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(54) **DETECTION METHOD FOR WEARABLE DEVICE, AND WEARABLE DEVICE**

(57) Embodiments of the present invention disclose a detection method for a wearable device and a wearable device. The method includes:
detecting a value of a distance between the wearable device and a user; detecting a body characteristic value of the user; and determining that the wearable device is worn on the user, if the value of the distance between the wearable device and the user is less than or equal to a preset distance threshold and the body characteristic value of the user does not exceed a preset threshold of the body characteristic value of the user.
According to the detection method for a wearable device and the wearable device in the embodiments of the present invention, whether a user wears a wearable device can be determined quickly and accurately by detecting a value of a distance between the wearable device and the user and a body characteristic value of the user, and a detection success rate is high.

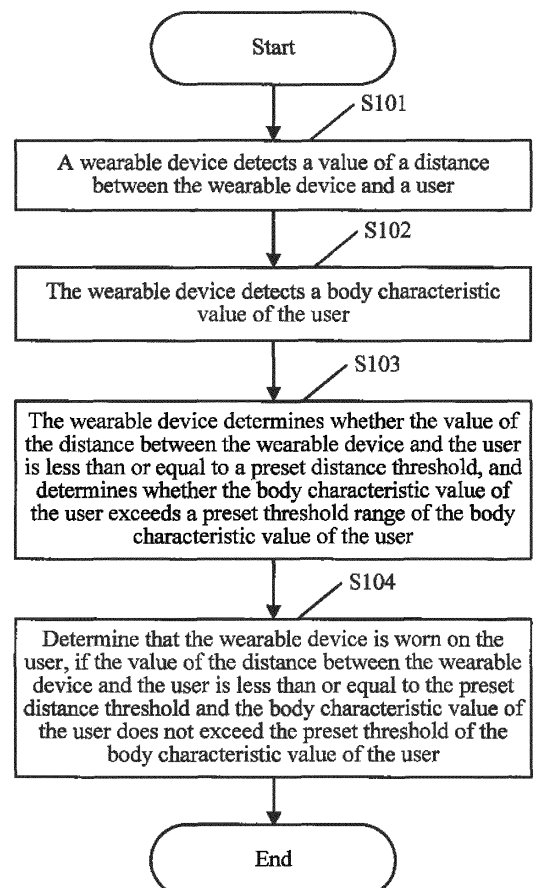


FIG. 4

Description

TECHNICAL FIELD

[0001] The present invention relates to the communications field, and in particular, to a detection method for a wearable device and a wearable device.

BACKGROUND

[0002] A wearable device is a portable device that can be directly worn on a body or integrated into clothes or an accessory of a user. The wearable device is a hardware device that implements multiple functions by means of software support, data exchange, and cloud interaction. In the prior art, detection is mainly performed by using a capacitive sensor. However, during use of the capacitive sensor, when a metal object approaches the capacitive sensor, the capacitive sensor fails and detection precision is relatively low. If whether the wearable device is worn on the user cannot be determined precisely, detection fails or a detection result is not accurate when another object approaches, making it difficult to use the wearable device normally, and causing much inconvenience to the user.

SUMMARY

[0003] Embodiments of the present invention provide a detection method for a wearable device and a wearable device. According to the method, whether a user wears a wearable device can be precisely determined by detecting both a value of a distance between the wearable device and the user and a body characteristic value of the user.

[0004] According to a first aspect, an embodiment of the present invention provides a detection method for a wearable device, including:

detecting a value of a distance between the wearable device and a user;
 detecting a body characteristic value of the user;
 determining whether the value of the distance between the wearable device and the user is less than or equal to a preset distance threshold; and determining whether the body characteristic value of the user exceeds a preset threshold range of the body characteristic value of the user; and
 determining that the wearable device is worn on the user, if the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold and the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user.

[0005] With reference to the first aspect, in a first possible implementation manner of the first aspect, the method further includes:

determining that the wearable device is not worn on the user, if the value of the distance between the wearable device and the user is greater than the preset distance threshold.

[0006] With reference to the first aspect, in a second possible implementation manner of the first aspect, the method further includes:

determining that the wearable device is not worn on the user, if the body characteristic value of the user exceeds the preset threshold of the body characteristic value of the user.

[0007] With reference to any one of the first aspect to the second possible implementation manner of the first aspect, in a third possible implementation manner of the first aspect, the body characteristic value of the user includes one or more of a body temperature value, a heart rate value, a blood glucose value, a blood pressure value, or a blood flow velocity value.

[0008] With reference to any one of the first aspect to the third possible implementation manner of the first aspect, in a fourth possible implementation manner of the first aspect, the value of the distance between the wearable device and the user is obtained by using a distance sensor.

[0009] With reference to any one of the first aspect to the fourth possible implementation manner of the first aspect, in a fifth possible implementation manner of the first aspect, the body characteristic value of the user is obtained by using a human body characteristic sensor.

[0010] According to a second aspect, an embodiment of the present invention further provides a wearable device, including: a distance sensor, a human body characteristic sensor, and a processor, where the distance sensor is configured to detect a value of a distance between the wearable device and a user; the human body characteristic sensor is configured to detect a body characteristic value of the user; and the processor is configured to: determine whether the value of the distance between the wearable device and the user is less than or equal to a preset distance threshold; determine whether the body characteristic value of the user exceeds a preset threshold range of the body characteristic value of the user; and determine that the wearable device is worn on the user, if the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold and the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user.

[0011] With reference to the second aspect, in a first possible implementation manner of the second aspect, the processor is further configured to:

determine that the wearable device is not worn on the user, if the value of the distance between the wearable device and the user is greater than the preset distance threshold.

[0012] With reference to the second aspect, in a second possible implementation manner of the second aspect, the method further includes:

determining that the wearable device is not worn on the user, if the body characteristic value of the user exceeds the preset threshold of the body characteristic value of the user.

