October 12, 2017

Coordinated Smart Alarm

COORDINATED SMART ALARM

Introduction

The present disclosure provides systems and methods that coordinate sleep monitor devices worn to monitor sleep quality and determine the most effective sleep phase to wake a user. The systems and methods of the present disclosure can allow sleeping partners to wake at a mutually optimal time for each. In particular, existing sleep monitors solely account for the wearer of the sleep monitor and although a vibration, sounds, or other waking mechanism can be intended to only wake such wearer, often a sleeping partner is woken as the wearer of the sleep monitor wakes and moves about. Thus, if both partners wear sleep monitor devices typically only one will receive the benefit of the smart alarm.

Summary

The present disclosure proposes to solve the challenges described above by describing sleep monitor devices that can coordinate to allow two or more users to wake when such users are in overlapping ideal sleep states. In this manner, such users are provided with the benefit of the sleep monitor device.

In particular, a monitoring device (e.g., a wrist worn health tracker) can be associated with a user interface which allows a user to enter a a desired time range for waking and the device can store the time range for later use. The monitoring device can also be capable of communicating with one or more other monitoring devices. For example, a first monitoring device worn by a user can be in communication with a second monitoring device worn by a different user.

In one aspect of the present disclosure, two or more users can enter an agreed upon time range for waking (e.g., between 7 A.M. to 8 A.M.). More particularly, first and second

monitoring devices can allow first and second associated users, respectively, to enter a time range for waking. One or more of the users can enter an agreed upon time range via a user interface. The devices can then store the entered time range either locally or remotely and begin monitoring each user's sleep patterns, respectively. For example, a first device can monitor a first user's sleep patterns, while a second device monitors a second user's sleep patterns.

Each respective device initiates a smart alarm during the predetermined time range once every associated user enters a desired sleep state or the time range expires, whichever comes first. In some embodiments of the present disclosure, each monitoring device notifies the one or more other monitoring devices when an associated user is in an ideal sleep mode. The plurality of devices each initiate a smart alarm when every device has provided notification that associated users have entered an ideal sleep mode. If the plurality of users' desired sleep modes do not overlap before the time range expires, the plurality of devices initiate a smart alarm to wake each of the users when the time range expires.

Additionally, the plurality of devices can monitor each user's sleep patterns. Over time, patterns observed for each user can be applied to maximize the likelihood that associated users are in a particular sleep state (e.g., light sleep) at the same time. In some embodiments of the present disclosure, each device can suggest an optimal wake range time based on such sleep patterns.

Detailed Description

Figure 1 depicts an example monitoring system **100**. A wearable monitoring device **102** is strapped to a user's wrist **116** by a band **104**. In an illustrative example, the device **102** can be a watch, but in other implementations the device can be any other suitable device.

The monitoring device **102** can include a user interface produced by a computing system which permits a user to interact with the monitoring device **102**. In some implementations, the user interface can include one or more graphical components such as, for example, windows, icons, menus, and/or pointing devices that allow a user to interact with the device. The user interface can display an environment where interaction with the environment can be through use of an input device. For example, the monitoring device **102** can contain a plurality of input devices **108** (e.g., knobs located in the side of the device housing). Additionally or alternatively, the monitoring device **102** can track user input provided to a display component (e.g., a display screen). For example, as a user moves the user's finger across a display screen **114** a user interface **118** of the monitoring device **102** can capture input.

The monitoring device **102** can include a display screen **114** that, in some implementations, can be a touch screen. The display screen **114** can allow a user to interact with the user interface **118** by translating user input into corresponding user interface actions. For example, a dragging action (e.g., with a finger, stylus, etc.) across the display screen **114** can cause a pointing device to mimic such movement. Similarly, tapping the display screen **114** can cause a right-click or other action to occur at the location of the tap.

The display screen **114** can be a resistive panel. In other implementations, the display screen **114** can be a capacitive screen. Other implementations can use surface acoustic wave technology or other touch screen technology.

In some implementations, the display screen **114** can be surrounded by a bezel **112**. For example, the bezel can rotate 360 degrees in a clockwise or counterclockwise direction. Both the bezel **112** and the display screen **114** can be supported by a frame **106**, which can be connected to a user attachment mechanism **104** (e.g., band, clasp, etc.). In addition to allowing a user to attach the device **102** to the user's body, in some implementations the user attachment mechanism **104** may include one or more sensors.

The device **102** can also include a crown **110** that can be attached to the frame **106**. The crown **110** can allow the user to adjust the display of the monitoring device **102**. For example, a user can utilize the crown to toggle the monitoring device interface between different user interfaces.

