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(54) **METHOD, MEDIUM, AND APPARATUS  
GENERATING HEALTH STATE BASED  
AVATARS**

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(57) **ABSTRACT**

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A method, medium, and apparatus extracting avatar parameters using an avatar transformation algorithm from health state information measured from a user and generating an avatar using the extracted parameters. In the apparatus, a state analysis unit receives at least one among a bio-signal and questionnaire information of a user and outputs health state information, a parameter extraction unit extracts parameters defining an avatar image, and an avatar generation unit generates the avatar image using the parameters. By providing the method, medium, and apparatus, it is possible to provide a user with a convenience in recognizing his health state by generating an avatar image describing the user's future health state as well as the user's current health state. Further, it is possible to induce a user to manage his health constantly by maintaining a user's with the avatar image change.

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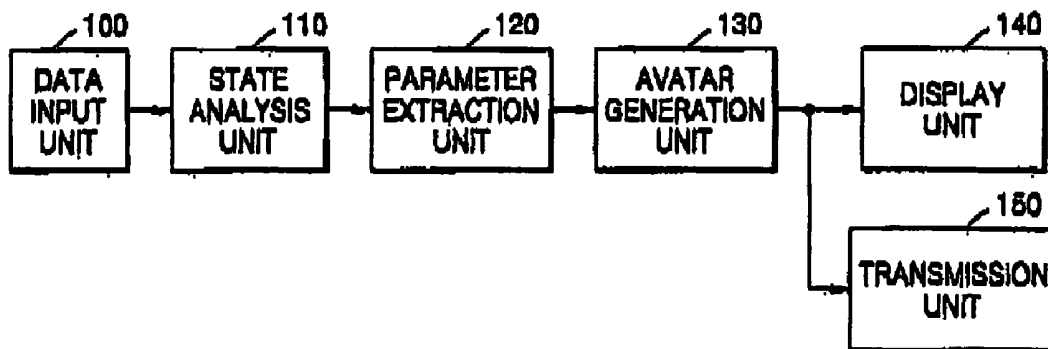


