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(54) **DISPLAYING RELEVANT USER INTERFACE OBJECTS**

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See application file for complete search history.

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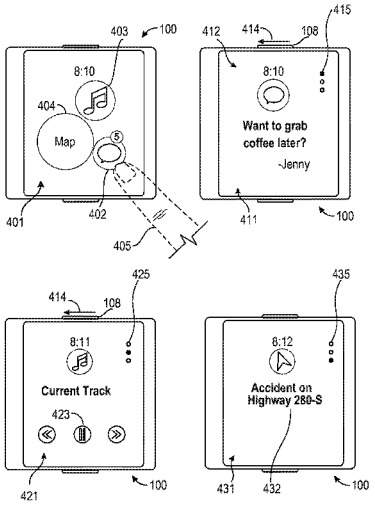
(57) **ABSTRACT**

Techniques for displaying relevant user interface objects when a device is placed into viewing position are disclosed. The device can update its display in response to user input. Display updates can be based on a logical arrangement of user interface information along a z-axis.

49 Claims, 18 Drawing Sheets



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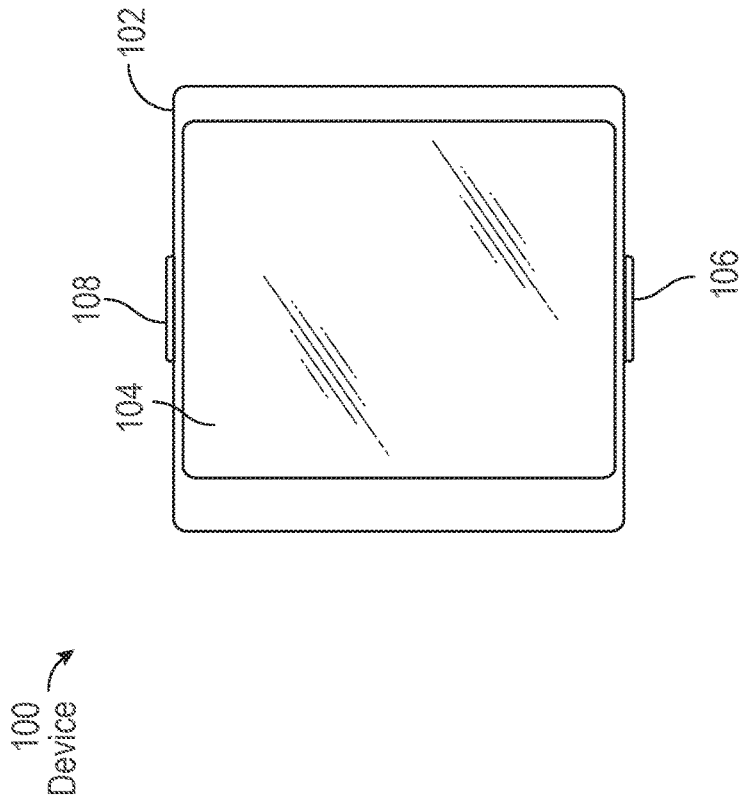


FIG. 1

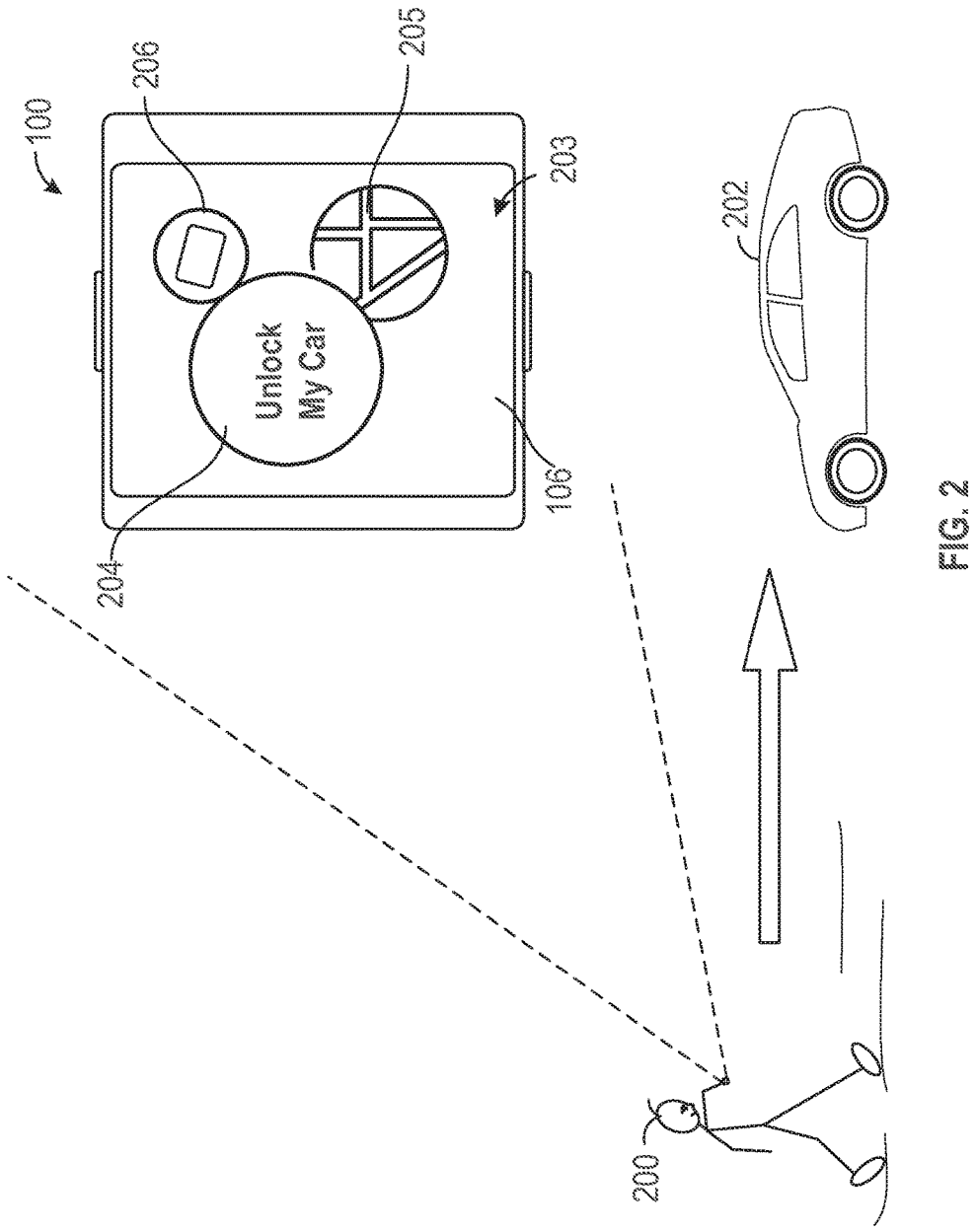


FIG. 2

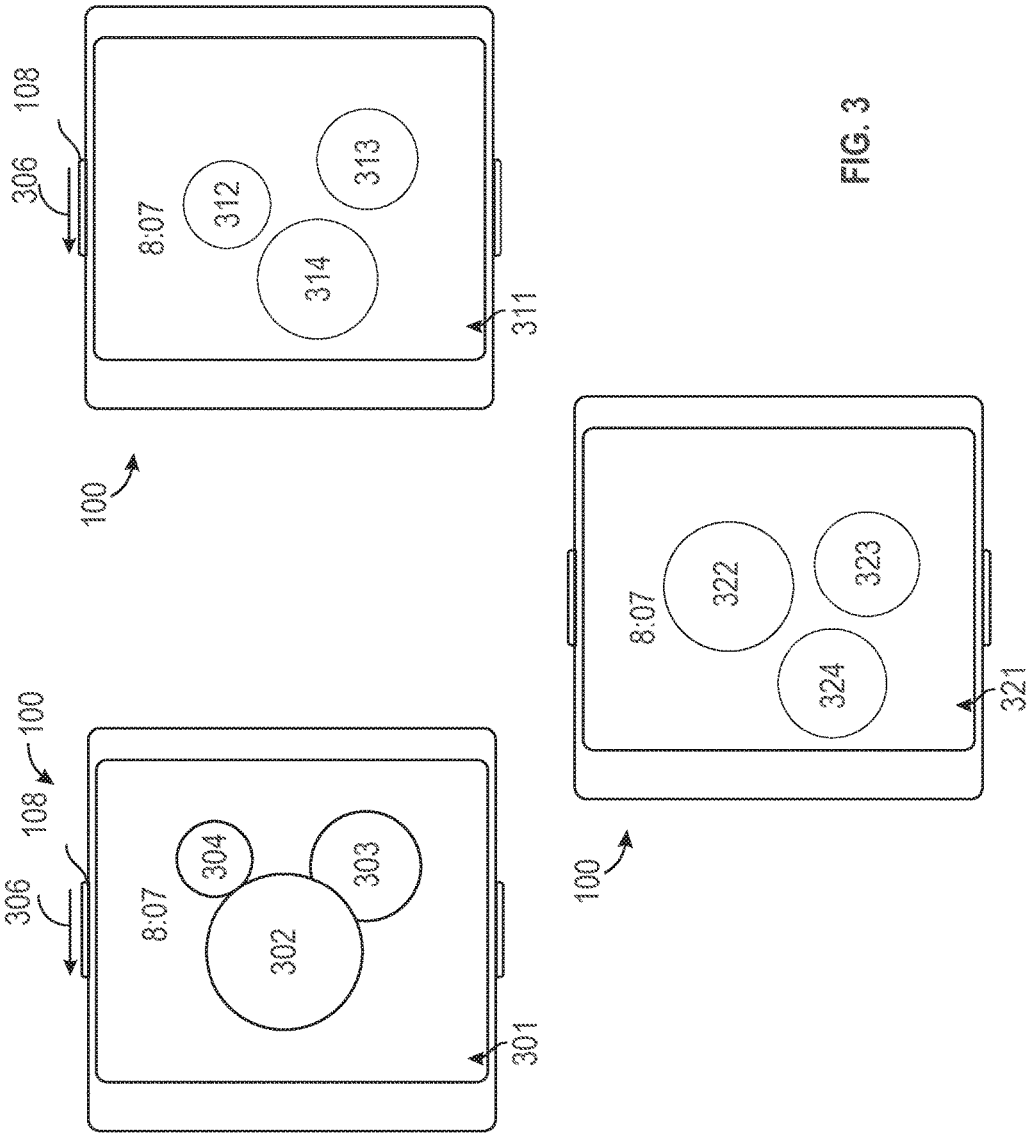

100
108
306
8:07
312
313
314
311
100
108
306
8:07
304
303
302
301
100
8:07
322
323
324
321

FIG. 3

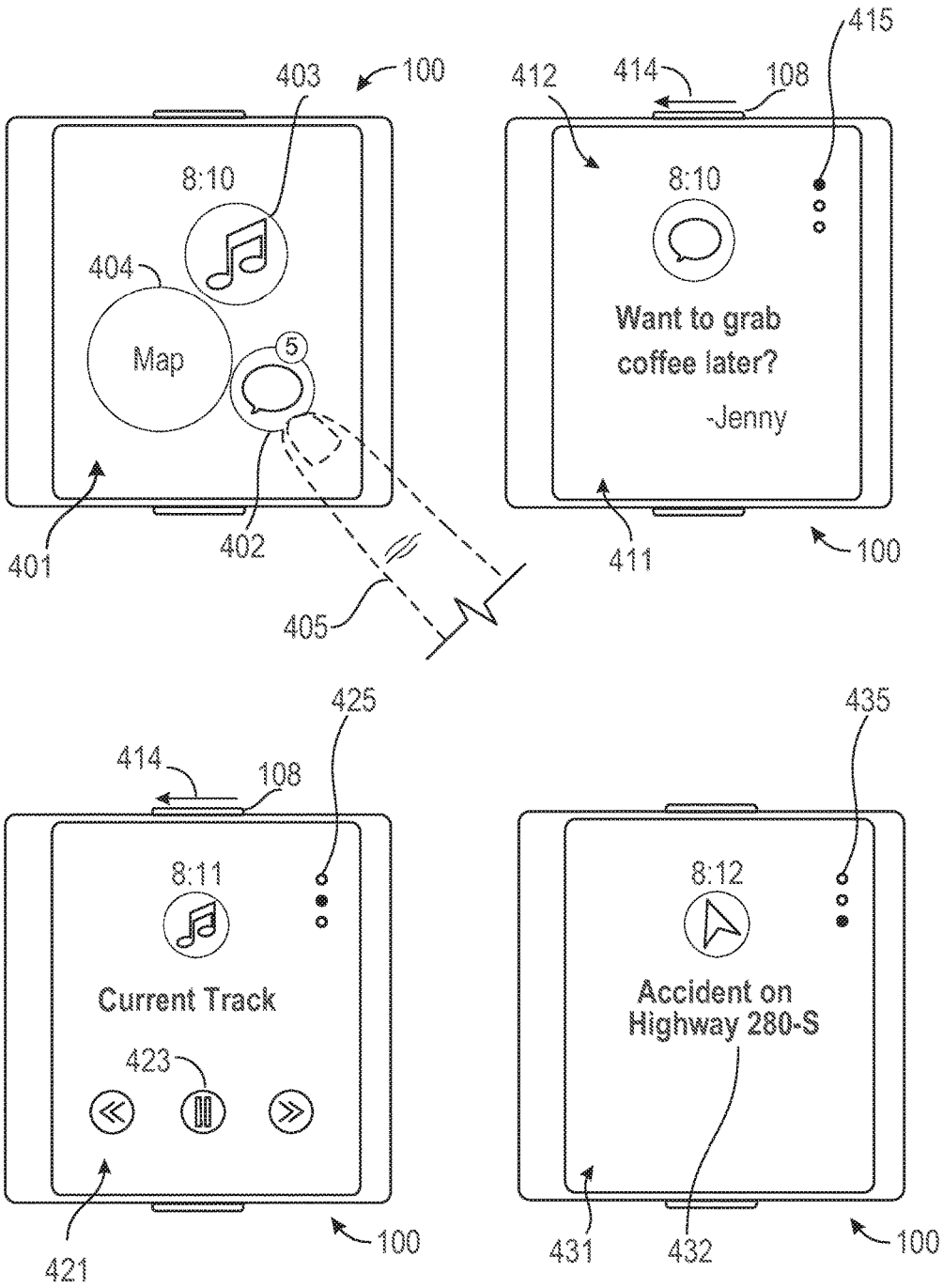

403
100
8:10
404
Map
5
401
402
405
412
414
108
415
8:10
Want to grab coffee later?
-Jenny
411
100
425
414
108
8:11
Current Track
423
421
100
435
8:12
Accident on Highway 280-S
431
432
100

