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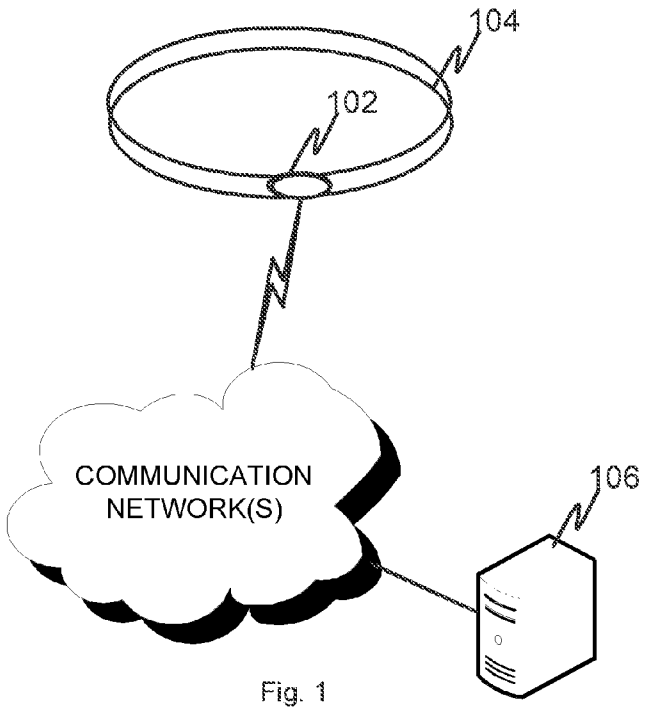

Fig. 1

(57) Abstract: The invention relates generally to a monitor device (102) which monitors heart rate and motion activity of a user. The device (102) collects measurement data of simultaneous heart rate and motion of a user. The device is further arranged to learn a correlation between said user's heart rate and activity based on the heart rate data and the activity data. After the learning period the device may calculate heart rate on the basis of motion data of the user and the learned correlation. Thus the user does not need to wear a chest strap (104) for obtaining the heart rate information.

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HEART RATE AND ACTIVITY MONITOR ARRANGEMENT AND A METHOD FOR USING THE SAME

Technical field

Generally, the invention relates to a monitor device, which monitors heart rate and activity of a user.

Background technology

Currently, several different types of devices are on market for user to monitor his activity, heart rate and consumed calories as well as counting steps and tracking exercises. Many of these devices, such as heart rate monitors, comprise a chest strap with means for detecting heart beats of the user. In general, this is advantageous, because heart rate monitoring gives very accurate data about user's current physical fitness and the intensity of an exercise, for example.

Unfortunately, the chest strap may be uncomfortable to use and a user has to wear it every time and during the whole exercise, when heart rate is desired to be monitored. In some exercises, the chest strap may hamper the exercise and the strap may also be dislocated during exercising, which may stop the heart rate monitoring or cause errors in the data.

The prior art knows a strapless heart rate monitor, such as presented in EP1815760A, wherein heart rate monitoring means are in a form of a glove. However, the glove having a display may also be uncomfortable to wear when exercising, e.g. running, because the runner may sweat a lot and feel hot.

Summary of the invention

It is an object of the present invention to implement such a solution, that previously mentioned drawbacks of the prior art could be diminished. In particular, the invention is implied to solve how to monitor heart rate and activity more effortlessly.

The objective of the invention is met by the features disclosed in the independent patent claims.

A heart rate and activity monitor arrangement according to the present invention is characterized by the features of claim 1.

According to an embodiment of the invention, a heart rate and activity monitor arrangement comprises heart rate monitoring means for monitoring a user's heart rate, motion detection means for monitoring said user's activity, and control means for obtaining and storing data from said heart rate monitoring means and from said motion detection means. The arrangement is arranged to learn a correlation between said user's heart rate and activity based on heart rate data and activity data monitored at the same time.

In one embodiment, the heart rate and activity monitor arrangement according to the present invention is arranged to provide a user's heart rate profile based on the activity data by using the correlation of said user.

In another embodiment, the heart rate and activity monitor arrangement according to the present invention is arranged to recognize the activity type of a particular exercise from the activity data and/or the heart rate data.

Yet, in another embodiment, the activity monitoring means comprises at least one 3D accelerometer. This feature is advantageous, because by using 3D accelerometer reliable data of the activity can be monitored and obtained. The measured activity data can comprise e.g. acceleration information combined with direction information from which further information can be defined.

In another embodiment, the heart rate and activity monitor arrangement according to the present invention further comprises means for tracking the location of the motion detection means. In another embodiment, the location tracking means comprises a GPS module. Tracking location by GPS is advantageous in many ways, because GPS gives accurate location and altitude information. Combining this information to 3D accelerometer information, for example, may provide reliable data to perform further deductions.

A method for teaching a heart rate and activity monitoring arrangement according to the present invention is characterized by the features of claim 7.

