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(54) **PHYSIOLOGICAL CONDITION MONITORING SYSTEM, DEVICE FOR COLLECTING PHYSIOLOGICAL CONDITION READINGS AND DEVICE FOR MONITORING PHYSIOLOGICAL CONDITION READINGS**

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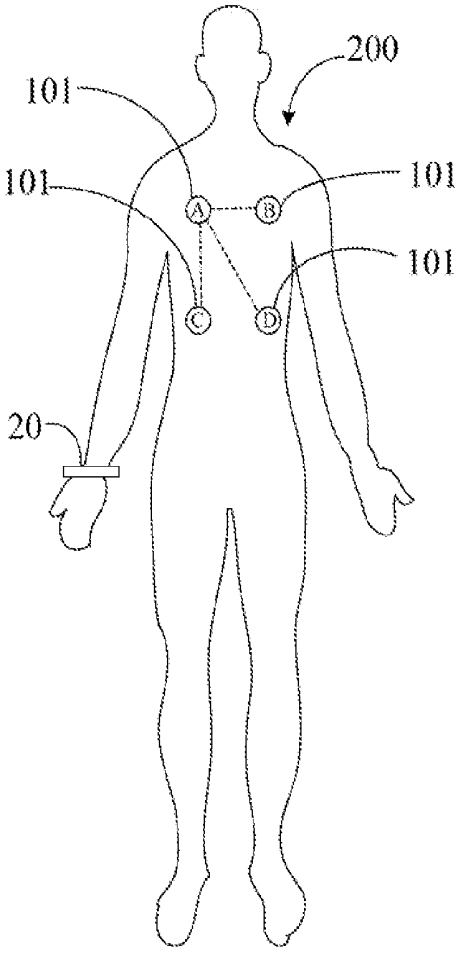
(57) **ABSTRACT**

A system for monitoring physiological condition includes a device for collecting readings and a monitoring device. The collecting device includes a number of collecting units configured to be selected human body. Based on different requirements, different numbers of collecting units can be selected to be attached to different portions of the living subject to collect readings. The selected collecting units transmit the readings to the monitoring device via wireless communication networks. The monitoring device can analyze the readings and generate a report.



