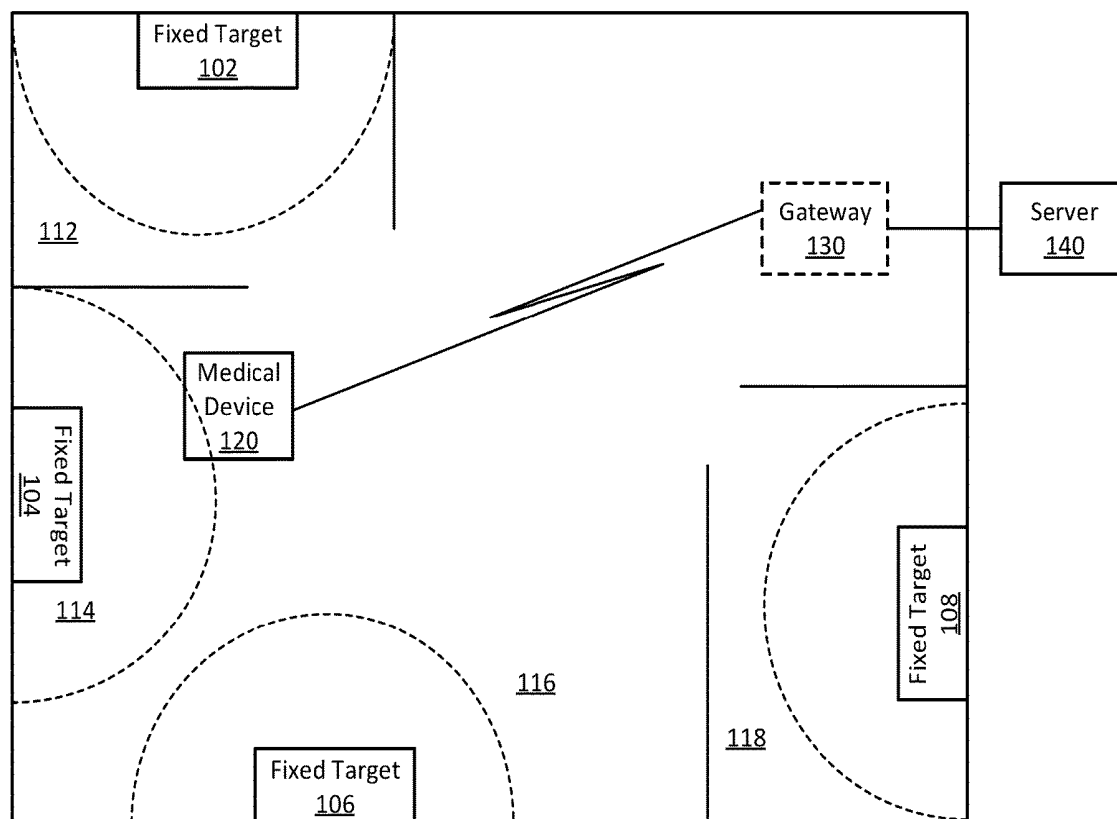(19) **United States**

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(54) **SYSTEMS AND METHODS FOR ADJUSTING MEDICAL DEVICE BEHAVIOR**

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(57) **ABSTRACT**

System and methods are disclosed for adjusting behavior of a medical device. An exemplary method includes monitoring physiological data of a patient and determining whether the medical device is stationary or in motion based on detection by a proximity sensor or a motion sensor. The method further includes displaying the monitored physiological data in a first display mode in response to determining that the medical device is stationary and displaying the monitored physiological data in a second display mode in response to determining that the medical device is in motion. The second display mode is simplified comparing to the first display mode.
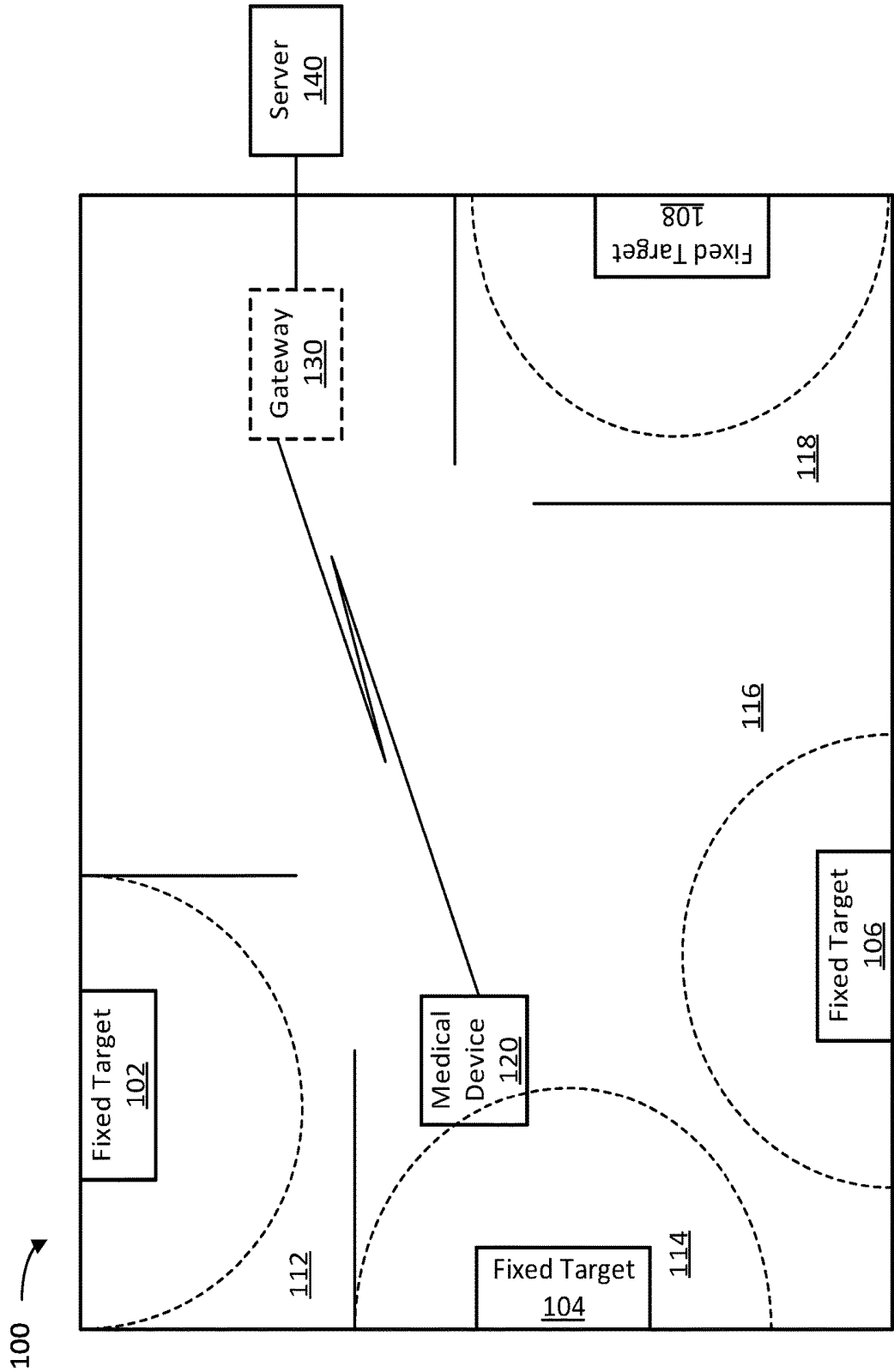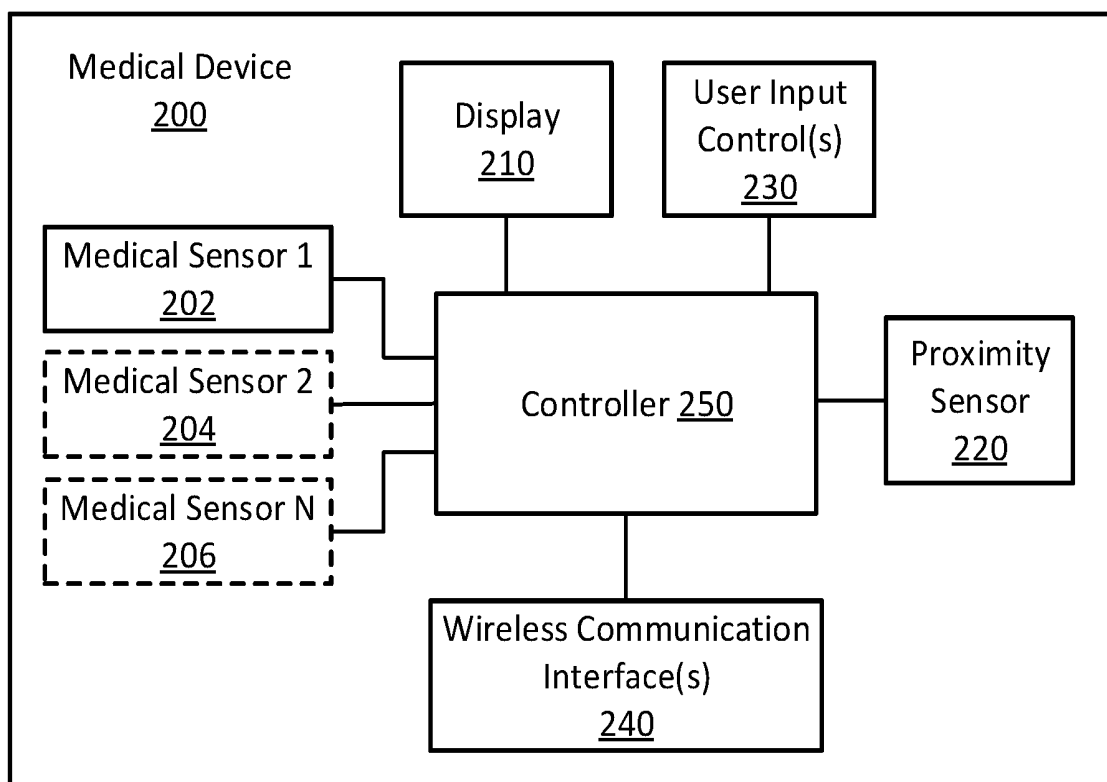
100