FIG. 4

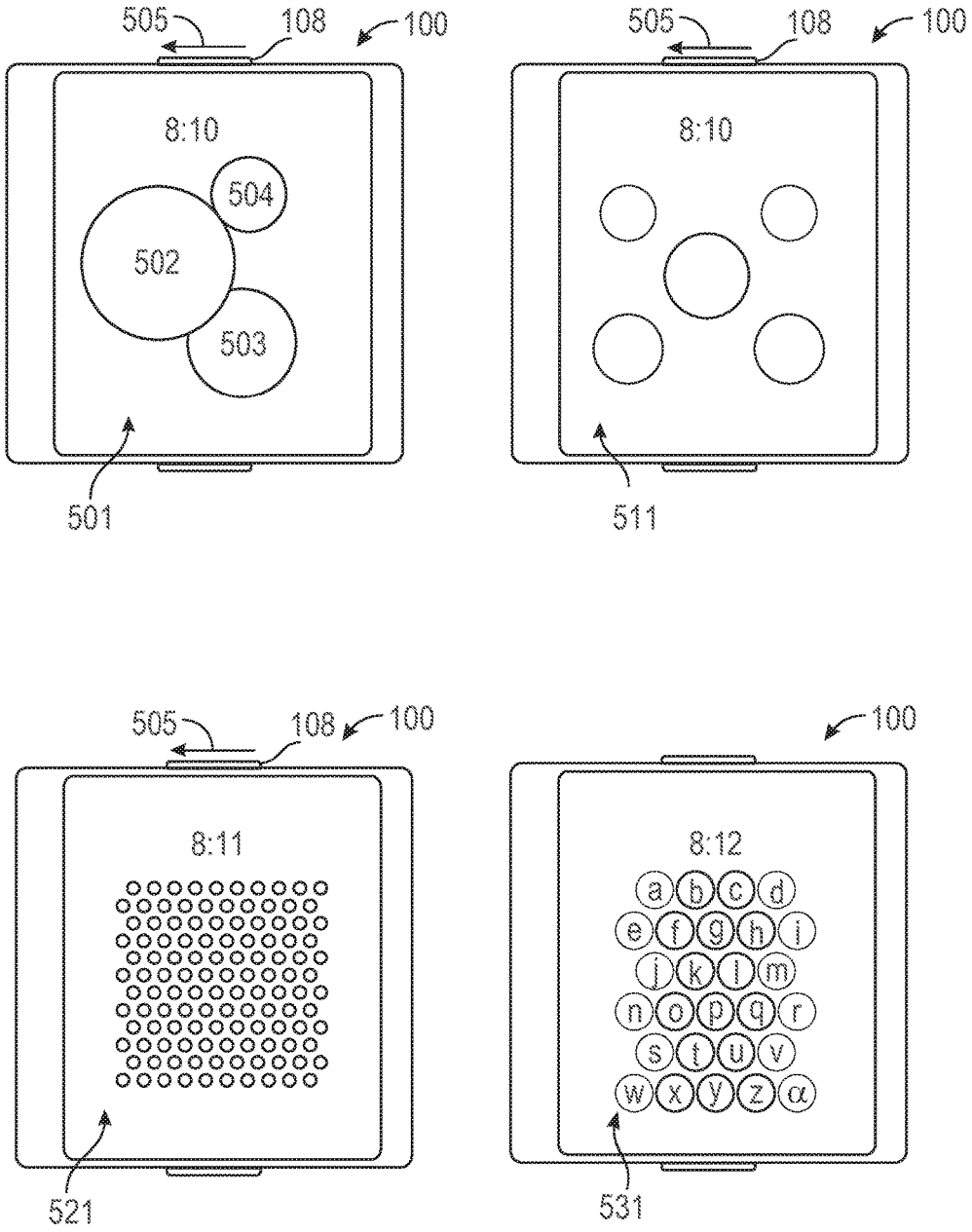

505
108
100
8:10
504
502
503
501
505
108
100
8:10
511
505
108
100
8:11
521
100
8:12
a b c d
e f g h i
j k l m
n o p q r
s t u v
w x y z α
531

FIG. 5

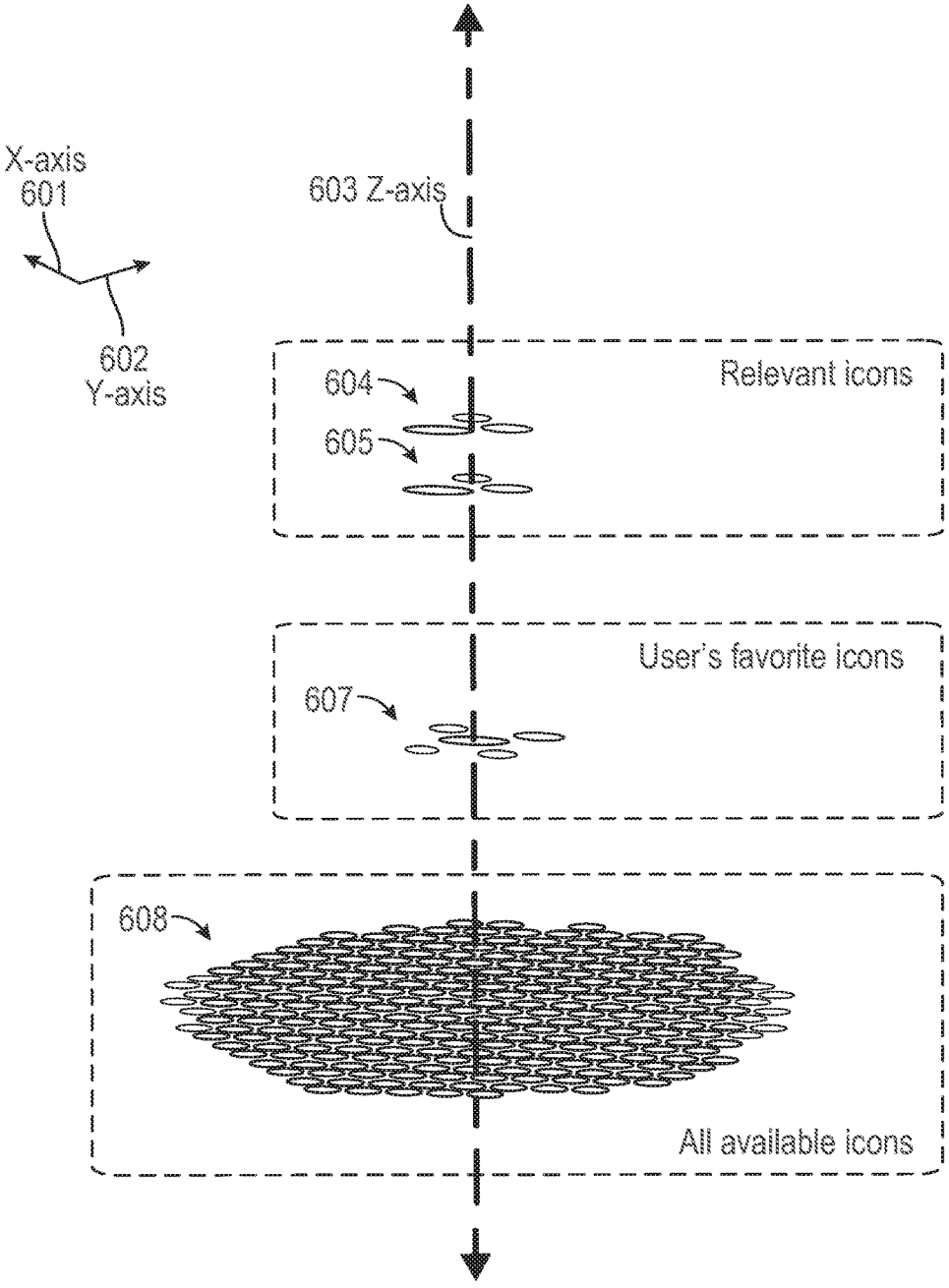

X-axis
601
602
Y-axis
603 Z-axis
604
605
Relevant icons
607
User's favorite icons
608
All available icons

FIG. 6

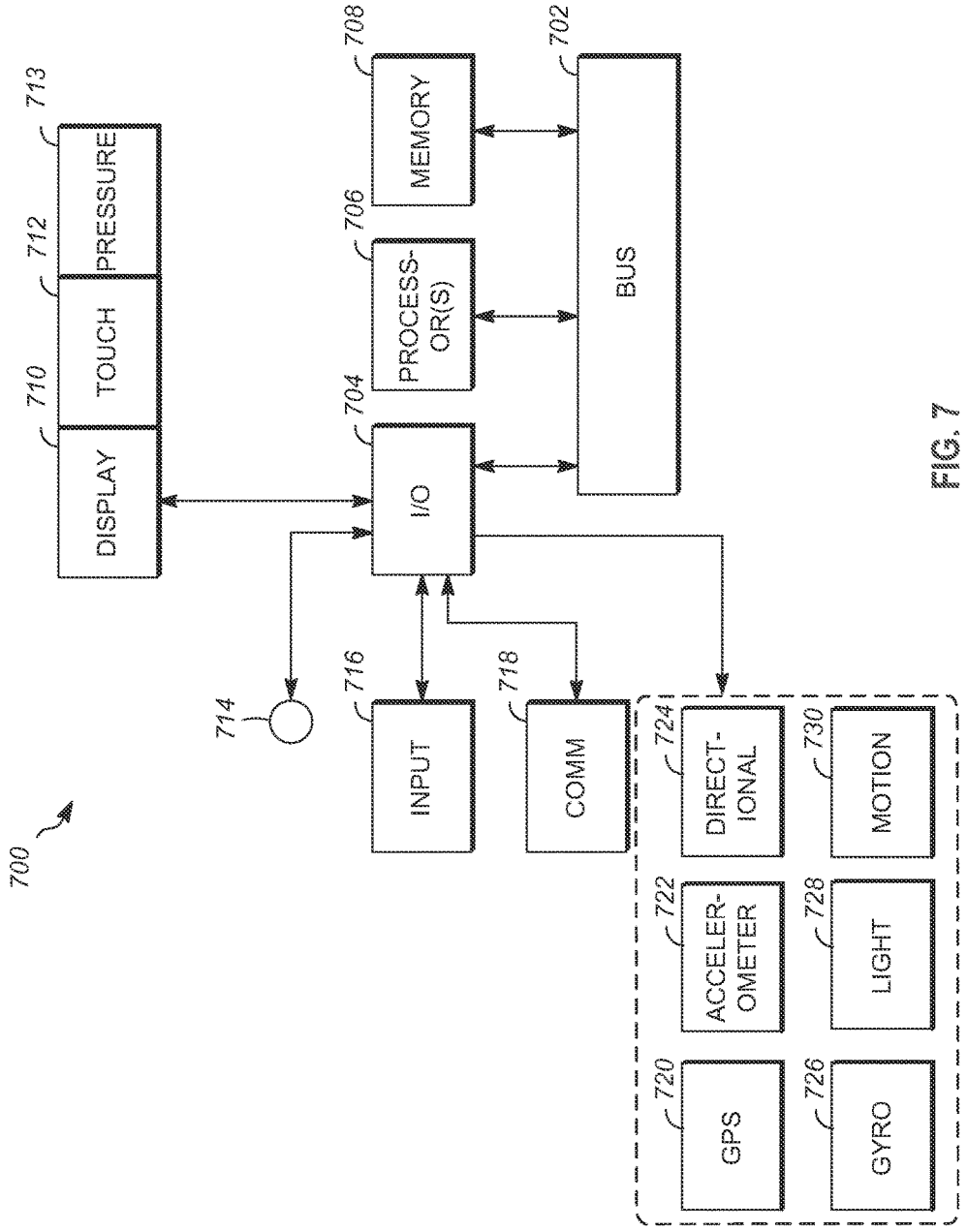

700
713
PRESSURE
712
TOUCH
710
DISPLAY
708
MEMORY
706
PROCESS-OR(S)
704
I/O
702
BUS
714
716
INPUT
718
COMM
724
DIRECT-IONAL
730
MOTION
722
ACCELER-OMETER
728
LIGHT
720
GPS
726
GYRO

