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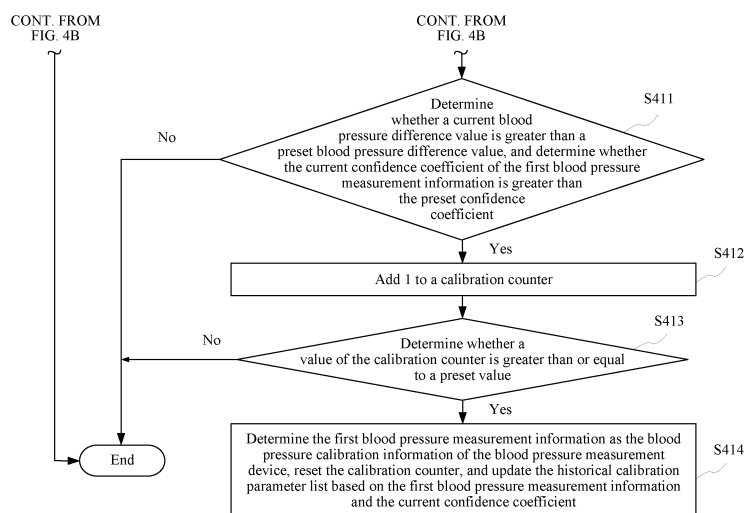
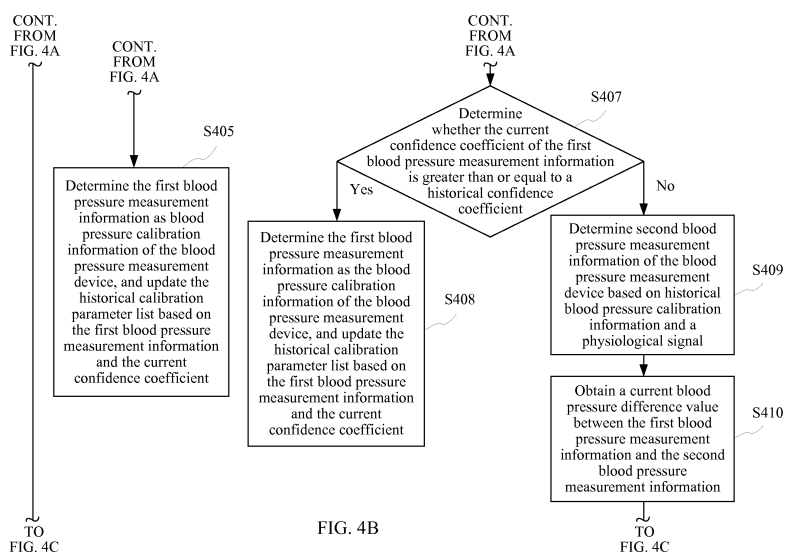
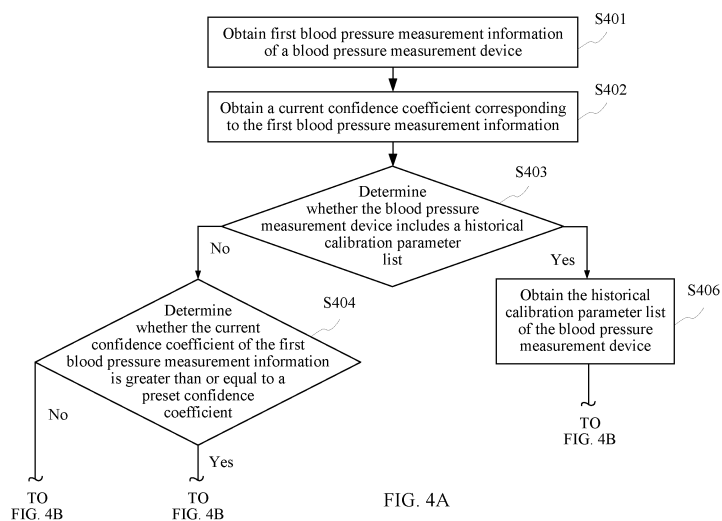
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(54) **CALIBRATION METHOD FOR BLOOD PRESSURE MEASURING DEVICE, AND BLOOD PRESSURE MEASURING DEVICE**

(57) The present invention provides a method for calibrating a blood pressure measurement device and a blood pressure measurement device. The method includes: obtaining first blood pressure measurement information of the blood pressure measurement device and a current confidence coefficient corresponding to the first blood pressure measurement information, where the first blood pressure measurement information includes a first systolic blood pressure value and/or a first diastolic blood pressure value; determining whether the blood pressure measurement device includes a historical calibration parameter list, where the historical calibration parameter list includes historical blood pressure calibration information and a historical confidence coefficient corresponding to the historical blood pressure calibration information; and if the blood pressure measurement device includes the historical calibration parameter list, and the current confidence coefficient is greater than or equal to a preset confidence coefficient, or is greater than or equal to the historical confidence coefficient, determining the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, and updating the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient. The method is used to ensure accuracy of blood pressure measurement information and avoid using an extra device to implement calibration of the blood pressure measurement information.

EP 3 524 137 A1



Description

TECHNICAL FIELD

[0001] The present invention relates to the field of intelligent terminal technologies, and in particular, to a method for calibrating a blood pressure measurement device and a blood pressure measurement device.

BACKGROUND

[0002] In recent years, with development of mobile medical technologies, convenience of monitoring a blood pressure is gradually improved, and national and foreign markets attach increasing importance to monitoring of home blood pressures and dynamic blood pressures. Therefore, accurate and portable blood pressure measurement is extremely necessary and is an important issue that currently attracts much attention from people.

[0003] Currently, a cuff-less blood pressure measurement apparatus is mainly used to measure a blood pressure of a user. The cuff-less blood pressure measurement apparatus measures a blood pressure by using a pulse wave transit time without a cuff. This can provide a convenient and comfortable measurement manner for the user. Physiological parameters such as an arterial wall elasticity and a blood density of different persons are different, and relationships between a pulse wave transit time and a blood pressure of different users are different. Therefore, when measuring a blood pressure of a user, the cuff-less blood pressure measurement apparatus may perform calibration on a blood pressure of each user, so as to ensure accuracy of the cuff-less blood pressure measurement apparatus on blood pressure measurement.

[0004] However, when the current cuff-less blood pressure measurement apparatus is used to perform calibration on a blood pressure of each user, an extra device (such as a cuff sphygmomanometer or a standard sphygmomanometer) is required to measure a standard blood pressure and input a measured standard blood pressure into the cuff-less blood pressure measurement apparatus to obtain an actual blood pressure of a user. Consequently, costs are relatively high.

SUMMARY

[0005] The present invention provides a method for calibrating a blood pressure measurement device and a blood pressure measurement device, so as to ensure accuracy of blood pressure measurement information and avoid using an extra device to implement calibration of the blood pressure measurement information.

[0006] According to a first aspect, the present invention provides a method for calibrating a blood pressure measurement device, including: obtaining first blood pressure measurement information of the blood pressure measurement device and a current confidence coefficient cor-

responding to the first blood pressure measurement information, where the first blood pressure measurement information includes a first systolic blood pressure value and/or a first diastolic blood pressure value; determining whether the blood pressure measurement device includes a historical calibration parameter list, where the historical calibration parameter list includes historical blood pressure calibration information and a historical confidence coefficient corresponding to the historical blood pressure calibration information, and the historical blood pressure calibration information includes a historical systolic blood pressure value and/or a historical diastolic blood pressure value; and if the blood pressure measurement device includes the historical calibration parameter list, and the current confidence coefficient is greater than or equal to a preset confidence coefficient, or is greater than or equal to the historical confidence coefficient, determining the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, and updating the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0007] The first blood pressure measurement information that is obtained through direct measurement based on the physiological signal of the user is used as the calibration information, and a non-calibration result is applied to manual calibration measurement. This ensures accuracy of a measured blood pressure, reduces times of using an extra device for manual calibration by the user, and avoids using an extra device to implement calibration of blood pressure measurement information. Consequently, costs of measuring blood pressure information by using the blood pressure measurement apparatus are reduced, and the blood pressure measurement apparatus has a relatively high portability.

[0008] In a possible implementation, if the blood pressure measurement device does not include the historical calibration parameter list, obtaining a physiological signal of the blood pressure measurement device, where the physiological signal includes an electrocardiogram signal of a user and/or a pulse wave signal of the user; when the current confidence coefficient is less than the historical confidence coefficient, determining second blood pressure measurement information of the blood pressure measurement device based on the historical blood pressure calibration information and the physiological signal, where the second blood pressure measurement information includes a second systolic blood pressure value and/or a second diastolic blood pressure value; obtaining a current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information; if the current blood pressure difference value is greater than or equal to a preset blood pressure difference value, and the current confidence coefficient is greater than or equal to the preset confidence coefficient, adding 1 to a calibration counter; and when a value of the calibration coun-

ter is greater than or equal to a preset value, determining the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, resetting the calibration counter, and updating the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0009] When the current confidence coefficient of the first blood pressure measurement information is less than the historical confidence coefficient of the historical blood pressure calibration information, it is determined whether the difference value between the first blood pressure measurement information and the second blood pressure measurement information is greater than the preset blood pressure value, and it is determined whether the current confidence coefficient of the first blood pressure measurement information is greater than a preset threshold, so as to determine whether accuracy of the first blood pressure measurement information measured by the non-calibration measurement module is higher than accuracy of the second blood pressure measurement information measured by the calibration measurement module. Therefore, availability of using the first blood pressure measurement information as the calibration information is determined.

[0010] In another possible implementation, the current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information may be obtained in the following feasible implementations:

a feasible implementation: determining the current blood pressure difference value based on the first systolic blood pressure value and the second systolic blood pressure value;

another feasible implementation: determining the current blood pressure difference value based on the first diastolic blood pressure value and the second diastolic blood pressure value; and

still another feasible implementation: determining the current blood pressure difference value based on a ratio of the first systolic blood pressure value to the first diastolic blood pressure value, and a ratio of the second systolic blood pressure value to the second diastolic blood pressure value.

[0011] In another possible implementation, the obtaining a current confidence coefficient corresponding to the first blood pressure measurement information includes: obtaining the current confidence coefficient based on at least one of the following parameters: input blood pressure data of the blood pressure measurement device, signal quality of the physiological signal of the blood pressure measurement device, historically input blood pressure data of the blood pressure measurement device, or historical physiological signal data of the blood pressure measurement device. The current confidence coefficient corresponding to the first blood pressure measurement

information is obtained based on the foregoing at least one parameter, so as to more accurately determine availability of using the first blood pressure measurement information as the calibration information.

[0012] In another possible implementation, the obtaining a current confidence coefficient corresponding to the first blood pressure measurement information includes: obtaining a first confidence coefficient based on the signal quality of the physiological signal; obtaining a second confidence coefficient based on a difference between the first blood pressure measurement information and the historical blood pressure calibration information; obtaining a third confidence coefficient based on similarity between the input blood pressure data of the blood pressure measurement device and the historically input blood pressure data of the blood pressure measurement device; and obtaining the current confidence coefficient of the first blood pressure measurement information by performing weighted summation on the first confidence coefficient, the second confidence coefficient, and the third confidence coefficient.