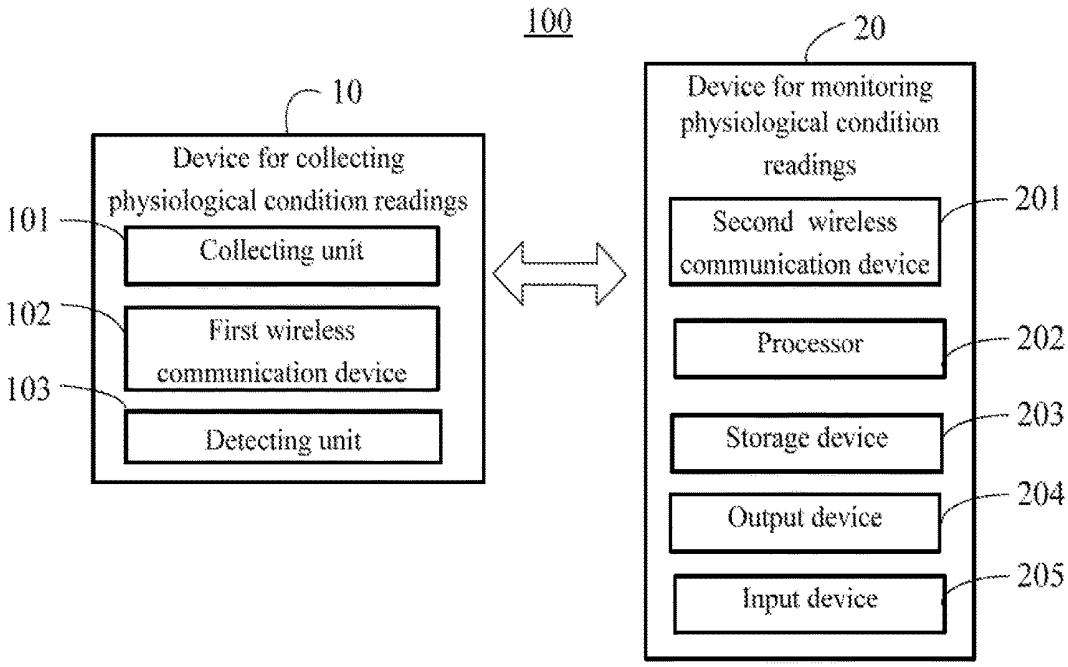

100
10
Device for collecting physiological condition readings
101
Collecting unit
102
First wireless communication device
103
Detecting unit
20
Device for monitoring physiological condition readings
Second wireless communication device
201
Processor
202
Storage device
203
Output device
204
Input device
205