FIG. 7

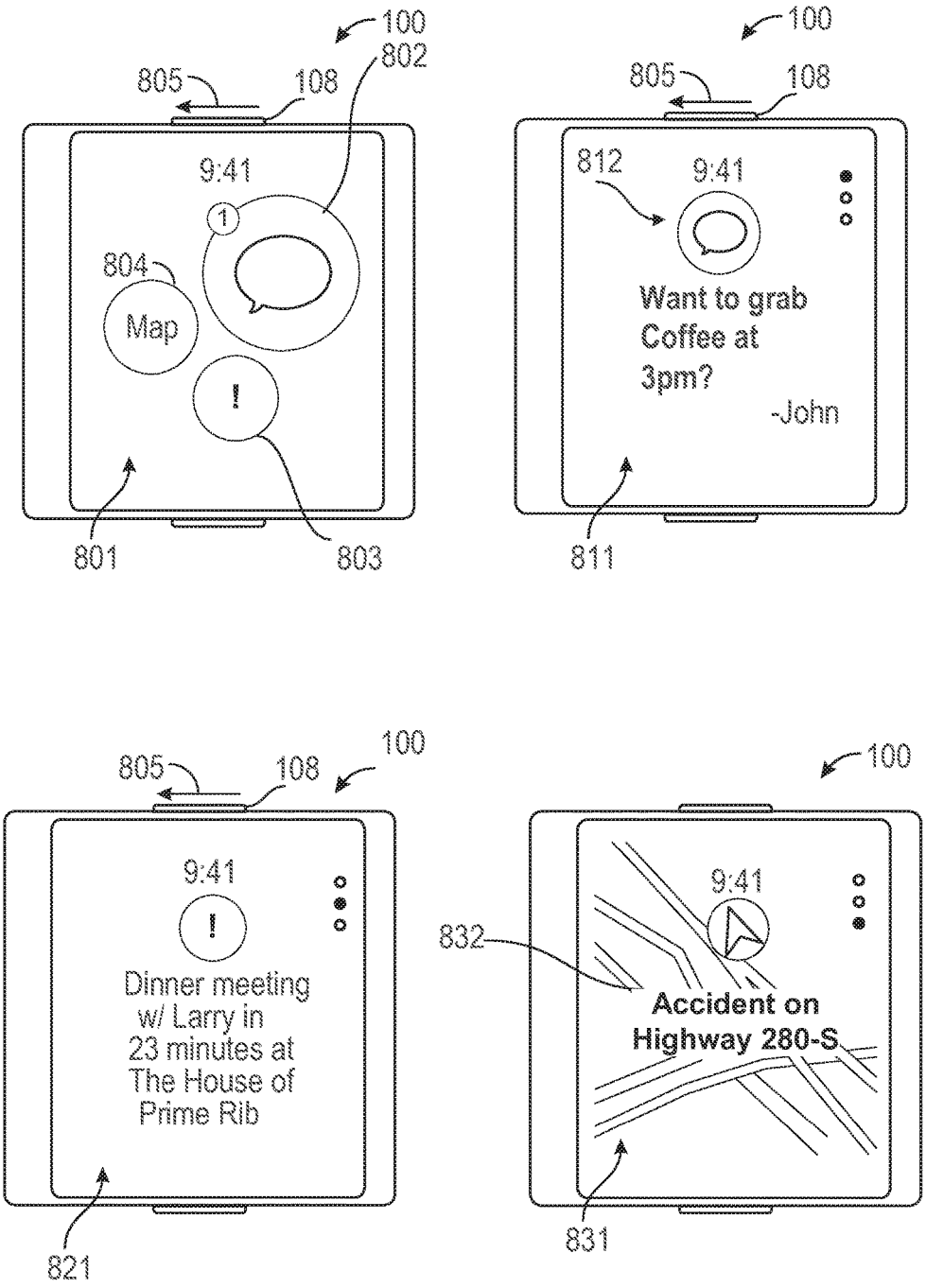

100
802
805
108
9:41
1
804
Map
!
801
803
100
805
108
812
9:41
Want to grab Coffee at 3pm?
-John
811
100
805
108
9:41
!
Dinner meeting w/ Larry in 23 minutes at The House of Prime Rib
821
100
9:41
832
Accident on Highway 280-S
831

FIG. 8

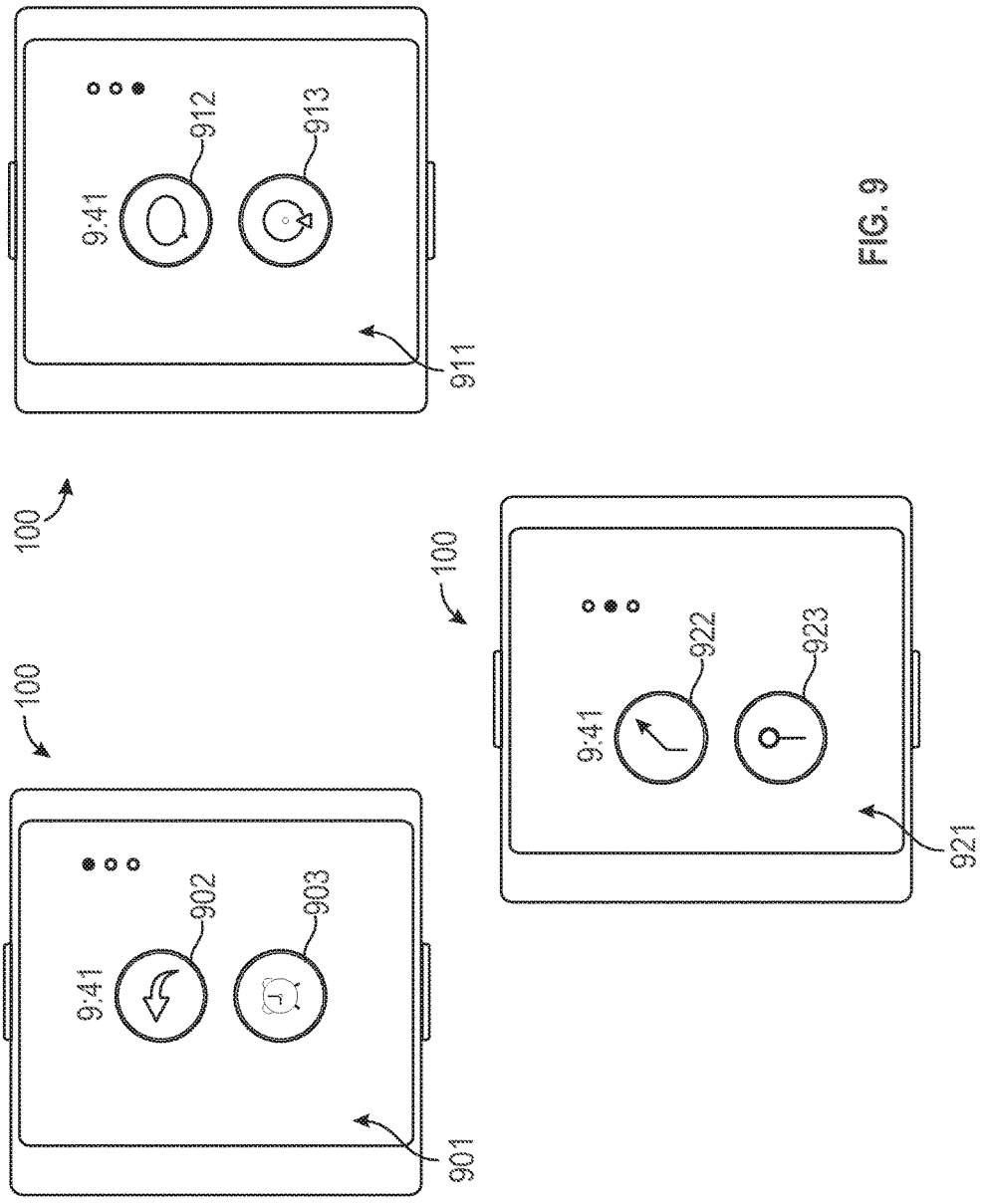


FIG. 9

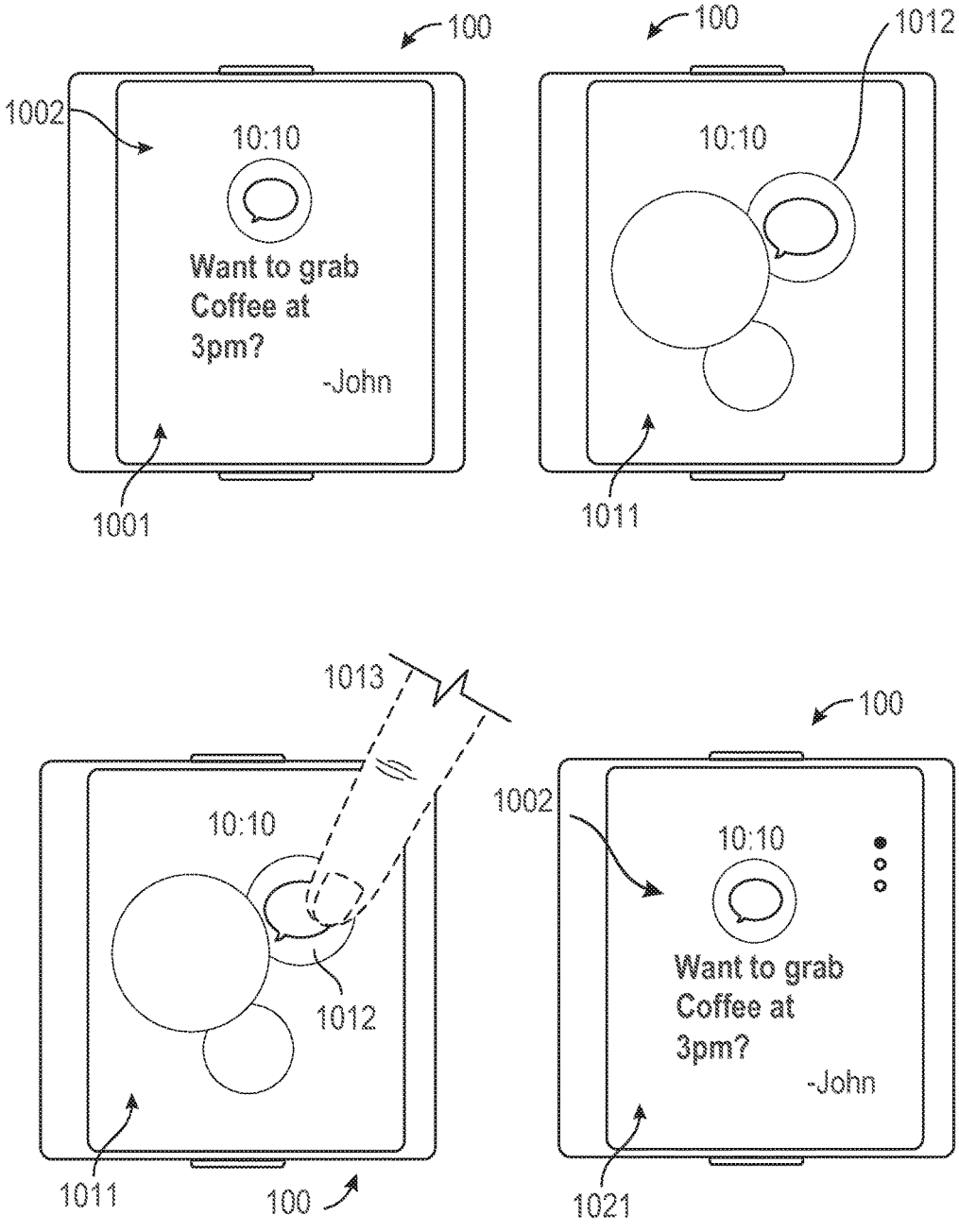
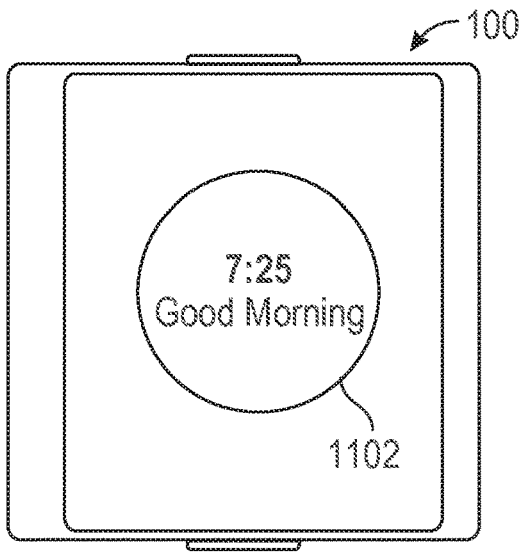

100
1002
10:10
Want to grab
Coffee at
3pm?
-John
1001
100
1012
10:10
1011
1013
10:10
1012
1011
100
100
1002
10:10
Want to grab
Coffee at
3pm?
-John
1021

