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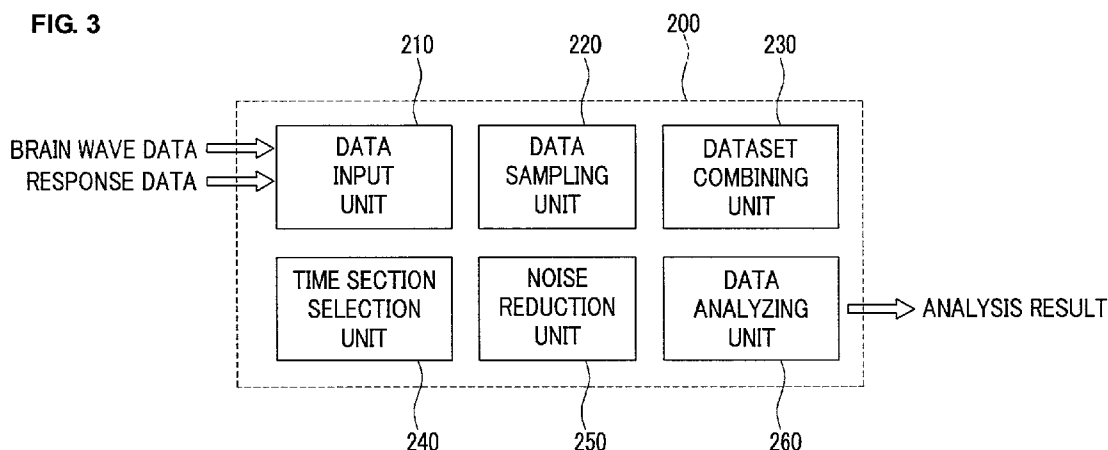
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FIG. 3



(57) Abstract: The present invention has been made in an effort to provide a system and an analysis method that judges a brain state of a user by analyzing a brain wave of the relevant user without a highly skilled expert's help to provide the judgment result to a brain wave training program for being skilled in a brain operating system (BOS). A brain wave analysis system according to the present invention includes: a data input unit that receives and stores brain wave data inputted through at least one electrode attached to a scalp of a human body and predetermined response data; a data sampling unit that converts the brain wave data and the response data into sampling datasets; a dataset combining unit that converts the plurality of sampling datasets into one combination dataset; a time section selection unit that selects a first time section serving as an analysis target with respect to the combination dataset; a noise reduction unit that generates a final dataset from which unnecessary signal components are removed from the combination dataset in which the time section serving as the analysis target is selected; and a data analyzing unit that judges the state of the brain wave of the human body by applying a brain wave analysis algorithm to the final dataset.

WO 2009/084898 A2

SYSTEM AND METHOD FOR ANALYSING BRAIN WAVE

Technical Field

The present invention relates to a system and a method for analyzing a
5 brain wave. More particularly, the present invention relates to a system and an
analysis method that judges a brain state of a user by analyzing a brain wave of
the relevant user without a highly skilled expert's help to provide a judgment
result in a brain wave training program for being skilled in a brain operating
system (BOS).

10 Background Art

A brain wave is a kind of biologic waves generated in a brain.

Even in the case of a human body, a brain wave is rhythmically
generated as a kind of voltage change in a brain region of the human body.
Further, the brain wave has a voltage range of 10 to 200 μ V in a frequency range
15 of approximately 0 to 60 Hz.

The brain wave of the human body is divided into a gamma wave
(γ -wave), an alpha wave (α -wave), a beta wave (β -wave), a delta wave (δ -wave),
and a theta wave (θ -wave) in accordance with the frequency range.

The gamma wave, which is a brain wave that has a voltage range of 2 to
20 20 μ V in a frequency band of 30 Hz or higher, is relatively frequently generated
in the frontal lobe and the parietal lobe in extremely stimulated and excited
conditions.

The alpha wave is a brain wave having a frequency band of 8 to 12.99

Hz. The alpha wave, which is generated when the mind and body keep quiet, is also referred to as "stable wave".

The beta wave has a frequency band of 13 to 30 Hz. The beta wave, which is activated in uneasy and nervous conditions, is referred to as "stress
5 wave".

The delta wave has the frequency band of 2 to 3.99 Hz. The delta wave, which is generated in sleep, is referred to as "sleep wave".

The theta wave has a frequency band of 4 to 7.99 Hz. The theta wave, which is generated in deep sleep, is referred to as "drowsy wave" or "slow-wave
10 sleep wave".

As such, since different brain waves are generated depending on the stimulation condition or mental stability of the human body, various devices using variations of the brain waves have been developed. As a representative device, a medical diagnosis device or a lie detector using the frequency of the
15 brain wave is put to practical use. In particular, various devices for promoting a learning effect by inducing mental stability are developed. In this case, a brain wave suitable for promoting the learning effect, i.e., the alpha wave, is activated at the time of using the corresponding devices.

This applicant has contrived a brain operating system (BOS) that is a
20 training curriculum to allow a user to operate a user's own brain wave state by himself/herself through special training. The user can develop a latent ability in a user's own brain, improve concentration and originality, and enhance a mental control ability and a personal relationship making ability through the BOS.