[0013] The current confidence coefficient corresponding to the first blood pressure measurement information is obtained in the implementation of calculating the current confidence coefficient of the first blood pressure measurement information based on the input blood pressure data, the physiological signal, and the first blood pressure measurement information, so as to ensure availability of using the first blood pressure measurement information as the calibration information.

[0014] According to a second aspect, the present invention provides a blood pressure measurement device, including a first obtaining module, a confidence coefficient calculation module, a determining module, and a calibration updating module, where

the first obtaining module is configured to obtain first blood pressure measurement information of the blood pressure measurement device, where the first blood pressure measurement information includes a first systolic blood pressure value and/or a first diastolic blood pressure value;

the confidence coefficient calculation module is configured to obtain a current confidence coefficient corresponding to the first blood pressure measurement information;

the determining module is configured to determine whether the blood pressure measurement device includes a historical calibration parameter list, where the historical calibration parameter list includes historical blood pressure calibration information and a historical confidence coefficient corresponding to the historical blood pressure calibration information, and the historical blood pressure calibration information includes a historical systolic blood pressure value and/or a historical diastolic blood pressure value; and

the calibration updating module is configured to: when the determining module determines that the blood pressure measurement device includes the historical calibra-

tion parameter list, and the current confidence coefficient is greater than or equal to a preset confidence coefficient, or is greater than or equal to the historical confidence coefficient, determine the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0015] The blood pressure measurement device provided in the second aspect of the present invention is configured to perform the technical solution in the method embodiment of the first aspect. The implementation principles and technical effects of the device are similar to those of the technical solution, and are not described herein again.

[0016] In a possible implementation, the blood pressure measurement device further includes a second obtaining module, where

the second obtaining module is configured to: when the determining module determines that the blood pressure measurement device does not include the historical calibration parameter list, obtain a physiological signal of the blood pressure measurement device, where the physiological signal includes an electrocardiogram signal of a user and/or a pulse wave signal of the user; the first obtaining module is further configured to: when the current confidence coefficient is less than the historical confidence coefficient, determine second blood pressure measurement information of the blood pressure measurement device based on the historical blood pressure calibration information and the physiological signal, where the second blood pressure measurement information includes a second systolic blood pressure value and/or a second diastolic blood pressure value; and the calibration updating module is further configured to: obtain a current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information; when the current blood pressure difference value is greater than or equal to a preset blood pressure difference value, and the current confidence coefficient is greater than or equal to the preset confidence coefficient, add 1 to a calibration counter; and when a value of the calibration counter is greater than or equal to a preset value, determine the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, reset the calibration counter, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0017] In another possible implementation, the calibration updating module is specifically configured to:

determine the current blood pressure difference value based on the first systolic blood pressure value and the second systolic blood pressure value; or determine the current blood pressure difference val-

ue based on the first diastolic blood pressure value and the second diastolic blood pressure value; or determine the current blood pressure difference value based on a ratio of the first systolic blood pressure value to the first diastolic blood pressure value, and a ratio of the second systolic blood pressure value to the second diastolic blood pressure value.

[0018] In another possible implementation, the confidence coefficient calculation module is specifically configured to:

obtain the current confidence coefficient based on at least one of the following parameters: input blood pressure data of the blood pressure measurement device, signal quality of the physiological signal of the blood pressure measurement device, historically input blood pressure data of the blood pressure measurement device, or historical physiological signal data of the blood pressure measurement device.

[0019] In another possible implementation, the confidence coefficient calculation module is specifically configured to:

obtain a first confidence coefficient based on the signal quality of the physiological signal;

obtain a second confidence coefficient based on a difference between the first blood pressure measurement information and the historical blood pressure calibration information;

obtain a third confidence coefficient based on similarity between the input blood pressure data of the blood pressure measurement device and the historically input blood pressure data of the blood pressure measurement device; and

obtain the current confidence coefficient of the first blood pressure measurement information by performing weighted summation on the first confidence coefficient, the second confidence coefficient, and the third confidence coefficient.

[0020] The blood pressure measurement device provided in the second aspect of the present invention is configured to perform the technical solution in the method embodiment of the first aspect. The implementation principles and technical effects of the device are similar to those of the technical solution, and are not described herein again.

[0021] According to a third aspect, an embodiment of the present invention provides a blood pressure measurement device, including a memory and a processor, where the memory is configured to store an executable instruction, and the processor is configured to invoke the executable instruction in the memory and perform the following operations:

obtaining first blood pressure measurement information of the blood pressure measurement device and a current confidence coefficient corresponding to the

first blood pressure measurement information, where the first blood pressure measurement information includes a first systolic blood pressure value and/or a first diastolic blood pressure value; determining whether the blood pressure measurement device includes a historical calibration parameter list, where the historical calibration parameter list includes historical blood pressure calibration information and a historical confidence coefficient corresponding to the historical blood pressure calibration information, and the historical blood pressure calibration information includes a historical systolic blood pressure value and/or a historical diastolic blood pressure value; and

if the blood pressure measurement device includes the historical calibration parameter list, and the current confidence coefficient is greater than or equal to a preset confidence coefficient, or is greater than or equal to the historical confidence coefficient, determining the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, and updating the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0022] The blood pressure measurement device provided in the third aspect of the present invention is configured to perform the technical solution in the method embodiment of the first aspect. The implementation principles and technical effects of the device are similar to those of the technical solution, and are not described herein again.

[0023] In a possible implementation, the processor is specifically configured to:

if the blood pressure measurement device does not include the historical calibration parameter list, obtain a physiological signal of the blood pressure measurement device, where the physiological signal includes an electrocardiogram signal of a user and/or a pulse wave signal of the user;

when the current confidence coefficient is less than the historical confidence coefficient, determine second blood pressure measurement information of the blood pressure measurement device based on the historical blood pressure calibration information and the physiological signal, where the second blood pressure measurement information includes a second systolic blood pressure value and/or a second diastolic blood pressure value;

obtain a current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information; and

if the current blood pressure difference value is greater than or equal to a preset blood pressure difference value, and the current confidence coefficient

is greater than or equal to the preset confidence coefficient, add 1 to a calibration counter; and when a value of the calibration counter is greater than or equal to a preset value, determine the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, reset the calibration counter, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0024] In another possible implementation, the processor is specifically configured to:

determine the current blood pressure difference value based on the first systolic blood pressure value and the second systolic blood pressure value; or determine the current blood pressure difference value based on the first diastolic blood pressure value and the second diastolic blood pressure value; or determine the current blood pressure difference value based on a ratio of the first systolic blood pressure value to the first diastolic blood pressure value, and a ratio of the second systolic blood pressure value to the second diastolic blood pressure value.

[0025] In another possible implementation, the processor is specifically configured to:

obtain the current confidence coefficient based on at least one of the following parameters: input blood pressure data of the blood pressure measurement device, signal quality of the physiological signal of the blood pressure measurement device, historically input blood pressure data of the blood pressure measurement device, or historical physiological signal data of the blood pressure measurement device.

[0026] In another possible implementation, the processor is specifically configured to:

obtain a first confidence coefficient based on the signal quality of the physiological signal;

obtain a second confidence coefficient based on a difference between the first blood pressure measurement information and the historical blood pressure calibration information;

obtain a third confidence coefficient based on similarity between the input blood pressure data of the blood pressure measurement device and the historically input blood pressure data of the blood pressure measurement device; and

obtain the current confidence coefficient of the first blood pressure measurement information by performing weighted summation on the first confidence coefficient, the second confidence coefficient, and the third confidence coefficient.

[0027] The blood pressure measurement device provided in the third aspect of the present invention is con-

figured to perform the technical solution in the method embodiment of the first aspect. The implementation principles and technical effects of the device are similar to those of the technical solution, and are not described herein again.

[0028] According to the method for calibrating a blood pressure measurement device and a blood pressure measurement device that are provided in the embodiments of the present invention, the first blood pressure measurement information that is obtained through direct measurement based on the physiological signal of the user is used as the calibration information, and the non-calibration result is applied to manual calibration measurement. This ensures accuracy of a measured blood pressure, reduces times of using an extra device for manual calibration by the user, and avoids using an extra device to implement calibration of blood pressure measurement information. Consequently, costs of measuring blood pressure information by using the blood pressure measurement apparatus are reduced, and the blood pressure measurement device has a relatively high portability.

BRIEF DESCRIPTION OF DRAWINGS

[0029] To describe the technical solutions in the embodiments of the present invention or in the prior art more clearly, the following briefly describes the accompanying drawings required for describing the embodiments or the prior art. Apparently, the accompanying drawings in the following description show merely some embodiments of the present invention, and a person of ordinary skill in the art may still derive other drawings from these accompanying drawings without creative efforts.

FIG. 1 is a schematic diagram of measuring a blood pressure of a user based on a pulse wave signal;
 FIG. 2 is a schematic diagram of measuring a blood pressure of a user based on a pulse wave signal and an electrocardiogram signal;
 FIG. 3 is a schematic diagram of obtaining a PPT based on a pulse wave signal and an electrocardiogram signal;
 FIG. 4A to FIG. 4C are a flowchart of a method for calibrating a blood pressure measurement device according to an embodiment of the present invention;
 FIG. 5 is a flowchart of calculating a current confidence coefficient of first blood pressure measurement information according to an embodiment of the present invention;
 FIG. 6 is a schematic structural diagram of a blood pressure measurement device according to an embodiment of the present invention; and
 FIG. 7 is a schematic structural diagram of a blood pressure measurement device according to an embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0030] The following clearly and completely describes the technical solutions in the embodiments of the present invention with reference to the accompanying drawings in the embodiments of the present invention. Apparently, the described embodiments are merely some but not all of the embodiments of the present invention. All other embodiments obtained by a person of ordinary skill in the art based on the embodiments of the present invention without creative efforts shall fall within the protection scope of the present invention.

[0031] Currently, blood pressure measurement technologies are mainly used to measure a blood pressure of a user by obtaining a physiological signal of the user (hereinafter referred to as the user). The physiological signal of the user includes an electrocardiogram signal and/or a pulse wave signal. The electrocardiogram signal is transmitted when the heart of the user beats, and the pulse wave signal is formed when blood of the user flows in a blood vessel and interacts with the blood vessel. FIG. 1 is a schematic diagram of measuring a blood pressure of a user based on a pulse wave signal. As shown in FIG. 1, a blood flow parameter of blood that flows in the blood vessel is analyzed and obtained based on the pulse wave signal and by using the Photoplethysmography. A pulsatility change of a blood volume of periphery capillaries that is generated with heartbeats is obtained by using the Photoplethysmography (Photoplethysmography, PPG for short), and a PPG signal is further obtained. The PPG is a simple and low-cost optical measurement technology that may be used to detect a blood volume change in a tissue blood vessel. In an implementation principle of measuring a blood pressure based on a pulse wave signal, two photoplethysmography sensors (a PPG 1 and a PPG 2 in FIG. 1) are respectively placed on skin of a brachial artery (a location 1 in FIG. 1) and a middle finger artery (a location 2 in FIG. 1) of the user, a distance between the two arteries may be obtained by measuring a distance between the brachial artery and the middle finger artery, that is, a distance between the two arteries that the pulse wave passes through, a pulse wave transit time (Pulse Transit Time, PTT) may be obtained by measuring a time point T1 when the pulse wave is at the location 1 and a time point T2 when the pulse wave is at the location 2, a pulse wave velocity (Pulse Wave Velocity, PWV) is calculated based on the distance between the two arteries and the pulse wave transit time, and the blood pressure of the user is measured based on a linear relationship between the PWV and the blood pressure.

