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(54) **METHOD OF ESTIMATING INTERNET ACTIVITY DEPENDENCE OF A HUMAN SUBJECT**

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(52) **U.S. Cl.**

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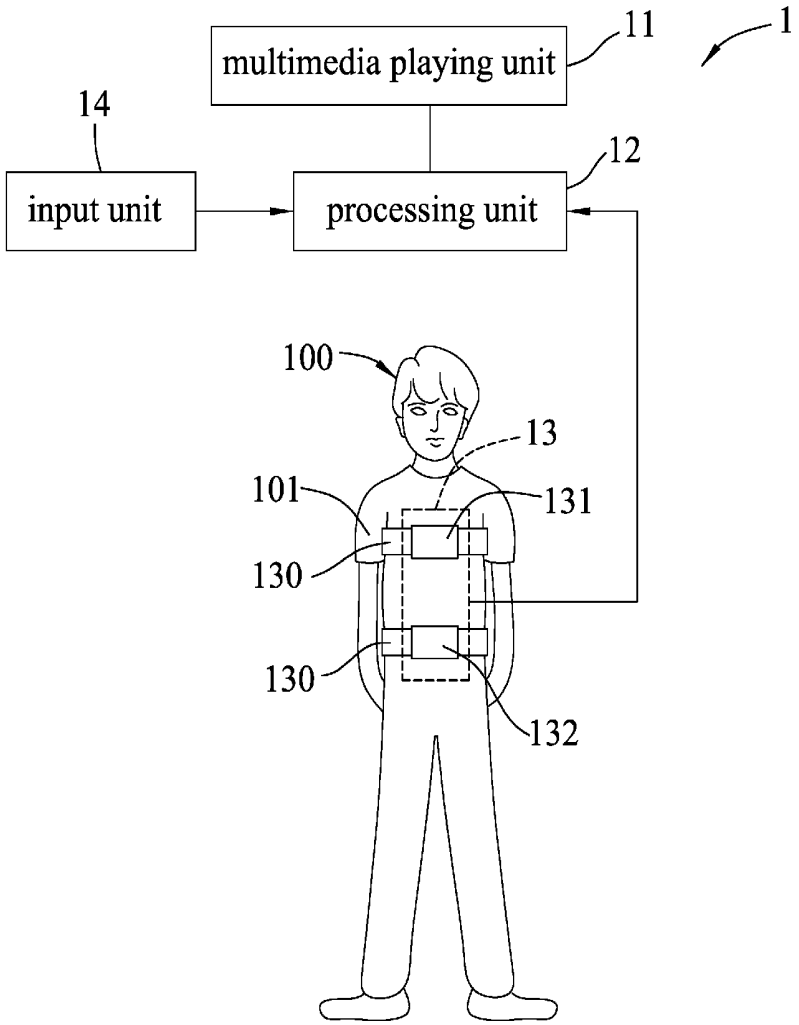
(57) **ABSTRACT**

In a method of estimating Internet activity dependence of a human subject, a respiration sensing unit senses respiration-caused thoracic and abdominal movements of the human subject during a first time period, and a subsequent second time period during which an emotion stimulating material played on a multimedia playing unit is being watched by the human subject so as to generate two sets of thoracic and abdominal respiratory signals corresponding respectively to the first and second time periods. A processing unit generates an estimation result associated with the Internet activity dependence based on the emotion stimulating material and the sets of thoracic and abdominal respiratory signals.