FIG. 1

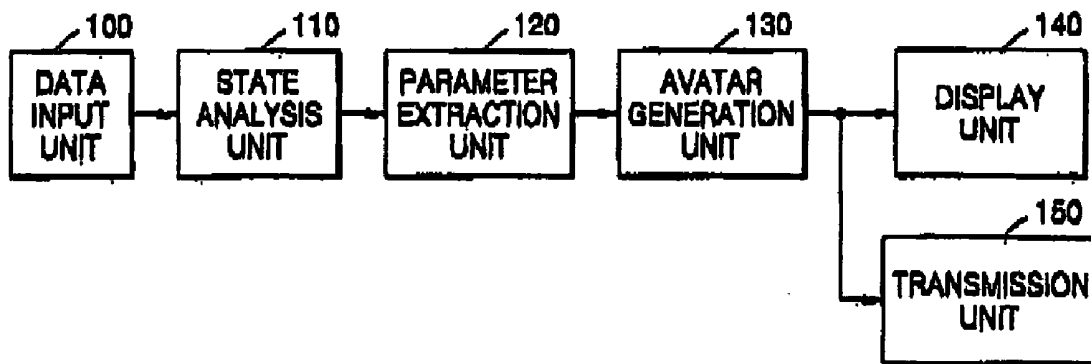


FIG. 2

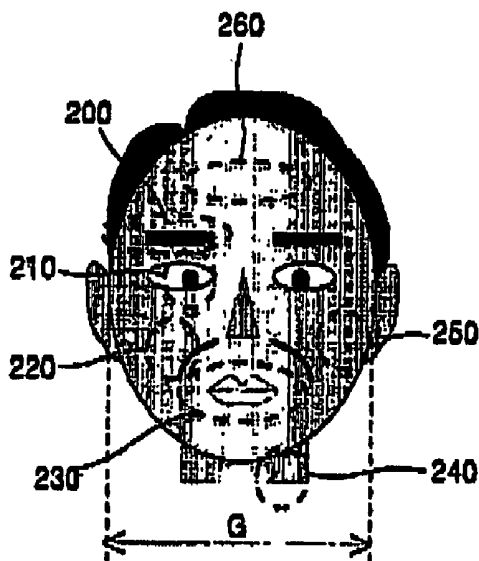


FIG. 3A

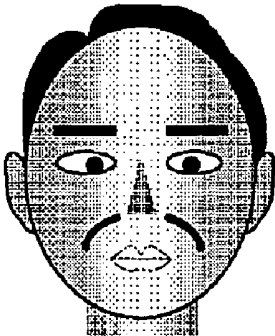


FIG. 3B

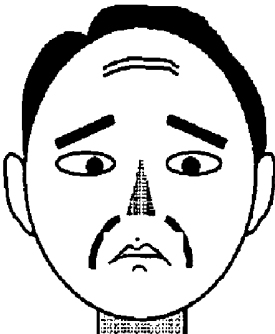


FIG. 3C

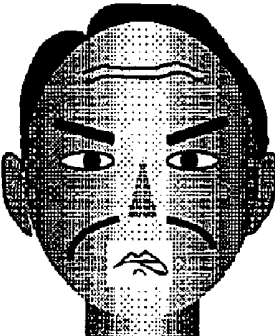


FIG. 3D

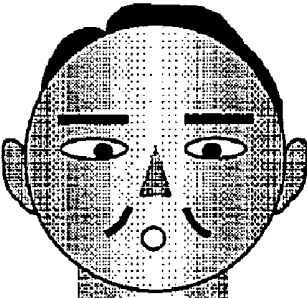


FIG. 4

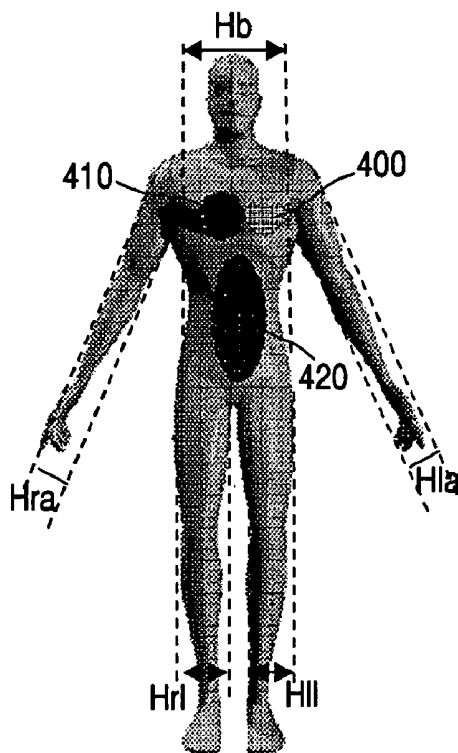


FIG. 5

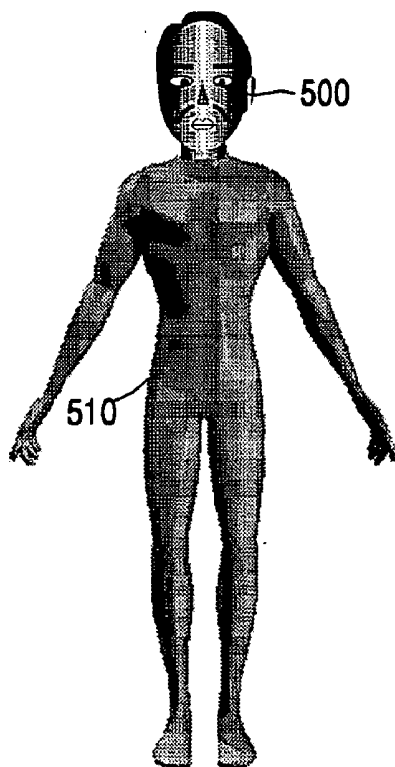


FIG. 6

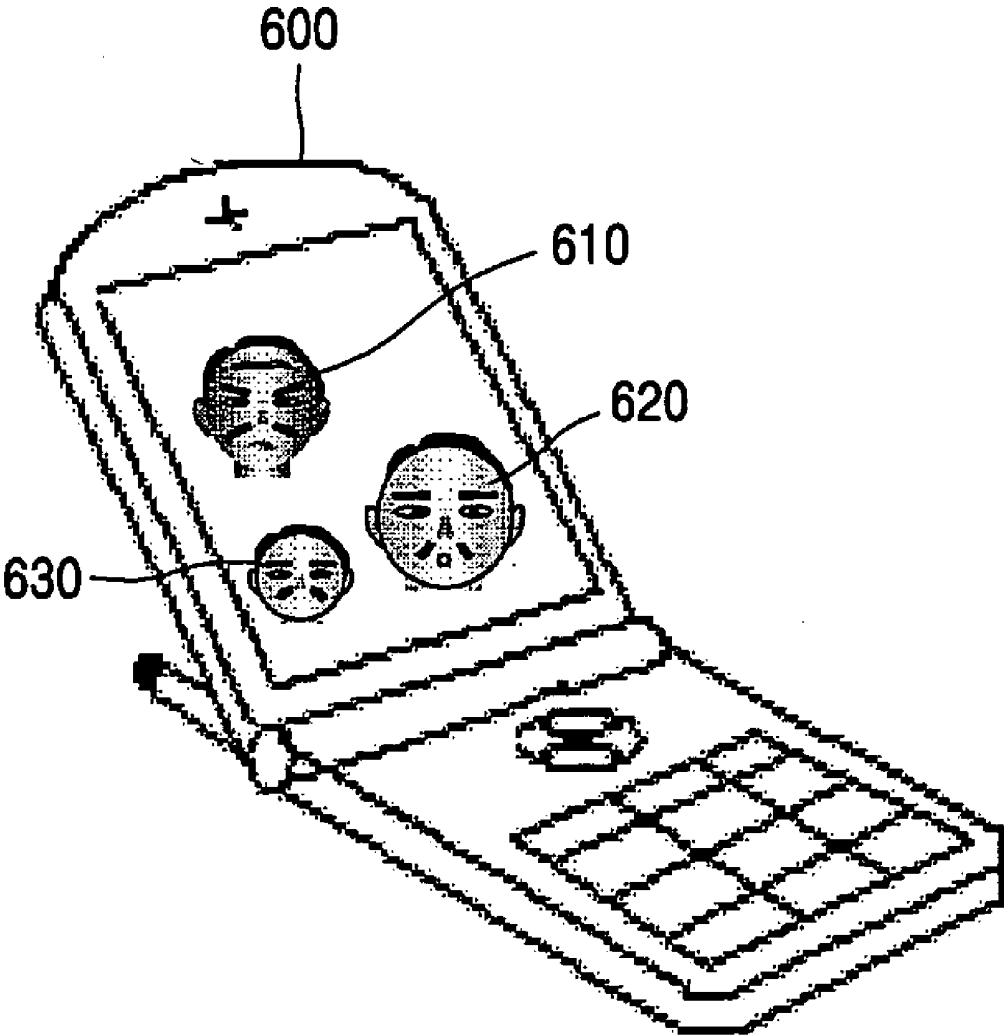


FIG. 7

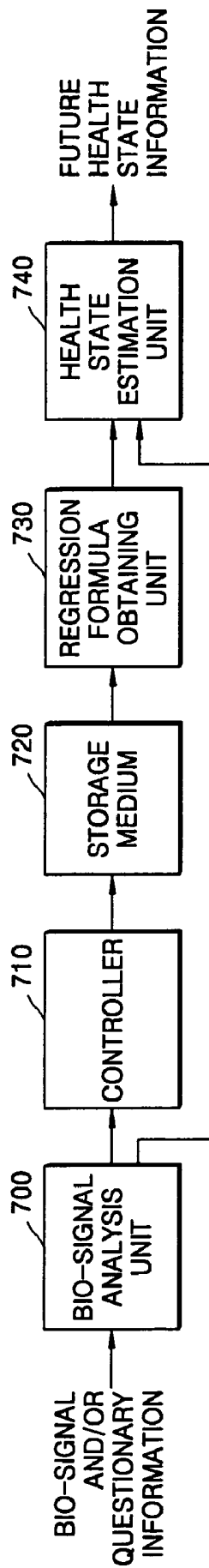


FIG. 8

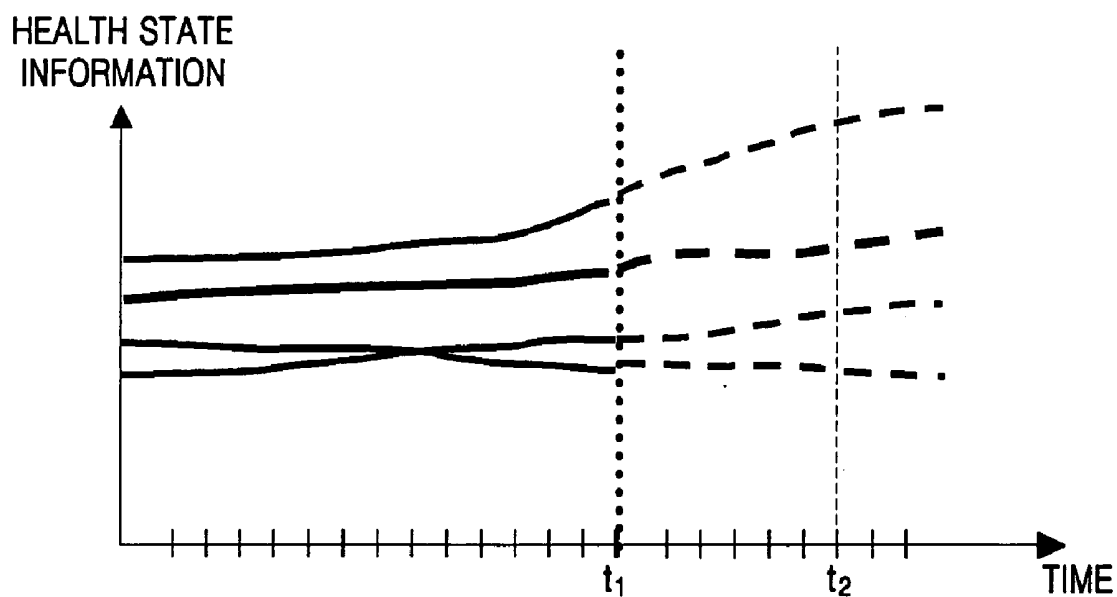


FIG. 9A

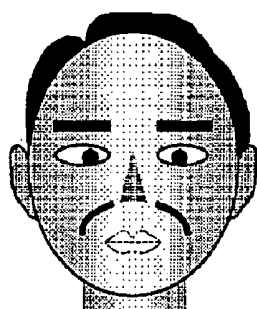
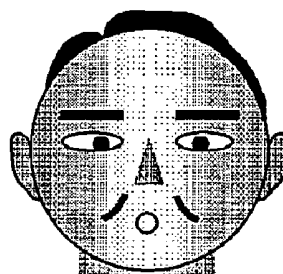


