ELECTRONIC DATA GATHERING AND PROCESSING FOR FITNESS MACHINES

Inventor: Gregory T. Cammerata, Greensburg, PA (US)

Correspondence Address:
JAMES RAY & ASSOCIATES
2640 PITCAIRN ROAD
MONROEVILLE, PA 15146 (US)

Appl. No: 10/862,652

Filed: Jun. 7, 2004

Publication Classification

Int. Cl.7 A63B 71/00; A63B 22/02

U.S. Cl. 482/8. 482/94

ABSTRACT

Fitness machines with attached machine parameter sensors send machine parameter data over a local area network to a computer where the sensed data is stored and processed. The processed data is made available to a user to show machine adjustments made in previous workouts, the number of repetitions made as well as other exercise or health related parameters. Other data which can be entered into the computer includes, for example, a user's body dimensions, if any soreness was felt during or immediately after a workout and data from body monitors worn during the workout to monitor, for example, heart rate. The computer can have data on different exercise regimes and application data for suggesting a workout regime for a particular user.
Figure 6
ELECTRONIC DATA GATHERING AND PROCESSING FOR FITNESS MACHINES

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention relates to fitness machines and, more specifically, to electronic data gathering and processing for fitness machines.

[0003] 2. Description of the Related Art

[0004] Currently a minority of fitness machines being used provide exercise data that is available for use with a data processing machine such as a computer, and this data is limited to a few machine parameters of the fitness machines. Furthermore, this data is not stored and thus there are many machine parameters of fitness machines which are not readily available to a user, or, in the case of electronic based fitness machines, are only available until the workout is complete at which time the data is lost. A few basic machine parameter, for example, are the seat position adjustment, weight used, repetitions completed, or in the case of electronic based fitness equipment, distance traveled, calories burned, etc. Some other parameters associated with using fitness machines are a knowledge of what a user's fitness goals are (e.g., muscle tone, weight loss, stamina, a muscular body), the user's individual physical parameters (e.g., weight, muscle strength), historical workout data and data showing progress toward a user’s goals.

[0005] Therefore, it can be appreciated that system which facilitates using existing or new fitness machines used in conjunction with a computer system which stores these and other machine parameters of the fitness machine from previous workouts by a particular user, which has algorithms in the computer for generating an appropriate selection and use of fitness machines, which uses a local area network to couple the computer to the individual fitness machines and which makes available summaries of the machine parameters of the fitness machines at previous workouts so that progress towards selected fitness goals can be monitored locally or remotely is highly desirable.

BRIEF SUMMARY OF THE INVENTION

[0006] In one aspect the present invention generally provides a system for monitoring exercise which includes a fitness machine with a sensor mounted on the machine for sensing a machine parameter of the fitness machine. The sensed parameter is converted to digital data and passed over a local area network which receives and processes the digital data.

[0007] In a further aspect the present invention generally provides a method for monitoring an exercise machine including converting a parameter of the machine into digital data and transferring the data over a local area network to a computer.

OBJECTS OF THE INVENTION

[0008] It is, therefore, one of the primary objects of the present invention to store predetermined machine parameter data for a particular user on a computer associated with a fitness machine.

[0009] Another object of the present invention is to provide algorithms stored in the computer for generating appropriate selection and use of fitness machines for a particular user.

[0010] A further object of the present invention is to provide a local area network coupling the computer to the individual fitness machines.

[0011] An even further object of the present invention is to make available summaries of the machine parameters at previous workouts so that progress towards selected fitness goals can be monitored.

[0012] Still another object of the present invention is to provide to a user the ability to monitor certain body parameters during exercise such as heart rate and blood pressure.

DESCRIPTION OF THE DRAWING

[0013] The aforementioned and other features, characteristics, advantages, and the invention in general will be better understood from the following more detailed description taken in conjunction with the accompanying drawings.