FIG. 1

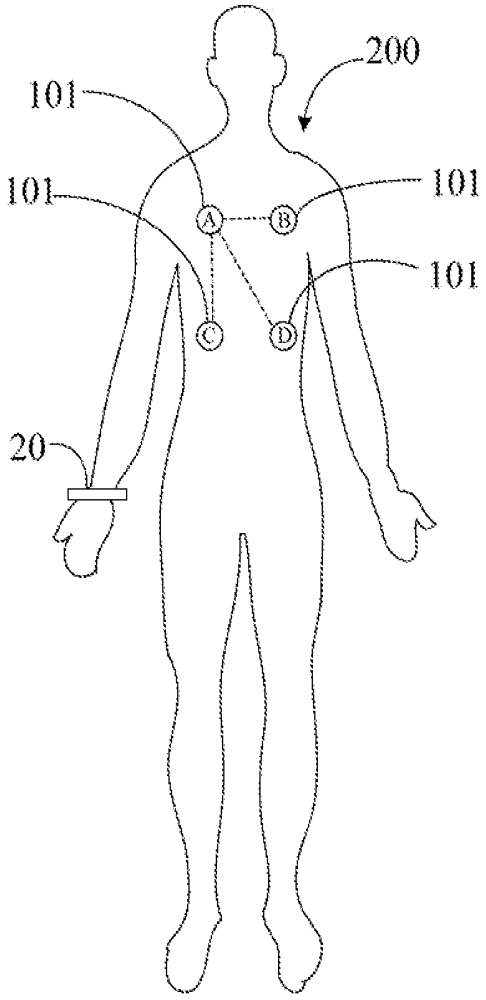


FIG. 2

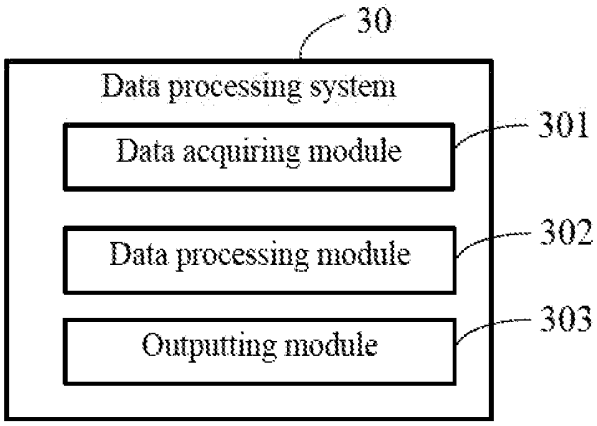

30
Data processing system
Data acquiring module
301
Data processing module
302
Outputting module
303

FIG. 3

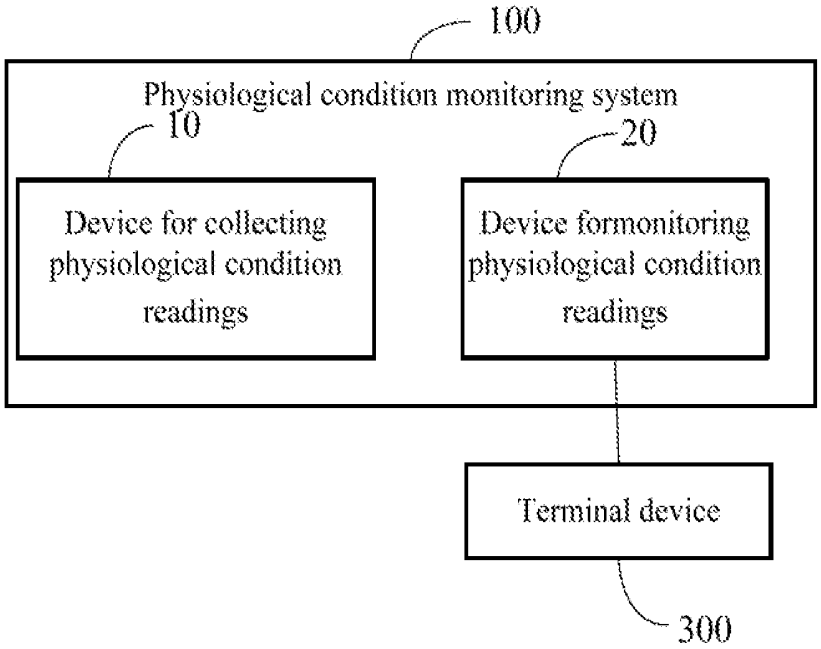

100
Physiological condition monitoring system
10
20
Device for collecting physiological condition readings
Device formonitoring physiological condition readings
Terminal device
300

FIG. 4

PHYSIOLOGICAL CONDITION MONITORING SYSTEM, DEVICE FOR COLLECTING PHYSIOLOGICAL CONDITION READINGS AND DEVICE FOR MONITORING PHYSIOLOGICAL CONDITION READINGS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 201711132692.5 filed on Nov. 15, 2017.

FIELD

[0002] The subject matter herein generally relates to physiological health, and particularly to a physiological condition monitoring system, a device for collecting physiological condition readings and a device for monitoring the physiological condition readings.

BACKGROUND

[0003] Sensor devices have been used in hospital or community nursing service to detect a variety of physiological conditions of patients. Conventional sensor devices can detect some portions of living subjects via a plurality of electrodes and wires.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Implementations of the present technology will now be described, by way of example only, with reference to the attached figures.

[0005] FIG. **1** is a block diagram illustrating an exemplary embodiment of a system for monitoring physiological conditions, wherein the system includes a physiological data collecting device and a physiological data monitoring device.

[0006] FIG. **2** is a schematic view of an exemplary embodiment showing the physiological data collecting device and the physiological data monitoring device of FIG. **1** being used to monitor a living subject.

[0007] FIG. **3** is a block diagram of an exemplary embodiment of a data processing system.

[0008] FIG. **4** is a block diagram illustrating an exemplary embodiment of a working environment of the monitoring system.

DETAILED DESCRIPTION

[0009] It will be appreciated that for simplicity and clarity of illustration, where appropriate, reference numerals have been repeated among the different figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the embodiments described herein. However, it will be understood by those of ordinary skill in the art that the embodiments described herein can be practiced without these specific details. In other instances, methods, procedures, and components have not been described in detail so as not to obscure the related relevant feature being described. Also, the description is not to be considered as limiting the scope of the embodiments described herein. The drawings are not necessarily to scale and the proportions of certain parts may be exaggerated to better illustrate details and features of the present disclosure.

[0010] The present disclosure, including the accompanying drawings, is illustrated by way of examples and not by way of limitation. Several definitions that apply throughout this disclosure will now be presented. It should be noted that references to "an" or "one" embodiment in this disclosure are not necessarily to the same embodiment, and such references mean "at least one."