FIG. 9B



**FIG. 10**

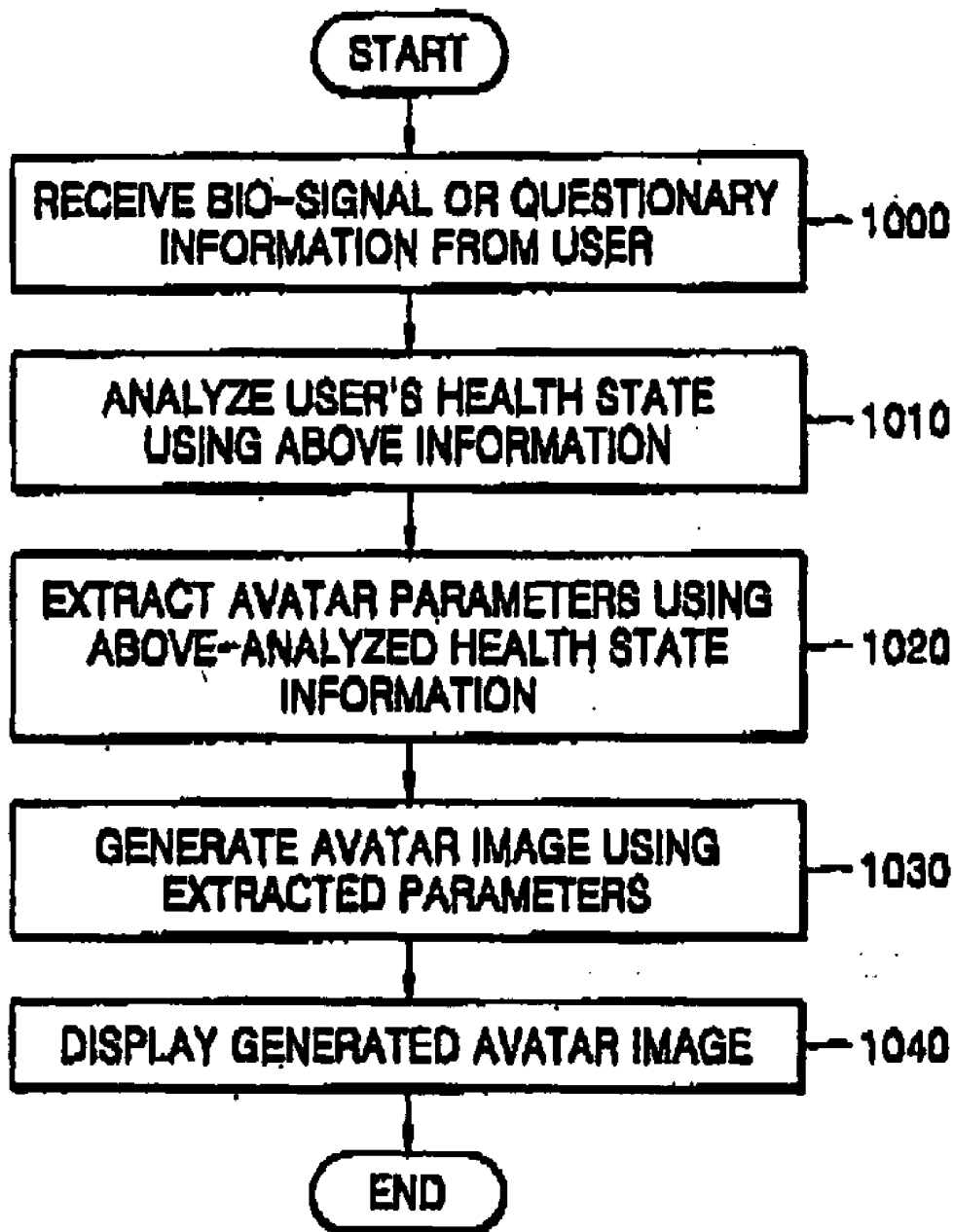


FIG. 11

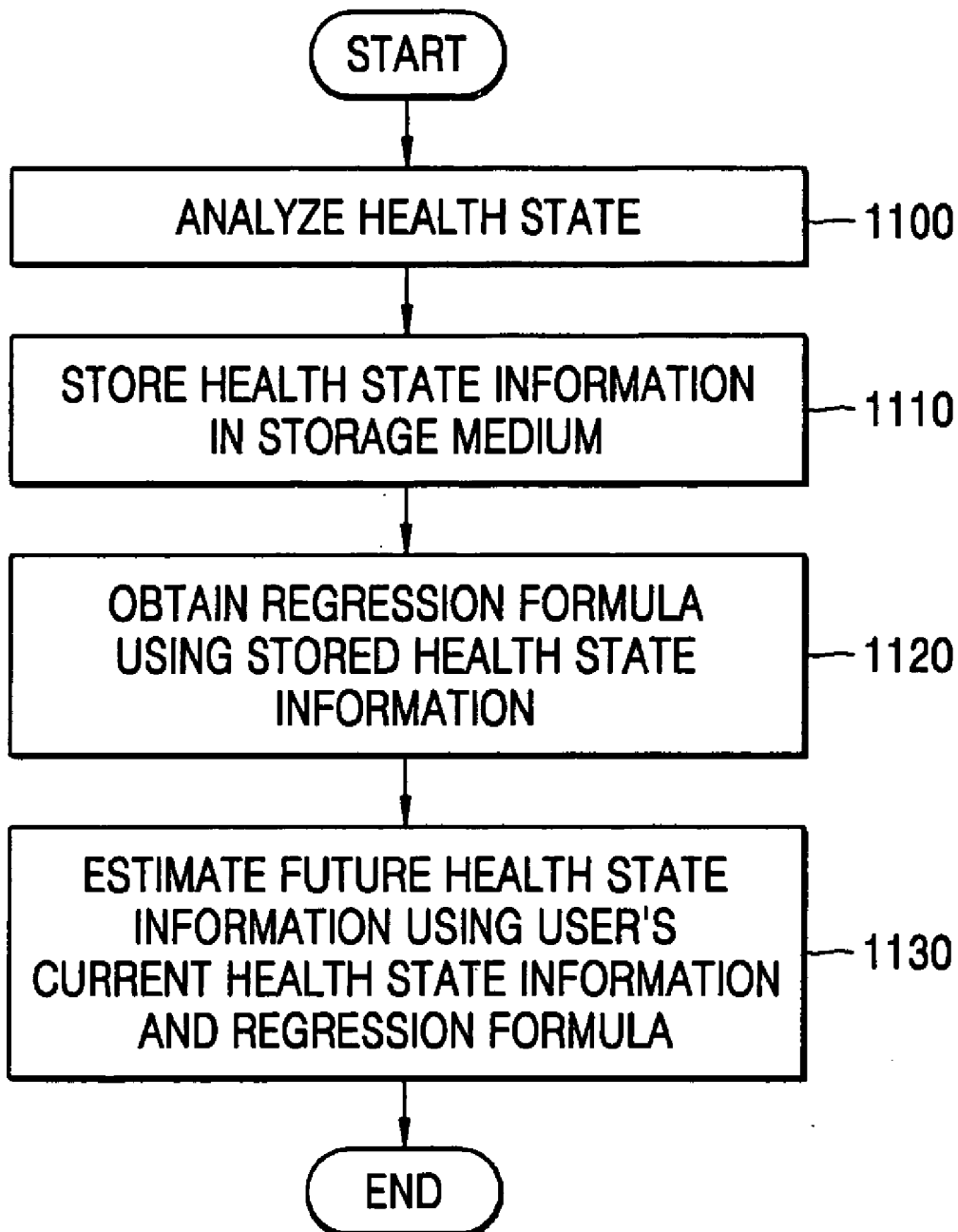