Fixed Target 102

112

Gateway 130

Server 140

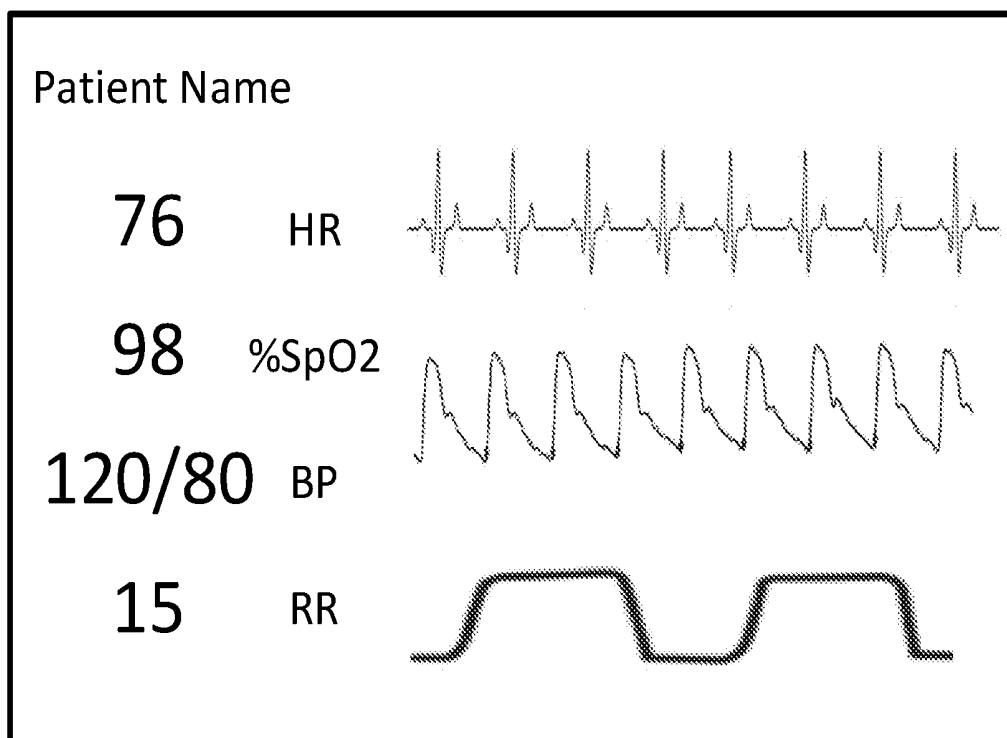Medical Device 120

Fixed Target 104

114

116

Fixed Target 108

118

Fixed Target 106

FIG. 1

FIG. 2

FIG. 4

Patient Name

76   HR

98   %SpO2

120/80   BP

15   RR

FIG. 3A

Patient Name

76   HR

98   %SpO2

120/80   BP

15   RR

FIG. 3B

Medical Device
500

Display
510

User Input
Control(s)
530

Medical Sensor 1
502