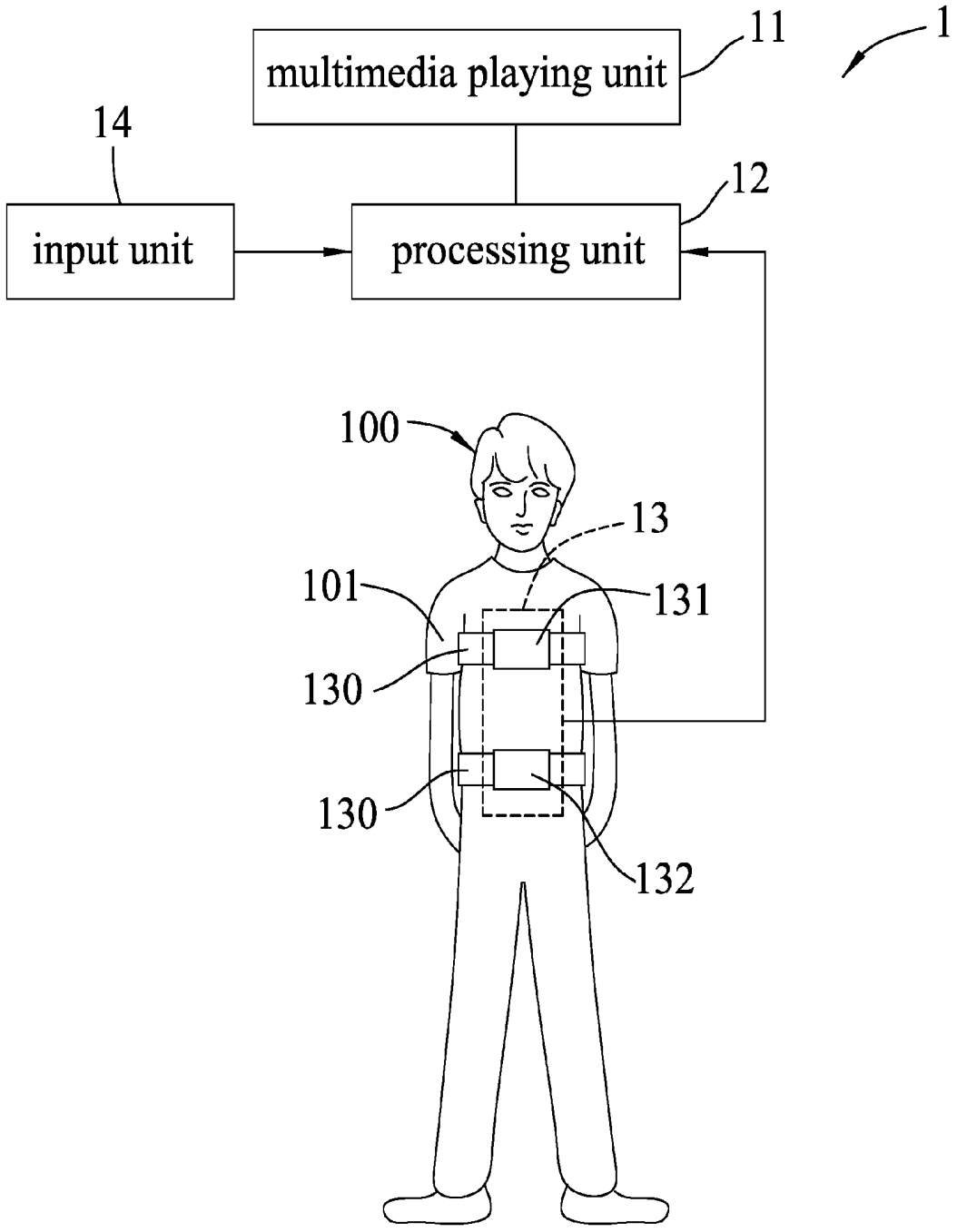

1
11
multimedia playing unit
14
12
input unit
processing unit
100
13
101
131
130
130
132