FIG. 10


100
7:25
Good Morning
1102

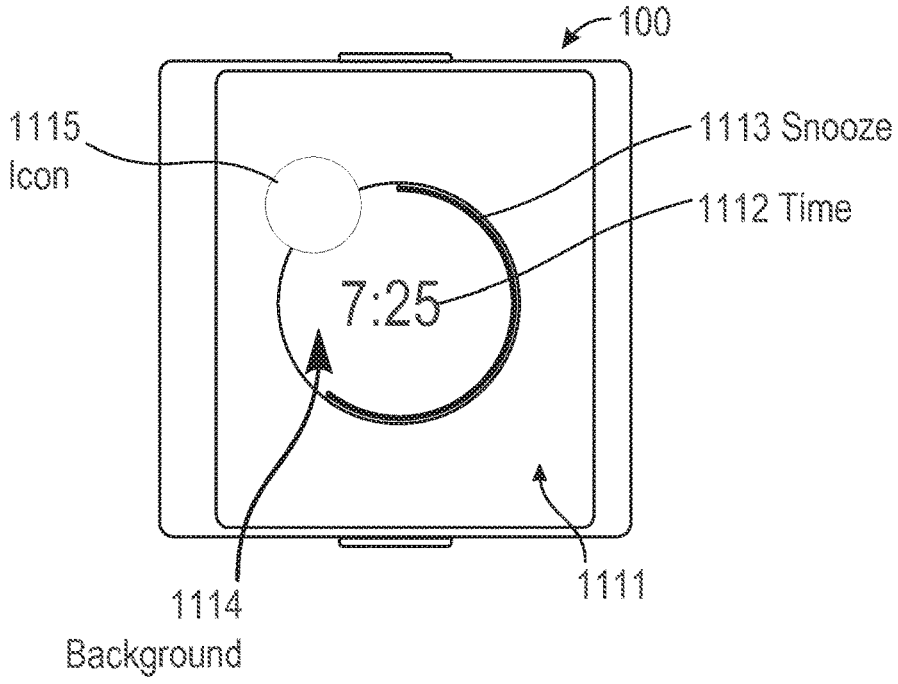

100
1115
Icon
1113 Snooze
1112 Time
7:25
1114
Background
1111

FIG. 11

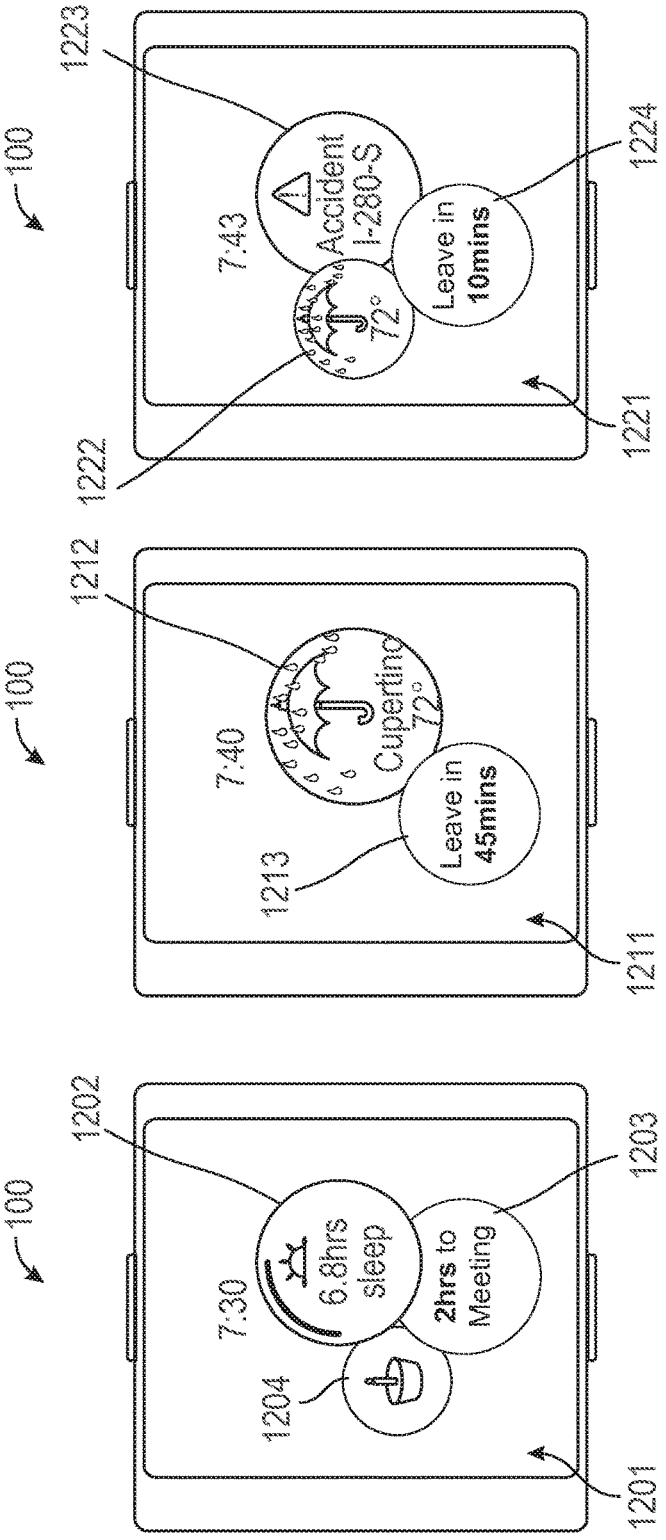

100
1201
1202
7:30
6.8hrs sleep
1204
2hrs to Meeting
1203
100
1211
1212
7:40
Cupertino 72°
1213
Leave in 45mins
100
1221
1222
1223
7:43
Accident I-280-S
72°
Leave in 10mins
1224

FIG. 12

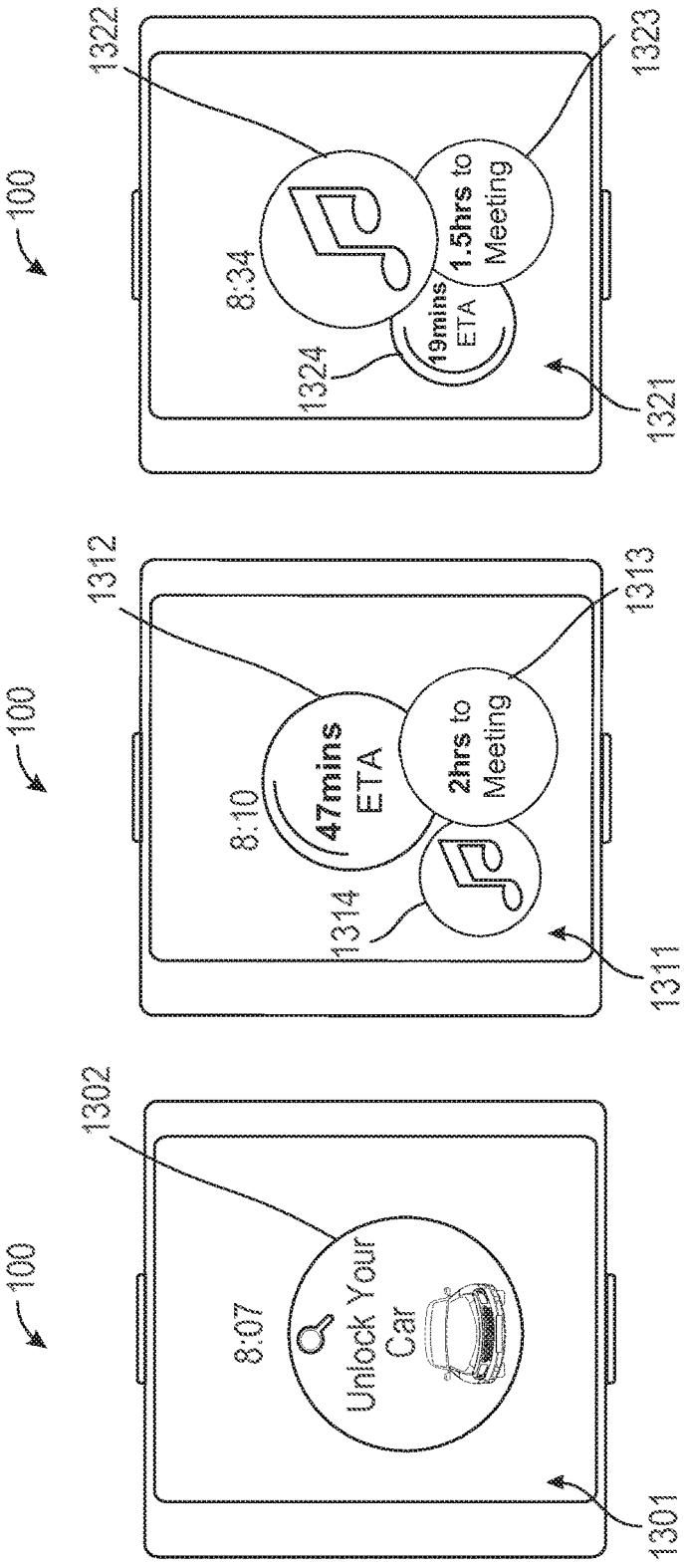

100
1322
1323
8:34
1.5hrs to Meeting
19mins ETA
1324
1321
100
1312
1313
8:10
47mins ETA
2hrs to Meeting
1314
1311
100
1302
8:07
Unlock Your Car
1301

FIG. 13

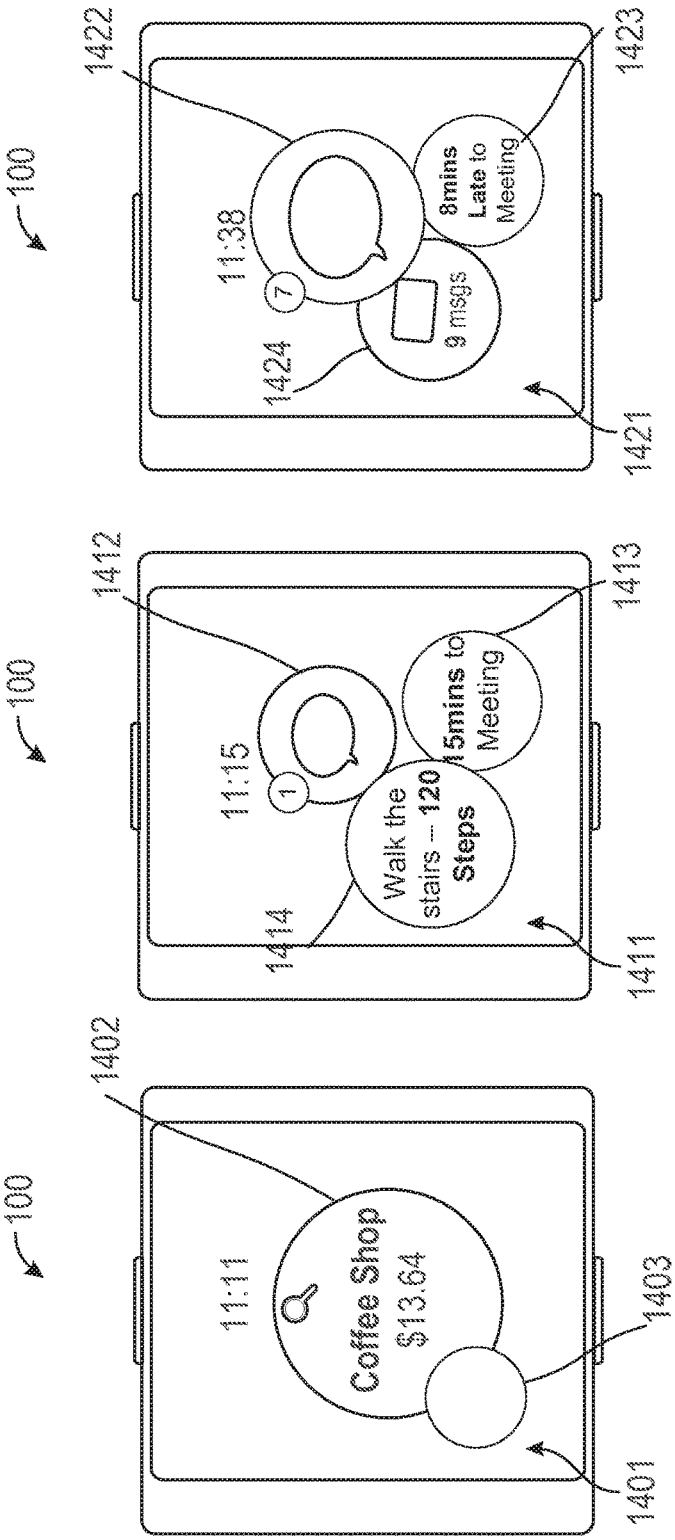

100
1422
1423
11:38
7
8mins Late to Meeting
9 msgs
1424
1421
100
1412
1413
11:15
1
15mins to Meeting
Walk the stairs – 120 Steps
1414
1411
100
1402
11:11
Coffee Shop
$13.64
1403
1401

FIG. 14

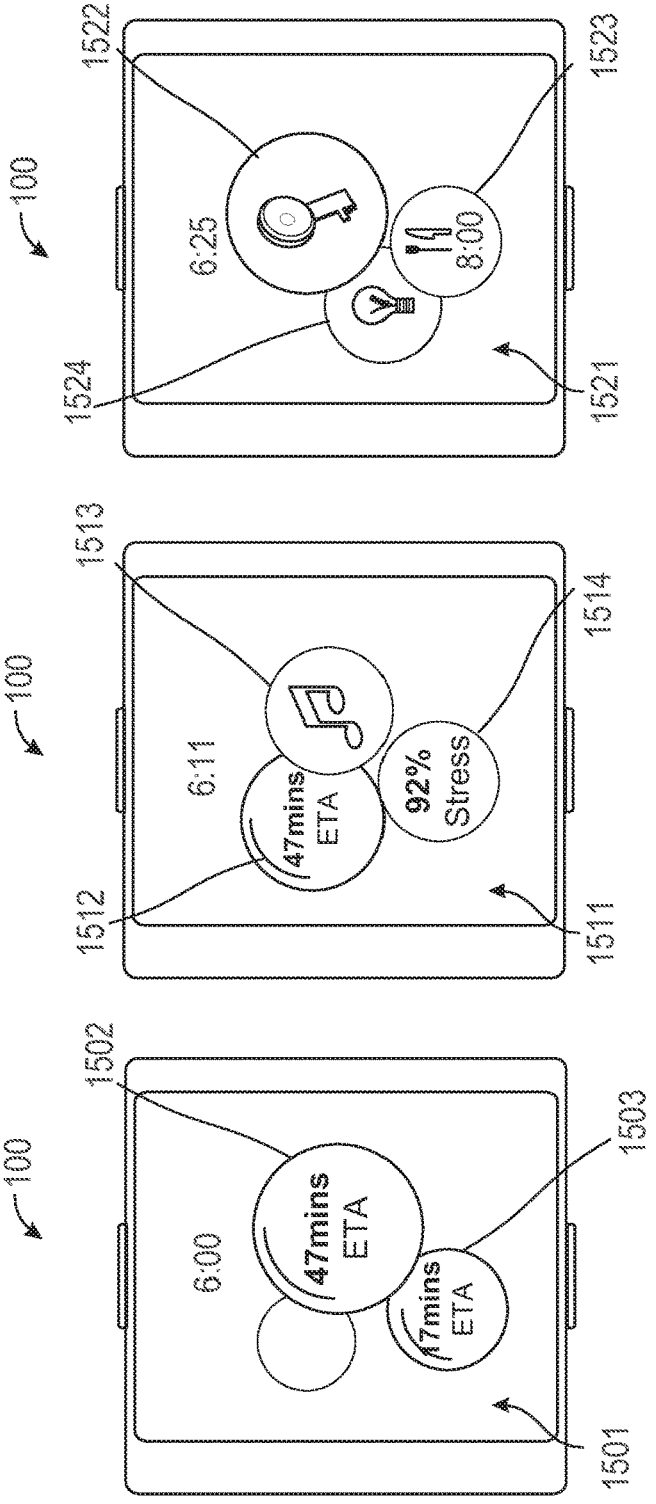

100
1522
1523
6:25
8:00
1524
1521
100
1513
1514
6:11
47mins
ETA
92%
Stress
1512
1511
100
1502
1503
6:00
47mins
ETA
47mins
ETA
1501