According to an embodiment of the invention, a method for teaching a heart rate and activity monitoring arrangement according to the present invention to convert activity data into a heart rate profile comprises at least following steps:

-attaching said heart rate monitoring means to a user for monitoring said user's heart rate;

-arranging said motion detection means to monitor said user's activity simultaneously with the heart rate monitoring;

-obtaining heart rate data and activity data from said user's particular activity in particular time period;

-arranging the arrangement to define the correlation between said heart rate data and said activity data;

-storing the correlation for usage of a further activity conversion.

A method for using a heart rate and activity monitoring arrangement according to the present invention is characterized by the features of claim 8.

According to an embodiment of the invention, a method for using a heart rate and activity monitoring arrangement according to the present invention for providing a heart rate profile based on the activity data of a user comprises at least following steps:

-arranging said motion detection means for monitoring activity of said user;

-obtaining activity data from said user's activity;

-converting said activity data into a heart rate profile by using said correlation for said user;

-providing said heart rate profile based on the activity data.

Yet, in another embodiment, a method for using a using a heart rate and activity monitoring arrangement according to the present invention comprises a further step for recognizing the user's activity type from the activity data and/or the heart rate data.

Some preferable embodiments of the invention are described in the dependent claims.

Significant advantages can be achieved with the present invention when compared to the prior art solution. The heart rate and activity monitor arrangement according to the present invention may be easy to teach to convert activity data with or with-

out location information to a heart rate profile for a particular user. After accomplishing a teaching period, it may be easy to the user to carry the motion detection means in order to monitor activity and heart rate. The monitoring means may be easy to use for monitoring daily activity in general, or for monitoring particular exercise, such as walking, jogging, running, biking, to name a few.

The arrangement may be configured to recognize the place of the motion detection means relative to the user, which may enable to set the motion detection device in numerous places, such as in a sock, in a pocket, such as a leg, ankle, thigh, hip, rear, breast or hand pocket, in an arm strap or in some other suitable place.

The arrangement according to the present invention can be used for measuring the workout progress, which usually implies also progress in physical fitness. The correlation between activity data and heart rate may be effortlessly updated at regular intervals to correspond user's current physical fitness by repeating the teaching period of the arrangement.

In the present document, the term "heart rate" refers the number of heartbeats per minute, which can be monitored in many ways, such as measuring the heart's electrical activity or measuring pressure waves, i.e. pulse, generated by the heart.

In the present document, the term "activity data" refers to various physical quantities, such as velocity, average velocity, maximum velocity distance, altitude variation, number of steps, step rate, type of exercise, location information, route tracking.

In the present document, the term "external entity" refers to an electronic device or a group of devices capable of obtaining data. In practice, the external entity can be for example, but not limited to, terminal devices, such as a personal computer, a smart phone, a PDA, a tablet, or a server, group of servers, for example.

Short description of the drawings

Next, the invention is described in more detail with reference to the appended drawings, in which

Fig. 1 illustrates the concept of an embodiment of the present invention;

Fig. 2 illustrates the internals of an embodiment of a portable device in accordance of the present invention;

Fig. 3 is a flowchart disclosing an embodiment of a method in accordance of the present invention;

Fig. 4 is a flowchart disclosing an embodiment of another method in accordance of the present invention;

Detailed description of the embodiments

Fig. 1 illustrates the concept of an embodiment of the present invention and Fig. 2 the internals of an embodiment of a portable device in accordance of the present invention. In one embodiment, the heart rate and activity monitor arrangement 100 comprises heart rate monitoring means for monitoring a user's heart rate, motion detection means for monitoring said user's activity, and control means for obtaining and storing data from said heart rate monitoring means and from said motion detection means, wherein said arrangement is arranged to learn a correlation between said user's heart rate and activity based on heart rate data and activity data monitored at the same time.

In one embodiment, the motion detection means 202 and the controlling means is preferably combined in a single entity, e.g. a portable device 102, which is attached to a user and/or is carried by the user. In another embodiment, part of the heart rate monitoring means 204 is also located in the portable device 102.

In one embodiment, the heart rate monitoring means comprises a chest strap 104, which is wound around the user's chest, when user's heart rate is desired to be monitored. In one embodiment, the chest strap 104 comprises electrodes (not shown) for producing heart rate data by measuring the difference in potential between the electrodes.

In one embodiment, the chest strap 104 comprises connectors (not shown) for the portable device 102 to be connected. The connectors are advantageously secure and easy to use, such as snap fastener connectors, which ensure a good connection between the device 102 and the chest strap 104. In one embodiment, the control means is configured to obtain the heart rate data measured by electrodes in the chest strap via the connectors. It is obvious for the skilled person that the chest strap can also

comprise additional and/or alternative data transferring means, such as Bluetooth or another RF transceiver method, for example.

It is obvious to the skilled person that the heart rate can be measured by some other means than using the chest strap. However, it is advantageous that in every embodiment using other means to measure the heart rate, the portable device is configured to obtain the heart rate data.

