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(54) **BANDS FOR MEASURING BIOMETRIC INFORMATION**

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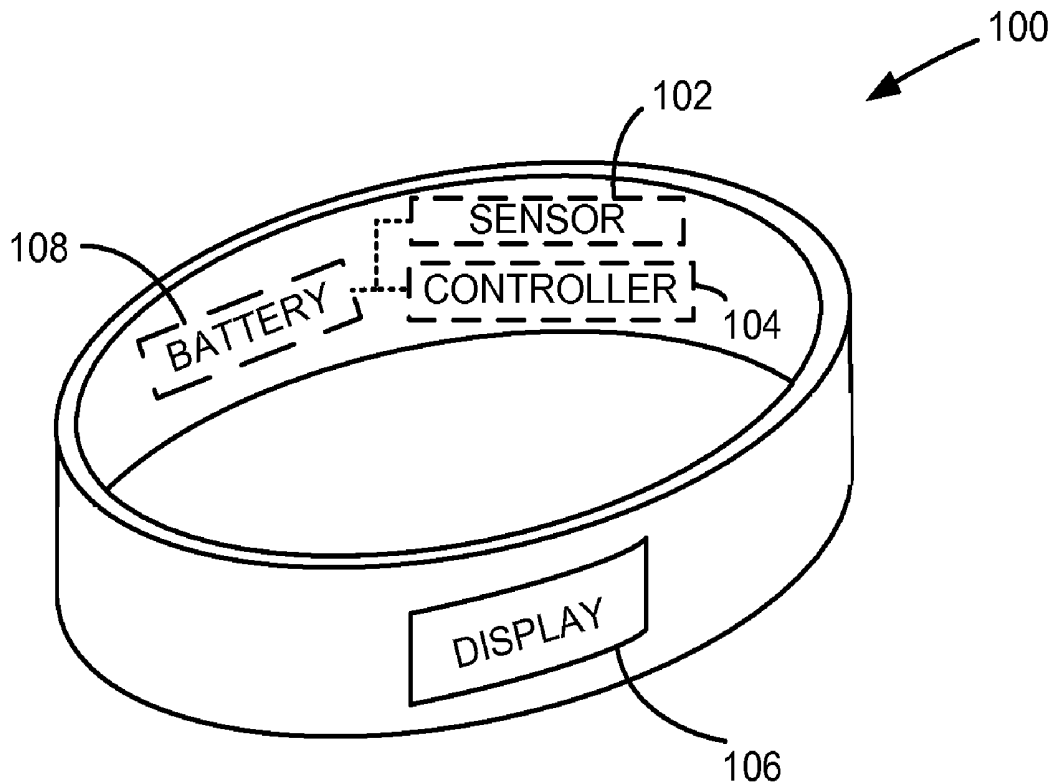
Related U.S. Application Data

(63) Continuation of application No. 13/488,436, filed on Jun. 4, 2012.

(60) Provisional application No. 61/493,313, filed on Jun. 3, 2011.

(57) **ABSTRACT**

In some aspects, a system is provided that includes (1) a wrist band having one or more sensors that measure biometric data of a user wearing the band; and (2) a display on the band that displays a message based on biometric data measured by the band. The message indicates a heart rate zone of the user. Numerous other aspects are provided.