[0011] The term "module", as used herein, refers to logic embodied in hardware or firmware, or to a collection of software instructions, written in a programming language, such as, Java, C, or assembly. One or more software instructions in the modules can be embedded in firmware, such as in an EPROM. The modules described herein can be implemented as either software and/or hardware modules and can be stored in any type of non-transitory computer-readable medium or other storage device. Some non-limiting examples of non-transitory computer-readable media include CDs, DVDs, BLU-RAY, flash memory, and hard disk drives. The term "comprising" means "including, but not necessarily limited to"; it specifically indicates open-ended inclusion or membership in a so-described combination, group, series, and the like.

[0012] FIG. **1** illustrates a physiological condition monitoring system **100** (hereinafter "monitoring system **100**") for monitoring physiological conditions. The monitoring system **100** includes a device for collecting physiological condition readings (collecting device **10**) and a device for monitoring physiological condition (monitoring device **20**). The collecting device **10** includes a number of collecting units **101** configured to be selected to be attached to a portion or portions of a living subject **200** (see FIG. **2**) to collect physiological condition readings of the living subject **200**. Each of the collecting unit **101** communicates with the monitoring device **20** via wireless connections to transmit data to the monitoring device **20**. In the embodiment, based on users' different requirements, different numbers of the collecting units **101** can be selected to be attached to different portions of the living subject **200**. Taking the condition of the heart for example, each of the collecting units **101** is an electrode patch, which can be placed on the skin of a patient to collect ECG signals. The EGC signal reflects when the heart is in systolic state and diastolic state. Cardiac muscle has a spontaneous beat and rhythmic contractions. An electrical pulse sent by a cardiac conduction system can irritate the cardiac muscle fibers to make the cardiac muscle contract. Accordingly, when the cardiac conduction system generates and sends the electric pulses, the cardiac muscle produces a weak current distribution to human body. When the electrodes (collection units **11**) are connected to different parts of human body, an ECG electrical pulse or signal is depicted via the electrodes (collection units **11**). For example, if a first patient needs to perform a single-lead ECG two collecting units **101** can be selected to be attached to two different portions of the first patient. If a second patient needs to perform a 3-lead ECG four collecting units **101** can be selected to be attached to four different portions of the second patient, as shown in FIG. **2**. If a third patient needs to perform a 12-lead ECG ten collecting units **101** can be selected to be attached to different portions of the third patient. The collecting units **101** collects electrical activity and transmits the activity to the monitoring device **20**, and the monitoring device **20** analyzes the activity and generates an ECG report.

[0013] In at least one embodiment, the physiological readings can include, but are not limited to, at least one of an electrocardiogram (ECG) signal, an electroencephalogram signal, a blood pressure value, an oxygen saturation reading, a skin temperature, or data as to respiration.

[0014] In one embodiment, the monitoring device **20** can be a wristband electronic device, which can be worn on the wrist of a human body, see FIG. **2**. In an alternative embodiment, the monitoring device **20** further can be, but is not limited to, other types of wearable electronic devices, for example head-mounted electronic devices, necklace-like electronic device which can be worn around the neck, or a device attached to a waistband. In other embodiments, the monitoring device **20** further can be portable electronic devices, such as mobile phone, tablet computer, or the like.

[0015] The physiological monitoring system **100** will be described in detail below.

[0016] The collecting device **10** includes a number of collecting units **101**, each of the collecting unit **101** configures a first wireless communication device **102**.