Depending on embodiment, the chest strap and/or the control means can comprise means for processing the signal measured by the electrodes, e.g. filtering, amplifying and/or averaging it.

The portable device 102 according to the present invention further comprises motion detection means 202 for monitoring the user's activity. In one embodiment, the motion detection means comprises at least one 3D accelerometer. In one embodiment, in addition to and/or instead of the 3D accelerometer, the motion detection means comprises some other means for detecting user's motions, such as one or more gyroscopes. Preferably, the motion detection means is fastened to the portable device so that it can freely detect the movements of the portable device.

The activity data provided by the motion detection means is further obtained and stored by the control means. Preferably, the sample rate is about 10 – 20 sample/seconds, which provides sufficient information about the movements of the portable device. As described above, the control means can comprise means for processing the data measured by the motion detection means, e.g. filtering, amplifying and/or averaging it.

The controlling means comprises means, such as a processor 206, for obtaining heart rate and activity data and storage means, such as a memory 208, for storing the obtained data. In an embodiment, the control means further comprises data transfer means, e.g. transceiver 210, for transferring data from the device 102 and receiving upcoming data. Typically, the control means also comprises user interface (UI) 212 and power management means 214. Furthermore, in some embodiments, the controlling means comprises location tracking means 216 for tracking the location of the motion detection means.

The storage means can be arranged in many ways. In one embodiment, the storage means comprises MMC (multimedia) card and/or micro SD card. These kinds of memory cards are well known technique, so they are not described more detailed in

the present document. Requirements for the memory module are that it is fast enough and has sufficient size of memory.

As described above, data transfer between heart rate monitoring means and control means can be arranged in several ways. Data transfer from the portable device 102 to an external entity, such as a server 106 or cloud, can also be arranged in several ways. In one embodiment, the data transfer means in the control means comprises a GSM module for data transfer between the portable device 102 and the external entity, for example, which external entity is accessible via one or more wireless and/or wired network(s). For communication purposes via GSM Radio network, the GSM module comprises an internal SIM card or other means for enabling the communication, and a unique communication ID for the communication.

In another additional or alternative embodiment, the control means further comprises physical means, such as a USB port, for data transfer between the portable device and the external entity. In the present embodiment, the data is normally first transferred to a terminal device, e.g. a personal computer, a smart phone, a tablet to name a few, and depending on embodiment, processed and performed on that device or transferred further to a server for example. Yet, in another additional or alternative embodiment, the control means further comprises RF means, such as Bluetooth for data transfer between the portable device and the external entity. The skilled person will understand that the preceding embodiments are meant for examples of data transfer, not for limiting the invention.

Data transferred from the portable device to the external entity may comprise heart rate data, if monitored, activity data and location information in embodiments comprising location tracking means. The control means may be configured to transfer also other information, such as device configuration data and device status information. Data transferred from the external entity to the portable device may contain e.g. software updates etc. Some known methods for compressing data before transmission can be used, which is obvious for the skilled person.

Preferably, the control means comprises a user interface 212, which can comprise e.g. one or more push-buttons and/or visible and/or audible signaling means, such as one or more LED devices and/or one or more beepers. The push-buttons may have different functions, such as, but not limited to, activating device, selecting activity type, selecting heart rate and/or activity data monitoring mode. More than one function can be related to one push-button by alternating a way of pressing the button, i.e. short press vs. long press and/or a number of presses. Respectively, visible

and/or audible signaling means can have different functions, such as, but not limited to, indicating the activation of the device, selected activity type, charge level of batteries, heart rate and/or activity level, etc. It is obvious to the skilled person that the visible and/or audible signaling means can also be arranged to indicate several types of malfunction situations. Respectively, more than one indication can be related to one visible/audible signaling means, such as constant light/sound vs. blinking light/sound, for example.

In addition, the control unit comprises power management means 214 comprising power means, such as batteries, for providing power for components in the portable device. Preferably, used batteries are rechargeable, but it is possible to use disposable batteries.

In embodiments, wherein power means comprises rechargeable batteries, the batteries are preferably charged from mains. In an embodiment, the arrangement according to the present invention comprises a cradle for charging, which cradle is preferably formed so that the charging process can be performed by placing the portable device in the cradle. Preferably, the cradle comprises means to secure the portable device in right position in the cradle, such as magnets for securing the portable device and/or design for assisting to set the device in right position and keep it in place during charging.

In an embodiment, the cradle is connectible to mains, e.g. 240 V and/or 110 V, so that either the cradle comprises a connector straight to the mains or the cradle comprises a port for a connection to a computer. The port can be any kind of suitable port, such as a micro USB port, but the skilled person will understand that any other kinds of ports can be used for connection.

As described above, the portable device and/or the cradle can comprise a visible and/or audible indicator in connection with the power management means to indicate several issues, such as charge level of the power means, charging status, etc.