[0013] With reference to any one of the second aspect to the second possible implementation manner of the second aspect, in a third possible implementation manner of the second aspect, the body characteristic value of the user includes one or more of a body temperature value, a heart rate value, a blood glucose value, a blood pressure value, or a blood flow velocity value.

[0014] According to the detection method for a wearable device and the wearable device in the embodiments of the present invention, both a value of a distance between a wearable device and a user and a body characteristic value of the user are detected. Only when both the two value of the distance between the wearable device and the user and the body characteristic value of the user have not exceeded a preset threshold range, it can be determined that the user has worn the wearable device. Compared with the prior art, in a manner of determining whether a user wears a wearable device in the embodiments of the present invention, determining accuracy is not affected by a change of an external condition, such as approaching of metal or other objects. Moreover, by means of a human body characteristic value, whether the wearable device is worn on a human body or another object can be precisely distinguished. Therefore, in the embodiments of the present invention, whether the user wears the wearable device can be precisely determined, and a detection success rate is high.

BRIEF DESCRIPTION OF DRAWINGS

[0015] 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. 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 schematic structural diagram of a smartwatch according to an embodiment of the present invention;

FIG. 2 is schematic structural diagram of smartglasses according to an embodiment of the present invention;

FIG. 3 is schematic structural diagram of a smartband according to an embodiment of the present invention;

FIG. 4 is a schematic flowchart of a detection method for a wearable device according to a first embodiment of the present invention;

FIG. 5 is a schematic flowchart of a detection method for a wearable device according to a second embodiment of the present invention; and

FIG. 6 is schematic structural diagram of a wearable device according to an embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0016] 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 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.

[0017] Referring to FIG. 1, FIG. 2, and FIG. 3, during specific implementation, a wearable device described in the embodiments of the present invention may include a smartwatch, a smartband, a smartring, smartglasses, and the like. The foregoing wearable devices are only for an exemplary rather than exhaustive purpose, and the present invention includes but not limited to the foregoing wearable devices.

[0018] Referring to FIG. 4, FIG. 4 is a schematic flowchart of a detection method for a wearable device according to a first embodiment of the present invention. The method specifically includes the following steps.

[0019] S 101: A wearable device detects a value of a distance between the wearable device and a user.

[0020] Specifically, the wearable device detects the value of the distance between the wearable device and the user by using a distance sensor, and determines, according to the value of the distance between the wearable device and the user, whether the user wears the wearable device. It should be understood that the distance sensor in this embodiment of the present invention include an optical proximity sensor, a linear proximity sensor, an ultrasonic displacement sensor, and the like.

[0021] S102: The wearable device detects a body characteristic value of the user.

[0022] Specifically, the wearable device obtains the body characteristic value of the user by using a human body characteristic sensor. The body characteristic value of the user includes one or more of a body temperature value, a heart rate value, a blood glucose value, a blood

pressure value, or a blood flow velocity value.

[0023] For example, the wearable device obtains a body temperature value of the user by using a temperature sensor in the human body characteristic sensor, or obtains a heart rate value of the user by using a heart rate sensor in the human body characteristic sensor, or obtains a blood flow velocity value of the user by using the human body characteristic sensor. Certainly, in another implementation manner of this embodiment of the present invention, body characteristic values such as the blood glucose value and the blood pressure value may be obtained by using the human body characteristic sensor, all of which can reflect a physical status of the user, and these body characteristic values are easy to obtain.

[0024] S103: The wearable device determines whether the value of the distance between the wearable device and the user is less than or equal to a preset distance threshold, and determines whether the body characteristic value of the user exceeds a preset threshold range of the body characteristic value of the user.

[0025] Specifically, the wearable device obtains the value of the distance between the wearable device and the user, and determines whether the value is less than or equal to the preset distance threshold. It should be understood that a value range of the preset distance threshold is greater than or equal to 0 cm and less than or equal to 2 cm. For example, if the value of the distance between the wearable device and the user obtained by the wearable device is 1.5 cm, the value is less than the preset distance threshold. For another example, if the value of the distance between the wearable device and the user obtained by the wearable device is 2.5 cm, the value is greater than the preset distance threshold.

[0026] It needs to be known that the preset threshold of the body characteristic value of the user includes preset thresholds of the body temperature value, the heart rate value, the blood glucose value, the blood pressure value, the blood flow velocity value, and the like. For example, a value range of the preset threshold of the body temperature value of the user is 36°C to 38°C. If the body temperature value of the user obtained by using the temperature sensor is 35°C, the body characteristic value of the user exceeds the value range of the preset threshold of the body characteristic value of the user. For another example, a value range of the preset threshold of the heart rate value is 60 times to 100 times per minute. If the heart rate value of the user obtained by the heart rate sensor in the human body characteristic sensor is 75 times per minute, the body characteristic value of the user does not exceed the value range of the preset threshold of the body characteristic value of the user. For still another example, a value range of a preset threshold of a forearm blood flow velocity value of the user is 6 ml/min/100g to 10 ml/min/100g. When the forearm skin blood flow velocity value of the user detected by the wearable device is 8 ml/min/100g, the body characteristic value of the user does not exceed the preset threshold range of the body characteristic value of the user. Similarly,

thresholds of the blood pressure value and the blood glucose value may be preset. After obtaining the foregoing body characteristic values, the wearable device compares the body characteristic values with the preset thresholds, to determine whether the body characteristic values exceed the preset threshold ranges. According to an actual requirement, one or more of the body characteristic values of the user may be obtained.

[0027] S104: Determine that the wearable device is worn on the user, if the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold and the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user.

[0028] Specifically, the wearable device obtains the value of the distance between the wearable device and the user, the value range of the preset distance threshold is greater than or equal to 0 cm and less than or equal to 2 cm, and the value range of the preset threshold of the body temperature value is 36°C to 38°C. If the value of the distance between the wearable device and the user obtained by the wearable device is 1.5 cm, the value is less than the preset distance threshold. If the body temperature value of the user obtained by the wearable device by using the temperature sensor is 37.3°C, the body characteristic value of the user does not exceed the preset threshold range of the body characteristic value of the user. According to the value of the distance between the wearable device and the user and the body temperature value of the user, it is determined that the wearable device is worn on the user.