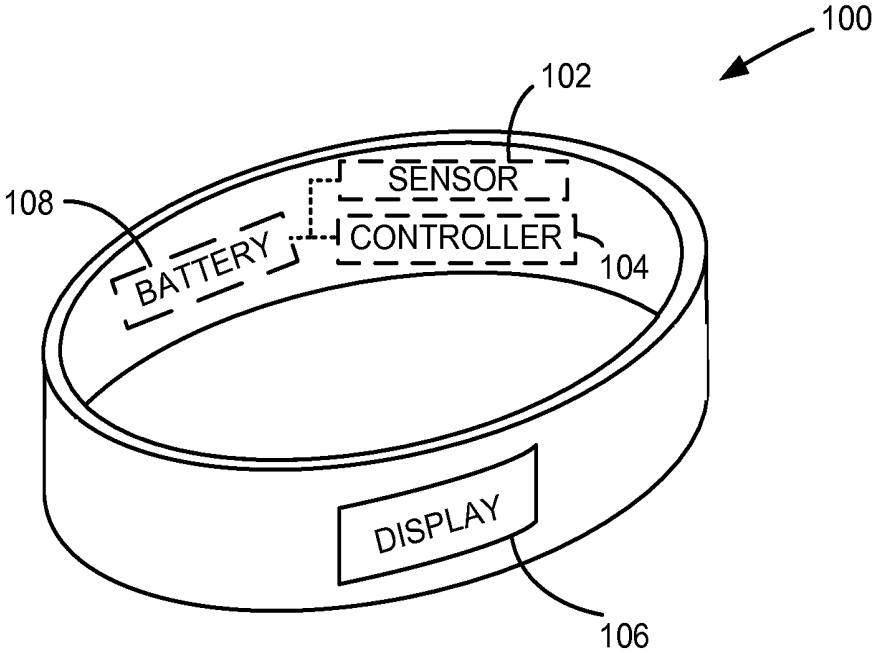


FIG. 1A

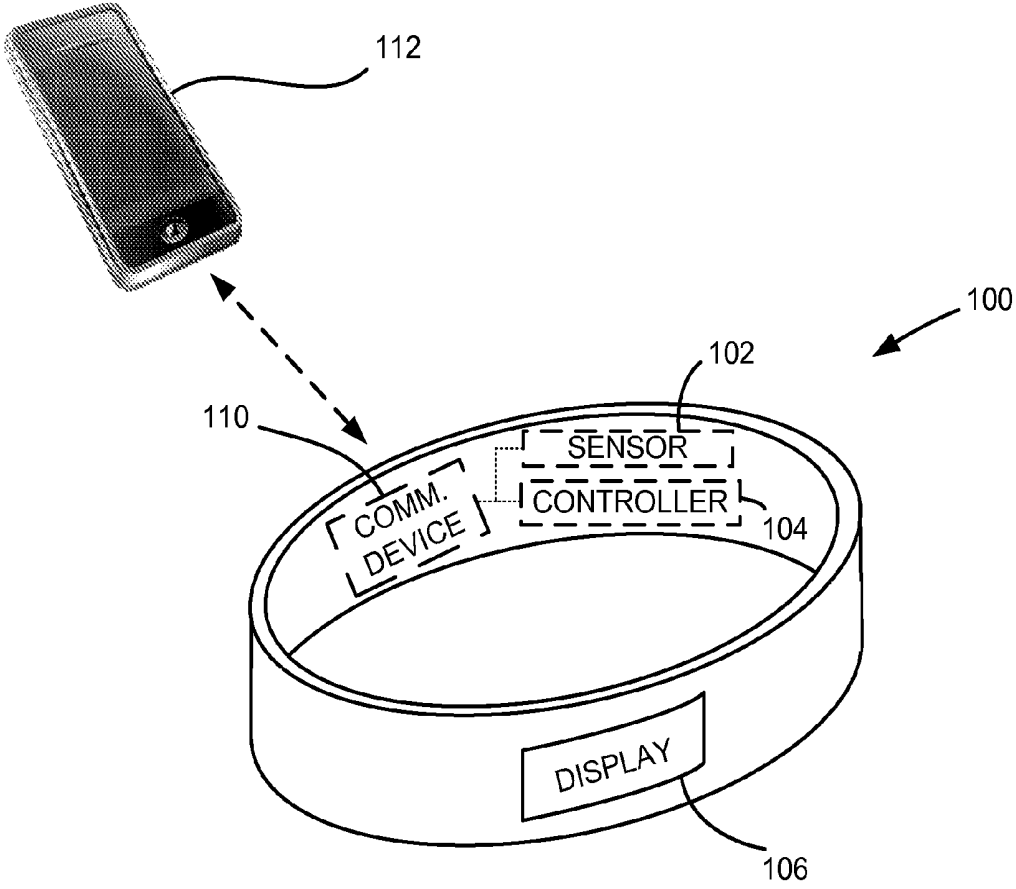


FIG. 1B

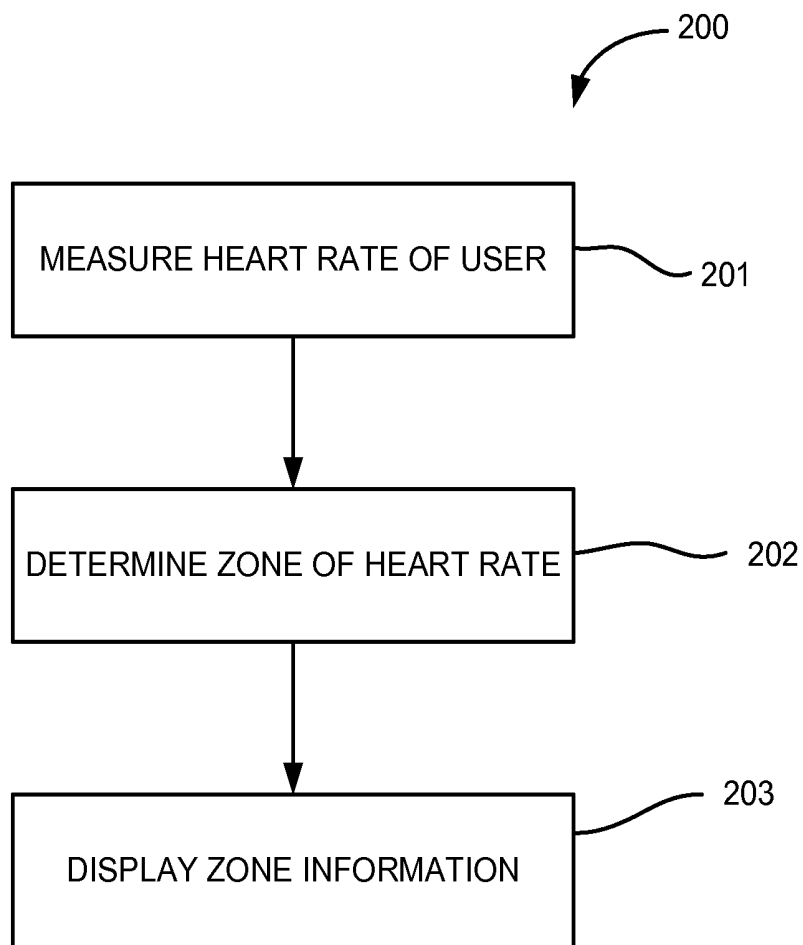


FIG. 2

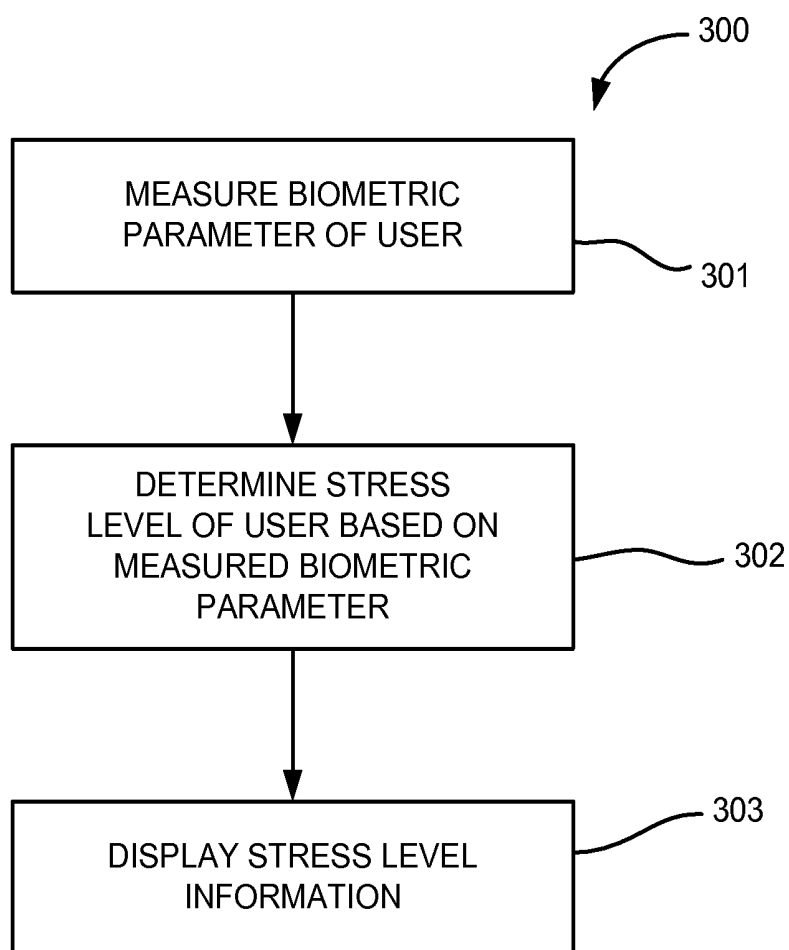


FIG. 3

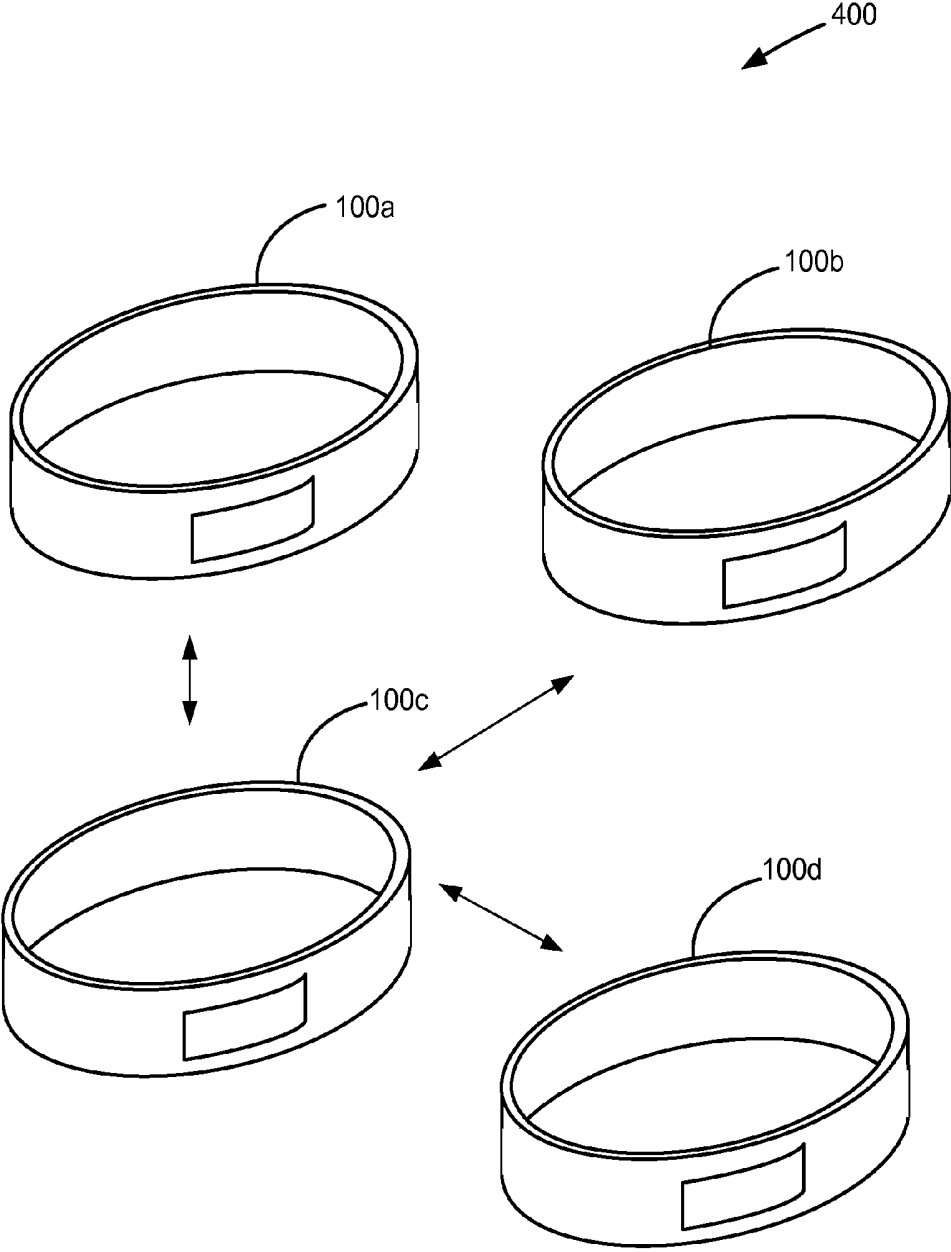


FIG. 4

BANDS FOR MEASURING BIOMETRIC INFORMATION

[0001] This application is a continuation of and claims priority to U.S. patent application Ser. No. 13/488,436 filed Jun. 4, 2012, and titled "BANDS FOR MEASURING BIOMETRIC INFORMATION" (Attorney Docket No. BMD014), which claims priority to U.S. Provisional Patent Application No. 61/493,313, filed Jun. 3, 2011 and titled "BANDS FOR MEASURING BIOMETRICS" (Attorney Docket No. BMD014/L). Each of these applications is hereby incorporated by reference herein in its entirety for all purposes.

