Portable Biofeedback Exercise Prescription Apparatus and Biofeedback Exercise Prescription Method Using the Same

A portable biofeedback exercise prescription apparatus includes a mobile phone unit accessing a predetermined mobile communication network and performing voice and data communications, an exercise prescription providing unit providing an exercise prescription corresponding to a health state of a user, a wireless interface transmitting physical information of a user generated by a physical information measurement module, and a biofeedback signal generation unit generating a biofeedback signal to control an exercise equipment that is used by the user based on the physical information and the exercise prescription. The wireless interface provides the biofeedback signal to the exercise equipment.
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
Description

PORTABLE BIOFEEDBACK EXERCISE PRESCRIPTION APPARATUS AND BIOFEEDBACK EXERCISE PRESCRIPTION METHOD USING THE SAME

Technical Field

[1] The present invention relates to a biofeedback exercise prescription apparatus for improvement of health of a user, and more particularly, to a biofeedback exercise prescription apparatus and method for wirelessly receiving physical information about the physical state of a user and controlling an exercise equipment based on the received physical information.

Background Art

[2] The quality of life of the modern people have been improved with the help of the development of technology and economy. In particular, the interest of the modern people have changed from the solution of basic things such as food, clothes, and house to a better healthier life. With the development of various convenient apparatuses and the appearance of the automatic apparatuses, man seeks more convenient things so that it is possible to live a life even without moving a body. In particular, the development of computer technology makes the modern persons sit in front of the computers doing noting but simple repetitive actions such as mouse or keyboard operation which results in the absolute lack in the amount of exercise. Also, the rapid spread of the Internet further increases the time of the modern persons spending in front of the computers. Thus, the lack of exercise resulting in the diseases of adult people endangers the health of the modern persons so that one needs to pay more attention to this situation.

[3] However, not all exercises are beneficial for everyone. For example, a muscle exercise which is regarded beneficial for healthy men on his twenties may be critical to women in the menopause showing an osteoporosis pseudo symptom. Thus, one who exercises needs to use a different exercise method according to one's body conditions. An exercise that is not appropriate for one's body condition may cause serious damages such as muscle injury or bone fracture.

[4] Therefore, a service for providing a specified health program based on detailed information on the health of a user is being highlighted. This service is referred to as an exercise prescription. The exercise prescription is a service to analyze physical information such as the health and physical strength of an individual and determine and provide the type, intensity, time, and frequency of an exercise appropriate for the individual based on the result of analysis. Also, the exercise prescription signifies a scientific and systematic health improvement service that appropriately controls the
quality and quantity of the exercise according to the step of the exercise. The exercise prescription is systematically made based on medical expertise and exercise science.

[5] The physical information of a user includes basic physical information such as weight, body fat, body mass index (BMI), and blood pressure and exercise physical information such as pulse, electrocardiogram, blood pressure during exercise. The basic physical information and the exercise physical information are provided as examples and any related information can be provided.

Disclosure of Invention

Technical Problem

[6] However, although an exercise program specified to an individual can be provided using the exercise prescription, since the exercise prescription is provided using an expensive equipment, general users need to visit a health center to receive an exercise prescription. Also, when a user exercises using various exercise equipments, the user need to load his/her physical information and exercise prescription corresponding thereto whenever using different exercise equipments which is very inconvenient.

[7] When the exercise prescription is provided to a user in one direction only from an apparatus providing an exercise prescription service, since whether the user exercise or not is totally dependent on the user, the effect of the exercise prescription is reduced. Furthermore, since the health state of a user is not constant, when an unexpected situation occurs, for example, the health state of the user becomes serious during exercise, such a case is not responded actively.

[8] Thus, there is a demand for an exercise prescription apparatus which can not only provide an exercise prescription optimized for a user based on the physical information of a user but also efficiently respond to an emergency which may occur, by continuously monitoring the exercise situation of the user. Also, there is a demand for an exercise prescription apparatus which can be commonly used for a variety of exercise equipments and improve accessibility so that the user can easily carry.