[0029] It needs to be known that only when the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold, and the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user, it can be determined that the wearable device is worn on the user. If the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold, but the body characteristic value of the user exceeds the preset threshold of the body characteristic value of the user, it cannot be determined that the wearable device is worn on the user. Similarly, if the value of the distance between the wearable device and the user is greater than the preset distance threshold, but the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user, it cannot be determined that the wearable device is worn on the user, either.

[0030] According to the detection method for a wearable device and the wearable device in this embodiment of the present invention, both a value of a distance between a wearable device and a user and a body characteristic value of the user are detected. Only when both the two value of the distance between the wearable device and the user and the body characteristic value of the user have not exceeded a preset threshold range, it

can be determined that the user has worn the wearable device. Compared with the prior art, in a manner of determining whether a user wears a wearable device in this embodiment of the present invention, determining accuracy is not affected by a change of an external condition, such as approaching of metal or other objects. Moreover, by means of a human body characteristic value, whether the wearable device is worn on a human body or another object can be precisely distinguished. Therefore, in this embodiment of the present invention, whether the user wears the wearable device can be precisely determined, and a detection success rate is high.

[0031] Referring to FIG. 5, FIG. 5 is a schematic flow-chart of a detection method for a wearable device according to a second embodiment of the present invention. The method specifically includes the following steps.

[0032] S201: A wearable device detects a value of a distance between the wearable device and a user.

[0033] Specifically, the wearable device detects the value of the distance between the wearable device and the user by using a distance sensor or an optical proximity sensor, and determines, according to the value of the distance between the wearable device and the user, whether the user wears the wearable device. It should be understood that the distance sensor in this embodiment of the present invention includes the optical proximity sensor, a linear proximity sensor, an ultrasonic displacement sensor, and the like.

[0034] S202: The wearable device detects a body characteristic value of the user.

[0035] Specifically, the wearable device obtains the body characteristic value of the user by using a human body characteristic sensor. The body characteristic value of the user includes one or more of a body temperature value, a heart rate value, a blood glucose value, a blood pressure value, or a blood flow velocity value. For example, the wearable device obtains a body temperature value of the user by using a temperature sensor in the human body characteristic sensor, or obtains a heart rate value of the user by using a heart rate sensor in the human body characteristic sensor, or obtains a blood flow velocity value of the user by using the human body characteristic sensor. Certainly, in another implementation manner of this embodiment of the present invention, body characteristic values such as the blood glucose value and the blood pressure value may be obtained by using the human body characteristic sensor, all of which can reflect a physical status of the user, and these body characteristic values are easy to obtain.

[0036] S203: The wearable device determines whether the value of the distance between the wearable device and the user is less than or equal to a preset distance threshold, and determines whether the body characteristic value of the user exceeds a preset threshold range of the body characteristic value of the user.

[0037] Specifically, the wearable device obtains the value of the distance between the wearable device and the user, and determines whether the value is less than

or equal to the preset distance threshold. It should be understood that a value range of the preset distance threshold is greater than or equal to 0 cm and less than or equal to 2 cm. For example, if the value of the distance between the wearable device and the user obtained by the wearable device is 1.5 cm, the value is less than the preset distance threshold. For another example, if the value of the distance between the wearable device and the user obtained by the wearable device is 2.5 cm, the value is greater than the preset distance threshold.

[0038] It needs to be known that the preset threshold of the body characteristic value of the user includes preset thresholds of the body temperature value, the heart rate value, the blood glucose value, the blood pressure value, the blood flow velocity value, and the like. For example, a value range of the preset threshold of the body temperature value of the user is 36°C to 38°C. If the body temperature value of the user obtained by using the temperature sensor is 35°C, the body characteristic value of the user exceeds the value range of the preset threshold of the body characteristic value of the user. For another example, a value range of the preset threshold of the heart rate value is 60 times to 100 times per minute. If the heart rate value of the user obtained by the heart rate sensor in the human body characteristic sensor is 75 times per minute, the body characteristic value of the user does not exceed the value range of the preset threshold of the body characteristic value of the user. For still another example, a value range of a preset threshold of a forearm blood flow velocity value of the user is 6 ml/min/100g to 10 ml/min/100g. When the forearm skin blood flow velocity value of the user detected by the wearable device is 8 ml/min/100g, the body characteristic value of the user does not exceed the preset threshold range of the body characteristic value of the user. Similarly, thresholds of the blood pressure value and the blood glucose value may be preset. After obtaining the foregoing body characteristic values, the wearable device compares the body characteristic values with the preset thresholds, to determine whether the body characteristic values exceed the preset threshold ranges. According to an actual requirement, one or more of the body characteristic values of the user may be obtained.

[0039] S204: Determine that the wearable device is worn on the user, if the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold and the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user.

[0040] Specifically, the wearable device obtains the value of the distance between the wearable device and the user, the value range of the preset distance threshold is greater than or equal to 0 cm and less than or equal to 2 cm, and the value range of the preset threshold of the body temperature value is 36°C to 38°C. If the value of the distance between the wearable device and the user obtained by the wearable device is 1.5 cm, the value is less than the preset distance threshold. If the body

temperature value of the user obtained by the wearable device by using the temperature sensor is 37.3°C, the body characteristic value of the user does not exceed the preset threshold range of the body characteristic value of the user. According to the value of the distance between the wearable device and the user and the body temperature value of the user, it is determined that the wearable device is worn on the user.

[0041] S205: Determine that the wearable device is not worn on the user, if the value of the distance between the wearable device and the user is greater than the preset distance threshold, and if the body characteristic value of the user exceeds the preset threshold of the body characteristic value of the user.

[0042] Specifically, only when the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold, and the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user, it can be determined that the wearable device is worn on the user. If the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold, but the body characteristic value of the user exceeds the preset threshold of the body characteristic value of the user, it cannot be determined that the wearable device is worn on the user. Similarly, if the value of the distance between the wearable device and the user is greater than the preset distance threshold, but the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user, it cannot be determined that the wearable device is worn on the user, either.