[0014] FIG. 1A is a local area network diagram of the present invention suitable for use in a home environment;

[0015] FIG. 1B is a variation of the local area network diagram of FIG. 1A;

[0016] FIG. 1C is the local area network of FIG. 1A with the direct connections of the local area network replaced by wireless connections;

[0017] FIG. 1D is another variation of the local area network diagram of FIG. 1A;

[0018] FIG. 2 is a is a local area network diagram of the present invention suitable for use in a health club environment;

[0019] FIG. 3A is a perspective view of a fitness machine that has sensors to provide information to the local area network of FIGS. 1A, 1B, 1C, 1D and 2;

[0020] FIG. 3B is a perspective view of a simplified version of the fitness machine of FIG. 3A;

[0021] FIG. 3C is a perspective view of a rower that provides information to the local area network of FIGS. 1A, 1B, 1C, 1D and 2;

[0022] FIG. 4 is a perspective view of a position sensor that may be used in the present invention;

[0023] FIG. 5 is a perspective view of a weight stack with weight position sensors that may be used with the present invention; and

[0024] FIG. 6 is a large area network diagram showing connections between remote fitness machines and other computers using the present invention.

[0025] It will be appreciated that for purposes of clarity and where deemed appropriate, reference numerals have been repeated in the figures to indicate corresponding features, and that the various elements in the drawings have not necessarily been drawn to scale in order to better show the features of the invention.
DETAILED DESCRIPTION OF THE PREferred EMBODIMENT

[0026] Turning now to the drawings, FIG. 1A is a local area network diagram of an electronic data gathering and processing system of the present invention suitable for use with fitness machines, particularly in a home environment, generally designated as 10. Fitness machines 12 and 14, each having sensors 16 and 18, respectively, can be of various types such as leg presses, stationary bicycles and leg extension machines. The fitness machines 12 and 14, when originally manufactured, did not have data ports.

[0027] A third fitness machine 22 has a data port 24, which transfers data through a cable 26 to a data interface module 28 over a local area network which connects together the various blocks of FIG. 1A. In FIG. 1A the data at the data port 24 does not have a format compatible with the computer interface module 20. For example, the data format used in one embodiment of the present invention is the Ethernet format, and the data format of the fitness machine 22 in FIG. 1A is an incompatible format. The data interface module 28 converts the format of the data transferred through the data port 24 into a format compatible with the computer interface module 20 and, if the fitness machine 22 is configured to receive data, the data received from the computer interface module 20 is converted into the format of the fitness machine 22. In addition to the data transferred through the data port 24, additional sensors 30, like sensors 16 and 18, could be installed on the fitness machine 22. The data transferred between the sensors 30 and the computer interface module 20 could be transferred between the data interface module 28 and the fitness machine 22 via a connection 32, where the data transferred between the data port 24 is combined with the data transferred between the sensors 30 and the data interface module 28. Alternatively, as shown in FIG. 1B, data could be transferred directly between the sensor 30 and the computer interface module 20 on a cable 34.

[0028] Returning to FIG. 1A, additional fitness machines, in addition to fitness machines 12, 14 and 22, could be added as indicated by the down arrow in FIG. 1A each having a connection on one of the cables 36 to the computer interface module 20.

[0029] It will be understood by those skilled in the art that the sensors 16 and 18 can be added after the original equipment manufacturer (OEM) ships the fitness machine from its factory, and it is also within the scope of the present invention that all of the sensors described herein could be installed by the fitness machine OEM.

[0030] Also shown in FIG. 1A is a body measurement device 38 for measuring physical parameters of a user which can be, for example, a scales, body dimension measurement tools or a device to determine the per cent body fat of a user. Sensors 40 associated with the body measurement device 38 capture this data and provides it to the computer interface module 20 through a direct connection cable 42.

[0031] In addition to the body measurement device 38, there is also a body monitor 44 for monitoring certain body parameters when a user is exercising. Such body parameters could be, for example, heart rate and blood pressure. Sensors 46 associated with the body monitor 44 captures this data and provides it to the computer interface module 20 through a cable 48. In another example, the body monitor 44 could consist of attachments for measuring the EKG of a user along with an adapter to transmit the EKG data to the computer 50 via the computer interface module 20. Furthermore, the computer 50 could, in turn, pass such data in real time or at a later time to an automated EKG analysis system 186 (shown in FIG. 6) located remote from the electronic data gathering and processing system 10.

