Toronto, Canada. 2014. 2863-2872. **Honourable mention award**
- c41 P Quinn, S Malacria and A Cockburn. Touch Scrolling Transfer Functions. *Proceedings of ACM UIST'2013 Symposium on User Interface Software and Technology*. St Andrews, Scotland. 2013. 61-71.
- c42 S Malacria, J Scarr, A Cockburn, C Gutwin and T Grossman. Skillometers: Reflective Widgets that Motivate and Help Users to Improve Performance. *Proceedings of ACM UIST'2013 Symposium on User Interface Software and Technology*. St Andrews, Scotland. 2013. 321-330.
- c43 M Jain, A Cockburn, and S Madhvanath. Comparison of Phone-Based Distal Pointing Techniques for Point-Select Tasks. *Proceedings of INTERACT'13*. Cape Town, South Africa. 2013. 714-721.
- c44 S Malacria, G Bailly, J Harrison, A Cockburn, and C Gutwin. Promoting Hotkey Use through Rehearsal with ExposeHK. *Proceedings of CHI'2013*. Paris, France. 2013. 573-582.
- c45 J Scarr, A Cockburn, C Gutwin, and S Malacria. Testing the Robustness and Performance of Spatially Consistent Interfaces. *Proceedings of CHI'2013*. Paris, France. 2013. 3139-3148. **Honourable mention award**
- c46 S Fitchett, A Cockburn, and C Gutwin. Improving Navigation-Based File Retrieval. *Proceedings of CHI'2013*. Paris, France. 2013. 2329-2338. **Best paper award**
- c47 T Piumsomboon, A Clark, M Billinghamurst, and A Cockburn. User-Defined Gestures for Augmented Reality. *Proceedings of INTERACT'13*. Cape Town, South Africa. September. 2013. 282-299.

- c48 P Quinn, A Cockburn, G Casiez, N Roussel, and C Gutwin. Exposing and Understanding Scrolling Transfer Functions. *Proceedings of ACM UIST'2012 Symposium on User Interface Software and Technology*. Cambridge, Massachusetts, October. 2012. 341-350.
- c49 A Cockburn, P Quinn, C Gutwin, and S Fitchett. Improving Scrolling Devices with Document-Length-Dependent Gain. *Proceedings of CHI'2012*. Austin, Texas, May. 2012. 267-276.
- c50 J Scarr, A Cockburn, C Gutwin, and A Bunt. Improving Command Selection with CommandMaps. *Proceedings of CHI'2012*. Austin, Texas, May. 2012. 257-266. **Best paper award**
- c51 S Fitchett and A Cockburn. AccessRank: Predicting What Users Will Do Next. *Proceedings of CHI'2012*. Austin, Texas, May. 2012. 2239-2242. **Honourable mention award**
- c52 J Scarr, A Cockburn, C Gutwin, and P Quinn. Dips and Ceilings: Understanding and Supporting Transitions to Expertise in User Interfaces. *Proceedings of CHI'2011*. Vancouver, Canada, May. 2011. 2741-2750.
- c53 V Levesque, L Oram, KE MacLean, A Cockburn, N Marchuk, D Johnson, JE Colgate, and M Peshkin. Enhancing Physicality in Touch Interaction with Programmable Friction. *Proceedings of CHI'2011*. Vancouver, Canada, May. 2011. 2481-2490. **Best paper award**.
- c54 P Quinn, A Cockburn, KJ Raiha, and J Delemarche. On the Costs of Multiple Trajectory Pointing Methods. *Proceedings of CHI'2011*. Vancouver, Canada, May. 2011. 859-862. **Honourable mention award**
- c55 R Xiao, M Nacenta, RL Mandryk, A Cockburn and C Gutwin. Ubiquitous Cursor: A Comparison of Direct and Indirect Pointing Feedback in Multi-Display Environments. *Proceedings of Graphics Interface '2011*. St Johns, Canada. 2011. 135-142. **Michael A. J. Sweeney best student paper award**.
- c56 S Bateman, A Doucette, C Gutwin, RL Mandryk and A Cockburn. Effects of View, Input Device, and Track Width on Video Game Driving. *Proceedings of Graphics Interface '2011*. St Johns, Canada. 2011. 207-214.
- c57 S Tak, J Scarr, C Gutwin and A Cockburn. Supporting Window Switching With Spatially Consistent Thumbnails Zones: Design and Evaluation. *Proceedings of INTERACT'2011*. Lisbon, Portugal. 2011. 331-347.
- c58 B Ens, D Ahlstrom, A Cockburn and P Irani. Characterizing User Performance with Assisted Direct Off-Screen Pointing. *Proceedings of Mobile HCI'2011*. Stockholm. 2011. 331-347.
- c59 D Ahlstrom, A Cockburn, C Gutwin, and P Irani. Why it's Quick to be Square: Modelling New and Existing Hierarchical Menu Designs. *Proceedings of CHI'2010*. Atlanta, GA, April. 2010. 1371-1380. **Best paper nomination**.
- c60 J Oosterman and A Cockburn. An Empirical Comparison of Tag Clouds and Tables. *Proceedings of OzCHI'2010*. Brisbane, Australia, 22-26 November. 2010. 288-295.
- c61 S Fitchett and A Cockburn. Using Multitouch Input to Support Hybrid Relative and Absolute Mobile Scrolling *People and Computers 24*. *Proceedings of the British HCI Conference*. Dundee, 6-10 September. 2010.

- c62 S Fitchett and A Cockburn. Evaluating Flick-Scrolling and Tilt Scrolling for Reading Tasks on Mobile Devices. *Proceedings of OzCHI'2009*. Melbourne, Australia, 23-27 November. 2009. 225-232.
- c63 P Quinn and A Cockburn. Zoofing! Faster List Selections with Pressure-Zoom-Flick-Scrolling. *Proceedings of OzCHI'2009*. Melbourne, Australia, 23-27 November. 2009. 185-192.
- c64 S Tak and A Cockburn. Window Watcher: A Visualisation Tool for Understanding Window Switching Activities. *Proceedings of OzCHI'2009*. Melbourne, Australia, 23-27 November. 2009. 241-248.
- c65 S Tak, A Cockburn, K Humm, D Ahlstrom, C Gutwin and J Scarr. Improving Window Switching Interfaces. *Proceedings of INTERACT'2009*. Uppsala, Sweden, 24-28 August. 2009. 187-200.
- c66 J Zucco, B Thomas, K Grimmer-Sommers and A Cockburn. A Comparison of Menu Configurations and Pointing Devices for use with Wearable Computers while Mobile and Stationary. *Proceedings of ACM ISWC'2009: 13th International Symposium on Wearable Computers*. Linz, Austria, 5-7 September. 2009. 63-70.
- c67 J Alexander, A Cockburn, S Fitchett, C Gutwin and S Greenberg. Revisiting Read Wear: Analysis, Design, and Evaluation of a Footprints Scrollbar. *Proceedings of ACM CHI'2009 Conference on Human Factors in Computing Systems*. Boston, MA, 5 April - 9 April. 2009. 1665-1674.
- c68 E Tanvir, J Cullen, P Irani and A Cockburn. Improving Selection in Cascading Pull-Down Menus. *Proceedings of ACM CHI'2008 Conference on Human Factors in Computing Systems*. Florence, Italy, 5 April - 10 April. 2008. 1381-1384.
- c69 J Alexander and A Cockburn. An Empirical Characterisation of Electronic Document Navigation. *Proceedings of Graphics Interface '08*. Windsor, Ontario, Canada, May 28-30. 2008. 123-130. **Michael A. J. Sweeney best student paper award.**
- c70 P Quinn, A Cockburn, Indratmo and C Gutwin. An Investigation of Dynamic Landmarking Functions. *Proceedings of Advanced Visual Interfaces (AVI'08)*. Napoli, Italy, May 28-30. 2008. ACM Press.
- c71 P Quinn and A Cockburn. The Effects of Menu Parallelism on Visual Search and Selection. *Proceedings of AUIC'08: Australasian User Interface Conference*. 2008, 79-84. ACM Press.
- c72 V Buchmann, M Billinghamurst and A Cockburn. Directional Interfaces for Wearable Augmented Reality. *Proceedings of CHINZ'08 2008*, 47-54. ACM Press.
- c73 J Looser, M Billinghamurst, R Grasset and A Cockburn. An Evaluation of Virtual Lenses for Object Selection in Augmented Reality. *Proceedings of GRAPHITE 2007*. Perth, Australia, 1-4 December. 2007, 203-210. ACM Press.
- c74 A Cockburn, C Gutwin and S Greenberg. A Predictive Model of Menu Performance *Proceedings of ACM CHI'2007 Conference on Human Factors in Computing Systems* San Jose, CA, 24-27 April. 2007, 627-636. ACM Press.
- c75 A Cockburn, PO Kristennson, J Alexander and S Zhai. Hard Lessons: Effort-Inducing Interfaces Benefit Spatial Learning *Proceedings of ACM CHI'2007 Conference on Human Factors in Computing Systems* San Jose, CA, 24-27 April. 2007, 1571-1580. ACM Press.