FIELD OF THE INVENTION

[0002] The present invention relates to biometric measurements, and more particularly to wearable bands that may be employed to measure biometric information.

BACKGROUND

[0003] Biofeedback devices such as portable heart rate monitoring (HRM) devices are commonly used in fitness related activities for weight loss, goal heart rate (HR) training, and general HR monitoring. Such devices may sometimes be employed by healthcare professionals for chronic and/or acute heart condition monitoring and/or diagnosis.

[0004] Portable HRMs and other monitoring devices typically are expensive, and in some cases are cost prohibitive for many consumers. A need exists for inexpensive and/or simplified monitoring systems.

SUMMARY

[0005] In some aspects, a system is provided that includes (1) a wrist band having one or more sensors that measure biometric data of a user wearing the band; and (2) a display on the band that displays a message based on biometric data measured by the band. The message indicates a heart rate zone of the user.

[0006] In some aspects, a system is provided that includes (1) a wrist band having one or more sensors that measure biometric data of a user wearing the band; and (2) a display on the band that displays a message based on biometric data measured by the band. The message indicates a stress level the user.

[0007] In some aspects, a system is provided that includes a wrist band having one or more sensors that measure biometric data of a user wearing the band. The wrist band adapted to (1) detect at least one of a handshake, a fist bump and a high five of the user; and (2) share information with another user in response to the detection.

[0008] Numerous other aspects are provided, as are various methods, apparatus and computer program products for carrying out these and other aspects of the invention. Each computer program product may be carried by a medium readable by a computer (e.g., a carrier wave signal, a floppy disc, a hard drive, a random access memory, etc.).

[0009] Other features and aspects of the present invention will become more fully apparent from the following detailed description, the appended claims, and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1A is a schematic diagram of a band provided in accordance with the present invention.

[0011] FIG. 1B illustrates an embodiment of the band of FIG. 1A that includes a communications device in accordance with the present invention.

[0012] FIG. 2 is a flowchart of an example method of employing the band of FIGS. 1A and/or 1B for zone training in accordance with the present invention.

[0013] FIG. 3 is a flowchart of an example method of employing the band of FIG. 1A and/or 1B for monitoring stress level in accordance with the present invention.

[0014] FIG. 4 illustrates a group that may be formed by a plurality of users employing bands in accordance with the present invention.

DETAILED DESCRIPTION

[0015] In one or more embodiments of the invention, a wearable wrist band or "bracelet" (collectively referred to as a band herein) is provided that includes a sensor for measuring heart rate, pulse, temperature, or the like and displaying an indication of the measured data such as (1) a color; and/or (2) a message, which may depend on the value of the measured data. Examples include, for example:

[0016] (1) a stress level band having a color and/or message based on a measured stress level of a person wearing the band (e.g., as determined by measuring and/or monitoring heart rate, pulse rate, body temperature, perspiration, or the like); and/or

[0017] (2) a zone band having a color and/or message based on a determined heart rate zone of a person wearing the band (e.g., recovery, fat burning, target heart rate, anaerobic zone, maximum, etc.).

In some embodiments, the bands may be flexible and/or waterproof. Such bands are simple to use and inexpensive. Example embodiments are these and other bands are described below.

[0018] FIG. 1A is a schematic diagram of a band 100 provided in accordance with the present invention. The band 100 may include a biometric sensor 102 coupled to a controller 104, and display 106 coupled to the controller 104. The band 100 may be fabricated from any suitable material. In some embodiments, the band 100 may be formed from a flexible and/or waterproof material such as silicone; and the sensor 102 and/or controller 104 may be embedded therein.

[0019] The sensor 102 may include any suitable biometric sensor configured to measure one or more of but is not limited to, heart rate, pulse rate, temperature, respiration, acceleration, skin resistivity, etc. More than one sensor 102 may be provided.

[0020] The controller 104 may include a programmable logic controller, microprocessor, application specific integrated circuit, or the like having suitable programming code for performing the methods described herein. More than one controller 104 may be used.

[0021] The display 106 may be any suitable display such as a liquid crystal display, electronic paper display, organic light-emitting diode display, or the like.

[0022] A battery 108 may be provided for powering sensor 102, controller 104 and/or display 106. In some embodiments, battery 108 may be rechargeable and/or replaceable. In one particular embodiment, the battery may be recharged

via a USB connection (not shown) that allows information to be transferred from band 100 to another device such as a computer (not shown).