FIG. 12A

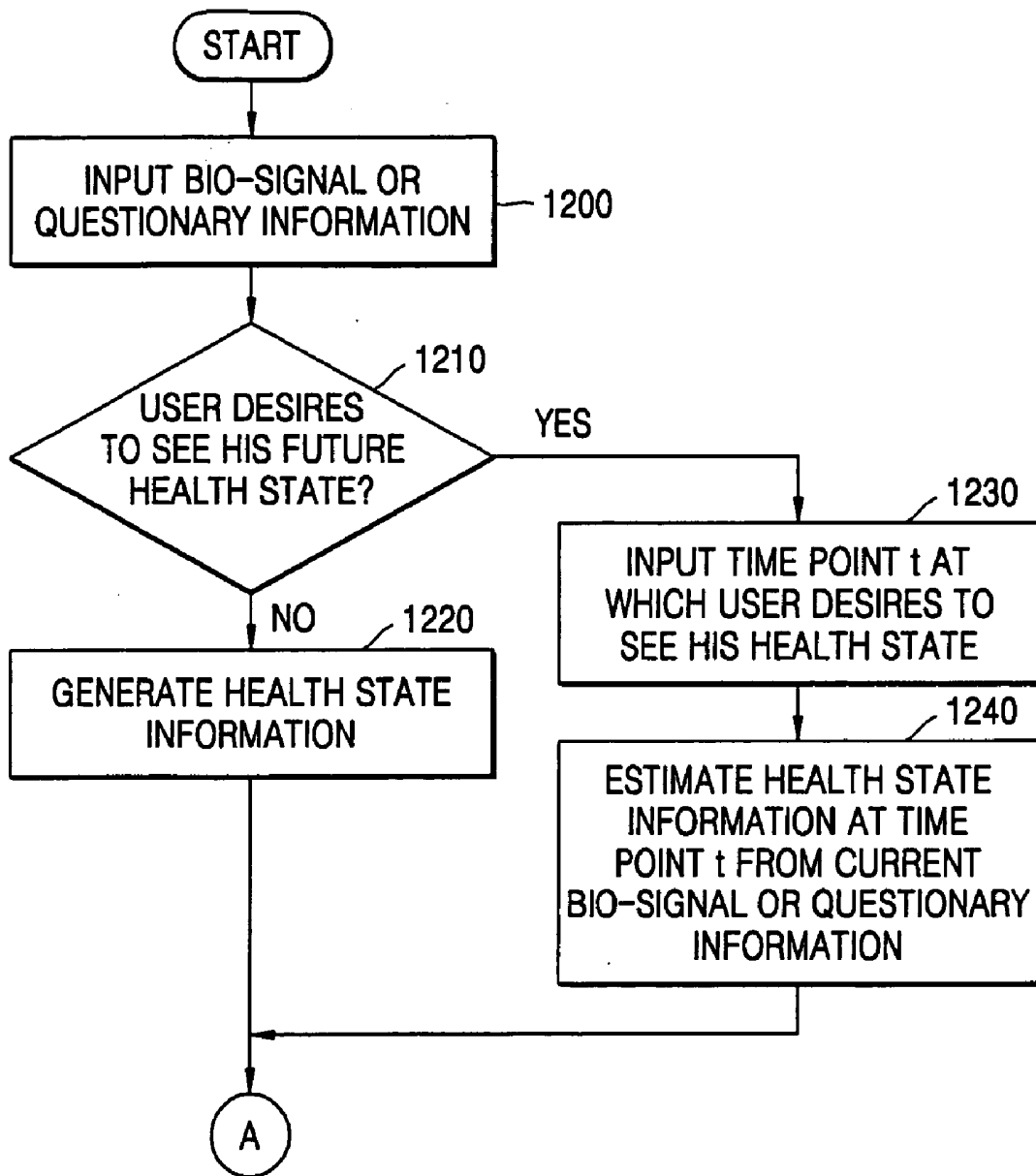
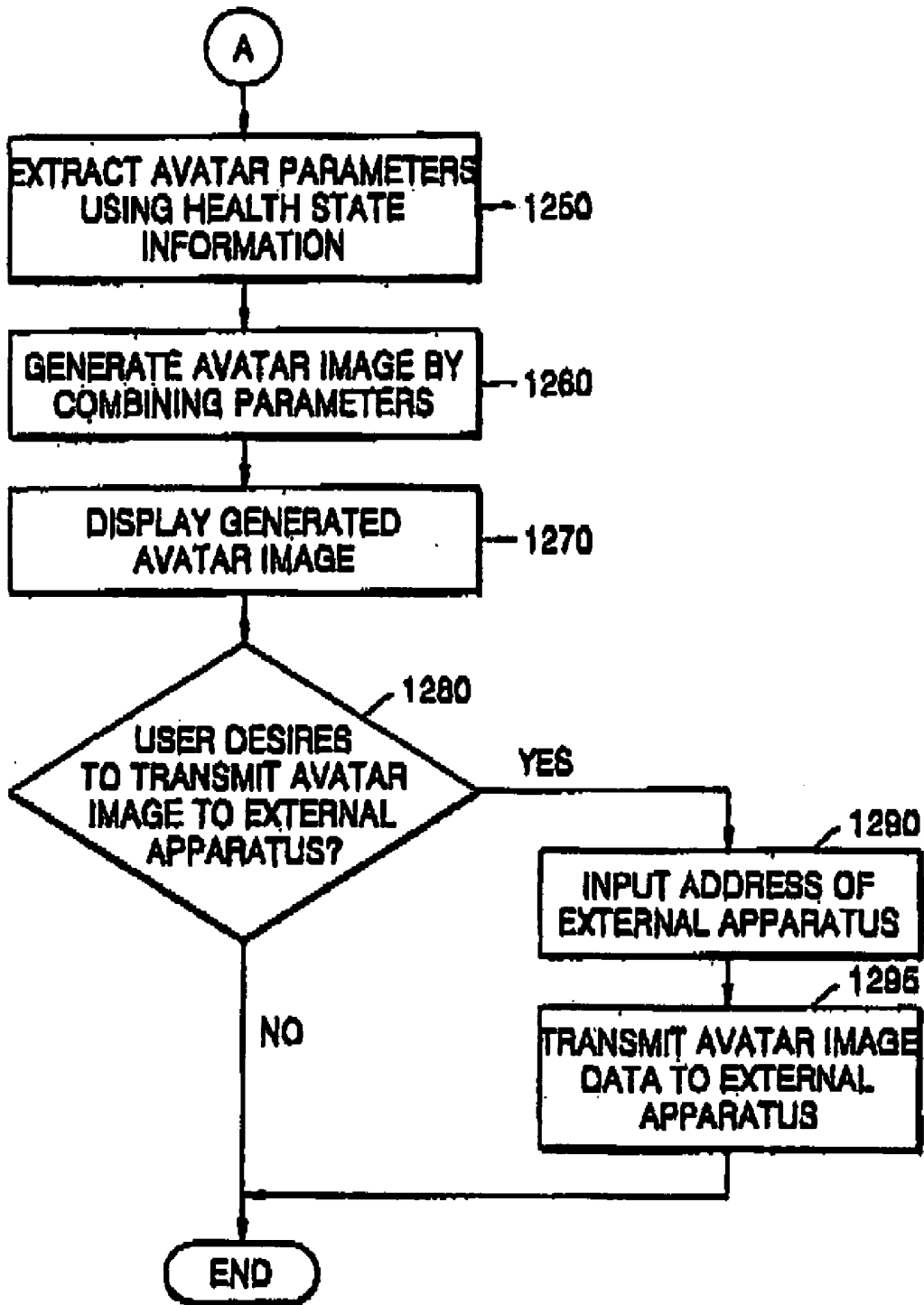


