METHOD FOR MONITORING EXERCISE, AND APPARATUS AND SYSTEM THEREOF

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ABSTRACT
An exercise monitoring device having sensors for monitoring and measuring the physiological and physical parameters of a person during an exercise. The monitored and measured parameters are stored and used in real-time comparison with the same person’s performance another time. The monitored and measured parameters of another person in the same exercise may also be used. Real-time monitoring and measuring of the parameters of several people provides the possibility to have virtual competition between people in different locations.
### Table 1(a)

<table>
<thead>
<tr>
<th>Name</th>
<th>ID</th>
<th>Personal Info</th>
<th>Exercise Level (record)</th>
<th>Exercise Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terry Chiu</td>
<td>001</td>
<td>gender: M, age: 28, wt: 60, ht: 1.9</td>
<td>5km, 7km, 10km</td>
<td>Table 1(b)</td>
</tr>
<tr>
<td>Tom Wai</td>
<td>002</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Mary Wong</td>
<td>003</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Usain Bolt</td>
<td>015</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Xiang Liu</td>
<td>016</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
</tbody>
</table>

### Table 1(b)

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Venue</th>
<th>Profile Data</th>
<th>Exercise Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>30/5/2009</td>
<td>Playground1</td>
<td>Table 1(c)</td>
<td>Running</td>
</tr>
<tr>
<td>02</td>
<td>3/6/2009</td>
<td>Playground1</td>
<td>***</td>
<td>Running</td>
</tr>
<tr>
<td>03</td>
<td>4/6/2009</td>
<td>Kowloon Bay</td>
<td>***</td>
<td>Running</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>SaKung</td>
<td>***</td>
<td></td>
</tr>
</tbody>
</table>

### Table 1(c)

<table>
<thead>
<tr>
<th>Time</th>
<th>Acc_x</th>
<th>Acc_y</th>
<th>Acc_z</th>
<th>Distance</th>
<th>Location coordinates</th>
<th>Heart rate</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:22:34</td>
<td>0.33</td>
<td>-0.22</td>
<td>0.4</td>
<td>0</td>
<td>(22.331539, 114.263241)</td>
<td>63</td>
<td>26.8</td>
</tr>
<tr>
<td>17:22:35</td>
<td>-0.19</td>
<td>-0.35</td>
<td>-0.37</td>
<td>0.56</td>
<td>Etc.</td>
<td>63</td>
<td>26.8</td>
</tr>
<tr>
<td>17:22:36</td>
<td>3.77</td>
<td>2.2</td>
<td>-0.16</td>
<td>1.12</td>
<td>Etc.</td>
<td>63</td>
<td>26.8</td>
</tr>
<tr>
<td>17:22:37</td>
<td>1.32</td>
<td>0.11</td>
<td>0.29</td>
<td>1.95</td>
<td>Etc.</td>
<td>64</td>
<td>26.8</td>
</tr>
<tr>
<td>17:22:38</td>
<td>-0.02</td>
<td>0.05</td>
<td>-0.07</td>
<td>2.67</td>
<td>Etc.</td>
<td>65</td>
<td>26.8</td>
</tr>
<tr>
<td>17:22:39</td>
<td>0.02</td>
<td>0.06</td>
<td>-0.35</td>
<td>3.51</td>
<td>Etc.</td>
<td>65</td>
<td>26.8</td>
</tr>
<tr>
<td>17:56:44</td>
<td>1.57</td>
<td>-0.11</td>
<td>0.05</td>
<td>3621.21</td>
<td>Etc.</td>
<td>96</td>
<td>24.5</td>
</tr>
<tr>
<td>17:56:45</td>
<td>0.39</td>
<td>-0.03</td>
<td>-0.02</td>
<td>3621.54</td>
<td>Etc.</td>
<td>96</td>
<td>24.5</td>
</tr>
</tbody>
</table>

Remark: Acc_x,y,z means measured acceleration value at x, y, z axis respectively.
METHOD FOR MONITORING EXERCISE, AND APPARATUS AND SYSTEM THEREOF

FIELD OF THE INVENTION

[0001] The present invention relates to devices for monitoring physical exercise.

BACKGROUND

[0002] A sportsman wishing to improve his sports performance would have a goal of beating his past performance. To do so require measurement devices and physical markers, such as a running track indicative of the run distance, a stopwatch to measure time.