Furthermore, in an embodiment, the control means further comprises location tracking mean 216s. In one embodiment, the GSM module is also used for location tracking. In another either additional or alternative embodiment, the location tracking means comprises a GPS module, which is used for tracking of the motion detection means. It is obvious to the skilled person that another tracking means can also use to obtain location information.

The arrangement further comprises an external entity as described above. The external entity can comprise e.g. software for processing the data transferred from the portable device. In one embodiment, the software in the external entity is arranged to calculate the correlation between activity data and heart rate data for each user and to provide user's heart rate profile based on his/hers activity data.

Preferably, the external entity further comprises an application for a user to monitor his/hers workout progress, physical fitness and/or heart rate profile as well as other information, which can be provided based on data obtained by means in the portable device during an exercise, for example. The application can be downloadable to user's computer and/or available over communication network(s).

Fig. 3 is a flowchart disclosing an embodiment of a method for teaching a heart rate and activity monitoring arrangement in accordance of the present invention to convert activity data into a heart rate profile. The teaching period starts at step 300.

At step 302, the heart rate monitoring means is attached to a user to monitor the user's heart rate. As described above, in one embodiment the portable device is connected to the chest strap, which is wound around user's chest. Depending on embodiment, the portable device may require activation and/or the activity type have to be selected. In another embodiment, the arrangement according to the present invention is arranged to recognize the activity type of a particular exercise from the activity data and/or the heart rate data. The recognition procedure can be performed in the external entity after the data relating to the particular exercise has been transferred.

At step 304, the motion detection means is arranged to monitor said user's activity simultaneously with the heart rate monitoring. In one embodiment, the simultaneous monitoring is a default feature, if the control means detects that the portable device is attached to the chest strap, for example. In another embodiment, user can select what he/she wants to be monitored; heart rate, activity or both. It is advantageous also to track location in those embodiments, wherein the portable device comprises a location tracking means. However, if the exercise or activity is e.g. an indoor activity, the user can select not to track the location or the arrangement can be arranged to recognize the stationary location information and stop or at least decrease the location information tracking rate.

At step 306, the arrangement obtains heart rate data and activity data from said user's particular activity in particular time period. When experiencing the teaching

period, the time for simultaneous heart rate and activity monitoring should be long enough, such as 30 min -1 h exercise three or four times in a week per activity type. That kind of teaching period provides sufficient amount data for the arrangement to define a reliable correlation.

In some embodiment, the method comprises a further step, wherein the data is transferred to an external entity. Depending on embodiment, the data can be transferred before the correlation is defined and/or after the correlation is defined.

At step 308, the arrangement is arranged to define a correlation between the user's heart rate data and activity data. In embodiments comprising the location tracking means the location data can be utilized in defining as a parameter, e.g. altitude information, altitude variation, type of environment, e.g. sand road, tarmac road, forest, can be used, when defining the personal correlation.

At step 310, the correlation is stored for a usage of a further activity conversion, and at step 312, the teaching period is ended. It is preferable that the user updates the correlation regularly by performing the teaching period again. If the user is a beginner, the correlation should be updated more regularly, e.g. once every two weeks. Later, once every month may be sufficient time interval to perform the teaching period again. In this way, the progress in physical fitness will be taken account in the user's correlation.

Fig. 4 is a flowchart disclosing an embodiment of a method for using a heart rate and activity monitoring arrangement in accordance of the present invention to provide a heart rate profile based on the activity data of a user. At 400, the usage of the arrangement is started.

At step 402, the motion detection means is arranged to monitor user's activity. In a preferable embodiment, the portable device comprising the motion detection means is arranged to monitor the activity after it is activated. In one embodiment, the portable device is placed to a pocket in a jacket, for example, or some other place, which is near that place, where the portable device would be, if connected to the chest strap. In another embodiment, the arrangement is configured to recognize the place of the motion detection means relative to the user, which enables to set the motion detection device in numerous places, such as in a sock, in a pocket, such as a leg, ankle, thigh, hip, rear, breast or hand pocket, in an arm strap or in some other suitable place. Every human's body part provides a typical movement, which can be detected and thus deduce the place of the portable device. Yet, in another embodi-

ment, algorithms used in the arrangement are arranged is such way that the results provided by the algorithms does not depend on the location of the portable device relative to the user. This can be achieved by detecting mainly frequency parameters of the motion detection means.

At step 404, the arrangement is arranged to obtain activity data from said user's activity. In one embodiment, the user activates the device when starting and deactivate when finishing. Further, at step 406, the activity data is converted into a heart rate profile by using said correlation for said user. In some embodiment, the data is first transferred to the external entity and the converting process is performed there. In other embodiment, the control means in the portable device comprises means for performing the conversion.