Further, this applicant intends the user to strive to be skilled in the BOS by using a brain wave training system with a brain wave training program.

In the brain wave training system, an activatable brain state is classified into five steps and a training program suitable for each step is provided to a trainee, such that the trainee can improve their ability to change their own brain state by himself/herself.

FIG. 1 is a block diagram illustrating a configuration of a known brain wave training system of this applicant.

As shown in FIG. 1, a person (hereinafter, referred to as "trainee") who undergoes brain training receives an audio-visual training program in a specific step by means of an output device 110, i.e., a monitor and a headphone. Further, in such a training course, feedback is inputted by means of a predetermined input device 120, i.e., a keyboard, a mouse, etc. An example of the feedback may include response data for a request in a specific training program.

Further, a brain wave of the trainee is inputted into a brain wave training system 100 through a brain wave measurement unit 130 attached to a trainee's scalp.

Meanwhile, a result showing a trainee's training state and a trainee's brain wave state through various means such as a trainee's electroencephalogram (EEG) topography, a trainee's response rate, etc. is displayed on an expert's output device 140 of the brain wave training system 100.

In the known brain wave training system shown in FIG. 1, a highly skilled expert personally analyzes the corresponding trainee's training state and brain wave state that are displayed on the output device of the brain wave training system and determines a trainee's current brain wave state.

5 In accordance with the known brain wave training system, the highly skilled expert is always needed to designate a training step that is suitable for the state of the corresponding brain wave by properly judging the state of the trainee's brain wave.

Accordingly, even though there is no highly skilled expert, there are
10 required a system and an analysis method that properly judge the state of the trainee's brain wave and provide the judgment result to a brain wave training program for being skilled in the BOS.

The above information disclosed in this Background section is only for enhancement of understanding of the background of the invention and therefore
15 it may contain information that does not form the prior art that is already known in this country to a person of ordinary skill in the art.

DETAILED DESCRIPTION

Technical Problem

The present invention has been made in an effort to provide a system
20 and an analysis method that judges a brain state of a user by analyzing a brain wave of the relevant user without a highly skilled expert's help to provide the judgment result to a brain wave training program for being skilled in a brain operating system (BOS).

Technical Solution

In order to achieve the above-mentioned object, an exemplary embodiment of the present invention provides a brain wave analysis system that includes: a data input unit that receives and stores brain wave data inputted through at least one electrode attached to a scalp of a human body and predetermined response data; a data sampling unit that converts the brain wave data and the response data into sampling datasets; a dataset combining unit that converts the plurality of sampling datasets into one combination dataset; a time section selection unit that selects a first time section serving as an analysis target with respect to the combination dataset; a noise reduction unit that generates a final dataset from which unnecessary signal components are removed from the combination dataset in which the time section serving as the analysis target is selected; and a data analyzing unit that judges the state of the brain wave of the human body by applying a brain wave analysis algorithm to the final dataset.

Another embodiment of the present invention provides a brain wave analysis method that includes: a data input step of receiving and storing brain wave data inputted through at least one electrode to a scalp of a human body and predetermined response data in a data input unit; a data sampling step of converting the brain wave data and the response data into sampling datasets in a data sampling unit; a dataset combining step of converting the plurality of sampling datasets into one combination dataset in a dataset combining unit; a time section selection step of selecting a first time section serving as an analysis

target in the combination dataset in a time section selection unit; a noise reduction step of removing unnecessary signal components from the combination dataset in which the time section serving as the analysis target is selected and generating a final dataset in a noise reduction unit; and a data
5 analyzing step of judging the state of the brain wave of the human body in a data analyzing unit by applying a brain wave analysis algorithm to the final dataset.

At this time, the data analyzing step further includes: the step of determining that the human body has a first-step brain wave state when there is no change in an alpha wave signal component of the occipital lobe within the first
10 time section of the final dataset; the step of judging that the human body has a second-step brain wave state when the alpha wave signal component of the occipital lobe is attenuated and there is no change in the alpha wave signal component of the parietal lobe within the first time section of the final dataset; the step of determining that the human body has a third-step brain wave state
15 when both the alpha wave signal component of the occipital lobe and the alpha wave signal component of the parietal lobe are attenuated and there is no change in the gamma wave signal component within the first time section of the final dataset; the step of determining that the human body has a fourth-step brain wave state when all of the alpha wave signal component of the occipital
20 lobe, the alpha wave signal component of the parietal lobe, and the gamma wave signal component are attenuated, and the percentage of correct answers is less than a predetermined threshold value within the first time section of the final dataset; and the step of determining that the human body has a fifth-step

brain wave state when all of the alpha wave signal component of the occipital lobe, the alpha wave signal component of the parietal lobe, and the gamma wave signal component are attenuated, and the percentage of correct answers is equal to or more than the predetermined threshold value within the first time
5 section of the final dataset.

Advantageous Effects

By using a system and a method for analyzing a brain wave according to the present invention, the system for analyzing a brain wave automatically judges a brain state of a user by analyzing a brain wave of the relevant user
10 without a highly skilled expert's help to provide the judgment result to a brain wave training program for being skilled in a brain operating system (BOS).