[0003] However, it is difficult for any sportsman to monitor his own progress while he is concentrating on the exercise. Only when he has finished with the exercise could he check the time, or other measurement parameters, to review his performance; the sportsman does not have a real time indication of his present performance. Therefore, the sportsman is unable to push himself at specific crucial moments during the exercise to exceed his past performance, unless he had specific help. For example, an assistant could be placed at specific locations along a running track to shout out to the sportsman his time. In this way, the sportsman can then decide if he needs to push himself harder based on the shouted information.

[0004] Furthermore, unless the sportsman shares the same running track and timing facilities with other sportsmen at the same time, it is impossible for the sportsman to compete with the other sportsmen.

[0005] It is desirable to provide a way to allow a sportsman to actively compare his performance during an exercise, with his past performance at the same exercise. Furthermore, it is also desirable to provide a way to allow two or more persons to exercise and compete with less restraints of travel.

SUMMARY OF INVENTION

[0006] In a first aspect the invention discloses a method of monitoring the exercise of a user, comprising the step of: using at least one sensor to record at least one performance parameter of the user during his exercise; comparing the record of the performance parameter against another record of the performance parameter; and indicating to the user the how the performance parameter of the user compares to the other record of the same performance parameter.

[0007] Optionally, the other record of the same performance parameter is of an earlier exercise of the same user. Alternatively, the other record of the performance parameter is of an earlier exercise of the other person. Preferably, the step of comparing the record of the performance parameter against another record of the performance parameter is made as the user is performing the exercise at the same time as another person.

[0008] Preferably, the indication of the comparison of the parameters to the user is provided by voice prompt, such as one which is audible by an earphone worn by the user.

[0009] In a second aspect the invention discloses an exercise monitoring device system for remote competition, comprising a host server; a plurality of client exercise monitoring devices in wireless communication with the host server; each client exercise monitoring device having at least one sensor for monitoring at least one performance parameter of a respective user during an exercise; each client exercise monitoring device is capable of sending the performance parameter of the respective user to the host server; the host server is adapted to compare the performance parameter sent from the plurality of client exercise monitoring devices; and the host server is adapted to communicate to each client exercise monitoring device how the performance parameter of each user compares to the performance parameter of another user; wherein the comparative performance of the users in the exercise is indicated to each user.

[0010] In a third aspect the invention discloses an exercise monitoring device comprising at least one sensor for monitoring at least one performance parameter of a user during an exercise, a controller for comparing the performance parameter of the user to another performance parameter; and an output device for indicating to the user the extent to which the performance parameter of the user differs from the other performance parameter.

[0011] Optionally, the other performance parameter is a performance parameter of the user during an earlier exercise. Alternatively, the other performance parameter is the performance parameter of another person.

[0012] The performance parameter is one of the following non-exhaustive list of: time, distance, location, track, speed, acceleration, inclination, altitude, temperature, humidity, ultraviolet index, heart beat rate, breath, calorie, SpO2 and any other parameter which is useable to measure, monitor or analyse the physical condition of the user and his performance in an exercise.

[0013] The at least one sensor includes any combination of the following non-exhaustive list: timer, GPS, accelerometer, gyroscope, barometer, temperature sensor, infrared sensor, ultraviolet sensor, CMOS sensor, piezo-electric, fingerprint sensors, and any other sensor which is useable to measure, monitor or analyse the physical condition of the user and his performance in an exercise.

[0014] The exercise of the user comprises, among other possibilities, running, walking, rowing, biking, rope skipping, number of times of weight lifting, sit-ups, push-ups, pull-up, so and on.

[0015] Accordingly, the embodiment provides the possibility that a user monitors, records and analyses the user's different sessions of the same exercise over a period of time, such as over months or years, to monitor and chart his improvement according to various parameters, i.e. not just speed or endurance, but also breathing rate, heart beat rate, and so on.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] It will be convenient to further describe the present invention with respect to the accompanying drawings that illustrate possible arrangements of the invention, in which like integers refer to like parts. Other arrangements of the invention are possible, and consequently the particularity of the accompanying drawings is not to be understood as superceding the generality of the preceding description of the invention.

[0017] FIG. 1 shows a front view of an embodiment of the invention;

[0018] FIG. 2 is a schematic diagram of the internal architecture of the embodiment of FIG. 1; and

[0019] FIG. 3 shows examples of relational-tables inside the database of the embodiment of FIG. 1;
FIGS. 4a and 4b illustrate how different physical parameters monitored by the embodiment of FIG. 1 can becharted for analysis;

FIG. 5 illustrates how the embodiment of FIG. 1 can be used in one way;

FIG. 6 illustrates how the embodiment of FIG. 1 can be used to provide results viewable on a computer.