Technical Solution

[9] To solve the above and/or other problems, the present invention provides a portable exercise prescription apparatus which can continuously monitor the physical information of a user.

Advantageous Effects

[10] The present invention provides a portable exercise prescription apparatus which can easily control a variety of exercise equipments by performing a wireless communication with the exercise equipments.

[11] The present invention provides a portable exercise prescription apparatus and method which can systematically manage the health information of users by storing the
exercise history of each user and the change of the physical information.

Description of Drawings

The above and other features and advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

FIG. 1 is a block diagram showing the concept of a portable biofeedback exercise prescription apparatus according to an embodiment of the present invention;

FIG. 2 is a block diagram showing the concept of a portable biofeedback exercise prescription apparatus according to another embodiment of the present invention;

FIG. 3 is a flowchart for explaining a biofeedback exercise prescription method according to an embodiment of the present invention; and

FIG. 4 is a flowchart showing the exercise prescription providing step of the biofeedback exercise prescription method of FIG. 3.

Best Mode

According to an aspect of the present invention, a portable biofeedback exercise prescription apparatus comprises a mobile phone unit accessing a predetermined mobile communication network and performing voice and data communications, an exercise prescription providing unit providing an exercise prescription corresponding to a health state of a user, a wireless interface transmitting physical information of a user generated by a physical information measurement module, and a biofeedback signal generation unit generating a biofeedback signal to control an exercise equipment that is used by the user based on the physical information and the exercise prescription, wherein the wireless interface provides the biofeedback signal to the exercise equipment.

The apparatus further comprises a display unit displaying at least one of the physical information, the exercise prescription, and information about the state of the exercise equipment as an audiovisual signal, wherein the display unit further displays at least one of usage of the exercise equipment used by the user and an exercise motion appropriate for the user as the audiovisual signal.

The apparatus further comprises an object recognition unit recognizing a user and an exercise equipment.

The object recognition unit comprises an RFID reader reading out at least one of information about identification of the user and information to identify the exercise equipment.

The physical information measurement module generates physical information about at least one of weight, body fat, blood pressure, pulse, and electrocardiogram of the user, and the biofeedback signal generation unit controls at least one of load and
speed of the exercise equipment.

[22] The exercise prescription providing unit accesses a health management server storing a plurality of exercise prescriptions through a predetermined network, reads out an exercise prescription corresponding to a health state of the user, and stores information about an exercise history in the health management server after exercise is complete.

[23] According to another aspect of the present invention, a biofeedback exercise prescription method using a mobile phone that accesses a predetermined mobile communication network and performs voice and data communications comprises receiving physical information of a user from a physical information measurement module, providing an exercise prescription corresponding to a health state of the user, and generating a biofeedback signal to control an exercise equipment that is used by the user based on the physical information and the exercise prescription. The physical information is transceived in any one of an infrared communication and a Bluetooth method.

[24] The method further comprises displaying at least one of the physical information, the exercise prescription, and information about the state of the exercise equipment as an audiovisual signal, and the above displaying operation comprises at least one of usage of the exercise equipment used by the user and an exercise motion appropriate for the user as the audiovisual signal.

[25] The method further comprises recognizing the user and an exercise equipment using an RFID reader that reads out at least one of information about identification of the user and information to identify the exercise equipment.

[26] The providing of an exercise prescription corresponding to a health state of the user comprises accessing a health management server storing a plurality of exercise prescriptions through a predetermined network, reading out an exercise prescription corresponding to a health state of the user, and storing information about an exercise history in the health management server after exercise is complete.

**Mode for Invention**

[27] FIG. 1 is a block diagram showing the concept of a portable biofeedback exercise prescription apparatus according to an embodiment of the present invention. Referring to FIG. 1, a portable biofeedback exercise prescription apparatus 100 includes an object recognition unit 110, an exercise prescription providing unit 120, a biofeedback signal generation unit 150, a display unit 160, a mobile phone unit 170, and a wireless interface 130.