- c76 M Hancock, S Carpendale and A Cockburn. Shallow Depth 3D Interaction: Design and Evaluation of One-, Two-, and Three-Touch Techniques *Proceedings of ACM CHI'2007 Conference on Human Factors in Computing Systems* San Jose, CA, 24–27 April. 2007, 1147–1156. **Nominated for best paper award.** ACM Press.
- c77 G Ramos, A Cockburn, M Beaudouin-Lafon and R Balakrishnan. Pointing Lenses *Proceedings of ACM CHI'2007 Conference on Human Factors in Computing Systems* San Jose, CA, 24–27 April. 2007, 757–766.. ACM Press.
- c78 T Bell, A Cockburn, A Wingkvist and R Green. Podcasts as a supplement in tertiary education: an experiment with two Computer Science courses *Proceedings of MoLTA 2007: Conference on Mobile Learning Technologies and Applications* Auckland, New Zealand. 2007, 70–77.
- c79 T Amer, A Cockburn, R Green and G Odgers. Evaluating Swiftpoint as a Mobile Device for Direct Manipulation Input *Proceedings of AUIC'2007 Australasian User Interface Conference* Ballarat, Australia. 2007, 63–70.
- c80 J Hauber, H Regenbrecht, M Billinghamurst and A Cockburn. Spatiality in Videoconferencing: Trade-offs between Efficiency and Social Presence *Proceedings of ACM CSCW'2006 Conference on Computer Supported Cooperative Work* Banff, Canada, November 4–8. 2006, 413–422.
- c81 V Jurgens, A Cockburn and M Billinghamurst Depth Cues For Augmented Reality Stakeout *Proceedings of CHINZ'2006: Conference of the New Zealand Chapter of the ACM Special Interest Group on Human-Computer Interaction* Canterbury, New Zealand 2006, 117–124.
- c82 C Gutwin and A Cockburn. Improving List Revisitation with LispMaps *Proceedings of ACM AVI'2006 Conference on Advanced Visual Interfaces*. Venice, Italy, May 23–26. 2006, 396–403. 32 accepted from 127 submissions.
- c83 A Cockburn and A Gin. Faster Cascading Menu Selections with Enlarged Activation Areas *Proceedings of Graphics Interface 2006*. Quebec City, Canada, June 7–9. 2006, 65–71.
- c84 A Cockburn and P Brock. Human On-Line Response to Visual and Motor Target Expansion *Proceedings of Graphics Interface 2006*. Quebec City, Canada, June 7–9. 2006, 81–87.
- c85 A Cockburn, C Gutwin and J Alexander. Faster Document Navigation with Space-Filling Thumbnails *Proceedings of ACM CHI'2006 Conference on Human Factors in Computing Systems* Montreal, Canada, 24–27 April. 2006, 1–10. ACM Press.
- c86 J Looser, A Cockburn and J Savage. On the Validity of Using First-Person Shooters for Fitts' Law Studies Acceptance rate: 35%, 26 from 73. *People and Computers XVII (Volume 2): British Computer Society Conference on Human Computer Interaction* Edinburgh, Scotland, September 2005, 33–36. Springer-Verlag.
- c87 J Savage and A Cockburn. Comparing Automatic and Manual Zooming Methods for Acquiring Off-Screen Targets *People and Computers XIX: British Computer Society Conference on Human Computer Interaction* Edinburgh, Scotland, September 2005, 439–454. Springer-Verlag. Acceptance rate: 34%, 31 from 92.
- c88 J Hauber, H Regenbrecht, A Hills, A Cockburn and M Billinghamurst. Social Presence in Two- and Three-dimensional Videoconferencing *Proceedings of 8th Annual International Workshop on Presence* London, UK, September 21–23, 2005, 189–198.

- c89 A Cockburn, J Savage and A Wallace. Tuning and Testing Scrolling Interfaces that Automatically Zoom *Proceedings of ACM CHI'2005 Conference on Human Factors in Computing Systems* Portland, Oregon, 2–7 April. 2005, 71–80. ACM Press. Acceptance rate: 25%, 93 from 371. **Nominated for best paper award.**
- c90 T Wright and A Cockburn. Evaluation of Two Textual Programming Notations for Children *Proceedings of the Sixth Australasian User Interface Conference (AUIC2005)* Newcastle, Australia, 2–3 February 2005, 55–62. Australian Computer Society.
- c91 L Rennie and A Cockburn. Aiding Text Entry of Foreign Alphabets with Visual Keyboard Plus *Proceedings of the Sixth Australasian User Interface Conference (AUIC2005)* Newcastle, Australia, 2–3 February 2005, 119–125. Australian Computer Society.
- c92 S Blinmann and A Cockburn. Program Comprehension: Investigating the effects of naming style and documentation *Proceedings of the Sixth Australasian User Interface Conference (AUIC2005)* Newcastle, Australia, 2–3 February 2005, 73–78. Australian Computer Society.
- c93 J Looser, M Billinghamurst and A Cockburn. Through the Looking Glass: The Use of Lenses as an Interface Tool for Augmented Reality *Proceedings of Graphite'04: International Conference on Computer Graphics and Interactive Techniques* Singapore, 15–18 June 2004, 204–211.
- c94 V Buchmann, S Violich, M Billinghamurst and A Cockburn. FingARtips — Gesture Based Direct Manipulation in Augmented Reality *Proceedings of Graphite'04: International Conference on Computer Graphics and Interactive Techniques* Singapore, 15–18 June 2004, pp 212–221.
- c95 A Cockburn. Revisiting 2D vs 3D Implications on Spatial Memory *Proceedings of the Fifth Australasian User Interface Conference (AUIC2004)* Dunedin, New Zealand, 18–22 January 2004, pp 25–32. Australian Computer Society.
- c96 A Wallace, J Savage and A Cockburn. Rapid Visual Flow: How Fast is Too Fast? *Proceedings of the Fifth Australasian User Interface Conference (AUIC2004)* Dunedin, New Zealand, 18–22 January 2004, pp 117–122. Australian Computer Society.
- c97 A Cockburn, J Looser and J Savage. Around the World in Seconds with Speed-Dependent Automatic Zooming *Paper and Video in the Conference Supplement of the ACM Conference on User Interface Software and Technology* Vancouver, Canada, November 2003, pp 35–36.
- c98 A Cockburn and J Savage. Comparing Speed-Dependent Automatic Zooming with Traditional Scroll, Pan and Zoom Methods *People and Computers XVII: British Computer Society Conference on Human Computer Interaction* Bath, England, September 2003, pages 87–102. Springer-Verlag.
- c99 A Cockburn and A Firth. Improving the Acquisition of Small Targets *People and Computers XVII: British Computer Society Conference on Human Computer Interaction* Bath, England, September 2003, pages 181–196. Springer-Verlag.
- c100 A Cockburn and A Siresena. Evaluating Mobile Text Entry with the Fastap Keypad Acceptance rate: 33%, 8 from 24. *People and Computers XVII (Volume 2): British Computer Society Conference on Human Computer Interaction* Bath, England, September 2003, pages 77–80. Springer-Verlag.