DETAILED DESCRIPTION

FIG. 1 shows an exercise monitoring device 100 which is an embodiment of the invention. The exercise monitoring device 100 contains a sensor bank 125, which is a collection of devices and sensors that allow the present exercise of a user to be compared to past exercise ‘records’, or Exercise Profiles.

The exercise monitoring device 100 comprises a housing 102, a user interface including a screen 104 and multiple buttons 106.

The exercise monitoring device 100 is small enough to be portable and worn by a user while he is performing an exercise. Typically, the exercise monitoring device 100 may be strapped to the user’s wrist in the way watches are worn, or worn on his arms or waist, or around his neck.

To be able to monitor the exercise of the user, the exercise monitoring device 100 contains devices for identifying the user, time and environment parameters, and sensors for monitoring the user’s physiological parameters. Physiology refers to the physical and chemical processes of living organisms and their parts.

FIG. 2 is a schematic diagram showing some of the devices and sensors inside the exercise monitoring device 100, including a processor 120, a storage media 122, a wireless communication interface 124, a user interface 104 and a biometric identification module (not illustrated).

The storage media 122 comprises a random access memory (RAM) 121 and flash type memory 123, etc. A database for recording the performance of the user and his identity is stored in the storage media 122.

The wireless communication interface 124 provides data transfer with remote electronic equipment, such as a server 503 (see FIG. 5).

The user interface 104 is connected to input and output ports 126 in the exercise monitoring device 100. For input, there is a keypad, a stylus pad, touch screen, keyboard or keypad (not illustrated) etc. Furthermore, there is a microphone (not shown) for voice recording.

Therefore, the exercise monitoring device 100 is capable of receiving input of personal information of the user, such as the user’s identity (ID), name, address, personal information and static physiological parameters including height, weight, age, sex etc.

The biometric identification module is a voice recognition module. Thus, after the user has entered his identity into the exercise monitoring device 100 at the first time he used the exercise monitoring device 100, the user can be subsequently identified by biometric voice recognition through the microphone. The biometric voice recognition allows the exercise monitoring device 100 to be used in turn by a plurality of identifiable users easily.

Furthermore, there are various output devices such as a screen for display, earphone socket 108 for an earphone or a speaker (not illustrated),

Other input and output components include a serial port or USB port (not illustrated) for data output to a computer.

The sensor bank 125 include one or more accelerometers, gyroscopes, heart beat rate monitors, CMOS sensors and piezoelectric sensors, blood oxygen sensors, breath sensors and so on. Furthermore, the sensor bank 125 includes devices for monitoring time, environmental parameters, location of the user and so on, such as temperature sensors, humidity sensors, ultraviolet sensors, barometers, CMOS cameras, infrared sensors and a location sensor. Preferably, the location sensor is a global position system (GPS) locator.

The sensor bank 125 is therefore capable of monitoring the user’s exercise and recording the time spent, the distance covered, the speed and acceleration of the user, the number of repetitions in the exercise, the user’s heart beat rate and breathing rate. Furthermore, the sensor bank 125 is capable of detecting geographical location and altitude, ambient temperature, humidity, ultraviolet index and so on. Advantageously, such environmental data is able to provide an indication if the weather has any effect on the exercise performance of the user.

The CMOS camera is usable to sense the monitor changes in pattern or colour of the user’s body parts, such as his tongue, eye, face, the skin etc. The piezoelectric sensor can be used to sense vibration or stress or strain on the muscle. Such devices or sensors help to monitor the user’s physiological parameters.

How each sensor or device in the sensor bank 125 works is known to the skilled man and needs no detailed elaboration here. Just for example, the accelerometer is usable to sense the steps of the user as he walks or runs, and to count the steps; a finely-tune accelerometer is capable of determining if the user has taken slow steps in a walk or quick steps in a run. U.S. application Ser. No. 12/342,678 of 12 Dec. 2008 explains how an accelerometer is able to monitor acceleration, calculate walking or running speed, and also count the steps of the user, and is entirely incorporated herein by reference.

Also, how is each physiological sensor 125 placed in contact with the user to monitor his physiological parameters is known to the skilled man, which also needs no detailed elaboration here.