[28] When a user exercise using an exercise equipment 190, a physical information measurement module 180 measures the physical information of the user. The physical information of a user includes at least one of the weight, body fat, blood pressure,
pulse, inhaling amount, and electrocardiogram. The physical information measurement module 180 can be operated by being attached to the body of the user and all of conventional measurement apparatuses can be used to generate physical information. For example, the physical information of a user can be directly collected by various measurement sensors (not shown) included in a treadmill equipment 190. Also, a weight sensor can be attached to the exercise equipment 190 and a pulsimeter and a respirometer can be provided at a predetermined portion of a handle that the user can hold. Thus, by holding the handle only during exercise, the user can measure the pulse and blood pressure of the user. Also, the physical information can be measured using a chest band that can accurately measure a heart rate by being attached around the chest of a user.

[29] The object recognition unit 110 can directly receive input of user ID or name. When the user is recognized, the exercise prescription providing unit 120 provides an exercise prescription corresponding to the health state of the recognized user. Then, the user exercises according to the exercise prescription provided by the exercise prescription providing unit 120. The display unit 160 displays the physical information received from the physical information measurement module 180 and the exercise prescription provided by the exercise prescription providing unit 120.

[30] The biofeedback signal generation unit 150 analyses the receive physical information through the wireless interface 130 while the user exercises. When the amount of exercise needs to be increased as a result of the physical information of the user, the biofeedback signal generation unit 150 generates a biofeedback signal to control the load or speed of the exercise equipment 190 and transfers the generated signal to the exercise equipment 190. For example, when the blood pressure of a user is sufficiently low, the biofeedback signal generation unit 150 can generate a biofeedback signal to increase the amount of exercise. For example, when the exercise equipment 190 is a treadmill, a pedal driving unit included in the treadmill may include a cam, which is arranged to be moved as a man walks on the treadmill. In this case, by controlling the load connected to the cam or changing a frictional force applied to the cam, a force needed for the user to drive the pedal can be controlled. As the load applied to the pedal increases, a more exercise effect can be obtained when the user takes the same exercise.

[31] Also, the biofeedback signal generation unit 150 analyses the exercise physical information of the user so that, when the blood pressure or pulse of the user exceeds a critical degree, the user is warned and an accident can be prevented.

[32] In the present specification, the biofeedback signifies a technology that provides in real time a change in the physical activity state of a body based on the various physical information collected from the body so that the body can control the amount of
exercise by oneself for the purpose that the body intends. For example, in the biofeedback technology, an exercise equipment is compensated by measuring and providing the heart rate of a user so that the user can recognize the present heart rate and continuously take exercise while maintaining a predetermined target heart rate. In particular, the biofeedback technology is very useful in aerobics such as walking, jogging, treadmill, cycling, and swimming because the user can continues exercise while controlling the intensity of the exercise to approximate to and maintain a target heart rate. While exercising, the user checks in real time the heart rate and exercises over the minimum heart rate. Also, it is very important to exercise not to exceed the maximum heart rate.

[33] The portable biofeedback exercise prescription apparatus 100 of FIG. 1 receives physical information using the wireless interface 130. Thus, the physical information can be easily measured regardless of the type of the exercise equipment 190. Also, the exercise prescription apparatus 100 can be embodied as a portable apparatus including the mobile phone unit 170. Then, a user can systematically and scientifically exercise according to an exercise prescription optimal to the user using a mobile phone that the user always carries. Also, the exercise prescription apparatus 100 is not only easy to carry but also mounted on the exercise equipment 190 during exercising so that it does not disturb the exercise.

[34] The exercise prescription apparatus 100 can make a user recognize a biofeedback signal using a display and a speaker basically installed at the mobile phone as they are. For example, the optimal exercise prescription and the present heart rate information provided to the user are displayed on the display so that the user can easily check exercise achievement thus far. When it is difficult to check the display during exercise, the present heart rate, exercise intensity, and future exercise plan can be informed through voice using the speaker. In particular, when the heart rate of a user approximate to the maximum heart rate, a warning can be delivered using the speaker and display so that the intensity of exercise is lowered not to damage the body.

