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(54) **Wearable life support apparatus**

Tragbare Vorrichtung zur Lebensunterstützung

Dispositif portable destiné à l'assistance vitale

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Description

[0001] The present invention relates to wearable life support apparatus for measuring a user's status while wearing the device and for supporting the user's activities such as health control and personal navigation.

[0002] Geriatric diseases such as an apoplexy, heart disease, and diabetes, may originate because of life style choices such as an unbalanced diet, lack of exercise, an irregular life, and stress. Such diseases are thus defined as "life style related disease". Recently, the disease due to the life style is greatly recognized. Especially, the recognition advances along direction to make much of first prevention (health) from usual second prevention (an early detection, an early medical treatment).

[0003] Many apparatus of a wearable type have been suggested to acquire the user's physiological information and control the user's health condition. For example, in Japanese Patent Disclosure (Kokai) PH11-53319, the user inputs meal data and movement data through a portable terminal, or the sensor measures these data. The user's health is then controlled based on the data. In Japanese Patent Disclosure (Kokai) PH10-295651, a host computer controls health information of the user through a network. However, in these references, the user must input meal menu or meal material as the food data, and this operation is very troublesome for the user. In addition to three times meal every day, it is very hard for the user to input something between meals and his luxury meals.

[0004] In Japanese Patent Disclosure (Kokai) PH11-53454, the portable terminal presents health advice to the user at random. Because the user often forgets health control if he does not always take care of health. However, in this reference, the health advice is presented to the user at random. It is useless if the health advice is not present at adequate timing based on the user's status. Conversely, it disturbs the user's work and the user is put under stress.

[0005] In Japanese Patent Disclosure (Kokai) PH9-322882, a portable terminal of a wearable type records the health information. In this case, by setting times to record vital data, the health information is output by speech. However, in this reference, the measurement time is presented, but the user must operate the measurement. Furthermore, the user cannot understand the relationship with his behavior and the reason of change of health condition. When the record time is presented to the user, if the user cannot keep quiet, he feels inconvenience in practical use.

[0006] Wearable computers have been suggested. The wearable computer is divided into each component (ex. CPU, display, communication part) worn by the user. A physiological sensor and an environmental sensor are combined with the wearable computer. By recognizing the user's status, adequate information is presented to the user. This function to recognize the user's status is called "context awareness". This operation is executed by speech dialogue because of hand-free operation.

[0007] Furthermore, in Japanese Patent Disclosure (Kokai) PH10-305016, the user's action information is acquired by location information from a GPS (Global Positioning System), schedule data, and the physiological information such as brain waves. The action information is recorded in correspondence with the physiological information such as pulse rate, body temperature, blood pressure, sweating. In this case, decision data representing whether the schedule is good for the user is also recorded, and advice of future schedule is created based on the decision data. However, in this reference, because the user must previously input all schedule information, this operation is very troublesome for the user and the action information is not sufficiently obtained. Furthermore, even if the user inputs his schedule, he does not always follow that schedule. In short, it is possible that his actual behavior is not matched with the schedule, and the schedule is incorrect.

[0008] EP 0 846 440 describes a system for the remote monitoring of personnel which is primarily intended for use on the battlefield. The system comprises sensors which can detect motion status and other parameters.

[0009] As mentioned-above, many apparatuses of a wearable type to acquire the user's physiological information and control the user's health condition are known. However, the measured physiological information largely changes according to the user's behavior. Therefore, a correct decision of health condition is difficult if the physiological information is not measured in correspondence with the user's behavior.

[0010] It is an object of the present invention to provide a wearable life apparatus and method for correctly supporting the user's life such as health control by a wearable device.

[0011] In a first aspect, the present invention provides a wearable life support apparatus, comprising:

a physiological information acquirement unit configured to acquire physiological information of a user;
an acceleration information acquirement unit configured to acquire acceleration information of the user;
a memory configured to store a table representing a correspondence between each acceleration information and each of the user's behaviours and a standard limit of physiological information of each behaviour;

a status recognition unit configured to recognize the user's status by retrieving a behaviour corresponding to acquired acceleration information from the table;

a physiological information decision unit configured to decide whether the acquired physiological information is normal by comparing acquired physiological information with the standard limit of physiological information of the behaviour, and

a presentation unit configured to present a decision result of said physiological information decision unit.

[0012] Further in accordance with a second aspect of the present invention, there is provided a computer-readable memory containing computer-readable instructions to support a user's life using a wearable device comprising:

an instruction unit to acquire physiological information of the user through the wearable device;
 an instruction unit to acquire acceleration information of the user through the wearable device;
 an instruction unit to store a table representing a correspondence between each acceleration information of the user and each behaviour of the user and a standard limit of physiological information of each behaviour;
 an instruction unit to recognize the user's status by retrieving a behaviour corresponding to acquired acceleration information from the table;
 an instruction unit to decide whether acquired physiological information is normal by comparing the acquired physiological information with the standard limit of physiological information of the behaviour;
 and
 an instruction unit to present a decision result through the wearable device.

Fig. 1 is a block diagram of an embodiment of a wearable life support apparatus.

Fig. 2 is an example of components in a sensor module of the wearable life support apparatus shown in Fig. 1.

Fig. 3 is a block diagram of a wearable life support apparatus according to a modification of the embodiment.

Fig. 4 is an example of components in a sensor module of the wearable life support apparatus shown in Fig. 3.

Fig. 5 is a flow chart of processing of the wearable life support apparatus according to the first embodiment of the present invention.

Fig. 6 is a schematic diagram of a correspondence table between action information and behavior.

Fig. 7 is a schematic diagram of a relationship plan to set personal tendency and limit of measurement value.

Fig. 8 is a flow chart of processing of a wearable life support apparatus according to a second embodiment.

Fig. 9 is a schematic diagram of a trend graph of blood pressure during one day.

Fig. 10 is a display example of graph of pulse and action posture.

Fig. 11 is a display example of retrieval result of synchronization data with graph of pulse and action posture.

Fig. 12 is a display example of stress during one day.

Fig. 13 is a display example of stress during one week.

Fig. 14 is a display example of stress during one month.

Figs. 15A-15D are examples of a memory format of various kinds of the physiological information corpus.

Fig. 16 is a display example of synchronization data of sensor information corpus.

Fig. 17 is a display example of sensor data of sensor information corpus.

Fig. 18 is an example summary of health conditions during one day shown on a portable display.

Fig. 19 is an example trend graph of blood pressure during one day shown on the portable display.

Fig. 20 is a block diagram of a wearable life support system including personal corpuses and sensor information corpus on an outside network according to a third embodiment.

Fig. 21 is a block diagram showing a relationship among the wearable terminal, a home server, and a family doctor/management company server according to the third embodiment.

Fig. 22 is an example of components of a sensor module of the wearable life support apparatus using analogue circuits.

Fig. 23 is a display example of physiological information corpus.

Fig. 24 is a selection example of retrieval area of physiological information.

Fig. 25 is a display example of the retrieval result.

Fig. 26 is a selection example of one pulse of electrocardiogram graph.

Fig. 27 is a selection example of two pulses of electrocardiogram graph.

Fig. 28 is a selection example of arrhythmia of electrocardiogram graph.

[0013] Hereinafter, embodiments of the present invention are explained with reference to the drawings. Fig. 1 is a block diagram of a wearable life support apparatus according to an embodiment of the present invention. In Fig. 1, a main module 101 includes a memory 1011, a CPU 1012, and a Bluetooth chip 1013 to communicate between modules. Bluetooth is one example of a short distance-wireless communication means; other wireless or wired communication protocols could also be used. The main module 101 executes reservation data for the system, unification processing of the system, data communication between modules, and communication to a home server and a management server.

[0014] A sensor module 102 includes a memory 1021, a CPU 1022, a Bluetooth chip 1023, an A/D converter 1024, and a preprocess unit 1025. The preprocess unit 1025 executes amplification and preprocessing for signals from each sensor (pulse wave sensor, electroencephalography sensor, cardiac electrode, myoelectric electrode, body temperature sensor, GSR electrode). The Bluetooth chip 1023 executes data communication to the main module 101. In this case, as shown in Fig. 2,

one sensor module is respectively connected to each sensor. However, as shown in Figs. 3 and 4, one sensor module may be connected to all sensors as one body. If the sensor module is composed as one body, wiring must be formed from each sensor to the sensor module. Accordingly, as shown in Figs. 1 and 2, it is desirable that the sensor module is dependently composed for each sensor and the wiring is omitted using Bluetooth. Furthermore, processing of the sensor and the module may be commonly executed. The CPU may be executed by utilizing a micro-controller (For example, Micro Chip Technologies Co., PIC 16F877) including A/D conversion function, and another A/D converter may not be prepared. The preprocess unit 1025 amplifies by gain suitable for each signal and includes a high-pass filter or a low-pass filter in proportion to a band of the signal. If necessary, each sensor includes a plurality of channels.

[0015] A cellular-phone 103 may be a common portable telephone including a liquid crystal display, operation buttons, and a communication unit to input/output speech. The cellular-phone 103 includes a Bluetooth chip 1031 to communicate to the main module 101. By this communication, input/output of speech and cursor control of cursor key are executed.

[0016] A display 104 is a liquid crystal screen only, and controls the display content from the main module 101 to Bluetooth chip 1041. A Bluetooth/CCD camera built into a head set 105 is a device for speech/image interface, and stores Bluetooth chip to execute input/output of speech and acquirement of image. Both the cellular-phone 103 and the headset 105 can be utilized at the same time. Furthermore, a digital camera 1052 differently equipped on the head set 105 may input an image.

[0017] Fig. 5 is a flow chart of processing of the wearable life support apparatus according to the first embodiment. Assume that the user carries a wearable device including the main module 101, each sensor module 102, the cellular-phone 103, the display 104, and the head set 105. When the system is activated (S501), each sensor inputs some physiological information and acceleration sensor measures the acceleration (S502). An analogue signal from the sensor is processed as amplification, filtering, and A/D conversion by the sensor module. The A/D converted signal is transferred to the main module 101. The main module 101 processes the instrumentation data by preset logic, and decides the user's status.

[0018] First, the user's action (movement) is recognized by the acceleration information (S503). As the recognition method, for example, three-dimensional acceleration sensor is attached to predetermined part of the user's body in order to measure the action. In case of measuring motion of body-trunk-part, this sensor is attached to the waist. An inclination of the sensor is calculated from DC (direct current) element obtained by low-pass filter output of acceleration waveform, and the posture is detected. An action (ex. walking, running, riding a bicycle, riding an automobile, taking an electric train) is discriminated from a frequency element and change pat-

tern of AC (alternating current). For example, as the acceleration sensor, a two-dimensional acceleration sensor (Analogue Devices Co., ADXL202JQC) is utilized. A three-dimensional acceleration sensor is composed by an orthogonal location of two-dimensional acceleration sensor.

[0019] In order to recognize the user's location, in case of being indoors, the main module communicates with a wireless tag (Bluetooth) in each room, and detects the user's location. In case of being outdoors, the user's location is detected, for example, using a position information service of the cellular-phone (PHS) or GPS. At the same time, the physiological information is measured. This measurement method is explained hereinafter.

[0020] In a pulse wave sensor 1026, a change in blood flow of a peripheral blood vessel such as the measurement part (finger, wrist, ear) is detected as a photoelectrical signal. An incandescent lamp or LED irradiates a light of absorption of wavelength of hemoglobin to the part gathering blood vessels, and a photodiode converts the transparent light or the reflected light to a photoelectrical signal. These instrumentation data are amplified and filtered by the preprocess unit and converted to a digital signal by an A/D converter. Then, the digital signal is transferred to the main module. The main module detects a peak interval of this instrumentation of electric potential waveform or analyzes the frequency and calculates a number of pulses (pulse rate) from this peak frequency.

[0021] Furthermore, the pulse wave sensor 1026 is located at a predetermined distance on the part of the user's body. Two waveforms are respectively measured, each digital signal is transferred to the main module, and the blood pressure or elastic rate of the blood vessel may be calculated from the difference between the two waveforms. In case of measuring a pulse, by using an electrocardiogram, the number of beats may be calculated from the peak interval or the peak frequency obtained by frequency analysis. This pulse value and blood pressure value are continually measured and stored in the memory 1011 of the main module 101. As for the body temperature, the output of a thermometer is converted to temperature. Furthermore, output of GSR is also stored in the memory 1011 of the main module 101. In addition to this instrumentation value, analogue (voltage) data from the acceleration sensor are stored in the memory after A/D conversion. These data are mutually corresponded by adding the measurement time to each data or by storing each data in the same record.

[0022] While the measurement is continually executed, if the physiological information (pulse rate, blood pressure, body temperature) changes, or if the action information changes such as "walking stops", this change status is detected (S504). Then, the action information (the user's behavior) is compared with the user's schedule data (S505), and a question for insufficient data or contradiction point is presented to the user by speech synthesis (S506, S507). For example, when an absolute

value along X, Y, Z axes directions of AC element from the acceleration sensor is above a threshold, the user is decided to be moving, a question "What are you doing?" is presented to the user, and the user's behavior information is input by speech-recognition of the user's reply (S508, 509). Furthermore, the behavior predicted from the acceleration data is compared with the schedule data of the present time. In case of non-coincidence, a dialogue to confirm the schedule item is presented to the user, and the prediction result is corrected according to the user's reply.

[0023] Conversely, if the user is decided to be not moving, this behavior is compared with the schedule of the present time to check whether non-moving behavior is correct. If the behavior does not match with the schedule, a question is presented to the user. For example, this inquiry is executed by speech dialogue. This processing is based on an experience rule to relate the action information with the behavior. For example, when the action information "walking" is acquired, combination between action "walking" and each behavior "sleeping", "watching TV", "watching movie" does not actually exist. Accordingly, the relationship of all combinations is previously stored in the memory. In this case, the behavior corresponding to the action information is retrieved from the memory, and the behavior is compared with the schedule of the present time.

[0024] Fig. 6 shows a table representing correspondences between the action information and the actual behavior. In Fig. 6, actual possibility of the action (lying, sitting, standing, and so on), while the user performs the behavior (sleep, meal, commute, and so on) is represented by "O" (The behavior is almost performed by the action.), "Δ" (The behavior is sometimes performed by the action), "X" (The behavior is not performed by the action). This probability may be represented by numerals (For example, 0~100).

[0025] For example, while the schedule shows a meeting in the meeting room of the company, if the action information is "continuous walking", the combination between "walking" and "meeting" is represented as "x" in the table. Accordingly, the question "The schedule represents meeting, but you are walking outside. How does your schedule change?" is presented to the user. When the user replies such as "I have to go out because of customer trouble.", the system changes the schedule of the present time as "treatment of trouble at a customer (go out)". In addition to the instrumentation and the dialogue, image of the user's meeting status (customer's image) may be input by CCD camera 1052 on the head set 105. At the same time, the microphone 1051 may record the dialogue between the user and the customer by directivity along the meeting direction. These data are mutually related by writing the same record time or the same file name.

[0026] Furthermore, if the recognized behavior of the present time should be performed before in the schedule, the user's behavior is delayed from the scheduled time.

Accordingly, an inquiry message to change the remaining schedule for the day is presented to the user. For example, the inquiry "You are scheduled to go out at 14:00, but you did not go out. How do you change the schedule?" is output to the user.

[0027] The physiological information may be used for comparison with the schedule. For example, when the user's pulse is quick while working at a desk, it is possible that he changed the schedule. Accordingly, a question "Are you walking or running now?" is output to the user. If he is working at a desk, an increase in the pulse rate may be mentally or sickly caused. First, a question "Are you working hard now?" is output in order to confirm whether the user is under stress. If the user does not reply, the user is recognized to be in serious condition. In this case, the user's status is reported to a family doctor by the cellular-phone or a warning is given to those around the user.

[0028] Next, it is decided whether the physiological information corresponding to the action information (behavior) obtained from these results is normal (S510). As a decision method of normal/abnormal, a standard limit of the physiological information for each behavior is stored as a parameter in a memory of the main module, and the measured physiological information is compared with the standard limit. If it is within the standard limit, the user is decided to be normal. If it is over the standard limit, the user is decided to be abnormal. In case of abnormal, a message "You are walking to the customer's office now. Your pulse is high for walking. Do you feel well? You had better take a rest." is presented to the user by speech synthesis (S511). If the user accepts this message, he replies, for example, "all right (acceptance)", otherwise he may reply, for example, "Shut up! (refusal)". This reply is recognized in order to confirm whether the user accepts or rejects the message. If the user thinks that the standard limit (parameter) is strictly set, he replies "No problem" or "Shut up!". In this case, the parameter is slightly corrected in order to loosely set.

[0029] The threshold limit to detect abnormal status is set as a parameter according to the user's purpose and personal information such as his constitution or heredity by set mode. Fig. 7 shows a relation between the threshold set and the screen. As shown in Fig. 7, when the user inputs each item in order by speech dialogue at operation start time, the threshold corresponding to each item is set, and the model course is selected by weighting of the constitution or the heredity. For example, in case the meal control is set "ON", a myoelectric sensor of chewing muscles is utilized to measure the movement of the jaw. In case the real time advice is set "ON", the decision result of the measurement and the advice is presented at that timing. Furthermore, when the pulse rate during exercise is above the threshold of exercise, a warning is presented.