[0017] The collecting units **101** are configured to be selected to attached to a portion of a living subject **200** to collect physiological condition readings of the living subject **200**. Based on different requirements, different numbers of the collecting units **101** can be selected to be attached to different portions of the living subject **200** to collect the physiological condition readings. In at least one embodiment, each of the collecting unit **101** is a wireless electrode patch. In a first embodiment, the physiological monitoring system **100** is an electrocardiograph, and the collecting device **10** includes a total of ten collecting units **101**. Each of the collecting units **101** is an electronic patch configured to be attached to a portion of a human body to collect ECG signals. FIG. **2** shows an example of the monitoring system **100** performing a 3-lead ECG When performing the 3-lead ECG, four collecting units **101** are selected from the ten collecting units **101** to be attached to different portions of the human body as shown in FIG. **2**. The four collecting units **101** are named as A, B, C, and D. In this example, the collecting unit A serves as a reference potential point, and a first lead is formed between the collecting unit A and collecting unit B. A second lead is formed between the collecting unit A and C, and a third lead is formed between the collecting unit A and D. In an alternative embodiment, each of the collecting units **101** can be a electrode patch configured to be attached to the head of the living subject **200** to collect electroencephalogram (EEG) signals of the living subject **200**, and also can be an electrode patch configured to attached to the skin of the living subject **200** to collect skin temperatures, respiration data, and blood pressure values of the living subject **200**. In other embodiments, each collecting unit **101** can be clamped to the finger of the living subject **200** to collect oxygen saturation data of the living subject **200**.

[0018] Each first wireless communication device **102** is set in one of the collecting units **101**. The first wireless communication device **102** can establish a wireless connection between the collecting unit **101** and the monitoring device **20**, and transmits the physiological condition readings collected by the collecting unit **101** to the monitoring device **20**. In at least one embodiment, the first wireless communication device **102** can be, but is not limited to, a BLUETOOTH module, a WI-FI module, or a ZIGBEE module.

[0019] In at least one embodiment, each collecting unit **101** has a detecting unit **103** to detect an anomaly of the collecting unit **101**. The anomalous situation can be, but is not limited to, the collecting unit **101** falling from the living subject, the battery power of the collecting unit **101** is low, and the like. The detecting unit **103** further transmits the anomalous situation to the monitoring device **20** via the first wireless communication device **102**. In at least one embodiment, the detecting unit **103** can include a pressure sensor to detect the collecting unit **101** falling from the living subject **200**. When the collecting unit **101** is attached to the portion of the living subject **200**, a pressure is generated between the collecting unit **101** and the living subject **200**. If the detecting unit **103** determines that the pressure is lower than a preset pressure value, the detecting unit **103** determines that the collecting unit **101** has fallen from the living subject **200**. If the detecting unit **103** so determines, the detecting unit **103** generates a prompt signal and transmits the prompt signal to the monitoring device **20** via the first wireless communication device **102**. In other embodiments, the detecting unit **103** detects when the collecting unit **101** is fallen by using an infrared sensor to detect an infrared signal of the living subject. The detecting unit **103** further can detect whether the collecting unit **101** is fallen by detecting whether a physiological condition reading (e.g. the ECG signal) is detected. In the embodiment, the detecting unit **103** further can include a voltage detecting circuit to detect a voltage of a battery (not shown) of the collecting unit **101**. The detecting unit **103** determines that the collecting unit **103** has low battery power if the voltage detected by the voltage detecting circuit is lower than a preset value.

[0020] The monitoring device **20** includes a second wireless communication device **201**, a processor **202**, a storage device **203**, an output device **204**, and an input device **205**.

[0021] The second wireless communication device **201** can establish a wireless connection between the monitoring device **20** and the collecting units **101** of the collecting device **10**, and receive the physiological condition readings from the collecting units **101**. In the embodiment, the second wireless communication device **201** further receives the anomalous situation of the collecting units **101** from the collecting device **10**. In the embodiment, the second wireless communication device **201** can be, but is not limited to, a BLUETOOTH module, a WI-FI module, or a ZIGBEE module.

[0022] In at least one embodiment, the processor **202** can be, but is not limited to, a central processing unit, a digital signal processor, or a single chip, for example.

[0023] In at least one embodiment, the storage device **203** can be, but is not limited to, an internal storage system, such as a flash memory, a random access memory (RAM) for temporary storage of information, and/or a read-only memory (ROM) for permanent storage of information. The storage device **203** can also be a storage system, such as a hard disk, a storage card, or a data storage medium.