[0032] The computer interface module 20 transfers data between itself and the individual fitness machines 12, 14 and 22, the body measurement device 38 and the body monitor 44. Cables 52, 54, 56, 42 and 48 connect fitness machines 12, 14 and 22, the body measurement device 38, and the body monitor 44, respectively, to the computer interface module 20.

[0033] The computer interface module 20 is connected via a cable 58 to the computer 50 which, in turn, is connected to a printer 60.

[0034] FIG. 1C uses a wireless connection instead of the direct connections of FIG. 1A in which antennas 62, along with their respective transceivers, communicate with an antenna 64, along with its respective transceiver, attached to the computer interface module 20, and cables 34, 42, 48, 52, 54 and 56 are eliminated.

[0035] FIG. 1D is a modification of FIG. 1A in which the data connections from the sensors 16 and the data interface module 28 are routed to the sensors 18 instead of directly to the computer interface module 20 in order to minimize the cabling required for the wired connections to the fitness machines 12, 18 and 22. Sensors 18 combine the data from sensors 16, data interface module 28 and its own data to communicate this data to or from the computer interface module 20 on cable 54. In a similar manner the data interface module 28 connects with the sensors from the additional fitness machines, with connections from each of the additional sensors connected in a daisy chain manner.

[0036] In operation the sensors including sensors 16, 18 and 30 are usually attached to a fitness machine as described in more detail below. The data transferred to and/or from the sensors 16, 18 and 30 can be encoded using any of the well known communication protocols such as the Ethernet protocol.

[0037] These signals are routed to and/or received from the computer interface module 20, which multiplexes the signals (if, for example, two people are using fitness machines at the same time) and sends the multiplexed signal to the computer 50.

[0038] In the preferred embodiment of the invention the communication paths are all bidirectional for reasons discussed below. However, for less complicated systems, such as may be used in a home, one way communication paths may be appropriate which would lower the cost of the system 10.

[0039] The computer 50 stores the data it receives from the computer interface module 20 and from the keyboard of the computer 50 and runs various applications that manipulate the received data according to computer algorithms which may also use information from a source such as a remote processing center 186. Such applications may simply store the data or may use more complicated applications such as the following:
[0040] (1) Applications which provide a selection of training regimes for a user with information about each of the regimes;

[0041] (2) Applications which provide daily workout exercises which vary so that the exercise session isn’t routine, but which is selected to fit the needs of a particular user at a particular point in his or her training; and

[0042] (3) Applications which provide instructions on the setup of the selected fitness machines by, for example, printing such instructions on the printer 60.

[0043] FIG. 2 is the electronic data gathering and processing system 10 of FIG. 1A which is modified for a health club, generally designated as 70. In FIG. 2 two computers are connected to the local area network, an administrator’s computer 50 with the attached printer 60, and a user’s computer 72 connected to the computer interface module 20 through a data cable 74. The fitness machines 12, 14 and 22 have attached to them card readers 76 for the users to identify themselves when they are using a particular machine. The body measurement device 38 and the body monitor 44 have card readers 78 and 79, respectively, associated with them, and the two computers 50 and 72 have associated card readers 80 and 82, respectively. In the preferred embodiment of the invention computer 50 can only be accessed by someone with an administrator’s card, while computer 72 can be used by anyone with a user’s card.

[0044] The electronic data gathering and processing system 70 operates in the same manner as FIG. 1A except that the user of each of the fitness machines 12, 14 and 22 or the user of the body measurement device 38 is identified by the card readers 74 and 78. In addition the users can manually enter data at the keyboard of the computer 72 after registering using the card reader 82. The variations of FIGS. 1B, 1C and 1D are also applicable to FIG. 2.