Medical Sensor 2
504

Medical Sensor N
506

Controller 550

Motion
Sensor
520

Wireless Communication
Interface(s)
540

FIG. 5

600

602
Receive motion sensor signal

604
Is the medical
device in motion?

Yes

No

606
First display mode/
First alarm mode

608
Second display mode/
Second alarm mode
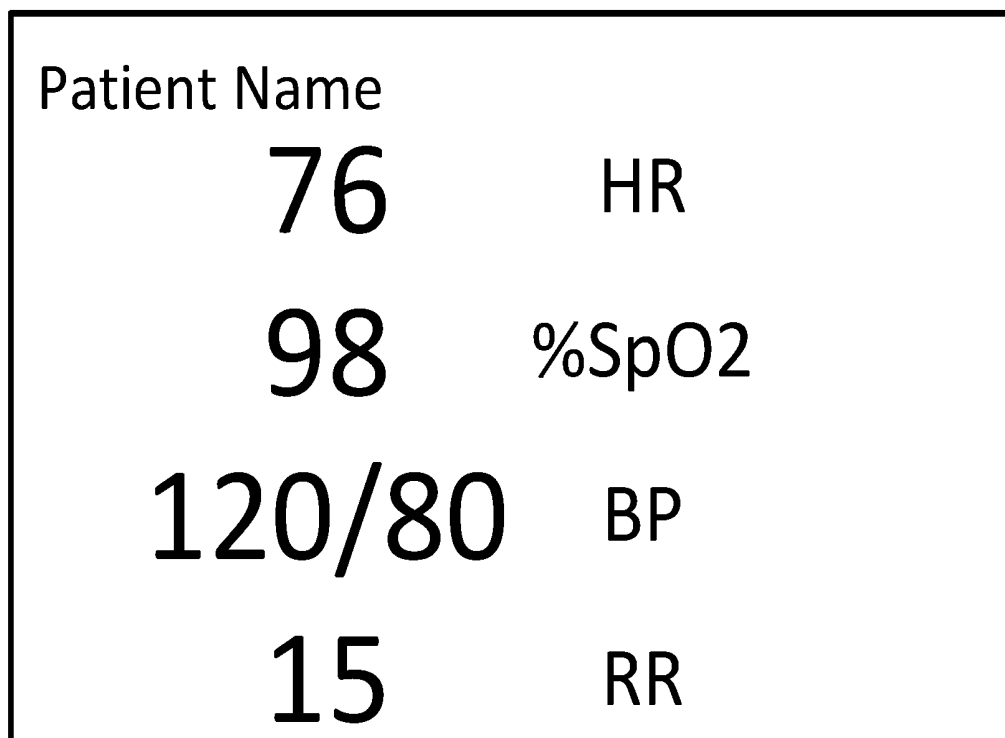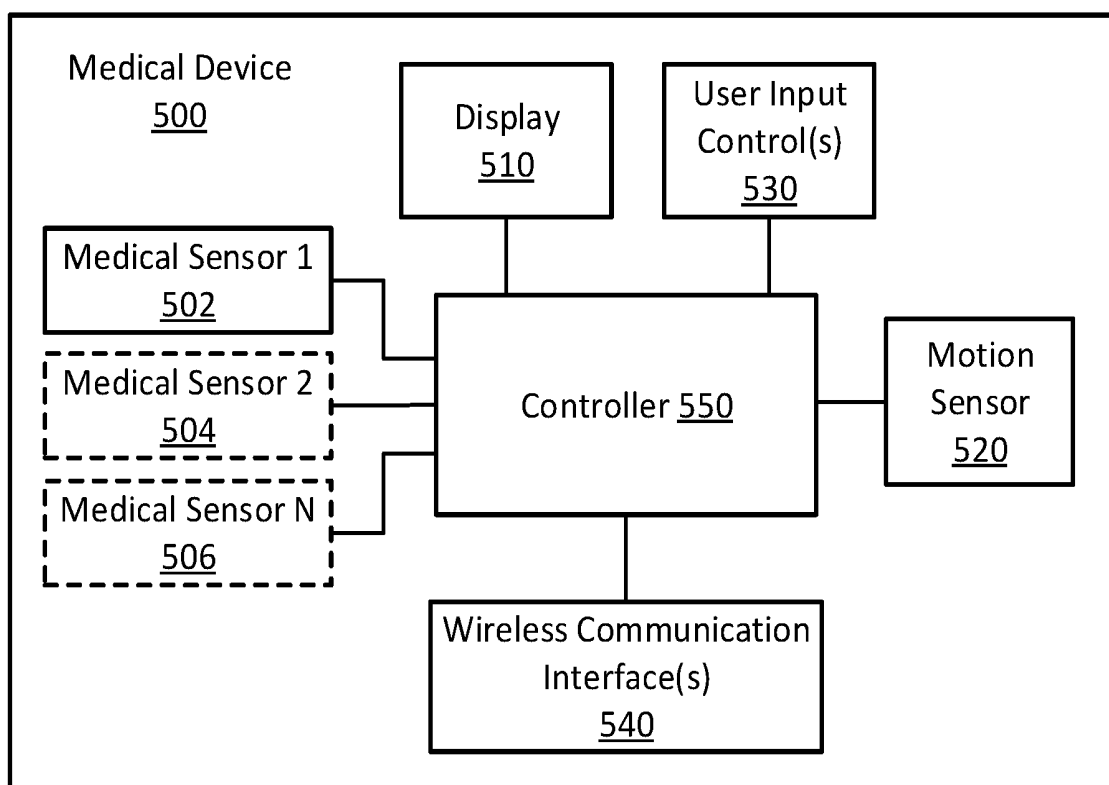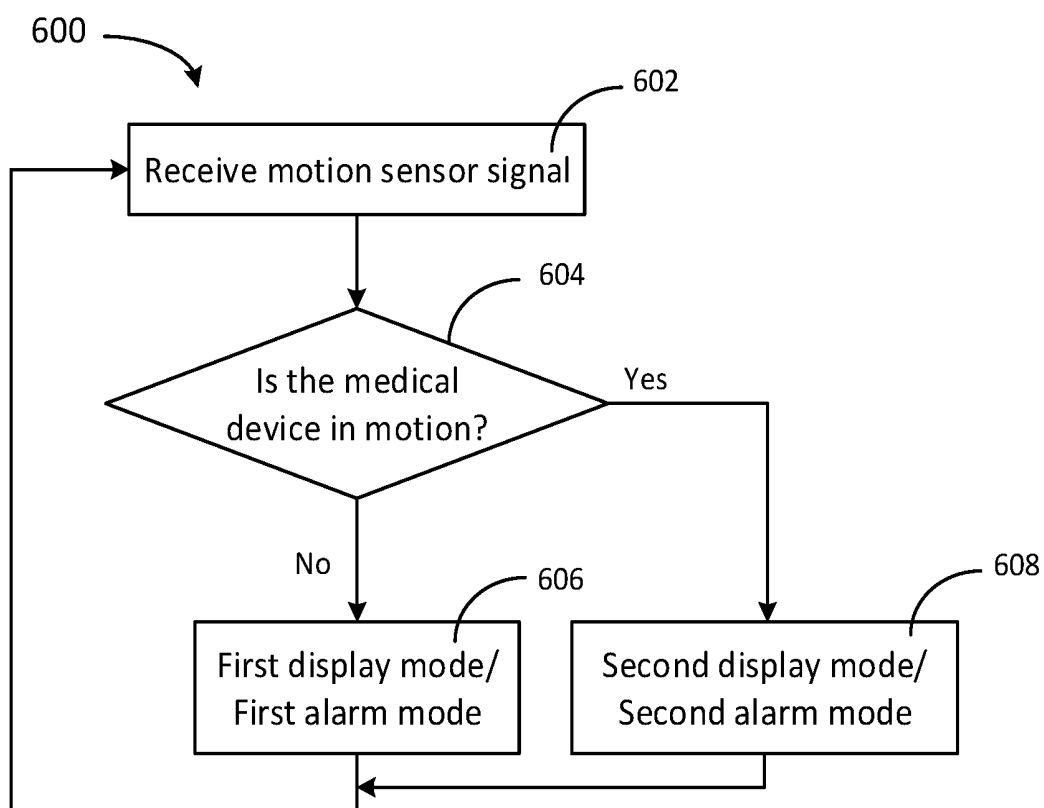
FIG. 6