[0023] In some embodiments, the band 100 may be configured to communicate wirelessly with other devices such as a mobile telephone, tablet computer, laptop computer, desktop computer or the like. For example, FIG. 1B illustrates an embodiment of the band 100 in which the band 100 includes a communications device 110 such as a transmitter/receiver chip that allows the controller 104 to communicate with a mobile device 112. In some embodiments, the controller 104 may send information to and/or receive information from mobile device 112 using a wireless protocol such as WiFi, Bluetooth, or the like.

[0024] FIG. 2 is a flowchart of an example method 200 of employing the band 100 for zone training. With reference to FIGS. 1A-2, an exerciser (not shown) may wear the band 100 on his/her wrist. In step 201, sensor 102 of band 100 detects and measures the heart rate, pulse or another biometric parameter of the exerciser and provides this information to controller 104.

[0025] Based on the measured heart (or other information), in step 202, the controller 104 may determine an exercise zone for the exerciser. Generally, recommended exercise zones may depend on such factors as age and/or weight. In some embodiments, band 100 may be pre-programmed with particular definitions of the target heart rates for multiple zones. Any number of zones may be used (e.g., 1, 2, 3, 4, 5, 6, 7, etc.). For instance, bands may be pre-programmed with suitable heart rate zones for exercisers based on age and/or weight. In other embodiments, an exerciser may specify his/her age and/or weight and controller 104 may determine appropriate heart rate zones for the exerciser. For example, a mobile device 112 may include an application that prompts an exerciser for his/her age and/or weight, and then communicates this information (or zone information calculated by the mobile device) to the controller 104 via communications device 110.

[0026] In step 203, the band 100 displays heart rate zone information. For example, the controller 104 may cause display 106 to display a different color for each heart rate zone. In some embodiments, text information may be provided such as heart rate, zone, encouraging messages and/or warnings, or the like. Table 1 below provides exemplary colors for heart rate zones. Other colors may be employed.

TABLE 1

HEART RATE RANGE (BEATS PER MINUTE)	COLOR
70-95	GREEN
95-105	BLUE
105-120	PURPLE
120-135	YELLOW
135-150	PINK
150+	RED

[0027] In at least one embodiment, the controller 104 may include exercise routines that specify which heart rate zones an exerciser should be in and/or move between during an exercise routine. Band 100 may display an up arrow or down arrow (or other indicators) to indicate that an exerciser should increase or decrease his/her heart rate so as to move to another zone. A zone band may have a color and/or message based on what zone a user's heart rate is in (e.g., recovery, fat burning,

target heart rate, or anaerobic zone). A different color can correspond to each zone, and/or the band 100 may display the current zone as a message.

[0028] FIG. 3 is a flowchart of an example method 300 of employing the band 100 for monitoring stress level in accordance with the present invention. With reference to FIGS. 1A-1B and FIG. 3, a user (not shown) may wear the band 100 on his/her wrist. In step 301, sensor 102 of band 100 detects and measures the heart rate, pulse or other biometric parameter of the user and provides this information to controller 104.

[0029] Based on the measured heart rate (or other parameter such as temperature), in step 302, the controller 104 may determine a stress level of the user. In general, heart rate increases as stress level increases. As such, controller 104 may determine when the heart rate of the user rises above a pre-determined heart rate level (e.g., such as a steady state heart rate for the user, or a heart rate measured when the user is relaxed). Zones of stress may be determined for the user such as low stress, moderate stress, high stress and extreme stress based on various heart rate ranges of the user. Temperature of the user may be similarly employed (e.g., as temperature may decrease with stress). Such stress ranges may be pre-programmed, determined by the controller 104, determined by mobile device 112 and communicated to controller 104 or the like. For example, a mobile device 112 may include an application that prompts the user to meditate, breath deep or otherwise relax when determining a low stress level for the user. The mobile application may then communicate this information (or zone information calculated by the mobile device) to the controller 104 via communications device 110.

[0030] In step 303, the band 100 displays stress level information for the user. For example, the controller 104 may cause display 106 to display a different color for each stress level zone of the user. In some embodiments, text information may be included such as heart rate, stress level zone, encouraging messages and/or warnings, or the like. Table 2 below provides example colors for stress level zones. Other colors may be employed.