[0043] For example, the value range of the preset distance threshold is greater than or equal to 0 cm and less than or equal to 2 cm, and the value range of the preset threshold of the body temperature value is 36°C to 38°C. If the value of the distance between the wearable device and the user obtained by the wearable device is 2.3 cm, the value is greater than the preset distance threshold. If the body temperature value of the user obtained by the wearable device by using the temperature sensor is 37°C, the body characteristic value of the user does not exceed the preset threshold range of the body characteristic value of the user. Therefore, it is determined that the wearable device is not worn on the user. For another example, the value range of the preset distance threshold is greater than or equal to 0 cm and less than or equal to 2 cm, and the value range of the preset threshold of the heart rate value is 60 times to 100 times per minute. If the value of the distance between the wearable device and the user obtained by the wearable device is 2 cm, the value is equal to the preset distance threshold, and if the heart rate value of the user obtained by the heart rate sensor in the human body characteristic sensor is 50 times per minute, it is determined that the wearable device is not worn on the user.

[0044] According to the detection method for a wearable device and the wearable device in this embodiment

of the present invention, both a value of a distance between a wearable device and a user and a body characteristic value of the user are detected. Only when both the two value of the distance between the wearable device and the user and the body characteristic value of the user have not exceeded a preset threshold range, it can be determined that the user has worn the wearable device. Compared with the prior art, in a manner of determining whether a user wears a wearable device in this embodiment of the present invention, determining accuracy is not affected by a change of an external condition, such as approaching of metal or other objects. Moreover, by means of a human body characteristic value, whether the wearable device is worn on a human body or another object can be precisely distinguished. Therefore, in this embodiment of the present invention, whether the user wears the wearable device can be precisely determined, and a detection success rate is high.

[0045] Refer to FIG. 6, which is schematic structural diagram of a wearable device according to an embodiment of the present invention. A wearable device 300 includes at least one processor 301, at least one human body characteristic sensor 305, and at least one distance sensor 306, and further includes at least one user interface 303, at least one communications bus 302, and at least one memory 304.

[0046] The processor 301 may include a CPU. The human body characteristic sensor 305 may include a body temperature sensor, a heart rate sensor, a blood glucose sensor, a blood pressure sensor, a blood flow velocity sensor, and the like. The distance sensor 306 may include an optical proximity sensor, a linear proximity sensor, an ultrasonic displacement sensor, and the like. The communications bus 302 is configured to implement connection and communication between these components. The user interface 303 may include a display (Display), a keyboard (Keyboard), and optionally, the user interface 303 may further include a standard wired interface and wireless interface. The memory 304 may be a high-speed RAM memory, or may be a non-volatile memory (non-volatile memory), such as at least one magnetic disk memory. Optionally, the memory 304 may further include at least one storage apparatus that is located far away from the processor 301. The memory 304 stores a set of program code, and the processor 301 is configured to invoke the program code stored in the memory 304 to execute the following operations:

[0047] The memory 304 stores a set of program code, and the processor 301 is configured to invoke the program code stored in the memory 304 to execute the following operations:

the distance sensor is configured to detect a value of a distance between the wearable device and a user;
the human body characteristic sensor is configured to detect a body characteristic value of the user; and
the processor is configured to: determine whether

the value of the distance between the wearable device and the user is less than or equal to a preset distance threshold; determine whether the body characteristic value of the user exceeds a preset threshold range of the body characteristic value of the user; and determine that the wearable device is worn on the user, if the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold and the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user.

[0048] Specifically, the wearable device detects the value of the distance between the wearable device and the user by using the distance sensor or the optical proximity sensor, and determines, according to the value of the distance between the wearable device and the user, whether the user wears the wearable device.

[0049] The wearable device obtains the body characteristic value of the user by using the human body characteristic sensor. The body characteristic value of the user includes one or more of a body temperature value, a heart rate value, a blood glucose value, a blood pressure value, or a blood flow velocity value. For example, the wearable device obtains a body temperature value of the user by using a temperature sensor in the human body characteristic sensor, or obtains a heart rate value of the user by using a heart rate sensor in the human body characteristic sensor, or obtains a blood flow velocity value of the user by using the human body characteristic sensor. Certainly, in another implementation manner of this embodiment of the present invention, body characteristic values such as the blood glucose value and the blood pressure value may be obtained by using the human body characteristic sensor, all of which can reflect a physical status of the user, and these body characteristic values are easy to obtain.

[0050] In an optional embodiment, the processor 301 may invoke the program code stored in the memory 304 to further execute the following operations:

determining that the wearable device is not worn on the user, if the value of the distance between the wearable device and the user is greater than the preset distance threshold.

[0051] In an optional embodiment, the processor 301 may invoke the program code stored in the memory 304 to further execute the following operations:

determining that the wearable device is not worn on the user, if the body characteristic value of the user exceeds the preset threshold of the body characteristic value of the user.

[0052] In an optional embodiment, the processor 301 may invoke the program code stored in the memory 304

to further execute the following operations:

the body characteristic value of the user includes one or more of a body temperature value, a heart rate value, a blood glucose value, a blood pressure value, or a blood flow velocity value.

[0053] Specifically, the wearable device obtains the value of the distance between the wearable device and the user, and determines whether the value is less than or equal to the preset distance threshold. It should be understood that a value range of the preset distance threshold is greater than or equal to 0 cm and less than or equal to 2 cm. For example, if the value of the distance between the wearable device and the user obtained by the wearable device is 1.5 cm, the value is less than the preset distance threshold. For another example, if the value of the distance between the wearable device and the user obtained by the wearable device is 2.5 cm, the value is greater than the preset distance threshold.