SYSTEMS AND METHODS FOR ADJUSTING MEDICAL DEVICE BEHAVIOR

TECHNICAL FIELD

[0001] This disclosure relates to systems and methods for adjusting behavior of medical devices, more specifically, wireless patient monitors, based on motion.

BACKGROUND

[0002] Wireless patient monitors are widely used in care delivery areas such as patient monitoring, fetal monitoring, and rehabilitation services. Physiological conditions of patients or fetuses, such as electrocardiogram (ECG), blood pressure, temperature, heart rate, oxygen saturation, etc., can be monitored and transmitted by the wireless patient monitor to a remote processing system. During a typical wirelessly monitored patient stay, the acuity level of the patient may vary which necessitates the patient to move from one care area to another care area. For example, a patient may enter an emergency department, be taken back to an imaging department, moved to a surgery preparation area, then into the operating room, transferred to a step-down unit, and then ultimately discharged. When the patient is transported, the medical devices used for monitoring the patient's health go along with the patient. The medical devices can move around, be jostled, or bounce a little as the patient bed is moved by a clinician.

[0003] When the patient is stationary, the clinician generally has more time to review the monitored physiological data that is present on a display of the monitoring device, such as waveforms, trends, historical data, and so on. On the other hand, during transport of the patient, the motion makes it hard for the clinician to read smaller fonts, numbers, and physiological waveforms. Furthermore, at a patient transport corridor, wireless connectivity is not always adequate so the monitoring device may raise additional technical alarms for poor connectivity. These alarms could be a nuisance to clinicians remotely monitoring the patient as they are likely already aware the patient is in transport from one ward to another.

SUMMARY

[0004] In one embodiment, the present disclosure provides a medical device for monitoring a patient. The medical device comprises a display configured to display monitored physiological data of the patient, a proximity sensor configured to detect proximity of the medical device to one or more targets positioned in a healthcare environment, and a controller communicably connected to the display and the proximity sensor. This controller is configured to determine whether the medical device is stationary or in motion based on detection by the proximity sensor, make the display present the monitored physiological data in a first display mode in response to determining that the medical device is stationary, and make the display present the monitored physiological data in a second display mode in response to determining that the medical device is in motion. The second display mode is different from the first display mode.

[0005] In another embodiment, the present disclosure provides a wireless patient monitor, which comprises one or more medical sensors configured to monitor physiological data of a patient, a display configured to display the monitored physiological data of the patient, a wireless commu-nication interface configured to transmit the monitored physiological data to a remote server, a motion sensor configured to detect motion status of the wireless patient monitor, and a controller communicably connected to the one or more medical sensors, display, wireless communication interface, and motion sensor. The controller is configured to determine whether the wireless patient monitor is stationary or in motion based on detection by the motion sensor, make the display present the monitored physiological data in a first display mode in response to determining that the wireless patient monitor is stationary, and make the display present the monitored physiological data in a second display mode in response to determining that the wireless patient monitor is in motion. The second display mode is different from the first display mode.