FIG.1

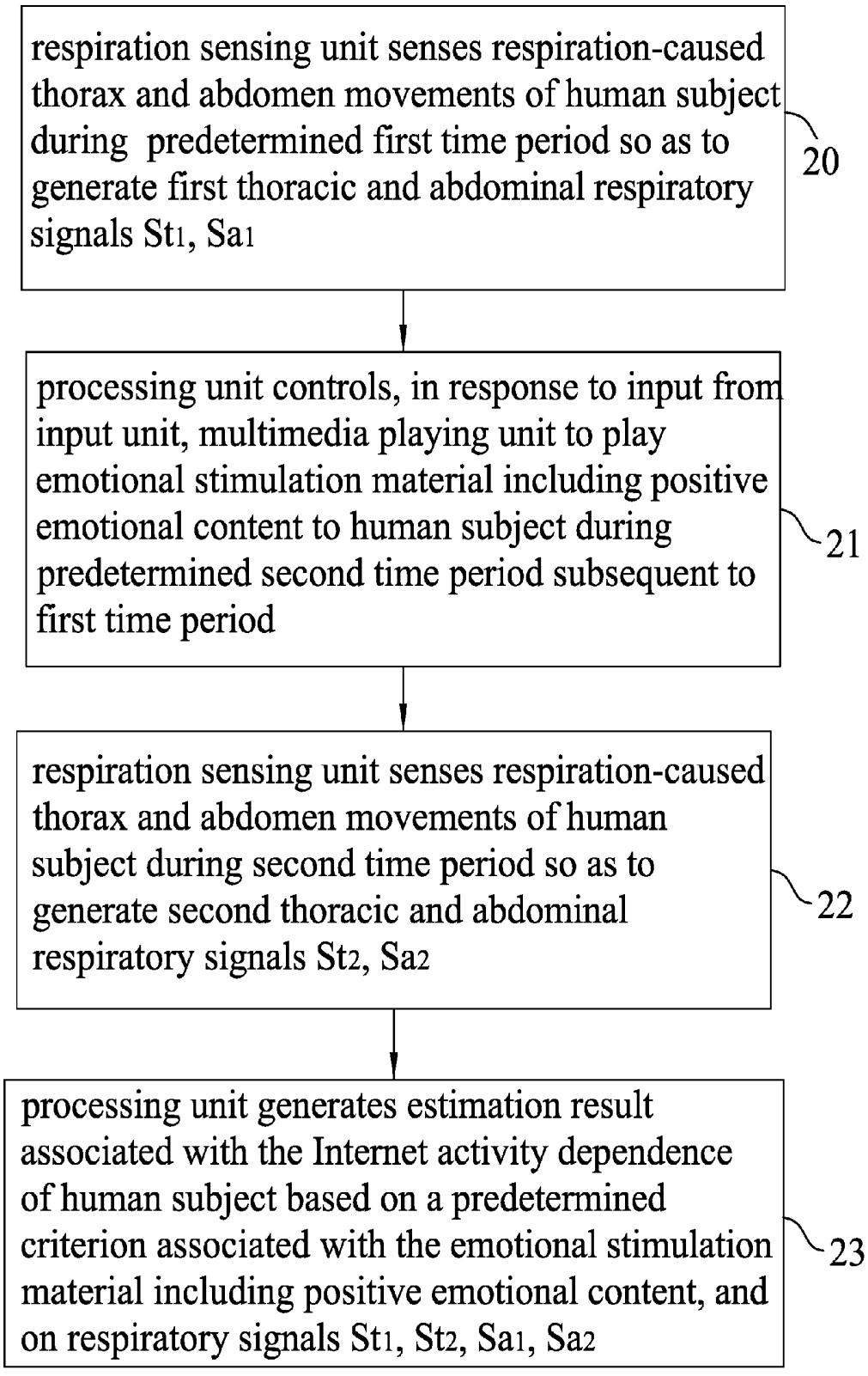

respiration sensing unit senses respiration-caused thorax and abdomen movements of human subject during predetermined first time period so as to generate first thoracic and abdominal respiratory signals St1, Sa1
20
processing unit controls, in response to input from input unit, multimedia playing unit to play emotional stimulation material including positive emotional content to human subject during predetermined second time period subsequent to first time period
21
respiration sensing unit senses respiration-caused thorax and abdomen movements of human subject during second time period so as to generate second thoracic and abdominal respiratory signals St2, Sa2
22
processing unit generates estimation result associated with the Internet activity dependence of human subject based on a predetermined criterion associated with the emotional stimulation material including positive emotional content, and on respiratory signals St1, St2, Sa1, Sa2
23