- C101 T Wright and A Cockburn. A Language and Task-based Taxonomy of Programming Environments *Proceedings of IEEE Symposium on Visual Languages and Formal Methods*. Auckland, October 28–31 2003, pages 192–194. Acceptance rate: 33%, 8 from 24.
- C102 T Wright and A Cockburn. An Evaluation of the Effects of Different Forms of Computer Supported Collaboration on Problem Solving Strategies *Proceedings of CHINZ'03. Annual conference of the New Zealand Chapter of the ACM Special Interest Group on Human-Computer Interaction*. Otago, July 2003, pages 99–104. Acceptance rate: 59%, 19 from 32.
- C103 T Wright and A Cockburn. A Framework for Evaluating Multiple Language Programming Environments *Proceedings of CHINZ'03. Annual conference of the New Zealand Chapter of the ACM Special Interest Group on Human-Computer Interaction*. Otago, July 2003, pages 21–26. Acceptance rate: 59%, 19 from 32.
- C104 M Apperley, P Carter, C Churcher, A Cockburn, M Jones, B Lobb, K Novins, C Phillips and W Wong. State of the Art: HCI in New Zealand (HCI Societies Worldwide Review) *Proceedings of INTERACT'03: Ninth IFIP TC13 International Conference on Human-Computer Interaction* Zurich, Switzerland, Sept 1–5 2003
- C105 M Moyle and A Cockburn. The Design and Evaluation of a Flick Gesture for 'Back' and 'Forward' in Web Browsers *Proceedings of the Fourth Australasian User Interface Conference (AUIC2003)* Adelaide, Australia, 4–7 February 2003, pages 39–46.
- C106 M JasonSmith and A Cockburn. Get a Way Back: An Evaluation of Temporal Lists *Proceedings of the Fourth Australasian User Interface Conference (AUIC2003)* Adelaide, Australia, 4–7 February 2003, pages 33–38.
- C107 T Wright and A Cockburn. MulspreN: A Multiple Language Simulation PProgramming ENvironment *Proceedings of the 2002 IEEE Symposia on Human Centric Computing Languages and Environments* Arlington, VA, Sept 3–6 2002, pages 101–103.
- C108 T Wright and A Cockburn. Evaluating Computer-Supported Collaboration for Learning a Problem Solving Task, *Proceedings of the International Conference on Computers in Education*, Auckland, NZ 2002, pages 266–267.
- C109 M Moyle and A Cockburn. Analysing Mouse and Pen Flick Gestures *Proceedings of the SIGCHI-NZ Symposium On Computer-Human Interaction* Hamilton, New Zealand, 11–12 July. 2002, pages 19–24.
- C110 A Cockburn and B McKenzie. Evaluating the Effectiveness of Spatial Memory in 2D and 3D Physical and Virtual Environments *Proceedings of ACM CHI'2002 Conference on Human Factors in Computing Systems* Minneapolis, Minnesota, 20–25 April. 2002, pages 203–210. Addison-Wesley. Acceptance rate: 15%, 61 from 409.
- C111 A Cockburn, B McKenzie, and M JasonSmith. Evaluating a Temporal Behaviour for Web Browsers' Back and Forward Buttons *CD and on-line Proceedings of WWW2002, the 11th International World Wide Web Conference* Honolulu, May 7–11. 2002. www2002.org
- C112 M Moyle and A Cockburn. Gesture Navigation: An Alternative Back for the Future *Extended Abstracts of ACM CHI'2002 Conference on Human Factors in Computing Systems* Minneapolis, Minnesota, 20–25 April. 2002, pages 822–823. ACM Press. Acceptance rate: 17%, 62 from 374.

- C113 L Butts and A Cockburn. An Evaluation of Mobile Phone Text Input Methods *Proceedings of Australian User Interface Conference*. 2002, pages 55–59. Australian Computer Society Inc.
- C114 T Wright and A Cockburn. Solo, Together, Apart: Evaluating Modes of CSCL for Learning a Problem Solving Task *Proceedings of ACM Computer Supported Collaborative Learning (CSCL) Conference 2002*. newmedia.colorado.edu/csc1/06.pdf
- C115 T Bell, A Cockburn, B McKenzie and J Vargo. Flexible Delivery Damaging to Learning? Lessons from the Canterbury Digital Lectures Project *Proceedings of ED-MEDIA'2001: World Conference on Educational Multimedia, Hypermedia and Telecommunications* Tampere, Finland, June 25–30. 2001, pages 117–122. Association for the Advancement of Computing in Education.
- C116 A Cockburn and B McKenzie. 3D or Not 3D? Evaluating the Effect of the Third Dimension in a Document Management System *Proceedings of ACM CHI'2001 Conference on Human Factors in Computing Systems* Seattle, Washington, March 31–April 6. 2001, pages 434–441. Addison-Wesley. Acceptance rate: 19%, 69 from 353.
- C117 B McKenzie and A Cockburn. An Empirical Analysis of Web Page Revisitation *34th Hawaiian International Conference on System Sciences, HICSS34 2001*. IEEE Computer Society Press.
- C118 T Wright and A Cockburn. Writing, Reading, Watching: A Task-Based Analysis and Review of Learners' Programming Environments *International Workshop on Advanced Learning Technologies, IWALT 2000*, pages 167–170. IEEE Computer Society Press.
- C119 A Cockburn and B McKenzie. An Evaluation of Cone Trees *People and Computers XIV: British Computer Society Conference on Human Computer Interaction 2000*, pages 425–436. Springer-Verlag. Acceptance rate: 27 from 57.
- C120 A Cockburn and S Greenberg. Issues of Page Representation and Organisation in Web Browser's Revisitation Tools *OzCHI'99: Australian Conference on Computer-Human Interaction*, Wagga Wagga, November 28–30, 1999, pages 7–14. Acceptance rate: 50%.
- C121 A Cockburn, S Greenberg, B McKenzie, M JasonSmith and S Kaasten. WebView: A Graphical Aid for Revisiting Web Pages *OzCHI'99: Australian Conference on Computer-Human Interaction*, Wagga Wagga, November 28–30, 1999, pages 15–22. Acceptance rate: 50%.
- C122 S Greenberg and A Cockburn. Getting Back to Back: Alternate Behaviors for a Web Browser's Back Button *5th Conference on Human Factors and the Web, Gaithersburg, Maryland. June 3, 1999*. Acceptance rate: 11 from 27.
- C123 P Weir and A Cockburn. Distortion-Oriented Workspace Awareness in DOME *British Computer Society Conference on Human-Computer Interaction. Imperial College, London. 1–4 September, 1998.*, pages 239–252. Springer-Verlag. Acceptance rate: 21 from 89.
- C124 E Ng, T Bell and A Cockburn. Improvements to a Pen-Based Musical Input System *OzCHI'98: The Australasian Conference on Computer-Human Interaction. Adelaide, Australia. 29th November to 4th December, 1998.* 1998., pages 239–252. IEEE Computer Society Press.
- C125 A Cockburn and T Bell. Extending HCI in the Computer Science Curriculum *ACM Australasian Computer Science Education Conference ACSE'98. Brisbane, Australia, 8–10 July, 1998*, pages 113–120. ACM Press. Acceptance rate: 28 from 59.