Brief Description of the Drawings

FIG. 1 is a block diagram illustrating a configuration of a known brain wave training system of this applicant;

15 FIG. 2 is a configuration diagram of a brain wave analysis system according to an exemplary embodiment of the present invention;

FIG. 3 is a block diagram of the brain wave analysis system of FIG. 2;

FIG. 4 is a table illustrating an example of an algorithm for determining a state of a brain wave in a data analysis unit 260;

20 FIG. 5 is a flowchart illustrating the flow of a brain wave analysis method according to an exemplary embodiment of the present invention; and

FIG. 6 is a flowchart more specifically illustrating a data analysis step S160.

Best Mode

In the following detailed description, only certain exemplary embodiments of the present invention have been shown and described, simply by way of illustration. As those skilled in the art would realize, the described
5 embodiments may be modified in various different ways, all without departing from the spirit or scope of the present invention. Accordingly, the drawings and description are to be regarded as illustrative in nature and not restrictive. Like reference numerals designate like elements throughout the specification.

In addition, throughout the specification, unless explicitly described to the
10 contrary, the word "comprise" and variations such as "comprises" or "comprising" will be understood to imply the inclusion of stated elements but not the exclusion of any other elements. Further, each of terms such as "... unit", "... member", "module", "block", etc. that are disclosed in the specification represent a unit that processes at least one function or operation. Each of the
15 terms may be implemented by hardware, software, or a combination of hardware and software.

Hereinafter, a brain wave analysis system and a brain wave analysis method according to an exemplary embodiment of the present invention will be described in detail with reference to the accompanying drawings.

20 FIG. 2 is a configuration diagram of a brain wave analysis system according to an exemplary embodiment of the present invention.

A brain wave analysis system 200 according to the exemplary embodiment of the present invention, which is shown in FIG. 2, plays a role of a

highly skilled expert who judges a trainee's brain wave state in the known brain wave training system 100 of FIG. 1 through an expert's output device 140 instead of the expert.

That is, brain wave data measured by a brain wave measurement unit 290 attached to the trainee and response data on a predetermined training program provided through an output device 270, which is inputted through an input device 280 by the trainee, are inputted to the brain wave analysis system 200, and a predetermined analysis procedure with respect to the data is performed such that a brain wave state of the corresponding trainee is determined.

Such a brain wave resultant value is again fed back to the training program, such that a training program suitable for the trainee's brain wave state may be provided to the trainee.

FIG. 3 is a block diagram of the brain wave analysis system of FIG. 2.

As shown in FIG. 3, the brain wave analysis system 200 according to the exemplary embodiment of the present invention includes a data input unit 210, a data sampling unit 220, a dataset combining unit 230, a time section selection unit 240, a noise reduction unit 250, and a data analyzing unit 260.

The data input unit 210 serves to load the brain wave data and the response data from the trainee.

The brain wave data and the response data that are inputted into the data input unit 210 are acquired through a brain wave measurement test executed by the training program of the brain wave training system.

The brain wave measurement test is executed several times. At least one of the brain wave data and the response data is acquired through the brain wave measurement test.

During a one-time brain wave measurement test, the brain wave data
5 measured from electrodes attached to 16 scalp regions are inputted into the data input unit 210 for each channel. More specifically, the brain wave data are stored in a predetermined storage in the data input unit 210 for each channel. Further, after input data inputted through an input device 280 in response to a response request provided through a trainee's output device 270 is transmitted
10 to the data input unit 210 during the brain wave measurement test, the response data is stored in a predetermined storage.

As such, brain wave and response data that are inputted from a specific trainee are loaded in the data input unit 210 for analyzing the brain wave data and the response data. Various analysis tools of the brain wave data have
15 been provided in recent years, but in this exemplary embodiment, the brain wave data and the response data are loaded through a tool such as MATLAB EEG LAB.

The data sampling unit 220 serves to convert the loaded brain wave data and response data into a dataset that is suitable for performing an independent
20 component analysis (ICA).

The object of the independent component analysis is to divide mixed data inputted through the electrodes for measuring the brain wave into original independent signals.

For example, by performing the independent component analysis, independent components (signals) such as a brain wave generated when eyes are blinked and a brain wave generated when an eyeball is moved may be separated from the mixed data measured in the electrodes. Therefore, the
5 brain wave analysis system according to the present invention can also completely separate only brain wave components required for analysis.

Since various patterns of actions generated in a human body generally follow a probability model, the independent component analysis can be performed. Various algorithms for the independent component analysis have
10 been developed in recent years. Various independent component analyses may be applied even to the brain wave analysis system according to the present invention.

In this exemplary embodiment, the independent component analysis is applied to the brain wave data based on an algorithm developed by Makeig.

15 That is, a one-time brain wave measurement test is performed and the resultant series of brain wave data are stored as one dataset. The brain wave data may be stored in the form of an ASCII text file, as an example.

After the dataset relating to the one-time brain wave data is loaded together with response data generated in the relevant time section, the data set
20 is converted into a new dataset (hereinafter, referred to as "sampling dataset") with respect to the relevant brain wave measurement test through sampling.

The dataset combining unit 230 serves to combine a plurality of sampling datasets converted through the data sampling into one so as to convert the

sampling datasets into a format suitable for performing the independent component analysis.