[0030] As the presentation method, following several kinds are selectively set at the initialization mode. As a first method, the values measured by the wearable sen-

sor are directly presented, such as "The upper blood pressure is 130 and the lower blood pressure is 70. ". As a second method, the measurement value is compared with the standard value. If it is over the standard value, the message is presented, such as "The blood pressure value is over the standard value. ". Furthermore, advice may be additionally presented, such as "Your blood pressure value is continuously high. You had better consult a doctor. ". Furthermore, when the wearable sensor measures the abnormal value, the user's behavior is inquired, such as "Your blood pressure value is over the standard value. What are you doing? What have you been doing? ". As a third method, the time (place, behavior) to measure the physiological information is set and the data change of every day is fed back to the user. For example, the body temperature thirty minutes after the user gets up is measured every morning. The data change such as "Your body temperature is higher than usual." is presented in order for the user to intuitively understand the status.

[0031] The utilization mode is explained for each life spot. During sleeping, the physiological information is only measured by small electric power mode. The message is not presented to the user except for serious case. As the small electric power mode, a battery is charged. In case of the hour of rising set by the schedule, the user wakes up because of a speech or alarm of vibration from the headset. The status that the user wakes up is detected by electroencephalography. If he awakes before alarming but does not rise yet, the message "It is the hour of rising" is presented instead of the alarm. A posture sensor such as the acceleration sensor detects the status that the user actually gets up. If the user does not rise yet, the message is presented again to urge the user to rise. Next, when the posture sensor detects the status that the user got up, the user is decided to start his action. Then, by referring to the schedule data, the leaving time from the house is informed to the user by counting backward from going time to the office. For example, the message "You had better leave the house at 8:10 AM." is output. Furthermore, a subtraction of the hour of rising from the hour of sleeping is calculated, and sleeping time is detected. If it is shorter than average sleeping time by over set limit, the message "Your sleeping time is short. You had better come back home early without overwork." is presented while he is going to the office. This message may be also presented to the user during overtime working.

[0032] As for the meal, the electromyogram of chewing muscles and the speech detects the status that the user takes a meal. An electrode set at the jaw measures the electromyogram of chewing muscles. If the electromyogram periodically repeats as the same change of period of chewing, the user is decided to be taking a meal, and a question "Are you eating?" is presented. When the user replies "Yes.", a question "What are you eating ?" is presented. Alternatively, an object image of the meal is obtained and the dish is recognized by the image. In case

of eating-out, components printed on a menu are recognized or the component is detected using a spoon or chopsticks including sensors. The quantity of food not consumed is inquired or input by image-recognition after the meal. The amount of chewing is counted based on the electromyogram of the chewing muscles, and a large or small amount of chewing is decided for the quantity of the meal. The method of eating is advised from a viewpoint of the eating time and the amount of chewing. For example, "More slowly" and "More chewing" are presented while eating. Furthermore, any unbalanced element of the meal is counted for every week or every month, and nourishment or calorie quantity far from the standard value is warned. When the user leaves the house without eating breakfast, a message "If you do not eat a breakfast, working efficiency in the morning falls." is presented to the user.

[0033] The sensor's "ON/OFF" is controlled by the behavior or the action in order to save electric power. For example, the acceleration sensor is set "OFF" during sleeping, and set "ON" when the user wakes up. When the user feels that the message is troublesome during the dialogue, he may voice a rejection reply such as "Shut up!" or "Stop! ". If the user repeats the rejection reply, this message may not be presented to the user after confirmation (The initialization set value is changed). Instead of this message, summary of the physiological information of one day may be displayed.

[0034] Next, the wearable life support apparatus according to a second embodiment is explained. The component of the wearable terminal carried by the user is the same as the first embodiment shown in Figs. 1 and 3. However, the physiological information and the action information are stored in a memory of main module by unit of the measurement timing. This stored information is called "sensor information corpus".

[0035] Fig. 8 is a flow chart of processing of the system according to the second embodiment. First, the system is activated (S801), and instrumentation of the physiological information and the acceleration begins (S802). The user's posture is recognized by DC element of the acceleration, and the user's motion (periodical motion: walking, running, taking an electric train, getting in a car, riding a bicycle) is recognized by AC element of the acceleration (S803). If the instrumentation value or the action changes (S804), this action is compared with the schedule data registered in PIM soft in order to check whether it is matched with the schedule of the present time (S805). In case of non-coincidence, the schedule is confirmed by speech dialogue (S807, S808). For example, a question "In the schedule, you will attend the meeting. However, are you walking in outside?" is presented to the user. When the user replies "Yes", the next question "Why do you change the schedule?" is presented to the user. When the user replies "I have to go out because trouble occurred at a customer's office.", the system changes the schedule as "trouble at a customer's office" (S809). Next, the sensor information corpus stored in the

memory of the main module is retrieved using a key such as the behavior information, the date, and the place obtained (S810).

[0036] The sensor information corpus is now explained in detail. The physiological information measured by the wearable terminal is preserved in relationship with a tag such as the time, the place, the behavior, and the environment. This database is retrieved by the tag as a key and is called "sensor information corpus". The corpus represents an accumulation of data, which is used in language processing area. For example, Fig. 9 shows a trend graph representing change of the blood pressure over one day. In this way, the physiological information is mutually related with the movement quantity and the action history (commuting, work, and so on), and structured as a database. In this database, a tag representing an abnormal case or a tag representing a cause of change is recorded.

[0037] As another example, Fig. 10 is a display example of pulse change and action posture. The pulse value and the action posture of that timing are displayed by different color. When the user clicks an arbitrary point on the screen, data (time, action posture, input image, recorded speech) simultaneously collected from other sensor are retrieved from the corpus and displayed on another window as shown in Fig. 11. When the user further clicks the retrieved data on the screen, the user can refer the detail data.

[0038] Furthermore, Figs. 12, 13 and 14 are respectively display examples of stress acquired from a plurality of physiological information during one day, one week and one month. In this way, the data can be displayed as various formats by assigning each tag.

[0039] Figs. 15A, 15B, 15C, and 15D show examples of corpus items as four kinds of the physiological information corpus. As shown in Fig. 15A, the action content (behavior), the posture (the pitch in case of periodical movement), the pulse rate, the blood pressure, the body temperature, and the GSR values, are recorded for each date and each place. The action content represents the user's life pattern. In this case, a part of the life pattern is shown. A form of the corpus is selectively used. As shown in Fig. 15B, the average of the physiological information corpus by unit of the time or the action content is utilized as the standard. As shown in Figs. 15C and 15D, trend corpus by sorting the trend data is utilized to display one day trend graph or one year trend graph.

[0040] Furthermore, examples of which the physiological information corpus is described by another method are shown in Figs. 16 and 17. They are described by XML format. Fig. 16 shows description of synchronization information of each data collected by each sensor (acceleration sensor, pulse sensor, camera, microphone). Fig. 17 shows description of data from the acceleration sensor (two axes) as one example of sensor data.

[0041] In this way, when the event occurs and similar data is retrieved from the sensor information corpus, the measured physiological information is compared with the

corpus value (the similar data) in order to decide whether the physiological information is normal (S818). In case of an abnormal result, the decision result is written in the corpus (S819), and the advice is presented to the user by speech synthesis (S820). As similar data to be compared with the measured physiological information, for example, the stored physiological information of the same time before one week for the same behavior is retrieved from the corpus. This comparison object is changed in the set mode mentioned in the first embodiment. For example, if the average value of one month, or the stored physiological information of the same period in last year is indicated, the comparison result is replied. When the measured physiological information as the comparison object is decided to be abnormal, this physiological information is newly stored in the corpus. Furthermore, when the user activates his carrying display (140, 304), the display outputs the trend graph of one week or one month in the past. Alternatively, when the alarm is previously output to the user, the user may activate the display to output the trend graph.

[0042] As the registration to the corpus, all data when the action information or the physiological information changes can be acquired. However, some physiological information is periodically measured (For example, at thirty minute intervals). If the all trend data of one day includes a problem, the problem is registered as the tag. Furthermore, these data may be registered as a personal database in relation with the life pattern (action history).

[0043] Furthermore, if the user executes action/behavior as a cause of which the physiological information changes, the physiological information is changing by the action/behavior along time. However, the time on which the change appears is different by the kind of the physiological information. Accordingly, when the action/behavior as the cause of which the physiological information changes occurs, the change of the physiological information is measured after passing the time predetermined by the kind of the physiological information, and the instrumentation data are recorded in the corpus in relation to the action/behavior. For example, weight change in case of having a meal is measured just after the meal. However, glucose level is measured after thirty minutes from the meal and recorded in the corpus in relation to the meal (If necessary, content of the meal). Alternatively, the instrumentation may be continuously executed. In case of data retrieval, the retrieval area may be called from a table by the kind of the physiological information. For example, the instrumentation period of the glucose level is set as one hour in the table. If the user selects the meal (For example, breakfast) in the action through the action graph screen, "one hour" is read from the table and a graph of glucose level during one hour after the meal is displayed. Furthermore, if a graph of electrocardiogram is set as one graph, only one graph is extracted by clicking one point on displayed graph.

[0044] Furthermore, above-mentioned similar data retrieval can be executed by real time. When the similar

data is retrieved from the sensor information corpus by real time using the physiological information/action information measured by the sensor module 102 (302), the similar data may be simultaneously output through the display 104 and the status may be reappeared in order for the user to recognize the present status. For example, in case that the pulse as the physiological information and the action/posture information from the acceleration sensor as the behavior information are recorded, and the dynamic image and the speech are simultaneously recorded, if the instrumentation data is abnormal based on the change of pulse and the behavior information in comparison with the past average value, the past data similar to the change pattern is retrieved. In addition to the pulse rate data (or graph) and the behavior information of the present status, the dynamic image and the speech in the retrieved data are output through the display 104 (304).

[0045] Furthermore, the trend data in case of normal results is averaged by unit of one day, one week, one month, one year for the same life pattern (the same action), and processed as the average trend data.

[0046] As mentioned-above, when the user thinks that the message is troublesome, he voices a rejection message such as "Shut up!" or "Stop! ". If the user repeatedly utters the rejection message, the system does not present the advice after confirming with the user. This user's indication is preserved in the corpus, and summed up at the end of each month. The fact that the threshold is loosely reset may be presented to the user in order for the user to reconsider. Furthermore, when the present time coincides with a preset time (For example, 10:00 PM, or after dinner), the average value of the physiological information (the blood pressure, the pulse, the body temperature, GSR) of one day is calculated for each behavior, and presented by speech message. If the user is interested in this message, he indicates the behavior to display the detail information. In response to the indication, the detail information (Fig. 18) or the trend graph (Fig.19) related with the indicated behavior is presented through a portable display or a home television. As the presentation method, the average value of one day of each behavior is displayed as a list, and the trend graph of one week and one month in the past is also displayed in case of indication. Furthermore, the number of footsteps is calculated from the pulse value and the acceleration data, and calorie consumption is calculated from the number of footsteps and the behavior information. The calorie of one day is decided by the consumption calorie and absorbed calorie of all meals. Then, a warning that the user suffers a lack of exercise, the user had too much food, or the nourishment is biased is output to the user.

[0047] A method of measuring the stress degree using the pulse or GSR is explained. In case of the pulse, when the measured pulse is faster than a preset limit or normal value, it is confirmed whether the user is moving from just before (several tens of seconds before) by the AC element of the acceleration sensor. If the user is not mov-

ing, the abnormal status of the pulse is decided to be caused by a psychological change of the user, and a product of the pulse rate is calculated as the stress degree. In case of GSR, if a first transition of change is faster than the preset timing, the first transition is counted up as the stress degree. The counted value is displayed at a predetermined time (For example, before sleeping), and the comment is additionally displayed. For example, if the counted value is within the limit being under stress, the comment "Today, you are under stress. Please relax by listening to music or taking a tepid bath slowly." is displayed. Furthermore, at the end of each week, a weekly summary of the health condition may be displayed. The user can indicate the display of the summary if necessary.

[0048] Next, the wearable life support apparatus according to a third embodiment is explained. The component of the wearable terminal carried by the user is the same as the first embodiment (Fig. 1 or Fig. 3). However, in the outside, a home server stores the physiological information, the action information, and the environment information acquired from an outside network, and an area server manages the information in an ambient area. The system of the third embodiment includes the home server and the area server. Fig. 20 is a block diagram of the wearable life support system according to the third embodiment. As shown in Fig. 20, the home server includes a personal physiological information corpus 131 and a personal environment information corpus 132 that stores environment information surrounding the user. The area server includes a city environment information corpus 133 that stores local environment information of city, town, village, and a company physiological information corpus 134 that stores information for each area or each company. These corpora are mutually connected by a network. The city environment information corpus 133 and the company physiological information corpus 134 may be merged as a prefecture or state sensor information corpus 135.

[0049] Next, Fig. 21 is a block diagram showing a relationship among the wearable terminal, the home server, and a family doctor/management company server according to the third embodiment. As shown in Fig. 21, the physiological information and the action information measured by the wearable terminal are stored in a memory of the wearable terminal, and transferred to the home server. The home server retrieves the personal environment information corpus 132 and the prefecture sensor information corpus 135 of local/company server based on the transferred information and obtains the environment information (temperature, humidity, and so on) surrounding the user and the user's status information such as place or the user's facing person through the network. In short, the data set similar to the user's present status is retrieved from the information and downloaded to the wearable terminal. Alternatively, the corpus data related to the user's status is previously downloaded from the server to the wearable terminal. However, in an unex-

pected case, the wearable terminal obtains the relationship data through communication by accessing the home server or a public server. For example, in case the user is a salaried man of business job, the user's status information represents personal data of the salaried man of business job and personal data of a person of similar environment stored in the sensor information corpus of outside.

[0050] In the sensor information corpus of the third embodiment, in addition to the physiological information and the action information of the second embodiment, the environment information such as temperature, humidity, the image of the user's facing person, and speech surrounding the user are stored. These data are transferred to the home server through the cellular-phone at a predetermined time, or are directly transferred to the home server by Bluetooth when the user is at home. In this case, the sum result and the stress degree of one day, and the trend data are displayed using the home server.

[0051] The wearable life support system is connected to an outside network. Accordingly, the following use situations are considered. As the use situation in life scene, in case of excretion, the status that the user enters a toilet room is detected by location recognition using a wireless tag or by speech dialogue during the user's walking in the house. In this case, a weighting machine and a body fat machine respectively detect the user's weight and body fat. The component of excretions is analyzed and transferred to the main module of the wearable terminal thorough Bluetooth.

[0052] It is difficult for the user to wear the wearable sensor while the user is taking a bath. Accordingly, an electrocardiogram sensor set to the bath detects the user's heart rate. After taking a bath, when the user wears the wearable terminal again, these data are transferred from the memory of the bath to the wearable terminal through Bluetooth.

[0053] Furthermore, an electrode to recognize the body wear is equipped in the wearable terminal. By detecting whether the electrode is exciting or insulating, the status whether the user wears the wearable terminal is recognized. While the user interacts speech dialogue through the wearable terminal or wears the display of the wearable terminal, the information is presented to the user by using these devices. While the user takes off the wearable terminal, the interface is exchanged to the dialogue system or the information system (For example, a home information terminal) surrounding the user. In short, the presentation means including the surrounding interface is exchanged by detachability of the wearable terminal.

[0054] In the above-mentioned three embodiments, the information presentation to the user is executed by the speech synthesis. However, this presentation may be executed by image or character through a head-mounted display, a pendant type display, or a wristwatch type display. Furthermore, if a message for the user is stored, a vibrator is built in the wristwatch type display or

the cellular-phone and the existence of the message is informed to the user by the vibrator.

[0055] Furthermore, the feedback media for the user's status is changed based on the measured/recognized behavior. For example, speech is utilized while walking, and the display is utilized while working. The message is not presented while sleeping. In case of an urgent status, this information is sent to those around the user, a family doctor, or a management company in addition to the user. When a serious case (the user himself can not cope with) is detected, this status is broadcast to a plurality of terminals of those around the user. In this case, the media is converted according to the use mode of each terminal in order to inform who and where the serious status occurs. By adding the urgent degree, for example, the more urgent status is informed by the larger volume.

[0056] If it is necessary that the user must measure the physiological information by oneself (if automatic instruction and data transmission can not be executed), a message to urge the user to measure is displayed according to the instrumentation schedule. If the user does not measure the physiological information, a message to force the instrumentation is periodically displayed (The method for displaying the message is interactively controlled.).

[0057] Another use situation using the above-mentioned component is explained. When the wearable terminal downloads prescription data of the doctor from a hospital server, a message to urge the user to prescribe medicine based on the data is displayed in cooperation with the user's behavior. For example, after having a meal, by displaying a message "Please take two capsules of medicine after a meal.", the user's taking is confirmed and preserved as the record. An electrical signature is assigned to the prescription data in order to clear the doctor's responsibility. Personal information such as the condition of a patient or the case history is additionally preserved. In case of an urgent case, those around the patient, ambulance operators, and the doctor can refer the personal information.

[0058] Furthermore, a route guidance based on the user's status can be presented. The route guidance represents a service to present a course from the user's present location (or the nearest station) to the destination. In case of determining the course, the physiological information and the action information acquired by the wearable sensor are additionally used as parameters (constraint conditions). For example, if the user's fatigue degree is high, a route for the user to follow without stairs is created. The fatigue degree is extracted by the condition such as the case that the user exercised greatly or the user repeatedly executed the same working while the behavior information is continuously measured. In this case, a question "Are you tired?" is presented to the user. The parameter of the fatigue degree is slightly controlled by this result.