[0054] It needs to be known that the preset threshold of the body characteristic value of the user includes preset thresholds of the body temperature value, the heart rate value, the blood glucose value, the blood pressure value, the blood flow velocity value, and the like. For example, a value range of the preset threshold of the body temperature value of the user is 36°C to 38°C. If the body temperature value of the user obtained by using the temperature sensor is 35°C, the body characteristic value of the user exceeds the value range of the preset threshold of the body characteristic value of the user. For another example, a value range of the preset threshold of the heart rate value is 60 times to 100 times per minute. If the heart rate value of the user obtained by the heart rate sensor in the human body characteristic sensor is 75 times per minute, the body characteristic value of the user does not exceed the value range of the preset threshold of the body characteristic value of the user. For still another example, a value range of a preset threshold of a forearm blood flow velocity value of the user is 6 ml/min/100g to 10 ml/min/100g. When the forearm skin blood flow velocity value of the user detected by the wearable device is 8 ml/min/100g, the body characteristic value of the user does not exceed the preset threshold range of the body characteristic value of the user. Similarly, thresholds of the blood pressure value and the blood glucose value may be preset. After obtaining the foregoing body characteristic values, the wearable device compares the body characteristic values with the preset thresholds, to determine whether the body characteristic values exceed the preset threshold ranges. According to an actual requirement, one or more of the body characteristic values of the user may be obtained.

[0055] In an optional embodiment, the processor 301 may invoke the program code stored in the memory 304 to further execute the following operations:

the value of the distance between the wearable de-

vice and the user is obtained by using the distance sensor.

[0056] In an optional embodiment, the processor 301 may invoke the program code stored in the memory 304 to further execute the following operations:

the body characteristic value of the user is obtained by using the human body characteristic sensor.

[0057] Specifically, the wearable device obtains the value of the distance between the wearable device and the user, the value range of the preset distance threshold is greater than or equal to 0 cm and less than or equal to 2 cm, and the value range of the preset threshold of the body temperature value is 36°C to 38°C. If the value of the distance between the wearable device and the user obtained by the wearable device is 1.5 cm, the value is less than the preset distance threshold. If the body temperature value of the user obtained by the wearable device by using the temperature sensor is 37.3°C, the body characteristic value of the user does not exceed the preset threshold range of the body characteristic value of the user. According to the value of the distance between the wearable device and the user and the body temperature value of the user, it is determined that the wearable device is worn on the user.

[0058] Only when the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold, and the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user, it can be determined that the wearable device is worn on the user. If the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold, but the body characteristic value of the user exceeds the preset threshold of the body characteristic value of the user, it cannot be determined that the wearable device is worn on the user. Similarly, if the value of the distance between the wearable device and the user is greater than the preset distance threshold, but the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user, it cannot be determined that the wearable device is worn on the user, either.

[0059] For example, the value range of the preset distance threshold is greater than or equal to 0 cm and less than or equal to 2 cm, and the value range of the preset threshold of the body temperature value is 36°C to 38°C. If the value of the distance between the wearable device and the user obtained by the wearable device is 2.3 cm, the value is greater than the preset distance threshold. If the body temperature value of the user obtained by the wearable device by using the temperature sensor is 37°C, the body characteristic value of the user does not exceed the preset threshold range of the body characteristic value of the user. Therefore, it is determined that the wearable device is not worn on the user. For another

example, the value range of the preset distance threshold is greater than or equal to 0 cm and less than or equal to 2 cm, and the value range of the preset threshold of the heart rate value is 60 times to 100 times per minute. If the value of the distance between the wearable device and the user obtained by the wearable device is 2 cm, the value is equal to the preset distance threshold, and if the heart rate value of the user obtained by the heart rate sensor in the human body characteristic sensor is 50 times per minute, it is determined that the wearable device is not worn on the user.

[0060] According to the detection method for a wearable device and the wearable device in the embodiments of the present invention, both a value of a distance between a wearable device and a user and a body characteristic value of the user are detected. Only when both the two value of the distance between the wearable device and the user and the body characteristic value of the user have not exceeded a preset threshold range, it can be determined that the user has worn the wearable device. Compared with the prior art, in a manner of determining whether a user wears a wearable device in this embodiment of the present invention, determining accuracy is not affected by a change of an external condition, such as approaching of metal or other objects. Moreover, by means of a human body characteristic value, whether the wearable device is worn on a human body or another object can be precisely distinguished. Therefore, in this embodiment of the present invention, whether the user wears the wearable device can be precisely determined, and a detection success rate is high.

[0061] A person of ordinary skill in the art may understand that, each aspect of the present invention or a possible implementation manner of each aspect may be specifically implemented as a system, a method, or a computer program product. In addition, each aspect of the present invention or the possible implementation manner of each aspect may take a form of a computer program product, and the computer program product refers to computer-readable program code stored in a computer-readable medium.

[0062] The computer-readable medium may be a computer-readable data medium or a computer-readable storage medium. The computer-readable storage medium includes but is not limited to an electronic, magnetic, optical, electromagnetic, infrared, or semi-conductive system, device, or apparatus, or any appropriate combination thereof, such as a random access memory (RAM), a read-only memory (ROM), an erasable programmable read only memory (EPROM or flash memory), an optical fiber, and a compact disc read only memory (CD-ROM).

[0063] A processor in a computer reads computer-readable program code stored in a computer-readable medium, so that the processor can perform a function and an action specified in each step or a combination of steps in a flowchart; an apparatus is generated to implement a function and an action specified in each block or a combination of blocks in a block diagram.

[0064] All computer-readable program code may be executed on a user computer, or some may be executed on a user computer as a standalone software package, or some may be executed on a local computer of a user while some is executed on a remote computer, or all the code may be executed on a remote computer or a server. It should also be noted that, in some alternative implementation solutions, each step in the flowcharts or functions specified in each block in the block diagrams may not occur in the illustrated order. For example, two consecutive steps or two blocks in the illustration, which are dependent on an involved function, may in fact be executed substantially at the same time, or these blocks may sometimes be executed in reverse order.

[0065] Obviously, a person skilled in the art can make various modifications and variations to the present invention without departing from the spirit and scope of the present invention. The present invention is intended to cover these modifications and variations provided that they fall within the scope of protection defined by the following claims and their equivalent technologies.