As described above, the brain wave measurement test is repeatedly performed several times and individual sampling datasets are generated for each of the brain wave measurement tests.

The dataset combining unit 230 loads a plurality of sampling datasets with respect to the brain wave measurement test that is repeatedly performed several times and thereafter generates a new incorporated dataset (hereinafter, "combination dataset").

The time section selection unit 240 serves to set a time section serving as an analysis target in the combination dataset.

The brain wave data basically has a continuous attribute with respect to time.

Accordingly, it is very important to set an analysis section in order to accurately judge what response is generated in a specific time section. A process of setting the analysis section is referred to as epoching.

The time section selection unit 240 calls in the combination dataset and thereafter sets a data section including all time sections of ready, stimulus, and response among response data from the trainee during the brain wave measurement test.

As an example of selecting the time section, 5.1 sec. may be set around a response point of time, but it may be appropriately increased or decreased depending on an algorithm performance result. Further, 0.1 sec. represents a

time for facilitating performance of a brain wave analysis algorithm.

The noise reduction unit 250 serves to remove unnecessary components for analysis of the brain wave from the brain wave data measured in the brain wave measurement test.

5 For example, a brain wave signal data relating to movement of muscles, eyelid blink, or movement of an eyeball is an unnecessary component for the analysis of the brain wave according to the present invention.

Therefore, the noise reduction unit 250 reduces the unnecessary signal components existing within the time section selected by the time section
10 selection unit 240 in the combination dataset through the above-mentioned independent component analysis.

For convenience, the combination dataset from which the unnecessary signal components are reduced with respect to the selected time section is referred to as "final dataset".

15 The data analyzing unit 260 serves to determine the state of the brain by applying the brain wave analysis algorithm to the final dataset according to the present invention.

FIG. 4 is a table illustrating an example of the algorithm for determining the state of the brain wave in the data analyzing unit 260.

20 As shown in FIG. 4, the state of the brain may be divided into 5 steps by applying the brain wave analysis algorithm to the final dataset.

Independent components in columns of the table are pure brain wave components from which all unnecessary signal components are removed by the

noise reduction unit 250. In the exemplary embodiment, three brain components such as an alpha wave of the occipital lobe, an alpha wave of the parietal lobe, and a gamma wave are used for analysis. In addition to the brain wave components, the trainee's response data is adopted in judging the state of the brain wave.

In the first step, the alpha wave of the occipital lobe and the alpha wave of the parietal lobe do not show significant variation within the selected time section.

This represents that even though the trainee receives a stimulus from the brain wave training system within the selected time section, the trainee shows no response. This step may be discriminated as the lowest step among 5 brain wave states.

In the case in which the alpha wave of the occipital lobe is attenuated in response to the stimulus within the time section, this step may be classified as the second step by being discriminated from the first step.

Meanwhile, since the occipital lobe of the cerebrum takes charge of eyesight, the attenuation of the alpha wave of the occipital lobe means that the trainee acquires improved concentration with respect to a visual stimulus from the brain wave training system.

In the third step, both the alpha wave of the occipital lobe and the alpha wave of the parietal lobe are attenuated in response to the stimulus within the selected time section.

The parietal lobe is a cerebral region that takes charge of human thought.

Therefore, attenuation of the alpha wave of the parietal lobe with respect to the stimulus from the brain wave training system means that a brain region (brain power) that was not generally used is used at a predetermined level or more.

In the fourth step, all of the alpha wave of the occipital lobe, the alpha
5 wave of the parietal lobe, and the gamma wave are attenuated in response to the stimulus from the brain wave training system within the selected time section.

Lastly, in the fifth step, all of the alpha wave of the occipital lobe, the alpha wave of the parietal lobe, and the gamma wave are attenuated and the
10 trainee's response data has a threshold value or more.

The trainee's response data may be a correct answer or an incorrect answer by the request of the corresponding training program.

As an example, a content of the training program may be a response request of a content of guessing a correct card after covering the eyes, or since
15 the final dataset includes a plurality of trainee's response data acquired through the several repetitive brain wave measurement tests, the percentage of correct answers of the response data may be thereby acquired.

The data analyzing unit 260 calculates the percentage of correct answers of the response data on the basis of the plurality of response data
20 included in the final dataset and judges whether the percentage of correct answers has a predetermined threshold value or more. In this case, the data analyzing unit 260 determines the state of the trainee's brain wave as the fifth-step state when all of the alpha wave of the occipital lobe, the alpha wave of

the parietal lobe, and the gamma wave are attenuated and the percentage of correct answers has a threshold value (e.g., 75%) or more.

Through such a process, the brain wave analysis system 200 according to the exemplary embodiment determines the state of the trainee's brain wave as any one of 5 brain steps that are discriminated from each other on the basis of the brain wave data and the response data from the relevant trainee.

Such an analysis result is fed back to the brain wave training system connected to the brain wave analysis system 200, such that the brain wave training system continuously provides a training program suitable for the corresponding brain step to the trainee.

FIG. 5 is a flowchart illustrating the flow of a brain wave analysis method according to an exemplary embodiment of the present invention.