[0059] In the third embodiment, Bluetooth is used as

the communication between the modules. However, if the communication of personal level is executed, various kinds of methods are selectively utilized. The special technique (PAN: Personal Area Network) to process electric signal by using the human body as a conductor may be utilized. In the same way, IrDA may be utilized. The above-mentioned three embodiments are explained by the wireless communication. However, the wired communication such as RS232C may also be used.

[0060] In the third embodiment, the instrumentation data is processed by A/D conversion, and the user's status is decided by a using digital signal. However, it may be decided by analogue signal processing. Fig. 22 shows an example of component of the sensor module using the analogue circuit. As shown in Fig. 22, after analogue signals from each sensor pass through a preprocess unit 151, a comparator 152 processes the signals by the threshold and outputs digital signals "0" "1" as the status information. A logic circuit 153 detects the user's status by referring to the digital signals, and the detection result is output through a display unit 154 (LED, LCD, and so on).

[0061] Next, modification examples of above-mentioned embodiment are explained. The component of the wearable terminal carried by the user is the same as the first embodiment. In this case, a method for retrieving the similar data from the sensor information corpus and for displaying as waveform level is explained. Fig. 23 shows one example of graph of the physiological information measured by the wearable terminal. If this waveform includes a part of which the user wishes to refer similar instances in the past, the user indicates the part as a square area (or ellipse and so on) using area indication means (For example, mouse or pen) as shown in Fig. 24. The indicated area is regarded as retrieval request data and a part similar to the waveform in the indicated area is retrieved by pattern matching. Furthermore, if a characteristic event is included in adjacent data of the similar part, the event is additionally displayed. Fig. 25 is one example of the retrieval result. In this way, the user can previously know some fit and receive a suitable treatment early.

[0062] Furthermore, in this case, the retrieval method or the recognition method may be controlled by the indicated shape of the area. For example, as for the area surrounded by the square, similar one is retrieved from the past data. As for the area surrounded by the ellipse, it is simply decided whether the data in the area is normal or abnormal. In case of abnormal, even if the shape is not similar, the past data in case of abnormal can be displayed.

[0063] Furthermore, in case of periodical physiological information such as electrocardiogram, the area can be indicated by the number of operation times using the area indication means except for above-mentioned area indication. For example, when the user operates a mouse as the area indication means, in case of single click as shown in Fig. 26, the waveform of one pulse is selected

for retrieval. In case of double clicks as shown in Fig. 27, the waveform of two pulses are selected for retrieval.

[0064] Furthermore, abnormal detection means for recognizing/detecting some abnormal part in the physiological information may be prepared. For example, in case of electrocardiogram, arrhythmia data is automatically detected. In response to the click operation, all of abnormal data can be selected and retrieved as shown in Fig. 28. In this case, the abnormal detection means may relatively detect the abnormal part by comparing with the past average value in the sensor information corpus. Otherwise, the abnormal detection means may absolutely detect the abnormal part by medical knowledge.

[0065] Furthermore, above-mentioned similar data retrieval can be executed by real time. When the similar data is retrieved from the sensor information corpus by real time using the physiological information/action information measured by the sensor module 102 (302), the similar data may be simultaneously output through the display 104 and the status may be reappeared in order for the user to recognize the present status. For example, in case that the pulse as the physiological information and the action/posture information from the acceleration sensor as the behavior information are recorded, and the dynamic image and the speech are simultaneously recorded, if the instrumentation data is abnormal based on the change of pulse and the behavior information in comparison with the past average value, the past data similar to the change pattern is retrieved. In addition to the pulse value (or graph) and the behavior information of the present status, the dynamic image and the speech in the retrieved data are output through the display 104 (304).

[0066] As mentioned-above, in the wearable life support apparatus of the present invention, the physiological information and the action information are correspondingly measured from the user's body. Accordingly, the user's health condition is decided by the physiological information related with the action, and adequate advice is presented to the user. Furthermore, by comparing the action information with the user's schedule, the user's life custom is correctly guided to the user's desired schedule.

[0067] A memory device, such as a CD-ROM, floppy disk, hard disk magnetic tape, or semiconductor memory can be used to store instructions for causing a processor or computer to perform the processes described above.

[0068] Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with the scope of the invention being defined by the following claims.

Claims

1. A wearable life support apparatus, comprising:

- a physiological information acquirement unit (102) configured to acquire physiological information of a user;
 an acceleration information acquirement unit (106) configured to acquire acceleration information of the user;
 a memory (1011) configured to store a table representing a correspondence between each acceleration information and each of the user's behaviours and a standard limit of physiological information of each behaviour;
 a status recognition unit (1012) configured to recognize the user's status by retrieving a behaviour corresponding to acquired acceleration information from the table;
 a physiological information decision unit (1012) configured to decide whether the acquired physiological information is normal by comparing acquired physiological information with the standard limit of physiological information of the behaviour; and
 a presentation unit (103, 104) configured to present a decision result of said physiological information decision unit.
2. The wearable life support apparatus according to claim 1,
 wherein said physiological information acquirement unit (102) includes at least one of a pulse wave sensor, an electroencephalogram electrode, a cardiac electrode, a myoelectric electrode, a body temperature sensor, and a galvanic skin response electrode.
 3. The wearable life support apparatus according to claim 1,
 wherein said acceleration information acquirement unit (106) includes an acceleration sensor.
 4. The wearable life support apparatus according to claim 1,
 wherein said presentation unit (103, 104) includes at least one of a display, a cellular-phone, and a speaker.
 5. The wearable life support apparatus according to claim 1,
 further comprising an input unit (105) configured to input supplemental information based on the user's status of said status recognition unit and the decision result of said physiological information decision unit.
 6. The wearable life support apparatus according to claim 1,
 wherein said data transmission between said acceleration information acquirement unit (106) and said status recognition unit (1012), data transmission between said physiological information acquirement unit (102) and said physiological information decision unit (1012), data transmission between said physiological information decision unit (1012) and said presentation unit (103, 104), are executed by wireless communication.
 7. The wearable life support apparatus according to claim 5,
 wherein said memory (1011) stores a schedule of the user,
 8. The wearable life support apparatus according to claim 7,
 wherein, when at least one of the acceleration information and the physiological information changes while the acceleration information and the physiological information are continually acquired, said status recognition unit (1012) compares the behaviour with the schedule.
 9. The wearable life support apparatus according to claim 8, wherein,
 if the behaviour does not match with the schedule, said presentation unit (103, 104) presents a non-coincidence message between the behaviour and the schedule to the user.
 10. The wearable life support apparatus according to claim 9, wherein,
 when said input unit (105) inputs supplemental information representing a reason for the non-coincidence, said status recognition unit (1012) corrects the schedule by referring to the supplemental information.
 11. The wearable life support apparatus according to claim 8,
 wherein said physiological information decision unit (1012) checks whether the acquired physiological information is within the standard limit of physiological information of the behaviour corresponding to the acquired acceleration information.
 12. The wearable life support apparatus according to claim 11, wherein,
 if the acquired physiological information is over the standard limit, said presentation unit (103, 104) presents an advice to recover normal physiological information.
 13. The wearable life support apparatus according to claim 5,
 wherein said input unit (105) previously sets the user's case history, the user's characteristic and constitution, and a dialogue model.
 14. The wearable life support apparatus according to claim 1,

further comprising a corpus memory (131, 132) configured to correspondingly store the physiological information, the acceleration information, the status, and the decision result.

15. The wearable life support apparatus according to claim 14, wherein said physiological information decision unit (1012) retrieves the physiological information corresponding to a present status from said corpus memory (131, 132), and compares present physiological information with retrieved physiological information.

16. The wearable life support apparatus according to claim 15, wherein, if the physiological information corresponding to the present status is not stored in said corpus memory (131, 132), said corpus memory (131, 132) stores the present physiological information in correspondence with the present status.

17. The wearable life support apparatus according to claim 15, wherein, if said physiological information decision unit (1012) decides that the present physiological information is not normal based on a comparison result, said corpus memory (131, 132) stores the present physiological information and the decision result.

18. The wearable life support apparatus according to claim 14, wherein said corpus memory (131, 132) stores a physiological information corpus, an average value corpus, a one day trend corpus, and a one year trend corpus, wherein the physiological information corpus includes the physiological information and the behaviour of each time and date, wherein the average value corpus includes an average value of the physiological information of each behaviour, wherein the one day trend corpus includes physiological history data and the behavior of one day for each kind of the physiological information, and wherein the one year trend corpus includes physiological history data and the behaviour of one year for each kind of the physiological information.

19. The wearable life support apparatus according to claim 18, wherein said presentation unit (103, 104) presents a comment of health condition of one day based on the physiological information corpus and the average value corpus to the user.

20. The wearable life support apparatus according to claim 19,

wherein said presentation unit (103, 104) presents a trend graph of the physiological information and behaviour history of one day based on the one day trend corpus and the one year trend corpus.

21. The wearable life support apparatus according to claim 14, wherein said corpus memory (131, 132) further stores personal environment information related to the status, wherein the personal environment information is exchanged from a local sensor information corpus (135) through a network, and wherein the local sensor information corpus (135) collects local sensor information from an environment information corpus (133) of particular area and a physiological information corpus (134) of particular company through the network.

22. The wearable life support apparatus according to claim 21, wherein said physiological information decision unit (1012) retrieves the personal environment information corresponding to the status from said corpus memory (131, 132), and decides whether the physiological information is normal in accordance with the personal environment information.

23. A computer-readable memory containing computer-readable instructions to support a user's life using a wearable device (101, 102, 103, 104, 105, 106), comprising:

an instruction unit to acquire physiological information of the user through the wearable device;
an instruction unit to acquire acceleration information of the user through the wearable device;
an instruction unit to store a table representing a correspondence between each acceleration information of the user and each behaviour of the user and a standard limit of physiological information of each behaviour;
an instruction unit to recognize the user's status by retrieving a behaviour corresponding to acquired acceleration information from the table;
an instruction unit to decide whether acquired physiological information is normal by comparing the acquired physiological information with the standard limit of physiological information of the behaviour; and
an instruction unit to present a decision result through the wearable device.

Patentansprüche

1. Tragbare Lebensunterstützungsvorrichtung, umfassend:

- eine Sammeleinheit (102) für physiologische Information, die konfiguriert ist, um physiologische Information eines Benutzers zu sammeln;
 eine Sammeleinheit (106) für Beschleunigungs-
 information, die konfiguriert ist, um Beschleuni-
 gungsinformation des Benutzers zu sammeln;
 einen Speicher (1011), der konfiguriert ist, um
 eine Tabelle zu speichern, die eine Entspre-
 chung zwischen jeder Beschleunigungsinfor-
 mation und dem Verhalten von jedem Benutzer
 und einer Standardgrenze von physiologischer
 Information von jedem Verhalten darstellt;
 eine Status-Erkennungseinheit (1012), die kon-
 figuriert ist, um den Benutzerstatus zu erken-
 nen, durch Zurückgewinnen eines Verhaltens,
 das einer gesammelten Beschleunigungsinfor-
 mation entspricht, aus der Tabelle;
 eine Entscheidungseinheit (1012) für physiolo-
 gische Information, die konfiguriert ist, um zu
 entscheiden, ob die gesammelte physiologi-
 sche Information normal ist, durch Vergleichen
 einer gesammelten physiologischen Informati-
 on mit der Standardgrenze von physiologischer
 Information des Verhaltens; und
 eine Präsentationseinheit (103, 104), die konfi-
 guriert ist, um ein Entscheidungsergebnis der
 Entscheidungseinheit für physiologische Infor-
 mation zu präsentieren.
2. Tragbare Lebensunterstützungsvorrichtung nach Anspruch 1, wobei die Sammeleinheit (102) für physiologische Information wenigstens einen Impuls-
wellensensor und/oder eine Elektroenzephalo-
gramm-Elektrode und/oder eine Herzelektrode und/
oder einen Körpertempersensor und/oder eine
galvanische Hautantwort-Elektrode einschließt.
 3. Tragbare Lebensunterstützungsvorrichtung nach
Anspruch 1, wobei die Sammeleinheit (106) für Be-
schleunigungsinformation einen Beschleunigungs-
sensor einschließt.
 4. Tragbare Lebensunterstützungsvorrichtung nach
Anspruch 1, wobei die Präsentationseinheit (103,
104) wenigstens eine Anzeige und/oder ein Zellular-
Telephon und/oder einen Lautsprecher einschließt.
 5. Tragbare Lebensunterstützungsvorrichtung nach
Anspruch 1, ferner umfassend eine Eingabeeinheit
(105), die konfiguriert ist, um Ergänzungsinformation
auf Grundlage des Benutzerstatus der Status-Er-
kennungseinheit und des Entscheidungsergebnis-
ses der Entscheidungseinheit für physiologische In-
formation einzugeben.
 6. Tragbare Lebensunterstützungsvorrichtung nach
Anspruch 1, wobei die Datenübertragung zwischen
der Beschleunigungsinformations-Sammeleinheit
(106) und der Status-Erkennungseinheit (1012), die
Datenübertragung zwischen der Sammeleinheit
(102) für physiologische Information und der Ent-
scheidungseinheit (1012) für physiologische Infor-
mation, und die Datenübertragung zwischen der
Entscheidungseinheit (1012) für physiologische In-
formation und der Präsentationseinheit (103, 104)
durch eine drahtlose Kommunikation ausgeführt
werden.
 7. Tragbare Lebensunterstützungsvorrichtung nach
Anspruch 1, wobei der Speicher (1011) eine Planung
der Benutzers speichert.
 8. Tragbare Lebensunterstützungsvorrichtung nach
Anspruch 7, wobei dann, wenn sich wenigstens die
Beschleunigungsinformation und/oder die physiolo-
gische Information ändert, während die Beschleuni-
gungsinformation und die physiologische Informati-
on kontinuierlich überwacht werden, die Status-Er-
kennungseinheit (1012) das Verhalten mit der Pla-
nung vergleicht.
 9. Tragbare Lebensunterstützungsvorrichtung nach
Anspruch 8, wobei dann, wenn das Verhalten nicht
mit der Planung überstimmt, die Präsentationsein-
heit (103, 104) einen Nicht-Übereinstimmungsnach-
richt zwischen dem Verhalten und der Planung des
Benutzers präsentiert.
 10. Tragbare Lebensunterstützungsvorrichtung nach
Anspruch 1, wobei dann, wenn die Eingabeeinheit
(105) Ergänzungsinformation eingibt, die einen
Grund für die Nicht-Übereinstimmung darstellt, die
Status-Erkennungseinheit (1012) die Planung durch
Bezugnahme auf die Ergänzungsinformation korri-
giert.
 11. Tragbare Lebensunterstützungsvorrichtung nach
Anspruch 8, wobei die Entscheidungseinheit (1012)
für physiologische Information prüft, ob die gesam-
melte physiologische Information innerhalb der
Standardgrenze von physiologischer Information
des Verhaltens, das der gesammelten Beschleuni-
gungsinformation entspricht, ist.
 12. Tragbare Lebensunterstützungsvorrichtung nach
Anspruch 11, wobei dann, wenn die gesammelte
physiologische Information über der Standardgren-
ze ist, die Präsentationseinheit (103, 104) einen Rat-
schlag präsentiert, um eine normale physiologische
Information zurückzugewinnen.
 13. Tragbare Lebensunterstützungsvorrichtung nach
Anspruch 5, wobei die Eingabeeinheit (105) vorher
die Fallgeschichte des Benutzers, die Charakteristik
und die Konstitution des Benutzers, und ein Dialog-
modell einstellt.