[0032] FIG. 2 is a schematic diagram of measuring a blood pressure of a user based on a pulse wave signal and an electrocardiogram signal. FIG. 3 is a schematic diagram of obtaining a PPT based on a pulse wave signal and an electrocardiogram signal. As shown in FIG. 2 and FIG. 3, the blood pressure of the user is measured based on a reference point of an electrocardiogram signal and a reference point on a pulse wave signal detected in a

same cardiac cycle. In an implementation principle of measuring a blood pressure based on a pulse wave signal and an electrocardiogram signal, a photoplethysmography sensor is placed on skin of a little finger artery of the user, and a pressure pulse wave sensor is placed on skin of a wrist of the user, a distance between the two arteries is obtained by measuring a distance between the little finger artery (a location 1 in FIG. 2) and the wrist (a location 2 in FIG. 2) of the user, the PPT may be obtained by measuring a time point when the pulse wave is at the location 1 and a time point when the electrocardiogram signal is at the location 2, a PWV is calculated based on the distance between the two arteries and the PTT, and the blood pressure of the user is measured based on a linear relationship between the PWV and the blood pressure.

[0033] Specific embodiments are used below to describe in detail the technical solutions of the present invention. The following several specific embodiments may be combined with each other, and a same or similar concept or process may not be described repeatedly in some embodiments.

[0034] FIG. 4A to FIG. 4C are a flowchart of a method for calibrating a blood pressure measurement device according to an embodiment of the present invention. As shown in FIG. 4, the method for calibrating a blood pressure measurement device according to an embodiment of the present invention includes the following steps.

[0035] S401. Obtain first blood pressure measurement information of the blood pressure measurement device.

[0036] The first blood pressure measurement information includes a first systolic blood pressure value and/or a first diastolic blood pressure value. The first blood pressure measurement information is to-be-calibrated blood pressure information.

[0037] Specifically, the method for calibrating a blood pressure measurement device provided in this embodiment of the present invention may be applied to a calibration apparatus of the blood pressure measurement device. The calibration apparatus of the blood pressure measurement device may be terminals such as a mobile phone and a wearable device. In this embodiment, the blood pressure measurement apparatus may include a first calibration measurement module and a second calibration measurement module. The first calibration measurement module is a non-calibration measurement module, and the second calibration measurement module is a calibration measurement module. When a user needs to measure a blood pressure, the user may enable the non-calibration measurement module by inputting personal information of the user (such as a height, a weight, an age, and a gender) and collecting a physiological signal in a specified period (for example, 30 seconds). The non-calibration measurement module may collect at least one physiological signal of the user, such as an electrocardiogram signal and/or a pulse wave signal. First blood pressure measurement information of the user is obtained based on the collected physiological sig-

nal and is used as the first blood pressure measurement information of the blood pressure measurement device. The first blood pressure measurement information is blood pressure measurement information of the user that is directly obtained through calculation based on the physiological signal of the user without being calibrated by using any calibration information. The first blood pressure measurement information includes a systolic blood pressure (Systolic pressure, SBP for short) of the user, a diastolic blood pressure (Diastolic pressure, DBP for short) of the user, and a pulse wave transit time (Pulse Transit Time, PTT) of the user. For example, if a measurement result is SBP/DBP = 112/72 mmHg (mmHg), it indicates that currently a systolic blood pressure is 112 mmHg, and a diastolic blood pressure is 72 mmHg.

[0038] It should be noted that the electrocardiogram signal in this embodiment may be measured by using an optical sensor, a pressure sensor, a sound sensor, a photoelectric sensor, an acceleration sensor, or a displacement sensor, and the pulse wave may be represented by using a photoplethysmogram signal collected by a photoelectric sensor. For information about obtaining, by the non-calibration measurement module, the blood pressure measurement information of the user based on the physiological signal of the user, refer to the foregoing description of FIG. 1 and FIG. 2. This is not limited and details are not described in this embodiment.

[0039] It should be noted that when a user needs to measure a blood pressure, the user may enable the non-calibration measurement module by inputting personal information of the user (such as a height, a weight, an age, and a gender) and collecting a physiological signal in a specified period (for example, 30 seconds). The user may set different user accounts, and each user account stores corresponding personal information of a user. For a user that has registered an account, the user may directly use the existing account to log in. For a user that logs in for the first time, the user needs to register a new account name, and input personal information of the user under the account name. When the user inputs the account name to log in to a personal account, the non-calibration measurement module may directly obtain user information stored under the account name, and determine whether historical blood pressure calibration information exists in a calibration database under the account name.

[0040] S402. Obtain a current confidence coefficient corresponding to the first blood pressure measurement information.

[0041] Specifically, this embodiment of the present invention uses the confidence coefficient to measure accuracy of the first blood pressure measurement information, so as to determine availability of using the first blood pressure measurement information measured by the non-calibration measurement module as calibration information.

[0042] Optionally, the current confidence coefficient may be obtained based on at least one of the following

parameters: input blood pressure data of the blood pressure measurement device, signal quality of the physiological signal of the blood pressure measurement device, historically input blood pressure data of the blood pressure measurement device, or historical physiological signal data of the blood pressure measurement device.

[0043] Specifically, in this embodiment, the current confidence coefficient corresponding to the first blood pressure measurement information (hereinafter referred to as the current confidence coefficient) may be calculated based on one of or a combination of the following: 1. Determining the current confidence coefficient of the first blood pressure measurement information based on input blood pressure data that is of an external user and that is obtained by the non-calibration measurement module; 2. Determining the current confidence coefficient of the first blood pressure measurement information based on historically input blood pressure data that is of the user and that is obtained by the calibration measurement module; 3. Calculating, by the non-calibration measurement module, the signal quality (such as a signal-to-noise ratio, an AC/DC ratio, and signal strength) based on the collected physiological signal of the user, and mapping the signal quality to the current confidence coefficient of the first blood pressure measurement information; 4. Calculating, by the calibration measurement module, the signal quality (such as a signal-to-noise ratio, an AC/DC ratio, and signal strength) based on the historical physiological signal of the user, and mapping the signal quality to the current confidence coefficient of the first blood pressure measurement information; 5. Using a confidence coefficient directly provided by the non-calibration measurement module as the current confidence coefficient of the first blood pressure measurement information; or 6. Calculating, by the current confidence coefficient of the first blood pressure measurement information based on the input blood pressure data, the physiological signal, and the first blood pressure measurement information.

[0044] Optionally, the obtaining a current confidence coefficient corresponding to the first blood pressure measurement information includes: obtaining a first confidence coefficient Q1 based on the signal quality of the physiological signal; obtaining a second confidence coefficient Q2 based on a difference between the first blood pressure measurement information and the preset calibration information; obtaining a third confidence coefficient Q3 based on similarity between the input blood pressure data and the historically input blood pressure data; and obtaining the current confidence coefficient Q of the first blood pressure measurement information by performing weighted summation on the first confidence coefficient Q1, the second confidence coefficient Q2, and the third confidence coefficient Q3.

[0045] Specifically, in this embodiment, the current confidence coefficient corresponding to the first blood pressure measurement information (hereinafter referred to as the current confidence coefficient) is calculated

based on the input blood pressure data, the physiological signal, and the first blood pressure measurement information. FIG. 5 is a flowchart of calculating a current confidence coefficient of first blood pressure measurement information according to an embodiment of the present invention. As shown in FIG. 5, the first confidence coefficient Q1 is obtained based on the signal quality of the physiological signal, the second confidence coefficient Q2 is obtained based on the difference between the first blood pressure measurement information and the historical blood pressure calibration information, and the third confidence coefficient Q3 is obtained based on the similarity between the input blood pressure data and the historically input blood pressure data. The current confidence coefficient Q of the first blood pressure measurement information is obtained based on the first confidence coefficient Q1, the second confidence coefficient Q2, and the third confidence coefficient Q3 and by using

$$Q = \sum_{i=1}^3 \omega_i Q_i \text{ and } \sum_{i=1}^3 \omega_i = 1$$

The weighted

weight ω_i may be a fixed value, and in this case, $\omega_i = \frac{1}{3}$,

or ω_i may be obtained through calculation based on an analytic hierarchy process. This is not limited and details are not described in this embodiment. It should be noted that in this embodiment, alternatively, an arithmetic average value of the first confidence coefficient Q1, the second confidence coefficient Q2, and the third confidence coefficient Q3 may be used as the current confidence coefficient Q of the first blood pressure measurement information.

[0046] S403. Determine whether the blood pressure measurement device includes a historical calibration parameter list. If the blood pressure measurement device does not include the historical calibration parameter list, perform S404; or if the blood pressure measurement device includes the historical calibration parameter list, perform S406.

[0047] The historical calibration parameter list includes historical blood pressure calibration information and a historical confidence coefficient corresponding to the historical blood pressure calibration information, and the historical blood pressure calibration information includes a historical systolic blood pressure value and/or a historical diastolic blood pressure value.

[0048] Specifically, in this embodiment, it is determined whether the blood pressure measurement device includes the historical calibration parameter list, to determine whether calibration of the blood pressure measurement device of the user has a historical calibration scenario or does not have the historical calibration scenario, so as to determine how to set calibration information of the blood pressure measurement device and how to update the calibration information of the blood pressure measurement device in subsequent steps. The historical

blood pressure calibration information may include an SBP, a DBP, and a PTT. The historical blood pressure calibration information may be from actual blood pressure data of the user that is input by the user, and in this case, the historical confidence coefficient of the historical blood pressure calibration information is 1. Alternatively, the historical blood pressure calibration information may be from the first blood pressure measurement information measured by the non-calibration measurement module, and in this case, the historical confidence coefficient of the historical blood pressure calibration information is the current confidence coefficient of the first blood pressure measurement information.

[0049] It should be noted that a performing sequence between S402 and S403 is interchangeable. S403 may be performed first, and then S402 is performed. This is not limited and details are not described in this embodiment.

[0050] S404. Determine whether the current confidence coefficient of the first blood pressure measurement information is greater than or equal to a preset confidence coefficient. If the current confidence coefficient of the first blood pressure measurement information is greater than or equal to the preset confidence coefficient, perform S405; or if the current confidence coefficient of the first blood pressure measurement information is less than the preset confidence coefficient, the process ends.