[0024] The output device **204** can be, but is not limited to, a display screen, a Light Emitting Diode (LED), or a loudspeaker. The input device **205** can be, but is not limited to, a button, a touch input screen, a keyboard, or the like.

[0025] FIG. **3** illustrates an exemplary embodiment of a data processing system **30** which can be run in the monitoring device **20**. In other embodiments, the data processing system **30** further can be run in a terminal device (e.g. a cloud server, a smart phone, or a tablet) which communi-

cates with the monitoring device **20**. The data processing system **30** can include a number of modules, which are collection of software instructions stored in the storage device **203** and executed by the processor **202**. Referring to FIG. **3**, in at least one embodiment, the data processing system **30** can include a data acquiring module **301**, a data processing module **302**, and an outputting module **303**.

[0026] The data acquiring module **301** acquires the physiological condition readings transmitted by the collecting units **101** of the collecting device **10**.

[0027] The data processing module **102** analyzes the acquired physiological condition readings and determines a quantity of the collecting units attached to the living subject **200** according to the acquired physiological condition readings, and generates a report according to the quantity of the collecting units attached to the living subject **200** and the acquired readings. In the first embodiment, the data acquiring module **101** acquires the ECG signals transmitted by the collecting units **101** attached to the living subject **200**. Herein, the data processing module **12** determines a quantity of leads of the ECG according to the ECG signals and generates an ECG report according to the determined number and the ECG signals. For example, as shown in FIG. **2**, the data acquiring module **101** acquires the ECG signals from the collecting units A-D, the data processing module **102** determines that there are three leads, A-B, A-C, and A-D, according to received ECG signals, and generates a three-lead ECG report according to the received ECG signals. In other embodiments, the data processing module **302** further can generate an EEG report, a skin temperature report, a report as to respiration, and/or a blood pressure report according to the acquired readings.

[0028] The outputting module **303** outputs the report via the output device **204**. For example, if the output device **204** is a display screen, the outputting module **303** displays the report on the display screen. If the output device **204** is a printer, the outputting module **303** prints the report by using the printer. In at least one embodiment, the outputting module **303** further stores the report to the storage device **202**.

[0029] In at least one embodiment, the data acquiring module **101** acquires the anomalous situation transmitted by the collecting device **10**. The outputting module **303** outputs the anomalous situation via the output device **204**, and thus warns the user about the anomaly. For example, if the anomaly is low battery, the output device **25** generates a prompt by flickering the LED, or by outputting a voice prompt using the loudspeaker.

[0030] In at least one embodiment, the input device **205** is configured for the user to input an alert when the user who wearing the monitoring system **100** feels ill. The data acquiring module **301** acquires the alert from the input device **205** and records the time that the alert is received, thus the doctor can know the time that the user feels ill.

[0031] Referring to FIG. **4**, in an alternative embodiment, the monitoring device **20** further can communicate with at least one terminal device **300** via the second wireless communication device **201**, and can transmit the physiological parameters to the at least one terminal device **300**. The at least one terminal device **300** analyzes the physiological condition readings and generates the report accordingly. In some embodiments, the monitoring device **20** transmits the report to the at least one terminal device **300**. Users can obtain physiological condition readings and/or reports from the at least one terminal device **300**. In at least one embodiment, the at least one terminal device **300** can be, but is not limited to, a cloud server, a web server, a personal computer (e.g. doctor's computer), or the like.

[0032] In at least one embodiment, the monitoring device **20** transmits the physiological condition readings to the at least one terminal device **300** in real time. If the connection between the monitoring device **20** and the at least one terminal device **300** is interrupted, the physiological condition readings are temporarily stored in the monitoring device **20**. The temporarily stored readings are transmitted to the at least one terminal device **300** when the connection between the monitoring device **20** and the at least one terminal device **300** is restored.