TABLE 2

STRESS LEVEL	COLOR
LOW	GREEN
MEDIUM	BLUE
HIGH	PURPLE
EXTREME	RED

[0031] In at least one embodiment, the controller 104 may cause messages to be displayed on the display 106 such as "relax", "breathe", "getting agitated", "step away from the situation", or the like based on the level of stress of the user. In some embodiments, a stress level band may have a color and/or message based on stress level (e.g., as determined by heart rate, pulse, temperature, etc.). A user may use mind control to adjust your heart rate and change the message (e.g., via breathing techniques). Any suitable message may be displayed such as be calm, back off, getting agitated, etc.

[0032] In some embodiments, the band 100 may be a "mood" band. For example, sensor 102 may measure temperature of a user and provide the temperature information to the controller 104. In response to this information, the controller 102 may cause display 106 to display a color repre-

sentative of the user's mood. Example colors are provided below in Table 3. Other colors may be employed.

TABLE 3

MOOD	COLOR
HAPPY/PASSIONATE	DARK BLUE
CALM	BLUE
SLIGHTLY CALM	BLUE GREEN
NORMAL	GREEN
SLIGHTLY NERVOUS	AMBER
ANXIOUS	GRAY
STRESSED	BLACK

[0033] The temperature ranges used for each mood/color may be pre-selected based on statistical averages for men, women, boys, girls, etc., or in some embodiments, may be determined by the controller 104 by monitoring the steady state or normal temperature of a user and/or the temperature of the user during known times of stress. For example, mobile device 112 may include an application that asks a user his/her mood. Based on this information, the mobile device 112 may direct the controller 102 to store relevant temperature ranges which correlate to moods of the user. Of course, if desired, a mood band may be formed using thermotropic liquid crystals calibrated to a nominal temperature of about 82° F. as in a conventional mood ring in place of or in addition to the above described controller embodiment.

[0034] In some embodiments, the band 100 may be configured to detect the presence of like bands. For example, a band 100a may be assigned to a group 400 of bands 100a-d as shown in FIG. 4. Fewer or more bands may be in the group 400. Each band 100a in the group 400 may be configured to communicate with other bands in the group 400 (e.g., via communications device 110 and/or mobile device 112) so as to identify members of the group, such as to beep, vibrate, change colors and/or display a message when other people/members of group 400 are near (e.g., other people from your college, people with similar interest or status, people within a frequent flyer program or points level, etc.), or the like. For instance, each band 100a-d may periodically broadcast identifying information so that any band in the group 400 may detect and identify the band(s).

[0035] In some embodiments, bands 100 may "exchange" information with other bands in a group or any other band. For instance, the sensor 102 may include an accelerometer (not separately shown) that may recognize a handshake by a user of the band (e.g., by detecting the rapid up/down motion which occurs when two people shake hands). This may trigger the controller 104 in the band 100 of each person to share contact information for the user (e.g., email addresses, cellular telephone numbers, generate a Facebook friend request, or the like). Likewise, bands may be "bumped" together to share information. Any such information may be communicated to mobile devices 112 if desired. As an example, person A wearing band 100a may shake hands, high five, bump fists, etc., with person B wearing band 100b. Each band 100a, 100b may include a sensor 102 such as an accelerometer, strain gauge or the like which detects an acceleration and/or an acceleration pattern along one or more axis that is identifiable by controller 104 of each band 100a, 100b as a request to share information. In response thereto, controller 104 of each band 100a, 100b may cause information to be shared. For instance, bands 100a, 100b may directly broadcast informa-

tion between one another; and/or bands 100a, 100b may direct mobile devices 112 of each user to share contact or other information.

[0036] In other embodiments, a wearable band may include a built in flash drive in place of or in addition to one or more the above. For example, monitored/collected data may be stored on the flash drive.

[0037] In one or more embodiments, a band may be used to motivate people to take the stairs. Most staircases in buildings are stark and depressing. A hotel chain may spruce up their staircases and even provide incentives for people to use them (to promote healthy living, save electricity by not using elevators, etc.). One or more of the above bands may be used as part of such a promotions.

[0038] Accordingly, while the present invention has been disclosed in connection with exemplary embodiments thereof, it should be understood that other embodiments may fall within the spirit and scope of the invention, as defined by the following claims.

The invention claimed is:

1. A system comprising:

a mobile device of a user; and
a wrist band having one or more sensors configured to measure biometric data of the user, the wrist band operative to communicate measured biometric data to the mobile device of the user, the wrist band and the mobile device of the user operative to:
determine an age and weight of the user;
determine a plurality of heart rate zones for the user based on the age and weight of the user;
measure heart rate of the user while the user is wearing the wrist band; and
display on the wrist band a message based on the heart rate measured by the wrist band, wherein the message indicates a heart rate zone of the user selected from the plurality of heart rate zones.