[35] When a user moves to another exercise equipment after finishing exercise at one exercise equipment, it is sufficient for the user to move while carrying the exercise prescription apparatus 100 only. The exercise prescription providing unit 120 provides an exercise prescription corresponding to an exercise equipment as the user approaches a new exercise equipment. For example, when the user moves to a bicycle after finishing a treadmill, the exercise prescription providing unit 120 provides an exercise prescription about the load and speed of the bicycle. Also, the exercise prescription providing unit 120 may provide various games designed appropriate for the determination of physical strength as a part of the exercise prescription to induce interest of the user. For example, a hiking course is displayed. On a screen, a leading car or
bicycle may go first and a virtual object of a user follows the leading car. The hiking course may include various situations such as a flat road, an uphill road, a place needing a sudden stop, and a curve road. Also, a variety of situations may appear arbitrarily to keep the user tense and make it difficult for the user to intentionally manage his/her physical strength evaluation. Also, the biofeedback signal generation unit 150 controls the exercise equipment so that, when the geographical feature appearing on the display is an upward slope and there is a need to increase the load of exercise, a brake load of a bicycle is increased. When it is a downward slope, the brake load needs to be reduced.

[36] The biofeedback signal generation unit 150 generates health information of a user by measuring the changes in the heart rate and blood pressure according to the load of exercise and the amount of exercise when a particular load is applied and the change in the heart rate in this case after the exercise is finished. There are many algorithms to generate the health information. The algorithm is not included in the technical concept of the present invention and any algorithm capable of producing health information based on the exercise information of a user can be used for the present invention. Also, the algorithm can be received wirelessly by the mobile phone unit 170 through a mobile phone network.

[37] While the user exercises, the wireless interface 130 receives the physical information measured by the physical information measurement module 180 connected to a bicycle and provides the received information to the biofeedback signal generation unit 150. Thus, the user can continuously exercise without manually setting or connecting by wire the exercise prescription apparatus 100 to a new exercise equipment. The wireless interface 130 transceives signals between the exercise prescription apparatus 100 and the physical information measurement module 180 according to a wireless communication method such as infrared communication, Bluetooth, and Zigbee. A Bluetooth method is preferably used as a wireless interface method. However, the present invention is not limited thereto and all conventional wireless communication methods can be used.

[38] The mobile phone unit 170 manages a typical telephone call and data communications using a mobile communication network. Thus, the portable biofeedback exercise prescription apparatus 100 works as a mobile phone at ordinary times and operates as an exercise prescription apparatus while a user exercises.

[39] The physical information measurement module 180 of FIG. 1 can be provided separately from the exercise equipment 190 or integrally with the exercise equipment 190 for the convenience of measurement. For example, a scale can be provided at a bicycle saddle. Then, the user can see his/her weight by merely sitting on the bicycle. The measured weight of a user is transferred to the wireless interface 230. A body fat
module measuring the body fat of the user can be installed at a handle portion of the bicycle. By installing the body fat module at the handle portion of a bicycle, the user can see his/her body fat in the middle of exercise without separate measurement.

FIG. 2 is a block diagram showing the concept of a portable biofeedback exercise prescription apparatus according to another embodiment of the present invention. Referring to FIG. 2, an exercise prescription apparatus 200 includes an object recognition unit 210, an exercise prescription providing unit 220, a wireless interface 230, a biofeedback signal generation unit 250, a display unit 280, and a mobile phone unit 270. Since the operations of the constituent elements shown in FIG. 2 are similar to those of the constituent elements shown in FIG. 1, detailed descriptions thereof will be omitted herein.

The object recognition unit 210 included in the exercise prescription apparatus 200 of FIG. 2 includes an RFID reader 215. The RFID reader 215 reads out user information from an RFID tag (not shown) attached to an RFID card 217 that a user carries. Thus, the user only needs to have the RFID card 217 approach the exercise prescription apparatus 200 without directly inputting information about his/her identification to the exercise prescription apparatus 200. Also, the RFID read 215 can read out information to identify an exercise equipment from the RFID tag attached to the exercise equipment. Thus, the user can continuously use various exercise equipments by using the exercise prescription apparatuses 200 of FIG. 2 only. When the user moves toward a new exercise equipment, the RFID reader 215 included in the object recognition unit 210 automatically identifies the new exercise equipment.