The database in the storage media 122 contains records from the sensor bank 125 in past exercises. FIG. 3 shows an example of three relational tables in the database, Table 1(a), Table 1(b) and Table 1(c), all containing information pertaining to past exercises.

Table 1(a) contains the personal information of all the users who have used the exercise monitoring device 100. These are shown as columns Name, Identity (Or Serial Number), Personal Information, Exercise Level and Exercise Profile. Although not illustrated in detail, the column “Personal Info” comprises information such as gender, age, weight, height, etc.

Table 1(b) contains information on each exercise perform by the users recorded in Table 1(a), such as the date and venue of the exercise, and the profile of the exercise. In this case, Table 1(b) contains information of a running exercise.

Table 1(c) contains the actual ‘profile data’ of each exercise and, by way of example, the data columns shows time, distance, location, track, speed, acceleration, terrain’s inclination, altitude, temperature, humidity, ultraviolet index,
heart beat rate, breath, SpO2 (Saturation of Peripheral Oxygen), and calorie burnt. To provide the data as shown in Table 1(c), the sensors in the sensor bank 125 monitor various physical and physiological parameters of the user during the user’s exercise. For example, in a running exercise, the heart-beat rate, steps and the quickness of the steps of the user are monitored by the accelerometer and counted.

Typically, the sensors 125 provide the data in Table 1(c) by sampling the user’s physiological parameters at intervals of one second. That is, the columns are filled with a new row of data every second.

The exercise monitoring device 100 contains software which allows the processor 120 to make comparisons between the present performance of the user and a record of the user’s past performance. During the present exercise, the sensor bank 125 measures the user’s physiological parameters, and the surrounding physical parameters in real-time, and compares them with his recorded profile or profiles. For example, if the user is performing a run and at moments where the user is slower compared to the same moments in the record, the exercise monitoring device 100 prompts the user to run faster, to encourage him to improve his performance. This provides the possibility that the exercise monitoring device issue alerts and messages in real time about the present performance in relation to the record.

Optionally, the exercise monitoring device 100 also helps the user to slow down if the user prefers to sustain only a comfortable, slightly less strenuous exercise routine than the record. It is possible to configure the exercise monitoring device 100 to monitor whether the user should outperform or under-perform the user’s past performances.

FIG. 5 shows that the exercise monitoring device may be worn on the arm of the user, or his waist, or around his neck. A suitable position will facilitate the sensors such as the accelerometer to sense the up and down movements of the arm of the user when the user is running. The ear phone extends from the exercise monitoring device to the ear of the user, so that the user is able to receive regular prompt messages, updating him on his progress of his exercise. Any parameter monitored by the exercise monitoring device may be announced to the user while the user is still at the exercise, such as distance covered, heart beat rate, blood pressure, calorie count, and can be used by the user to decide whether he has achieved his goal of the exercise. Thus, the embodiment provides an advantage that review of the user’s performance is in real time. This relieves the need of another person to monitor the user’s performance.

In a variation of the embodiment, the embodiment provides the possibility of comparing the performance of the user with the performance of other people, instead of with a record of the user’s own past performance. In this case, the user loads a single or a plurality of the Exercise Profiles of other people to compare with the user’s present performance in real time. That means, during the present exercise, the sensor bank 125 measures the user’s physiological parameters and the physical parameters in real-time, and compares them with the parameters in the Exercise Profiles, i.e. records, of the other people.

There are many ways to obtain another person’s record against which to compare the performance of the present user. Firstly, the exercise monitoring device 100 may wirelessly communicate with a server 503 containing a database of other people’s records, to download a selected person’s record into the exercise monitoring device 100 (preferably, the user’s own record in the exercise monitoring device 100 is also uploaded into the server 503 for other people to download). Alternatively, the exercise monitoring device 100 has Bluetooth, IrDa or other wireless communication protocol which allows the exercise monitoring device 100 to communicate directly with the exercise monitoring device 100 of another person, to allow record sharing. Alternatively, the record can be downloaded into a computer, floppy disk or portable memory, to be transferred between computers which can then further transfer the record into another exercise monitoring device 100. The means for data transfer into a computer include serial or USB communication, or other communication protocol as the skilled man would know.