FIG. 15

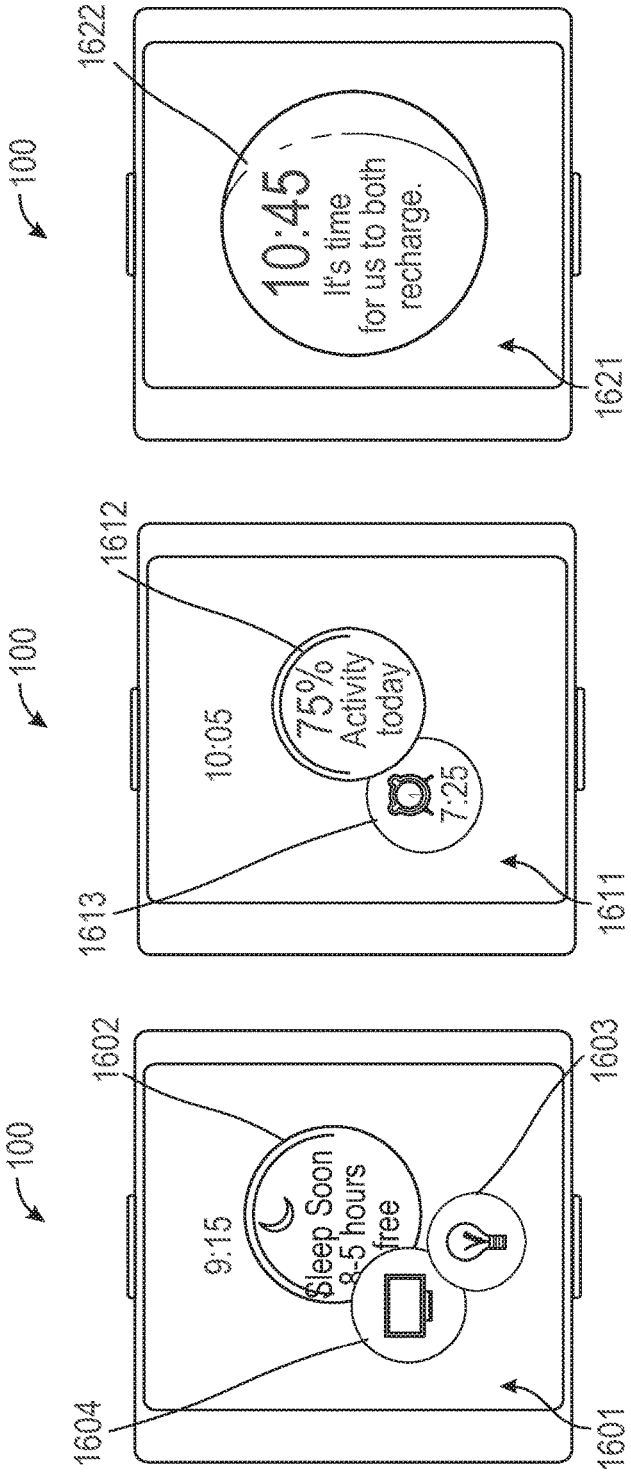

100
1622
10:45
It's time
for us to both
recharge.
1621
100
1612
10:05
75%
Activity
today
7:25
1613
1611
100
1602
1603
9:15
Sleep Soon
8-5 hours
free
1604
1601

FIG. 16

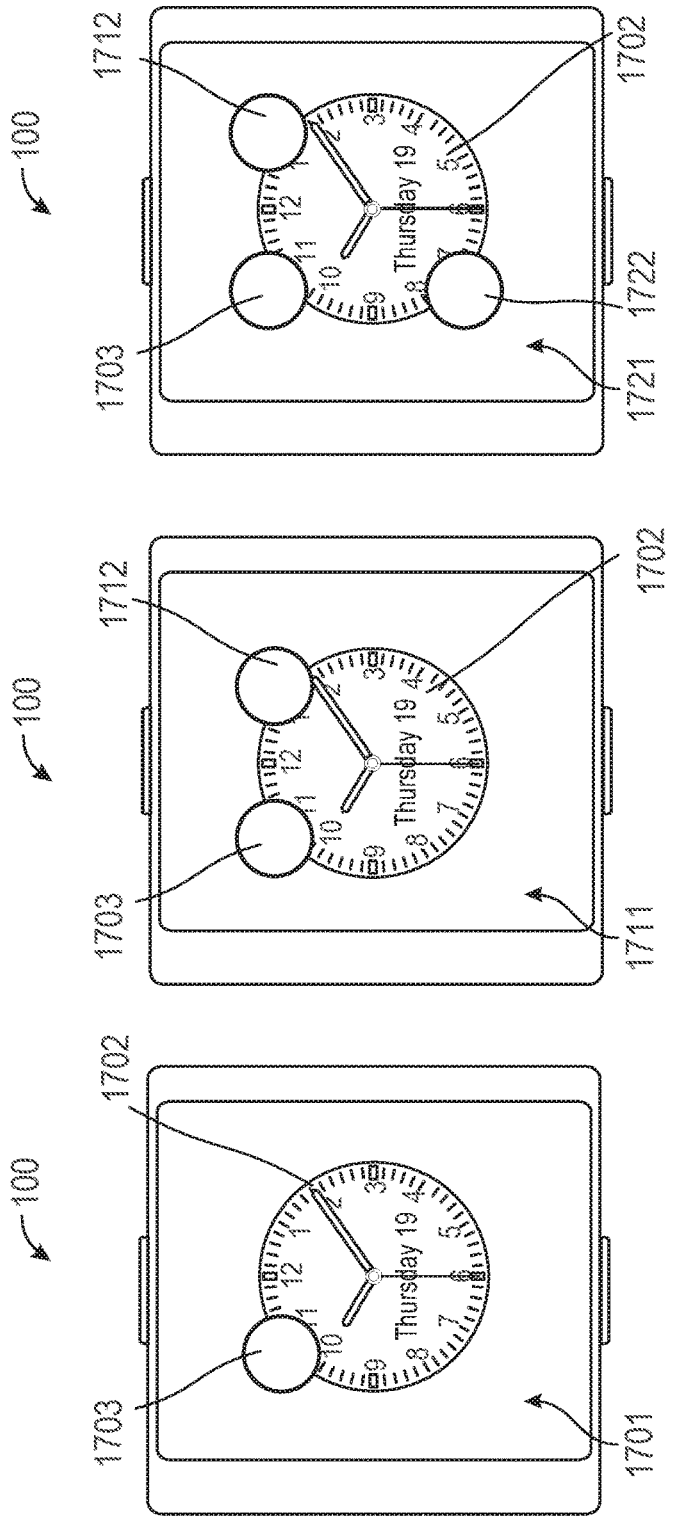

100
1712
1702
1703
1722
1721
Thursday 19
100
1712
1702
1703
1711
Thursday 19
100
1702
1703
1701
Thursday 19

FIG. 17

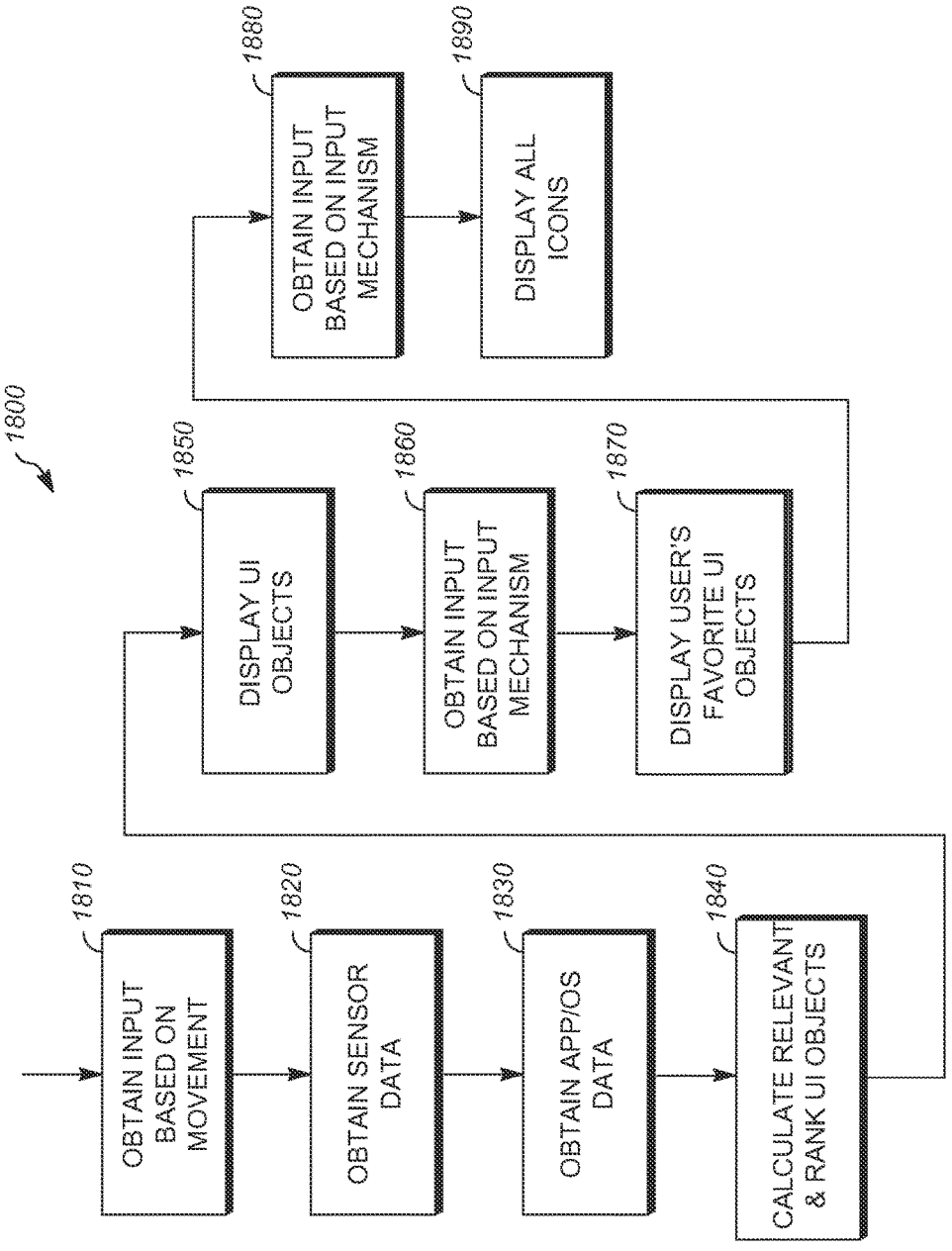

1800
1810
OBTAIN INPUT BASED ON MOVEMENT
1820
OBTAIN SENSOR DATA
1830
OBTAIN APP/OS DATA
1840
CALCULATE RELEVANT & RANK UI OBJECTS
1850
DISPLAY UI OBJECTS
1860
OBTAIN INPUT BASED ON INPUT MECHANISM
1870
DISPLAY USER'S FAVORITE UI OBJECTS
1880
OBTAIN INPUT BASED ON INPUT MECHANISM
1890
DISPLAY ALL ICONS

FIG. 18

DISPLAYING RELEVANT USER INTERFACE OBJECTS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a national stage application under 35 U.S.C. § 371 of International Patent Application No. PCT/US2013/67634, filed Oct. 30, 2013, titled "DISPLAYING RELEVANT USE INTERFACE OBJECTS," the content of which is hereby incorporated by reference in its entirety for all purposes.

FIELD

The disclosed embodiments relate generally to user interfaces of electronic devices.

BACKGROUND

Advanced personal electronic devices can have small form factors. Exemplary personal electronic devices include but are not limited to tablets and smart phones. Uses of such personal electronic devices involve presentation and manipulation of user interface objects on display screens that are designed to be small to complement the personal electronic devices.

Exemplary user interface objects include digital images, video, text, icons, control elements such as buttons, and other graphics. As used here, the term icon refers to an image that is used to represent and to launch an application, consistent with its ordinary meaning in the art. In addition, a "widget," which is used in the art to refer to a simplified view of an application, constitutes an icon, for purposes of this disclosure.

Existing user interfaces on reduced-size personal electronic devices can be inefficient, as they may require multiple manipulations by a user before appropriate information is presented.

SUMMARY

Techniques for presenting user interface objects on a personal electronics device are disclosed.

DESCRIPTION OF THE FIGURES

FIG. **1** illustrates an exemplary personal electronic device.

FIG. **2** illustrates an exemplary user interface.

FIG. **3** illustrates an exemplary user interface.

FIG. **4** illustrates an exemplary logical structure of a user interface.

FIG. **5** illustrates an exemplary user interface.

FIG. **6** illustrates an exemplary user interface.

FIG. **7** illustrates an exemplary computing system.

FIG. **8** illustrates an exemplary user interface.

FIG. **9** illustrates an exemplary user interface.

FIG. **10** illustrates an exemplary user interface.

FIG. **11** illustrates an exemplary user interface.

FIG. **12** illustrates an exemplary user interface.

FIG. **13** illustrates an exemplary user interface.

FIG. **14** illustrates an exemplary user interface.

FIG. **15** illustrates an exemplary user interface.

FIG. **16** illustrates an exemplary user interface.

FIG. **17** illustrates an exemplary user interface.

FIG. **18** illustrates an exemplary process for displaying user interface objects.

DETAILED DESCRIPTION

In the following description of the disclosure and examples, reference is made to the accompanying drawings in which it is shown by way of illustration specific examples that can be practiced. It is to be understood that other examples can be practiced and structural changes can be made without departing from the scope of the disclosure.

FIG. **1** illustrates exemplary personal electronic device **100** (hereafter device **100**). In the illustrated example, device **100** includes body **102**. Device **100** can have touch-sensitive display screen (hereafter touchscreen) **104**.

