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User Equipment (UE) Bimodal User Interface (UI)

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Abstract:

This publication describes a user equipment (UE), such as a smartphone, that offers a user a bimodal user interface (UI) having an input mode and an output mode. The user may use various techniques to instruct the UE whether the UI needs to be in input mode or in output mode. As described herein, input mode refers to a user experience in which the user instructs the UE what to do, such as perform a computation, write an email, make a call, draw a figure, take notes, and other user-initiated activities. The UI in input mode silences and hides some or all calls, texts, and notifications from an operating system (OS) and various application software, unless the user specifically requests them, such as by tapping on a specific UI element. In addition, the UI in input mode creates shortcuts to certain OS and application software elements. On the other hand, as described herein, output mode refers to a user experience in which the UE instructs or notifies the user on what to do or what happened and fundamentally involves the user receiving information from other users, the operating system (OS), or various application software. The UI in output mode may offer the user the option to read email, read news, read posts from various social networking sites, browse the internet, read a list of bank transactions, receive calls, messages, and notifications, and other activities that involves the user receiving and consuming information. The bimodal UI in input mode or in output mode can help the user regain control of their user experience with the UE and can help the user better-manage their amount of time in front of the UE's screen display.

Keywords:

User interface, UI, user experience, user equipment, UE, graphical user interface, GUI, operating system, OS, input mode, output mode, bimodal operation, user input, user intent, notification, application programming interface, API, gesture, focus, distraction.

Background:

User equipment (UE) are a ubiquitous part of modern life, and their beneficial role in humanity is undeniable. Early UE were often standalone (not networked), lacked the modern user interface (UI), and offered a different user experience from the modern UE. A user interacted with early UE mainly in input mode. As described herein, input mode refers to a user experience in which the user instructs the UE what to do, such as perform a computation, write an email, draw a figure, take notes, and so forth. In addition, early UE offered a user experience in which the user was engaged in a single activity. Furthermore, users were often engineers, scientist, mathematicians, and other technical professionals, who often used UE to carry out specific work-related tasks.

In modern times, the relation between the user and the UE has changed. UE are not just tools for technical professionals. Worldwide, over two billion people use a UE, such as a smartphone, which has more computational power than a high-end computing device in the 1970s. The smartphone's UI enables a user with ordinary technical skills to carry out complex tasks with relative ease. In addition, the smartphone is networked and capable to offer the user an impressive user experience in a variety of tasks, as illustrated in Figure 1.

Missed call	**21m ago**
Mom	
National News	**50m ago**
S&P 500 dips 2.5%. Fed to announce an increase in rates.	
Social Media #1	**51m ago**
Ben replied to your comment.	
Reminder	**in 2h**
Pick up Billy from soccer practice.	
Music Provider #1	
Check out the latest album by The Band X.	
House Camera	**1h ago**
Motion at the front door.	
Social Media #2	**2h ago**
Senator Jones of NY comments on the latest WH statement.	
Bank $$$	**3h ago**
Your utility bill from the State Energy Company was paid in full.	

Figure 1

Figure 1 illustrates Jane's smartphone. Assume Jane has not used her smartphone in three hours. The smartphone routes incoming calls, alerts, and notifications directly to its history. As shown in Figure 1, in just three hours Jane's smartphone notified her on bank transactions, various social media posts, news, task reminders, notifications, and missed calls. The smartphone is interacting with Jane in an output mode. As described herein, output mode refers to a user experience in which the UE instructs or notifies the user on what to do or what happened, such as read email, read news, consume media, answer a call, and other activities that fundamentally involve the user receiving information from other users, the operating system (OS), or various application software.

Due to extensive networking and more-sophisticated UI, the UE's output mode user experience has increasingly become more aggressive. This is one of the reasons the modern user spends an alarming amount of time in front of a screen display and not all of it is productive or healthy. Modern users are constantly using smartphones, using computers, watching television, and performing other activities that involve a UE with a screen display. The Pew Research Center has reported the following statistics on UE usage by Americans:

- 77% go online daily interacting on social networking sites;

- More than 25% report being online "almost constantly;" and

- 46% of adults report that they "could not live" without their smartphone.