As shown in FIG. 5, the brain wave analysis method according to the exemplary embodiment of the present invention generally includes a data input step S110, a data sampling step S120, a dataset combining step S130, a time section selection step S140, a noise reduction step S150, and a data analyzing step S160.

In the data input step S110, the brain wave data and response data are loaded, and are inputted and stored in the data input unit 210 of the brain wave measurement system 200 from the trainee.

In the data sampling step S120, the loaded brain wave data and response data are converted into a sampling data set by the data sampling unit 220.

In the dataset combining step S130, the sampling datasets that are subjected to several data samplings are combined by the dataset combining unit 230, such that the combination dataset is generated.

5 In the time section selection step S140, the time section serving as the analysis target in the combination dataset is set by the time section selection unit 240.

At this time, the time section that becomes the analysis target is set to include all time sections of ready, stimulus, and response among the response data from the trainee during the brain wave measurement test.

10 In the noise reduction step S150, after the unnecessary components for analysis of the brain wave are removed from the brain wave data measured in the brain wave measurement test by the noise reduction unit 250, the final dataset is generated.

15 In the data analyzing step S160, the state of the brain wave is determined by the data analyzing unit 260 through application of the brain wave analysis algorithm to the final dataset.

FIG. 6 is a flowchart more specifically illustrating the data analysis step S160.

20 As shown in FIG. 6, the data analyzing step S160 further includes the steps of judging whether the alpha wave of the occipital lobe is attenuated within the selected time section (S162), judging whether the alpha wave of the parietal lobe is attenuated (S164), judging whether the gamma wave is attenuated (S166), and judging whether the response data has a predetermined threshold

value or more (S168).

In accordance with the result for each subordinate step, as described above by referring to FIG. 4, the state of the trainee's brain wave can be judged by five steps including the first to fifth steps that are discriminated from each other.

Although the exemplary embodiments of the present invention are not only implemented by the above-mentioned system and/or method, the exemplary embodiments may be implemented by a program for realizing functions corresponding to constituent members of the embodiments of the present invention and a recording medium in which the program is recorded. In addition, the implementation will be easily made by those skilled in the art according to the exemplary embodiment of the present invention.

While this invention has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

CLAIMS**Claim 1**

A brain wave analysis system comprising:

5 a data input unit that receives and stores brain wave data inputted through at least one electrode attached to a scalp of a human body and predetermined response data;

a data sampling unit that converts the brain wave data and the response data into sampling datasets;

10 a dataset combining unit that converts the plurality of sampling datasets into one combination dataset;

a time section selection unit that selects a first time section serving as an analysis target with respect to the combination dataset;

15 a noise reduction unit that generates a final dataset from which unnecessary signal components are removed from the combination dataset in which the time section serving as the analysis target is selected; and

a data analyzing unit that judges the state of the brain wave of the human body by applying a brain wave analysis algorithm to the final dataset.

Claim 2

20 The brain wave analysis system of claim 1, wherein

one electrode is attached to each of 16 regions of the scalp, and the brain wave data is stored in the data input unit as 16 channels by one channel for each electrode attached to the 16 regions.

Claim 3

The brain wave analysis system of claim 2, wherein
a second time section in which the brain wave data is measured
5 coincides with a third time section in which the response data is measured.

Claim 4

The brain wave analysis system of claim 3, wherein
the first time section is selected to include all time sections of a ready
10 time section, a stimulus time section, and a response time section with respect to
the human body.

Claim 5

The brain wave analysis system of claim 4, wherein
15 the final dataset includes an alpha wave signal component of the
occipital lobe, an alpha wave signal component of the parietal lobe, and a
gamma wave signal component.

Claim 6

20 The brain wave analysis system of claim 5, wherein
the brain wave analysis algorithm determines that the human body has a
first-step brain wave state when there is no change in the alpha wave signal

component of the occipital lobe within the first time section of the final dataset.

Claim 7

The brain wave analysis system of claim 6, wherein

5 the brain wave analysis algorithm determines that the human body has a second-step brain wave state when the alpha wave signal component of the occipital lobe is attenuated and there is no change in the alpha wave signal component of the parietal lobe within the first time section of the final dataset.

Claim 8

The brain wave analysis system of claim 7, wherein

10 the brain wave analysis algorithm determines that the human body has a third-step brain wave state when both the alpha wave signal component of the occipital lobe and the alpha wave signal component of the parietal lobe are
15 attenuated and there is no change in the gamma wave signal component within the first time section of the final dataset.

Claim 9

The brain wave analysis system of claim 8, wherein

20 the brain wave analysis algorithm determines that the human body has a fourth-step brain wave state when all of the alpha wave signal component of the occipital lobe, the alpha wave signal component of the parietal lobe, and the gamma wave signal component are attenuated, and the percentage of correct

answers is less than a predetermined threshold value within the first time section of the final dataset.

Claim 10

5 The brain wave analysis system of claim 9, wherein

 the brain wave analysis algorithm determines that the human body has a fifth-step brain wave state when all of the alpha wave signal component of the occipital lobe, the alpha wave signal component of the parietal lobe, and the gamma wave signal component are attenuated, and the percentage of correct
10 answers is equal to or more than the predetermined threshold value within the first time section of the final dataset.