- C126 A Cockburn and A Bryant. Cleogo: Collaborative and Multi-Paradigm Programming for Kids *APCHI'98: Asia Pacific Conference on Computer Human Interaction*. Japan. July 15–17, 1998, pages 187–192. IEEE Computer Society Press.
- C127 N Churcher, A Cockburn, B McMaster, J Horlor. CUTE—The Design and Evolution of a First Year Programming Environment *Software Engineering: Education and Practice '98*. Dunedin. January, 1998, pages 142–148. IEEE Computer Society Press.
- C128 A Cockburn and T Dale. CEVA: A Tool for Collaborative Video Analysis *ACM Group'97: International Conference on Supporting Group Work* Phoenix, Arizona, November 16–19, 1997, pages 47–55. ACM Press. Acceptance rate: 44 from 104.
- C129 A Cockburn and N Churcher. Towards Literate Tools for Novice Programmers *ACM Australasian Computer Science Education Conference ACSE'97*. Melbourne, Australia, 2-4 July 1997, pages 163–169. ACM Press. Acceptance rate: 31 from 46.
- C130 N Churcher and A Cockburn. An Immersion Model for Software Engineering Projects *ACM Australasian Computer Science Education Conference ACSE'97*. Melbourne, Australia, 2-4 July 1997, pages 107–116. ACM Press. Acceptance rate: 31 from 46.
- C131 A Cockburn and S Jones. Design Issues for World Wide Web Navigation Visualisation Tools *RIAO'97: The Fifth Conference on Computer-Assisted Research of Information*. McGill University, Montreal, Quebec, Canada, 25th-27th June 1997. pages 55–74. Acceptance rate: 35 from 90.
- C132 J Anstice, T Bell, A Cockburn and M Setchell. The Design of a Pen-Based Musical Input System. *OzCHI'96: The Sixth Australian Conference on Computer-Human Interaction*, Hamilton, New Zealand, November 24–27, 1996, pages 260–267. IEEE Press. Acceptance rate: 38 from 79.
- C133 A Cockburn and A Bryant. Do It This Way: Equal Opportunity Programming for Kids *OzCHI'96: The Sixth Australian Conference on Computer-Human Interaction*, Hamilton, New Zealand, November 24–27, 1996, pages 246–251. IEEE Press. Acceptance rate: 38 from 79.
- C134 A Tay and A Cockburn User Interfaces for Workflow Systems: Designing for End-User Tailorability Short paper in *OzCHI'96: The Sixth Australian Conference on Computer-Human Interaction*, Hamilton, New Zealand, November 24–27, 1996, pages 301–302. IEEE Press.
- C135 A Cockburn. Collaborative Usability Analysis Using Video Protocols *APCHI'96: The First Asia Pacific Conference Human Computer Interaction*, Information Technology Institute Singapore, 25–28 June, 1996, pages 67–80. Acceptance rate: lower than 50%.
- C136 S Greenberg, C Gutwin, and A Cockburn. Using Distortion-Oriented Displays to Support Workspace Awareness. *British Computer Society Conference on Human-Computer Interaction. Imperial College, London. 20–23 August, 1996*. Cambridge University Press. Acceptance rate: 23 from 63.
- C137 A Cockburn and S Greenberg. Children's Collaboration Styles in a Newtonian Microworld. In *Companion Proceedings of CHI'96. ACM Conference on Human Factors in Computing Systems* Vancouver, April 13–18 1996, pages 181–182. ACM Press. Acceptance rate: 78 from 335.
- C138 S Greenberg, C Gutwin, and A Cockburn. Awareness Through Fisheye Views in Relaxed-WYSIWIS Groupware *Proceedings of Graphics Interface, May 21–24, 1996. Toronto*, pages 28–38. Morgan-Kauffman. Acceptance rate: 29 from 73.

- C139 SRA Jones and AJG Cockburn. A Study of Navigational Support Provided by Two World Wide Web Browsing Applications. In *Hypertext '96. Seventh ACM Conference on Hypertext. Washington DC March 16–20, 1996*, pages 161–169. ACM Press. Acceptance rate: 24 from 85.
- C140 AJG Cockburn and SRA Jones. Trails, Trials, and Tribulations: Unravelling Navigational Problems in the World Wide Web. In *Proceedings of the 5th Workshop on Information Technologies and Systems (WITS '95). Nijenrode University, The Netherlands. 9–10 December.*, pages 46–55, 1995. Acceptance rate: 24 from 70.
- C141 A Cockburn and S Greenberg. TurboTurtle: A Collaborative Microworld for Exploring Newtonian Physics. In *ACM Conference on Computer Supported Cooperative Learning (CSCL '95). Bloomington, Indiana. October 17–20, 1995*, pages 62–66. Lawrence Erlbaum Associates, Inc, October 1995.
- C142 AJG Cockburn. TurboTurtle: Educating Children in an Alternative Reality Universe. In *Proceedings of the 1994 Computer Human Interaction Specialist Interest Group of the Ergonomics Society of Australia (OZCHI'94)*. November 28 to December 1. Melbourne., pages 99–105, 1994.
- C143 A Cockburn and S Jones. Four Principles for Groupware Design. In *Proceedings of the 1994 Computer Human Interaction Specialist Interest Group of the Ergonomics Society of Australia (OZCHI'94)*. November 28 to December 1. Melbourne., pages 21–26, 1994.
- C144 AJG Cockburn and S Greenberg. Making Contact: Getting the Group Communicating with Groupware. In *COOCS '93. The ACM Conference on Organisational Computing Systems. November 1st to 4th. Milpitas, California.*, pages 31–41, 1993.
- C145 AJG Cockburn. Supporting Social Awareness in Distributed Work. In P *et al* Collings, editor, *Proceedings of OZCHI 1993. CHISIG Annual Conference*. Canberra. November., pages 224–241, 1993.
- C146 AJG Cockburn and HW Thimbleby. Reducing User Effort in Collaboration Support. In WD Gray, WE Hefley, and D Murray, editors, *Proceedings of the 1993 International Workshop on Intelligent User Interfaces, Orlando, Florida. January 4–7.*, pages 215–218. New York: ACM Press, January 1993.
- C147 AJG Cockburn and HW Thimbleby. Automatic Conversational Context: Avoiding Dependency on User Effort in Groupware. In MJ Rees and R Iannella, editors, *Interface Technology: Advancing Human-Computer Communication. Proceedings of OZCHI 1992. CHISIG Annual Conference*. Bond University Australia, Queensland. November 26–27, pages 142–149, 1992.
- C148 AJG Cockburn. Reflexive CSCW and Managing Commitments. In *IEE Colloquium on CSCW: Some Fundamental Issues*. London, March 15, number 065 in 1991, pages 9/1–9/5. IEE, 1991.