[0045] FIG. 3A is a perspective view of a leg press which includes sensors according to the present invention and can be one of the fitness machines of FIGS. 1A, 1B, 1C, 1D and 2. The leg press 90 has a seat 92, a foot plate 94, a weight stack 96 and various pulleys and cables for connecting the foot plate 94 to the weight stack 96. The leg press 90 also has an interactive display 98 consisting of a visual display 100 for receiving visual information from the computer 50, a keypad 102 and a speaker 104. The interactive display 98 also has a USB port 105 for receiving data from and/or sending data to a USB memory stick 107 that can be plugged into the port 105. Below the interactive display 98 is a card reader 106 which has a LED 108 mounted on it. An adjustment position sensor 110 is connected to a support member 111 receiving a portion of the seat assembly, and a rotation sensor 112 for sensing the amount of rotation the foot plate 94 has with respect to the frame of the leg press 90.

[0046] In operation the interactive display 98 accepts information manually entered on the keypad 102 and provides information to the user on the display 100. Information can also be communicated to the user using the speaker 104. For example, the user could use the keypad 102 to ask the computer 50 and/or the USB memory stick 107 for certain information such as, for example, the machine parameters from the last workout (e.g., seat position, amount of weight, number of repetitions per set and the number of sets). The computer 50 or the USB memory stick 107 would then provide this information to the user via the display 100. Also, the speaker 104 could provide beeps to provide a cadence for the user when exercising. Moreover, the computer 50 or the USB memory stick 107 could ask, using the display 100, a series of questions which would be answered by the user using the keypad 102, about the machine parameters not directly sensed in order to have a complete set of parameters available when the user again uses the leg press 90. The display 98 could be used to show video of the proper settings and use of the leg press 90.

[0047] The card reader 106 would be used to identify the user with the LED 108 providing a confirmation that the user has been recognized. The position sensor 110 senses the seat adjustment position with regard to the foot plate 94 as described below in more detail with respect to FIG. 5.

[0048] During the use of the machine the foot plate 94 moves back and forth and thereby changes the angle of the connecting member 114 with respect to the frame of the leg press 90. This angle is measured with the rotation sensor 112 to thereby provide the motion of the foot plate 94 to the computer 50 during the workout to capture the range of motion and the time of each cycle of the foot plate 94. The display 100 and/or the speaker 104 could provide feedback to the user during the exercise as to where to stop the foot plate 94 during the exertion phase, where to stop the foot plate 94 during the relaxation phase, to indicate to the user the cadence (the amount of time to spend on each of the exertion and relaxation phases) and the rest time between each set. Wires 116 provide power to the sensors and a cable for transferring data between the foot press 90 and the computer interface module 20.

[0049] The data sensed by the sensors, such as the rotation sensor 112, during the workout could be stored directly in the memory stick 107, or the memory stick 107 could be updated after the workout from the computer 50 using the USB port on the computer 50.

[0050] FIG. 3B is a perspective view of an alternate leg press 117 that is a simplified version of FIG. 3A. In one form of this simplified version only the card reader 106 would be used to identify a user. The LED 108 could be present to indicate to the user that the card has been read and that his or her identity has been confirmed. The user would manually adjust the leg press 117, including the weights, and the computer 50 would receive and store the data from the sensors during the workout.

[0051] Instead of the card reader 106, the display 98 with the visual display 100 and keypad 102 could be used for registering the user using a password. In this embodiment the visual display 100 could be simply one or more LEDs to indicate to the user that his or her password has been accepted.

[0052] FIG. 3C is a perspective view of a rower 118 having a visual display 119 attached to the rower 118 at the factory. The information shown on the visual display 119 would be transmitted over the wire 121 to the computer 50 using either a modification to the visual display 119 to provide the data on the wire 121, or using the data from the data port 24 on the visual display 119 installed by the manufacturer.
FIG. 4 is a perspective view of a weight stack 120 and its supporting frame 122, designated generally as 124. The weight stack 120 consists of 14 separate weights, each having a hole there through 126 for connecting each weight to a central shaft 128 with a pin 130. The central shaft 128 is attached to a cable 132 which is connected to a movable element in a fitness machine which is moved when the machine is being used. Guide rods 134 keep the weights in line. The elements described above with respect to FIG. 4 are well known in the art. A plurality of bar codes 136, 158, bar code readers 138 and 140, an encoder box 142 and cables 144 are used in conjunction with the present invention.