Touchscreen **104** can include a display device, such as a liquid crystal display (LCD), light-emitting diode (LED) display, organic light-emitting diode (OLED) display, or the like, positioned partially or fully behind or in front of a touch sensor panel implemented using any desired touch sensing technology, such as mutual-capacitance touch sensing, self-capacitance touch sensing, resistive touch sensing, projection scan touch sensing, or the like. Touchscreen **104** can allow a user to perform various functions by touching over hovering near the touch sensor panel using one or more fingers or other object.

In some embodiments, device **100** can have one or more input mechanisms **106** and **108**. Input mechanisms **106** and **108**, if included, can be touch-sensitive. Examples of touch-sensitive input mechanisms include touch-sensitive buttons and touch-sensitive surfaces. Input mechanisms **106** and **108**, if included, can be physical. Examples of physical input mechanisms include push buttons and rotatable mechanisms. Body **102**, which can include a bezel, can have predetermined regions on the bezel that act as input mechanisms. In some embodiments, device **100** can have an attachment mechanism. Such an attachment mechanism, if included, can permit attachment of device **100** with clothing, jewelry, and other wearable accessories, for example. For example, the attachment mechanism can attach to hats, eyewear, earrings, necklaces, shirts, jackets, bracelets, watch straps, chains, trousers, belts, shoes, purses, backpacks, so forth.

In some embodiments, device **100** can have one or more pressure sensors (not shown) for detecting a force or pressure applied to touchscreen **104**. The force or pressure applied to touchscreen **104** can be used as an input to device **100** to perform any desired operation, such as making a selection, entering or exiting a menu, causing the display of additional options/actions, or the like. Different operations can be performed based on the amount of force or pressure being applied to touchscreen **104**. The one or more pressure sensors can further be used to determine a position that the force is being applied to touchscreen **104**.

1. Displaying Relevant User Interface Objects

FIG. **2** illustrates exemplary device **100** worn by user **201**, who is walking towards his vehicle **202**. As user **201** moves device **100** into a viewing position, device **100** displays a user interface screen **203** on touchscreen **104**, automatically. In some embodiments, the display elements of touchscreen **104** are inactive until user **201** moves device **100** into viewing position, meaning that the display elements of touchscreen **104** are off or appear to be off. In some embodiments, device **100** can rotate the displayed contents of touchscreen **104** (e.g., between landscape and portrait modes) so that the displayed information is in a proper

viewing orientation, regardless of whether device **100** is held upwards, downwards, or sideways by user **201**.

User interface screen **203** includes user interface objects that device **100** has determined to be the most relevant to the user this moment. In particular, screen **203** includes an icon **204** for unlocking vehicle **202**, which is useful to user **201** as he approaches his vehicle. Screen **203** also includes map icon **205** for accessing traffic information, which can be useful to user **201** as he begins his trip. Screen **203** also includes icon **206** referencing an upcoming calendar event, which can be useful in providing destination information. Sizes of displayed icons can be relative to their relevance. On screen **203**, icon **204** is larger than icons **205** and **206** because device **100** has concluded that the unlocking of vehicle **202**, provided via icon **204**, is more relevant.

This user interface presentation is notable in that it prioritizes and displays a manageable subset of icons to user **201**, even if many more user interface objects are available for display. Also, this user interface is made available to user **201** without any user interface navigation input from the user, other than the raising of his arm (e.g., without requiring user **201** to push a power-on or equivalent button). In this way, device **100** reduces the amount of user input required to invoke an appropriate user interface action. This benefit is non-trivial, particularly because device **100** has a relatively small display screen size, as compared with smart phones and other electronic devices, which can impede a user's navigation of a larger user interface environment.

It is possible for the number of relevant user interface objects in a given situation to exceed the number that can be reasonably displayed together on touchscreen **104**, such as three as shown in FIG. **2**. When this is the case, device **100** can prioritize the most relevant icons—as determined by a computer-based relevance algorithm on device **100**—for initial display. In some embodiments, a user can bring the remaining relevant icons onto the display using input mechanisms **106** or **108**. In some embodiments, a user can bring the remaining relevant icons onto the display using touchscreen **104**, such as by swiping touchscreen **104** with a touch object.

FIG. **3** illustrates the display of relevant icons over multiple user interface screens. In the illustrated example, user interface screen **301** was displayed on device **100** in response to an upward movement of the device. Screen **301** includes icons **302-304** representing relevant applications, which can be icons **203-205** (FIG. **2**) in some examples. In response to a rotation of input mechanism **108** in direction **306**, user interface screen **311** becomes displayed on device **100**. Screen **311** can show a number of additional relevant icons **312-314** that are less relevant than those shown in screen **301**. In a response to a further rotation of input mechanism **108** in the same direction **306**, device **100** can show user interface screen **321**. Screen **321** can include another set of relevant icons **322-324** that are less relevant than those shown in screen **311**, which are in turn less relevant than those in screen **301**. Input mechanism **108** can be a rotatable crown. In this way, a user can navigate between multiple sets of relevant user interface objects (e.g., icons) on device **100**.

A user can launch an application that corresponds to a displayed icon by touching (e.g., via a finger tap) the displayed icon. As used here, the launching of an application means that the application runs in the foreground of device **100** and is shown on-screen. FIG. **4** illustrates this aspect. In the illustrated example, user interface screen **401** was displayed on device **100** in response to a movement of the device into viewing position. Screen **401** includes icon **402** representing a messaging application (e.g., supporting Short Message Service (SMS)) having five unread messages, as well as icons **403** and **404** representing other applications. In response to a tap on icon **402** from a touch object (e.g., finger **405**), device **100** launches the corresponding messaging application and displays unread messages **412** on user interface screen **411**.

Under some usage conditions, a user may wish to navigate from the messaging application to another relevant application. For instance, the user may wish to navigate to the music and map applications previously represented by icons **403** and **404** on screen **401**. Device **100** can permit navigation between these applications directly, without first returning to screen **401**. In particular, a rotation of input mechanism **108** in direction **414** while screen **411** is displayed causes device **100** to display the music player represented by icon **403** on screen **421**. Screen **421** can include music playback controls **423**. A further rotation of input mechanism **108** in direction **414** while screen **421** is displayed causes device **100** to display the map application represented by icon **404** on screen **431**. Screen **431** can include traffic information **432**.

In some embodiments, screens **411**, **421**, and **431** include visual aids, such as paging dots **415**, **425**, and **435**, respectively, that identify the relative position of the currently displayed application along the sequence of applications accessible via input mechanism **108**. Other visual aids, such as scroll bars and screen-to-screen transitions, can also be used to aid the user's identification of the currently displayed user interface screen in relation to the larger set of available user interface screens.

While the exemplary user interface screens depicted in FIGS. **2-4** are primarily concerned with the efficient display of relevant user interface objects, it should be noted that device **100** can include many more user interface objects that should be accessible to a user, even if their relevance in the moment is not readily discernible. For example, a user may wish to play a game impulsively. Device **100** can permit user navigation beyond relevant user interface objects to other user interface objects. FIG. **5** illustrates this aspect.

In FIG. **5**, user interface screen **501** is displayed on device **100** in response to movement of the device into viewing position. Screen **501** includes icons **502-504** representing relevant applications, which can be icons **203-205** (FIG. **2**) in some examples. In the illustrated example, device **100** has determined that only three user interface objects (i.e., icons **502-504**) are relevant at the moment. Thus, in response to a rotation of input mechanism **108** in direction **505**, device **100** displays user interface screen **511** having other user interface objects available for user selection on device **100**. The icons shown on screen **511** can be a user's favorite icons, meaning that the icons of screen **511** are a predetermined subset of user interface objects available on device **100**. In response to a further rotation of input mechanism **108** in direction **505**, device **100** displays user interface screen **521**, which includes icons that represent all of the available applications on device **100**. Because the size of the displayed icons on screen **521** may be too small for user navigation, in response to a further rotation of input mechanism **108** in direction **505**, device **100** displays screen **531**, which has the effect of zooming into a subset of the icons from screen **521** so that those icons are displayed in larger size for user interaction.

The user interface navigation described with reference to FIG. **5** can be logically organized according to logical structure **600** depicted in FIG. **6**. In the illustrated example of FIG. **6**, x-axis **601** and y-axis **602** form a plane co-planar with the touchscreen screen surface of device **100** (FIG. **1**),

and z-axis **603** is perpendicular to the x/y-plane formed by axes **601** and **602**. Plane **604**, in one example, corresponds to user interface screen **501** (FIG. **5**), while plane **605** corresponds to user interface screen **511** (FIG. **5**), and plane **607** corresponds to user interface screens **521** and **531** (FIG. **5**). More specifically, screen **521** (FIG. **5**) can correspond to a viewpoint of the entire content of plane **607**, while screen **531** (FIG. **5**) can correspond to a zoomed in viewpoint (i.e., an enlarged subset) of the content of plane **607**. In another example, planes **604**, **607**, **608** can correspond to user interface screens **301**, **311**, and **321** of FIG. **3**, respectively. Movement of an input mechanism can be used to select a particular plane of information (i.e., screen of icons) for display on device **100**. For example, rotation of input mechanism **108** can cause different screens of icons to be displayed on device **100** similar to the fashion depicted in FIG. **5**, for example.

2. Determining Relevant User Interface Objects

Consistent with its plain meaning, the phrase "relevant icons" is used here to refer to user interface icons that bear upon or properly apply to the matter that is at hand. In the example of FIG. **2**, an icon for unlocking a vehicle application is relevant as a user draws near his car, because the user is likely to want to drive the car. Device **100** can determine relevance using computer instructions (e.g., algorithms) that account for different inputs, including sensor input, application data, and operating system data.

FIG. **7** depicts exemplary computing system **700** that, in some embodiments, form device **100**. Computing **700** includes components for determining and displaying relevant user interface objects. In the illustrated example, computing system **700** includes an I/O section **704** that can be operatively coupled (connected) with various sensors, such as GPS sensor **720**, accelerometer **722**, directional sensor **724**, gyroscope **726**, light sensor **728**, and/or a combination thereof. I/O section **704** also can be connected with communication unit **718**, for receiving application and operating system data, over Wi-Fi, Bluetooth™, near-field communication ("NFC"), cellular and other wireless communication techniques. In addition, computing system **700** can have bus **702** that connects I/O section **704** together with one or more computer processors **706** and memory section **708**. Memory section **708** can contain computer-executable instructions (e.g., representing algorithms) and/or data for determining and displaying relevant user interface objects. One or more of these components can be part of an integrated chip or a so-called system-on-a-chip. In addition, I/O section **704** can be connected to input mechanism **714**. I/O section **704** can be connected to one or more input buttons **716**. I/O section **704** can be connected to display **710**, which can have touch-sensitive component **712** and, optionally, touch-pressure sensitive component **713**.

The sensors and communication units of computing system **700** can provide information for identifying relevant user interface objects. For example, GPS sensor **720** can determine a user's location and movement while communication unit **718** can receive information about the location and identity of a nearby vehicle (e.g., vehicle **202** in FIG. **2**). Accelerometer **722**, directional sensor **724**, and gyroscope **726** can further detect device movement. Optionally, the outputs of GPS sensor **720**, accelerometer **722**, directional sensor **724**, and/or gyroscope **726** can be interpreted by motion processor **730**. Processors **706** and computer-executable instructions in memory section **708** can use some or all of this information to determine that the user is approaching his vehicle. Processors **706** and instructions in memory **708** can also determine, based on application data and/or operating system data (including meta-data) stored in memory **708**, that an application for interacting with the user's vehicle is installed. In this way, the relevance algorithms of device **100** can conclude that the vehicle interaction application is relevant to the user in the moment. In addition, device **100** can also conclude, based on the same data, that a map application would also be relevant to the user.

Communication unit **718** can also receive other information that affects the relevance of user interface objects. For example, the communication unit can detect nearby devices that are identical or similar, such as other wearable devices of the same design. The communication unit can also detect non-identical units that are running the same operating system as device **100**, such as smart phones and tablets of the same brand. The communication unit can also identify dissimilar devices that support communication over a common protocol. These protocols can include wireless protocols such as Wi-Fi, Bluetooth™, NFC, and the like. These protocols can also be software-based service protocols, such as operating environment service protocols (Apple™ AirPlay™ and AirDrop™), home automation service protocols (e.g., those offered by Phillips™ Lighting and Nest™), authentication service protocols (e.g., airport clearance and metro fares), to point of sale service protocols (e.g., at grocery checkouts), for example. The algorithms used by device **100** to identify relevant user interface objects can account for these inputs provided by the communication unit **718**.

Furthermore, communication unit **718** can receive application and operating system data that inform relevance. For example, a messaging application can receive an incoming message via SMS or Wi-Fi service, and thereby become relevant. As another example, the relevance algorithms of device **100** can use calendar data and the cellular system time to determine that an event reminder is relevant. Furthermore, the relevance algorithms of device **100** can consider the content of application and operating system data in determining relevance. For example, the algorithms can consider an incoming message that contains a reference to a specific time (e.g., "let's meet at 3:00p") to be increasingly relevant as that time (i.e., 3:00 pm) approaches.

In some embodiments, user interface objects can be relevant in groups. That is, application data (including meta-data) can specify that whenever user interface object A is relevant, that user interface object B is also relevant. For example, a music application can be tied to a vehicle interaction application in this way, because drivers typically enjoy music. A map application can also be tied to a vehicle interaction application in this way, because drivers typically desire traffic and/or routing information.

In some embodiments, relevance algorithms used by device **100** can be adaptive, meaning that the outcome of the algorithms can change based on historical user behavior. For example, the algorithms can recognize a user's work commute based on the user's driving pattern during weekday mornings. In this way, device **100** can prioritize specific traffic information for display in the morning. As another example, if a user repeatedly launches one particular radio application over other available radio applications during his commute, device **100** can identify that radio application as being more relevant, and display its icon whenever the user unlocks his car.