In one embodiment, the arrangement is arranged to recognize the activity type of a particular exercise from the activity data and/or the heart rate data. Normally, heart rate data and activity data for running and walking, for example, differ from each other significantly. This difference combined e.g. with the location information can be used for recognizing the activity type. In addition to the signal strength obtained from the motion detection means, other characteristic can be utilize in activity type recognition, such as frequency information obtained from the motion detection means. Typically, the strength of the acceleration signal linearly correlates with the heart rate of the user, but some activity types make an exception, such as cycling. These activity types can be recognize in some other way, such as detecting velocity of the user. In some embodiments, the user can select or provide the activity type information and/or correct it, if the arrangement has recognized it wrong.

As described above, the correlation is activity type specific, i.e. for walking is used different correlation than for running.

At step 408, the heart rate profile based on the activity data is provided. In one embodiment, the arrangement comprises means in external entity for presenting information to the user, and in another embodiment the user has means, e.g. by downloading software, in his/her terminal device in order to transfer data and examine information based on that data. Yet, in another embodiment, wherein the conversion is performed in the portable device, the portable device can further comprise means for providing the heart rate profile to the user. The device can comprise e.g. a display to present a current heart rate. In another embodiment, the means can be e.g. visible and/or audible signal, which can be arranged to indicate, when user's current

heart beat exceeds and/or go under a predetermined heart rate level. At step 410, the usage of the arrangement is ended.

The scope of the invention is determined by the attached claims together with the equivalents thereof. The skilled persons will again appreciate the fact that the explicitly disclosed embodiments were constructed for illustrative purposes only, and the scope will cover further embodiments, embodiment combinations and equivalents that better suit each particular use case of the invention.

CLAIMS

1. A heart rate and activity monitor arrangement comprising

- heart rate monitoring means for monitoring a user's heart rate,

- motion detection means for monitoring said user's activity, and

-control means for obtaining and storing data from said heart rate monitoring means and/or from said motion detection means,

wherein said arrangement is arranged to learn a correlation between said user's heart rate and activity based on heart rate data and activity data monitored at the same time.

2. A heart rate and activity monitor arrangement according to claim 1, wherein said arrangement is further arranged to provide a user's heart rate profile based on the activity data by using the correlation of said user.

3. A heart rate and activity monitor arrangement according to any preceding claim, wherein said arrangement is further arranged to recognize the activity type of a particular exercise from the activity data and/or the heart rate data.

4. A heart rate and activity monitor arrangement according to any preceding claim, wherein said activity monitoring means comprises at least one 3D accelerometer.

5. A heart rate and activity monitor arrangement according to any preceding claim further comprising GSM module for transferring data obtained by the control means to an external entity and/or for tracking the location of the motion detection means.

6. A heart rate and activity monitor arrangement according to claim 5, wherein said device further comprises a GPS module for tracking the location of the motion detection means.

7. A method for teaching a heart rate and activity monitoring arrangement according to any of claims 1-6 to convert activity data into a heart rate profile comprising at least following steps:

-attaching said heart rate monitoring means to a user in order monitor said user's heart rate;

-arranging said motion detection means to monitor said user's activity simultaneously with the heart rate monitoring;

-obtaining heart rate data and activity data from said user's activity in particular time period;

-arranging said arrangement to define a correlation between said heart rate data and said activity data;

-storing the correlation for a usage of a further activity conversion.

8. A method for using a heart rate and activity monitoring arrangement according to any of claims 1-6 to provide a heart rate profile based on the activity data of a user comprising at least following steps:

-arranging said motion detection means to monitor the activity of said user;

-obtaining activity data from said user's activity;

-converting said activity data into a heart rate profile by using said correlation for said user;

-providing said heart rate profile based on the activity data.

9. A method for teaching and/or using a heart rate and activity monitoring arrangement according to any of claim 7-8 comprising a further step for transferring data to said external entity.

10. A method for teaching and/or using a using a heart rate and activity monitoring arrangement according to any of claim 7-9 comprising a further step for recognizing the user's activity type from the activity data and/or the heart rate data.