Claims

1. A detection method for a wearable device, comprising:

detecting a value of a distance between the wearable device and a user;
 detecting a body characteristic value of the user;
 determining whether the value of the distance between the wearable device and the user is less than or equal to a preset distance threshold;
 determining whether the body characteristic value of the user exceeds a preset threshold range of the body characteristic value of the user; and
 determining that the wearable device is worn on the user, if the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold and the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user.

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

determining that the wearable device is not worn on the user, if the value of the distance between the wearable device and the user is greater than the preset distance threshold.

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

determining that the wearable device is not worn on the user, if the body characteristic value of

the user exceeds the preset threshold of the body characteristic value of the user.

4. The method according to any one of claims 1 to 3, wherein the body characteristic value of the user comprises one or more of a body temperature value, a heart rate value, a blood glucose value, a blood pressure value, or a blood flow velocity value.
5. The method according to any one of claims 1 to 4, wherein the value of the distance between the wearable device and the user is obtained by using a distance sensor.
6. The method according to any one of claims 1 to 5, wherein the body characteristic value of the user is obtained by using a human body characteristic sensor.
7. A wearable device, comprising: a distance sensor, a human body characteristic sensor, and a processor, wherein the distance sensor is configured to detect a value of a distance between the wearable device and a user; the human body characteristic sensor is configured to detect a body characteristic value of the user; and the processor is configured to: determine whether the value of the distance between the wearable device and the user is less than or equal to a preset distance threshold; determine whether the body characteristic value of the user exceeds a preset threshold range of the body characteristic value of the user; and determine that the wearable device is worn on the user, if the value of the distance between the wearable device and the user is less than or equal to the preset distance threshold and the body characteristic value of the user does not exceed the preset threshold of the body characteristic value of the user.
8. The wearable device according to claim 7, wherein the processor is further configured to determine that the wearable device is not worn on the user, if the value of the distance between the wearable device and the user exceeds the preset distance threshold.
9. The wearable device according to claim 7, wherein the processor is further configured to determine that the wearable device is not worn on the user, if the body characteristic value of the user exceeds the preset threshold of the body characteristic value of the user.
10. The wearable device according to any one of claims 7 to 9, wherein the body characteristic value of the user comprises

one or more of a body temperature value, a heart rate value, a blood glucose value, a blood pressure value, or a blood flow velocity value.

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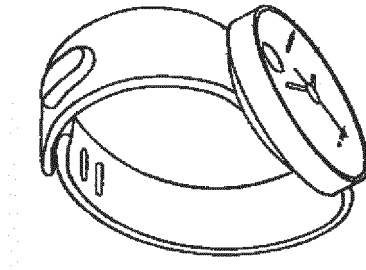