In some embodiments, computing system **700** can include biometric sensors such as health-related sensors such as photoplethysmograph (PPG) sensors, electrocardiography (ECG) sensors, and/or galvanic skin response (GSR) sensors. Device **100** can receive input from one or more of these

sensors to provide health-related information. For example, device **100** can use PPG sensor information to alert a user to abnormal respiratory rate, blood pressure, and/or oxygen saturation. As another example, device **100** can use an ECG sensor to alert a user to irregular heartbeats. As yet another example, device **100** can use a GSR sensor to detect a user's skin moisture indicative of sweating, and prioritize a thermostat application for display on device **100**. These sensors can also be used to facilitate biometric identification and authentication of a user.

The sensors of computing system **700** can detect when the system (e.g., device **100**) is placed into a viewing position. For example, accelerometer **724** and/or motion sensor **722** can detect when computing system **700** is raised, lowered, and shaken. These sensors can also detect wrist rotation forward and backward. In some embodiments, the raising of computing device **700** is interpreted as a placement of the device into viewing position. In some embodiment, the raising and rotation of computing device **700** is interpreted as a placement of the device into viewing position. In some embodiments, the time duration between the raising and lowering of computing device **700** is interpreted as a placement of the device into viewing position.

Algorithms used by device **100** to identify relevant user interface objects for display can use one or more of the above-described aspects of the device (e.g., computing system **700**). That is, the algorithms can consider a combination of inputs in determining relevance, including location, movement (including orientation, direction, tilt, acceleration, and velocity), ambient conditions (including light, time, temperature, user's health status), application data (including incoming calls, incoming messages, upcoming calendar events).

For example, device **100** can determine that when it is moving at a velocity that exceeds a threshold (e.g., 10 mph, 20 mph, 25 mph, 30 mph, 40 mph, 50 mph, 55 mph, 60 mph, 65 mph, so forth), the user of the device is commuting, and that icons corresponding to navigational applications have higher relevance. In this situation, device **100** can also determine that icons representing in-vehicle entertainment applications are relevant, if an available in-vehicle device is in communication with the communication unit of device **100**. As another example, device **100** can determine that when its biometric sensors and motion sensors detect movement indicative of exercising, icons representing health-related applications have higher relevance. As another example, device **100** can determine that a calendar event that is coming up in a particular amount of time (e.g., 15 minutes, 30 minutes, 1 hour, 1 day, 1 week, so forth) is of higher relevance. Optionally, device **100** can factor in other variables, such as the distance between the device's current location and the event's location, as well as the current weather, in determining the relevance of an event. That is, device **100** may determine that a nearby event that is upcoming in 15 minutes has less relevance than an event that is upcoming in an hour but is 30 miles away, for example.

3. Exemplary User Interactions

A user can interact with the user interface of device **100**. These interactions can include shortcuts for invoking applications features. This aspect is discussed with reference to FIGS. **8-9**.

In the example of FIG. **8**, device **100** had just received an incoming SMS message, and had provided haptic feedback to the user. In response to the haptic feedback, the user raises device **100** into viewing position, thereby causing device **100** to display user interface screen **801**. Screen **801** includes icons **802-804** representing applications that it has determined as being relevant to the user at the moment. Icon **802** represents the unread SMS message. Icon **803** represents an upcoming calendar event. Icon **804** represents available traffic information. Icon **802** is displayed in large format because the SMS message, which was recently received, ranks highest in relevance.

Because messaging icon **802** has the highest relevance, when the user rotates input mechanism **108** in direction **805**, device **100** launches the corresponding messaging application and displays unread SMS message **812** on user interface screen **811**. In response to a further rotation of input mechanism **108** in direction **805**, device **100** displays calendar event **822** in the calendar application represented by icon **803** on user interface screen **821**. In response to a further rotation of input mechanism **108** in direction **805**, device **100** displays traffic information provided by the map application (corresponding to icon **804**) on user interface screen **831**.

From screen **811**, a user may tap on SMS message **812** to invoke user interface screen **901**, shown in FIG. **9**. Turning to FIG. **9**, screen **901** includes icon **902** for responding to SMS message **812**. Screen **901** also includes icon **903** for creating an alarm at 3 o'clock in the afternoon as suggested by SMS message **812**. Similarly, when screen **821** (FIG. **8**) is displayed, the user may tap on calendar event **822** to invoke user interface screen **911**, shown in FIG. **9**. Screen **911** includes icon **912** for messaging an event attendee (e.g., Larry). Screen **911** also includes icon **913** for obtaining navigation to the event location. Finally, when screen **831** (FIG. **8**) is displayed, a user may tap on map **832** to invoke user interface screen **921**, shown in FIG. **9**. Screen **921** includes icon **922** for setting a navigation waypoint and icon **923** for obtaining turn-by-turn navigation instructions.

In some embodiments, device **100** can distinguish between short taps and long taps on touch-screen **104** (FIG. **1**), and invoke screen **901** only after a long-tap on screen **811** (FIG. **8**), for example. For purposes of this disclosure, a short tap refers to a brief touch on touchscreen **104** (FIG. **1**) followed by a release of the touch. A long tap refers to a longer touch on touchscreen **104** (FIG. **1**) before touch release. Device **100** can consider touches exceeding a predetermined duration to be long taps (and touches of shorter duration to be short taps). In some embodiments, device **100** can distinguish between the level of pressure on touchscreen **104**. That is, device **100** can detect the intensity of a touch object (e.g., a user's finger) on touchscreen **104**. Thus, device **100** can invoke screen **901** only after a user taps on screen **811** (FIG. **8**.) with sufficient pressure.

In some embodiments, device **100** can distinguish between brief glances and longer stares at touchscreen **104** (FIG. **1**). A brief glance can be characterized by having a short duration between the raising of the device into viewing position and the subsequent lowering of the device. A longer stare can be characterized by a period of relative steadiness of the device in the viewing position. Device **100** can respond to brief glances and longer stares differently. This aspect is illustrated by FIG. **10**. In the example of FIG. **10**, user interface screen **1001** was displayed in response to a user's movement of device **100** into viewing position. However, instead of displaying multiple relevant user interface objects, user interface screen **1001** emphasizes the display of an unread SMS message **1002** from a contact, because message **1002** had arrived immediately before device **100** was raised into viewing position. If the user maintains device **100** in viewing position exceeding a predetermined time duration, device **100** replaces screen **1001** with user interface screen **1011**, which shows multiple icons repre-

senting relevant user interface objects available on device **100**. From screen **1011**, the user can tap on icon **1012** using finger **1013** to return to SMS message **1002**. In this way, device **100** permits a user to briefly glance at an incoming message.

4. Exemplary User Interfaces

FIGS. **11-16** illustrate exemplary user interfaces that device **100** can display, based on relevance, over the course of a day. In FIG. **11**, device **100** determines that the user has recently awakened, and displays an appropriate greeting **1102** stating "good morning". Device **100** can make this determination based on the time of day, the user's interaction with an alarm clock application (e.g., user may have just turned off an alarm), and/or movement of the device that indicate the user is walking after a sedentary period, for example. Device **100** can rank greeting **1102** as the most relevant icon to be displayed to a user as he wakes up. Because of its high relevance, greeting **1102** is emphasized on user interface screen **1101**, meaning that greeting **1102** can be largest icon displayed, or the only icon displayed. Note, however, that when greeting **1102** is the only icon displayed, other non-icon user interface elements (such as the current time) can still be displayed on-screen.

User interface screen **1111** depicts another exemplary user interface that device **100** can display as its user wakes up. Screen **1111** includes icon **1112** indicating the current time. Icon **1123** can have circumferential outline **1113** indicating the time remaining in snooze. Optionally, icon **1112** can have a background that indicates the current weather, for example, with blue representing temperate weather and gray representing inclement weather. Screen **1112** can also include icon **1115** indicating unread messages that the user should attend to.

FIG. **12** illustrates user interface screen **1201**, which can show additional relevant user interface objects after a user wakes up. Screen **1201** includes relevant icons **1202-1204**. Icon **1202** can correspond to a health application and indicate sleep information, such as the duration of sleep by the user. Icon **1203** can correspond to calendar information, such as the remaining time before a next calendar event. Icon **1204** can correspond to additional calendar information, such as all-day events.

User interface screen **1211** depicts additional relevant user interface objects that device **100** can display after a user wakes up. Screen **1211** includes relevant icons **1212** and **1213**. Icon **1212** can correspond to a weather application indicating the weather at the device's present location. Optionally, icon **1212** can indicate the weather at a location that the user historically travels to in the morning, such as the weather at the user's work location. In addition, icon **1213** can indicate that the user should begin his morning commute to work in 45 minutes. Device **100** can make this determination based on the first event in today's calendar, the user's usual travel destination on weekday mornings, and the estimated time of travel to that destination based on distance and traffic information, for example.

User interface screen **1221** depicts additional relevant user interface objects that device **100** can display later in the morning. Exemplary user interface screen **1121** includes relevant icons **1222-1224**. Icon **1222**, which indicates weather condition, can display the same information that was displayed earlier by icon **1212**. However, while icon **1212** was the most relevant icon on screen **1211**, its relevance in screen **1221** is superseded by traffic icon **1223**. Traffic icon **1223** indicates a traffic alert and is displayed as the largest icon because device **100** has determined that information about an accident along the user's typical morning commute is highly relevant at the moment. Screen **1221** also includes icon **1224** indicating that the user should begin his commute to work in 10 minutes, rather than the 45 minute indication given earlier by icon **1213**, in view of traffic information (caused by the accident) received by device **100**.

Turning to FIG. **13**, screen **1301** depicts icon **1302** for unlocking the user's vehicle as he approaches his vehicle. Device **100** can display icon **1302** based on decreasing distance between device **100** and his nearby vehicle. Optionally, screen **1301** can include additional relevant icons, such as those discussed with respect to FIG. **1**. While the user is in his car, device **100** can display user interface screen **1311** if it is raised into viewing position. Screen **1311** includes information about the estimate time to arrival ("ETA") to work (i.e., icon **1312**), the time to his next calendared meeting (i.e., icon **1313**), and the music player (i.e., as represented by icon **1314**), which are relevant to the user as he is en route to work. Device **100** can determine that the user is driving based on GPS movement and/or by communication with an in-car telematics system (e.g., through Bluetooth™ or a cable connection). Device **100** can determine that the user is driving to his work based on historical information about the user's commute pattern. As the user nears his workplace, the estimated time to arrival may become less relevant, causing the information to be displayed with less emphasis. For example, in user interface screen **1321**, music icon **1322** is displayed in larger format than ETA icon **1224**. Icon **1323** can continue to display the time to the next calendared meeting as the information continues to be highly relevant. Device **100** can mark the reminder as highly relevant if the meeting is off-site (i.e., physically far from the user's work location), based on GPS sensor and calendar information.

Turning to FIG. **14**, later in the day, the user of device **100** can visit a store such as a coffee shop. On screen **1401**, device **100** can display an electronic-payment icon **1412** that permits the user to authorize a purchase at the coffee shop. Device **100** can determine its proximity to the coffee shop based on GPS information and application data provided by a map application or a third-party application, such as a Starbucks™ application. Device **100** can also determine its proximity to the coffee shop based on wireless communication with the store's point-of-sale system, such as through near-field communication with a payment reader. In addition, on screen **1401**, device **100** can display icon **1403** indicating the proximity of a contact (e.g., a friend) at the coffee shop. On screen **1411**, device **100** can display icon **1412** indicating a new incoming message, icon **1413** counting down to an upcoming meeting, and icon **1414** suggesting that the user should take the stairs to the meeting for additional exercise. Device **100** can remind a user if he is late to a meeting. For example, on screen **1421**, device **100** can display icon **1422** alerting the user that the user is eight minutes late to a calendared meeting, and icons **1423** and **1424** alerting the user to new incoming messages, some of which may have been triggered by his absence at the meeting.

Turning to FIG. **15**, device **100** can display information relevant as the workday draws to a close. On user interface screen **1501**, device **100** can display the user's ETA to home (i.e., icon **1502**) and his spouse's ETA to home (i.e., icon **1503**). On user interface screen **1511**, device **100** can continue to display the user's ETA to home (i.e., icon **1512**), a music application to changing the music in his vehicle (i.e., icon **1513**), and a stress level indicator (i.e., icon **1514**). Device **100** can calculate the user's stress level based on

sensor input including, for example, PPG, ECG, and GSR sensor readings. As the user arrives home and looks at device **100**, device **100** can display icon **1522** for unlocking a wireless-enabled front-door door lock. Device **100** can also display icon **1524** for controlling in-home electronics, such as lighting and furnace settings, through Wi-Fi enabled lighting and HVAC controllers. Device **100** can also display icon **1523** indicating a dinner event.

Turning to FIG. **16**, device **100** can display information relevant as the day ends. On user interface screen **1601**, device **100** can display icon **1602** suggesting that the user should sleep soon, based on the user's usual sleep time and the next morning's calendared activities, for example. Device **100** can also display icon **1604** for controlling televisions, based on the user's habit of watching television at night. Device **100** can also display icon **1603** for lighting control, also based on the user's usual end-of-day routine. As the user's usual bed time continues to draw near, device **100** can display a summary of the user's physical activities for the day (i.e., icon **1612** indicating the user met 75% of their daily goal), and an alarm clock icon **1613** for setting an alarm for the next morning. Device **100** can also reduce the amount of user interface objects displayed at the end of the day. For example, as shown on screen **1621**, device **100** can display a single icon **1622** suggesting sleep. In addition, icon **1622** can be displayed using light wavelengths that are less likely to interfere with a user's sleep pattern. In this way, device **100** can avoid keeping its user awake and/or awaking its sleeping user.

Optionally, device **100** can be configured to display a clock face persistently. This aspect is described with respect to FIG. **17**. In the illustrated example, device **100** displays user interface screen **1702** in response to the raising of the device into viewing position. On screen **1702**, clock **1702** is displayed together with relevant icon **1703**. As device **100** identifies additional relevant user interface objects, they can be displayed in the foreground of touchscreen **104** (FIG. **1**) about the circumference of clock **1702**, as demonstrated by additional relevant icons **1712** and **1713** on screens **1711** and **1721**. In this way, a user can configure device **100** so as to emphasize its time-keeping function.