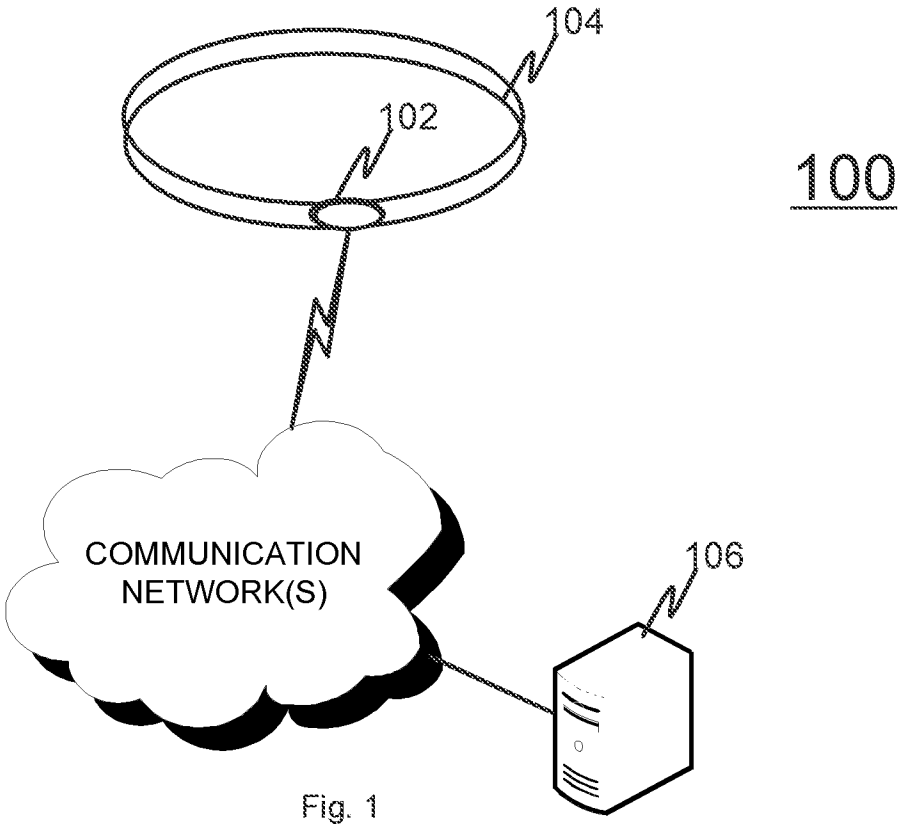
104
102
100
COMMUNICATION NETWORK(S)
106

Fig. 1

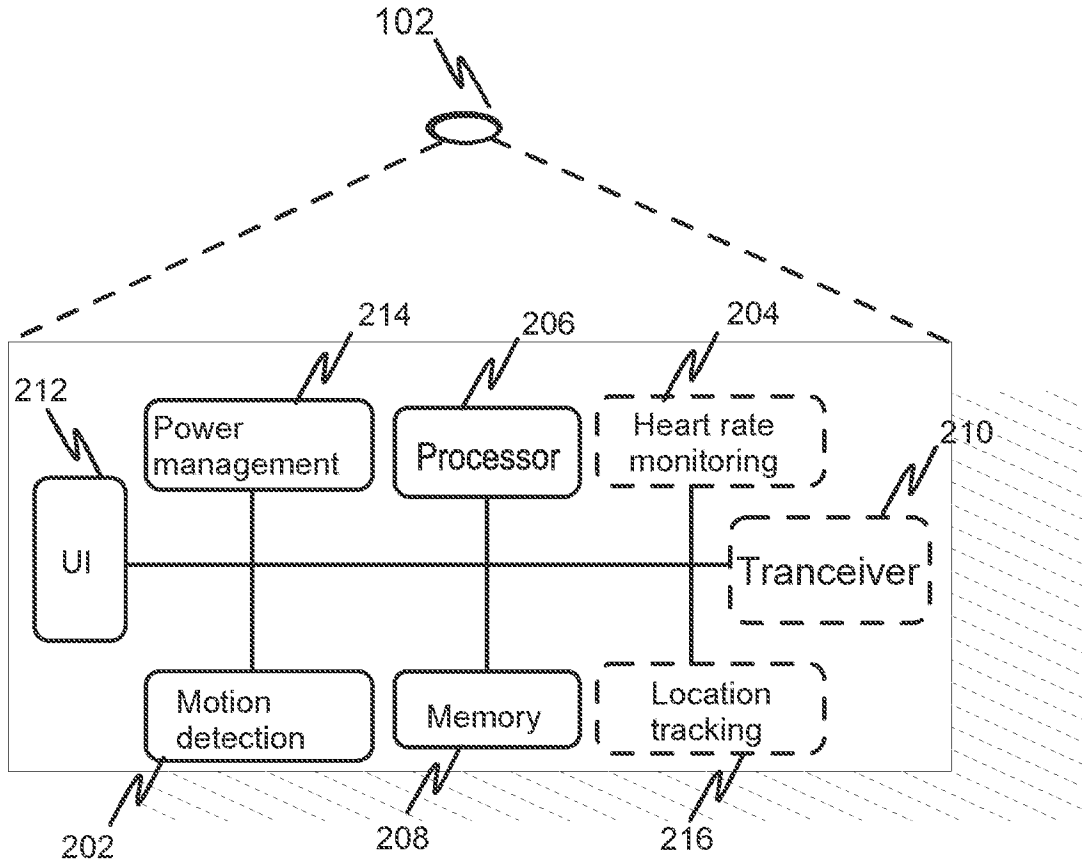
102
214
206
204
212
Power management
Processor
Heart rate monitoring
210
UI
Tranceiver
Motion detection
Memory
Location tracking
202
208
216