FIG.2

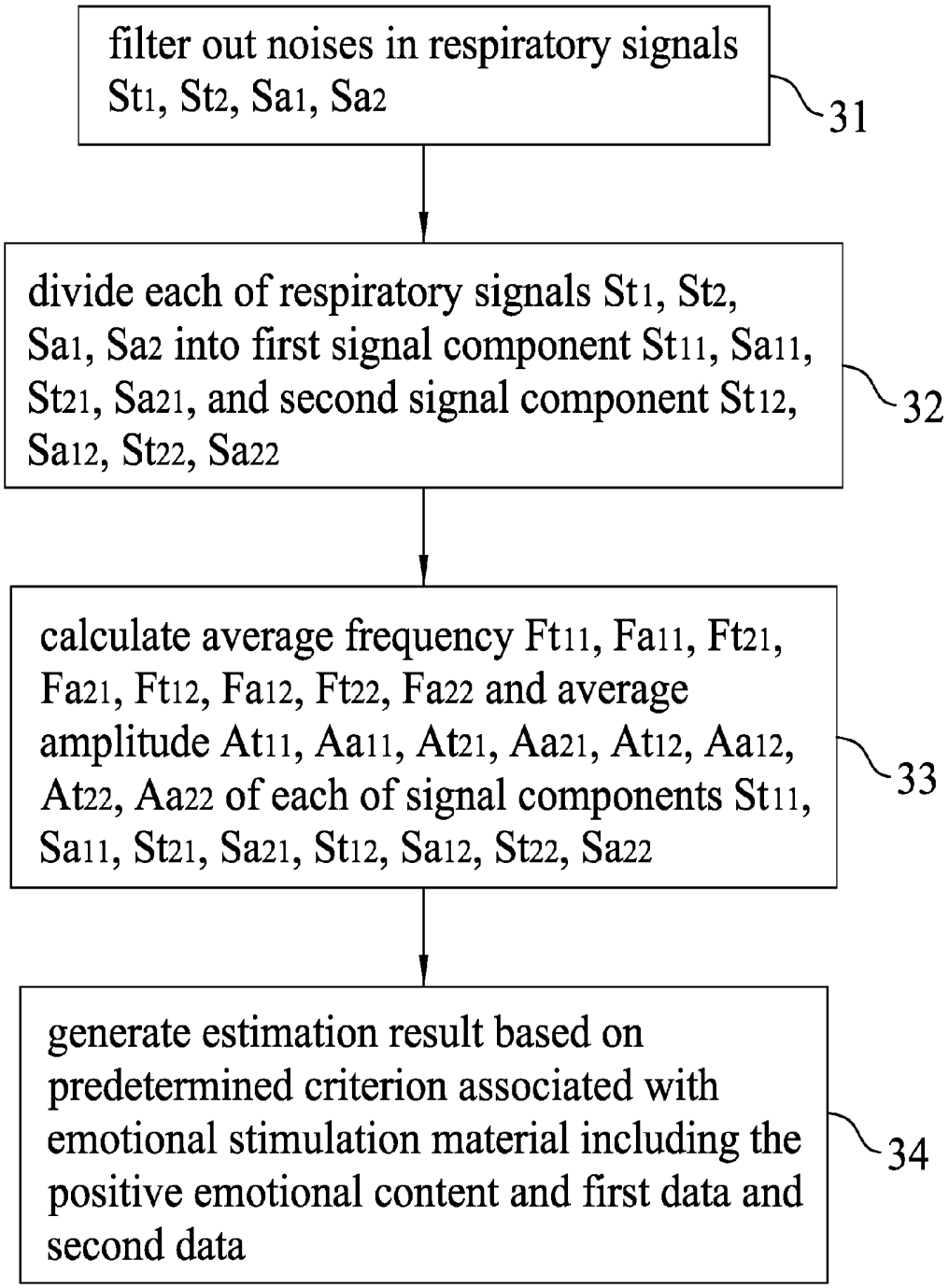

filter out noises in respiratory signals St1, St2, Sa1, Sa2
31
divide each of respiratory signals St1, St2, Sa1, Sa2 into first signal component St11, Sa11, St21, Sa21, and second signal component St12, Sa12, St22, Sa22
32
calculate average frequency Ft11, Fa11, Ft21, Fa21, Ft12, Fa12, Ft22, Fa22 and average amplitude At11, Aa11, At21, Aa21, At12, Aa12, At22, Aa22 of each of signal components St11, Sa11, St21, Sa21, St12, Sa12, St22, Sa22
33
generate estimation result based on predetermined criterion associated with emotional stimulation material including the positive emotional content and first data and second data
34