FIG. 12B



## METHOD, MEDIUM, AND APPARATUS GENERATING HEALTH STATE BASED AVATARS

### CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the priority of Korean Patent Application No. 10-2004-0081351, filed on Oct. 12, 2004, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

### BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] Embodiments of the present invention relate to a method, medium, and apparatus generating an avatar, and more particularly, to a method, medium, and apparatus extracting avatar parameters, using an avatar transformation algorithm, from health state information measured from a user and generating an avatar using the extracted parameters.

[0004] 2. Description of the Related Art

[0005] Generally, results obtained by measuring a patient's electrocardiogram signal, ultrasonic signal, body fat rate, and/or body mass index (BMI) have been used to monitor a patient's current health state or estimate future health states. However, since the measurement results are typically only described in terms of technical numerical values or graphs, it is difficult for the general public, who may have no medical knowledge, to understand their current health state, estimate future health states from the measurement results, or use the results in managing their health or disease prevention.

[0006] Therefore, recently, methods have been introduced for generating and displaying a user's health state in form of an image using health information measured from a user so that a user may easily check his health state with his natural eye. For the methods of generating a user's health state in form of an image, there exists a method of generating an avatar image based on an obesity degree, using an exercise amount and an ingested calorie amount, as input by a user.

[0007] An avatar, an animation character which may behave on behalf of a user in cyber space, for example, is a virtual body representing a user is mainly graphically constructed. The related art avatars are mostly two-dimensional images, but recently three-dimensional (3D) characters have been used, taking advantages of a cubic effect and a reality sense thanks to developments in computer graphic technology. For example, such 3D avatars have been widely used in cyber shopping malls, virtual education, and virtual offices, as well as in a chatting or in on-line gaming.

[0008] In the case of monitoring a user's health state, using the related art method as described above, it is difficult for a user who has no medical knowledge to check his health state. Even when using an avatar, a user can only check his level of obesity using only several predetermined avatar images, i.e., there is nothing individually generated for the user.

### SUMMARY OF THE INVENTION

[0009] Embodiments of the present invention set forth a method, medium, and apparatus extracting parameters mak-

ing up an avatar using an avatar transforming algorithm from health state information measured from a user, and generating an avatar modified in various ways based on the extracted parameters to overcome the aforementioned conventional drawbacks in checking a user's health state.

[0010] To achieve the above and/or other aspects and advantages, embodiments of the present invention include an apparatus for generating an avatar image using parameters, the apparatus including a state analysis unit to receive at least one of a bio-signal and questionnaire information of a user to analyze a user's health state, and to output health state information of the user, a parameter extraction unit to receive the health state information, and to extract parameters defining the avatar image by implementing a formula relating the health state information with the parameters, and an avatar generation unit to generate the avatar image using the parameters.

[0011] The state analysis unit may receive the at least one of the bio-signal and questionnaire information of the user and estimates the health state of the user for a predetermined period of time to output future health state information for the user.

[0012] In addition, the state analysis unit may include a bio-signal analysis unit to receive at least the one of the bio-signal and questionnaire information of the user and analyzing the user's health state to output the health state information, a storage medium to store the health state information, a controller to obtain the health state information from the bio-signal analysis unit to be stored in the storage medium, a regression formula obtaining unit to obtain a regression formula representing a temporal change in the health state information, using the health state information of the user stored in the storage medium, and a health state estimation unit to receive the health state information of the user from the bio-signal analysis unit and to output a user's future health state information, using the regression formula and the health state information.

[0013] The bio-signal may include at least one of an electrocardiogram signal, an ultrasonic signal, EDA (electrodermal activity), a body temperature, and a body fat rate. Further, the questionnaire information may include at least one of information of a habit, a syndrome, a stature, a weight, and a waist measure of the user.

[0014] The health state information may include information of at least one of whether a hospital visit is required, a stress/fatigue degree, a health age, a skin state, an obesity degree, a body portion balance degree, a heart health degree, a digestive organ health degree, and a respiratory organ health degree. Here, the body portion balance degree may be representative of being derived using an eight-point tactile electrodes method.

[0015] The parameters may include at least one of a facial muscle variation rate, a facial skin color variation rate, a facial wrinkle variation rate, a facial width variation rate, a heart size variation rate, a heart color variation rate, a color variation rate of an abnormal portion in a digestive organ, a color variation rate of an abnormal portion in a respiratory organ, and a size variation rate for each body portion depending on a body balance.

[0016] The apparatus may further include a display unit to display the generated avatar image.

[0017] In addition, the apparatus may further include a transmission unit to transmit data of the generated avatar image to a remote station or remote apparatus.

[0018] To achieve the above and/or other aspects and advantages, embodiments of the present invention include a method for generating an avatar image using parameters, including analyzing a user's health state using at least one of a bio-signal and questionnaire information of the user, receiving information of the analyzed health state to obtain a formula relating health state information of the user and parameters, extracting the parameters, and generating the avatar image using the extracted parameters.

[0019] The analyzing may include estimating the user's health state for after a predetermined period of time using the at least one of the user's bio-signal and the questionnaire information.

[0020] In addition, the analyzing may include analyzing the user's health state using the at least one of the bio-signal and the questionnaire information of the user, obtaining a regression formula representing a temporal change in the health state information from the analyzed user's health state, using the health state information, and generating future health state information of the user of after a predetermined period of time, using the health state information and the regression formula.

[0021] To achieve the above and/or other aspects and advantages, embodiments of the present invention include a medium including computer readable code to implement embodiments of the present invention.

[0022] To achieve the above and/or other aspects and advantages, embodiments of the present invention include an apparatus for generating an avatar image using parameters, the apparatus including a state analysis means for outputting health state information of a user, a parameter extraction means for extracting parameters defining the avatar image by implementing a formula relating the health state information with the parameters, and an avatar generation means for generating the avatar image using the extracted parameters.

[0023] The method for generating the avatar may further include: displaying the generated avatar; and transmitting the generated avatar image data to the outside.

[0024] The method for generating the avatar can be written as computer programs and can be implemented in general-use digital computers that execute the programs using a computer-readable recording medium.