[0033] In at least one embodiment, the at least one terminal device **200** further can obtain diagnosis and treatment recommendations from the network or doctors according to the readings received. The diagnosis and treatment recommendations can be transmitted to the monitoring device **20**.

[0034] It is believed that the present embodiments and their advantages will be understood from the foregoing description, and it will be apparent that various changes may be made thereto without departing from the spirit and scope of the disclosure or sacrificing all of its material advantages, the examples hereinbefore described merely being exemplary embodiments of the present disclosure.

What is claimed is:

1. A device for collecting physiological condition readings comprising:

a plurality of collecting units configured to be selected to be attached to at least one portion of a living subject to collect physiological condition readings of the living subject;

each of the collecting units having a wireless communication device, the wireless communication device being configured to establish a wireless communication between the collecting unit and a device for monitoring physiological condition readings, and transmit the physiological condition readings to the device for monitoring physiological condition readings;

wherein based on different requirements, different numbers of the collecting units are selected to be attached to different portions of the living subject.

2. The device of claim **1**, wherein each of the collecting unit is a wireless electrode patch.

3. The device of claim **2**, wherein each collecting unit comprises a detecting unit, the detecting unit is configured to detect an anomalous situation of the collecting unit, and transmits the anomalous situation to the device for monitoring physiological condition readings via the wireless communication device.

4. The device of claim **3**, wherein the anomalous situation is that the collecting unit falling from the living subject, the detecting unit is selected from a group consisting of:

a pressure sensor configured to detect whether the collecting unit has fallen from the living subject by detecting whether a pressure between the collecting unit and the living subject is less than a preset pressure value;

an infrared sensor configured to detect whether the collecting unit has fallen from the living subject by detecting whether an infrared signal of the living subject is detected; and

a detecting unit configured to detect whether the collecting unit has fallen from the living subject by detecting whether a corresponding physiological condition reading is detected.

5. The device of claim **3**, wherein the anomalous situation is that a battery power of the collecting unit is low, and the detecting unit is a voltage detecting circuit.

6. The device of claim **1**, wherein the physiological condition readings comprise at least one of an electrocardiogram signal, an electroencephalogram signal, a blood pressure value, an oxygen saturation reading, a skin temperature, or data as to respiration.

7. A device for monitoring physiological condition communicating with at least one device for collecting physiological condition readings, the at least one device for collecting physiological condition readings comprising a plurality of collecting units configured to be selected to attached to at least one portion of a living subject, the device for monitoring the physiological condition comprising:

a wireless communication device configured to communicate with the plurality of collecting units to receive the physiological condition readings from the collecting units;

a processor; and

a storage device storing one or more programs, when executed by the processor, the one or more programs cause the processor to:

acquire the physiological condition readings transmitted by the collecting units;

analyze the acquired physiological condition readings and determines a quantity of the collecting units attached to the living subject according to the acquired physiological condition readings, and generate a report according to the quantity of the collecting units attached to the living subject and the acquired physiological condition readings.

8. The device of claim **7**, wherein the device is a wristband electronic device.

9. The device of claim **7**, wherein the one or more programs further cause the processor to: acquire an anomalous situation of the collecting units from the device for collecting physiological condition readings, and output the anomalous situation via an output device.

10. The device of claim **7**, further comprising an input device configured for a user to input an alert when the user who wearing the device for monitoring the physiological condition readings feels ill, wherein the one or more programs further cause the processor to: acquire the alert from the input device and record a time that the alert is received.

11. The device of claim **7**, further communicating with at least one terminal device via the wireless communication device, and transmitting the physiological condition readings to the at least one terminal device to generate the report by the at least one terminal device.

12. The device of claim **11**, further transmitting the physiological condition readings to the at least one terminal device in real time; if a connection between the device for monitoring the physiological condition readings and the at least one terminal device is interrupted, the physiological condition readings are temporarily stored in the device for monitoring the physiological condition readings, and the temporarily stored physiological condition readings are transmitted to the at least one terminal device when the connection is restored.