FIG. 1

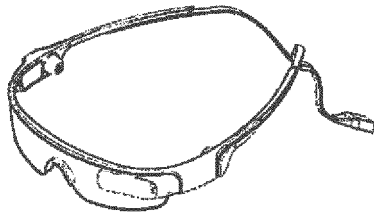


FIG. 2

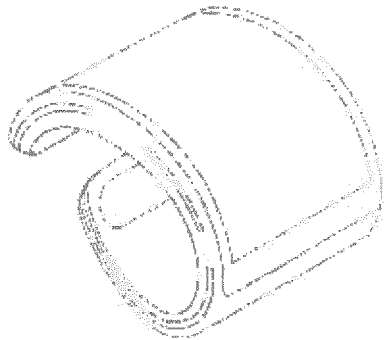


FIG. 3

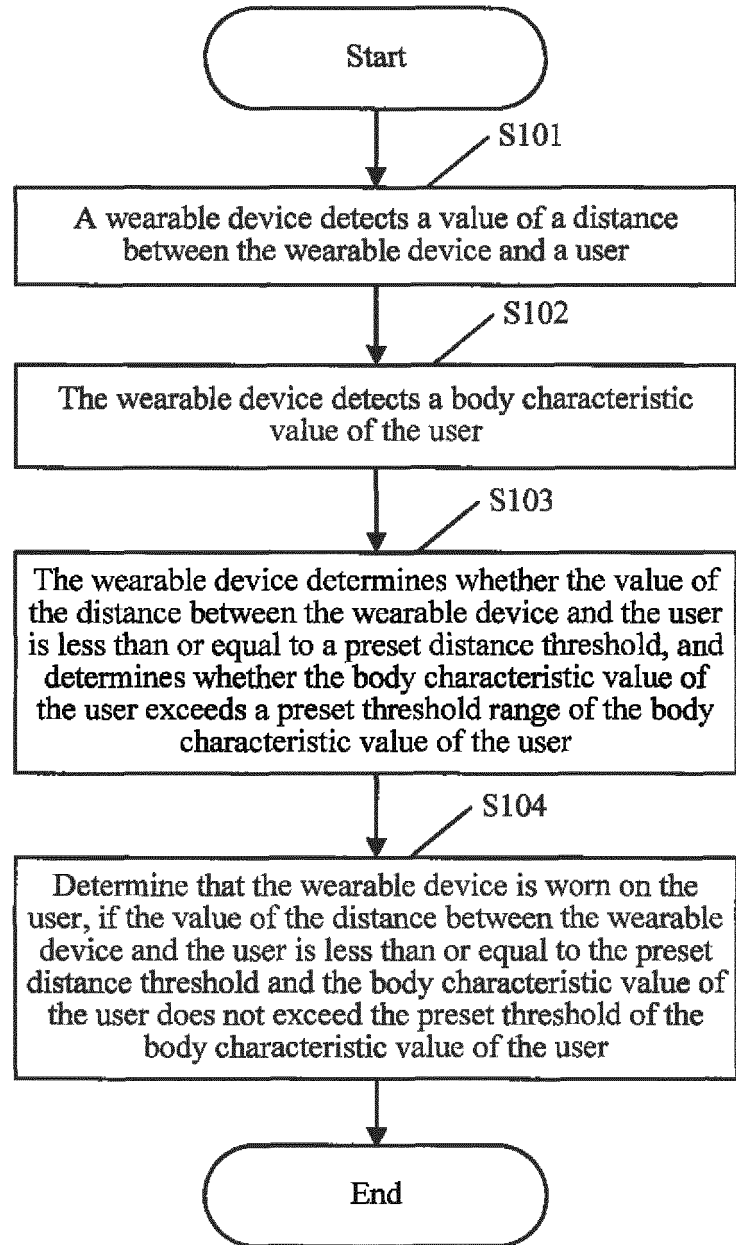


FIG. 4

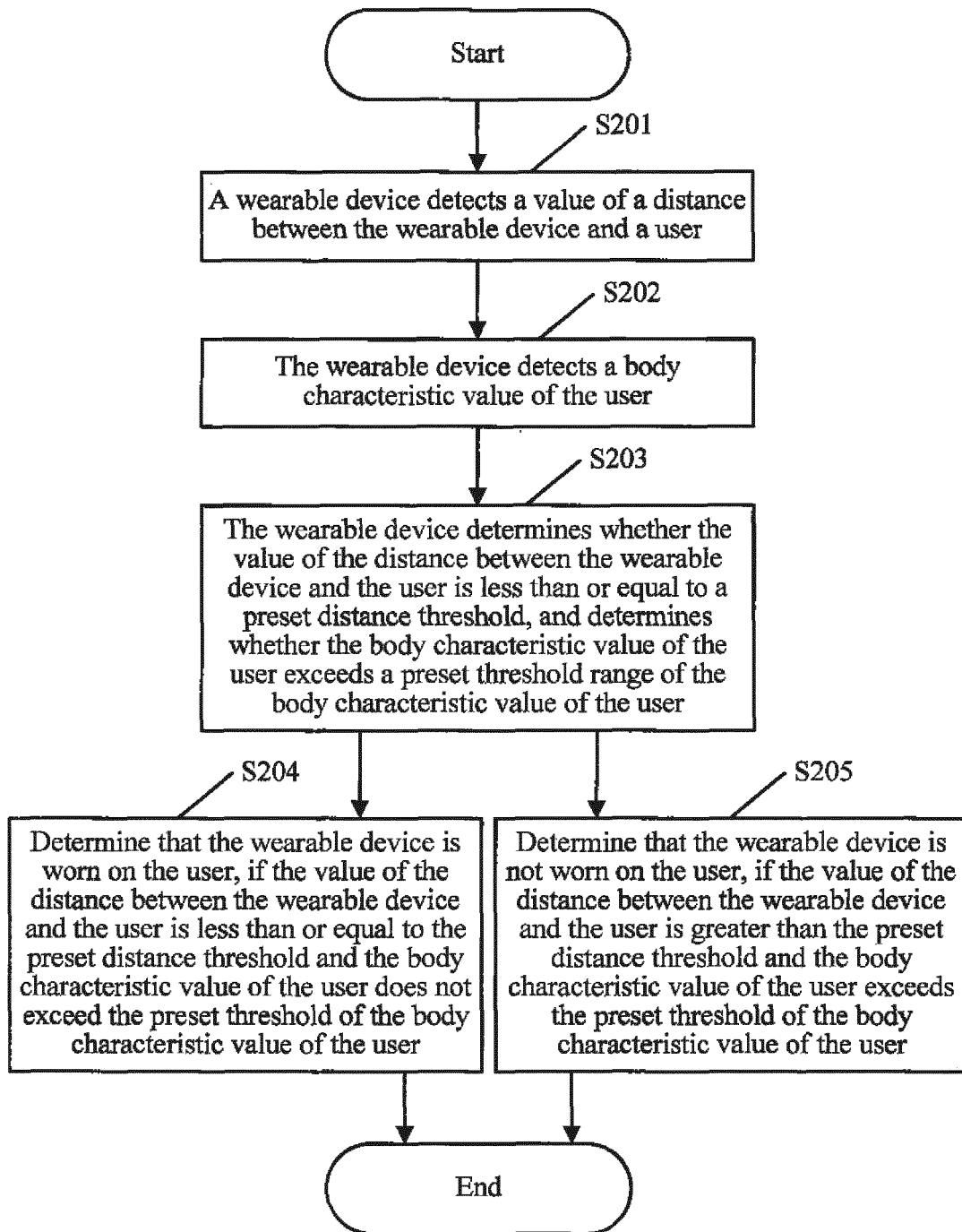


FIG. 5

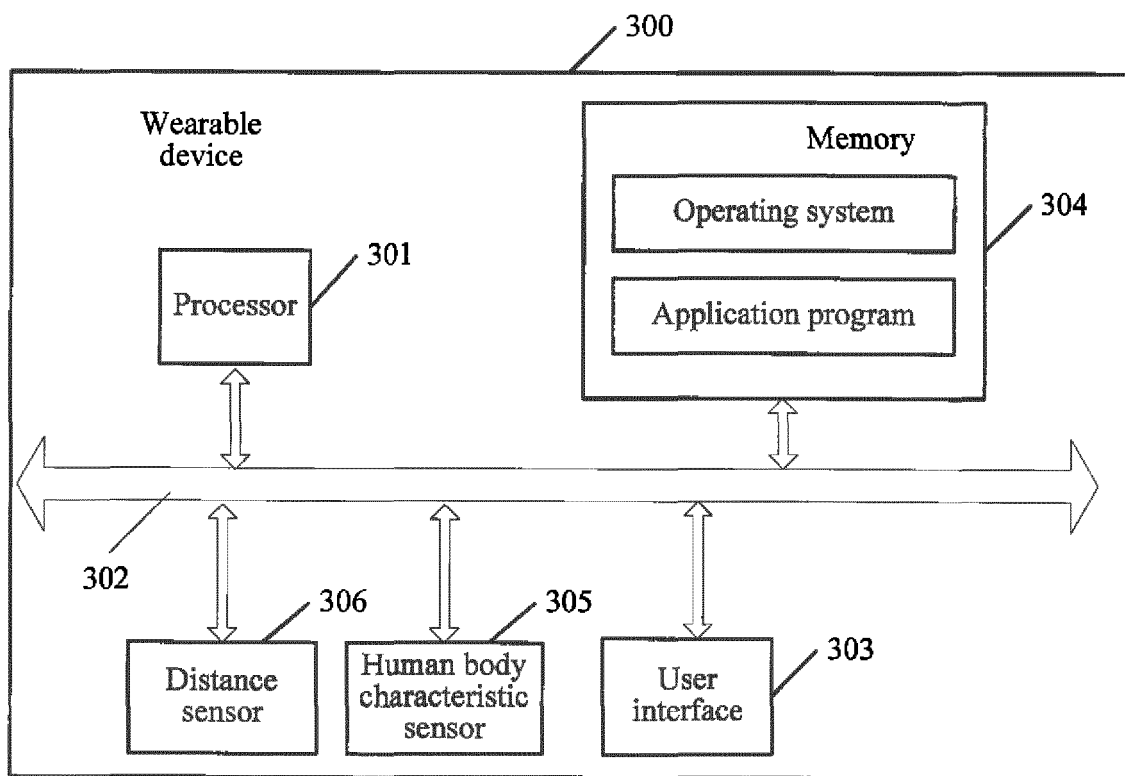


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2015/070088

A. CLASSIFICATION OF SUBJECT MATTER

A44C 5/00 (2006.01) i; G06F 3/01 (2006.01) i; 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)

A44C, A61B 5, G06F 3, G05B, H04M 1

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)

CPRSABS; CNABS; DWPI; SIPOABS; VEN; CNKI; CNTXT: LI, Liang; user, threshold value, wear+, whether, distanc+, body, detect+, sens+, temperature, blood, pulse, HUAWEI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 203759644 U (WEIFANG GOERTEK ELECTRONICS CO., LTD.), 06 August 2014 (06.08.2014), description, paragraphs [0005]-[0034], and figures 1-3	1-10
A	US 2014225730 A1 (DEPASCALE CHRISTOPHER), 14 August 2014 (14.08.2014), the whole document	1-10
A	CN 104155897 A (GUANG DONG OPPO MOBILE TELECOMMUNICATIONS CO., LTD.), 19 November 2014 (19.11.2014), the whole document	1-10
A	US 2012184878 A1 (NAJAFI BIJAN et al.), 19 July 2012 (19.07.2012), the whole document	1-10
A	CN 101410900 A (ROYAL DUTCH PHILIPS ELECTRONICS LTD.), 15 April 2009 (15.04.2009), the whole document	1-10
A	CN 103536279 A (DESAY ELECTRONICS (HUIZHOU) CO., LTD.), 29 January 2014 (29.01.2014), the whole document	1-10

☐ 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	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search