[0025] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0026] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

[0027] **FIG. 1** illustrates an apparatus for generating an avatar, according to an embodiment of the present invention;

[0028] **FIG. 2** illustrates facial regions, modified by parameters, making up an avatar, according to an embodiment of the present invention;

[0029] **FIGS. 3A-3D** illustrate avatars generated using different parameters, e.g., modifying the regions of **FIG. 2**, according to an embodiment of the present invention;

[0030] **FIG. 4** illustrates regions of an avatar modifiable by parameters, according to an embodiment of the present invention;

[0031] **FIG. 5** illustrates an avatar generated using parameters, e.g., parameters modifying the regions illustrated in **FIGS. 2 and 4**, according to an embodiment of the present invention;

[0032] **FIG. 6** illustrates an apparatus for receiving and displaying data of an avatar, generated based on a health state of a user, according to an embodiment of the present invention;

[0033] **FIG. 7** illustrates a state analysis unit, e.g., the state analysis unit of **FIG. 1**, according to an embodiment of the present invention;

[0034] **FIG. 8** graphically explains a method for obtaining a regression formula for estimating a future health state based on a current health state, according to an embodiment of the present invention;

[0035] **FIGS. 9A-9B** illustrate avatars estimating a future health state based on a present health state;

[0036] **FIG. 10** illustrates a flowchart for a method to generate an avatar, according to an embodiment of the present invention;

[0037] **FIG. 11** illustrates a flowchart for a method to estimate a future health state based on a current health state, according to an embodiment of the present invention; and

[0038] **FIG. 12A-12B** illustrate a flowchart for a method to generate an avatar, according to an embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0039] Reference will now be made in detail to embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. Embodiments are described below to explain the present invention by referring to the figures.

[0040] **FIG. 1** illustrates an apparatus for generating an avatar, according to an embodiment of the present invention. The apparatus for generating the avatar can include a data input unit **100**, a state analysis unit **110**, a parameter extraction unit **120**, an avatar generation unit **130**, a display unit **140**, and a transmission unit **150**. Similar to **FIG. 1**, a method for generating the avatar will also be described concurrently below, referencing operations in **FIG. 10**, in connection with this apparatus.

[0041] The data input unit **100** can receive a bio-signal having information such as an electrocardiogram signal, an ultrasonic signal, electrodermal activity (EDA), a body temperature, and/or a body fat rate, which may have been measured from a user, and/or questionnaire information in

which a user may have provided answers to questions related to the health state of the user, e.g., as in operation 1000 of FIG. 10. It may be desirable for the apparatus generating the avatar to use results obtained by measuring an electrocardiogram signal or a body fat rate directly from a user, as well as data from an electrocardiogram measuring device or a body fat rate measuring device.

[0042] The state analysis unit 110 can receive a bio-signal or questionnaire information from the data input unit 100 to analyze a user's health state using the received information, e.g., as in operation 1010 of FIG. 10. The state analysis unit 110 can analyze a current health state based on a user's bio-signal or received questionnaire information, and estimate a desired future health state, using a regression formula obtained based on past health data and the analyzed current health state, thereby possibly outputting a user's future health state information.

[0043] It may also be desirable for the state analysis unit 110 to analyze health states such as a first screening judgment degree (Hs), a stress/fatigue degree (St), a health age (Ha), a skin state (Ag), and/or an obesity degree (Ob) of a user, and also output the health state degrees in terms of numerical values.

[0044] The first screening judgment degree (Hs), which may be a numerical value representing a health state regarding whether a hospital visit is necessary for a user, may be computed from basic inquiries generally used in a hospital, e.g., questionnaire results related to living habits or disease syndromes.

[0045] The stress/fatigue degree (St) can be computed using a standard deviation for differences of intervals of adjacent rate ratio (RR) waves in an electrocardiogram and a ratio of a low frequency (LF) and a high frequency (HF) obtained through a heart rate variability (HRV) spectrum analysis of an electrocardiogram, for example. The LF, which reflects activation of a sympathetic system, is a power value for a low frequency region (0.04-0.15 Hz) in the HRV spectrum of the electrocardiogram and the HF, which reflects activation of a sympathetic system, is a power value for a high frequency region (0.15-0.4 Hz) in the HRV spectrum of the electrocardiogram.

[0046] The health age (Ha) can be computed from user questionnaire results for measuring a health age, used in a National Health Insurance Corporation or a hospital, for example. The skin state (Ag) can be computed from an ultrasonic signal or an EDA and the obesity (Ob) can be computed from a BMI, which is a value obtained by dividing a current weight by a square of a stature, a waist measure, and a body fat rate measured by a body fat measuring device, for example.

[0047] The parameter extraction unit 120 receives information regarding a user's health state from the state analysis unit 110 and extracts avatar parameters using an avatar transformation algorithm, i.e., a relation formula between the health state information set in advance and the avatar parameters, e.g., as in operation 1020 of FIG. 10. The avatar parameters and the avatar transformation algorithm will be described in more detail with following reference to FIGS. 2 and 4.

[0048] The avatar generation unit 130 can receive parameters defining an avatar from the parameter extraction unit

120 and generates avatar data using the parameters, e.g., as in operation 1030 of FIG. 10. The display unit 140 can then display the avatar representing a user's health state using the generated avatar data, e.g., as in operation 1040 of FIG. 10.

[0049] It may be desirable for the apparatus to generate the avatar to further include the transmission unit 150 for transmitting/distributing the generated avatar data, generated by the avatar generation unit 130. For example, the transmission unit 150 can transmit the generated avatar data representing a user's health state so that the user's health state may be checked at a remote station or apparatus.

[0050] FIG. 2 illustrates facial regions, modified by parameters, making up an avatar, according to an embodiment of the present invention, with the facial regions expressing a user's health state in terms of a facial muscular change, a skin color change, a facial wrinkle change, and a facial width change, for example.

[0051] In a face avatar, the regions that change based on the health state are modifiable by each parameter, such that the images of the regions set by each parameter change depending on values of the parameters.

[0052] The parameter extraction unit 120 can receive user's health state information, such as a first screening judgment degree (Hs), a stress/fatigue degree (St), a health age (Ha), a skin state (Ag), and/or an obesity degree (Ob) of a user from the state analysis unit 110, and can perform computation using the following equation 1, to extract the avatar parameters.

[0053] In the following Equation 1, A is a parameter representing a facial muscular change rate for a region 200 of FIG. 2, B is a parameter representing a facial muscular change rate for a region 210, C is a parameter representing a facial muscular change rate for a region 220, D is a parameter representing a facial muscular change rate for a region 230, E is a parameter representing a facial skin color change rate for regions 240 and 250, F is a parameter representing a facial wrinkle change rate for a region 260, and G is a parameter representing a facial width change rate, for example. The image generated by each parameter can also be symmetric with respect to right and left.

$$A = a1 \times Hs + a2 \times St + a3 \times Ha + a4 \quad \text{Equation 1}$$

$$B = b1 \times St + b2 \times Hs + b3 \times Ha + b4$$

$$C = c1 \times St + c2 \times Hs + c3 \times Ha + c4 \times Ag + c5$$

$$D = d1 \times St + d2 \times Hs + d3 \times Ha + d4$$

$$E = e1 \times St + e2 \times Hs + e3 \times Ag + e4$$

$$F = f1 \times Ha + f2 \times Ag + f3$$

$$G = g1 \times Ob + g2$$

[0054] In Equation 1, a1, a2, a3, a4, b1, b2, b3, b4, c1, c2, c3, c4, c5, d1, d2, d3, d4, e1, e2, e3, e4, f1, f2, f3, g1, g2 may be parameter constants.

[0055] FIGS. 3A-3D illustrate avatars generated using the avatar parameters of FIG. 2, for example, with FIG. 3A illustrating an avatar generated representing a user's health state being normal, FIG. 3B illustrating an avatar represent-

ing a user's weak health state, **FIG. 3C** illustrating an avatar representing a user being under a lot of stress, and **FIG. 3D** illustrating an avatar representing a user being in an obese state.