In the present embodiment, the RFID technology signifies a non-contact recognition system which transmits and processes information of an object and surrounding environment information by attaching a small chip to various items. The RFID system is referred to as a dedicated short-range communication (DSRC) ir a wireless identification system.

The RFID system includes a reader having a reading function, an RFID tag having intrinsic information, operation software, and a network. The RFID system processes information by identifying a tag that has a thin plate shape and is attached to an item. The RFID tag includes a transponder chip manufactured as a semiconductor and an antenna and is divided into a passive type and an active type. While the passive type is operated by receiving energy from a radio signal of the read without an internal power, the active type includes a battery to operate for itself. When the RFID technology is used, direct contact like a barcode or scanning within a visible range is not needed to read out information. A low frequency radio identification system of 30 kHz–500 kHz is used at a short distance of 1.8 m or less and a high frequency system of 850 MHz–950 MHz or 2.4 GHz–2.5 GHz is capable of transmitting at a far distance of 27
For example, it is assumed that a user enters a large fitness center. As the user enters the fitness center, an employee gives the exercise prescription apparatus 200 to the user. The user has a membership card, that is, the RFID card 217, storing his/her identification information, approach the exercise prescription apparatus 200 to automatically identify the user. When the user is recognized, the exercise prescription providing unit 220 provides an exercise prescription appropriate for the identified user. The exercise prescription providing unit 220 accesses a health management server 260 to obtain more special health information. This process will be described in detail with reference to FIG. 4.

Then, the user selects an exercise equipment to use. When the user selects and approaches a treadmill, the RFID reader 215 reads out information to identify a treadmill from the RFID tag attached to the treadmill. The exercise prescription providing unit 220 first provides the user with an exercise prescription using the treadmill. While the user exercises, the biofeedback signal generation unit 250 receives physical information through the wireless interface 230 and provides the received information to the user through the display and speaker. In addition, the biofeedback signal generation unit 250 can control the load or speed of the exercise equipment by determining the physical state of the user.

The biofeedback signal generation unit 250 can assume the maximum oxygen intake amount $\text{VO}_{2}$. That is, the user can exercise while holding in the mouth the physical information measurement module, for example, a mouth piece (not shown), which can measure the $\text{VO}_{2}$ of the user. The heart rate is obtained by processing an electrocardiogram or a blood oxygen saturation concentration (SPO$_2$) signal $\text{VO}_{2,\text{max}}$ can be assumed using the obtained heart rate. Also, the biofeedback signal generation unit 250 can generate other physical information by processing physical information received through the wireless interface 230. For example, the agility of a user can be measured using the time to press a button in reaction to a command displayed on the display or how the user is quick can be measured by measuring how fast the user can drive a pedal to a predetermined speed.

In addition, the exercise prescription providing unit 220 not only provides an exercise prescription based on the present physical information of a user but also provides a more systematic exercise prescription by storing the history about the progress of exercise of the user.

When the exercise is finished, the user moves to another exercise equipment. When the user determines to have a muscle exercise using a barbell and approaches the barbell, the RFID reader 215 receives information to identify the barbell from the RFID tag attached to the barbell. Thus, whenever changing the exercise equipments,
the user can easily maximize the effect of exercise without a separate operation.

When the exercise prescription apparatus 200 is a mobile phone used by the user, the RFID reader 215 does not need to read out the information to identify the user from the RFID card 217. In this case, the RFID read 215 merely reads out the information needed for the identification of an exercise equipment from the RFID tag attached to the exercise equipment.

The display unit 280 displays and provides at least one of information about the physical information of a user, an exercise prescription, and the state of an exercise equipment as an audiovisual signal. Furthermore, the display unit 280 provides the user with the usage of the exercise equipment and an exercise motion appropriate for the user. The exercise prescription apparatus 200 can encourage the user using a voice signal, inform the passage of time after the user starts the exercise, and provides how much calorie is consumed, as voice or image, while the user exercises, thus performing as a trainer. In particular, as clothes suitable for exercise and stretching instructions are displayed on the display unit 280, the user can maximize the exercise effect. The display unit 280 can provide music or digital multimedia broadcasting (DMB) to prevent that the user is bored. The DMB can be received by the mobile phone unit 270 and provided.