In operation the two bar code readers 138 and 140 read the bar codes 136 on the weights and provide this information through the encoder box 142 and out one of the cables 144 to the computer interface module 20 and then to the computer 50, with the second cable used to provide power to the encoder box 142 and the bar code readers 138 and 140. When some of the weights are moving up and down, the bar code readers 138 and 140 detect the bar code 136 on whatever weights are moving. This data is used in the computer 50 to determine how much weight has been selected by the user, and can also be used to detect the end points of the exertion phase and the relaxation phase and to detect the user’s speed of motion.

The bar code readers, such as the bar code readers 138 and 140 may vary in number and placement depending on the particular weight stack 120. The number and placement of the bar code readers is chosen such that the bar code readers are able to detect which individual weights have been selected for an exercise. The top bar code reader is positioned to read the bar code of the top weight when the weight is at rest. The minimum amount of travel of the central shaft 128 needs to be determined based on the range of movement of the central shaft 128 during normal operation of the fitness machine using the weight stack 120. After the minimum amount of travel has been determined, the placement of the next lower bar code reader is set by placing the bar code reader opposite the weight that is just below the weight that the top bar code reader reads when the central shaft 128 has moved the minimum amount of travel. In the same manner additional bar code readers are positioned until the bottom weight’s bar code can be read when the central shaft 128 has moved the minimum distance.

FIG. 5 is a perspective view of an adjustment device for adjusting the relative position of an inner rectangular box member 150 with respect to an outer rectangular box member 152, together with a locking pin 154 and knob 156 and a bar card reader 158 for reading bar codes 160 and 162, generally designated as 164. A bar code reader module 166 is mounted at an acute angle with respect to the long axis of the inner and outer rectangular members 150 and 152. The bar card reader module 166 projects a beam 168 onto the bar code 160 and detects the reflection from the bar code 160 to read the bar code 160. As can be seen in FIG. 5 a series of holes 170 are present in the inner member 150 for locking the inner member 150 with respect to the outer member 152 using the pin 154.

In operation once the position of the inner member 150 is secured with respect to the outer member 152 and locked in place with the pin 154, the bar code reader 158 reads the bar code 160 immediately under the adjustment hole 170 of the inner member 150 which holds the locking pin 156. The bar code number is transferred over the local area network to the computer 50 where it is recorded as the particular adjustment position for a particular fitness machine for a particular user. The information is then made available to the user so that the same adjustment position can be used, if desired, the next time the user uses such fitness machine.

A variation of the assembly 164 of FIG. 5 would be to mount the bar code reader module 166 perpendicular to the long axis of the inner and outer members 150 and 152 provided that the inner member 150 is long enough for the required extra bar codes below the bottom hole of the adjustment holes 170 which would need to be placed at the same height intervals as the upper two bar codes 162.

FIG. 6 is a large area network diagram, generally designated as 180, showing connections between remote fitness machines which are using the present invention. The diagram 180 shows a group of electronic data gathering and processing systems 182 which are connected to a switch or router 184 of a large area network. The large area network in the preferred embodiment of the invention is the internet with switch 184 representing a plurality of switches and/or routers. Each of the systems 182 can communicate to the other systems 182 through the large area network which includes the switch 184. Using this large area networking a user in a remote health club could connect with his home health club and get information stored in the computer 50 at his home health club or at his or her home computer for use in the remote health club. A remote processing center 186 for performing complicated or proprietary processing of a user’s data could also be connected to the large area network 182. In addition a user’s home computer 188 could be connected to the large area network 182 so that users could review their personal data at home, and could also pursue different types of training regimes away from the health club.