13. A physiological condition monitoring system comprising:

a device for collecting physiological condition readings comprising a plurality of collecting units configured to be selected to be attached to at least one portion of a living subject to collect physiological condition readings of the living subject; each of the collecting units having a first wireless communication device, the first wireless communication device being configured to establish a wireless communication between the collecting unit and a device for monitoring physiological condition readings, and transmit the physiological condition readings to the device for monitoring physiological condition readings; wherein based on different requirements, different numbers of the collecting units are selected to be attached to different portions of the living subject; and

a device for monitoring physiological condition readings comprising:

a second wireless communication device configured to communicate with the first wireless communication device and receives the physiological condition readings transmitted by the collecting units;

a processor; and

a storage device storing one or more programs, when executed by the processor, the one or more programs cause the processor to:

acquire the physiological condition readings transmitted by the collecting units; and

analyze the acquired physiological condition readings and determines a quantity of the collecting units attached to the living subject according to the acquired physiological condition readings, and generate a report according to the quantity of the collecting units attached to the living subject and the acquired physiological condition readings.

14. The physiological condition monitoring system of claim **13**, wherein each collecting unit comprises a detecting unit, the detecting unit is configured to detect an anomalous situation of the collecting unit, and transmits the anomalous situation to the device for monitoring physiological condition readings via the wireless communication device.

15. The physiological condition monitoring system of claim **13**, the physiological condition readings comprise at least one of an electrocardiogram signal, an electroencephalogram signal, a blood pressure value, an oxygen saturation reading, a skin temperature, or data as to respiration.

16. The physiological condition monitoring system of claim **13**, wherein the device for monitoring the physiological condition readings is a wristband electronic device.

17. The physiological condition monitoring system of claim **13**, wherein the device for monitoring the physiological condition readings further comprises an input device configured for a user to input an alert when the user who wearing the device for monitoring the physiological condition readings feels ill, wherein the one or more programs further cause the processor to: acquire the alert from the input device and record a time that the alert is received.

18. The physiological condition monitoring system of claim **13**, wherein the device for monitoring the physiological condition readings further communicates with at least one terminal device via the second wireless communication

device, and transmits the physiological condition readings to the at least one terminal device to generate the report by the at least one terminal device.

19. The physiological condition monitoring system of claim **18**, wherein the device for monitoring the physiological condition readings transmits the physiological condition readings to the at least one terminal device in real time; if a connection between the the device for monitoring the physiological condition readings and the at least one terminal device is interrupted, the physiological condition readings are temporarily stored in the device for monitoring the physiological condition readings, and the temporarily stored physiological condition readings are transmitted to the at least one terminal device when the connection is restored.

* * * * *

专利名称(译)	生理状态监测系统，收集生理状态读数的装置和监测生理状态读数的装置		
公开(公告)号	US20190142340A1	公开(公告)日	2019-05-16
申请号	US15/826710	申请日	2017-11-30
[标]申请(专利权)人(译)	路提科技股份有限公司		
申请(专利权)人(译)	ROOTI LABS LIMITED		
当前申请(专利权)人(译)	ROOTI LABS LIMITED		
[标]发明人	CHANG MING SHIUNG LI KO MAI		
发明人	CHANG, MING-SHIUNG LI, KO-MAI		
IPC分类号	A61B5/00 H04W4/00 A61B5/0408 A61B5/0478 A61B5/1455 A61B5/01 A61B5/021 A61B5/08 A61B5/0205		
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优先权	201711132692.5 2017-11-15 CN		
外部链接	Espacenet USPTO		

摘要(译)

一种用于监测生理状况的系统包括用于收集读数的装置和监测装置。收集装置包括多个收集单元，所述收集单元被配置为被选择的人体。基于不同的要求，可以选择不同数量的收集单元以附着到生活对象的不同部分以收集读数。所选择的收集单元通过无线通信网络将读数发送到监控设备。监控设备可以分析读数并生成报告。