Patents and Patent Applications

- P1 Andy Cockburn, Mark Billinghurst, Dinesh Mandalapu. User Interface Device. US Patent Application Number: PCT/IN2011/000897.

Other: Refereed Videos, Media Reports and Non-Refereed Publications

- 01 L Besanon, Y Jansen, A Cockburn, and P Dragicevic. Definitely Maybe: Hedges And Boosters in the HCI Literature. OSF Preprints. <https://osf.io/mjg7h/>, 2021.
- 02 National Science Challenges report. ‘Meet the researchers: Andy Cockburn, Turbulent touch’. 22/03/2019.
- 03 Marsden update. ‘Young researchers experience international science.’ (PhD student Stephen Fitchett). February 2012.
- 04 Magazine article. New Zealand Listener. “Charge of the tech brigade”. Mar 31, 2012.
- 05 Newspaper article. The Press. “Conference acceptance a coup”. Dec 22, 2011.
- 06 Newspaper article. The Press. “Intuitive Innovations”. Feb 22, 2011.
- 07 UC Communications. ‘UC/Microsoft internship opens up world for computer science student.’ Mar 22, 2011.
- 08 Marsden update. ‘Highlights of the 2010 funding round.’ November 2010.
- 09 Magazine article. ‘Profiling Excellence’. Royal Society of New Zealand. ‘Thirty years of research in a single hit’, March 2010.
- 010 Newspaper article. Sydney Morning Herald. ‘Computer mouse still rules, says expert’, Jan 19, 2010. (Widely syndicated through AAP.)
<http://news.smh.com.au/breaking-news-national/computer-mouse-still-rules-says-expert-20100119-mhnp.html>
- 011 Newspaper article. Dominion Post. ‘Next-step mouse on its way’, Feb 1, 2010.
- 012 Radio Interview (Live). ABC Perth. ‘Drive Time’ program. January 19th, 2010.
- 013 Newspaper article. The Press. ‘Boost for Computer Activation Project’, Nov. 5, 2009.
- 014 Radio interview (Sweden). ‘Highlights of the INTERACT Conference’, Sept 3 2009. <http://www.sr.se/cgi-bin/p1/program/artikel.asp?ProgramID=406&nyheter=1&artikel=3075930>
- 015 Newspaper article. Dominion Post. ‘Kiwi mouse comes out of hiding’, March 10, 2008. <http://www.stuff.co.nz/4433363a28.html>
- 016 Newspaper article. Christchurch Press. ‘Fast Kiwi mouse attracts interest from big players’, March 5, 2008. <http://www.stuff.co.nz/4425499a28.html>
- 017 Newspaper article. The Age (Australia). ‘Kiwi mouse attracts interest’, March 5, 2008. <http://http://www.theage.com.au/news/biztech/kiwi-mouse-attracts-interest/2008/03/10/1204998342852.html>
- 018 Magazine article. Marsden Update. ‘Document Navigation’, December 2008.
- 019 Interview. IEEE Spectrum. ‘A New Spin on the Computer Mouse’, October 2006. <http://www.spectrum.ieee.org/oct06/4668>

- 020 Video. Faster Document Navigation with Space-Filling Thumbnails *Video in the Video Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI2006)* Montreal, Canada, April 2006. <http://www.cosc.canterbury.ac.nz/~andy/sft.mov>
- 021 Video. Tuning and Testing Scrolling Interfaces that Automatically Zoom *Video in the Refereed Video Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI2005)* Portland, Oregon, April 2005. <http://www.cosc.canterbury.ac.nz/~andy/tuning-n-testing.wmv>
- 022 Video. Around the World in Seconds with Speed-Dependent Automatic Zooming *Video and Demonstration at the ACM Conference on User Interface Software and Technology* Vancouver, Canada, November 2003. <http://www.cosc.canterbury.ac.nz/~andy/uist-sdaz.avi>
- 023 Radio Interview. BBC World Service. 'Go Digital' program. January 14th, 2003 <http://news.bbc.co.uk/2/hi/technology/2677337.stm>
- 024 Nature Journal's Science Update. 'Browsers go back to the future' www.nature.com/nsu/021230/021230-3.html
- 025 'The Register' in the UK. 'Kiwis redesign the Back button'. <http://www.theregister.co.uk/content/6/28729.html>
- 026 Canadian Broadcast Corporation. Programmers try out alternative to browser's back button. http://cbc.ca/storyview/CBC/2002/12/30/back_button021230
- 027 Slashdot. 'Redesigning The "Back" Button' slashdot.org/article.pl?sid=02/12/30/1727206&mode=thread&tid=95
- 028 NZOOM's Technology Page. technology.nzzoom.com/technology_subcategory/0,1610,113-116,00.html
- 029 Newspaper Interview. Christchurch Press. 'Better Going Back', Feb 11, 2003.
- 030 University Chronicle. "Taking the frustration out of the web", Feb 20, 2003.
- 031 S Greenberg, C Gutwin, and A Cockburn. Applying Distortion-Oriented Displays to Groupware. Video Programme of the ACM Conference on Computer Supported Cooperative Work. 1996.
- 032 S Greenberg, C Gutwin, and A Cockburn. Sharing fisheye views in relaxed-WYSIWIS groupware applications. Technical Report 95/577/29, Department of Computer Science, University of Calgary, Calgary, CANADA., 1996.
- 033 S Greenberg, C Gutwin, and A Cockburn. Using distortion-oriented displays to support workspace awareness. Technical Report 96/581/01, Department of Computer Science, University of Calgary, Calgary, CANADA., 1996.
- 034 S Greenberg, C Gutwin, M Roseman, and A Cockburn. From awareness to teamrooms, groupweb and turboturtle: Eight snapshots of recent work in the grouplab project. Technical Report 95/580/32, Department of Computing Science, University of Calgary, Canada, December 1995.
- 035 A Cockburn and S Greenberg. The design and evolution of turboturtle: A collaborative microworld for exploring newtonian physics. Technical Report tr-cosc.03.95, University of Canterbury, Christchurch. New Zealand, 1995.

- o36 AJG Cockburn. Social awareness without mega-bits. In *Proceedings of Uniforum. Rotoroa, New Zealand.*, 1994.
- o37 AJG Cockburn. *Groupware design: principles, prototypes, and systems*. PhD thesis, Department of Computing Science and Mathematics, University of Stirling, Scotland. FK9 4LA, 1993. Available from British Libraries, or as Technical Report 107 from the University of Stirling.
- o38 SRA Jones and AJG Cockburn. Reducing requirements in computer supported writing tasks, 1993. Paper presented at: 6th UK conference on computers and writing. University of Wales. April 13-15.
- o39 AJG Cockburn and S Greenberg. Making contact: getting the group communicating. Technical Report 93/498/03, Department of Computer Science, University of Calgary, Alberta T2N 1N4 Canada, 1993.
- o40 AJG Cockburn and HW Thimbleby. Reducing user effort in collaboration support. Technical Report 93, University of Stirling, Stirling, Scotland, FK9 4LA, 1992.
- o41 AJG Cockburn and HW Thimbleby. A reflexive perspective of CSCW. *ACM SIGCHI Bulletin*, 23(3):63-68, July 1991.
- o42 AJG Cockburn. A user's guide to TELEFREEK: a communication and social awareness environment. Technical Report 105, Department of Computing Science and Mathematics, University of Stirling, Stirling, Scotland, FK9 4LA, 1993.
- o43 AJG Cockburn. A user's guide to *mona*: an enhanced email system. Technical Report 97, Department of Computing Science and Mathematics, University of Stirling, Stirling, Scotland, FK9 4LA, 1992.