[0051] Specifically, when it is detected in S403 that no historical blood pressure calibration information exists in the calibration database, the first blood pressure measurement information may be directly used as the calibration information for calibration in this embodiment. Before the first blood pressure measurement information is used as the calibration information for calibration, the current confidence coefficient of the first blood pressure measurement information needs to be determined, so as to determine availability of using the first blood pressure measurement information measured by the non-calibration measurement module as the calibration information.

[0052] S405. Determine the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0053] Specifically, when it is detected in S403 that no historical blood pressure calibration information exists in the calibration database, if the current confidence coefficient of the first blood pressure measurement information is greater than or equal to the preset confidence coefficient, where the preset confidence coefficient may be 90%, the current confidence coefficient of the first blood pressure measurement information is high, an error between the first blood pressure measurement information and an actual blood pressure of the user is relatively small, and accuracy of a blood pressure measured by the non-calibration measurement module is relatively high. In this case, the first blood pressure measurement

information may be used as the blood pressure calibration information, that is, the calibration measurement module may calculate the blood pressure based on the first blood pressure measurement information and the collected physiological signal of the user, which may be specifically: performing calibration, by using the first blood pressure measurement information, on the blood pressure measurement information obtained based on the physiological signal of the user, so as to output the blood pressure measurement information matching the actual blood pressure of the user, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient. It is detected in S403 that no historical calibration information exists, that is, the historical list is not included. Therefore, it may be understood that the updating the historical calibration parameter list described herein is establishing the historical calibration parameter list. When it is detected in S403 that no historical blood pressure calibration information exists in the calibration database, if the current confidence coefficient of the first blood pressure measurement information is less than the preset confidence coefficient, the process ends and no subsequent process is implemented.

[0054] S406. Obtain the historical calibration parameter list of the blood pressure measurement device.

[0055] S407. Determine whether the current confidence coefficient of the first blood pressure measurement information is greater than or equal to a historical confidence coefficient. If the current confidence coefficient of the first blood pressure measurement information is greater than or equal to the historical confidence coefficient, perform S408; or if the current confidence coefficient of the first blood pressure measurement information is less than the historical confidence coefficient, perform S409.

[0056] Specifically, in S406 and S407, when it is detected in S403 that the historical blood pressure calibration information exists in the calibration database, the historical blood pressure calibration information and the historical calibration parameter list that are of the blood pressure measurement device are obtained, and it is determined whether the current confidence coefficient of the first blood pressure measurement information is greater than or equal to the historical confidence coefficient corresponding to the historical blood pressure calibration information in the historical calibration parameter list, so as to determine whether the first blood pressure measurement information may be used as the calibration information for calibration.

[0057] S408. Determine the first blood pressure measurement information as the blood pressure calibration information of the blood pressure measurement device, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0058] Specifically, when it is detected in S403 that the historical blood pressure calibration information exists in

the calibration database, and the current confidence coefficient of the first blood pressure measurement information is greater than or equal to the historical confidence coefficient corresponding to the historical blood pressure calibration information, the current confidence coefficient of the first blood pressure measurement information is high, the error between the first blood pressure measurement information and the actual blood pressure of the user is relatively small, and the accuracy of the blood pressure measured by the non-calibration measurement module is relatively high. In this case, the first blood pressure measurement information may be used as the blood pressure calibration information, that is, the calibration measurement module may calculate the blood pressure based on the first blood pressure measurement information and the collected physiological signal of the user, which may be specifically: performing calibration, by using the first blood pressure measurement information, on the blood pressure measurement information obtained based on the physiological signal of the user, so as to output the blood pressure measurement information matching the actual blood pressure of the user, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0059] S409. Determine second blood pressure measurement information of the blood pressure measurement device based on historical blood pressure calibration information and a physiological signal.

[0060] The second blood pressure measurement information includes a second systolic blood pressure value and/or a second diastolic blood pressure value.

[0061] Further, when the first blood pressure measurement information of the blood pressure measurement device is obtained in S401, the physiological signal in the blood pressure measurement device is obtained, where the physiological signal includes an electrocardiogram signal of a user and/or a pulse wave signal of the user.

[0062] Specifically, when it is detected in S403 that the historical blood pressure calibration information exists in the calibration database, and the current confidence coefficient of the first blood pressure measurement information is less than the historical confidence coefficient, the second blood pressure measurement information of the blood pressure measurement device is determined based on the historical blood pressure calibration information and the physiological signal in this embodiment, which is specifically obtaining the second blood pressure measurement information after performing calibration, by using the historical blood pressure calibration information, on the blood pressure measurement information of the user that is obtained based on the physiological signal.

[0063] S410. Obtain a current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information.

[0064] Specifically, the current blood pressure differ-

ence value between the first blood pressure measurement information and the second blood pressure measurement information may be determined based on a current blood pressure difference value between the first systolic blood pressure value and the second systolic blood pressure value; or the current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information may be determined based on a current blood pressure difference value between the first diastolic blood pressure value and the second diastolic blood pressure value; or the current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information may be determined based on a ratio of the first systolic blood pressure value to the first diastolic blood pressure value, and a ratio of the second systolic blood pressure value to the second diastolic blood pressure value.

[0065] The current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information is determined, so as to determine whether the first blood pressure measurement information may be used as the calibration information for calibration.

[0066] S411. Determine whether a current blood pressure difference value is greater than a preset blood pressure difference value, and determine whether the current confidence coefficient of the first blood pressure measurement information is greater than the preset confidence coefficient. If the current blood pressure difference value is greater than or equal to the preset blood pressure difference value, and the current confidence coefficient of the first blood pressure measurement information is greater than or equal to the preset confidence coefficient, perform S412; or if the current blood pressure difference value is less than the preset blood pressure difference value, and the current confidence coefficient of the first blood pressure measurement information is less than the preset confidence coefficient, the process ends.

[0067] Specifically, when it is detected in S403 that the historical blood pressure calibration information exists in the calibration database, and the current confidence coefficient of the first blood pressure measurement information is less than the historical confidence coefficient of the historical blood pressure calibration information, it is determined whether the difference value between the first blood pressure measurement information and the second blood pressure measurement information is greater than a preset blood pressure value, and it is determined whether the current confidence coefficient of the first blood pressure measurement information is greater than the preset confidence coefficient, so as to determine whether accuracy of the first blood pressure measurement information measured by the non-calibration measurement module is higher than accuracy of the second blood pressure measurement information measured by the calibration measurement module. Therefore,

availability of using the first blood pressure measurement information as the calibration information is determined.

[0068] S412. Add 1 to a calibration counter.

[0069] Specifically, the calibration counter may be provided in this embodiment of the present invention. When it is determined in S410 that the difference value between the first blood pressure measurement information and the second blood pressure measurement information is greater than the preset blood pressure value, and it is determined that the current confidence coefficient of the first blood pressure measurement information is greater than the preset confidence coefficient, 1 is added to the calibration counter.

[0070] S413. Determine whether a value of the calibration counter is greater than or equal to a preset value. If the value of the calibration counter is greater than or equal to the preset value, perform S414; or if the value of the calibration counter is less than the preset value, the process ends.

[0071] Specifically, in this embodiment, the value of the calibration counter is compared with the preset value. The preset value may be 3, 4, 5, or the like. For example, in this embodiment, the preset value is set to 5, so as to further determine the availability of using the first blood pressure measurement information as the calibration information.

[0072] S414. Determine the first blood pressure measurement information as the blood pressure calibration information of the blood pressure measurement device, reset the calibration counter, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0073] Specifically, when it is determined in S413 that the value of the calibration counter is greater than or equal to the preset value, accuracy of the first blood pressure measurement information is relatively high. The first blood pressure measurement information may be used to perform calibration on blood pressure measurement information of the user, and the historical blood pressure calibration information is updated with first blood pressure measurement information, the historical confidence coefficient of the historical blood pressure calibration information is updated with the current confidence coefficient of the first blood pressure measurement information, and the calibration counter is reset, so as to implement updating of the calibration database and updating of the calibration counter.

[0074] According to the method for calibrating a blood pressure measurement device provided in this embodiment of the present invention, the first blood pressure measurement information that is obtained through direct measurement based on the physiological signal of the user is used as the calibration information, and a non-calibration result is applied to manual calibration measurement. This ensures accuracy of a measured blood pressure, reduces times of using an extra device for manual calibration by the user, and avoids using an extra

device to implement calibration of blood pressure measurement information. Consequently, costs of measuring blood pressure information by using the blood pressure measurement apparatus are reduced, and the blood pressure measurement device has a relatively high portability. In addition, it is determined whether the historical blood pressure calibration information exists in the calibration database, two different algorithms are used to determine availability of using the first blood pressure measurement information as the calibration information, and when the historical blood pressure calibration information exists in the calibration database, the historical blood pressure calibration information is updated with the first blood pressure measurement information, so that updated historical blood pressure calibration information matches as much as possible the actual blood pressure of the user to further ensure accuracy of the blood pressure measurement information. When the current confidence coefficient of the first blood pressure measurement information is less than the historical confidence coefficient of the historical blood pressure calibration information, it is determined whether the difference value between the first blood pressure measurement information and the second blood pressure measurement information is greater than the preset blood pressure value, and it is determined whether the current confidence coefficient of the first blood pressure measurement information is greater than a preset threshold, so as to determine whether accuracy of the first blood pressure measurement information measured by the non-calibration measurement module is higher than accuracy of the second blood pressure measurement information measured by the calibration measurement module. Therefore, availability of using the first blood pressure measurement information as the calibration information is determined.

[0075] FIG. 6 is a schematic structural diagram of a blood pressure measurement device according to an embodiment of the present invention. As shown in FIG. 6, the blood pressure measurement device includes a first obtaining module 61, a confidence coefficient calculation module 62, a determining module 63, and a calibration updating module 64.

[0076] The first obtaining module 61 is configured to obtain first blood pressure measurement information of the blood pressure measurement device, where the first blood pressure measurement information includes a first systolic blood pressure value and/or a first diastolic blood pressure value.

[0077] The confidence coefficient calculation module 62 is configured to obtain a current confidence coefficient corresponding to the first blood pressure measurement information.

[0078] The determining module 63 is configured to determine whether the blood pressure measurement device includes a historical calibration parameter list, where the historical calibration parameter list includes historical blood pressure calibration information and a historical confidence coefficient corresponding to the historical

blood pressure calibration information, and the historical blood pressure calibration information includes a historical systolic blood pressure value and/or a historical diastolic blood pressure value.

[0079] The calibration updating module 64 is configured to: when the determining module 63 determines that the blood pressure measurement device includes the historical calibration parameter list, and the current confidence coefficient is greater than or equal to a preset confidence coefficient, or is greater than or equal to the historical confidence coefficient, determine the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0080] The blood pressure measurement device in this embodiment of the present invention may perform the technical solution shown in the foregoing method embodiment. The implementation principles and beneficial effects of the device are similar to those of the technical solution, and are not described herein again.

[0081] In a possible implementation, the blood pressure measurement device further includes a second obtaining module 65.