14. Tragbare Lebensunterstützungsvorrichtung nach Anspruch 1, ferner umfassend einen Korpus-Speicher (131, 132), der konfiguriert ist, um entsprechend die physiologische Information, die Beschleunigungsinformation, den Status, und das Entscheidungsergebnis zu speichern. 5
15. Tragbare Lebensunterstützungsvorrichtung nach Anspruch 14, wobei die Entscheidungseinheit (1012) für physiologische Information die physiologische Information, die dem gegenwärtigen Status entspricht, aus dem Korpus-Speicher (131, 132) zurückgewinnt, und die gegenwärtige physiologische Information mit der zurückgewonnenen physiologischen Information. 10
16. Tragbare Lebensunterstützungsvorrichtung nach Anspruch 15, wobei dann, wenn die physiologische Information, die dem gegenwärtigen Status entspricht, nicht in dem Korpus-Speicher (131, 132) gespeichert ist, der Korpus-Speicher (131, 132) die gegenwärtige physiologische Information in Entscheidung zu dem gegenwärtigen Status speichert. 15
17. Tragbare Lebensunterstützungsvorrichtung nach Anspruch 15, wobei dann, wenn die Entscheidungseinheit (1012) für physiologische Information entscheidet, dass die gegenwärtige physiologische Information nicht normal ist auf Grundlage eines Vergleichsergebnisses, der Korpus-Speicher (131, 132) die gegenwärtige physiologische Information und das Entscheidungsergebnis speichert. 20
18. Tragbare Lebensunterstützungsvorrichtung nach Anspruch 14, wobei der Korpus-Speicher (131, 132) einen Korpus für physiologische Information, einen Korpus für einen Durchschnittswert, einen Korpus für einen eintägigen Trend, und einen Korpus für einen einjährigen Trend speichert, wobei der Korpus für physiologische Information die physiologische Information und das Verhalten von jeder Zeit und jedem Datum speichert, wobei der Korpus für einen Durchschnittswert einen Durchschnittswert der physiologischen Information von jedem Verhalten einschließt, wobei der Korpus für den eintägigen Trend Daten der physiologischen Geschichte und das Verhalten von einem Jahr für jede Art der physiologischen Information einschließt. 25
19. Tragbare Lebensunterstützungsvorrichtung nach Anspruch 18, wobei die Präsentationseinheit (103, 104) einen Kommentar über den Gesundheitszustand von einem Tag auf Grundlage des Korpus für physiologische Information und des Korpus für einen Durchschnittswert darbietet. 30
20. Tragbare Lebensunterstützungsvorrichtung nach Anspruch 19, wobei die Präsentationseinheit (103, 104) einen Trendgraph der physiologischen Information und der Verhaltensgeschichte von einem Tag auf Grundlage des Korpus für den eintägigen Trend und des Korpus für den einjährigen Trend darbietet. 35
21. Tragbare Lebensunterstützungsvorrichtung nach Anspruch 14, wobei der Korpus-Speicher (131, 132) weiter eine persönliche Umgebungsinformation, die sich auf den Status bezieht, speichert, wobei die persönliche Umgebungsinformation von einem Lokalsensorinformationskorpus (135) durch ein Netz ausgetauscht wird, und wobei der Lokalsensorinformationskorpus (135) Lokalsensorinformation von einem Korpus für die Umgebungsinformation (133) eines bestimmten Gebiets und einem Korpus (134) für die physiologische Information einer bestimmten Firma durch das Netz sammelt. 40
22. Tragbare Lebensunterstützungsvorrichtung nach Anspruch 21, wobei die Entscheidungseinheit (1012) für physiologische Information die persönliche Umgebungsinformation, die dem Status entspricht, aus dem Korpus-Speicher (131, 132) zurückgewinnt, und entscheidet, ob die physiologische Information normal in Übereinstimmung mit der Information der persönlichen Umgebung entscheidet. 45
23. Ein von einem Computer lesbarer Speicher, der von einem Computer lesbare Befehle enthält, um das Leben eines Benutzers, der eine tragbare Einrichtung (101, 102, 103, 104, 105, 106) verwendet, zu unterstützen, umfassend: 50
- eine Befehlseinheit, um physiologische Information des Benutzers durch die tragbare Einrichtung zu sammeln;
 - eine Befehlseinheit, um Beschleunigungsinformation des Benutzers durch die tragbare Einrichtung zu sammeln;
 - eine Befehlseinheit, um eine Tabelle zu speichern, die eine Entsprechung zwischen jeder Beschleunigungsinformation des Benutzers und jedem Verhalten des Benutzers und einer Standardgrenze von physiologischer Information von jedem Verhalten darstellt;
 - eine Befehlseinheit, um den Benutzerstatus zu erkennen, durch Zurückgewinnen eines Verhaltens, das einer gesammelten Beschleunigungsinformation entspricht, aus der Tabelle;
 - eine Befehlseinheit, um zu entscheiden, ob die gesammelte physiologische Information normal ist, durch Vergleichen der gesammelten physiologischen Information mit der Standardgrenze von physiologischer Information des Verhaltens; und
 - eine Befehlseinheit, um ein Entscheidungsergebnis durch die tragbare Einrichtung zu prä-

sentieren.

Revendications

1. Appareil d'assistance vitale portable, comprenant:

une unité d'acquisition d'information physiologique (102) qui est configurée pour acquérir une information physiologique d'un utilisateur;
une unité d'acquisition d'information d'accélération (106) qui est configurée pour acquérir une information d'accélération de l'utilisateur;
une mémoire (1011) qui est configurée pour stocker une table qui représente une correspondance entre chaque information d'accélération et chacun des comportements d'utilisateur et une limite standard d'information physiologique de chaque comportement;
une unité de reconnaissance d'état (1012) qui est configurée pour reconnaître l'état d'utilisateur en retrouvant un comportement qui correspond à une information d'accélération acquise à partir de la table;
une unité de décision d'information physiologique (1012) qui est configurée pour décider si oui ou non l'information physiologique acquise est normale en comparant une information physiologique acquise avec la limite standard d'information physiologique du comportement; et
une unité de présentation (103, 104) qui est configurée pour présenter un résultat de décision de ladite unité de décision d'information physiologique.

2. Appareil d'assistance vitale portable selon la revendication 1, dans lequel ladite unité d'acquisition d'information physiologique (102) inclut au moins un élément pris parmi un capteur d'onde impulsionnelle, une électrode d'électroencéphalogramme, une électrode cardiaque, une électrode myoélectrique, un capteur de température du corps et une électrode de réponse de peau galvanique.

3. Appareil d'assistance vitale portable selon la revendication 1, dans lequel ladite unité d'acquisition d'information d'accélération (106) inclut un capteur d'accélération.

4. Appareil d'assistance vitale portable selon la revendication 1, dans lequel ladite unité de présentation (103, 104) inclut au moins un élément pris parmi un affichage, un téléphone cellulaire et un haut-parleur.

5. Appareil d'assistance vitale portable selon la revendication 1, comprenant en outre une unité d'entrée (105) qui est configurée pour entrer une information supplémentaire sur la base de l'état d'utilisateur de

ladite unité de reconnaissance d'état et du résultat de décision de ladite unité de décision d'information physiologique.

6. Appareil d'assistance vitale portable selon la revendication 1, dans lequel ladite transmission de données entre ladite unité d'acquisition d'information d'accélération (106) et ladite unité de reconnaissance d'état (1012), ladite transmission de données entre ladite unité d'acquisition d'information physiologique (102) et ladite unité de décision d'information physiologique (1012), ladite transmission de données entre ladite unité de décision d'information physiologique (1012) et ladite unité de présentation (103, 104) sont exécutées au moyen d'une communication sans fil.

7. Appareil d'assistance vitale portable selon la revendication 5, dans lequel ladite mémoire (1011) stocke une planification de l'utilisateur.

8. Appareil d'assistance vitale portable selon la revendication 7, dans lequel, lorsqu'au moins une information prise parmi l'information d'accélération et l'information physiologique change tandis que l'information d'accélération et l'information physiologique sont acquises en continu, ladite unité de reconnaissance d'état (1012) compare le comportement à la planification.

9. Appareil d'assistance vitale portable selon la revendication 8, dans lequel, si le comportement ne correspond pas à la planification, ladite unité de présentation (103, 104) présente un message de non coïncidence entre le comportement et la planification à l'utilisateur.

10. Appareil d'assistance vitale portable selon la revendication 9, dans lequel, lorsque ladite unité d'entrée (105) entre une information supplémentaire représentant une raison de la non coïncidence, ladite unité de reconnaissance d'état (1012) corrige la planification par référence à l'information supplémentaire.

11. Appareil d'assistance vitale portable selon la revendication 8, dans lequel ladite unité de décision d'information physiologique (1012) vérifie si oui ou non l'information physiologique acquise est à l'intérieur de la limite standard d'information physiologique du comportement correspondant à l'information d'accélération acquise.

12. Appareil d'assistance vitale portable selon la revendication 11, dans lequel, si l'information physiologique acquise est au-delà de la limite standard, ladite unité de présentation (103, 104) présente un avis pour restaurer une information physiologique normale.

13. Appareil d'assistance vitale portable selon la revendication 5, dans lequel ladite unité d'entrée (105) établit au préalable l'historique de cas d'utilisateur, la caractéristique d'utilisateur et la constitution d'utilisateur ainsi qu'un modèle de dialogue. 5
14. Appareil d'assistance vitale portable selon la revendication 1, comprenant en outre une mémoire de corpus (131, 132) qui est configurée pour stocker de façon correspondante l'information physiologique, l'information d'accélération, l'état et le résultat de décision. 10
15. Appareil d'assistance vitale portable selon la revendication 14, dans lequel ladite unité de décision d'information physiologique (1012) retrouve l'information physiologique qui correspond à un état courant à partir de ladite mémoire de corpus (131, 132) et compare une information physiologique courante à une information physiologique retrouvée. 15 20
16. Appareil d'assistance vitale portable selon la revendication 15, dans lequel, si l'information physiologique qui correspond à l'état courant n'est pas stockée dans ladite mémoire de corpus (131, 132), ladite mémoire de corpus (131, 132) stocke l'information physiologique courante en correspondance avec l'état courant. 25
17. Appareil d'assistance vitale portable selon la revendication 15, dans lequel, si ladite unité de décision d'information physiologique (1012) décide que l'information physiologique courante n'est pas normale sur la base d'un résultat de comparaison, ladite mémoire de corpus (131, 132) stocke l'information physiologique courante et le résultat de décision. 30 35
18. Appareil d'assistance vitale portable selon la revendication 14, dans lequel ladite mémoire de corpus (131, 132) stocke un corpus d'information physiologique, un corpus de valeur moyenne, un corpus de tendance sur un jour et un corpus de tendance sur une année, dans lequel le corpus d'information physiologique inclut l'information physiologique et le comportement de chaque date et heure, dans lequel le corpus de valeur moyenne inclut une valeur moyenne de l'information physiologique de chaque comportement, dans lequel le corpus de tendance sur un jour inclut des données d'historique physiologique et le comportement sur un jour pour chaque type de l'information physiologique et dans lequel le corpus de tendance sur une année inclut des données d'historique physiologique et le comportement sur une année pour chaque type de l'information physiologique. 40 45 50 55
19. Appareil d'assistance vitale portable selon la revendication 18, dans lequel ladite unité de présentation (103, 104) présente un commentaire de condition de santé sur un jour sur la base du corpus d'information physiologique et du corpus de valeur moyenne à l'utilisateur.
20. Appareil d'assistance vitale portable selon la revendication 19, dans lequel ladite unité de présentation (103, 104) présente un graphique de tendance de l'information physiologique et de l'historique de comportement sur un jour sur la base du corpus de tendance sur un jour et du corpus de tendance sur une année.
21. Appareil d'assistance vitale portable selon la revendication 14, dans lequel ladite mémoire de corpus (131, 132) stocke en outre une information d'environnement personnel rapportée à l'état, dans lequel l'information d'environnement personnel est échangée depuis un corpus d'information de capteur local (135) par l'intermédiaire d'un réseau et dans lequel le corpus d'information de capteur local (135) collecte une information de capteur local à partir d'un corpus d'information d'environnement (133) d'une zone particulière et d'un corpus d'information physiologique (134) d'une entreprise particulière par l'intermédiaire du réseau.
22. Appareil d'assistance vitale portable selon la revendication 21, dans lequel ladite unité de décision d'information physiologique (1012) retrouve l'information d'environnement personnel correspondant à l'état à partir de ladite mémoire de corpus (131, 132) et décide de si oui ou non l'information physiologique est normale conformément à l'information d'environnement personnel.
23. Mémoire lisible par ordinateur contenant des instructions lisibles par ordinateur pour un assistance vitale d'un utilisateur qui utilise un dispositif portable (101, 102, 103, 104, 105, 106), comprenant:
une unité d'instruction pour acquérir une information physiologique de l'utilisateur par l'intermédiaire du dispositif portable;
une unité d'instruction pour acquérir une information d'accélération de l'utilisateur par l'intermédiaire du dispositif portable;
une unité d'instruction pour stocker une table qui représente une correspondance entre chaque information d'accélération de l'utilisateur et chaque comportement de l'utilisateur et une limite standard d'information physiologique de chaque comportement;
une unité d'instruction pour reconnaître l'état d'utilisateur en retrouvant un comportement qui correspond à une information d'accélération acquise à partir de la table;
une unité d'instruction pour décider de si oui ou

non une information physiologique acquise est normale en comparant l'information physiologique acquise à la limite standard d'information physiologique du comportement; et une unité d'instruction pour présenter un résultat de décision par l'intermédiaire du dispositif portable.

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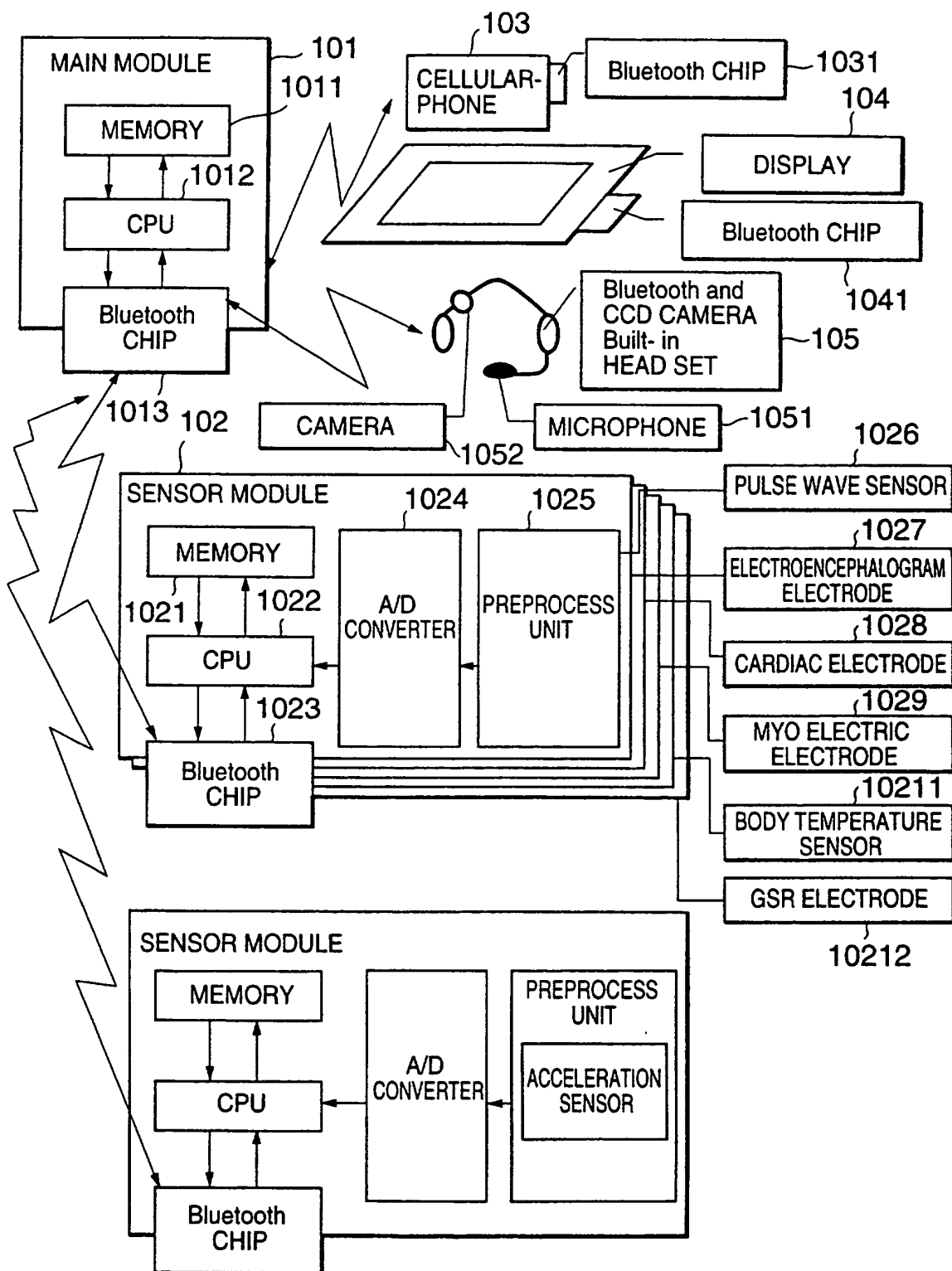