[0006] In yet another embodiment, the present disclosure provides a method for adjusting behavior of a medical device. The method comprises monitoring physiological data of a patient, determining whether the medical device is stationary or in motion based on detection by a sensor, displaying the monitored physiological data in a first display mode in response to determining that the medical device is stationary, and displaying the monitored physiological data in a second display mode in response to determining that the medical device is in motion. The second display mode is different from the first display mode.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Various aspects of this disclosure may be better understood upon reading the following detailed description and upon reference to the drawings in which:

[0008] FIG. 1 is a schematic diagram of a healthcare environment in which a medical device operates, in accordance with an exemplary embodiment;

[0009] FIG. 2 is a block diagram of a medical device which can be used in FIG. 1, in accordance with an exemplary embodiment;

[0010] FIG. 3A shows a first display mode of a medical device, in accordance with an exemplary embodiment;

[0011] FIG. 3B shows a second display mode of the medical device, in accordance with an exemplary embodiment;

[0012] FIG. 4 is a flow chart of a method for adjusting medical device behavior, in accordance with an exemplary embodiment;

[0013] FIG. 5 is a block diagram of a medical device which can be used in FIG. 1, in accordance with another exemplary embodiment; and

[0014] FIG. 6 is a flow chart of a method for adjusting medical device behavior, in accordance with another exemplary embodiment.

[0015] The drawings illustrate specific aspects of the described systems and methods for adjusting medical device behavior. Together with the following description, the draw-ings demonstrate and explain the principles of the structures, methods, and principles described herein. In the drawings, the size of components may be exaggerated or otherwise modified for clarity. Well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the described components, systems and methods.

DETAILED DESCRIPTION

[0016] One or more specific embodiments of the present disclosure are described below in order to provide a thorough understanding. These described embodiments are only examples of systems and methods for adjusting medical device behavior. The skilled artisan will understand that specific details described in the embodiments can be modified when being placed into practice without deviating the spirit of the present disclosure.

[0017] When introducing elements of various embodiments of the present disclosure, the articles "a," "an," and "the" are intended to mean that there are one or more of the elements. The terms "first," "second," and the like, do not denote any order, quantity, or importance, but rather are used to distinguish one element from another. The terms "comprising," "including," and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. As the terms "connected to," "coupled to," etc. are used herein, one object (e.g., a material, element, structure, member, etc.) can be connected to or coupled to another object regardless of whether the one object is directly connected or coupled to the other object or whether there are one or more intervening objects between the one object and the other object. In addition, it should be understood that references to "one embodiment" or "an embodiment" of the present disclosure are not intended to be interpreted as excluding the existence of additional embodiments that also incorporate the recited features.

[0018] Referring to the figures generally, the present disclosure is to provide systems and methods for adjusting behavior of a medical device, and more specifically, a wireless patient monitor. An exemplary method detects automatically whether the medical device is in motion (e.g., goes along with a patient in transport) or stationary via proximity-based or motion-based technology. If the medical device is in motion, the monitored physiological data of the patient displayed at the medical device is simplified comparing to the displayed information in stationary. For example, the medical device may display waveforms (e.g., ECG waveform, respiration waveform), trends, historical data in detail in the stationary state while display only numerical values of important parameters (e.g., heart rate, blood oxygenation, respiration rate) in large font in the mobile state. This becomes particularly valuable for devices with small displays. In addition, if the medical device is in motion, technical alarms regarding poor wireless connectivity are delayed and/or suppressed.

[0019] Technical solutions disclosed herein can increase the usability of medical devices during patient transport and reduce technical alarms associated with poor wireless network connectivity typically raised during patient transport. When the patient is being transported from one care area to another, detailed view is not always needed or necessary. By detecting the mobile state, the medical device can change physiological data display to be more readable by the clinician. Simply displaying numerical values of critical parameters instead of detailed information, especially on medical devices with small displays (e.g., bedside monitors), would be enough for the clinician to ensure the patient is stable during transport. In addition, by detecting the mobile state, the medical device can reduce the numbers of or delay the time to raise technical alarms associated with poor wireless network connectivity which is often observed in, for example, patient transport corridors.

[0020] Referring to FIG. 1, a schematic diagram of a healthcare environment 100 (e.g., a hospital, clinic, doctor's office, etc.) in which a medical device 120 operates is shown, in accordance with an exemplary embodiment. The healthcare environment 100 includes various areas 112, 114, 116, and 118 defined by walls and/or functions. For example, the area 112 is an operating room, area 118 is a recovery room, and areas 114 and 116 are corridors connecting 112 and 118.

[0021] One or more fixed targets are positioned (e.g., affixed to a wall and/or other structure) in one or more areas 112-118 of the environment 100. As shown in FIG. 1, for example, a fixed target 102 is positioned in area 112, fixed target 104 in area 114, fixed target 106 in area 116, and fixed target 108 in area 118. Each of the fixed targets 102-108 communicates or broadcasts beacon signals for a covered range (e.g., ranges shown with dashed lines in FIG. 1), using near field communication (NFC), radio frequency identification (RFID), Bluetooth, iBeacon, or the like. The medical device 120 includes a proximity sensor (e.g., RFID reader, Bluetooth radio) configured to detect the beacon signals transmitted from the targets, which will be described in detail below with reference to FIG. 2. In operation, each of the fixed targets 102-108 may continually or periodically (e.g., every second, 2 seconds, 3 seconds, etc.) communicate or broadcast beacon signals. The medical device 120 may continually or periodically look for beacon signals from the targets. When the medical device 120 is within the covered range of a fixed target, the medical device 120 detects the beacon signals regarding the respective target. As shown in FIG. 1, medical device 120 can detect the fixed target 104 when moving into the ranged covered by the fixed target 104.

[0022] In some embodiments, a beacon signal from a fixed target includes target identifying information which may be a unique identifier of the respective fixed target, such as a MAC address, serial number, alphanumeric signature, etc. The beacon signal may include additional or alternative information, such as a time stamp (e.g., Jul. 18, 2018, 9:10:04 am), signal strength level, frequency channel, and so on.

[0023] It should be noted that any proximity-based sensor technology can be utilized herein, such as NFC, RFID, Bluetooth, iBeacon, and so on. Proximity-based technology relies on a sensor being able to detect a target ranging from as close as few millimeters (mm) to over several meters (m) of separation. Moreover, various proximity-based technologies may be employed in a single implementation of the medical device 120. In other words, this disclosure is not limited to a particular proximity-based technology as certain physiological measurements and subsequent device actions may desire different ranges of detection (e.g., a patient in transport passing through a RFID checkpoint between wards or passing by multiple Bluetooth beacons).