[0082] The second obtaining module 65 is configured to: when the determining module 63 determines that the blood pressure measurement device does not include the historical calibration parameter list, obtain a physiological signal of the blood pressure measurement device, where the physiological signal includes an electrocardiogram signal of a user and/or a pulse wave signal of the user.

[0083] The first obtaining module 61 is further configured to: when the current confidence coefficient is less than the historical confidence coefficient, determine second blood pressure measurement information of the blood pressure measurement device based on the historical blood pressure calibration information and the physiological signal, where the second blood pressure measurement information includes a second systolic blood pressure value and/or a second diastolic blood pressure value.

[0084] The calibration updating module 64 is further configured to: obtain a current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information; when the current blood pressure difference value is greater than or equal to a preset blood pressure difference value, and the current confidence coefficient is greater than or equal to the preset confidence coefficient, add 1 to a calibration counter; and when a value of the calibration counter is greater than or equal to a preset value, determine the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, reset the calibration counter, and update the historical calibration parameter list based on the first blood pressure

measurement information and the current confidence coefficient.

[0085] In another possible implementation, the calibration updating module 64 is specifically configured to:

determine the current blood pressure difference value based on the first systolic blood pressure value and the second systolic blood pressure value; or determine the current blood pressure difference value based on the first diastolic blood pressure value and the second diastolic blood pressure value; or determine the current blood pressure difference value based on a ratio of the first systolic blood pressure value to the first diastolic blood pressure value, and a ratio of the second systolic blood pressure value to the second diastolic blood pressure value.

[0086] In another possible implementation, the confidence coefficient calculation module 62 is specifically configured to:

obtain the current confidence coefficient based on at least one of the following parameters: input blood pressure data of the blood pressure measurement device, signal quality of the physiological signal of the blood pressure measurement device, historically input blood pressure data of the blood pressure measurement device, or historical physiological signal data of the blood pressure measurement device.

[0087] In another possible implementation, the confidence coefficient calculation module 62 is specifically configured to:

obtain a first confidence coefficient based on the signal quality of the physiological signal;
obtain a second confidence coefficient based on a difference between the first blood pressure measurement information and the historical blood pressure calibration information;
obtain a third confidence coefficient based on similarity between the input blood pressure data of the blood pressure measurement device and the historically input blood pressure data of the blood pressure measurement device; and
obtain the current confidence coefficient of the first blood pressure measurement information by performing weighted summation on the first confidence coefficient, the second confidence coefficient, and the third confidence coefficient.

[0088] The blood pressure measurement device in this embodiment of the present invention may perform the technical solution shown in the foregoing method embodiment. The implementation principles and beneficial effects of the device are similar to those of the technical solution, and are not described herein again.

[0089] FIG. 7 is a schematic structural diagram of a blood pressure measurement device according to an embodiment of the present invention. As shown in FIG. 7,

the blood pressure measurement device provided in this embodiment of the present invention includes a memory 71 and a processor 72.

[0090] Specifically, the memory 71 is configured to store an executable instruction. The processor 72 may be a central processing unit (Central Processing Unit, CPU) 72, or an application-specific integrated circuit (Application Specific Integrated Circuit, ASIC), or one or more integrated circuits configured to implement this embodiment of the present invention. The processor 72 is configured to invoke the executable instruction in the memory 71 and perform the following operations:

obtaining first blood pressure measurement information of the blood pressure measurement device and a current confidence coefficient corresponding to the first blood pressure measurement information, where the first blood pressure measurement information includes a first systolic blood pressure value and/or a first diastolic blood pressure value;

determining whether the blood pressure measurement device includes a historical calibration parameter list, where the historical calibration parameter list includes historical blood pressure calibration information and a historical confidence coefficient corresponding to the historical blood pressure calibration information, and the historical blood pressure calibration information includes a historical systolic blood pressure value and/or a historical diastolic blood pressure value; and

if the blood pressure measurement device includes the historical calibration parameter list, and the current confidence coefficient is greater than or equal to a preset confidence coefficient, or is greater than or equal to the historical confidence coefficient, determining the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, and updating the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0091] The blood pressure measurement device in this embodiment of the present invention may perform the technical solution shown in the foregoing method embodiment. The implementation principles and beneficial effects of the device are similar to those of the technical solution, and are not described herein again.

[0092] In a possible implementation, the processor 72 is specifically configured to:

if the blood pressure measurement device does not include the historical calibration parameter list, obtain a physiological signal of the blood pressure measurement device, where the physiological signal includes an electrocardiogram signal of a user and/or a pulse wave signal of the user; when the current confidence coefficient is less than

the historical confidence coefficient, determine second blood pressure measurement information of the blood pressure measurement device based on the historical blood pressure calibration information and the physiological signal, where the second blood pressure measurement information includes a second systolic blood pressure value and/or a second diastolic blood pressure value;

obtain a current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information; and

if the current blood pressure difference value is greater than or equal to a preset blood pressure difference value, and the current confidence coefficient is greater than or equal to the preset confidence coefficient, add 1 to a calibration counter; and when a value of the calibration counter is greater than or equal to a preset value, determine the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, reset the calibration counter, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

[0093] In another possible implementation, the processor 72 is specifically configured to:

determine the current blood pressure difference value based on the first systolic blood pressure value and the second systolic blood pressure value; or determine the current blood pressure difference value based on the first diastolic blood pressure value and the second diastolic blood pressure value; or determine the current blood pressure difference value based on a ratio of the first systolic blood pressure value to the first diastolic blood pressure value, and a ratio of the second systolic blood pressure value to the second diastolic blood pressure value.

[0094] In another possible implementation, the processor 72 is specifically configured to:

obtain the current confidence coefficient based on at least one of the following parameters: input blood pressure data of the blood pressure measurement device, signal quality of the physiological signal of the blood pressure measurement device, historically input blood pressure data of the blood pressure measurement device, or historical physiological signal data of the blood pressure measurement device.

[0095] In another possible implementation, the processor 72 is specifically configured to:

obtain a first confidence coefficient based on the signal quality of the physiological signal; obtain a second confidence coefficient based on a difference between the first blood pressure meas-

urement information and the historical blood pressure calibration information;

obtain a third confidence coefficient based on similarity between the input blood pressure data of the blood pressure measurement device and the historically input blood pressure data of the blood pressure measurement device; and

obtain the current confidence coefficient of the first blood pressure measurement information by performing weighted summation on the first confidence coefficient, the second confidence coefficient, and the third confidence coefficient.

[0096] The blood pressure measurement device in this embodiment of the present invention may perform the technical solution shown in the foregoing method embodiment. The implementation principles and beneficial effects of the device are similar to those of the technical solution, and are not described herein again.

[0097] Finally, it should be noted that the foregoing embodiments are merely intended for describing the technical solutions of the present invention, but not for limiting the present invention. Although the present invention is described in detail with reference to the foregoing embodiments, a person of ordinary skill in the art should understand that they may still make modifications to the technical solutions described in the foregoing embodiments or make equivalent replacements to some or all technical features thereof, without departing from the scope of the technical solutions of the embodiments of the present invention.

Claims

1. A method for calibrating a blood pressure measurement device, comprising:

obtaining first blood pressure measurement information of the blood pressure measurement device and a current confidence coefficient corresponding to the first blood pressure measurement information, wherein the first blood pressure measurement information comprises a first systolic blood pressure value and/or a first diastolic blood pressure value;

determining whether the blood pressure measurement device comprises a historical calibration parameter list, wherein the historical calibration parameter list comprises historical blood pressure calibration information and a historical confidence coefficient corresponding to the historical blood pressure calibration information, and the historical blood pressure calibration information comprises a historical systolic blood pressure value and/or a historical diastolic blood pressure value; and

if the blood pressure measurement device com-

prises the historical calibration parameter list, and the current confidence coefficient is greater than or equal to a preset confidence coefficient, or is greater than or equal to the historical confidence coefficient, determining the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, and updating the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

2. The method according to claim 1, wherein the method further comprises:

if the blood pressure measurement device does not comprise the historical calibration parameter list, obtaining a physiological signal of the blood pressure measurement device, wherein the physiological signal comprises an electrocardiogram signal of a user and/or a pulse wave signal of the user;

when the current confidence coefficient is less than the historical confidence coefficient, determining second blood pressure measurement information of the blood pressure measurement device based on the historical blood pressure calibration information and the physiological signal, wherein the second blood pressure measurement information comprises a second systolic blood pressure value and/or a second diastolic blood pressure value;

obtaining a current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information; and

if the current blood pressure difference value is greater than or equal to a preset blood pressure difference value, and the current confidence coefficient is greater than or equal to the preset confidence coefficient, adding 1 to a calibration counter; and when a value of the calibration counter is greater than or equal to a preset value, determining the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, resetting the calibration counter, and updating the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

3. The method according to claim 2, wherein the obtaining a current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information comprises:

- determining the current blood pressure difference value based on the first systolic blood pressure value and the second systolic blood pressure value; or
determining the current blood pressure difference value based on the first diastolic blood pressure value and the second diastolic blood pressure value; or
determining the current blood pressure difference value based on a ratio of the first systolic blood pressure value to the first diastolic blood pressure value, and a ratio of the second systolic blood pressure value to the second diastolic blood pressure value.
4. The method according to claim 2 or 3, wherein the obtaining a current confidence coefficient corresponding to the first blood pressure measurement information comprises:
obtaining the current confidence coefficient based on at least one of the following parameters: input blood pressure data of the blood pressure measurement device, signal quality of the physiological signal of the blood pressure measurement device, historically input blood pressure data of the blood pressure measurement device, or historical physiological signal data of the blood pressure measurement device.
5. The method according to claim 2 or 3, wherein the obtaining a current confidence coefficient corresponding to the first blood pressure measurement information comprises:
obtaining a first confidence coefficient based on the signal quality of the physiological signal;
obtaining a second confidence coefficient based on a difference between the first blood pressure measurement information and the historical blood pressure calibration information;
obtaining a third confidence coefficient based on similarity between the input blood pressure data of the blood pressure measurement device and the historically input blood pressure data of the blood pressure measurement device; and
obtaining the current confidence coefficient of the first blood pressure measurement information by performing weighted summation on the first confidence coefficient, the second confidence coefficient, and the third confidence coefficient.
6. A blood pressure measurement device, comprising a first obtaining module, a confidence coefficient calculation module, a determining module, and a calibration updating module, wherein:
the first obtaining module is configured to obtain first blood pressure measurement information
- of the blood pressure measurement device, wherein the first blood pressure measurement information comprises a first systolic blood pressure value and/or a first diastolic blood pressure value;
the confidence coefficient calculation module is configured to obtain a current confidence coefficient corresponding to the first blood pressure measurement information;
the determining module is configured to determine whether the blood pressure measurement device comprises a historical calibration parameter list, wherein the historical calibration parameter list comprises historical blood pressure calibration information and a historical confidence coefficient corresponding to the historical blood pressure calibration information, and the historical blood pressure calibration information comprises a historical systolic blood pressure value and/or a historical diastolic blood pressure value; and
the calibration updating module is configured to: when the determining module determines that the blood pressure measurement device comprises the historical calibration parameter list, and the current confidence coefficient is greater than or equal to a preset confidence coefficient, or is greater than or equal to the historical confidence coefficient, determine the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.
7. The device according to claim 6, wherein the blood pressure measurement device further comprises a second obtaining module, wherein:
the second obtaining module is configured to: when the determining module determines that the blood pressure measurement device does not comprise the historical calibration parameter list, obtain a physiological signal of the blood pressure measurement device, wherein the physiological signal comprises an electrocardiogram signal of a user and/or a pulse wave signal of the user;
the first obtaining module is further configured to: when the current confidence coefficient is less than the historical confidence coefficient, determine second blood pressure measurement information of the blood pressure measurement device based on the historical blood pressure calibration information and the physiological signal, wherein the second blood pressure measurement information comprises a