FIG.1

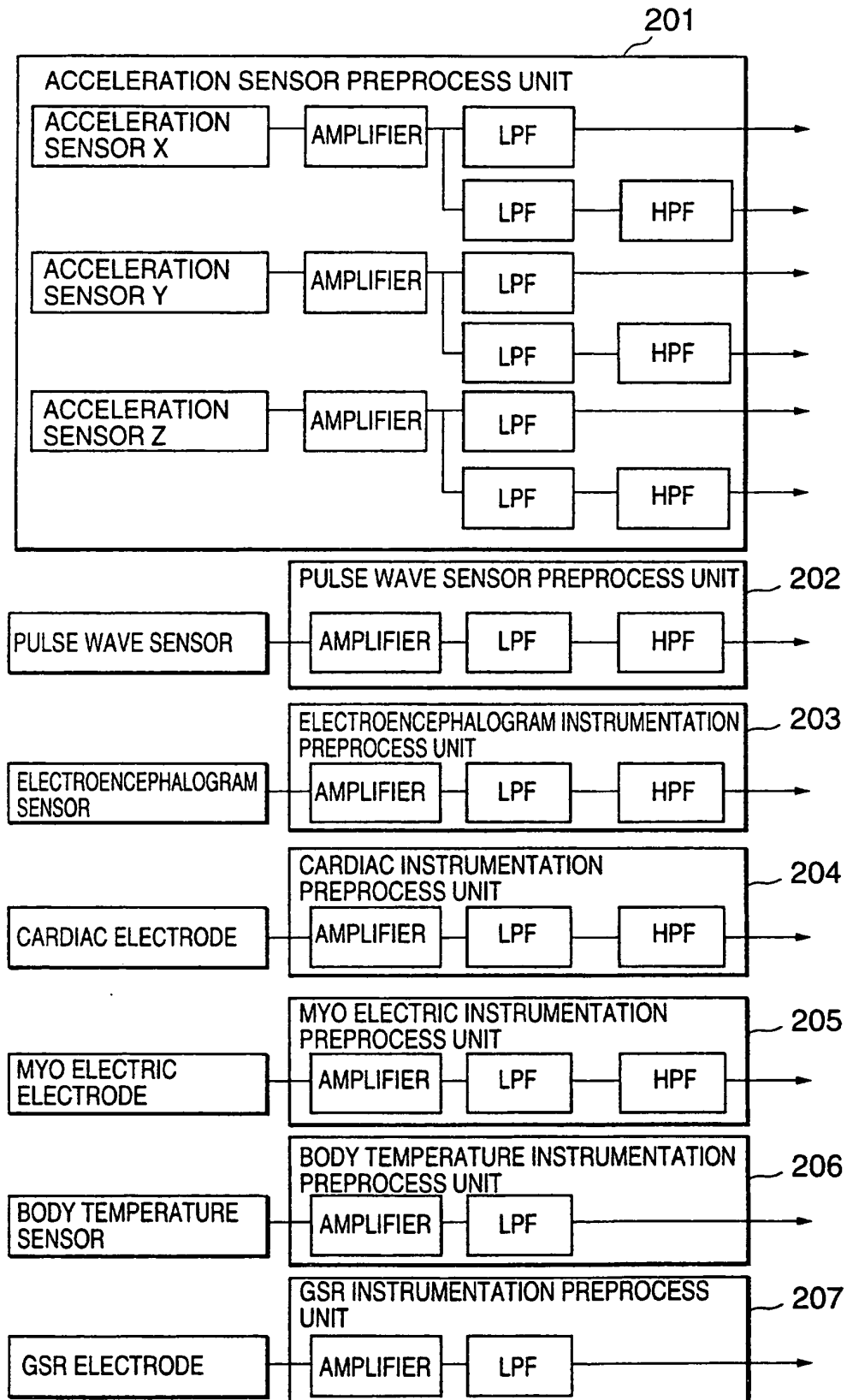


FIG.2

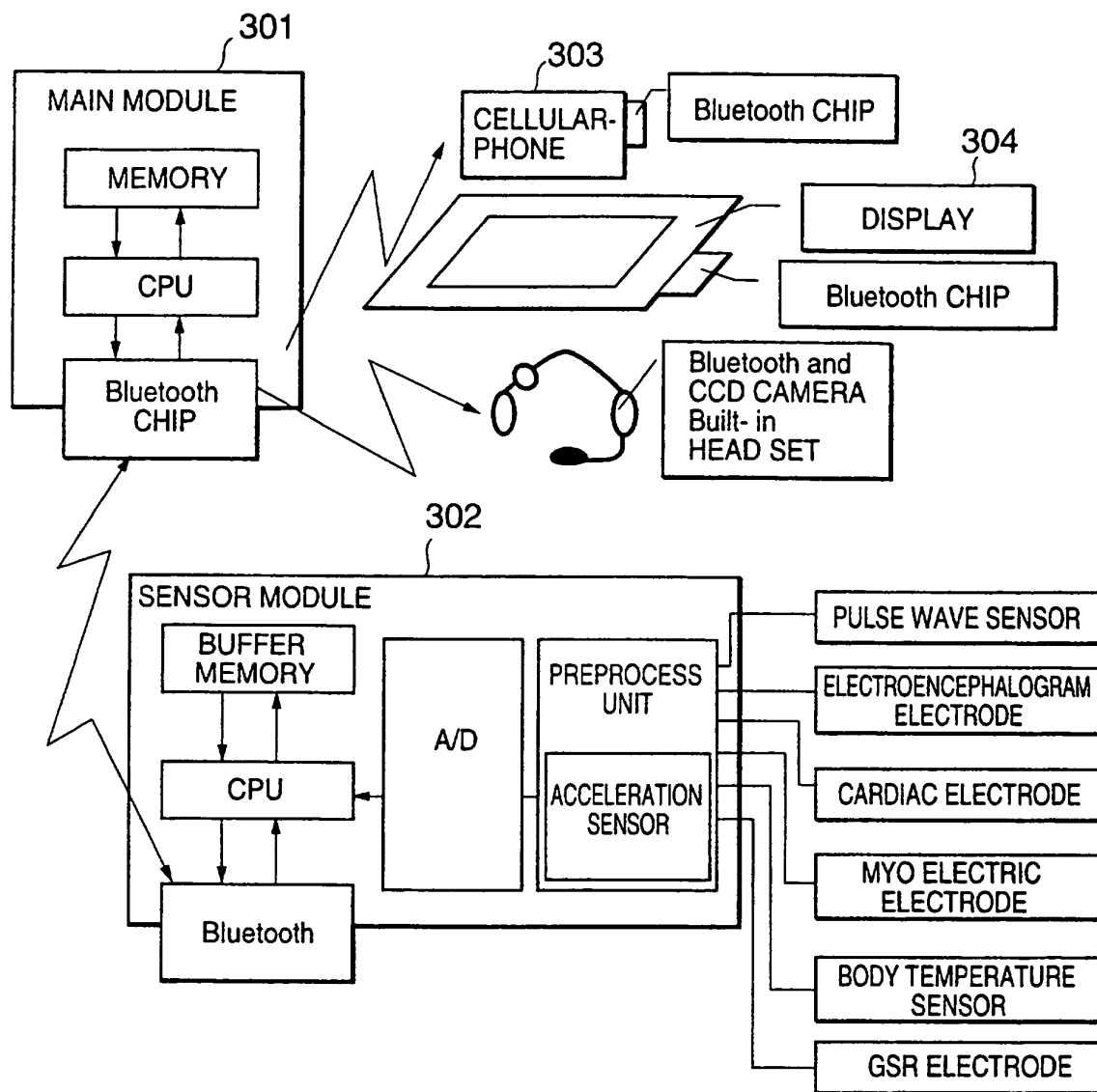


FIG.3

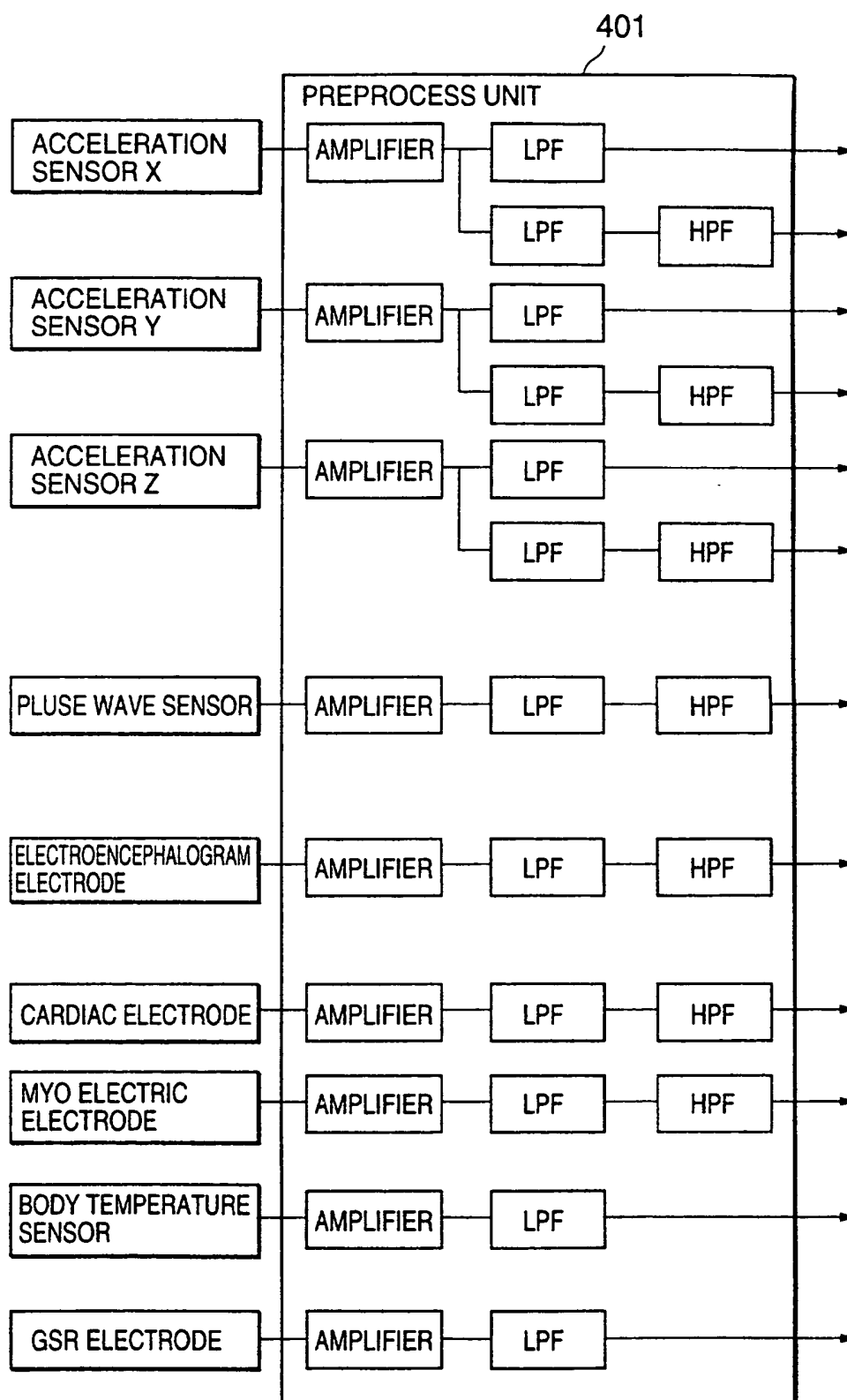


FIG.4

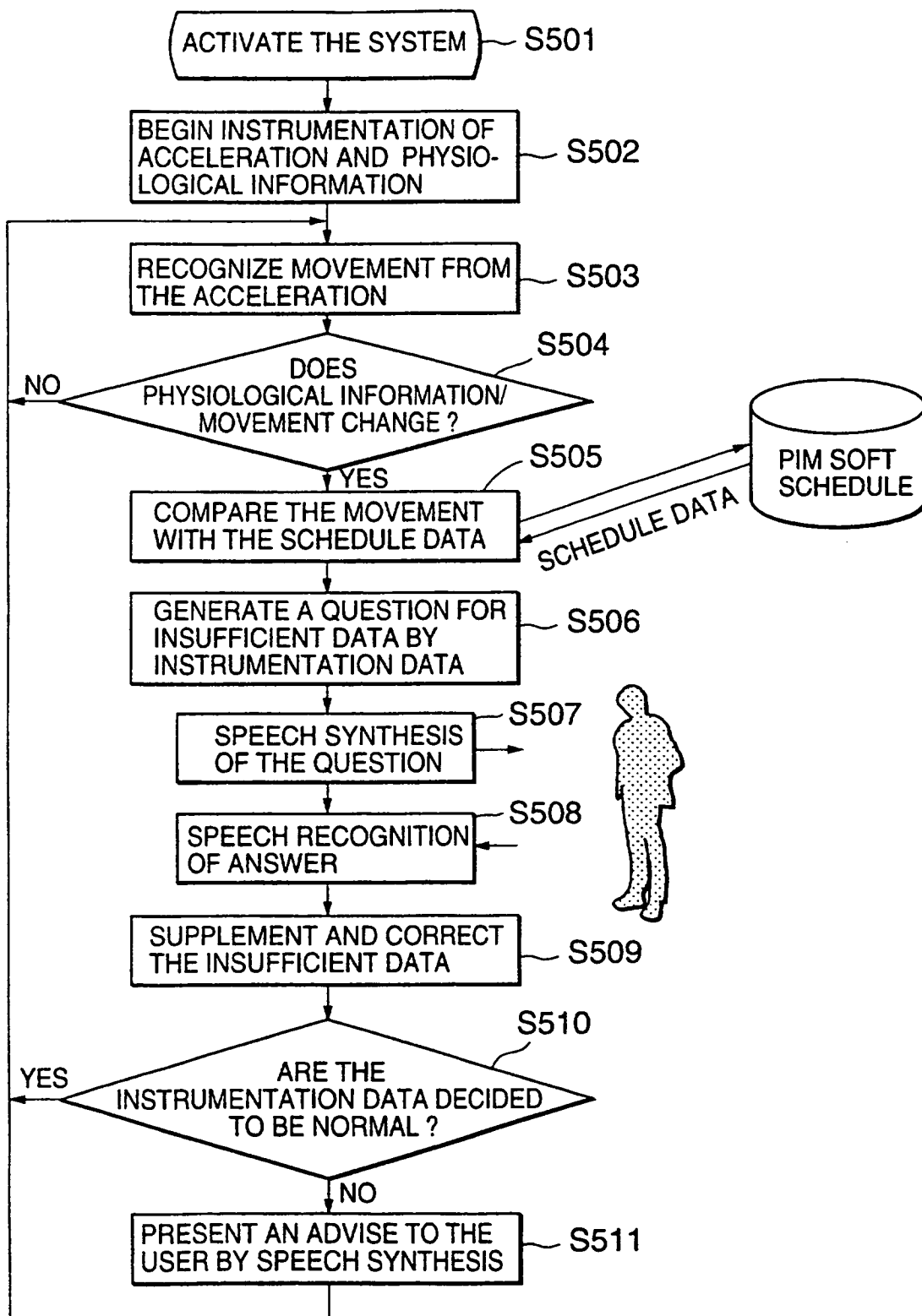


FIG.5

	SLEEP	MEAL	COMMUTE	WORK	REST	READING	EXERCISE	...
LYING	O	Δ	X	X				...
SITTING	Δ	O	Δ	O				...
STANDING	X	Δ	Δ	Δ				...
WALKING	X	Δ	Δ	Δ				...
RUNNING	X	X	Δ	Δ				...
BICYCLE	X	Δ	Δ	Δ				...
MOTOR CAR	Δ	Δ	Δ	Δ				...
TRAIN	Δ	Δ	Δ	Δ				...
...	...	...	...	...	...	...	...	...