[0024] In some embodiments, the medical device 120 is a wireless patient monitor that communicates with a remote server 140 through wireless communication links (e.g., antennas, access points). In some embodiments, communication with the server 140 can be routed through a gateway 130 and/or other edge device. The server 140 may process the information (e.g., monitored physiological data, wireless connectivity, motion status, etc.) received from the medical device 120 or send the information to a central station (not shown in the present figures) for processing/viewing via, for example, a dedicated network interface (e.g., dedicated

Ethernet). The wireless communication link may employ various wireless communication protocols used with antennas, access point, or similar infrastructure, such as Bluetooth, Bluetooth Low Energy (BLE), ZigBee, Wi-Fi, infrared, ultrasound, and so on.

[0025] At the server **140** or central station, monitored physiological data for multiple patients may be displayed simultaneously. In addition, the server **140** or central station may generate various types of alarms based on data received from the medical device **120**. For example, patient physiological alarms are triggered if alarm limits for the respective physiological parameter are exceeded, or certain data patterns are detected. Technical alarms can be generated if network connectivity is poor. In some embodiments, alarms include audible noises and/or flashing lights at the medical device **120**. In some embodiments, the server **140** or central station generates alarm notifications for sending to mobile devices (e.g., pagers, PDAs, mobile phones) of caregivers via, for example, an alert or alarm notification system (e.g., ASCOM alarm notification system).

[0026] It should be understood that the configuration as shown in FIG. **1** is for illustration not for limitation. Any appropriate changes to, for example, fixed targets configuration, network configuration, etc., can be made. For example, in alternative embodiments, the medical device **120** may include a wireless tag (i.e., as the proximity sensor) that communicates or broadcasts beacon signals while the one or more fixed targets positioned in the environment **100** look for the beacon signals. When the medical device **120** is within the range covered by a fixed target, the respective target may detect the beacon signals from the medical device **120** and send an acknowledgement message to the medical device **120**. Upon receiving the acknowledgement message, the medical device **120** is notified of the proximity to the respective fixed target.

[0027] Referring to FIG. **2**, a block diagram of a medical device **200** which can be used in FIG. **1** (i.e., corresponds to medical device **120** in FIG. **1**) is shown, in accordance with an exemplary embodiment. In some embodiments, the medical device **200** is a bedside wireless patient monitor, which moves along with a patient bed and monitors one or more physiological parameters for the patient. The medical device **200** may include one or more medical sensors **202**, **204**, and **206**, including, for example, ECG electrodes for sensing ECG, scalp electrodes for sensing electroencephalograph (EEG), a blood pressure cuff for sensing non-invasive blood pressure (NIBP), a fingertip pulse oximetry sensor for sensing peripheral oxygen saturation (SpO2), a temperature sensor for sensing patient temperature, and so on. Each of the medical sensors **202-206** measures one or more physiological parameters from the patient and communicates measurement information to a controller **250**. In some embodiments, the medical sensors **202-206** are not part of the medical device **200** but independent devices. The medical device **200** includes interfaces (e.g., slots, wireless transceivers) for receiving measurement information from the medical sensors **202-206**.

[0028] The medical device **200** also includes a display **210** for displaying the physiological data of the patient monitored by the medical sensors **202-206**. In some embodiments, the display **210** includes a screen (e.g., touchscreen). The display **210** may be configured by the controller **250** to display the monitored physiological data in different modes. Referring to FIGS. **3A** and **3B**, two display modes are shown, in accordance with an exemplary embodiment. FIG. **3A** illustrates a first display mode which displays both numerical values and waveforms of the monitored physiological data (e.g., ECG, SpO2, blood pressure, respiration rate). FIG. **3B** illustrates a second display mode which is a simplified version of the first mode and displays only the numerical values of the monitored physiological data with larger fonts. It should be understood that the first and second display modes as shown in FIGS. **3A** and **3B** are for illustration, not for limitation. The controller **250** may configure the display **210** to present the monitored physiological data in any appropriate ways, such as including trends, historical data, charts, more, fewer, or different parameters with any appropriate color, font, style, etc.

[0029] Referring back to FIG. **2**, the medical device **200** further includes a proximity sensor **220** configured to detect beacon signals from the fixed targets **102-108** in the environment **100**, using any appropriate proximity-based sensor technologies, such as NFC, RFID, Bluetooth, iBeacon, and so on. As discussed above with reference to FIG. **1**, when the medical device **120** is within the predefined range of a fixed target, the target sensor **220** detects the beacon signals regarding the respective target and communicates the information to the controller **250**.

[0030] The medical device **200** includes one or more user input control(s) **250** which facilitates control of the medical device **200** by a user, such as activating/deactivating the medical device **200**, configurating the medical device **200**, etc. The user input control(s) **250** may include hardware (keyboard, button switch), software (interactive graphical user interface), middleware, or any appropriate combination thereof.

[0031] The one or more wireless communication interface(s) **240** of the medical device **200** facilitates the communication between the medical device **200** and a remote server (e.g., server **140** of FIG. **1**). The controller **250** may transmits monitored patient physiological data, detected target information, wireless connectivity, as well as other data to the server via the wireless communication interface(s) **240**, which may employ various wireless communication protocols used with antennas, access point, or similar infrastructure, such as Bluetooth, Bluetooth Low Energy (BLE), ZigBee, Wi-Fi, infrared, ultrasound, and so on.

[0032] The controller **250** controls operations for the medical device **200** including target detection, patient monitoring, data communication, timing, memory operation, etc. In some embodiments, the controller **250** includes a processor (e.g., a central processing unit (CPU)), memory, radio frequency (RF) core for radio communication, sensor control, peripheral control, and so on. The processor executes instructions stored in the memory to facilitate programming, testing, and/or operation of the medical device **200**. In some embodiments, the memory stores information of the fixed targets associated with the areas where they are positioned. For example, the memory may store a lookup table which associates the identifying information of the fixed target **102** with area **112** (operating room), fixed target **104** with area **114** (corridor), fixed target **106** with area **116** (corridor), and fixed target **108** with area **118** (recovery room). In some embodiments, the information of the fixed targets associated with the areas where they are positioned is not stored at medical device **200**, but at the remote server or central station. The medical device **200** communicates the received beacon signals to the server or central station, the server or

central station identifies the associated fixed target and communicates back to the medical device **200**.