In some implementations, the crown **110** can extend out from the monitoring device **102** and swivel about its axis (e.g., when it has been pulled out from the monitoring device **102** body, much like pulling a stem out in order to switch from a winding mode to a time setting mode on a traditional analog mechanical watch). Sensors at the base of the crown **110** can be positioned to sense motion of the crown **110** in various directions. Manipulating the crown **110** can allow the user to control the user interface **118**. For example, a user can extend the crown **110** and twist it to move between different user interfaces. In some implementations, the crown **110** can allow a user to control a user interface's pointing device.

The input devices of monitoring device **102** allow the monitoring device to track user sleep phases. For example, using sensors in the user attachment mechanism **104** or otherwise associated with the monitoring device **102**, the monitoring device **102** can determine whether the wearer is in light, deep, disturbed or sound sleep modes. For example, the sensors can be configured to recognize certain characteristics of the user (e.g., user bodily motion can be measured to indicate certain sleep modes).

In some embodiments, the monitoring device **102** is capable of storing this information. The monitoring device **102** can send this information to a plurality of other monitoring devices

102. The monitoring device **102** can also receive such information from a plurality of other monitoring devices **102.**

FIG. 2 is a flow chart illustrating a process **200** for waking users during a predetermined time range, in accordance with one aspect of the disclosure. Although the operations in process **200** are shown and described in a particular order, certain operations can be performed in different orders or at the same time. The process begins at operation **202** where a monitoring device **102** identifies a time range to wake the users.

In some implementations, the time range is decided by the users; each user agrees to a time range for waking and inputs the agreed upon time into their respective devices. For example, each user could agree upon a time ranging from 7 A.M. to 8 A.M. and input such time range into the monitoring device **102**. The monitoring device **102** receives the time range for waking and can store the range in memory. In some embodiments, the user can enter a time range in the monitoring device **102**. In other embodiments, the monitoring device **102** can receive a desired time range from another monitoring device.

Additionally or alternatively, the monitoring device **102** can log observations of user sleep patterns over time to give the user suggestions to maximize the likelihood that users achieve overlapping ideal sleep states. Suggestions can include but are not limited to an optimal wake range time. The monitoring device **102** can prompt the user to set the optimal wake range time as a default time range for the user to wake. In some embodiments, the monitoring device can perform steps 206-212, without an identified time range. For example, monitoring devices can monitor sleep modes and wake users at an optimal time determined by the monitoring device.

At step **204**, the monitoring device tracks the time to identify if a predetermined time range has started. If the predetermined time range has started (e.g., at 7 A.M.) the monitoring device **102** begins to analyze the user's individual sleep modes at step **206**. The monitoring device **102** is able to track sleep quality by assessing whether the user enters light, deep, disturbed or sound sleep mode. A plurality of monitoring devices can then communicate to each other the current sleep mode of each user.

The monitoring devices will continue to monitor the users' individual sleep modes until all users enter an overlapping ideal state, at **208**, or the time range expires, at **210,** (e.g., at 8 A.M.). At step **208**, a plurality of monitoring devices can determine when/if all users' ideal sleeping states overlap. For example, each device can update the plurality of monitoring devices each time its respective user's sleeping state changes or when an ideal sleeping state is determined to exist.

If the monitoring devices determine that all users have entered overlapping ideal sleep states, at **208**, the plurality of monitoring devices can wake all users, at **212**. Likewise, if the time range expires, at **210**, the plurality of monitoring devices can wake all users, at **212**. The monitoring devices wake all users at the earliest occurrence of the two events **208** or **210**. For instance, if the users' ideal sleeping states overlap before the time range expires, the monitoring devices will wake all users when it is determined that their ideal sleeping states are overlapping. On the other hand, if the users' ideal sleeping states fail to overlap before the time range expires, the monitoring devices will wait to wake the users until the time range expires.

The monitoring devices can wake the users, at **212**, using any type of alarm mechanism. For instance, a monitoring device **102** can begin to vibrate while attached to the wearer. Alternatively, a monitoring device **102** can output a sound, light up or any combination of the above. In some embodiments, the user can set a preferred method of waking. In other embodiments, a preferred method of waking can be a preset default. In this way, the monitoring devices of the present disclosure can implement a smart alarm system to wake a plurality of users while at overlapping ideal sleep states.