With regard to the location and ownership of the software used in the present invention, a number of alternatives are available. For purposes of this analysis, the software will be considered to consist of three segments. The first segment is the software to transfer the data from the sensors, such as sensors 16 shown in FIG. 1A to the computer 50. The second segment is the software to store the data. The third segment is software to arrange the data into a form convenient for a user to read, and optionally, to analyze the data and to provide to various training regimes for the user’s selection. For the first two segments, the software resides in the home or health club facility and usually would be licensed for use in the home or health club facility. The third segment could also reside in the home or health club facility, or could reside in a remote location as shown in FIG. 6. Such a location could be a URL on the internet. The owner of the URL location could then develop the software and thereby own the software, or the software could be licensed to URL by a another company who would then own the software.

Although the invention has been described in part by making detailed reference to a certain specific embodiment, such detail is intended to be, and will be understood to be, instructional rather than restrictive. It will be appreciated by those skilled in the art that many variations may be made on the structure and mode of operation without
I claim:

1. A system for monitoring exercise comprising:
   a) a fitness machine for use by a user;
   b) a sensor mounted on said fitness machine for sensing an machine parameter of said fitness machine and for converting said sensed parameter into digital data;
   c) a local area network for transferring said digital data to a first computing device which receives and processes said digital data.

2. The system for monitoring exercise, according to claim 1, further including an output device in the area of said fitness machine for providing information over said local area network to said user.

3. The system for monitoring exercise, according to claim 2, wherein said output device is a visual display.

4. The system for monitoring exercise, according to claim 1, further including an input device in the area of said fitness machine whereby said user can identify one of himself and herself over said local area network.

5. The system for monitoring exercise, according to claim 1, further including a body measurement device whereby data about a user’s physical parameters can be sensed, converted to digital data and transferred over said local area network to said first computer.

6. The system for monitoring exercise, according to claim 1, further including a body monitor for monitoring, during exercise, said user’s body parameters which may change when said user is using said fitness machine, converting said body parameters into digital data and transmitting said digital data to said first computer over said local area network.

7. The system for monitoring exercise, according to claim 1, further including a second computer coupled to said local area network for viewing data stored in said first computer and for entering data at said second computer which is then sent over said local area network to said first computer.

8. The system for monitoring exercise, according to claim 1, further including a large area network connectable to said first computer for transferring data from said first computer to a remote location.

9. The system for monitoring exercise, according to claim 8, wherein said remote location processes said transferred data from said first computer and provides a result of said processing to said first computer over said large area network.

10. The system for monitoring exercise, according to claim 1, wherein said local area network uses one of direct physical connections and wireless connections.

11. A method for monitoring an fitness machine comprising the steps of:
   a) converting an machine parameter of said fitness machine into digital data; and
   b) transferring said digital data over a local area network to a first computer.

12. The method for monitoring an fitness machine, according to claim 11, including the additional step of transferring information from said first computer over said local area network to a user of said fitness machine.

13. The method for monitoring an fitness machine, according to claim 12, wherein the transfer of information is the transfer of visual information.

14. The method for monitoring an fitness machine, according to claim 11, including the additional step of receiving data manually entered by said user while in the area of said fitness machine and transferring said data over said local area network to said first computer.

15. The method for monitoring an fitness machine, according to claim 11, including the additional step of measuring, at a location remote from any of said fitness machines, a physical parameter of a user, converting said physical parameter to digital data, and transferring said data over said local area network to a first computer.

16. The method for monitoring an fitness machine, according to claim 11, including the additional step of monitoring a body parameter of a user of said fitness machine, wherein said body parameter may change when said user is using said fitness machine, converting said body parameter into digital data and transmitting said digital data to a first computer over said local area network.

17. The method for monitoring an fitness machine, according to claim 11, including the additional step of transferring data over said local area network from said first computer to a second computer for viewing at said second computer data stored in said first computer and for entering data at said second computer which is then sent over said local area network to said first computer.

18. The method for monitoring an fitness machine, according to claim 11, including the additional step of transferring data from said first computer over a large area network to a remote location.

19. The method for monitoring an fitness machine, according to claim 18, including the additional step of processing at said remote location said data transferred from said first computer and providing a result of said processing to said first computer over said large area network.

20. The method for monitoring an fitness machine, according to claim 11, including the additional step of transferring data over said local area network by one of direct connections and wireless connections.

* * * * *