FIG.3

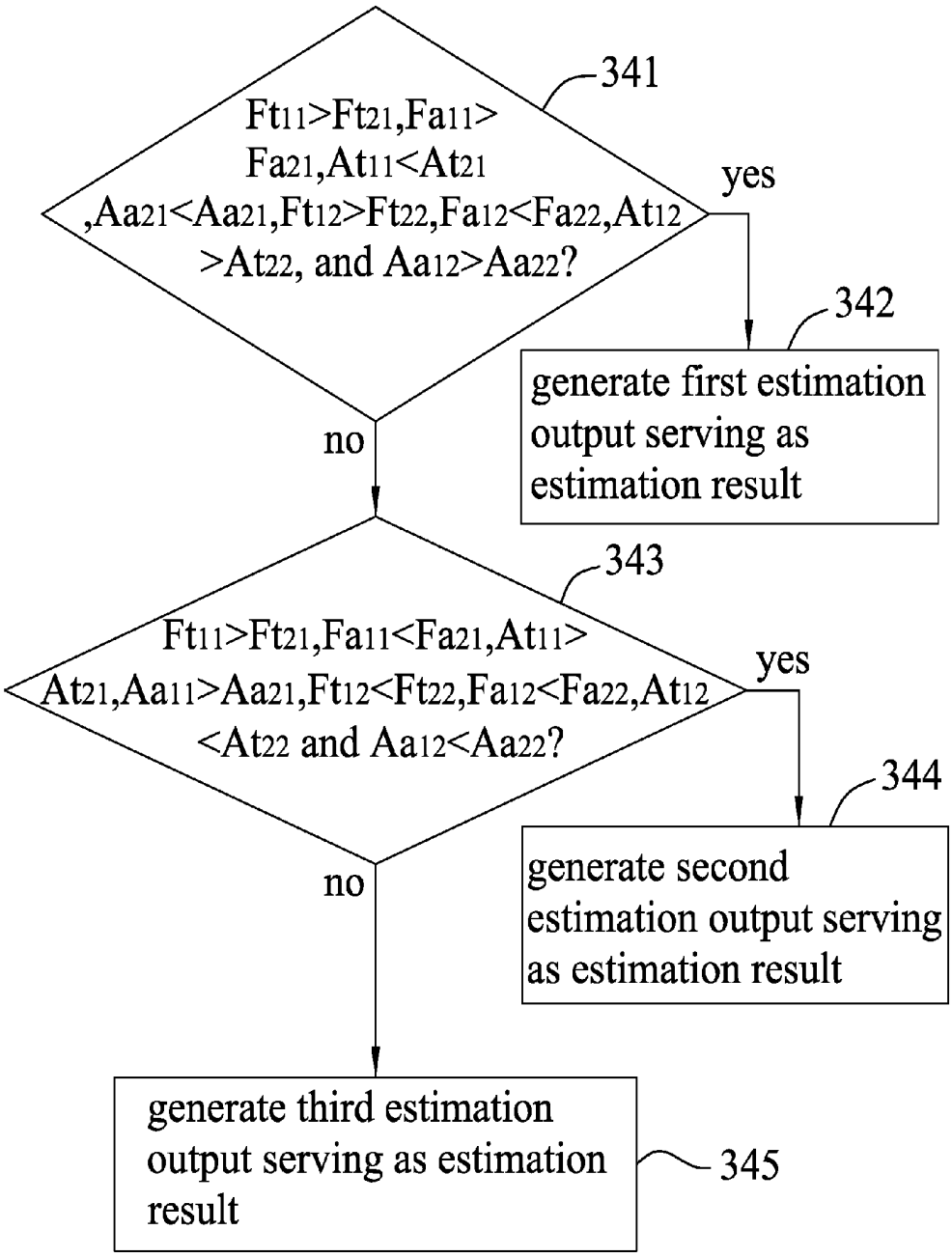

341
Ft11>Ft21,Fa11>
Fa21,At11<At21
,Aa21<Aa21,Ft12>Ft22,Fa12<Fa22,At12
>At22, and Aa12>Aa22?
yes
342
generate first estimation output serving as estimation result
no
343
Ft11>Ft21,Fa11<Fa21,At11>
At21,Aa11>Aa21,Ft12<Ft22,Fa12<Fa22,At12
<At22 and Aa12<Aa22?
yes
344
generate second estimation output serving as estimation result
no
generate third estimation output serving as estimation result
345