- second systolic blood pressure value and/or a second diastolic blood pressure value; and the calibration updating module is further configured to: obtain a current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information; when the current blood pressure difference value is greater than or equal to a preset blood pressure difference value, and the current confidence coefficient is greater than or equal to the preset confidence coefficient, add 1 to a calibration counter; and when a value of the calibration counter is greater than or equal to a preset value, determine the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, reset the calibration counter, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.
8. The device according to claim 7, wherein the calibration updating module is specifically configured to:
- determine the current blood pressure difference value based on the first systolic blood pressure value and the second systolic blood pressure value;
 - or
 - determine the current blood pressure difference value based on the first diastolic blood pressure value and the second diastolic blood pressure value;
 - or
 - determine the current blood pressure difference value based on a ratio of the first systolic blood pressure value to the first diastolic blood pressure value, and a ratio of the second systolic blood pressure value to the second diastolic blood pressure value.
9. The device according to claim 7 or 8, wherein the confidence coefficient calculation module is specifically configured to:
- obtain the current confidence coefficient based on at least one of the following parameters: input blood pressure data of the blood pressure measurement device, signal quality of the physiological signal of the blood pressure measurement device, historically input blood pressure data of the blood pressure measurement device, or historical physiological signal data of the blood pressure measurement device.
10. The device according to claim 7 or 8, wherein the confidence coefficient calculation module is specifically configured to:
- obtain a first confidence coefficient based on the signal quality of the physiological signal;
 - obtain a second confidence coefficient based on a difference between the first blood pressure measurement information and the historical blood pressure calibration information;
 - obtain a third confidence coefficient based on similarity between the input blood pressure data of the blood pressure measurement device and the historically input blood pressure data of the blood pressure measurement device; and
 - obtain the current confidence coefficient of the first blood pressure measurement information by performing weighted summation on the first confidence coefficient, the second confidence coefficient, and the third confidence coefficient.
11. A blood pressure measurement device, comprising a memory and a processor, wherein the memory is configured to store an executable instruction, and the processor is configured to invoke the executable instruction in the memory and perform the following operations:
- obtaining first blood pressure measurement information of the blood pressure measurement device and a current confidence coefficient corresponding to the first blood pressure measurement information, wherein the first blood pressure measurement information comprises a first systolic blood pressure value and/or a first diastolic blood pressure value;
 - determining whether the blood pressure measurement device comprises a historical calibration parameter list, wherein the historical calibration parameter list comprises historical blood pressure calibration information and a historical confidence coefficient corresponding to the historical blood pressure calibration information, and the historical blood pressure calibration information comprises a historical systolic blood pressure value and/or a historical diastolic blood pressure value; and
 - if the blood pressure measurement device comprises the historical calibration parameter list, and the current confidence coefficient is greater than or equal to a preset confidence coefficient, or is greater than or equal to the historical confidence coefficient, determining the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, and updating the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.
12. The device according to claim 11, wherein the processor is specifically configured to:

if the blood pressure measurement device does not comprise the historical calibration parameter list, obtain a physiological signal of the blood pressure measurement device, wherein the physiological signal comprises an electrocardiogram signal of a user and/or a pulse wave signal of the user;

when the current confidence coefficient is less than the historical confidence coefficient, determine second blood pressure measurement information of the blood pressure measurement device based on the historical blood pressure calibration information and the physiological signal, wherein the second blood pressure measurement information comprises a second systolic blood pressure value and/or a second diastolic blood pressure value;

obtain a current blood pressure difference value between the first blood pressure measurement information and the second blood pressure measurement information; and

if the current blood pressure difference value is greater than or equal to a preset blood pressure difference value, and the current confidence coefficient is greater than or equal to the preset confidence coefficient, add 1 to a calibration counter; and when a value of the calibration counter is greater than or equal to a preset value, determine the first blood pressure measurement information as blood pressure calibration information of the blood pressure measurement device, reset the calibration counter, and update the historical calibration parameter list based on the first blood pressure measurement information and the current confidence coefficient.

13. The device according to claim 12, wherein the processor is specifically configured to:

determine the current blood pressure difference value based on the first systolic blood pressure value and the second systolic blood pressure value;

or

determine the current blood pressure difference value based on the first diastolic blood pressure value and the second diastolic blood pressure value;

or

determine the current blood pressure difference value based on a ratio of the first systolic blood pressure value to the first diastolic blood pressure value, and a ratio of the second systolic blood pressure value to the second diastolic blood pressure value.

14. The device according to claim 12 or 13, wherein the processor is specifically configured to:

obtain the current confidence coefficient based on at least one of the following parameters: input blood pressure data of the blood pressure measurement device, signal quality of the physiological signal of the blood pressure measurement device, historically input blood pressure data of the blood pressure measurement device, or historical physiological signal data of the blood pressure measurement device.

15. The device according to claim 12 or 13, wherein the processor is specifically configured to:

obtain a first confidence coefficient based on the signal quality of the physiological signal;

obtain a second confidence coefficient based on a difference between the first blood pressure measurement information and the historical blood pressure calibration information;

obtain a third confidence coefficient based on similarity between the input blood pressure data of the blood pressure measurement device and the historically input blood pressure data of the blood pressure measurement device; and

obtain the current confidence coefficient of the first blood pressure measurement information by performing weighted summation on the first confidence coefficient, the second confidence coefficient, and the third confidence coefficient.