FIG. 3 is a flowchart for explaining a biofeedback exercise prescription method according to an embodiment of the present invention. Referring to FIG. 3, a user is recognized by using the RFID reader or directly receiving identification information of the user (S310). An exercise prescription according to the health state of the recognized user is provided (S320). The exercise prescription may be provided after the health state of a user is measured or based on the previously stored history information.

When the user starts exercise, the physical information of the user is received in a wireless communication method (S330). By using the wireless communication method, the user is not disturbed during the exercise. When the physical information is received, a biofeedback signal is generated based on the exercise prescription and the physical information (S340). The biofeedback signal is the physical information of a user itself, one obtained by processing the received physical information, or a signal to control the exercise equipment as described above. The user can control the amount of exercise by oneself, referring to the physical information displayed on the display. The exercise equipment can be automatically controlled according to the exercise prescription so that the user continues to exercise (S350).

Whether the exercise of a user is excessive is determined by analyzing the physical information received during the exercise (S360). Whether the exercise of a user is excessive can be determined using the physical information such as the maximum
heart rate as described above. When the user's exercise is determined to be excessive, the user is warned of the excessive exercise (S370) or the exercise can be forcibly stopped. As a result, the damage to the health of a user due to the excessive exercise can be prevented through the above process. The above steps are repeated until the exercise is complete (S380).

[54] FIG. 4 is a flowchart showing the exercise prescription providing step of the biofeedback exercise prescription method of FIG. 3. Referring to FIG. 4, when a user is recognized, the exercise prescription providing unit accesses the health management server through a predetermined network (S410). The predetermined network may be either a broadband communication network such as the Internet or a mobile communication network or a wired/wireless short distance communication network.

[55] The health management server stores information about the exercise histories of various users or a huge amount of exercise prescriptions. The exercise prescriptions can be updated at a time. When the health management server is used, more special health prescription can be provided. When the health management server reads out an exercise prescription optimized for the user (S420), the user exercises using the provided exercise prescription.

[56] When the exercise is complete, the exercise history information is stored in the health management server (S430). The health management server may be an external computer, a personal computer, or a health information server provided at a special facility such as a hospital. When the health management server is a health information server provided at a special facility such as a hospital, new and special knowledge such as improved healing methods about various diseases can be continuously updated. Thus, best medical service based on new healing method or theory can be provided to the user. Also, the information on the user's exercise history can be instantly referred by an expert such as a doctor. Thus, it is advantageous that, unlike a case of exercising alone, the user can refer to advice of an expert about the user's exercise history.

[57] The health management server can further include a database (not shown). The database provided at the server contains the exercise information of a user, health information, a change in the health state of a user during exercise, and the physical information of a user so that the stored information can be used as useful information for the user's exercise prescription. The physical strength of a user can be measured, a disease can be diagnosed in an early stage, a change in the physical state of a user can be recognized, and an abnormal change in the physical state of a user can be detected early, using the database. For example, by measuring the heart rate of a user after running a predetermined distance, whether the user has a pseudo heart disease can be diagnosed in an early stage. The user's physical information recorded on the database is sued in the early diagnosis step. Also, an abnormal increase in the heart rate or pulse
compared to that in the previous exercises can be easily detected using the information recorded on the database. When the abnormal change in the physical state is detected, the user is warned of the abnormal state so that the occurrence of an emergency situation is prevented.

[58] The invention can also be embodied as computer readable codes on a computer readable recording medium. The computer readable recording medium is any data storage device that can store data which can be thereafter read by a computer system. Examples of the computer readable recording medium include read-only memory (ROM), random-access memory (RAM), CD-ROMs, magnetic tapes, floppy disks, optical data storage devices, and carrier waves (such as data transmission through the Internet). The computer readable recording medium can also be distributed over network coupled computer systems so that the computer readable code is stored and executed in a distributed fashion. Also, functional programs, codes, and code segments for accomplishing the present invention can be easily construed by programmers skilled in the art to which the present invention pertains.