The UE's output mode is increasingly influencing human behavior and social interaction. Self-disclosure and responsiveness are human psychological adaptations that enhance human survival because they build trust and increase cooperation. Nevertheless, by being constantly online, these valuable human psychological traits are starting to inhibit our ability to communicate and cooperate with family members, friends, coworkers, and other human beings. Similar to the human desire for sweet-tasting food, what was beneficial for our ancestors has become an obstacle for our well-being. Modern humans do not lack the willpower of our ancestors, but we constantly face triggers that our ancestors did not face. As John F. Kennedy once said, "Our problems are man-made, therefore they may be solved by man." Given that we understand one of the problems, it is desirable to have a technological solution that can help the user regain control of their user experience with the UE.

Description:

This publication describes a user equipment (UE), such as a smartphone, that offers a user a bimodal user interface (UI) having an input mode and an output mode. The user pursues a variety of user intents when interacting with the smartphone. One class of user intent involves the UE being in output mode. In this mode of operation, the UE's UI may offer the user the option to read email, read news, read posts from various social networking sites, browse the internet, read a list of bank transactions, receive calls, messages, and notifications, and other activities that involves the user receiving and consuming information. This mode of operation may seem familiar because current smartphones' UIs are largely focused on this class of intent, which herein is called output mode.

When the user activates the smartphone's screen, the smartphone often shows notifications on the lock screen, which fundamentally involves incoming information. This output mode is not restricted to only an operating system (OS), but many application software also often operate in output mode. For example, when the user opens an email application software, the application software directs the user to an inbox that displays incoming emails. Assume the user's first intent is to send an email to a colleague using their smartphone. As the user activates the smartphone's screen, the smartphone's OS displays various notifications, as illustrated in Jane's example in Figure 1. After the user either reads or ignores some or all of the OS's notifications, they open the email application software. The email application software directs the user to the inbox. At this stage, the user reads or ignores some or all incoming emails. Then, the user clicks "New Email" or "Create Email" to start typing the email they intend to send. As described in this widely-practiced example of how the user may use the smartphone, both the OS and the application software ignore the user intent, which is to input information. Differently said, the OS and the

application software display the UI in output mode and not in input mode. The OS and the various application software bias the user experience towards receiving information rather than sending information. Such UI output mode bias may distract the user before they can carry out the task at hand. This may create a stressful and unsatisfactory user experience and may force the user to spend more time with the UE than they intend to spend.

In addition, many OSs and application software are increasingly sophisticated, offering the user with an array of tools to carry out various tasks. As the OSs and the application software integrate more functions, the ease of use may suffer due to the complexity and the sheer number of tabbed document interfaces (TDIs or tabs), toolbars, and other UI features. OS and application software developers are aware of the inherent drawbacks that an increased number of features may cause, such as degrading the user experience. Therefore, they try to organize the OS and application software UIs to increase the intuitiveness of use. Nevertheless, the user still faces challenges trying to navigate these UIs. After all, the user may want to spend their energy accomplishing the task at hand, such as writing and sending an email. Instead, the user spends a considerable amount of time managing incoming notifications, deciphering where the application software's features-of-interest are located, figuring out how to best-use these application software features, and strategizing how to increase productivity and lessen the time spent in front of the UE's screen display.

The UE's OM, however, may be valuable at times. The user may want to read notifications, read posts on social networking sites, read emails, catch up on news, read bank statements, and perform other activities that fundamentally involve the user receiving information. To enhance the user experience, it is desirable that the OS and the supported application software display the UE's UI in either in input mode or in output mode.