Preferably, if the parameters in another person’s record are too difficult for the user, the exercise monitoring device 100 automatically adjusts the parameters of the other person’s record by a factor to make it easier, such as 10%. The skilled man understands that, depending on the parameter, this may means an adjustment to the greater or lesser value. For example, the parameter of speed is adjusted lower to make the speed easier to beat. On the other hand, the parameter of time taken in the other person’s record may be adjusted longer to make it easier to beat. The exercise monitoring device 100 determines that an record is too difficult if the difference between one or more selected parameter in the latest record of the user’s performance and the same parameters in the selected other person’s record is greater than a certain threshold. On the other hand, if the difference is too small, the exercise monitoring device 100 determines that a record is too easy and the user is capable of beating the record of the other person. In this case, the exercise monitoring device 100 amends the parameters in the record of the other person by a factor to make the competition more difficult, such by a 5% amendment. This will make the challenge to measure up to the other person’s record stiffer. In a variation of this embodiment, the user specifies to the exercise monitoring device 100 a certain amount or percentage of improvement over the user’s past records. For example, he could specify an improved speed by 10%.

Preferably, the exercise monitoring device 100 also allows comparison with the performance of famous sportsmen. If the user is a sprinter, he may want to improve himself or learn from a famous sprinter such as Usain Bolt or Xiang Liu. He then can download Bolt’s profiles and then sprit with the exercise monitoring device 100 providing prompts as to how the user’s performance at any stage of his sprint compares to Bolt’s record.

In a variation of the embodiment, the exercise monitoring device 100 automatically selects records for comparison. For example, the user inputs into the exercise monitoring device 100 an indication of improving his running speed by 5%. Based on the past record of the user’s exercises, the exercise monitoring device 100 searches within the exercise monitoring device’s memory or from a remote server 503 at least one suitable record of another person against which the user’s present exercise is to be monitored, where the suitable record of another person having a running speed of around 5% faster than the user’s past record.

In a further variation of the embodiment, the exercise monitoring device 100 is in wireless communication with a remote database which records and compares the performance parameters of several users in real time. This makes it possible to hold “Virtual competition” among multiple competitors. Even if the competitors are at different locations.
around the world, the exercise monitoring devices 100 is able to inform all competitors to begin the exercise at the same time, to measure and upload the exercise status of each competitor into the server for comparison. This allows several exercise monitoring devices 100 to monitor the physiological and physical parameters of several respective competitors at the same time via remote communication, and making comparison between the parameters in the database. The parameters can include the position of every competitor, the distance traveled and time passed, etc. Based on the information in the database, each exercise monitoring device 100 can suggest suitable effort improvement to the respective competitor in real time. The may include, for example, telling the competitor his current position in the virtual competition and suggesting a strategy to beat the other competitors, such as

- [0054] “You are No. 4 of 6. You can follow them now.”
- [0055] “You are lagged behind, must be faster in next minute.”
- [0056] “It is time for you to exceed. Rush!”
- [0057] “Run faster in next half minute!”
- [0058] “Maybe slow down a bit for a minute to catch your breathe.”

A virtual competition is illustrated in FIG. 5, showing one runner 501 in the USA running during the day and another runner 502 running at the same time, such as at night in China. The server 503 with which the exercise monitoring devices 100 on each of the runner 501, 502 communicate compares the performances, and issues prompts or updates to each runner 501, 502. Thus, a virtual but literal competition is held at the same time but in different locations. With real-time exercise sensing and analysis functions, the exercise monitoring device 100 is able to record a users’ 501, 502 real-time records and transmit the records to a server 503 (not illustrated). The server 503 processes all the users’ 501, 502 information, and compute some statistics. For instance, the real-time positions of all users 501, 502 are known by the GPS. Thus, the server 503 informs each user 501, 502 of the user’s current position and how far he is from the leading the other user, via the voice prompting of the exercise monitoring device 100. Furthermore, one user may be informed of processed statistics during a competition of many players, such as who is the leading person in the completion, and the user’s position among all male athletes at specific age groups, or body mass groups, and so on. The skilled man knows that cloud computing or distributed computing are all possible options for realizing such an embodiment and there is no need for detailed elaboration.

The skilled man understands that it is not necessary that all aforesaid physiological parameters have to be monitored for a competition. For example, the heart beat rate need not be monitored during a competition.

After the competition, the records of each competitor may be uploaded into a computer and displayed as an animation. This will allow friends of the competitors to appreciate their performance on a display screen, as illustrated in FIG. 6.