2. The system of claim 1 wherein the wrist band is adapted to display a color corresponding to a heart rate zone of the user.

3. The system of claim 1 wherein the wrist band and the mobile device of the user are operative to determine a heart rate zone selected from at least four heart rate zones.

4. The system of claim 1 wherein the wrist band and the mobile device of the user are operative to determine a heart rate zone selected from a first heart rate zone, a second heart rate zone, a third heart rate zone, a fourth heart rate zone, a fifth heart rate zone and a sixth heart rate zone.

5. The system of claim 4 wherein the wrist band is adapted to display:

a green color if the user's heart rate is in the first heart rate zone;
a blue color if the user's heart rate is in the second heart rate zone;
a purple color if the user's heart rate is in the third heart rate zone;
a yellow color if the user's heart rate is in the fourth heart rate zone;
a pink color if the user's heart rate is in the fifth heart rate zone; and
a red color if the user's heart rate is in the sixth heart rate zone.

6. The system of claim 4 wherein:

the first heart rate zone corresponds to approximately 95 or less heart beats per minute;

the second heart rate zone corresponds to approximately 95-105 heart beats per minute;
 the third heart rate zone corresponds to approximately 105-120 heart beats per minute;
 the fourth heart rate zone corresponds to approximately 120-135 heart beats per minute;
 the fifth heart rate zone corresponds to approximately 135-150 heart beats per minute; and
 the sixth heart rate zone corresponds to approximately greater than 150 heart beats per minute.

7. A system comprising:

a wrist band having one or more sensors that measure heart rate and perspiration level of a user wearing the band; and

a display on the wrist band that displays a message based on the measured heart rate and perspiration level; wherein the message indicates a stress level the user.

8. The system of claim 7 wherein the wrist band is adapted to display a warning message based on a stress level of the user.

9. The system of claim 7 wherein the wrist band is adapted to display a color corresponding to a stress level of the user.

10. The system of claim 9 wherein the wrist band is adapted to display a first color for a first stress level, a second color for a second stress level, a third color for a third stress level and fourth color for a fourth stress level.

11. The system of claim 10 wherein the first color is green, the second color is blue, the third color is purple and the fourth color is red.

12. The system of claim 9 wherein the wrist band is adapted to display up to seven different colors based on a stress level of the user.

13. The system of claim 12 wherein the seven different colors include dark blue, blue, blue green, green, amber, gray and black.

14. A system comprising:

a mobile device of a first user; and

a first wrist band having one or more sensors configured to measure biometric data of the first user, the first wrist band operative to communicate measured biometric data to the mobile device of the first user, the first wrist band and the mobile device of the first user operative to:

detect proximity to a second user wearing a second wrist band, the second wrist band being adapted to communicate with a mobile device of the second user;

determine if the second user is a member of a group associated with the first user; and

if the second user is a member of the group associated with the first user, display a color on the first wrist band indicating the group association.

15. The system of claim 14 wherein the mobile device is adapted to share information with the second user if the second user is a member of the group associated with the first user.

16. The system of claim 15 wherein the information shared includes contact information.

17. The system of claim 15 wherein the information shared includes monitored or collected data.

18. The system of claim 14 wherein the first wrist band is further adapted to emit a sound or vibration or display a message indicating the presence of the second user who is a member of the group associated with the first user.

19. The system of claim 14 wherein the group association includes people with similar interests or status.

20. A system comprising:

a mobile device of a first user; and

a first wrist band having one or more sensors configured to measure biometric data of the first user, the first wrist band operative to communicate measured biometric data to the mobile device of the first user, the first wrist band and the mobile device of the first user operative to: detect at least one of a handshake, a fist bump and a high five occurring between the first user and a second user based on communication from the first wrist band; and

share information between the first and second users in response to the detection of the handshake, fist bump, or high five;

wherein the sharing of information between the first and second users in response to the detection of the handshake, fist bump, or high five includes sharing of information between the mobile devices of the first and second users and includes generating a social network friend request.

* * * * *

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摘要(译)

在一些方面，提供了一种系统，其包括（1）具有一个或多个传感器的腕带，所述传感器测量佩戴该带的用户的生物识别数据；（2）在频带上显示基于由频带测量的生物特征数据的消息的显示。该消息指示用户的心率区。提供了许多其他方面。