Grants and industry research/consulting

Project	Source	Date	Amount
Understanding the human experience of intelligent user interfaces	Marsden. (19-UOC-021)	2020-2023	\$530,000
Travel expenses	Airbus & U. Paul Sabatier	2018	≈ \$7,000
In-Vehicle Touchscreens	NZ Science for Innovation	2017	\$200,000
Travel expenses	ACM CHI Steering Committee	2017	≈ \$4,000
Travel expenses	Australian National University	2016	≈ \$3,000
Travel expenses	Airbus & U. Paul Sabatier	2016	≈ \$5,000
Travel expenses	ACM CHI Academy Award (Seoul)	2015	≈ \$5,000
Benjamin Meaker Visiting Professorship	University of Bristol	2013	£7,000
Understanding and improving the novice to expert transition with user interfaces	Marsden. (10-UOC-020)	2011-2014	\$496,000
Dynamic Multimodal Affordances	HP Innovations Award	2011-2012	US\$40,000
Travel expenses	ACM UIST conference	June 2009	≈ \$4,000
Postdoctoral Fellow	BuildIT	2011-2012	\$116,000
Dynamic Multimodal Affordances	HP Innovations Award	2010-2011	US\$40,000
Travel expenses	ACM UIST conference	June 2009	≈ \$4,000
Scrolling device studies	Logitech Inc	2010	\$10,000
Canadian GRAND project	Canadian Centres of Excellence	2010-2014	C\$25,000,000
BuildIT Emerging Researcher Mentoring Fund	BuildIT	2010	\$8,000
Pythodogical	UC Teaching and Learning	2009-2010	\$15,000
Dynamic Multimodal Affordances	HP Innovations Award	2009-2010	US\$40,000
Travel expenses	ACM UIST conference	June 2009	≈ \$4,000
Travel expenses	ACM CHI conference	Nov. 2008	≈ \$4,000
Improving document navigation interfaces	Marsden. (07-UOC-013)	2007–2010	\$400,000
Accessible AR on Everyday Devices	FRST (UOCX0704)	2007–2011	\$1,875,000
Usability training	Jade Software	2007	≈ \$2,000
Usability training	AMI	2007	≈ \$2,000
Expenses	Logitech Inc., California	April 2007	≈ \$5,000
Expenses	Logitech Inc., California	July 2006	≈ \$2,000
Grant in aid	University of Toronto	July 2006	≈ \$8,000
Grant in aid	University of Saskatoon	June 2006	≈ \$6,000
Grant in aid	University of Calgary	May 2006	≈ \$3,000
Grant in aid	IBM Almaden Research, California	April 2006	≈ \$3,000
NOKIA Pocket (Assoc. with HIT Lab).	Nokia Research Center	2006.	≈ \$100,000.
Speed-Dependent Automatic Zooming	Computer Science	2003	\$3,000
Evaluation of Speed-Coupled Scrolling	Computer Science	2002	\$3,000
Multimedia Learning of Graphics (Assoc.)	UoC Teaching and Learning Ctte.	2002	\$5,000
Fastap Evaluation	Digit Wireless LLC, MA, USA.	2002	\$3,000
Supermedia—The MagicBook Project (Assoc.)	NZ NERF (UOCX0204)	2002	\$333,000
Practical Flexible Delivery of Virtual Learning	UoC (U6360)	1999–2002	\$40,000
Collaborative Programming for Children	Marsden, Royal Soc. (UOC805)	2000–2002	\$135,000
Evaluation of Back/Forward in Web-browsers	Computer Science	2001	\$3,000
Interfaces for WWW navigation.	Microsoft Research, USA.	1999	≈ \$8,000
HCI and multi-media research lab	Computer Science	1999	\$7,400
Video analysis and multi-media lab	UoC (2313728)	1996	\$30,000
Collaborative video analysis	Computer Science	1996	\$3,000
Collaborative microworlds	Computer Science	1995	\$4,000
Asynchronous groupware toolkits	Computer Science	1994	\$2,000

Academic Service

EiC Cttee.	2024	Search committee for ACM ToCHI Editor in Chief.
Grant reviewer	2024	French National Research Agency (ANR).
Grant reviewer	2024	Israel Science Foundation (ISF).
External assessor	2019	Promotion to Full Professor: University of Toronto.
External assessor	2018	Promotion to Full Professor: University of Cambridge.
Rapporteur	2018	Habilitation, Dr Eric Lecolinet, Université Paris Sud, France.
Rapporteur	2018	Habilitation, Dr Marcos Serrano, University Toulouse III Paul Sabbatier, France.
External assessor	2017	Promotion application: University of Waterloo.
Chair	2018–2021	Technical program chair for ACM CHI 2020 Conference
Committee member	2016–2020	Steering Committee for the ACM CHI Conference
Rapporteur	2017	Habilitation, Dr Caroline Appert, University Paris-Sud, France.
Chair	2016–2018	CORE Chris Wallace Research Award Panel
Deputy Chair	2016–2018	PBRF Mathematical and Information Sciences Panel
Editorial	2015–	Editorial Board of Foundations and Trends in Human-Computer Interaction.
Editorial	2015–	Editorial Board of Human-Computer Interaction. Taylor and Francis.
Chair	2012–2015	Papers co-chair for ACM CHI 2014 and 2015 (over 2000 submissions).
Service Award.	2014.	ACM SIGCHI Recognition of Service Award.
Editorial	2012–	Editorial Board of ACM Transactions on Computer-Human Interaction. ACM.
Panel member	2011–2012	Member of the Mathematics, Information Sciences and Technology PBRF panel.
Panel member	2008–2009	BuildIT Postdoctoral Award.
Governance board	2008–2010	Elected member of the governance board of BuildIT.
Panel member	2009, 2011	Member of the Mathematics and Information Sciences Marsden panel.
Panel member	2008–2009	BuildIT Postdoctoral Award.
Panel member	2008–2010	BuildIT Emerging Reseacher Travel Fund.
Mentor	2009–2010	BuildIT mentor for early career researchers.
External assessor	2010	Docent application advisor, University of Tampere, Finland.
External assessor	2010	Promotion application for University of Auckland.
External assessor	2007, 2009	Promotion applications for INRIA, University Paris-Sud.
External assessor	2007	Postdoctoral applicants for Ryerson Univerity, Canada.
Editorial	2002–2013	Associate Editor for International Journal of Human-Computer Studies.
Editorial	2002–2013	Member Editorial Board for Interacting with Computers Journal.
Chair	2010–2011	Subcommittee Chair ACM CHI'11.
Senior Reviewing	2004–	Associate Chair (Papers) for ACM CHI'04, CHI'08, CHI'09.
Senior Reviewing	2009	Associate Chair (Papers) for ACM UIST 2009.
Senior Reviewing	2007	Short papers chair for INTERACT 2007
Chair	2004–2005	Papers chair for Australasian User Interface Conferences
Competition judge	2009	Student Research Competition at CHI 2009.
Journal Reviewing	1993–	Communications of the ACM, Human-Computer Interaction Journal, IEEE Transactions on Visualization and Computer Graphics, ACM Transactions on Computer-Human Interaction, Ergonomics, Information and Software Technology, Information Technology and Society, Interacting with Computers, Virtual Reality, Personal and Ubiquitous Computing, Journal of Computer-Mediated Communication, and International Journal of Human-Computer Studies.
Misc.	2003	Organised the 'Masterclass and Symposium on Interacting with and Through Next Generation Computer Systems', held at the University of Canterbury.
Organising committees	1996, 1998	OzCHI
Doctoral consortium	2008	CHI 2008
Other reviewing	Ongoing	Graphics Interface 2009, 2010, 2011; UIST Demos 2009; ACM CHI 2007, 2006, 2005, 2004, 2003, 2002. AICCS-07; ACM UIST 2007, 2006, 2005, 2003; InfoVis 2006; BEyond time and errors: novel evaLuation methods for Information Visualization (BELIV'06); ACM Advanced Visual Interfaces (AVI) 2006; IEEE Tencon'05; CHINZ'05; Interact'05; MobileHCI'05; ACM CSCW 2004; ACM UIST 2003; INTERACT 2003; Australasian User Interface Conference, 2000–2003; The Active Web, '99; ACM Conference on Data Communications 1994; ACM Conference on Human Factors in Computing Systems 1996; OZC '97; APCHI'96 & '98; ACM Hypertext '97; Graphics Interface '97; In '97; ACM Group '97.