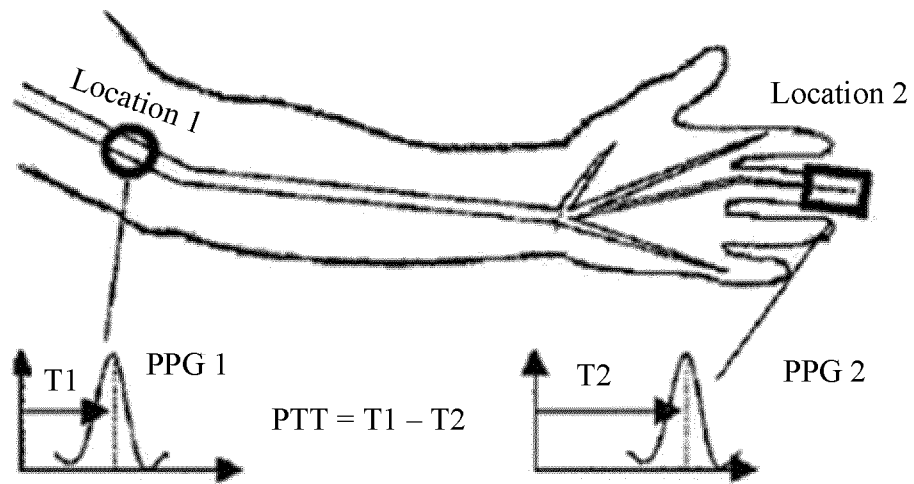


FIG. 1

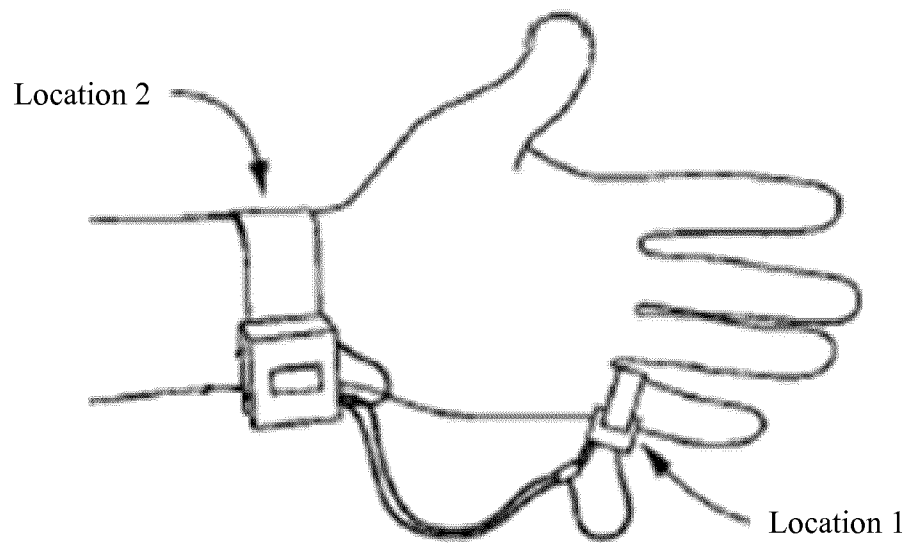


FIG. 2

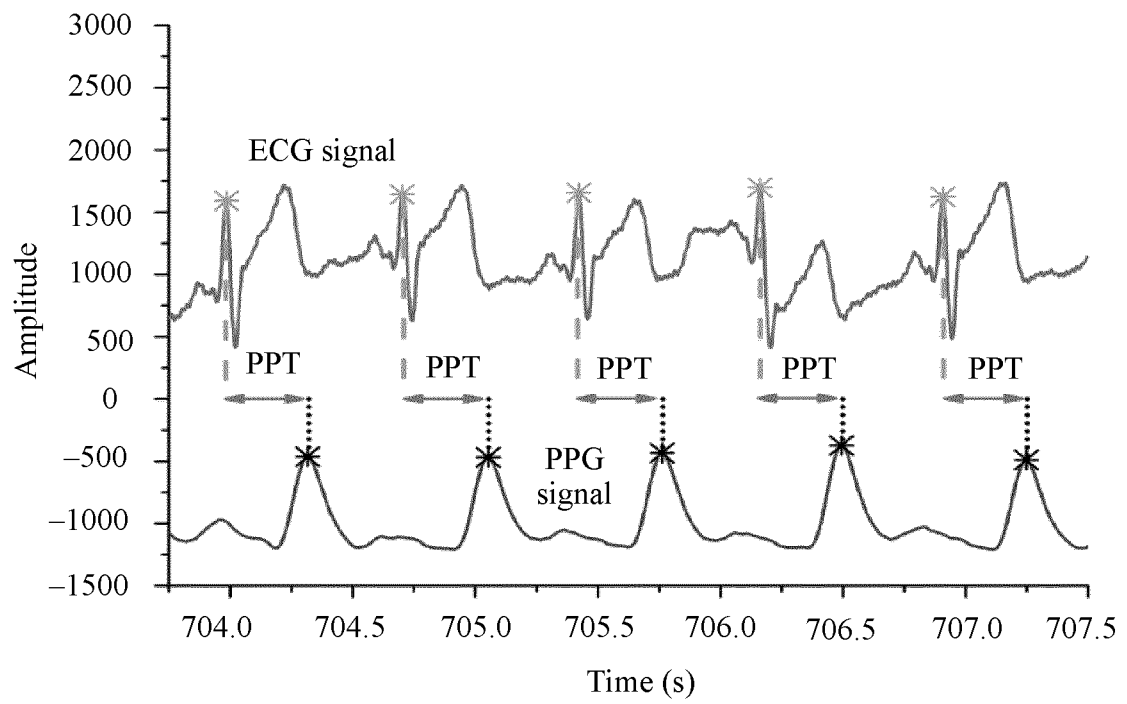
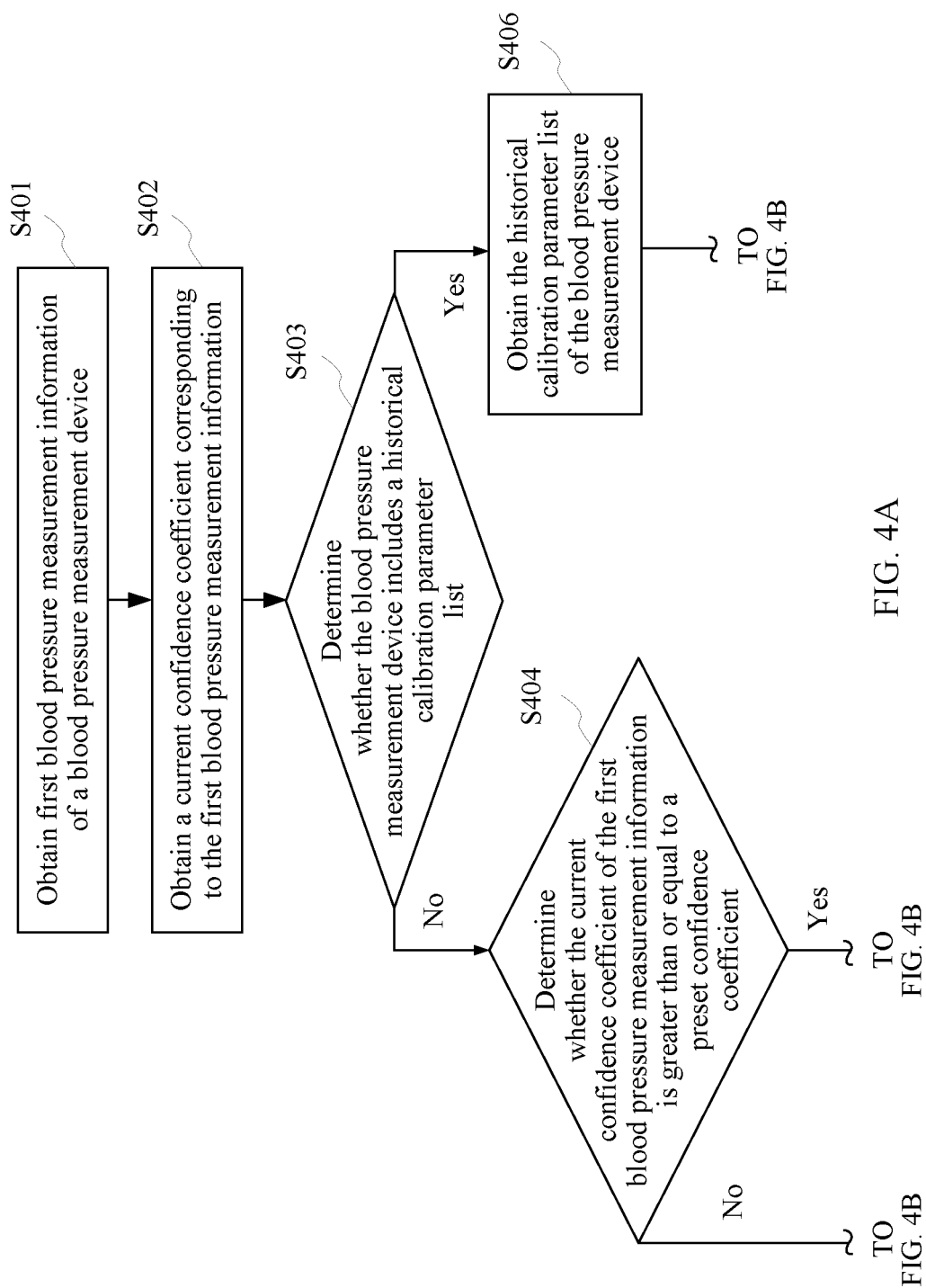