FIG.3A

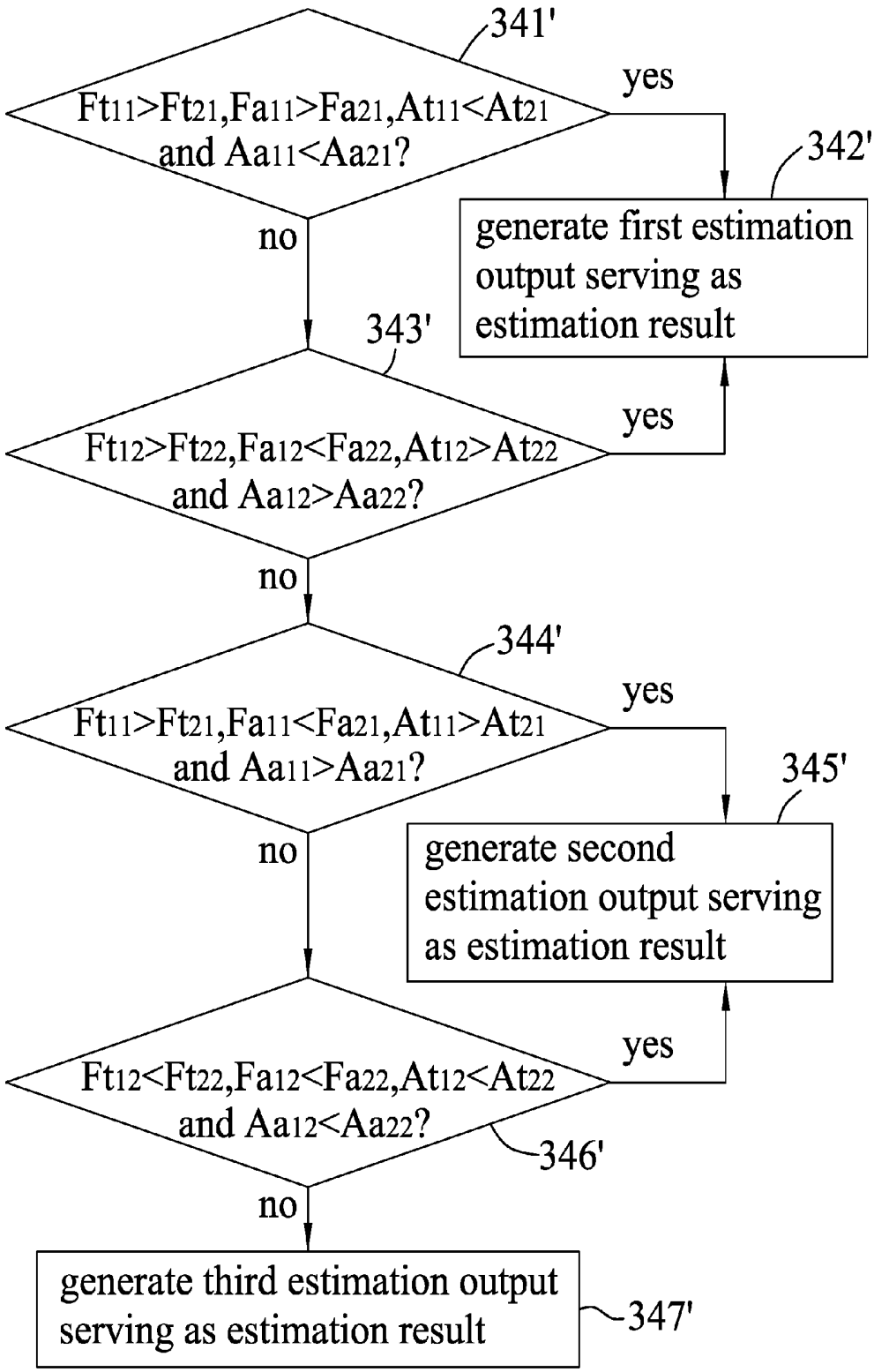

341'
Ft11>Ft21,Fa11>Fa21,At11<At21 and Aa11<Aa21?
yes
342'
generate first estimation output serving as estimation result
no
343'
Ft12>Ft22,Fa12<Fa22,At12>At22 and Aa12>Aa22?
yes
no
344'
Ft11>Ft21,Fa11<Fa21,At11>At21 and Aa11>Aa21?
yes
345'
generate second estimation output serving as estimation result
no
Ft12<Ft22,Fa12<Fa22,At12<At22 and Aa12<Aa22?
yes
346'
no
generate third estimation output serving as estimation result
347'

FIG.3B

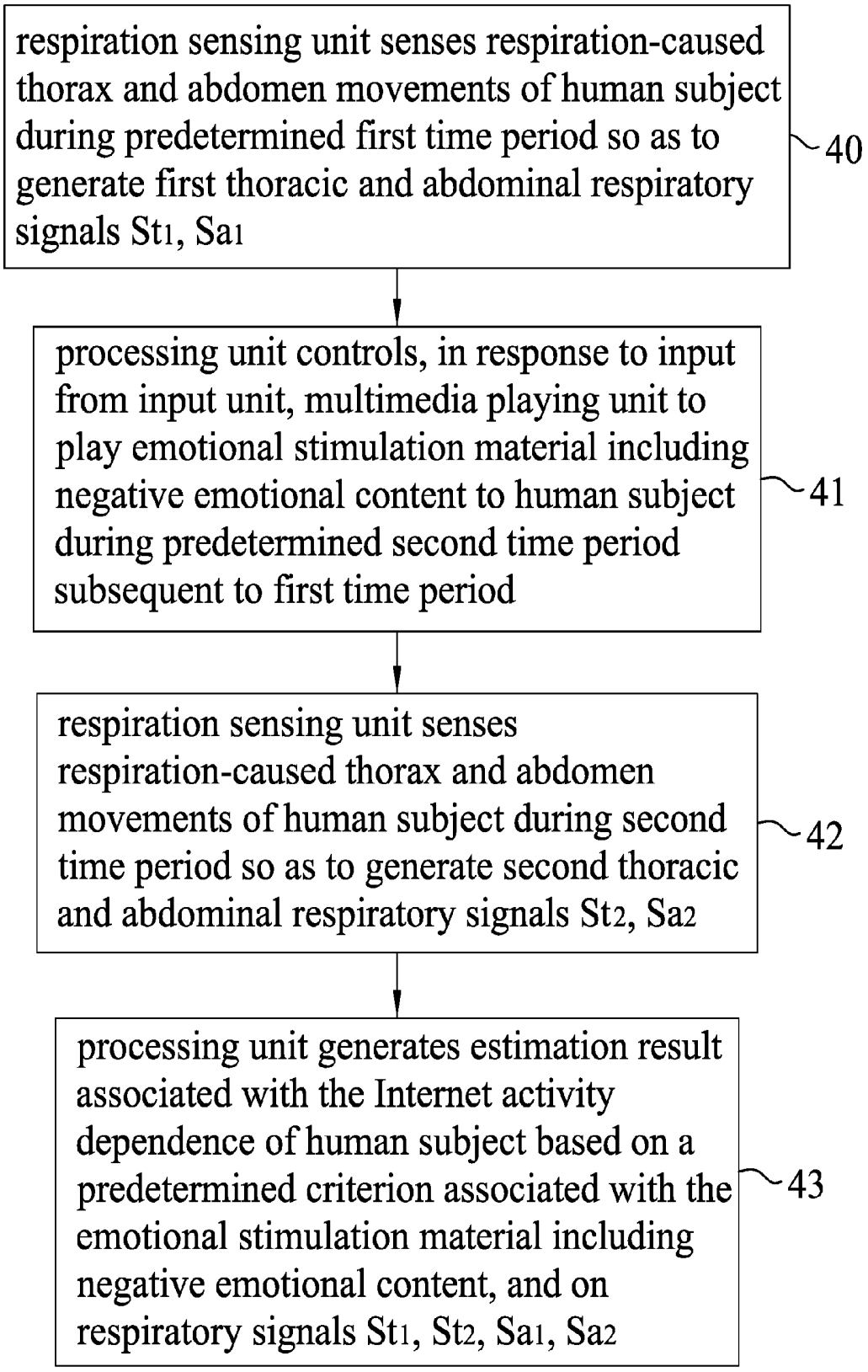

respiration sensing unit senses respiration-caused thorax and abdomen movements of human subject during predetermined first time period so as to generate first thoracic and abdominal respiratory signals St1, Sa1
40
processing unit controls, in response to input from input unit, multimedia playing unit to play emotional stimulation material including negative emotional content to human subject during predetermined second time period subsequent to first time period
41
respiration sensing unit senses respiration-caused thorax and abdomen movements of human subject during second time period so as to generate second thoracic and abdominal respiratory signals St2, Sa2
42
processing unit generates estimation result associated with the Internet activity dependence of human subject based on a predetermined criterion associated with the emotional stimulation material including negative emotional content, and on respiratory signals St1, St2, Sa1, Sa2
43