Claim 11

 The brain wave analysis system of claim 10, wherein

15 the percentage of correct answers is acquired by dividing the number of the response data corresponding to a correct answers among the plurality of response data included in the final dataset by the total number of the response data.

Claim 12

20 An analysis method of a brain wave analysis system, comprising
 a data input step of receiving and storing brain wave data inputted through at least one electrode to a scalp of a human body and predetermined

response data in a data input unit;

a data sampling step of converting the brain wave data and the response data into sampling datasets in a data sampling unit;

a dataset combining step of converting the plurality of sampling datasets
5 into one combination dataset in a dataset combining unit;

a time section selection step of selecting a first time section serving as an analysis target in the combination dataset in a time section selection unit;

a noise reduction step of removing unnecessary signal components from the combination dataset in which the time section serving as the analysis target
10 is selected and generating a final dataset in a noise reduction unit; and

a data analyzing step of judging the state of the brain wave of the human body in a data analyzing unit by applying a brain wave analysis algorithm to the final dataset.

15 **Claim 13**

The analysis method of claim 12, wherein

the data analyzing step further includes the step of determining that the human body has a first-step brain wave state when there is no change in an alpha wave signal component of the occipital lobe within the first time section of
20 the final dataset.

Claim 14

The analysis method of claim 13, wherein

the data analyzing step further includes the step of judging that the human body has a second-step brain wave state when the alpha wave signal component of the occipital lobe is attenuated and there is no change in the alpha wave signal component of the parietal lobe within the first time section of the
5 final dataset.

Claim 15

The analysis method of claim 14, wherein

the data analyzing step further includes the step of determining that the
10 human body has a third-step brain wave state when both the alpha wave signal component of the occipital lobe and the alpha wave signal component of the parietal lobe are attenuated and there is no change in the gamma wave signal component within the first time section of the final dataset.

Claim 16

The analysis method of claim 15, wherein

the data analyzing step further includes the step of determining that the human body has a fourth-step brain wave state when all of the alpha wave signal component of the occipital lobe, the alpha wave signal component of the parietal
20 lobe, and the gamma wave signal component are attenuated, and the percentage of correct answer is less than a predetermined threshold value within the first time section of the final dataset.

Claim 17

The analysis method of claim 16, wherein

the data analyzing step further includes the step of determining that the human body has a fifth-step brain wave state when all of the alpha wave signal component of the occipital lobe, the alpha wave signal component of the parietal lobe, and the gamma wave signal component are attenuated, and the percentage of correct answers is equal to or more than the predetermined threshold value within the first time section of the final dataset.