Invited seminar presentations outside the University of Canterbury

Keynote address, ACM Interactive Surfaces and Spaces Conference, Wellington, NZ.	November, 2022.
Keynote address, INTERACT Conference, Mumbai.	September, 2017.
Dean's Colloquium, ANU, Australia.	August, 2016.
Engineering & Computer Science, ANU, Australia.	August, 2016.
Institute of Advanced Studies, University of Bristol, UK.	August, 2013.
Department of Computer Science, University of Glasgow, UK.	August, 2013.
Colloquium Polaris, INRIA, Lille, France.	July, 2013.
Department of Computer Science, University of Manitoba, Canada.	August, 2010.
Department of Computer Science, University of Manitoba, Canada.	August, 2010.
Department of Computer Science, University of British Columbia, Canada.	August, 2010.
Keynote address, Australasian Computer Science Week.	January, 2010.
Department of Computer Science, University of British Columbia, Canada.	July, 2009.
Department of Computer Science, University of Calgary, Canada.	July, 2008.
Department of Computer Science, Swansea University, UK.	September, 2008.
INRIA, Universite Paris-Sud, France.	September, 2006.
Department of Computer Science, Swansea University, UK.	August, 2006.
Logitech Inc., California.	July, 2006.
Department of Computer Science, Dalhousie University, Nova Scotia.	July, 2006.
Digital Graphics Project Lab, University of Toronto.	June, 2006.
Department of Computer Science, University of Saskatoon.	June, 2006.
Department of Computer Science, University of Calgary.	April, 2006.
IBM Almaden Research Centre.	March, 2006.
Digital Fusion Inc..	February, 2006.
Usability Professionals Association (UPA), Canterbury Innovation Incubator.	November, 2005.
Usability Professionals Association (UPA), Canterbury Innovation Incubator.	November, 2004.
Department of Computer Science, University of Calgary, Canada.	November, 2003.
Human-Computer Interaction Lab, Univ. of Maryland, College Park, USA.	October 2003.
Department of Computer Science, University of Glasgow.	September, 2003.
Department of Psychology, University of York.	September, 2003.
Interaction Centre, University College London.	September, 2003.
Department of Computer Science, University of Southampton.	September, 2003.
New Zealand Computer Society, Christchurch.	June, 2003.
Department of Computer Science, University of Waikato.	December, 2002.
Allied Telesyn Research.	November, 2002.
Department of Computer Science, University of Calgary, Canada.	October, 2001.
Institute for Info. Tech., National Research Center, Ottawa, Canada.	October, 2001.
Grouplab, University of Calgary, Canada.	October, 2001.
Department of Computer Science, University of Saskatchewan, Canada.	October, 2001.
Department of Computer Science, University of Cape Town, South Africa.	September, 2001.
Department of Computer Science, Victoria University of Wellington.	July, 2000.
Inaugural ACM SIGCHI.NZ meeting. Massey University.	June 2000.
Department of Computer Science, University of Waikato.	May, 2000.
Department of Computer Science, University of Calgary.	March, 1999.
Center for LifeLong Learning and Design, University of Colorado, Boulder.	November, 1998.
Norsk Regencentral (Norwegian Research Centre), Oslo, Norway.	August, 1998.
Department of Computer Science, University of Calgary.	January, 1996.
Department of Computer Science, Massey University.	January, 1993.
Department of Computer Science, University of Waikato.	January, 1993.

Visiting academics

I have attracted many world leaders in Human-Computer Interaction to the department. Most of them have presented several seminars while at Canterbury, including numerous ‘Science Prestige Lectures’ and Ben Sheiderman’s Royal Society Evening Lecture.

Prof. Joanna McGrenere	University of British Columbia, Vancouver, Canada.	One month, 2023.
Prof. Carl Gutwin	University of Saskatchewan, Saskatoon, Canada.	Two months, 2023.
Dr. Philip Quinn	Google Research, Mountain View, California.	One year, 2020-2021.
Prof. Carl Gutwin	University of Saskatchewan, Saskatoon, Canada.	Four weeks, 2020.
Prof. Carl Gutwin	University of Saskatchewan, Saskatoon, Canada.	Seven weeks, 2015-2016.
Prof. Wolfgang Stuerzlinger	University of Waterloo, Canada	Three months, 2011-2012
Prof. Kari-Jouko Raiha	University of Tampere, Finland	Nine months, 2009-2010
Dr. Saila Ovaska	University of Tampere, Finland	Nine months, 2009-2010
Dr. David Ahlstrom	Klagenfurt University, Austria.	Eighteen months, 2008-2010.
Prof. Carl Gutwin	University of Saskatchewan, Saskatoon, Canada.	Three months, 2008.
Prof. Karon MacLean	University of British Columbia, Canada.	Six months, 2007-2008.
Prof. Bob Kraut	Carnegie Mellon University.	Erskine Visitor. Three months, 2008.
Prof. Andrew Monk	University of York, UK.	Three months, 2008.
Dr. Gonzalo Ramos	University of Toronto, Canada.	One month, 2007.
Prof. Carl Gutwin	University of Saskatchewan, Saskatoon, Canada.	Erskine Fellow. Four months, 2007.
Prof. Alistair Sutcliffe	University of Manchester, UK.	One month, 2007.
Prof. Carl Gutwin	University of Saskatchewan, Saskatoon, Canada.	One week, 2005.
Prof. Ben Bederson	University of Maryland, Maryland, USA.	One week, 2004.
Prof. Ben Shneiderman	University of Maryland, Maryland, USA.	Erskine Fellow. One month, 2003.
Prof. Jenny Preece	University of Maryland, Baltimore County, Maryland.	Erskine Fellow. One month, 2003.
Prof. Stephen Brewster	University of Glasgow, UK.	Erskine Fellow. Six months, 2003.
Prof. Gerhard Fischer	University of Colorado, Boulder.	One year, 2002–2003.
Prof. Bob Spence	Imperial College London.	Erskine Fellow. One month, 2002.
Prof. Gerhard Fischer	University of Colorado, Boulder.	Erskine Fellow. One month, 2000.
Prof. Harold Thimbleby	Middlesex University, UK.	Erskine Fellow. One month, 1997.
Dr Allen Cypher	Apple Research, Cupertino, California.	One week, 1996.
Dr Akihiko Machizawa	Communications Research Laboratory, Japan.	Three years, 1996–1998.
Professor Brian Wyvill	University of Calgary, Canada.	Erskine Fellow. Two months, 1996.
Professor Saul Greenberg	University of Calgary, Canada.	Erskine Fellow. Six months, 1995.
Carl Gutwin	University of Calgary, Canada.	Two months, 1995.
Dr Steve Jones	University of Abertay, Dundee.	Six months, 1995.