[0033] Upon detecting proximity to a fixed target, the controller **250** determines whether the medical device **200** is stationary or in motion based on the respective fixed target. For example, if the beacon signal indicates that the medical device **200** is in a range covered by the fixed target **102** (or the fixed target **108**), the controller **250** may determine that the medical device **200** is stationary in the operating room (or the recovery room). If the beacon signal indicates that the medical device is in a range covered by the fixed target **104** (or the fixed target **106**), the controller **250** may determine that the medical device **200** is in motion, going along with the patient to pass the corridor(s). As another example, fixed targets are positioned at only the corridor(s) but not the rooms. The controller **250** may determine that the medical device is stationary if no beacon signal is detected and determine that the medical device is in motion upon detecting any beacon signal. It should be understood that the above approaches are described as non-limiting examples. Any appropriate methods can be used to determine the stationary or mobile status of the medical device **200** based on detection of proximity, such as using signal strength levels, real time location system (RTLS), etc.

[0034] The controller **250** may then configure the display **210** based on the stationary or mobile state of the medical device **200**. For example, the controller **250** may instruct the display **210** to present the monitored physiological data in the first mode (e.g., shown in FIG. **3A**) if the medical device **200** is determined to be stationary, or instruct the display **210** to present in the second mode (e.g., shown in FIG. **3B**) if the medical device **200** is determined to be in motion.

[0035] In addition, in some embodiments, the controller **250** may suppress or delay technical alarms regarding poor wireless connectivity in response to determining the medical device **200** is in motion. In other embodiments, the controller **250** may communicate to the server or central station that the medical device **200** is in motion and the server or central station may suppress or delay the technical alarms of poor network connectivity from its end.

[0036] It should be understood that the medical device **200** as shown in FIG. **2** is for illustration, not for limitation. A medical device may include more, fewer, and/or different components. For example, in alternative embodiments, the medical device **200** may include a wireless tag as the proximity sensor **220**. The wireless tag communicates or broadcasts beacon signals while the one or more fixed targets positioned in the environment **100** look for the beacon signals. When the medical device **200** is within the range covered by a fixed target, the respective target may detect the beacon signals from the medical device **200** and send an acknowledgement message to the medical device **200**. Upon receiving the acknowledgement message, the medical device **200** is notified of the proximity to the respective fixed target.

[0037] Referring to FIG. **4**, a flow chart **400** of a method for adjusting medical device behavior is shown, in accordance with an exemplary embodiment. The method can be executed by the medical device **200** in FIG. **2**. At an operation **402**, proximity of the medical device **200** to fixed targets positioned in a healthcare environment is detected. In some embodiments, the medical device **200** may continually or periodically (e.g., every second, 2 seconds, 3 seconds, etc.) detect beacon signals transmitted by fixed targets

positioned in various areas of the healthcare environment, using any appropriate proximity-based sensor technologies, such as NFC, RFID, Bluetooth, iBeacon, and so on. When the medical device **200** is within the predefined range of a fixed target, the beacon signal regarding the respective target is detected. The beacon signal includes target identifying information which may be a unique identifier of the respective fixed target such as a MAC address, serial number, alphanumeric signature, etc. The beacon signal may include additional or alternative information, such as a time stamp, signal strength level, frequency channel, and so on.

[0038] In alternative embodiments, the medical device **200** continually or periodically communicates or broadcasts beacon signals while the one or more fixed targets positioned in the environment **100** look for the beacon signals. When the medical device **200** is within the range covered by a fixed target, the respective target may detect the beacon signals from the medical device **200** and send an acknowledgement message to the medical device **200**. Upon receiving the acknowledgement message, the medical device **200** is notified of the proximity to the respective fixed target.

[0039] At an operation **404**, it is determined whether the medical device **200** is in motion based on the proximity detected at **402**. In some embodiments, the medical device **200** stores information of the fixed targets associated with the areas where they are positioned. If the beacon signal indicates that the medical device **200** is in a range covered by certain fixed target (e.g., target **102** or **108**) at a room, the medical device **200** is determined to be stationary. If the beacon signal indicates that the medical device is in a range covered by certain fixed target (e.g., target **102** or **106**) at the corridor, the medical device is determined to be in motion, i.e., going along with the patient to pass the corridor. In some embodiments, fixed targets are positioned at only the corridor(s) but not the rooms. The medical device **200** is determined to be stationary if no beacon signal is detected while determined to be in motion upon detecting any beacon signal.

[0040] In some embodiments, the information of the fixed targets associated with the areas where they are positioned is stored at the remote server or central station. The medical device **200** queries the server or central station to determine the stationary or mobile state of itself. It should be understood that the above approaches are described as non-limiting examples. Any appropriate operations can be used to determine the stationary or mobile status of the medical device **200** based on detection of proximity, such as using signal strength levels, real time location system (RTLS), etc.

[0041] At an operation **406**, the medical device **200** displays the monitored physiological data with a first display mode and/or the alarm mode is set as a first alarm mode, if the medical device **200** is determined to be stationary at **404**. For example, the medical device **200** displays the monitored physiological data as shown in FIG. **3A**, which includes displaying detailed information such as numerical values, waveforms, trends, historical data, etc. In addition, the medical device **200** raises technical alarms as soon as wireless connectivity is poor in the first alarm mode.

[0042] At an operation **408**, the medical device **200** displays the monitored physiological data with a second display mode and/or the alarm mode is set as second alarm mode, if the medical device **200** is determined to be in motion at **404**. For example, the medical device **200** displays the monitored physiological data as shown in FIG. **3B**, which may include

displaying only numerical values with larger fonts. In addition, the medical device **200** suppresses or delay technical alarms relating to poor wireless connectivity in the second alarm mode. Furthermore, the medical device **200** may communicate to the server or central station that the medical device **200** is in motion and the server or central station may suppress or delay the technical alarms relating to poor wireless connectivity from its end.

[0043] It should be understood that the process as shown in FIG. **4** is for illustration not for limitation. An appropriate process may include more, fewer, or different operations than those shown in FIG. **4**.