Fig.2

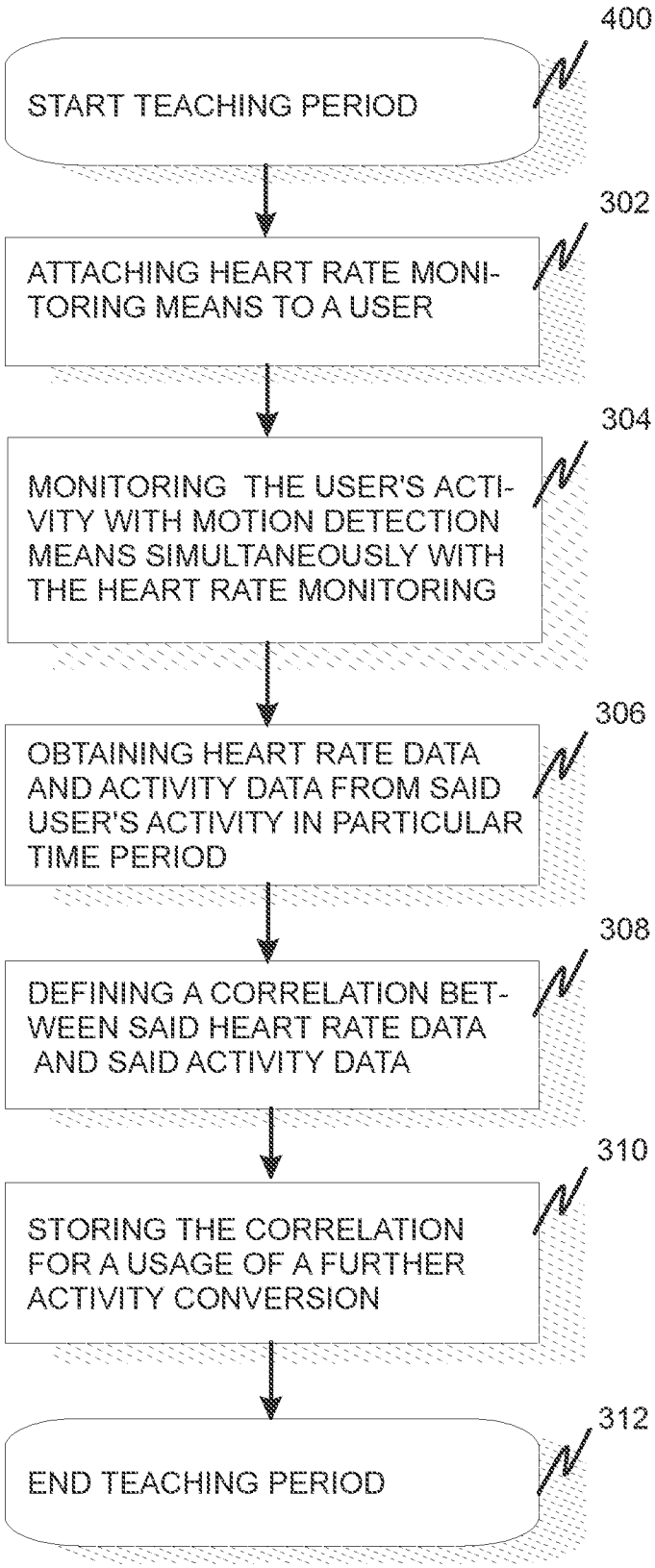
400
START TEACHING PERIOD
302
ATTACHING HEART RATE MONITORING MEANS TO A USER
304
MONITORING THE USER'S ACTIVITY WITH MOTION DETECTION MEANS SIMULTANEOUSLY WITH THE HEART RATE MONITORING
306
OBTAINING HEART RATE DATA AND ACTIVITY DATA FROM SAID USER'S ACTIVITY IN PARTICULAR TIME PERIOD
308
DEFINING A CORRELATION BETWEEN SAID HEART RATE DATA AND SAID ACTIVITY DATA
310
STORING THE CORRELATION FOR A USAGE OF A FURTHER ACTIVITY CONVERSION
312
END TEACHING PERIOD