**[0056]** **FIG. 4** illustrates regions of an avatar modifiable by parameters, according to an embodiment of the present invention expressing a user's health state focusing on a particular body portion balance degree, a heart health degree, a digestive organ health degree, and a respiratory organ health degree, for example.

**[0057]** The body portion balance degree may be based on parameters of Hb, Hra, Hla, Hll, Hrl, and may desirably include parameters computed using a body fat rate measuring method for each portion, e.g., using an eight-point tactile electrode method.

**[0058]** Here, Hb may be a parameter representing a body fat rate of the trunk, Hra may be a parameter representing a body fat rate of the right arm, Hla may be a parameter representing a body fat rate of the left arm, and Hll may be a parameter representing a body fat rate of the left leg, and Hrl may be a parameter representing a body fat rate of the right leg.

**[0059]** The parameter extraction unit **120** may receive, for example, from the state analysis unit **110**, a user's health state information such as a standard deviation of differences between intervals of adjacent RR waves in an electrocardiogram (SDSD), a root mean square (RMS) of differences between intervals of adjacent RR waves in the electrocardiogram (RMSSD), a rate in which an interval of adjacent RR waves in the electrocardiogram is more than 50 ms (pNN50), whether a user is under an arrhythmia state (AM), digestive organ-related questionnaire results (JS), respiratory organ-related questionnaire results (RS), and can perform computations using the following Equation 2, for example, to extract a heart health degree, a digestive organ health degree, and/or a respiratory organ health degree.

$$I = i1 \times SDDS + i2 \times RMSSD + i3 \times pNN50 + i4 \times AM + i5 \quad \text{Equation 2}$$

$$J = j1 \times JS + j2$$

$$K = k1 \times RS + k2$$

**[0060]** Here, in Equation 2, i1, i2, i3, i4, i5, j1, j2, k1, k2 may be parameter constants.

**[0061]** I is a parameter representing a heart health degree for a region **400** in **FIG. 4**. It may be desirable for the region **400** of the avatar, based on the parameter I, to represent a red color image, of a standard size, when the heart health degree is normal, represent a red color image, of a small size, when the heart health degree is abnormal, and represent a gray color image when the heart is in arrhythmia.

**[0062]** J is a parameter representing a respiratory organ health degree for a region **410** in **FIG. 4**, and may be desirable for the region **410** of the avatar, based on the parameter J, to represent a skin color image when the respiratory organ health degree is normal and represent a gray color image when the respiratory organ health degree is abnormal.

**[0063]** K is a parameter representing a digestive organ health degree for a region **420** in **FIG. 4**, and it may be desirable for the region **420** of the avatar, based on the parameter K, to represent a skin color image when the digestive organ health degree is normal and represent a gray color image when the digestive organ health degree is abnormal.

**[0064]** **FIG. 5** illustrates a avatar generated using parameters, e.g., parameters modifying the regions illustrated in **FIGS. 2 and 4**, according to an embodiment of the present invention. By combining a face avatar, generated using the parameter modified regions of **FIG. 2**, for example, with the trunk, avatar, generated using the parameter modified regions of **FIG. 4**, for further example, it is possible to generate a whole avatar image illustrating the whole health state of a user.

**[0065]** **FIG. 6** illustrates an apparatus for receiving and displaying data of the generated avatar. Referring to **FIG. 6**, it may be desirable to display avatar image data, generated by the above-described operations, using a cellular phone **600**, a personal digital assistant (PDA) (not shown), or a television (TV), for example. Further, the transmission unit **150** of **FIG. 1** may transmit the generated avatar image data to the remote cellular phone **600**, e.g., so that a user can see health state representing avatars **610**, **620**, and **630** of people desired by the user using the cellular phone **600**, such that the health state of those people can be checked.

**[0066]** **FIG. 7** illustrates an embodiment of a state analysis unit, e.g., the state analysis unit of **FIG. 1**. The illustrated state analysis unit may include a bio-signal analysis unit **700**, a controller **710**, a storage medium **720**, a regression formula obtaining unit **730**, and a health state estimation unit **740**, for example. Similar to **FIG. 7**, a method for estimating a user's future health state using a user's current bio-signal or questionnaire information will also be described concurrently below, referencing operations in **FIG. 11**, in connection with this state analysis unit.

**[0067]** The bio-signal analysis unit **700** can receive bio-signals such as an electrocardiogram signal, an ultrasonic signal, a body fat rate, a waist measure, and/or a body mass index (BMI) measured from a user for a predetermined period of time, and/or questionnaire information, and analyzes a user's health state for each time band, e.g., as in operation **1100** of **FIG. 11**. The controller **710** can receive a user's health state information from the bio-signal analysis unit **700** to store the health state information in the storage medium **720**, for each time band, e.g., as in operation **1110** of **FIG. 11**.

**[0068]** The regression formula obtaining unit **730** can obtain a regression formula describing a user's health state information change depending on time, using the health state information for each time band stored in the storage medium **720**, e.g., as in operation **1120** of **FIG. 11**.

**[0069]** The health state estimation unit **740** may receive from a user a date on which a user desires to see his future health state, and may input the date into the regression formula to estimate and output user's desired future health state information, e.g., as in operation **1130** of **FIG. 11**.

**[0070]** **FIG. 8** graphically explains a method for obtaining a regression formula for estimating a future health state based on a current health state, according to an embodiment of the present invention. With the illustrated graph, it is possible to analyze a health state information change based on the progression of time, obtain the regression formula

using health state information of up to the current time  $t_1$ , and estimate health state information for a time point  $t_2$  by inputting the time  $t_2$ , for which a health state will be estimated, into the computed regression formula.

[0071] It may be desirable that the state analysis unit receives, from a user, the point in time in which a user desires to know his/her health state, e.g., a time point after one month, six months, or one year to estimate health state information at a time point desired by a user, using the regression formula.

[0072] FIGS. 9A-9B illustrate avatars estimating a future health state based on a present health state, where FIG. 9A illustrates an avatar representing a current health state and FIG. 9B illustrates an avatar generated by estimating a future health state. As an example, a user may be able to estimate that his current health state is in a state of high probability of becoming obese, by checking an avatar change illustrated in FIG. 9B from the current state in FIG. 9A.

[0073] FIGS. 12A-12B illustrate a flowchart for a method to generate an avatar, according to an embodiment of the present invention. A data input unit, such as the data input unit 100 of FIG. 1, can receive a bio-signal having information such as an electrocardiogram signal, an ultrasonic signal, a body fat rate, a waist measure, and/or a body mass index which have been measured from a user, and/or questionnaire information in which a user has given answers to questions related to a predetermined health state, in operation 1200.

[0074] A state analysis unit, such as the state analysis unit 110 of FIG. 1, can determine whether a user desires to check a future health state, operation 1210. If a user desires to determine a current health state, the state analysis unit may generate current health state information using the bio-signal or questionnaire information, in operation 1220. If a user desires to check a future health state, the state analysis unit may receive, from a user, a time point  $t$  at which a user desires to determine his health state, in operation 1230, and may estimate health state information at the further time point  $t$  using the bio-signal or the questionnaire information, in operation 1240.

[0075] A parameter extraction unit, such as the parameter extraction unit 120 of FIG. 1, may receive information regarding a user's health state from the state analysis unit to extract avatar parameters using an avatar transformation algorithm, i.e., a relation formula between the predetermined health state information and the avatar parameters, in operation 1250.