[0044] Referring to FIG. **5**, a block diagram of a medical device **500** which can be used in FIG. **1** (e.g., corresponding to medical device **120** in FIG. **1**) is shown, in accordance with another exemplary embodiment. Components of the medical device **500** may be the same as or similar to corresponding components of the medical device **200** in FIG. **2** except that the medical **500** includes a motion sensor **520** rather than the proximity sensor **220**. The motion sensor **520** may be an accelerometer, gyroscope sensor, or any other appropriate type of motion sensor. The motion sensor **520** may continually detect the stationary or mobile state of the medical device **500** and communicate the detection to the controller **550**.

[0045] Referring to FIG. **6**, a flow chart of a method **600** for adjusting medical device behavior is shown, in accordance with another exemplary embodiment. The method can be executed by the medical device **500** in FIG. **5**. Operations of the method **600** may be the same as or similar to corresponding operations of method **400** shown in FIG. **4** except that at operation **602**, motion sensor signal rather than proximity is received and at operation **604**, the medical device is determined to be stationary or mobile based on the received motion sensor signal.

[0046] In addition to any previously indicated modification, numerous other variations and alternative arrangements may be devised by those skilled in the art without departing from the spirit and scope of this description, and appended claims are intended to cover such modifications and arrangements. Thus, while the information has been described above with particularity and detail in connection with what is presently deemed to be the most practical and preferred aspects, it will be apparent to those of ordinary skill in the art that numerous modifications, including, but not limited to, form, function, manner of operation and use may be made without departing from the principles and concepts set forth herein. Also, as used herein, the examples and embodiments, in all respects, are meant to be illustrative only and should not be construed to be limiting in any manner.

What is claimed is:

1. A medical device for monitoring a patient, the medical device comprises:

a display configured to display monitored physiological data of the patient;

a proximity sensor configured to detect proximity of the medical device to one or more targets positioned in a healthcare environment; and

a controller communicably connected to the display and the proximity sensor and configured to:

determine whether the medical device is stationary or in motion based on detection by the proximity sensor;

make the display present the monitored physiological data in a first display mode in response to determining that the medical device is stationary; and

make the display present the monitored physiological data in a second display mode in response to determining that the medical device is in motion, wherein the second display mode is different from the first display mode.

2. The medical device of claim **1**, wherein determining whether the medical device is stationary or in motion comprises:

determining that the medical device is in motion in response to detecting proximity to a target positioned at a corridor of the healthcare environment.

3. The medical device of claim **1**, wherein detecting proximity of the medical device to one or more targets comprises detecting beacon signals transmitted from the one or more targets, and the beacon signals comprise identifying information that identifies a respective target.

4. The medical device of claim **3**, wherein determining whether the medical device is stationary or in motion comprises:

determining that the medical device is in motion if the identifying information indicates the respective target positioned at a corridor of the healthcare environment.

5. The medical device of claim **1**, wherein the second display mode is simplified comparing to the first display mode.

6. The medical device of claim **1**, wherein the first display mode displays both numerical values and waveforms for the monitored physiological data, and the second display mode displays only the numerical values.

7. The medical device of claim **1**, further comprising:

one or more medical sensors configured to monitor at least one of ECG, SpO2, blood pressure, respiration, and temperature of the patient.

8. The medical device of claim **1**, further comprising:

one or more medical sensor interfaces configured to receive the monitored physiological data from one or more medical sensors.

9. The medical device of claim **1**, further comprising a wireless communication interface configured to facilitate communication of the medical device with a remote server.

10. The medical device of claim **9**, wherein the controller is further configured to:

suppress or delay a technical alarm regarding wireless connectivity in response to determining that the medical device is in motion.

11. A wireless patient monitor comprising:

one or more medical sensors configured to monitor physiological data of a patient;

a display configured to display the monitored physiological data of the patient;

a wireless communication interface configured to transmit the monitored physiological data to a remote server;

a motion sensor configured to detect motion status of the wireless patient monitor; and

a controller communicably connected to the one or more medical sensors, display, wireless communication interface, and motion sensor and configured to:

determine whether the wireless patient monitor is stationary or in motion based on detection by the motion sensor;

make the display present the monitored physiological data in a first display mode in response to determining that the wireless patient monitor is stationary; and

make the display present the monitored physiological data in a second display mode in response to determining that the wireless patient monitor is in motion, wherein the second display mode is different from the first display mode.

12. The wireless patient monitor of claim 11, wherein the first display mode displays both numerical values and waveforms for the monitored physiological data, and the second display mode displays only the numerical values.

13. The wireless patient monitor of claim 11, wherein the controller is further configured to:

suppress or delay a technical alarm regarding wireless connectivity in response to determining that the medical device is in motion.

14. A method for adjusting behavior of a medical device, the method comprising:

monitoring, by the medical device, physiological data of a patient;

determining, by the medical device, whether the medical device is stationary or in motion based on detection by a sensor;

displaying, by the medical device, the monitored physiological data in a first display mode in response to determining that the medical device is stationary; and

displaying, by the medical device, the monitored physiological data in a second display mode in response to determining that the medical device is in motion, wherein the second display mode is different from the first display mode.

15. The method of claim 14, wherein the monitored physiological data comprises at least one of ECG, SpO2, blood pressure, respiration, and temperature.

16. The method of claim 14, wherein the sensor is a proximity sensor, determining whether the medical device is stationary or in motion comprises:

detecting proximity of the medical device to one or more targets positioned in a healthcare environment; and

determining the medical device is in motion in response to detecting proximity to a target positioned at a corridor of the healthcare environment.

17. The method of claim 14, wherein the sensor is a motion sensor.

18. The method of claim 14, wherein the second display mode is simplified comparing to the first display mode.

19. The method of claim 14, wherein the first display mode displays both numerical values and waveforms for the monitored physiological data, and the second display mode displays only the numerical values.

20. The method of claim 14, further comprising suppressing or delaying a technical alarm regarding wireless connectivity in response to determining that the medical device is in motion.

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专利名称(译)	调整医疗设备行为的系统和方法		
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摘要(译)

公开了用于调节医疗设备的行为的系统和方法。 示例性方法包括监视患者的生理数据，并基于接近传感器或运动传感器的检测来确定医疗设备是静止的还是运动中的。 该方法还包括响应于确定医疗设备静止而以第一显示模式显示监视的生理数据，以及响应于确定医疗设备处于运动中以第二显示模式显示监视的生理数据。 与第一显示模式相比，简化了第二显示模式。