The exercise monitoring device 100 also provides health and fitness monitoring. The values in any two columns of data in Table 1(c) may be charted against each other to trend the relationship between the two types of values. FIGS. 4a and FIG. 4b shows how acceleration may be plotted against time 401, and heart-rate against distance 402. Mathematical or statistical manipulation for these matters is known and need no detailed explanation here.

In one use, the exercise monitoring device 100 is able to monitor the user’s heart rate and propose whether the user could push himself harder. For example, if the user has indicated to the exercise monitoring device 100 that he would run 5 km, and by the end of the 5 km the exercise monitoring device detects that the heart rate rate of the user is at a rate which is considered safe, the exercise monitoring device 100 issues encouraging message to request the user to push himself harder to complete 5.5 km. On the other hand, if the heart beat rate is outside the safety zone at any point during the run, the exercise monitoring device 100 suggests at suitable moments that the user runs only 4.5 km or less. Health prompts may also be provided, such as “Your heart beat rate is too fast! Slow down!” “You have potential to be faster in next 3 minutes!” Thus, the exercise monitoring device 100 also provides both health and performance monitoring. The prompt is typically given in the form of audible messages through an ear phone attached to the exercise monitoring device 100. However, other than an audible prompt message by the earphones, the exercise monitoring device can also issue meaningful alarms that are not in textual or audio formats. For example, the exercise monitoring device can provide a steady beeping sound when the user is performing his exercise in pace with the record his present performance is being compared to. When the efforts of the user are not as good as the record he is comparing his present performance to, the beeping increases to encourage the user to improve his performance. When the efforts of the user are better than the record, the beeping may slow down or stop.

Preferably, the exercise monitoring device 100 allows the user to identify the type of exercise he about to perform. For example, the user can type ‘running’, ‘aerobics’, ‘triathlon’ and so on into the exercise monitoring device 100 or select the type of exercise from a dropdown list of exercises stored in the exercise monitoring device 100. Furthermore, the exercise monitoring device 100 also allows the user to input or select information on the ‘level’ of exercise. The ‘levels’ of exercise can be pre-determined in the factory, and differentiated such as by speed or duration of exercise, and means varying levels of exercise programs. For example, in running, there may be different levels of running relating to a run of 10 km, half marathon, full marathon and so on, or different levels of training profiles such as Weight Loss exercise, De-stress exercise etc. Furthermore, ‘levels’ can also be determined by the different purposes involving different parameters targets, such as target heart rate or exercise duration and so on.

Furthermore, the location of the exercise can also be selected from a dropdown list. To do so, the name and features of each exercise location that contribute to sports difficulty are predetermined and stored into the exercise monitoring device 100 for selection by the user. For example, the location is named descriptively as a “sport stadium running track”, a “forest track” of a specific place, a “swimming lake” and so on. Subsequently, the physical attributes or features of the locations which affect the exercise, such as the inclination and distance of a running track, the number of steps to be climbed along the running track, the breadth of the swimming lake and so on are recorded. Official maps, and the rangers or facility managers of such locations can be consulted to establish this information. Each location recorded is given a difficulty level in advance, according to the location features. Specific details of how this can be done are known to the skilled man and need no elaboration here. The GPS locator in the exercise moni-
monitoring device 100 may automatically identify the location of the exercise and impose the difficulty level base on the exercise which the user selects to perform there.

[0066] The skilled man understands that in addition to using “time” as the primary key, as in the example here in Table 1(c), the database may also use multiple primary keys as time & acceleration, distance & heart-rate, or time & location & distance, etc. Some data which are not obtained directly from the sensors can also be deduced from the sensor’s output. For example, from the user’s weight and distance covered in the exercise, the amount of calorie burnt in the exercise can be calculated at any point of time during the run. This helps to provide real time information to the user on how much calories has been burnt at any point in time.

[0067] While there has been described in the foregoing description preferred embodiments of the present invention, it will be understood by those skilled in the technology concerned that many variations or modifications in details of design, construction or operation may be made without departing from the scope of the present invention as claimed.

[0068] For example, while the described embodiment has many parts, including a screen, a touch pad, a keypad, several sensor modules, the skilled man understands that any of these may be exempted from some embodiments while still achieving the desired invention as claimed.

[0069] Thus, although a plurality of physiological and physical parameters has been described, a sole parameter can also be used to monitor the user performance. Correspondingly, it is possible that only one sensor or device is used.