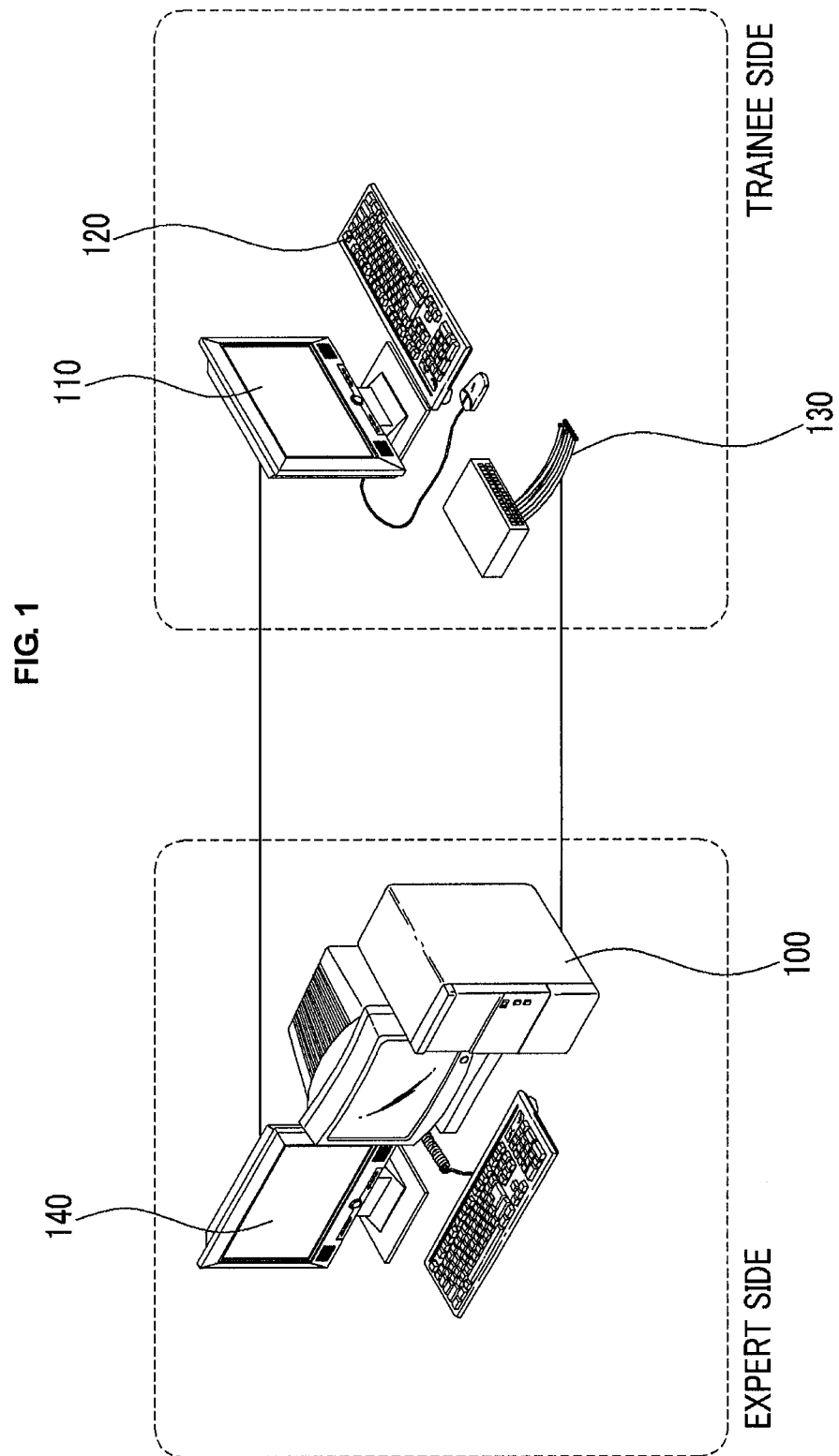


FIG. 2

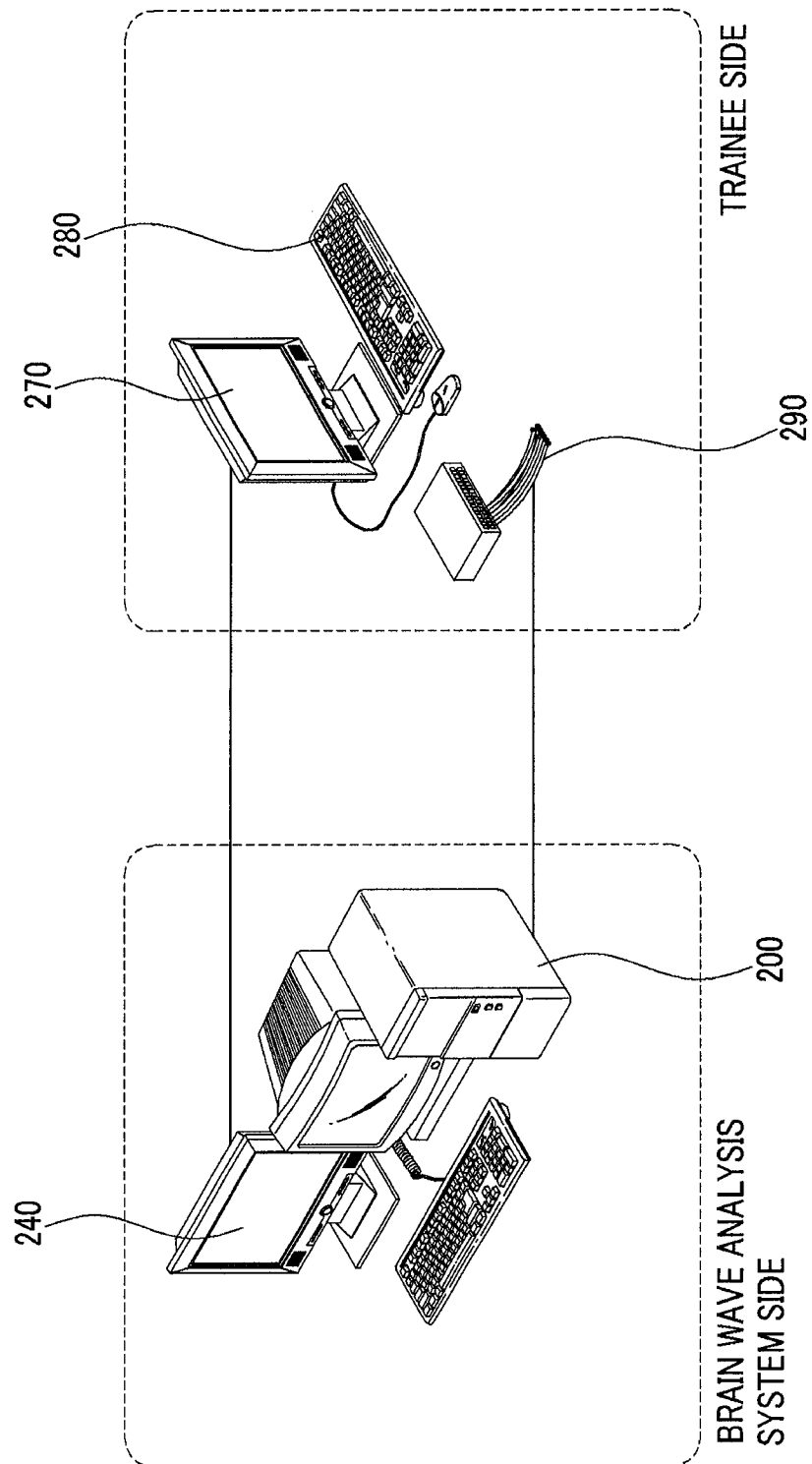


FIG. 3

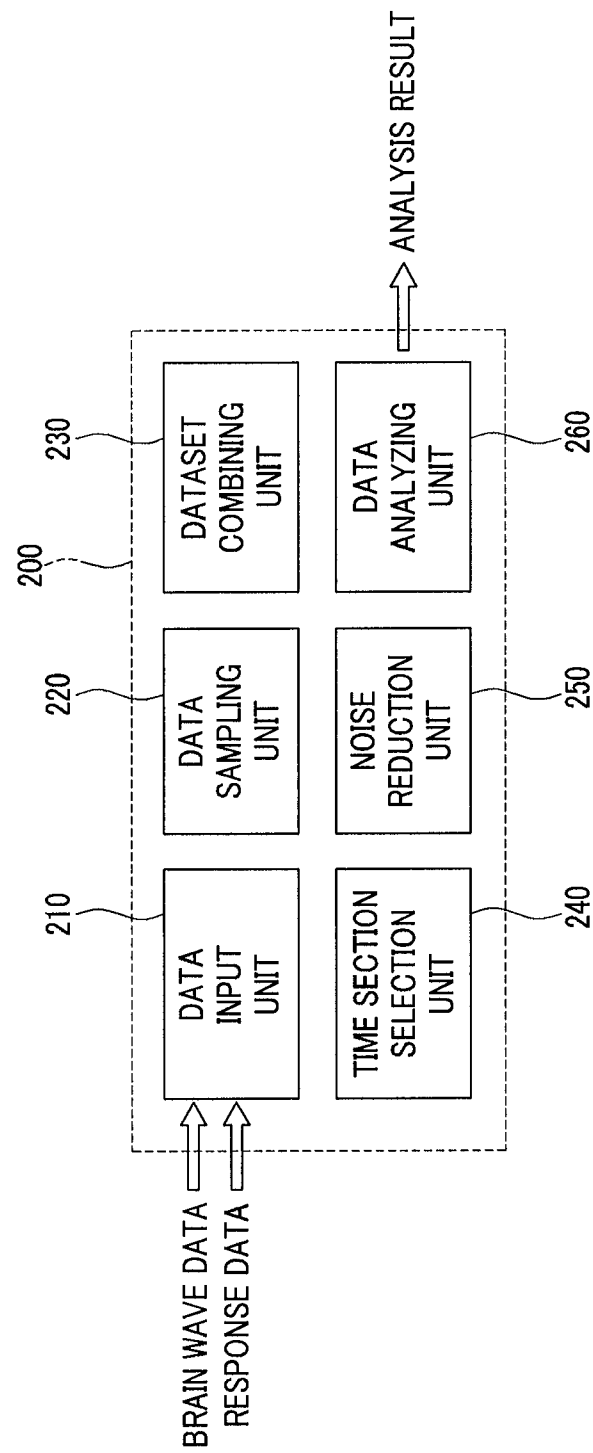


FIG. 4

BRAIN WAVE STATE INDEPENDENT COMPONENT	FIRST STEP	SECOND STEP	THIRD STEP	FOURTH STEP	FIFTH STEP
ALPHA WAVE OF OCCIPITAL LOBE	NOT CHANGED	ATTENUATED	ATTENUATED	ATTENUATED	ATTENUATED