Expert Witness Consulting

Role	Expert witness for SBM Legal, counsel for New Zealand Te Whatu Ora Waitemata. (analysis, reports).
Case	Vinod Chand v Health New Zealand Te Whatu Ora Waitemata. <i>Employment relations authority (regarding text auto-correct functionality).</i>
Dates	May 2024 – June 2024.
Role	Expert witness for Fish & Richardson, counsel for Apple. (analysis, reports).
Case	Smith Interface Technologies v. Apple. <i>Patent Trial and Appeal Board.</i>
Dates	December 2023 –
Role	Expert witness for Finnegan, Henderson, Farabow, Garrett & Dunner, counsel for Samsung.
Role	Expert witness for Fish & Richardson, counsel for Apple. (analysis, reports, deposition).
Case	Masimo v. Apple. <i>Patent Trial and Appeal Board. IPR2023-00664, IPR2024-00290</i>
Dates	July 2023 –
Role	Expert witness for Finnegan, Henderson, Farabow, Garrett & Dunner, counsel for Samsung. (analysis).
Case	Smith Interface Technologies v. Samsung. <i>Eastern District of Texas. 2:22-cv-00290-JRG</i>
Dates	November 2022 – June 2023.
Role	Expert witness for Morrison Foerster, counsel for Apple. (analysis, reports, deposition).
Case	Firstface Co. Ltd. v. Apple Inc. <i>Northern District of California. 3:18-cv-02245-JD.</i>
Dates	June 2022 – March 2024.
Role	Expert witness for Finnegan, Henderson, Farabow, Garrett & Dunner, counsel for Samsung. (analysis).
Case	Village Green Technologies v. Samsung. <i>Eastern District of Texas. 2:21-cv-00323-JRG-RSP</i>
Dates	January 2022 – March 2022.
Role	Expert witness for Desmarais, counsel for IBM. (analysis, reports, deposition).
Case	Chewy, Inc. v. IBM. <i>Southern District of New York. 1:21-cv-01319-JSR.</i>
Dates	August 2021 – Jan 2023.
Role	Expert witness for Farella, Braun & Martel, counsel for Google. (analysis, reports, testimony at trial).
Case	Profectus Technology versus Google. <i>Western District of Texas. 6:20-cv-101-ADA.</i>
Dates	March 2021 – October 2021.
Role	Expert witness for Latham & Watkins and Allen & Overy, counsel for Facebook/Instagram/WhatsApp/Meta. (analysis, reports, deposition).
Case	Facebook/Meta Platforms <i>et al.</i> versus Wrinkl <i>Patent Trial and Appeal Board. IPR2021-00882, -00883</i>
Dates	February 2021 – November 2022.

Role	Expert witness for Morrison & Foerster, counsel for Renesas. (analysis).
Case	Neodron versus Renesas Electronics Corp. <i>Western District of Texas</i> . 6:20-CV-00529.
Dates	December 2020 – August 2021.
Role	Expert witness for DLA Piper, counsel for Samsung. (analysis, declaration).
Case	Neonode versus Samsung. <i>Western District of Texas</i> . 6:20-CV-00507.
Dates	September 2020 – July 2023.
Role	Expert witness for DLA Piper (counsel for Apple, Microsoft and ASUS), Morrison & Foerster (counsel for Amazon), Finnegan, Henderson, Farabow, Garrett & Dunner (counsel for LG), O'Melveny & Myers (counsel for Samsung), Vasquez Benisek & Lindgren (counsel for ASUS). (analysis).
Case	Neodron versus Apple, Microsoft, Amazon & others. <i>US International Trade Commission</i> . 337-TA-1193.
Dates	May 2020 – November 2020.
Role	Expert witness for Desmarais, counsel for IBM. (analysis, reports).
Case	IBM versus Zillow Group. <i>Central District of California</i> . 8:19-CV-01777.
Dates	October 2019 – May 2020.
Role	Expert witness for DLA Piper (counsel for Microsoft, HP, Lenovo), Morrison & Foerster (counsel for Amazon), Finnegan, Henderson, Farabow, Garrett & Dunner (counsel for Motorola and Lenovo), Alston & Bird (counsel for Dell), O'Melveny & Myers (counsel for Samsung). (analysis, reports, deposition).
Case	Neodron versus Microsoft, HP, Amazon, Samsung, Dell, Motorola, Lenovo. <i>US International Trade Commission</i> . 337-TA-1162.
Dates	August 2019 – December 2020.
Role	Expert witness for Jones Day, counsel for Google and Huawei. (analysis).
Case	American Patents versus Huawei.
Dates	April 2019 – July 2019
Role	Expert witness for Gilbert+Tobin, counsel for Aristocrat Technologies. (reports, testimony at trial).
Case	Aristocrat Technologies versus Commissioner of Patents. <i>Federal Court of Australia</i> . NSD 1343/2018.
Dates	September 2018 – June 2020
Role	Expert witness for Williams & Connolly and Alston & Bird, counsel for Google and ASUS Inc. (reports, deposition).
Case	Koninklijke Philips versus ASUS. <i>Northern District of California</i> 4:18-cv-01885-HSG.
Dates	March 2016 – March 2020
Role	Expert witness for Williams and Connolly, counsel for Google Inc. (reports, deposition).
Case	Google versus Philips. <i>Patent Trial and Appeal Board</i> . IPR2017-00386/387/388/389.
Dates	March 2016 – March 2020

Role	Expert witness for DLA Piper, counsel for Apple Inc. (reports, deposition, testimony at trial).
Case	Immersion versus Apple. <i>US International Trade Commission</i> . 337-TA-1004 and 337-TA-990 (consolidated).
Dates	June 2016 – May 2017
Role	Expert witness for DLA Piper, counsel for Apple Inc. (reports).
Case	Apple versus Immersion. <i>Patent Trial and Appeal Board</i> . IPR2016-01777.
Dates	June 2016 – May 2017
Role	Expert witness for Wilmer Cutler Pickering Hale and Dorr, counsel for Apple Inc. (analysis).
Case	Core Wireless Licensing S.a.r.l. v. Apple Inc. <i>Eastern District of Texas</i> . 6:14-cv-00751 and 6:14-cv-00752.
Dates	August 2015 – June 2016
Role	Expert witness for Weil, Gotshal & Manges, counsel for Apple Inc. (analysis).
Case	Motorola Mobility Inc. versus Apple Inc. <i>Southern District of Florida</i> . 10-CV-23580-RNS-TEB and 12-CV-20271-RNS-TEB.
Dates	October 2013 – March 2014
Role	Expert witness for Gibson, Dunn & Crutcher, counsel for Apple Inc. (reports, deposition, testimony at trial).
Case	Apple Inc. versus Samsung Electronics Co. Ltd. <i>Northern District of California</i> . 12-CV-0630-LHK.
Dates	June 2013 – June 2014
Role	Expert witness for Herbert Smith Freehills, counsel for Apple Inc. (reports, testimony at trial).
Case	Apple Inc. versus Samsung Electronics Co. Ltd. <i>Federal Court of Australia</i> . NSD 1243 of 2011.
Dates	September 2011 – May 2013

Other

- Member of the Association of Computing Machinery (ACM).
- Member of the ACM Special Interest Group of Computer-Human Interaction.