FIG. **18** depicts exemplary process **1800** that can be performed by device **100** to display relevant user interface objects. At block **1810**, device **100** obtains input from a movement sensor indicating movement of the device into a viewing position. In some embodiments, the movement can be an upward movement. At block **1820**, device **100** obtains additional sensor data. Such sensor data can include GPS location information, lighting information, movement information, and/or accelerometer information. At block **1830**, device **100** obtains application or operating system data. Such data can be obtained through a communication channel such as Wi-Fi, Bluetooth™, or NFC. At block **1840**, device **100** identifies, based on the sensor data and application/OS data, user interface objects that are relevant for display to the user. Device **100** can also rank the relevant user interface objects. At block **1850**, the most relevant user interface objects are displayed to the user. At block **1860**, device **100** receives a input representing movement of an input mechanism. In response, at block **1870**, device **100** displays icons representing the user's favorite applications available on the device. At block **1880**, device **100** receives an additional input representing movement of an input mechanism. In response, at block **1890**, device **100** displays icons representing all of the available applications on the device.

Turning back to FIG. **7**, memory section **708** of computing system **700** can be a non-transitory computer readable storage medium, for storing computer-executable instructions, which, when executed by one or more computer processors **706**, for example, can cause the computer processors to perform the user interface techniques described above, including process **1800** (FIG. **18**). The computer-executable instructions can also be stored and/or transported within any non-transitory computer readable storage medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. For purposes of this document, a "non-transitory computer readable storage medium" can be any medium that can contain or store computer-executable instructions for use by or in connection with the instruction execution system, apparatus, or device. The non-transitory computer readable storage medium can include, but is not limited to, magnetic, optical, and/or semiconductor storages. Examples of such storage include magnetic disks, optical discs based on CD, DVD, or Blu-ray technologies, as well as RAM, ROM, EPROM, flash memory, and solid-state memory. Computing system **700** is not limited to the components and configuration of FIG. **7**, but can include other or additional components in multiple configurations.

Although the disclosure and examples have been fully described with reference to the accompanying figures, it is to be noted that various changes and modifications will become apparent to those skilled in the art. Such changes and modifications are to be understood as being included within the scope of the disclosure and examples as defined by the appended claims.

What is claimed is:

1. A non-transitory computer readable storage medium having computer-executable instructions which, when executed by one or more computer processors, causes the one or more computer processors to display a user interface, the computer-executable instructions comprising instructions for:

receiving input from a movement sensor based on a movement of an electronic device; and

displaying a first plurality of user interface objects on a touch-sensitive display,

wherein the display is in response to the received movement sensor input,

wherein the first plurality of user interface objects is a subset of a larger plurality of user interface objects available for display, and

wherein the first plurality of user interface objects was selected from the larger plurality of user interface objects using a relevance algorithm that uses as input user health information represented by input received from a biometric sensor and at least one of:

a location of the electronic device;

a location of an external device;

a current time;

an upcoming calendar event; or

map information.

2. The non-transitory computer readable storage medium of claim **1**, wherein the computer-executable instructions further comprise instructions for:

receiving input based on a movement of a rotatable input mechanism; and

in response to the received rotatable input mechanism input, replacing the first plurality of user interface objects with a second plurality of user interface objects on the touch-sensitive display.

3. The non-transitory computer readable storage medium of claim 1, wherein the computer-executable instructions further comprise instructions for:

receiving input from the touch-sensitive display based on a movement of a touch object; and

in response to the received touch-sensitive display input, replacing the first plurality of user interface objects with a second plurality of user interface objects on the touch-sensitive display.

4. The non-transitory computer readable storage medium of claim 1, wherein the device is a wearable device.

5. The non-transitory computer readable storage medium of claim 1, wherein the computer-executable instructions further comprise instructions for:

receiving input from a GPS sensor representing a location of the device; and

obtaining application data identifying an external device,

wherein the relevance algorithm uses the location of the device and a location of the external device as input.

6. The non-transitory computer readable storage medium of claim 5, wherein:

the relevance algorithm increases the relevance of user interface objects from the larger plurality of user interface objects that are associated with the external device, as a distance between the device and the location of the external device decreases.

7. The non-transitory computer readable storage medium of claim 1, wherein the computer-executable instructions further comprise instructions for:

receiving input from a GPS sensor; and

obtaining a velocity of movement of the device based on the received GPS sensor input, and

wherein the relevance algorithm uses a location of the device and a location of an external device as input.

8. The non-transitory computer readable storage medium of claim 1, wherein the relevance algorithm uses the current time as input.

9. The non-transitory computer readable storage medium of claim 1, wherein the computer-executable instructions further comprise instructions for:

receiving input from an external device via a wireless communication unit; and

identifying the external device, and

wherein the relevance algorithm uses the identity of the external device as input.

10. The non-transitory computer readable storage medium of claim 1,

wherein the relevance algorithm uses meta-data as input, and

wherein the meta-data identifies at least one application corresponding to the user interface objects of the first plurality of user interface objects.

11. The non-transitory computer readable storage medium of claim 1, wherein the relevance algorithm uses application data as input.

12. The non-transitory computer readable storage medium of claim 11,

wherein the application data represents a message, and

wherein the relevance algorithm increases the relevance of an icon a user interface object from the larger plurality of user interface objects that is associated with messaging.

13. The non-transitory computer readable storage medium of claim 11,

wherein the application data represents the upcoming calendar event, and

wherein the relevance algorithm increases the relevance of a user interface object from the larger plurality of user interface objects that is associated with the event.

14. The non-transitory computer readable storage medium of claim 11,

wherein the application data represents the map information, and

wherein the relevance algorithm increases the relevance of a user interface object from the larger plurality of user interface objects that is associated with the map information,

when the device is moving faster than a predetermined velocity.

15. The non-transitory computer readable storage medium of claim 1, wherein the computer-executable instructions further comprise instructions for:

receiving the input from the biometric sensor representing the user health information; and

wherein the relevance algorithm:

increases the relevance of a user interface object from the larger plurality of user interface objects that is associated with an application for displaying the health information, when the biometric sensor input indicates a user of the device is exercising.

16. The non-transitory computer readable storage medium of claim 1, wherein the computer-executable instructions further comprise instructions for:

storing, in a memory, data determined using input from at least one previous day, and

wherein the relevance algorithm uses the stored data from the previous day as input.

17. The non-transitory computer readable storage medium of claim 16, wherein the input from the at least one previous day includes input from at least one of:

a GPS sensor, an accelerometer sensor, a directional sensor, a gyroscope, and/or a light sensor.

18. The non-transitory computer readable storage medium of claim 2, wherein the second plurality of user interface objects:

is another subset of the larger plurality of user interface objects,

is selected from the larger plurality of user interface objects using the relevance algorithm, and

is different from the first plurality of user interface objects.

19. The non-transitory computer readable storage medium of claim 1, wherein the movement is an upward movement.

20. The non-transitory computer readable storage medium of claim 2, wherein the second plurality of user interface objects is a subset, selected by a user, of the larger plurality of user interface objects.

21. The non-transitory computer readable storage medium of claim 1, wherein the touch-sensitive display was inactive immediately before the movement.

22. A computer-enabled method comprising:

receiving input from a movement sensor based on a movement of an electronic device; and

displaying a first plurality of user interface objects on a touch-sensitive display,

wherein the display is in response to the received movement sensor input,

wherein the first plurality of user interface objects is a subset of a larger plurality of icons available for display, and

wherein the first plurality of user interface objects was selected from the larger plurality of user interface objects using a relevance algorithm that uses as input

user health information represented by input received from a biometric sensor and at least one of:
a location of the electronic device;
a location of an external device;
a current time;
an upcoming calendar event or
map information.

23. An electronic device comprising:
one or more processors operatively coupled to:
a movement sensor configured to detect movement of the electronic device;
a memory; and
a touch-sensitive display;
the one or more processors configured to:
receive input from the movement sensor based on a movement of the electronic device; and
display a first plurality of user interface objects on the touch-sensitive display,
wherein the display is in response to the received movement sensor input,
wherein the first plurality of user interface objects is a subset of a larger plurality of user interface objects available for display, and
wherein the first plurality of user interface objects was selected from the larger plurality of user interface objects using a relevance algorithm that uses as input user health information represented by input received from a biometric sensor and at least one of:
a location of the electronic device;
a location of an external device;
a current time;
an upcoming calendar event or
map information.

24. The method of claim **22**, further comprising:
receiving input based on a movement of a rotatable input mechanism; and
in response to the received rotatable input mechanism input, replacing the first plurality of user interface objects with a second plurality of user interface objects on the touch-sensitive display.

25. The method of claim **22**, further comprising:
receiving input from the touch-sensitive display based on a movement of a touch object; and
in response to the received touch-sensitive display input, replacing the first plurality of user interface objects with a second plurality of user interface objects on the touch-sensitive display.

26. The method of claim **22**, further comprising:
receiving input from a GPS sensor representing a location of the device; and
obtaining application data identifying an external device,
wherein the relevance algorithm uses the location of the device and a location of the external device as input.

27. The method of claim **26**, wherein:
the relevance algorithm increases the relevance of user interface objects from the larger plurality of user interface objects that are associated with the external device, as a distance between the device and the location of the external device decreases.

28. The method of claim **22**, further comprising:
receiving input from a GPS sensor; and
obtaining a velocity of movement of the device based on the received GPS sensor input, and
wherein the relevance algorithm uses a location of the device and a location of an external device as input.

29. The method of claim **22**, further comprising:
receiving input from an external device via a wireless communication unit; and
identifying the external device, and
wherein the relevance algorithm uses the identity of the external device as input.

30. The method of claim **22**,
wherein the relevance algorithm uses meta-data as input, and
wherein the meta-data identifies at least one application corresponding to the user interface objects of the first plurality of user interface objects.

31. The method of claim **22**,
wherein the relevance algorithm uses application data as input,
wherein the application data represents a message, and
wherein the relevance algorithm increases the relevance of a user interface object from the larger plurality of user interface objects that is associated with messaging.

32. The method of claim **22**,
wherein the relevance algorithm uses application data as input,
wherein the application data represents the map information, and
wherein the relevance algorithm increases the relevance of a user interface object from the larger plurality of user interface objects that is associated with the map information,
when the device is moving faster than a predetermined velocity.

33. The method of claim **22**, wherein the computer-executable instructions further comprise instructions for:
receiving the input from the biometric sensor representing the user health information; and
wherein the relevance algorithm:
increases the relevance of a user interface object from the larger plurality of user interface objects that is associated with an application for displaying the health information, when the biometric sensor input indicates a user of the device is exercising.

34. The method of claim **22**, further comprising:
storing, in a memory, data determined using input from at least one previous day, and
wherein the relevance algorithm uses the stored data from the previous day as input.

35. The method of claim **24**, wherein the second plurality of user interface objects:
is another subset of the larger plurality of user interface objects,
is selected from the larger plurality of user interface objects using the relevance algorithm, and
is different from the first plurality of user interface objects.

36. The method of claim **24**, wherein the second plurality of user interface objects is a subset, selected by a user, of the larger plurality of user interface objects.

37. The device of claim **23**, further comprising:
receiving input based on a movement of a rotatable input mechanism; and
in response to the received rotatable input mechanism input, replacing the first plurality of user interface objects with a second plurality of user interface objects on the touch-sensitive display.

38. The device of claim **23**, further comprising:
receiving input from the touch-sensitive display based on a movement of a touch object; and

in response to the received touch-sensitive display input, replacing the first plurality of user interface objects with a second plurality of user interface objects on the touch-sensitive display.

39. The device of claim **23**, further comprising:

receiving input from a GPS sensor representing a location of the device; and

obtaining application data identifying an external device,

wherein the relevance algorithm uses the location of the device and a location of the external device as input.

40. The device of claim **39**, wherein:

the relevance algorithm increases the relevance of user interface objects from the larger plurality of user interface objects that are associated with the external device, as a distance between the device and the location of the external device decreases.

41. The device of claim **23**, further comprising:

receiving input from a GPS sensor; and

obtaining a velocity of movement of the device based on the received GPS sensor input, and

wherein the relevance algorithm uses a location of the device and a location of an external device as input.

42. The device of claim **23**, further comprising:

receiving input from an external device via a wireless communication unit; and

identifying the external device, and

wherein the relevance algorithm uses the identity of the external device as input.

43. The device of claim **23**,

wherein the relevance algorithm uses meta-data as input, and

wherein the meta-data identifies at least one application corresponding to the user interface objects of the first plurality of user interface objects.

44. The device of claim **23**,

wherein the relevance algorithm uses application data as input,

wherein the application data represents a message, and

wherein the relevance algorithm increases the relevance of a user interface object from the larger plurality of user interface objects that is associated with messaging.

45. The device of claim **23**,

wherein the relevance algorithm uses application data as input,

wherein the application data represents the map information, and

wherein the relevance algorithm increases the relevance of a user interface object from the larger plurality of user interface objects that is associated with the map information, when the device is moving faster than a predetermined velocity.

46. The device of claim **23**, wherein the computer-executable instructions further comprise instructions for:

receiving the input from the biometric sensor representing the user health information; and

wherein the relevance algorithm:

increases the relevance of a user interface object from the larger plurality of user interface objects that is associated with an application for displaying the health information, when the biometric sensor input indicates a user of the device is exercising.

47. The device of claim **23**, further comprising:

storing, in a memory, data determined using input from at least one previous day, and

wherein the relevance algorithm uses the stored data from the previous day as input.

48. The device of claim **37**, wherein the second plurality of user interface objects:

is another subset of the larger plurality of user interface objects,

is selected from the larger plurality of user interface objects using the relevance algorithm, and

is different from the first plurality of user interface objects.

49. The device of claim **37**, wherein the second plurality of user interface objects is a subset, selected by a user, of the larger plurality of user interface objects.

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