ALPHA WAVE OF PARIETAL LOBE	NOT CHANGED	NOT CHANGED	ATTENUATED	ATTENUATED	ATTENUATED
GAMMA WAVE	NOT CHANGED	NOT CHANGED	NOT CHANGED	ATTENUATED	ATTENUATED
RESPONSE DATA	LESS THAN THRESHOLD VALUE	LESS THAN THRESHOLD VALUE	LESS THAN THRESHOLD VALUE	LESS THAN THRESHOLD VALUE	THRESHOLD VALUE OR MORE

FIG. 5

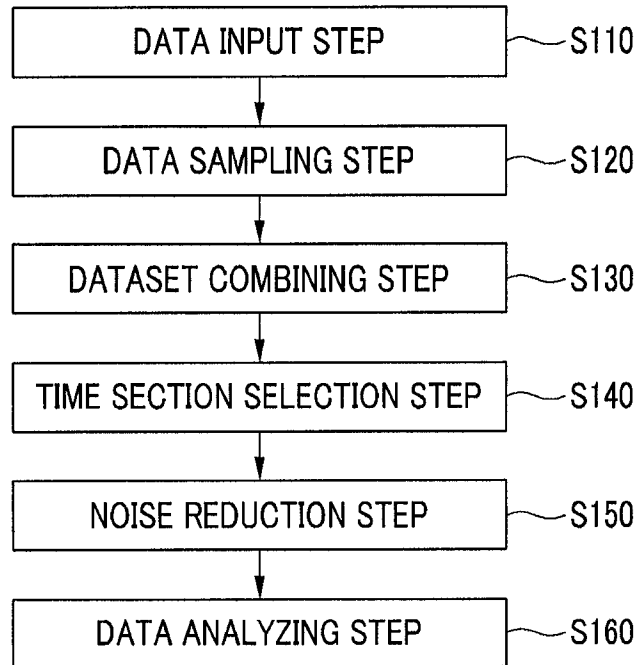


FIG. 6