FIG.6

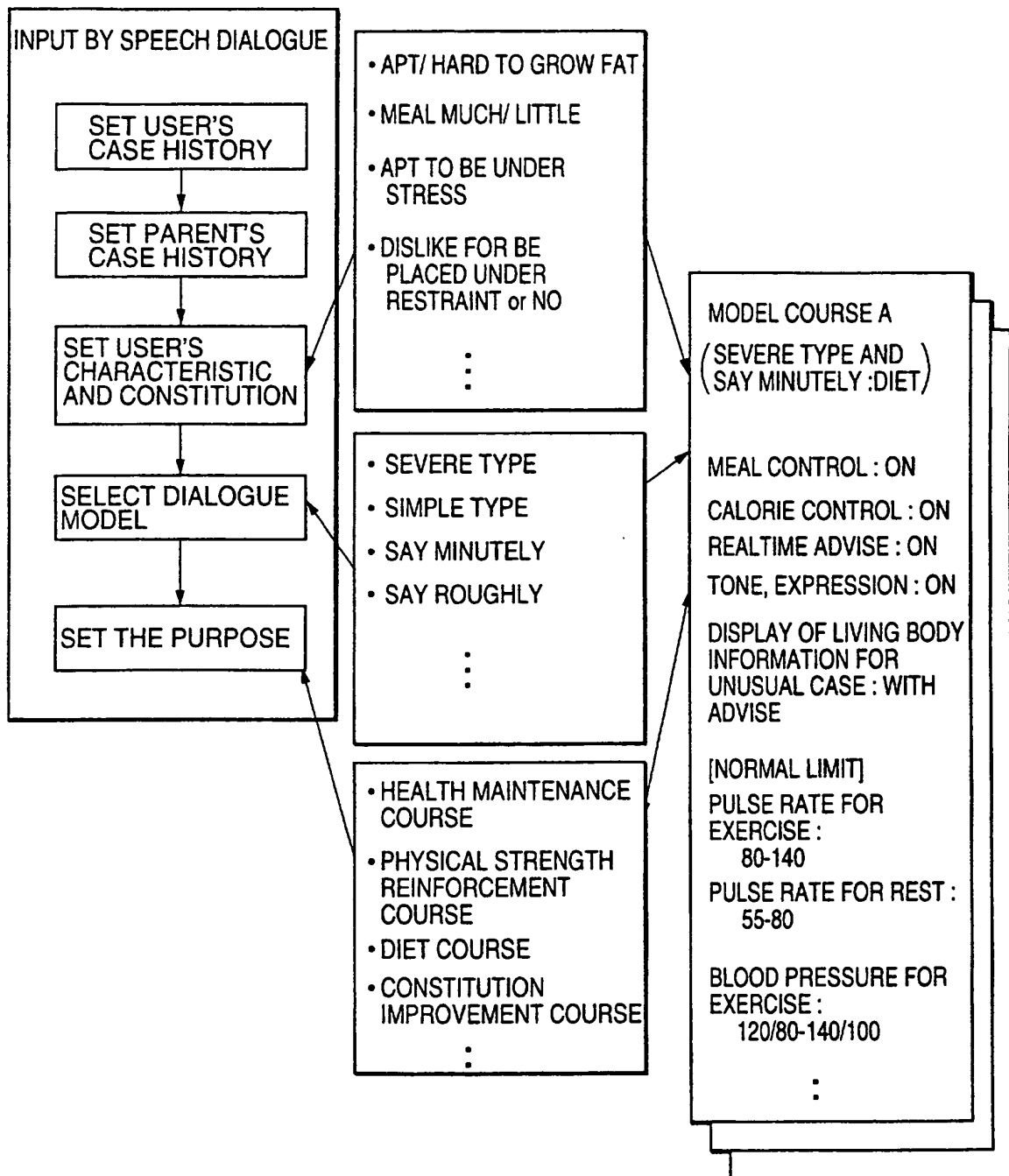


FIG.7

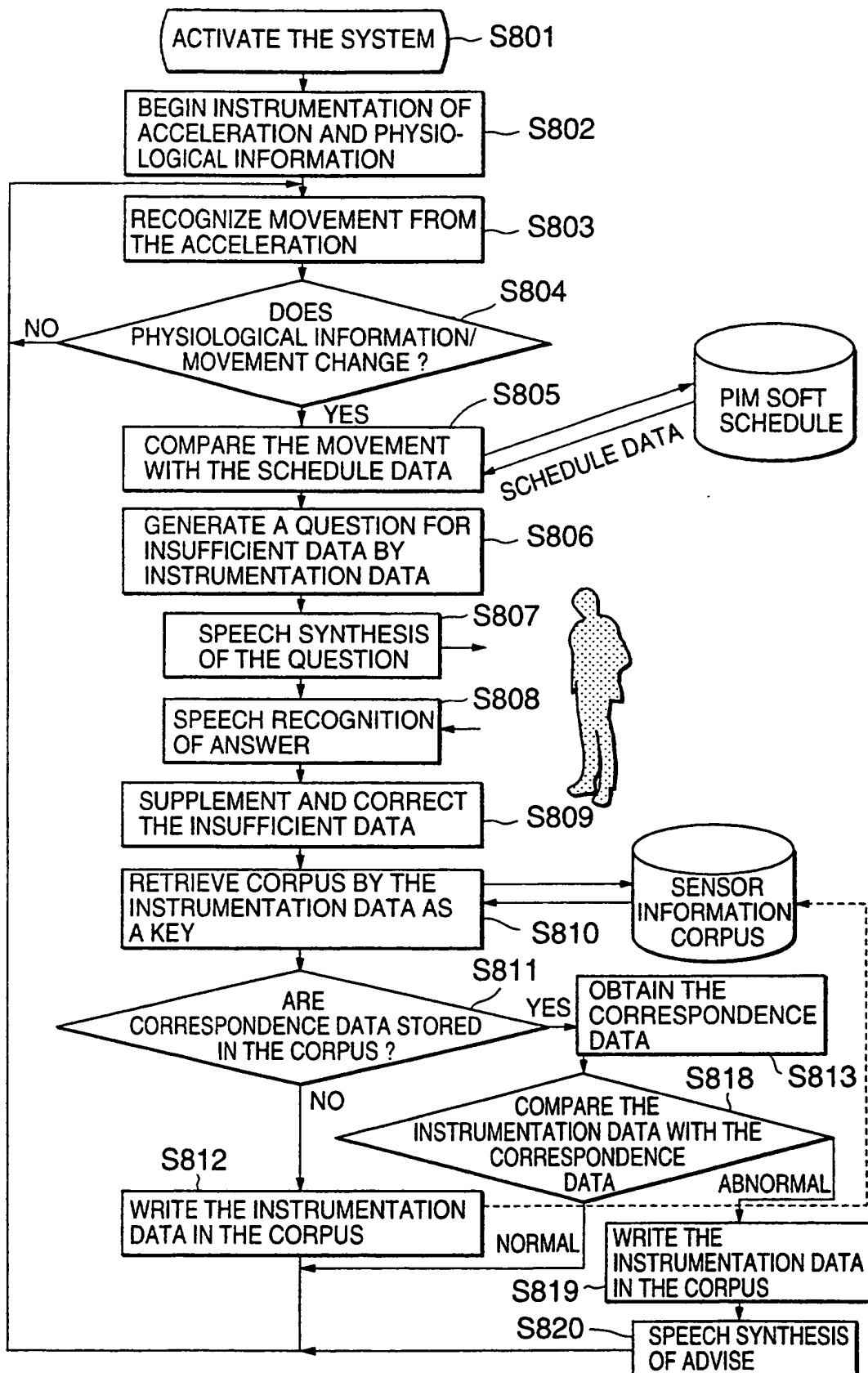


FIG.8

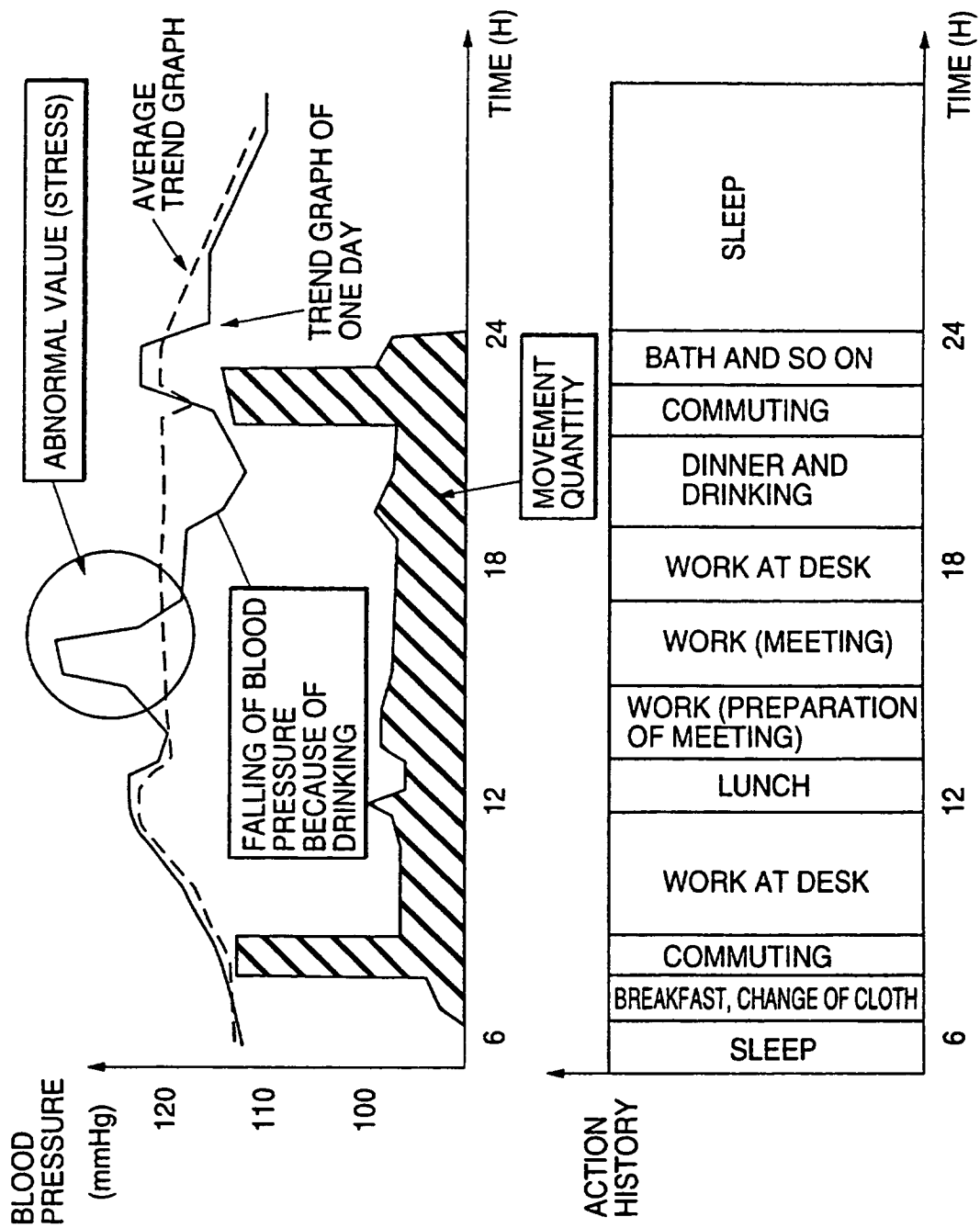


FIG.9

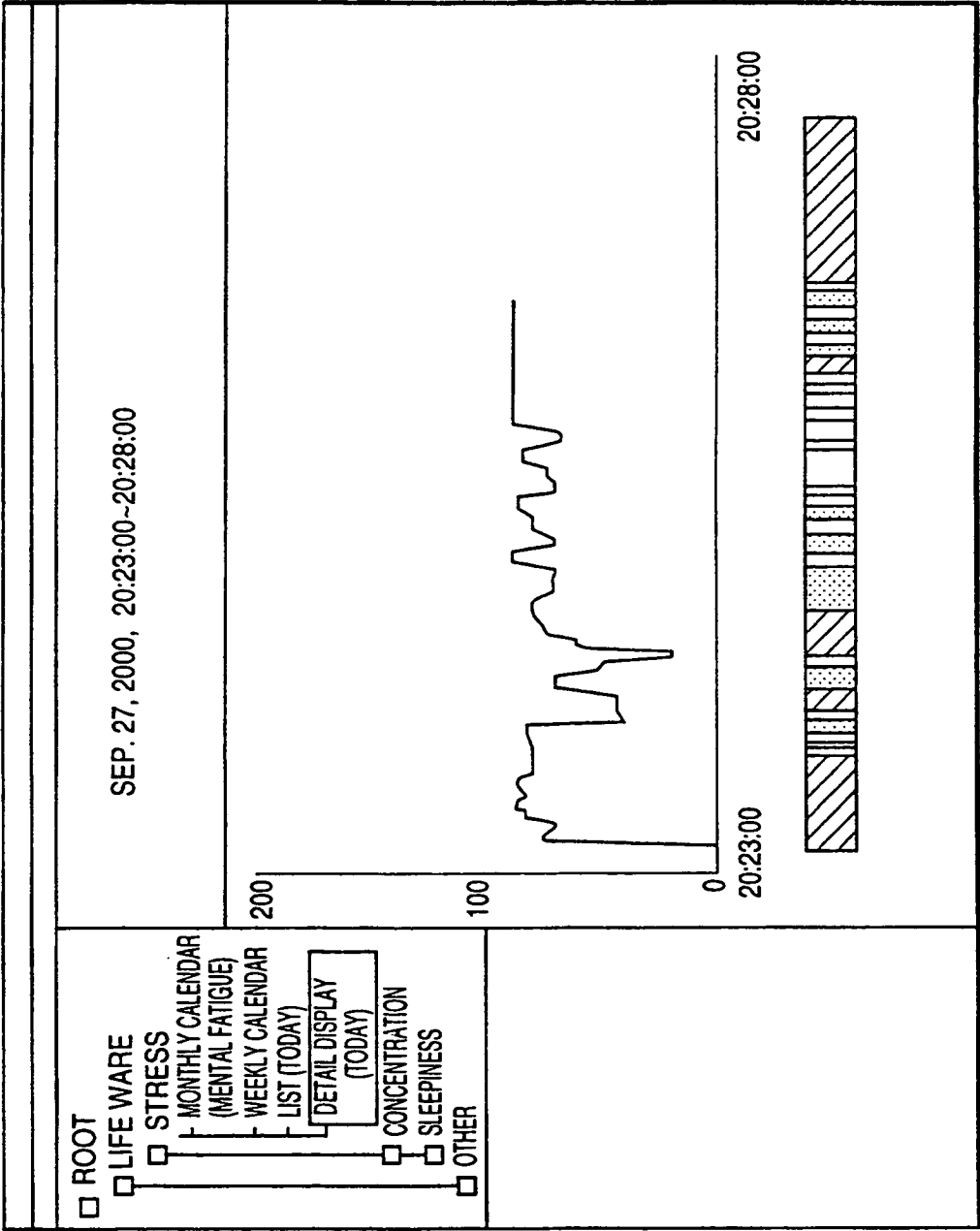


FIG.10

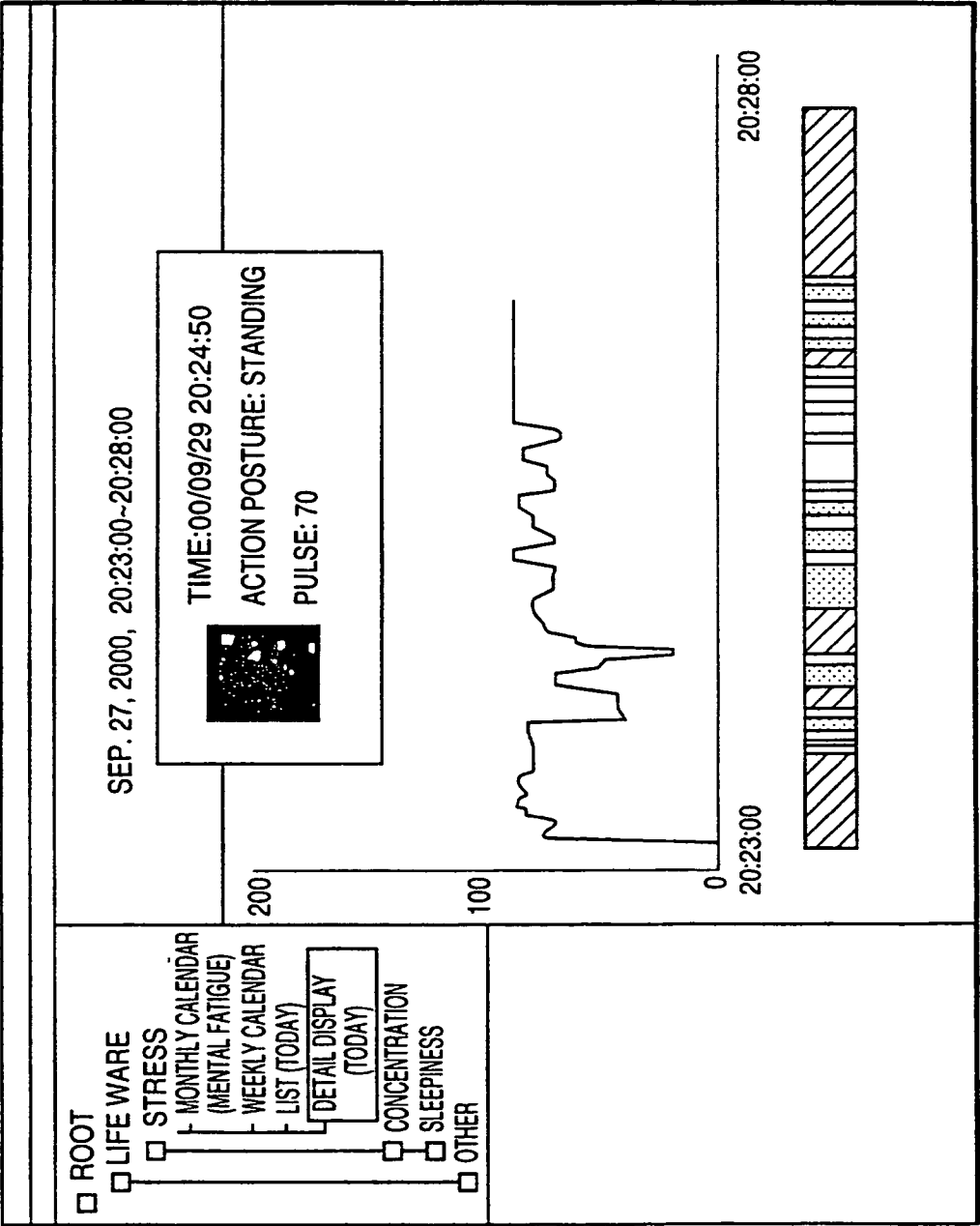


FIG.11

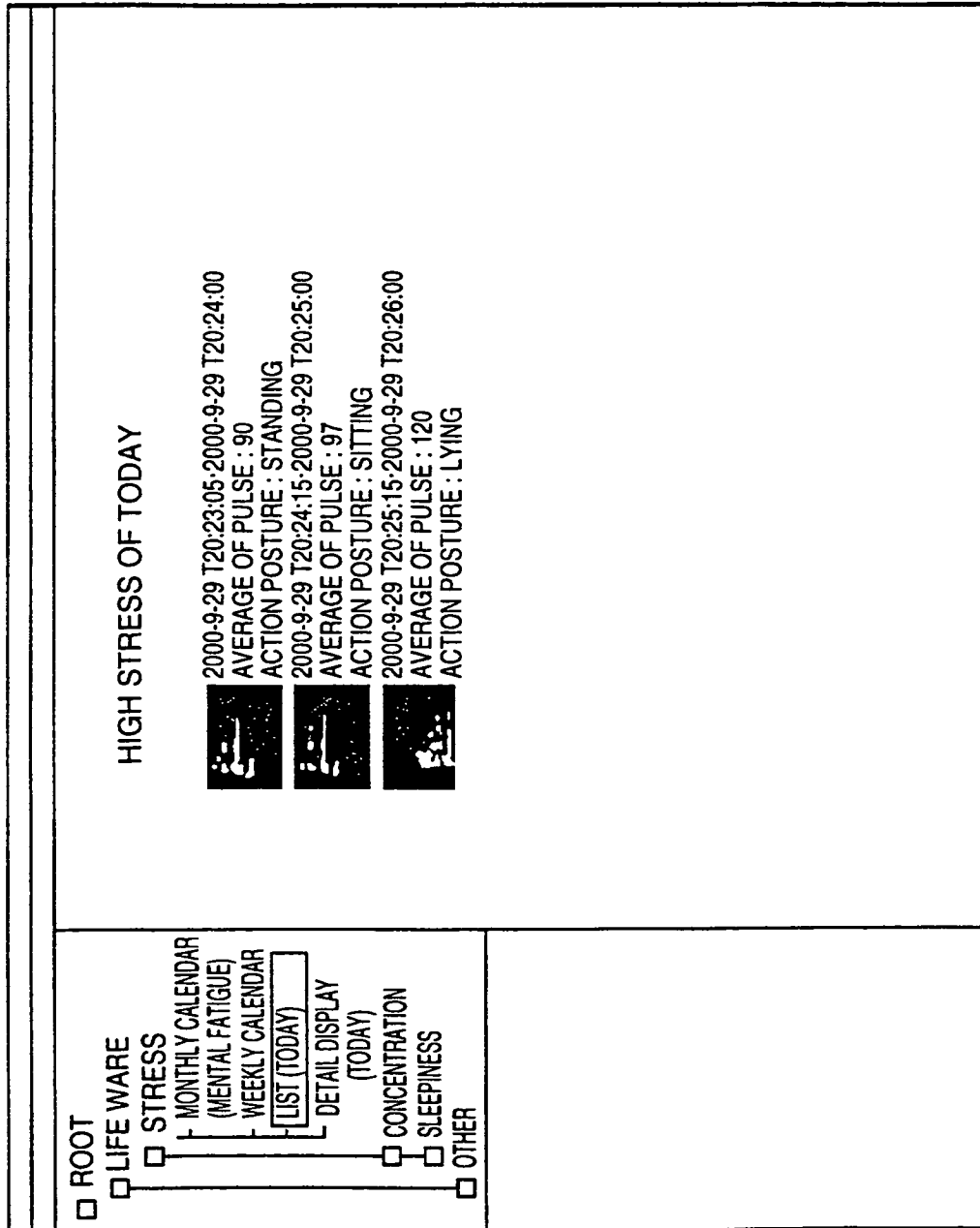


FIG. 12

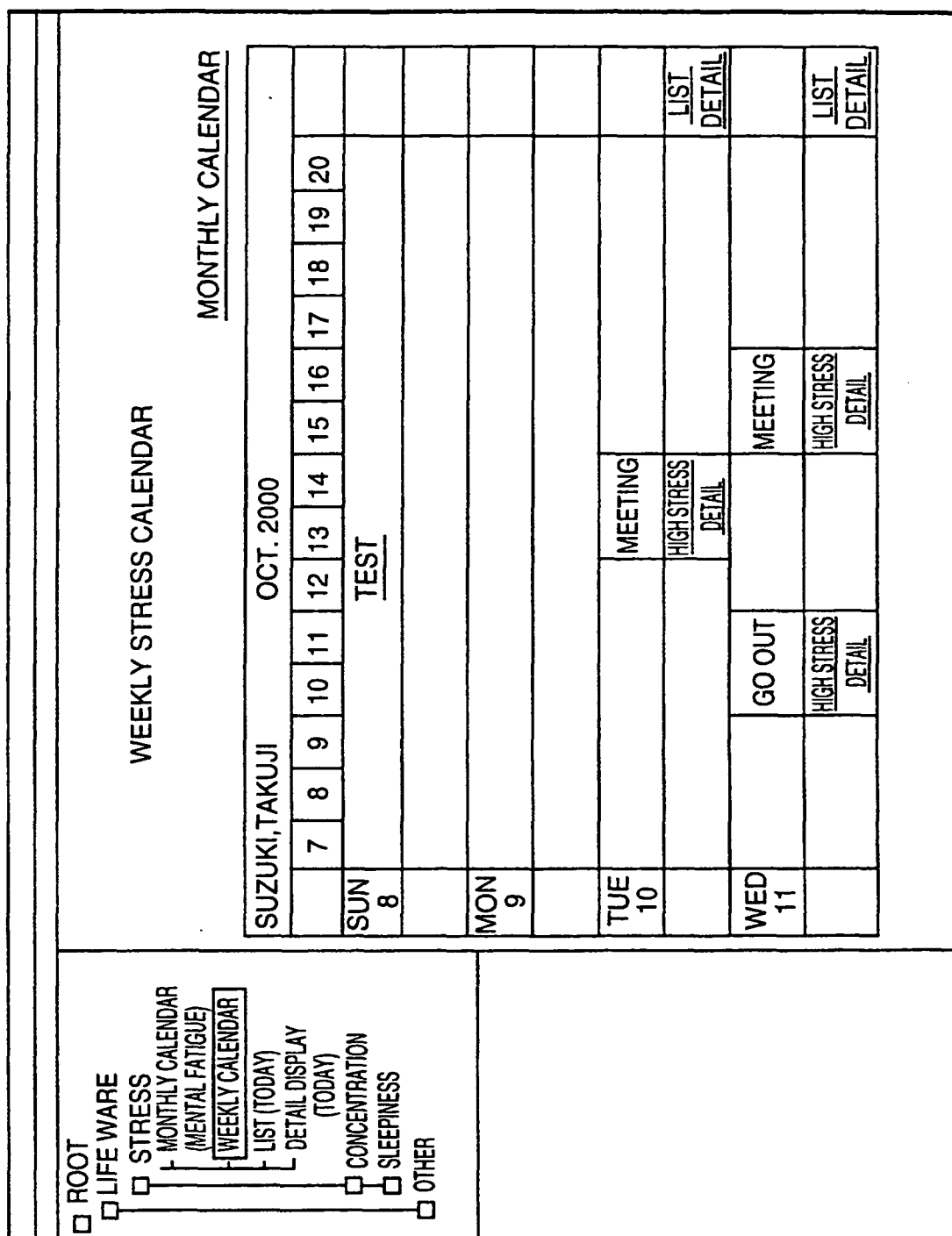


FIG. 13

☐ ROOT

☐ LIFE WARE

☐ STRESS

☐ MONTHLY CALENDAR (MENTAL FATIGUE)
☐ WEEKLY CALENDAR LIST (TODAY)
☐ DETAIL DISPLAY (TODAY)
☐ CONCENTRATION
☐ SLEEPINESS
☐ OTHER

MONTHLY STRESS CALENDAR

1 2 3 4 5 6 7 8 9 10 11 12

1 2 3 4 5 6 7 8 9 10 11 12

WEEKLY CALENDAR

SUZUKI, TAKUJI OCT. 2000

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10 HIGH STRESS DETAIL	11 HIGH STRESS DETAIL	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

FIG. 14

PHYSIOLOGICAL INFORMATION CORPUS

DATE	TIME	ACTION	POSTURE/ PITCH	PLACE	PULSE RATE	BLOOD PRESSURE	TEMPERA- TURE	GSR CHANGE
2000/1/5	10:35	WATCH TV	LYING	HOUSE	70	130	36.0	No
2000/1/5	10:48	WATCH TV	LYING	HOUSE	120	130	36.0	Yes
2000/1/5	10:55	WATCH TV	SITTING	HOUSE	75	120	36.5	No
2000/1/5	11:02	WALK	80-100	HOUSE→STATION	120	143	36.7	No
2000/1/5	15:03	WORK	SITTING	OFFICE	133	150	36.9	Yes
.	.	.	.	.	.	.	.	.
2000/3/5	14:55	RUN	130-150	STATION →COMPANY	180	150	37.3	Yes

FIG.15A

PHYSIOLOGICAL INFORMATION CORPUS (AVERAGE VALUE)

ACTION	POSTURE/ PITCH	MONTH	TIME	PLACE	AVERAGE VALUE			
					PULSE RATE	BLOOD PRESSURE	TEMPERA- TURE	GSR
WATCH TV	LYING	1	10:00- 11:00	HOUSE	70	130	36.0	No
WALK	80-100	1	10:00- 12:00	HOUSE→ A STATION	120	143	36.7	No
RUN	130-150	3	16:00- 18:00	B STATION→ C COMPANY				Yes
SLEEP	LYING	2	00:00- 12:00	HOUSE				
MEAL	SITTING	5	12:00- 14:00					

FIG.15B

PHYSIOLOGICAL INFORMATION CORPUS (ONE DAY TREND)

DATA TYPE	ACTION	MONTH	TIME	PLACE	TREND
NUMBER OF VEIN	WATCH TV	1	10:00-11:00	HOUSE	DATA
		1	11:00-12:00	HOUSE	DATA
		1	12:00-12:30	HOUSE	DATA
BLOOD PRESSURE					

FIG.15C

PHYSIOLOGICAL INFORMATION CORPUS (ONE YEAR TREND)

DATA TYPE	ACTION	MONTH	TIME	PLACE	TREND
NUMBER OF PULSE RATE	WATCH TV	1	10:00-11:00	HOUSE	DATA
		1	11:00-12:00	HOUSE	DATA
		1	12:00-12:30	HOUSE	DATA
BLOOD PRESSURE					

FIG.15D

```

<?xml version="1.0" encoding="Shift_JIS"?>
<mmdi>
  <body>
    <par>
      <acceleration src="AC000929202302.lwa" begin="0.0s" dur="243s" />
      <action- postue src="AP000929202302.lwa" begin="0.0s" dur="243s" />