Fig. 3

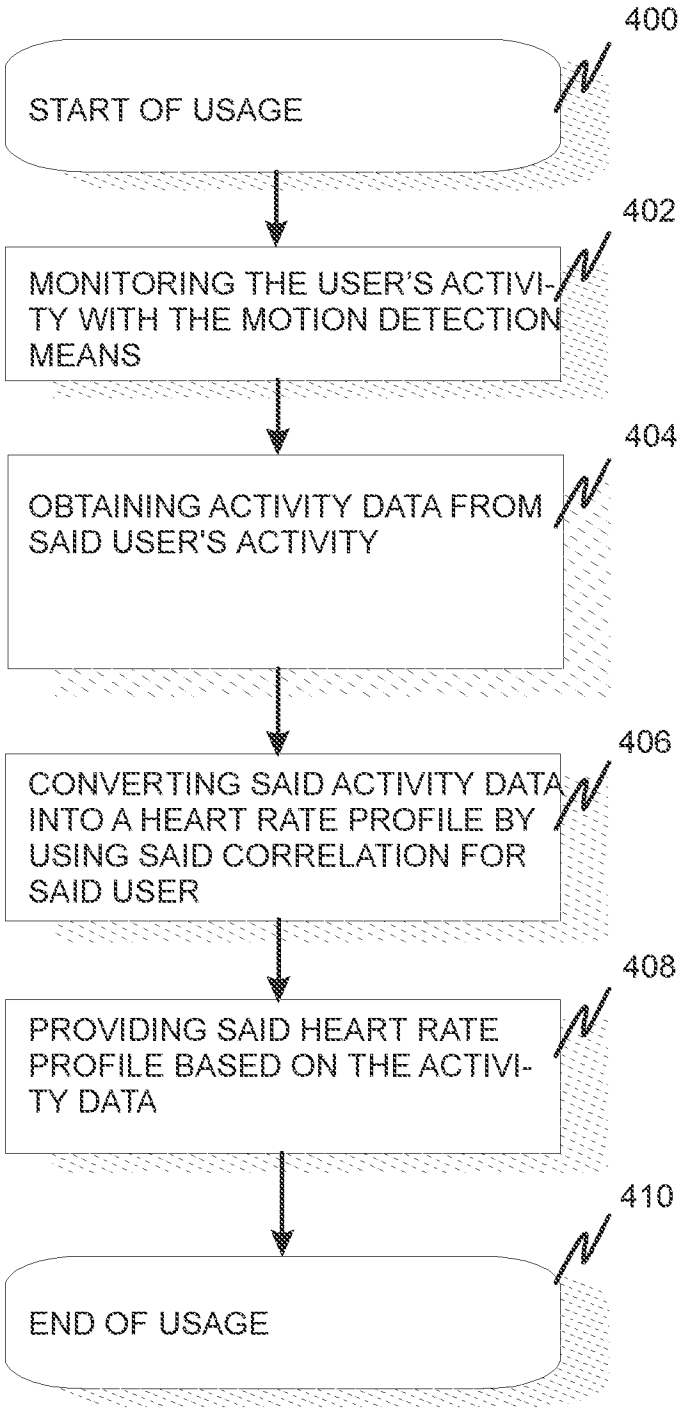
400
START OF USAGE
402
MONITORING THE USER'S ACTIVITY WITH THE MOTION DETECTION MEANS
404
OBTAINING ACTIVITY DATA FROM SAID USER'S ACTIVITY
406
CONVERTING SAID ACTIVITY DATA INTO A HEART RATE PROFILE BY USING SAID CORRELATION FOR SAID USER
408
PROVIDING SAID HEART RATE PROFILE BASED ON THE ACTIVITY DATA
410
END OF USAGE

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2014/050307

A. **CLASSIFICATION OF SUBJECT MATTER**

See extra sheet

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)

IPC: A61B

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

FI, SE, NO, DK

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

EPO-Internal & translations from Thomson Reuters and IPPH/SIPO, WPI, XPAIP, XPESP, XPESP2, XPI3E, XPIEE, XPIOP, XPOAC, XPRD, XPTK, BIOSIS, COMPDX, EMBASE, INSPEC, MEDLINE, TDB, NPL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PERNEK, I. et al., 'How Hard Am I Training? Using Smart Phones to Estimate Sport Activity Intensity', 32nd International Conference on Distributed Computing Systems Workshops (ICDCSW), 18-21 June 2012, Macau, pp. 65-68 abstract; Section IIA; Section IIC, last paragraph; Section IID, first paragraph; Section IV	1-2, 4-8
X	US 2010274100 A1 (BEHAR A [US] et al.) 28 October 2010 (28.10.2010) paragraphs [0009], [0012], [0050]-[0051], [0102]-[0106], [0111], [0116], [0123]-[0125]; Figs. 1A-1C, 4A-4B, and 7	1-10
X	EP 2407217 A2 (POLAR ELECTRO OY [FI]) 18 January 2012 (18.01.2012) paragraphs [0007], [0009]-[0010], [0018], [0020]-[0025], [0035]-[0036]; Figs. 1-2 and 7	1-2, 7-8

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

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Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2014/050307

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2011288381 A1 (BARTHOLOMEW J [US] et al.) 24 November 2011 (24.11.2011) the whole document, especially paragraphs [0012]-[0016], [0027], and [0041]; Fig. 1	1-10
P, X	JP 2014041426 A (NTT DOCOMO INC) 06 March 2014 (06.03.2014) English translation (Thomson Reuters) [online] EPOQUENET TXTJPS: the whole document, especially paragraphs [0027]-[0044]	1-2, 4, 7-8

INTERNATIONAL SEARCH REPORT
Information on Patent Family Members

International application No.
PCT/FI2014/050307

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2014/050307

CLASSIFICATION OF SUBJECT MATTER

Int.Cl.
A61B 5/024 (2006.01)
A61B 5/0402 (2006.01)
A61B 5/103 (2006.01)