FIG. 3



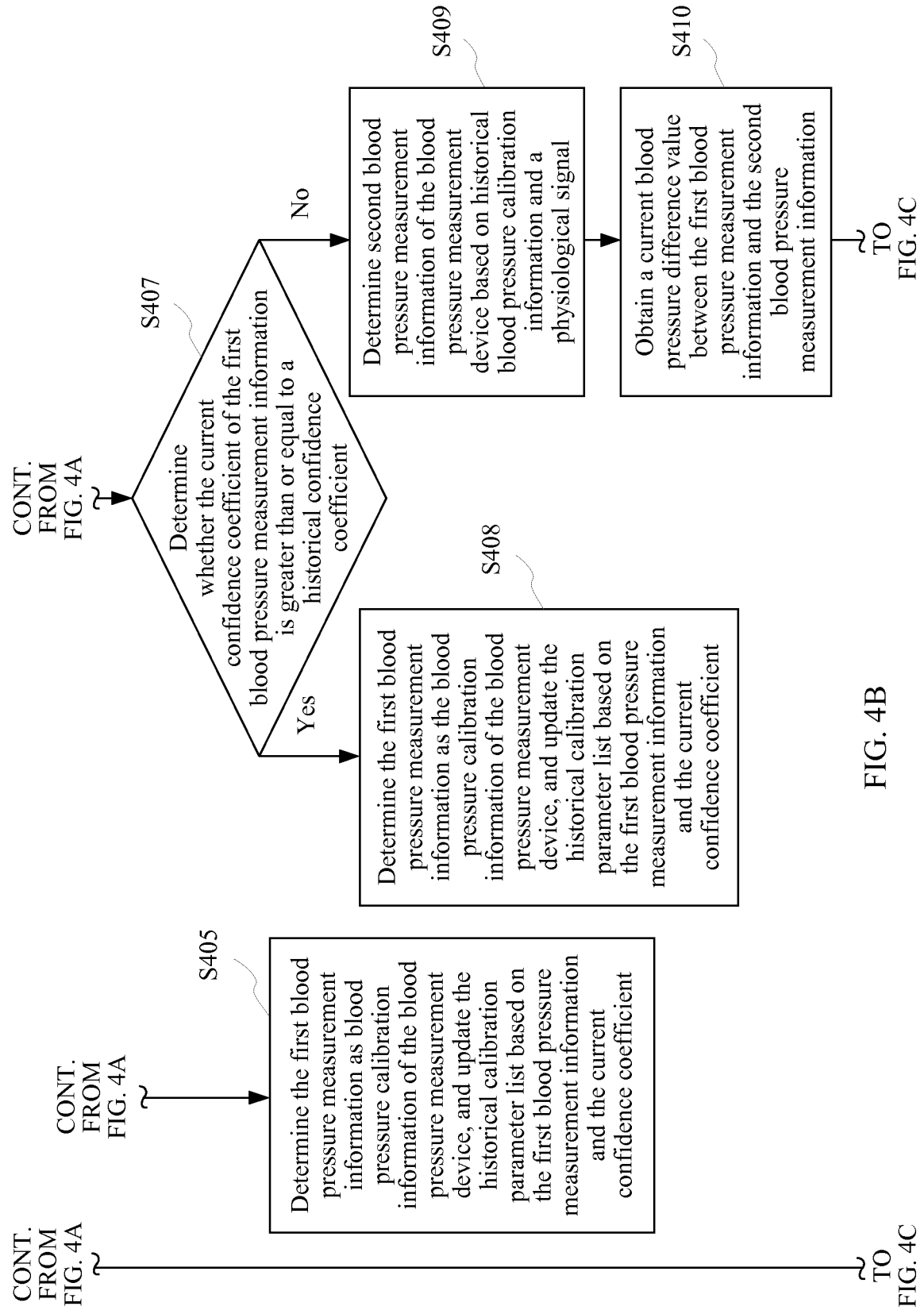


FIG. 4B

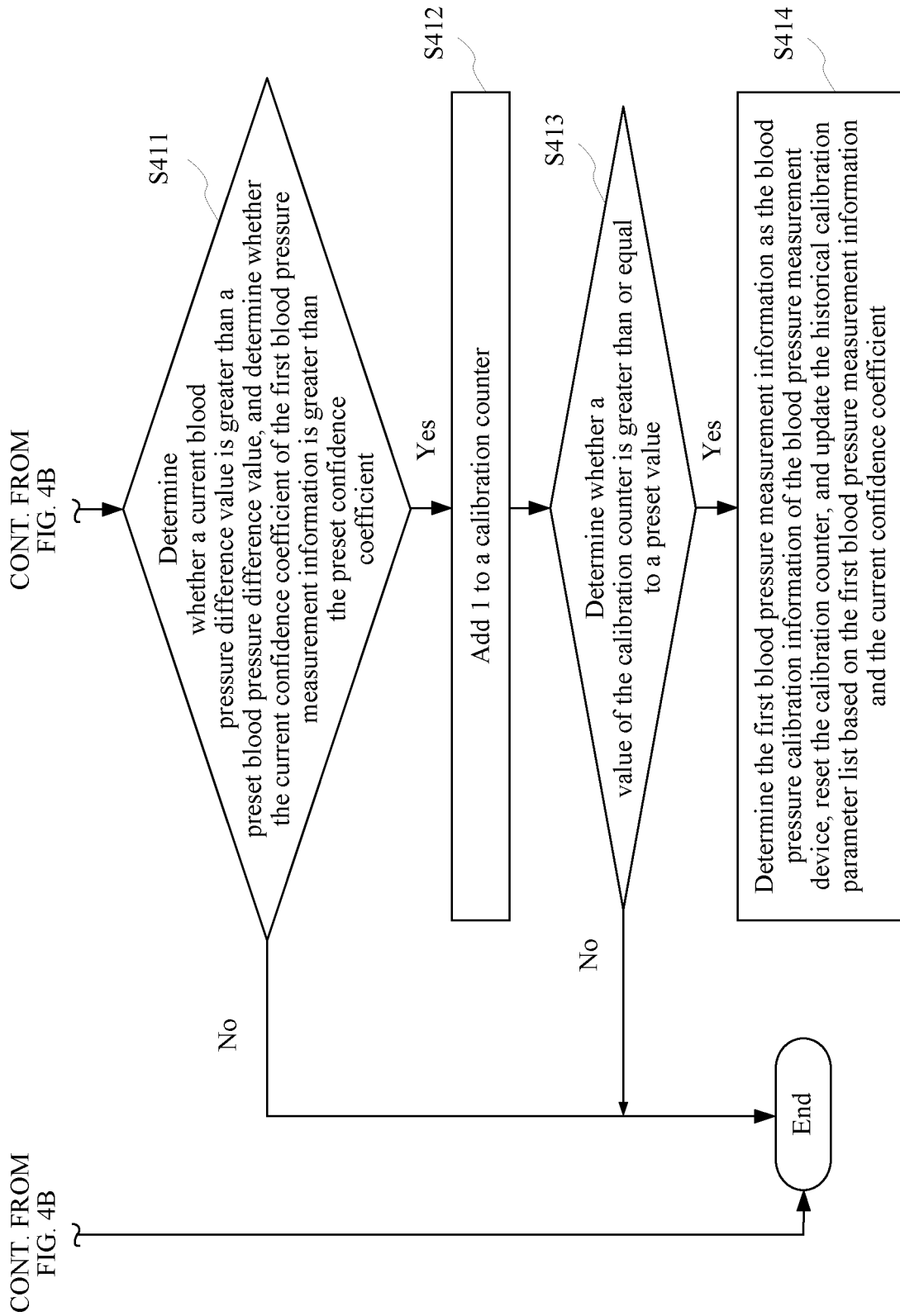


FIG. 4C

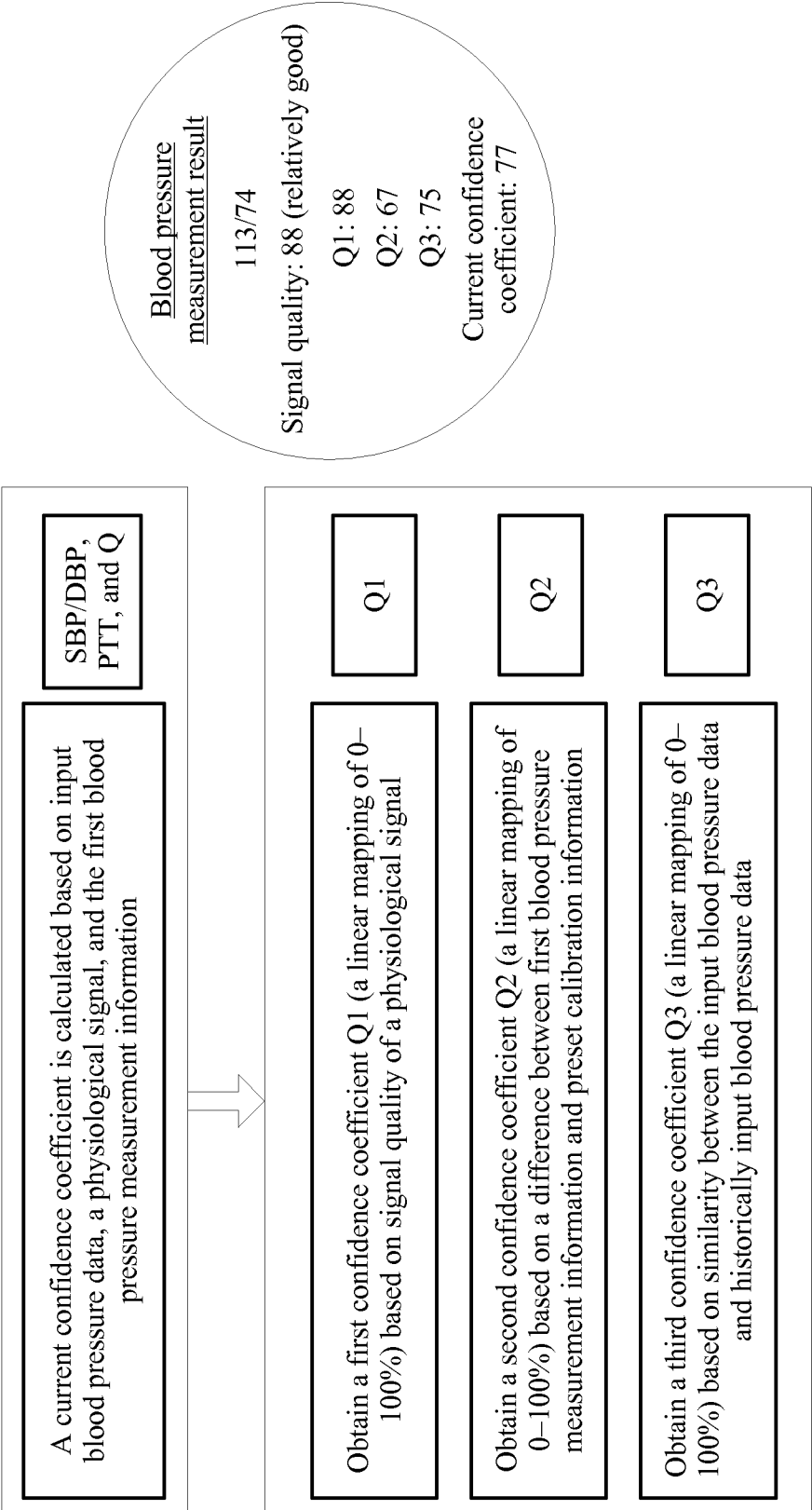


FIG. 5

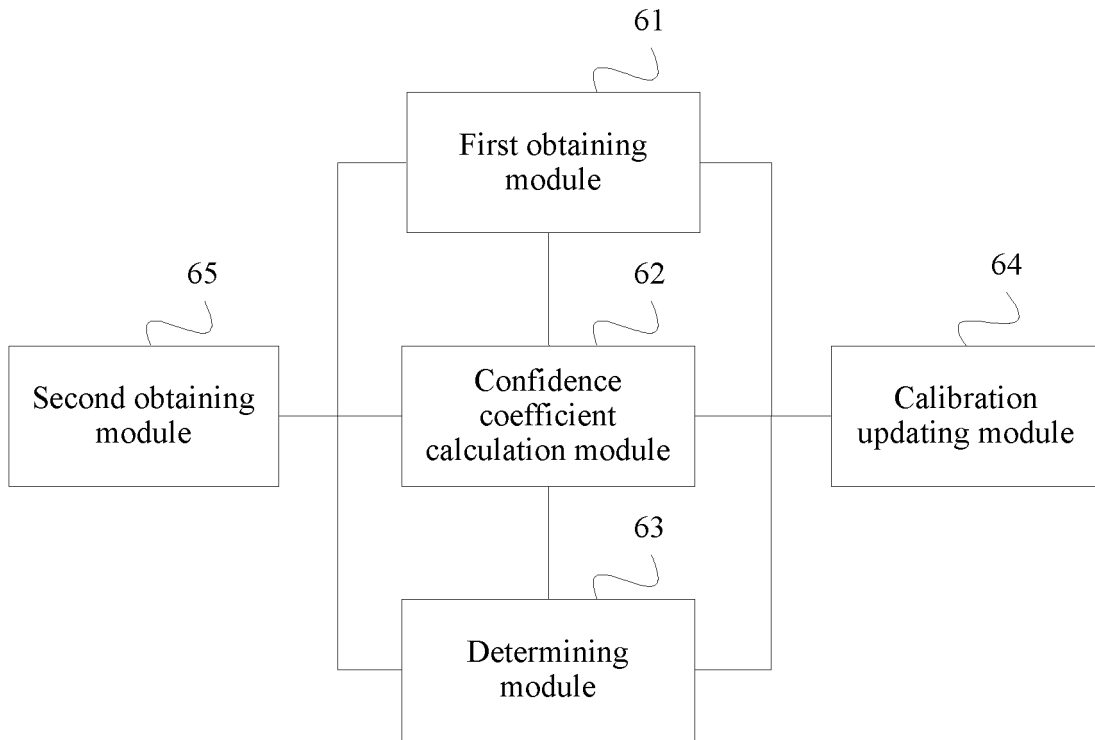


FIG. 6

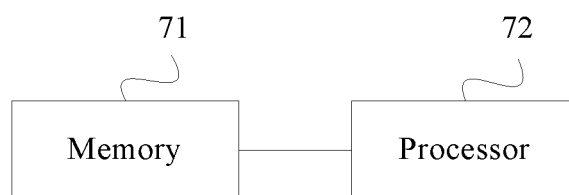


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/102947

A. CLASSIFICATION OF SUBJECT MATTER

A61B 5/00 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, VEN, CNKI, CNTXT: 血压, 校准, 置信, 可信, 可靠, 准确, 有效, 测量, 校正, 更正, 修正, 修改, 调, 历史, 原始, 初始, 更新, 改, 替, 换, 旧, 以往, 数据, 表, 记录, blood pressure, confidence, certitude, renovat+, renew+, updat+, regulat+, calibrat+, adjust+, correct+, effect+, determin+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2015057554 A1 (COVIDIEN LP), 26 February 2015 (26.02.2015), description, paragraphs 16-44, and figures 1-4	1-15
A	CN 102655814 A (KONINKLIJKE PHILIPS ELECTRONICS N.V.), 05 September 2012 (05.09.2012), entire document	1-15
A	CN 105342592 A (HONSUN (NANTONG) CO., LTD.), 24 February 2016 (24.02.2016), entire document	1-15
A	CN 101366627 A (LUDONG UNIVERSITY), 18 February 2009 (18.02.2009), entire document	1-15
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A	US 2008188733 A1 (AL-ALI, A. et al.), 07 August 2008 (07.08.2008), entire document	1-15

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

30 March 2017

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2016/102947

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US 2015057554 A1	26 February 2015	WO 2015027038 A1	26 February 2015
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Form PCT/ISA/210 (patent family annex) (July 2009)

专利名称(译)	血压测量装置的校准方法和血压测量装置		
公开(公告)号	EP3524137A1	公开(公告)日	2019-08-14
申请号	EP2016919380	申请日	2016-10-21
[标]申请(专利权)人(译)	华为技术有限公司		
申请(专利权)人(译)	华为技术有限公司		
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发明人	XU, PEIDA CHEN, WENJUAN ZHU, YU		
IPC分类号	A61B5/00 A61B5/021		
其他公开文献	EP3524137A4		
外部链接	Espacenet		

摘要(译)

本发明提供一种校准血压测量装置和血压测量装置的方法。该方法包括：获取血压测量装置的第一血压测量信息和与第一血压测量信息对应的当前置信系数，第一血压测量信息包括第一收缩压值和/或第一舒张压血压值；确定血压测量装置是否包括历史校准参数列表，其中历史校准参数列表包括历史血压校准信息和历史血压校准信息对应的历史置信系数；若血压测量装置包括历史校准参数列表，且当前置信系数大于或等于预设置信系数，或者大于或等于历史置信系数，则将第一血压测量信息确定为血压测量装置的血压校准信息，并基于第一血压测量信息和当前置信系数更新历史校准参数列表。该方法用于确保血压测量信息的准确性，并避免使用额外的装置来实现血压测量信息的校准。