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Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2015/070088

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 203759644 U	06 August 2014	None	
US 2014225730 A1	14 August 2014	None	
CN 104155897 A	19 November 2014	None	
US 2012184878 A1	19 July 2012	US 8753275 B2	17 June 2014
CN 101410900 A	15 April 2009	JP 2009530950 A	27 August 2009
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		WO 2007110807 A3	13 March 2008
		EP 2002438 A2	17 December 2008
		WO 2007110807 A2	04 October 2007
		IN 200805096 P4	20 March 2009
CN 103536279 A	29 January 2014	None	

Form PCT/ISA/210 (patent family annex) (July 2009)

专利名称(译)	可穿戴设备和可穿戴设备的检测方法		
公开(公告)号	EP3228207A1	公开(公告)日	2017-10-11
申请号	EP2015876428	申请日	2015-01-05
[标]申请(专利权)人(译)	华为技术有限公司		
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当前申请(专利权)人(译)	HUAWEI TECHNOLOGIES CO. LTD.		
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发明人	LI, LIANG		
IPC分类号	A44C5/00 G06F3/01 A61B5/00 A61B5/01 A61B5/0205 A61B5/021 A61B5/024 A61B5/026 A61B5/145		
CPC分类号	A61B5/6844 A44C5/00 A61B5/01 A61B5/02055 A61B5/021 A61B5/02438 A61B5/026 A61B5/14532 A61B5/6803 A61B5/681 G06F3/01 G06F3/011		
其他公开文献	EP3228207B1 EP3228207A4		
外部链接	Espacenet		

摘要(译)

本发明的实施例公开了一种用于可穿戴设备和可穿戴设备的检测方法。该方法包括：检测可穿戴设备与用户之间的距离值；检测用户的身体特征值；如果可穿戴设备与用户之间的距离值小于或等于预设距离阈值并且用户的身体特征值未超过预设阈值，则确定可穿戴设备佩戴在用户身上用户的身体特征值。根据本发明实施例中的可穿戴设备和可穿戴设备的检测方法，通过检测可穿戴设备与用户之间的距离值，可以快速准确地确定用户是否佩戴可穿戴设备。用户的身体特征值，检测成功率高。

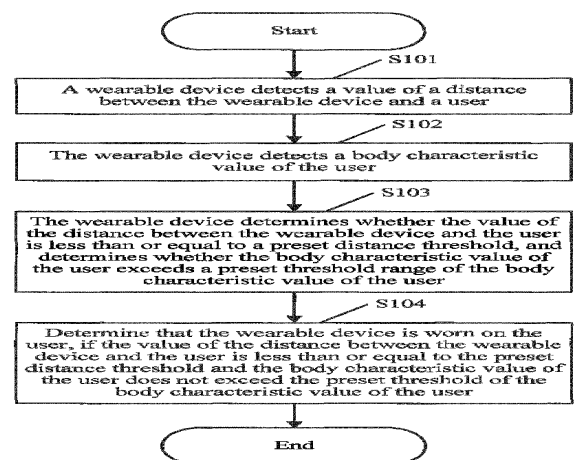


FIG. 4