[0070] Furthermore, the skilled man knows that various embodiments may be applied to different forms of exercise such as chin-ups, swimming, walking, running, walking, rowing, biking, rope skipping, number of times of weight lifting, sit-ups, push-ups, pull-ups and so on.

[0071] Furthermore, other than voice recognition, other biometric sensors such as fingerprint identification can be used.

[0072] Furthermore, the skilled man knows that other applications may be envisaged even though they are not described in detail herein, such as monitoring the performance of racing animals.

[0073] Therefore, the embodiment 100 includes a method of monitoring the exercise of a user, comprising the step of: using at least one sensor to record at least one performance parameter (given as examples in relation to Table 1(c)) of the user during his exercise; comparing the record of the performance parameter against another record of the same performance parameter; and indicating to the user the how the performance parameter of the user compares to the other record of the same performance parameter.

[0074] Therefore, the embodiment 100 includes an exercise monitoring device system for remote competition, comprising a host server; a plurality of client exercise monitoring devices in wireless communication with the host server; each client exercise monitoring device having at least one sensor for monitoring at least one performance parameter of a respective user during an exercise; each client exercise monitoring device is capable of sending the performance parameter of the respective user to the host server; the host server is adapted to compare the performance parameter sent from the plurality of client exercise monitoring devices; and the host server is adapted to communicate to each client exercise monitoring device how the performance parameter of each user compares to the performance parameter of another user; wherein the comparative performance of the users in the exercise is indicated to each user.

[0075] Therefore, the embodiment includes an exercise monitoring device 100 comprising at least one sensor for monitoring at least one performance parameter of a user during an exercise, a controller for comparing the performance parameter of the user to another performance parameter; and an output device for indicating to the user the extent to which the performance parameter of the user differs from the other performance parameter.

[0076] The skilled man knows that the performance parameter is one of the following non-exhaustive list of: time, distance, location, track, speed, acceleration, inclination, altitude, temperature, humidity, ultraviolet index, heart beat rate, breath, calorie, SpO2 and any other parameter which is usable to measure, monitor or analyses the physical condition of the user and his performance in an exercise.

1. A method of monitoring the exercise of a user, comprising the step of: using at least one sensor to record at least one performance parameter of the user during his exercise; comparing the record of the performance parameter against another record of the same performance parameter; and indicating to the user the how the performance parameter of the user compares to the other record of the same performance parameter.

2. A method of monitoring the exercise of a user, as claimed in claim 1, wherein the other record of the same performance parameter is of an earlier exercise of the same user.

3. A method of monitoring the exercise of a user, as claimed in claim 1, wherein the other record of the same performance parameter is of an earlier exercise of another person.

4. A method of monitoring the exercise of a user, as claimed in claim 1, wherein the comparison is made as the user is performing the exercise.

5. A method of monitoring the exercise of a user, as claimed in claim 4, wherein the step of comparing the record of the performance parameter against another record of the same performance parameter is made when the user is performing the exercise at the same time as the other person.

6. A method of monitoring the exercise of a user, as claimed in claim 1, wherein the step of indicating to the user the how the performance parameter of the user compares to the other record of the same performance parameter comprises providing a voice prompt to the user.

7. A method of monitoring the exercise of a user, as claimed in claim 6, wherein the voice prompt is via a earphone.

8. An exercise monitoring system for remote competition, comprising a host server; a plurality of client exercise monitoring devices in wireless communication with the host server;
each client exercise monitoring device having at least one sensor for monitoring at least one performance parameter of a respective user during an exercise;
each client exercise monitoring device being capable of sending the performance parameter of the respective user to the host server;
the host server being adapted to compare the performance parameter sent from the plurality of client exercise monitoring devices; and
the host server being adapted to communicate to each client exercise monitoring device how the performance parameter of each user compares to the performance parameter of another user, wherein the comparative performance of the users in the exercise is indicated to each user.


10. An exercise monitoring device comprising at least one sensor for monitoring at least one performance parameter of a user during an exercise, and a controller for comparing the performance parameter of the user to another performance parameter; and
output device for indicating to the user the extent to which the performance parameter of the user differs from the other performance parameter.

11. An exercise monitoring device as claimed in claim 10 wherein
the other performance parameter is the performance parameter of the user during an earlier exercise.

12. An exercise monitoring device as claimed in claim 10 wherein
the other performance parameter is of another person.