The UI in input mode silences and hides some or all calls, texts, and notifications from the OS and various application software, unless the user specifically requests them, such as by tapping on a specific UI element. In addition, the UI in input mode creates shortcuts to certain OS and application software elements, such as make a call, "New Email" or "Create Email" in an email application software, "Buy Again" in a retailer's site, "Post Something" on a social networking site, "Pay a Bill" in an online banking application software, or any other shortcuts or deep links that enables the user to instruct the OS and various application software to perform a user-initiated task. Figure 2 helps explain how the UI may differ in output mode versus in input mode.
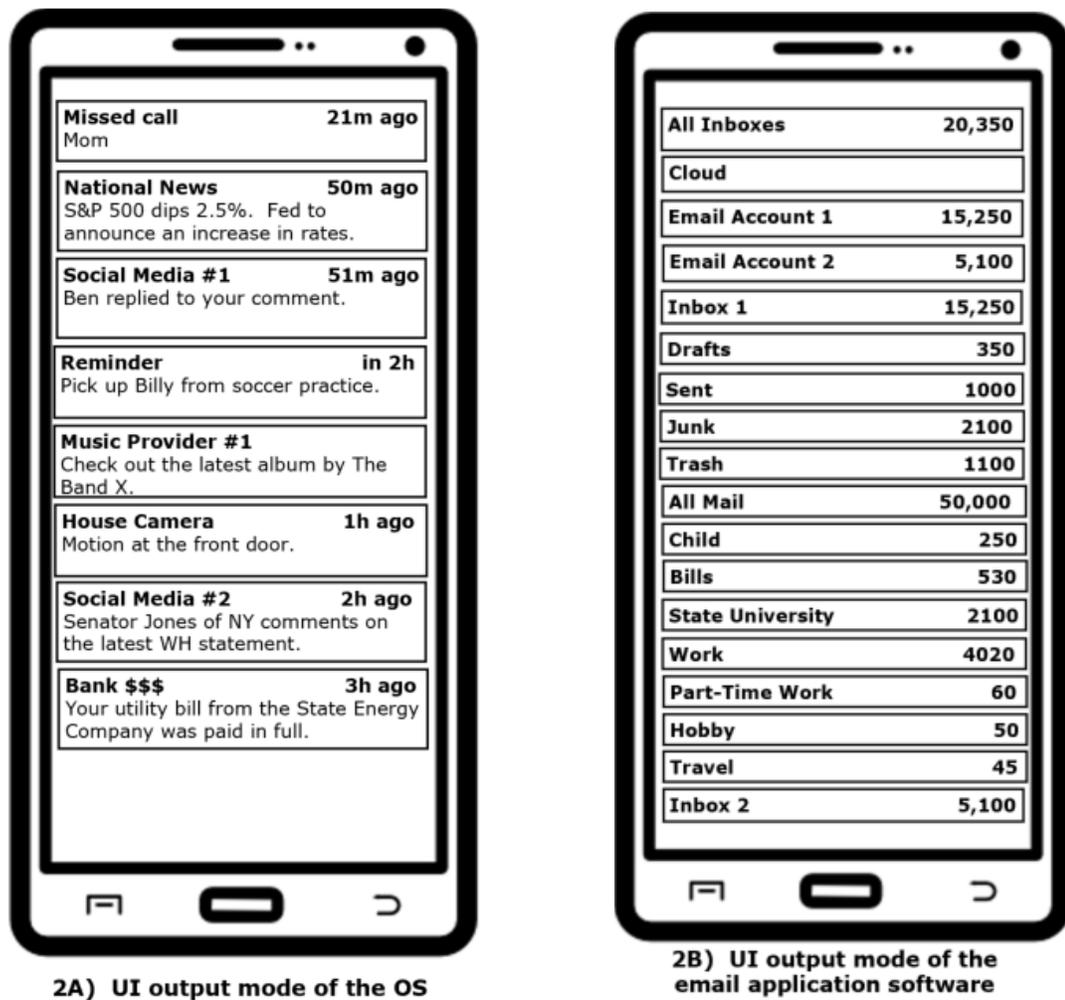

2A) UI output mode of the OS

2B) UI output mode of the email application software

2C) UI input mode of the OS

2D) UI input mode of the
email application software

Figure 2

Assume Jane wants to send a work-related email to her colleague, John. Figure 2A and

Figure 2B demonstrate the UI in output mode as Jane attempts to write and send an email to John.