      <pulse- wave src="PW000929202302.lwa" begin="0.0s" dur="243s" />
      <pulse- rate src="PR000929202302.lwa" begin="0.0s" dur="243s" />
      
      <audio src="SC000929202302.wav" begin="0.0s" dur="243s" />
    </par>
  </body>
  <recg>
    xmlns:rdf="http://www.w3c.org/1999/02/22-rdf-syntax-ns#"
    xmlns:LW="http://description.toshiba.cp.jp/LifeWare_lw"
    xmlns:LWPAR="http://description.toshiba.cp.jp/LifeWare_lw"
    : <rdf:Description about="AP000929202302.lwa">
      <LW:action_recg rdf:resource="AC000929202302.lwa">
        <rdf:Description >
          <rdf:Description about="PR000929202302.lwa">
            <LW:p-p_period rdf:resource="PW000929202302.lwa">
              <rdf:Description >
            </recg>
          </rdf:Description>
        </LW:action_recg>
      </rdf:Description>
    </recg>
  </mmdi>

```

FIG.16

```

<?xml version="1.0" encoding="Shift_JIS"?>
<lwml>
  <head>
    <sensor-module> 0001 </sensor-module>
    <sensor-position> lumbar </sensor-position>
    <data-type> acceleration </data-type>
    <dimensions> 2 </dimensions>
    <sampling-rate> 0.05 </sampling-rate>
    <date> 2000-9-29T20:23:07 </date>
    <unit-x> s </unit-x>
    <unit-y> G </unit-y>
    </label>
    <itemname> Acceleration-X </itemname>
    <itemname> Acceleration-Y </itemname>
    <label>
  </head>

  <body>
    <items>
      <item type="stream">
        -0.09521484375      0.07568359375
        -0.09521484375      0.07568359375
        -0.09521484375      0.07080078125
        -0.09521484375      0.0732421875
        -0.09521484375      0.0732421875
        -0.09521484375      0.068359375
        -0.09521484375      0.07080078125
        ⋮                      ⋮
      </item>
    </items>
  </body>
</lwml>

```

FIG.17

HEALTH CONDITION OF TODAY							
Your health condition is.....		CONCLUSION : NO PROBLEM					
		STRESS : A LITTLE HIGH					
MOVEMENT QUANTITY VS. ABSORBED CALORIE : A LITTLE SHORTAGE OF EXERCISE (500 kcal)							
SLEEP TIME : A LITTLE SHORTAGE (5 HOURS AT LAST NIGHT)							
⋮							
	PULSE RATE			BLOOD PRESSURE			TEMPERATURE
	TODAY	PAST 1W	PAST 1M	TODAY	PAST 1W	PAST 1M	TODAY
WORK (DESK WORK)	81.2	78.1	79.7	131/78	128/61	126/74	
WORK (GO OUT)	121.3	102.1	113.1				
WORK (MEETING)	120.1	90.1	89.2				
COMMUTING (TRAIN)							
COMMUTING (WALKING)							
COMMUTING (RUNNING)							
SLEEPING							
TAKING A MEAL							
⋮							
ACTION IN HOUSE							