[59] While this invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

[60] As described above, according to the present invention, not only an optimal exercise prescription can be provided to a user but also the physical information of a user can be continuously monitored and provided to the user. Also, since the wireless communication is performed with a variety of exercise equipments, the exercise equipment can be easily controlled. In addition, by storing the user's exercise history and the change in the physical information, an exercise prescription apparatus and method which can systematically manage the health information for each user is provided.

**Industrial Applicability**

[61] The present invention is applicable to a biofeedback exercise prescription apparatus for improvement of health of a user. The present invention is further applicable to a biofeedback exercise prescription apparatus and method for wirelessly receiving physical information about the physical state of a user and controlling an exercise equipment based on the received physical information.
Claims

[1] A portable biofeedback exercise prescription apparatus comprising:
a mobile phone unit accessing a predetermined mobile communication network
and performing voice and data communications;
an exercise prescription providing unit providing an exercise prescription cor-
responding to a health state of a user;
a wireless interface transmitting physical information of a user generated by a
physical information measurement module; and
a biofeedback signal generation unit generating a biofeedback signal to control
an exercise equipment that is used by the user based on the physical information
and the exercise prescription,
wherein the wireless interface provides the biofeedback signal to the exercise
equipment.

[2] The apparatus of claim 1, further comprising a display unit displaying at least
one of the physical information, the exercise prescription, and information about
the state of the exercise equipment as an audiovisual signal, wherein the display
unit further displays at least one of usage of the exercise equipment used by the
user and an exercise motion appropriate for the user as the audiovisual signal.

[3] The apparatus of claim 1, further comprising an object recognition unit
recognizing a user and an exercise equipment.

[4] The apparatus of claim 3, wherein the object recognition unit comprises an RFID
reader reading out at least one of information about identification of the user and
information to identify the exercise equipment.

[5] The apparatus of claim 1, wherein the physical information measurement module
generates physical information about at least one of weight, body fat, blood
pressure, pulse, and electrocardiogram of the user, and the biofeedback signal
generation unit controls at least one of load and speed of the exercise equipment.

[6] The apparatus of claim 1, wherein the exercise prescription providing unit
accesses a health management server storing a plurality of exercise prescriptions
through a predetermined network, reads out an exercise prescription cor-
responding to a health state of the user, and stores information about an exercise
history in the health management server after exercise is complete.

[7] A biofeedback exercise prescription method using a mobile phone that accesses a
predetermined mobile communication network and performs voice and data
communications, the method comprising:
receiving physical information of a user from a physical information
measurement module;
providing an exercise prescription corresponding to a health state of the user; and

generating a biofeedback signal to control an exercise equipment that is used by
the user based on the physical information and the exercise prescription,

wherein the physical information is transceived in any one of an infrared com-
munication and a Bluetooth method.

[8] The method of claim 7, further comprising displaying at least one of the physical
information, the exercise prescription, and information about the state of the
exercise equipment as an audiovisual signal, and the above displaying operation
comprises at least one of usage of the exercise equipment used by the user and an
exercise motion appropriate for the user as the audiovisual signal.

[9] The method of claim 7, further comprising recognizing the user and an exercise
equipment using an RFID reader that reads out at least one of information about
identification of the user and information to identify the exercise equipment.