Figure 2A shows Jane activating the smartphone's screen in output mode, same as in the example

in Figure 1. The UE's UI notifies Jane on bank transactions, various social media posts, news,

task reminders, notifications, and missed calls. The OS may distract Jane with these notifications.

Even if Jane has a strong work ethic, she still needs to dismiss these notifications. Then, Jane

opens the email application software, as shown in Figure 2B. In output mode, the email application

software displays a list of new or saved emails, which Jane does not need to see as she tries to

write and send an email to John. Jane needs to ignore these emails and needs to find the feature that allows her to write and send an email.

Figure 2C and Figure 2D show Jane's experience as she tries to send an email to John by activating the smartphone in input mode. Figure 2C shows Jane activating the smartphone's screen in input mode. The smartphone does not show any notifications. The smartphone simply shows icons of various application software and OS features. Differently said, the smartphone's UI does not distract Jane from carrying out the task at hand. Then, Jane opens the email application software, as shown in Figure 2D. In input mode, the email application software automatically opens the "New Email" feature. The email application software does not distract Jane by showing her a list of saved or new emails. In addition, Jane does not need to find where the "New Email" feature is located. She simply starts typing her email to John.

The user may not expect all application software to have a UI in input mode or in output mode because some application software may be inherently input mode only or output mode only. For example, when the user opens an application software of a newspaper, such as *The Washington Post*, *Süddeutsche Zeitung*, *The Sun*, *Corriere Della Sera*, and so forth, they do not intend to publish news, but read news. In input mode, the application software may not display any notifications on breaking news or may only display certain features of the application software, such as a blog, letter to the editor, or other application software features where the user input may be needed. Also, in input mode the UE's UI may not display at all application software that are inherently output mode only. Specific application programming interfaces (APIs) decide what features of the UE's UI are presented to the user when they use the UE in input mode. The OS developer may negotiate with application software developers what application software features may be presented to the user when they use the UE in input mode. In addition, the OS developer

may supply a set of templates or some guidelines to the application software developers to aid them to not ignore the input mode. Furthermore, the OS developer may offer the user a choice to help determine the user's preferences on how the UE may function in input mode.

The user may use various techniques to instruct the UE whether the UI needs to be in input mode or in output mode. The UE may incorporate two "activate" or "power" buttons, one for input mode and another for output mode. The UE may also use one button, which may activate the phone in different modes, such as single press for input mode and double press for output mode, or one second hold for input mode and two, three, four and so forth seconds hold for output mode. In addition, the UE's OS may offer the user the ability to instruct the UE on the mode of operation by using a voice activating feature. The user may instruct the UE by saying phrases, such as "Hey OS, operate in input mode," "Hey OS, operate in output mode," "Input mode," "Output mode," or other well-defined phrases. The UE may also incorporate a radar-based sensor array (*e.g.*, radar transceivers) or an optical-based sensor array (*e.g.*, cameras). Therefore, the user may instruct the UE on the mode of operation by using gestures, such as a hand wave, a nod, and other well-defined gestures that help the UE disambiguate the user intent. Another possibility may be for the UI to be in input mode by default. In that case, the user needs to take an extra step to change the UI to output mode. The user may also set his or her UE in input mode during certain times, such as during work hours, dinner time, religious activities, rest time, and other times that the user decides to use their UE in input mode only.

In summary, a UE that offers the user a UI in input mode or in output mode can help the user regain control of their user experience with the UE and can help the user better-manage their amount of time in front of the UE's screen display.

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