FIG.4

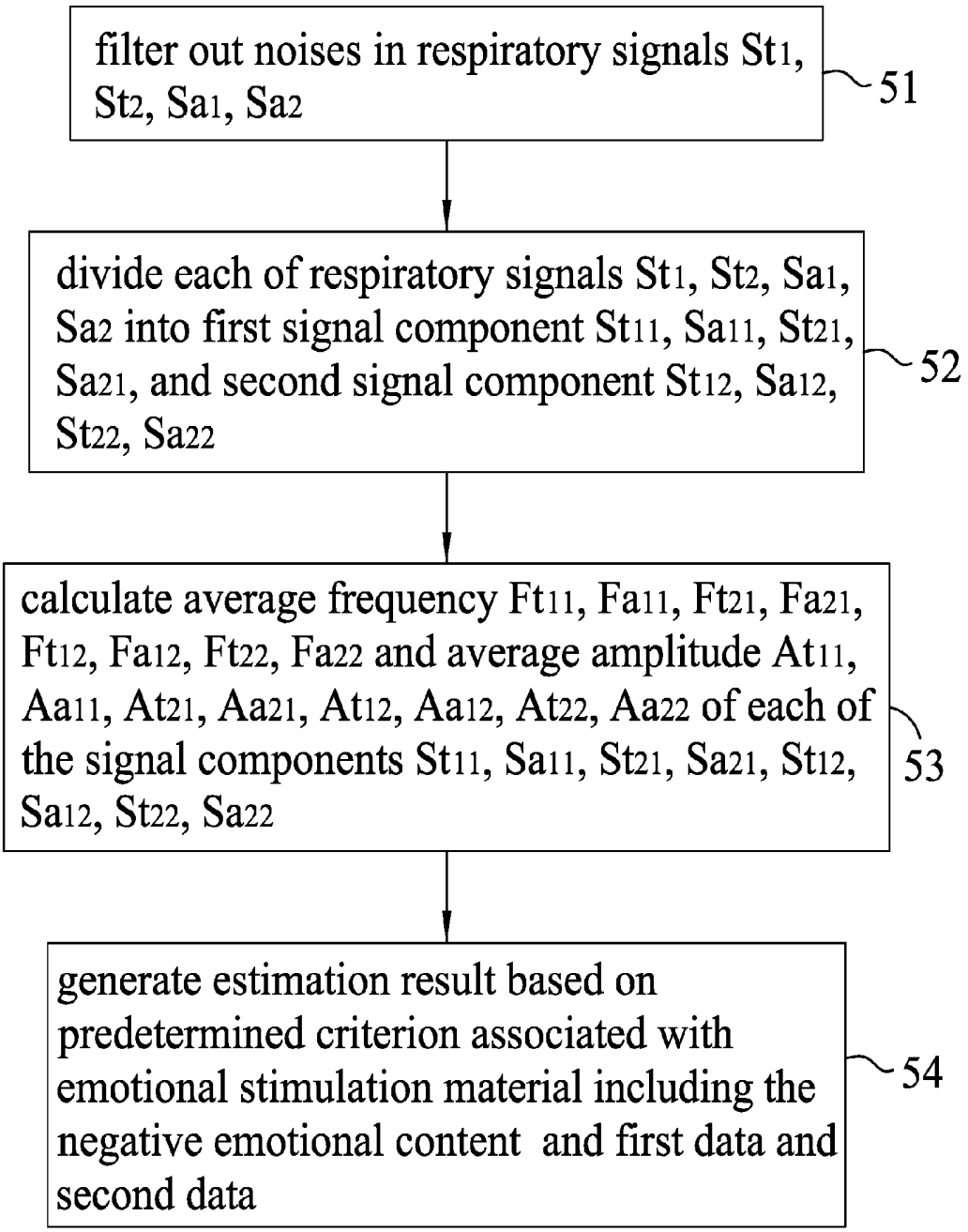

filter out noises in respiratory signals St1, St2, Sa1, Sa2
51
divide each of respiratory signals St1, St2, Sa1, Sa2 into first signal component St11, Sa11, St21, Sa21, and second signal component St12, Sa12, St22, Sa22
52
calculate average frequency Ft11, Fa11, Ft21, Fa21, Ft12, Fa12, Ft22, Fa22 and average amplitude At11, Aa11, At21, Aa21, At12, Aa12, At22, Aa22 of each of the signal components St11, Sa11, St21, Sa21, St12, Sa12, St22, Sa22
53
generate estimation result based on predetermined criterion associated with emotional stimulation material including the negative emotional content and first data and second data
54