[10] The method of claim 7, wherein the providing of an exercise prescription cor-
responding to a health state of the user comprises:

accessing a health management server storing a plurality of exercise pre-
scriptions through a predetermined network;

reading out an exercise prescription corresponding to a health state of the user;

and

storing information about an exercise history in the health management server
after exercise is complete.
FIG. 1

MOBILE PHONE UNIT
DISPLAY UNIT
OBJECT RECOGNITION UNIT
EXERCISE PRESCRIPTION PROVIDING UNIT
BIOFEEDBACK SIGNAL GENERATION UNIT
WIRELESS INTERFACE

PHYSICAL INFORMATION MEASUREMENT MODULE
**FIG. 3**

1. **START**
2. **RECOGNIZE USER** (S310)
3. **PROVIDE EXERCISE PRESCRIPTION APPROPRIATE FOR HEALTH STATE OF RECOGNIZED USER** (S320)
4. **RECEIVE PHYSICAL INFORMATION OF USER DURING EXERCISE IN WIRELESS COMMUNICATION METHOD** (S330)
5. **GENERATE BIOFEEDBACK SIGNAL BASED ON PHYSICAL INFORMATION AND EXERCISE PRESCRIPTION** (S340)
6. **CONTROL EXERCISE EQUIPMENT USING BIOFEEDBACK SIGNAL** (S350)
7. **IS THE EXERCISE EXCESSIVE TO THE USER?**
   - **NO**
   - **YES** (S360)
   - **WARN USER** (S370)
8. **HAS THE EXERCISE COMPLETED?**
   - **NO**
   - **YES** (S380)
9. **END**
FIG. 4

ACCESS HEALTH MANAGEMENT SERVER THROUGH PREDETERMINED NETWORK

READ OUT EXERCISE PRESCRIPTION CORRESPONDING TO HEALTH STATE OF USER

STORE EXERCISE HISTORY INFORMATION IN HEALTH MANAGEMENT SERVER AFTER EXERCISE IS COMPLETE
**INTERNATIONAL SEARCH REPORT**

**International application No.**

PCT/KR2007/001134

---

**A. CLASSIFICATION OF SUBJECT MATTER**

G06Q 10/00(2006.01)

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 G06Q 10/00

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

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for Utility models since 1975

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

PAJ, PPD, USPAT, eKIPASS *Keyword: biofeedback, sense, exercise, equipment, server, health, RFID, and management*

---

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>KR 10-2005-0013905 A (CODISOFT CO., LTD.; PARK, SEUNG HUN) 05 FEBRUARY 2005. See the abstract; pages 3, 4, 6; claims 1-21; figures 1b, 1d, 2a, 2b, 2e.</td>
<td>1, 2, 6, 7, 8, 10 3-5, 9</td>
</tr>
<tr>
<td>Y</td>
<td>KR 10-2005-0086556 A (KIMBERLY-CLARK WORLDWIDE, INC.) 30 AUGUST 2005. See the abstract; pages 7-9; claims 1-41; figures 1, 5.</td>
<td>3-5, 9</td>
</tr>
<tr>
<td>A</td>
<td>KR 10-2004-0106648 A (O2RUN CO., LTD.) 18 DECEMBER 2004. See the abstract, claims 1-9; figures 1-7.</td>
<td>1-10</td>
</tr>
</tbody>
</table>

- * Special categories of cited documents:
  - "A" document defining the general state of the art which is not considered to be of particular relevance
  - "E" earlier application or patent but published on or after the international filing date
  - "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
  - "O" document referring to an oral disclosure, use, exhibition or other means
  - "P" document published prior to the international filing date but later than the priority date claimed

- I later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- & document member of the same patent family

Date of the actual completion of the international search

04 JUNE 2007 (04.06.2007)

Date of mailing of the international search report

05 JUNE 2007 (05.06.2007)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
920 Dunsan-dong, Seco-gu, Daejeon 302-701, Republic of Korea
Facsimile No. 82-42-472-7140

Authorized officer

KOO, Young Hoi
Telephone No. 82-42-481-8376
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>KR 10-2005-0013905 A</td>
<td>05.02.2005</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CA2505749A1</td>
<td>10.06.2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CN1700879A</td>
<td>23.11.2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EP1586548A1</td>
<td>07.09.2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP18507078</td>
<td>02.03.2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US2004100376A1</td>
<td>27.05.2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W02004047630A1</td>
<td>10.06.2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP17087731</td>
<td>07.04.2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US2005124463AA</td>
<td>09.06.2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP17000636</td>
<td>06.01.2005</td>
</tr>
</tbody>
</table>