FIG.18

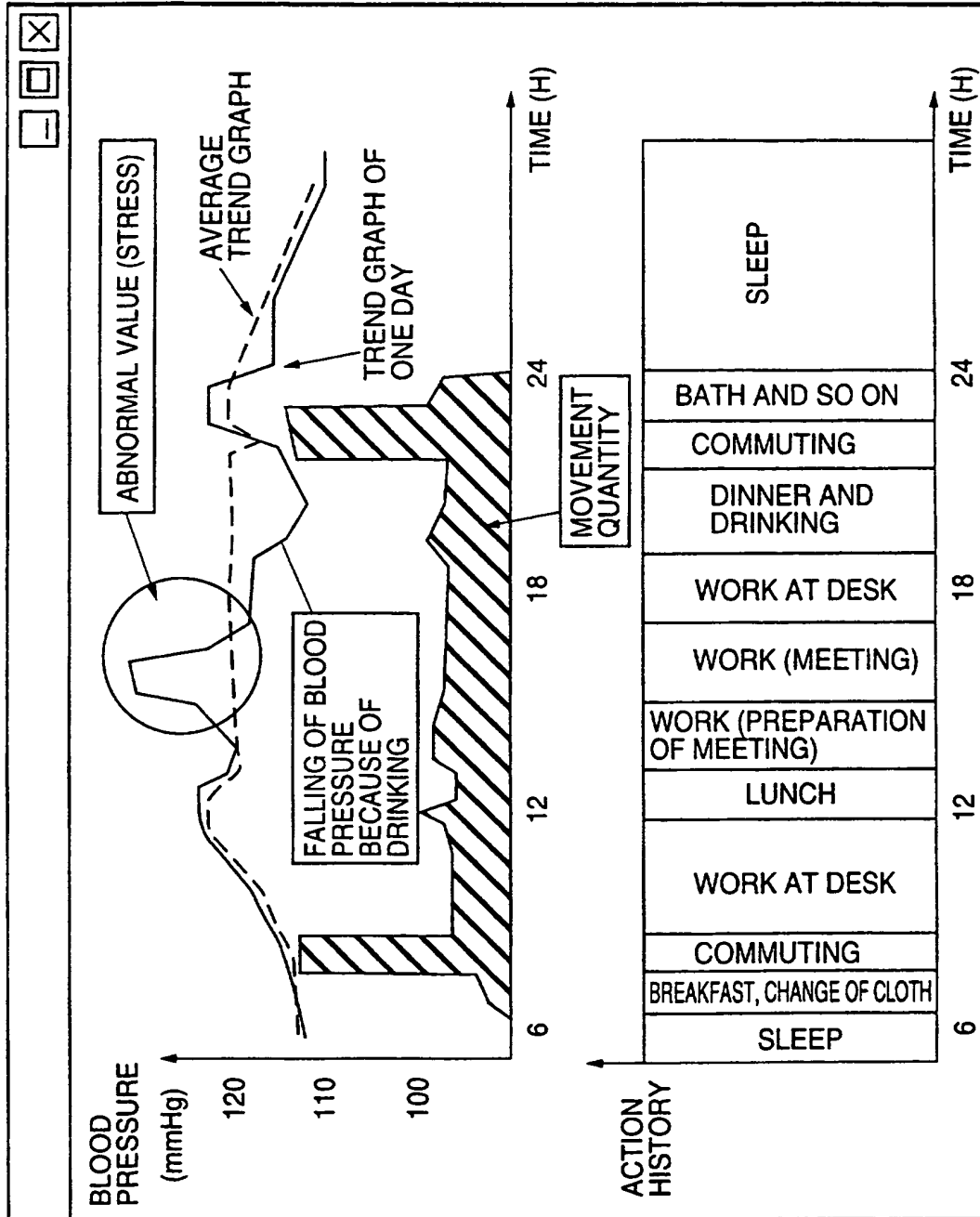


FIG.19

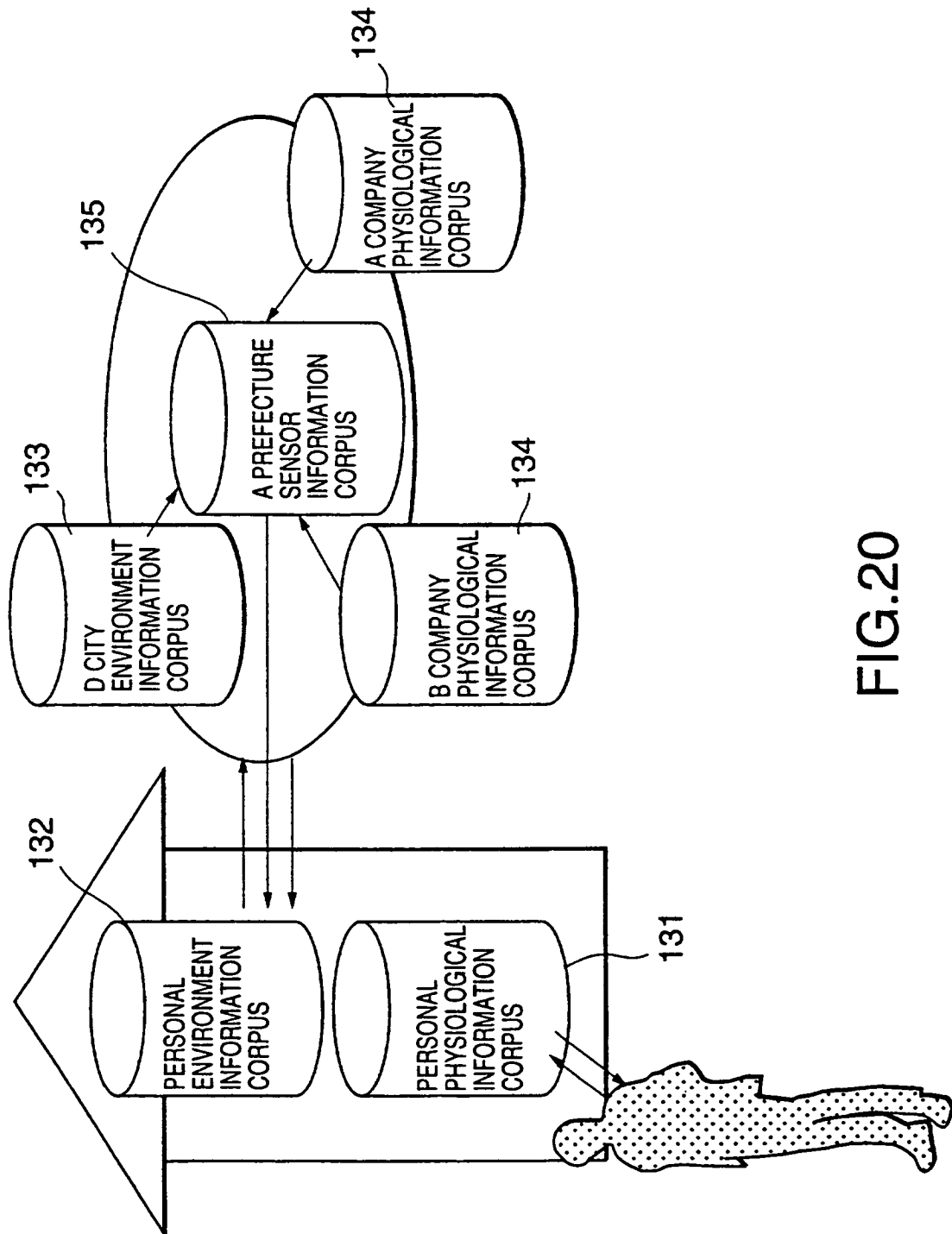


FIG.20

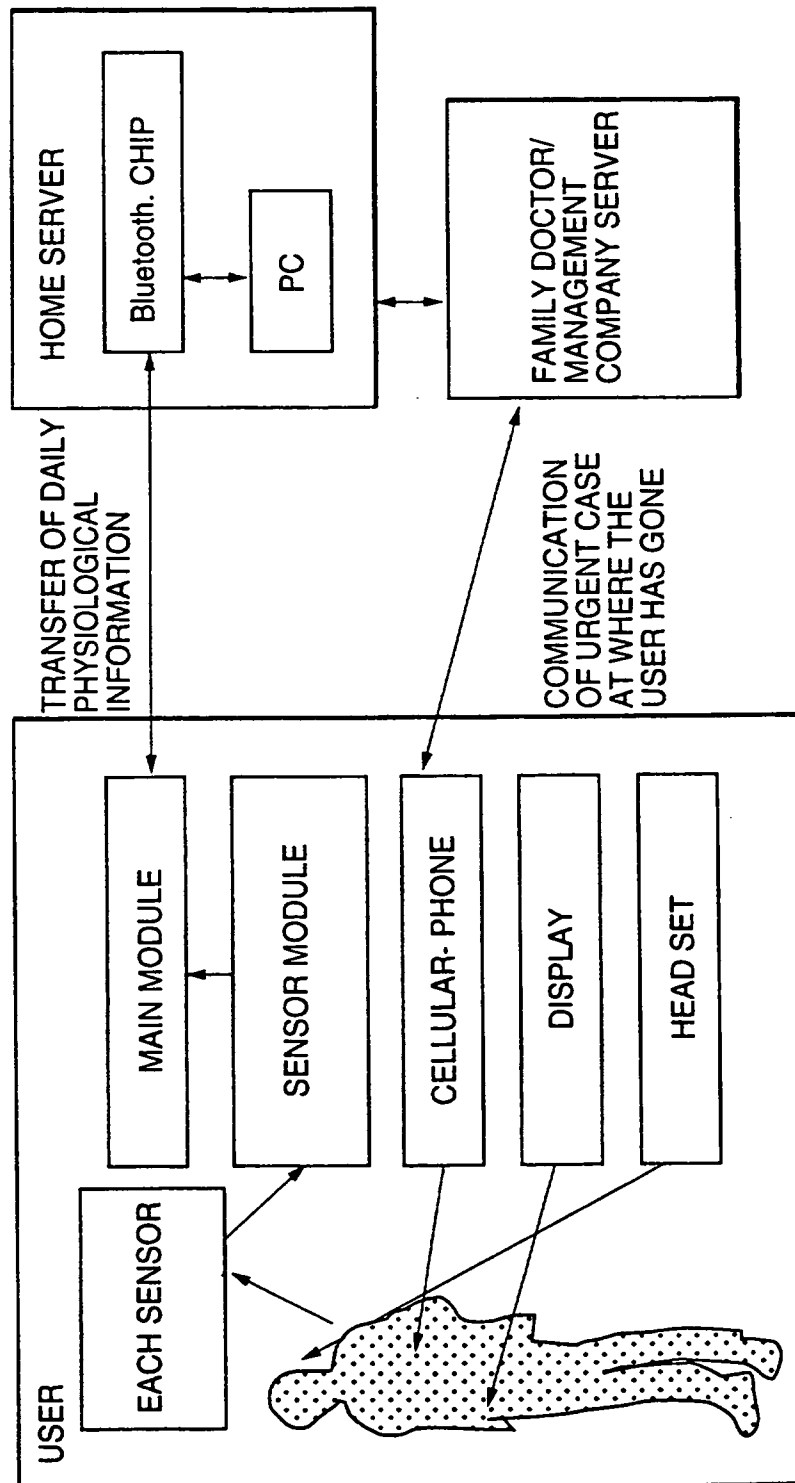


FIG.21

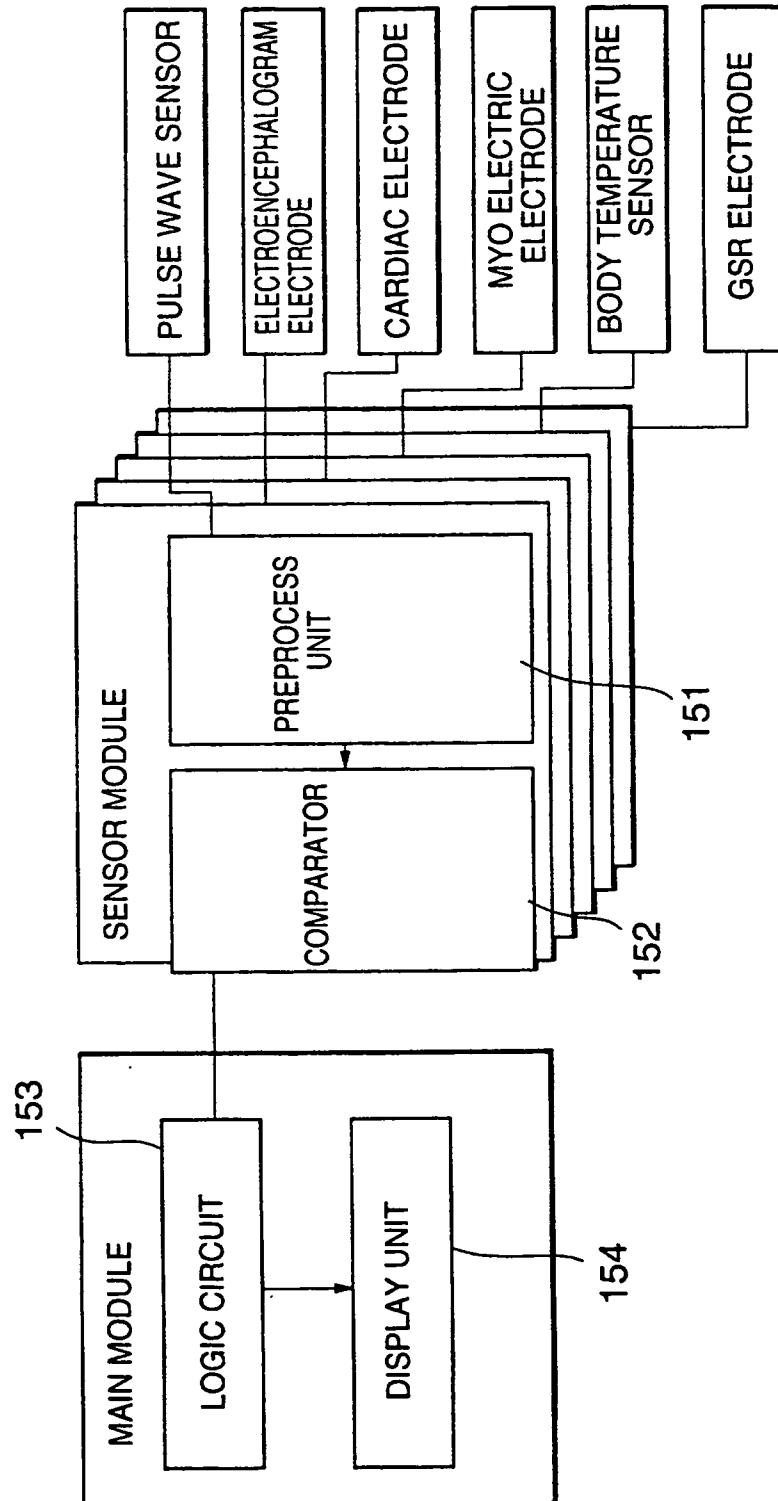


FIG.22

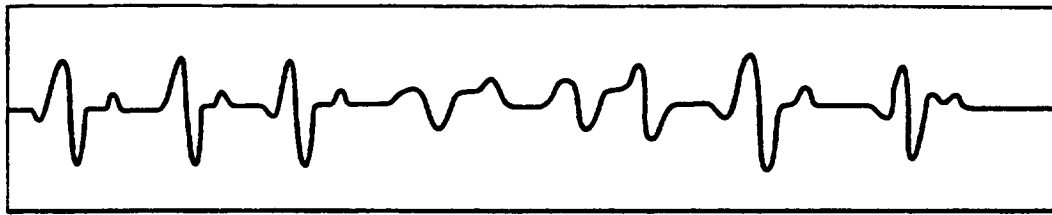


FIG.23

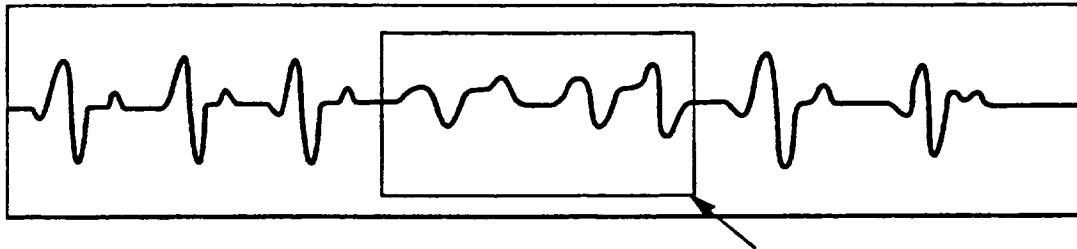


FIG.24

1. 2000/06/23 21:24:35	NO PROBLEM → <u>TO DETAIL DATA</u>
2. 2000/02/14 22:00:03	FIT AFTER 10 MINUTES → <u>TO DETAIL DATA</u>
3. 1999/11/11 19:31:42	NO PROBLEM → <u>TO DETAIL DATA</u>

FIG.25

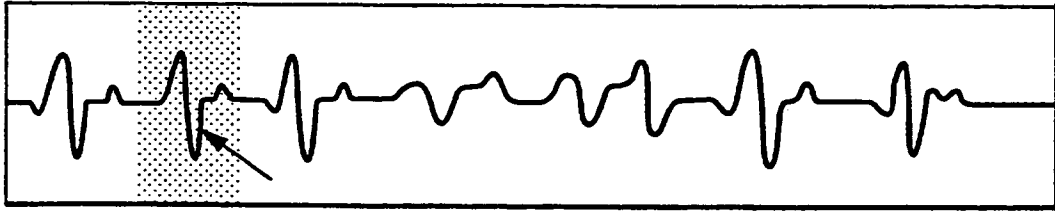


FIG.26

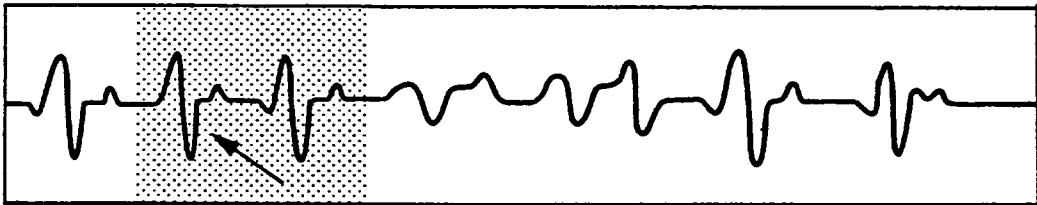


FIG.27

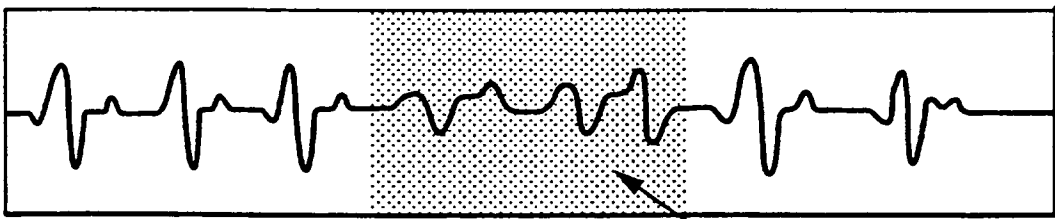


FIG.28

专利名称(译)	可穿戴式生命支持设备		
公开(公告)号	EP1136035B1	公开(公告)日	2006-05-10
申请号	EP2001302301	申请日	2001-03-13
[标]申请(专利权)人(译)	株式会社东芝		
申请(专利权)人(译)	株式会社东芝		
当前申请(专利权)人(译)	株式会社东芝		
[标]发明人	DOI MIWAKO OUCHI KAZUSHIGE SUZUKI TAKUJI		
发明人	DOI, MIWAKO OUCHI, KAZUSHIGE SUZUKI, TAKUJI		
IPC分类号	A61B5/00 A61B5/11 G06Q10/00 G06Q10/06 G06Q10/10 G06Q30/06 G06Q50/00 G06Q50/10 G06Q50/22 G06Q50/24 G08C19/00 G16H10/60		
CPC分类号	A61B5/0002 A61B5/0013 A61B5/02007 A61B5/02055 A61B5/021 A61B5/02416 A61B5/0245 A61B5/0476 A61B5/0488 A61B5/0533 A61B5/11 A61B5/1112 A61B5/1116 A61B5/749 Y10S128/903 Y10S128/92		
优先权	2000069823 2000-03-14 JP 2000329915 2000-10-30 JP		
其他公开文献	EP1136035A1		
外部链接	Espacenet		

摘要(译)

公开了一种用户佩戴的可穿戴式生命支持装置。生理信息获取单元获取单元的生理信息。动作信息获取单元获取用户的动作信息。状态识别单元根据动作信息识别用户的状态。生理信息决定单元根据用户的状态判定生理信息是否正常。呈现单元将生理信息决定单元的决定结果呈现给用户。

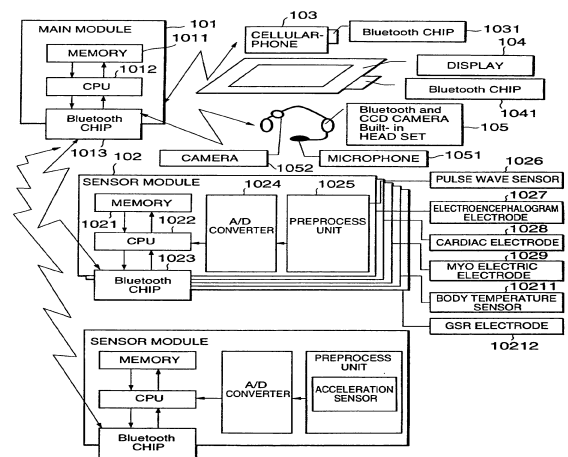


FIG. 1