[0076] An avatar generation unit, such as the avatar generation unit 130 of FIG. 1, may receive parameters defining the avatar from the parameter extraction unit to generate avatar data using the parameters, in operation 1260. A display unit, such as the display unit 140 of FIG. 1, may display an avatar representing the user's health state using the generated avatar data, in operation 1270.

[0077] A transmission unit, such as the transmission unit 150 of FIG. 1, may determine whether a user desires to release and transmit the generated avatar data to remote stations or apparatuses, in operation 1280 if a user desires to transmit the avatar data, the transmission unit may receive an address of the remote station or apparatus to which the avatar data will be transmitted, in operation 1290, and then transmit the generated avatar data to the remote station or apparatus, in operation 1295. It may be desirable that the

address of the remote station or apparatus be one of a phone number, an e-mail address, and/or an Internet protocol (IP) address, for example.

[0078] Embodiments of the present invention may also be embodied as computer readable code on a medium, e.g., a computer-readable recording medium. The medium may be any data storage/transmission device that can store/transmit data which can be thereafter read by a computer system. Examples of the medium may 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), for example. The medium may also be distributed/stored over network coupled computer systems so that the computer readable code is stored/transferred and implemented in a distributed fashion. Lastly, the computer readable code, e.g., functional programs, codes, code segments, and instructions, to implement embodiments of the present invention can be easily construed by programmers skilled in the art to which the present invention pertains.

[0079] As described above, embodiments of the present invention include a method, medium, and apparatus generating an avatar based on the health state of a user. Accordingly, it is possible to provide users with the convenience of recognizing their health state by generating an avatar image describing a user's future health state as well as a user's current health state using bio-signals measured in real-time or questionnaire information obtained from a user and showing the user the avatar image. Further, it may be possible to induce a user to manage his/her health constantly by maintaining a user's interest due to the avatar image change. Still further, monitoring of health states of family members can be realized by making it possible to transmit the generated avatar image data to remote stations or apparatuses.

[0080] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. An apparatus for generating an avatar image using parameters, the apparatus comprising:

a state analysis unit to receive at least one of a bio-signal and questionnaire information of a user to analyze a user's health state, and to output health state information of the user;

a parameter extraction unit to receive the health state information, and to extract parameters defining the avatar image by implementing a formula relating the health state information with the parameters; and

an avatar generation unit to generate the avatar image using the parameters.

2. The apparatus of claim 1, wherein the state analysis unit receives the at least one of the bio-signal and questionnaire information of the user and estimates the health state of the user for a predetermined period of time to output future health state information for the user.

3. The apparatus of claim 1, wherein the state analysis unit comprises:

a bio-signal analysis unit to receive at least the one of the bio-signal and questionnaire information of the user and analyzing the user's health state to output the health state information;

a storage medium to store the health state information;

a controller to obtain the health state information from the bio-signal analysis unit to be stored in the storage medium;

a regression formula obtaining unit to obtain a regression formula representing a temporal change in the health state information, using the health state information of the user stored in the storage medium; and

a health state estimation unit to receive the health state information of the user from the bio-signal analysis unit and to output a user's future health state information, using the regression formula and the health state information.

4. The apparatus of claim 1, wherein the bio-signal comprises at least one of an electrocardiogram signal, an ultrasonic signal, EDA (electrodermal activity), a body temperature, and a body fat rate.

5. The apparatus of claim 1, wherein the questionnaire information comprises at least one of information of a habit, a syndrome, a stature, a weight, and a waist measure of the user.

6. The apparatus of claim 1, wherein the health state information comprises information of at least one of whether a hospital visit is required, a stress/fatigue degree, a health age, a skin state, an obesity degree, a body portion balance degree, a heart health degree, a digestive organ health degree, and a respiratory organ health degree.

7. The apparatus of claim 6, wherein the body portion balance degree is representative of being derived using an eight-point tactile electrodes method.

8. The apparatus of claim 1, wherein the parameters comprise at least one of a facial muscle variation rate, a facial skin color variation rate, a facial wrinkle variation rate, a facial width variation rate, a heart size variation rate, a heart color variation rate, a color variation rate of an abnormal portion in a digestive organ, a color variation rate of an abnormal portion in a respiratory organ, and a size variation rate for each body portion depending on a body balance.

9. The apparatus of claim 1, further comprising a display unit to display the generated avatar image.

10. The apparatus of claim 1, further comprising a transmission unit to transmit data of the generated avatar image to a remote station or remote apparatus.

11. A method for generating an avatar image using parameters, comprising:

analyzing a user's health state using at least one of a bio-signal and questionnaire information of the user;

receiving information of the analyzed health state to obtain a formula relating health state information of the user and parameters;

extracting the parameters; and

generating the avatar image using the extracted parameters.

12. The method of claim 11, wherein the analyzing comprises estimating the user's health state for after a predetermined period of time using the at least one of the user's bio-signal and the questionnaire information.

13. The method of claim 11, wherein the analyzing comprises:

analyzing the user's health state using the at least one of the bio-signal and the questionnaire information of the user;

obtaining a regression formula representing a temporal change in the health state information from the analyzed user's health state, using the health state information; and

generating future health state information of the user of after a predetermined period of time, using the health state information and the regression formula.

14. The method of claim 11, wherein the bio-signal comprises at least one of an electrocardiogram signal, an ultrasonic signal, EDA (electrodermal activity), a body temperature, and a body fat rate.

15. The method of claim 11, wherein the questionnaire information comprises at least one of information regarding a habit, a syndrome, a stature, a weight, and a waist measure.

16. The method of claim 11, wherein the health state information comprises information of at least one of whether a hospital visit is required, a stress/fatigue degree, a health age, a skin state, an obesity degree, a body portion balance degree, a heart health degree, a digestive organ health degree, and a respiratory organ health degree.

17. The method of claim 16, wherein the body portion balance degree is representative of being derived using an eight-point tactile electrodes method.

18. The method of claim 11, wherein the parameters comprise at least one of a facial muscle variation rate, a facial skin color variation rate, a facial wrinkle variation rate, a facial width variation rate, a heart size variation rate, a heart color variation rate, a color variation rate of an abnormal portion in a digestive organ, a color variation rate of an abnormal portion in a respiratory organ, and a size variation rate for each body portion depending on a body balance.

19. The method of claim 11, further comprising displaying data of the generated avatar image.

20. The method of claim 11, further comprising transmitting data of the generated avatar image to a remote station or apparatus.

21. A medium comprising computer readable code to implement the method of claim 11.

22. An apparatus for generating an avatar image using parameters, the apparatus comprising:

a state analysis means for outputting health state information of a user;

a parameter extraction means for extracting parameters defining the avatar image by implementing a formula relating the health state information with the parameters; and

an avatar generation means for generating the avatar image using the extracted parameters.

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摘要(译)

一种方法，介质和装置，其使用化身变换算法从用户测量的健康状态信息中提取化身参数，并使用所提取的参数生成化身。在该装置中，状态分析单元接收用户的生物信号和问题信息中的至少一个并输出健康状态信息，参数提取单元提取定义化身图像的参数，并且化身生成单元使用生成头像图像来生成化身图像。参数。通过提供方法，介质和装置，可以通过生成描述用户的未来健康状态以及用户的当前健康状态的化身图像来向用户提供识别他的健康状态的便利。此外，可以通过维持用户的化身图像改变来诱导用户不断地管理他的健康。