Figures

Figure 1

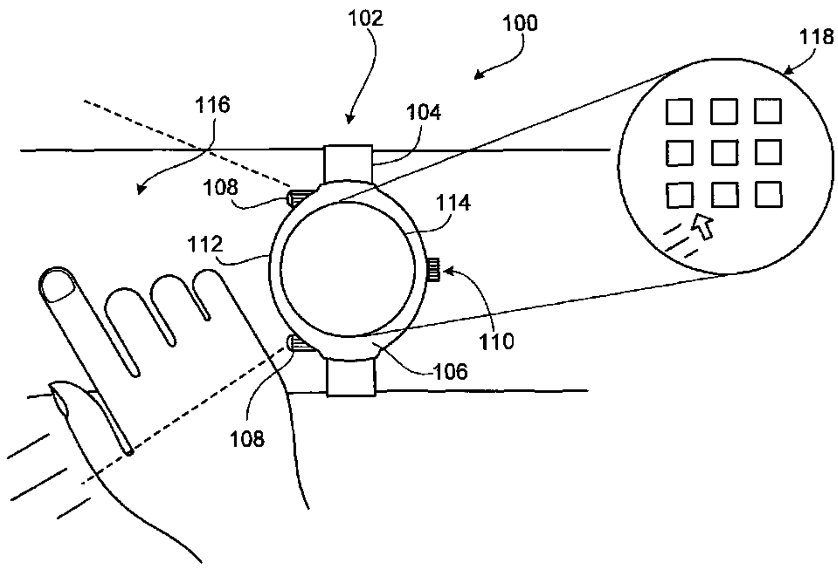
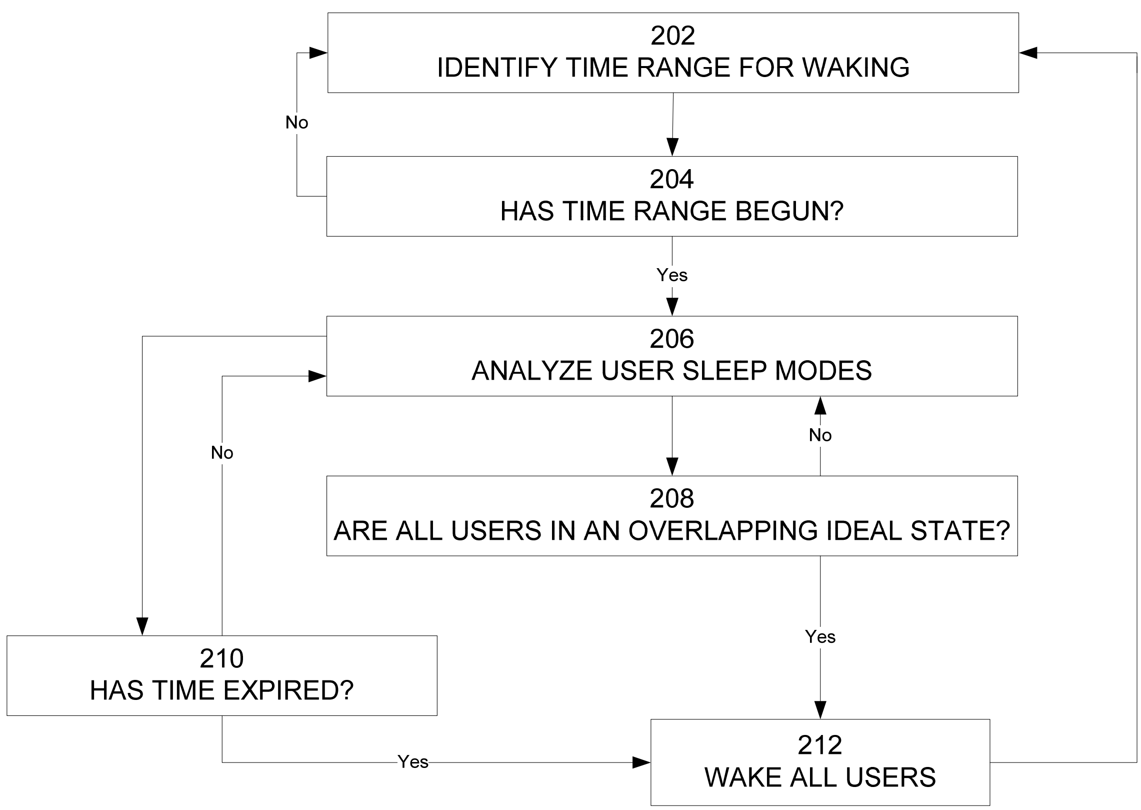


Figure 2



Abstract

The present disclosure provides systems and methods that coordinate sleep monitor devices worn to monitor sleep quality and determine the most effective sleep phase to wake a user. The systems and methods of the present disclosure can allow sleeping partners to wake at a mutually optimal time for each. In particular, existing sleep monitors solely account for the wearer of the sleep monitor and although a vibration, sounds, or other waking mechanism can be intended to only wake such wearer, often a sleeping partner is woken as the wearer of the sleep monitor wakes and moves about. Thus, if both partners wear sleep monitor devices typically only one will receive the benefit of the smart alarm. Keywords associated with the present disclosure include: sleep; wearable device; monitoring device; smart alarm; sleep phase; sleep mode.