FIG.5

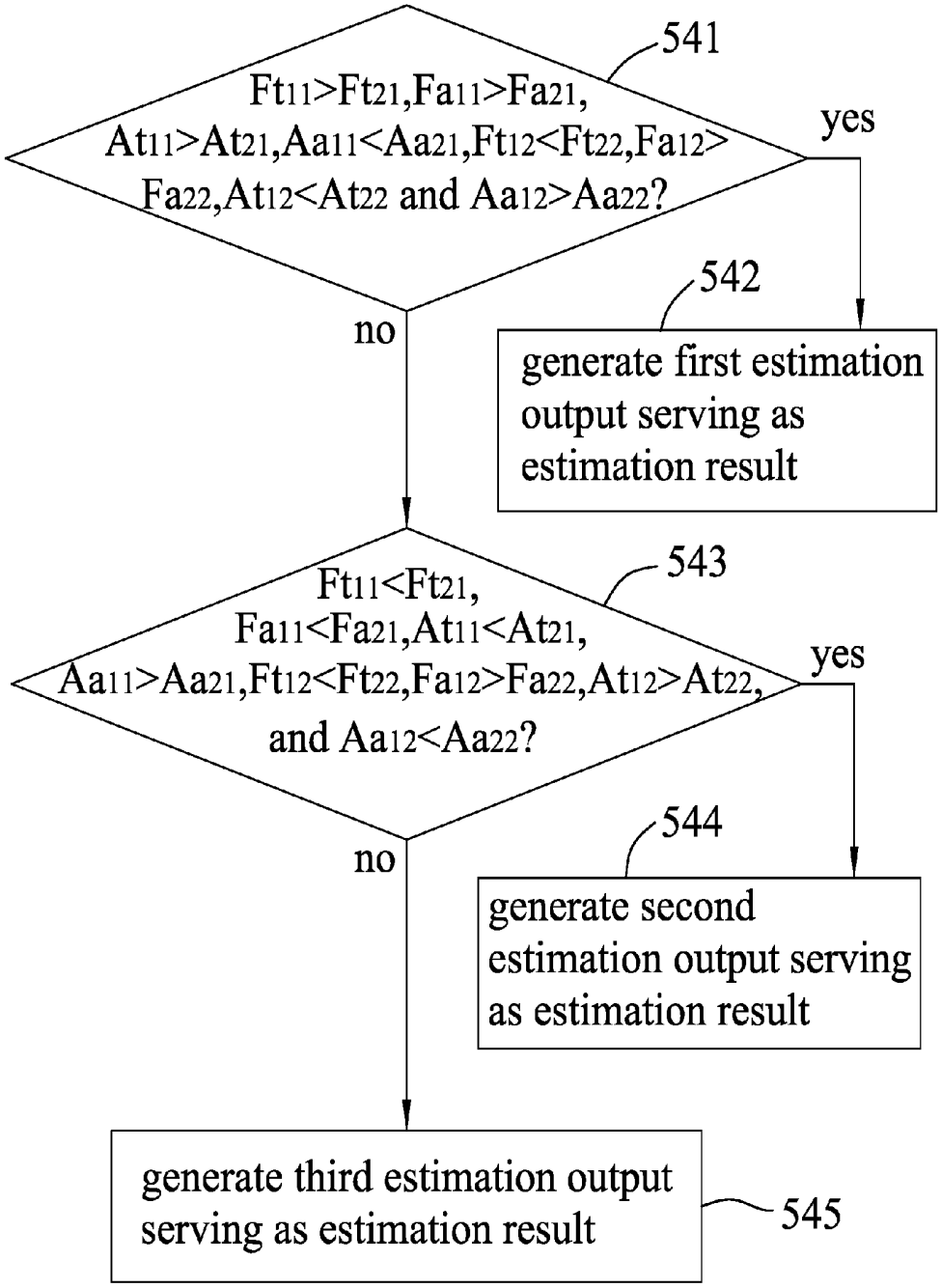

541
$Ft_{11}>Ft_{21}, Fa_{11}>Fa_{21}, At_{11}>At_{21}, Aa_{11}<Aa_{21}, Ft_{12}<Ft_{22}, Fa_{12}>Fa_{22}, At_{12}<At_{22}$ and $Aa_{12}>Aa_{22}$?
yes
no
542
generate first estimation output serving as estimation result
543
$Ft_{11}<Ft_{21}, Fa_{11}<Fa_{21}, At_{11}<At_{21}, Aa_{11}>Aa_{21}, Ft_{12}<Ft_{22}, Fa_{12}>Fa_{22}, At_{12}>At_{22}$, and $Aa_{12}<Aa_{22}$?
yes
no
544
generate second estimation output serving as estimation result
generate third estimation output serving as estimation result
545

FIG.5A

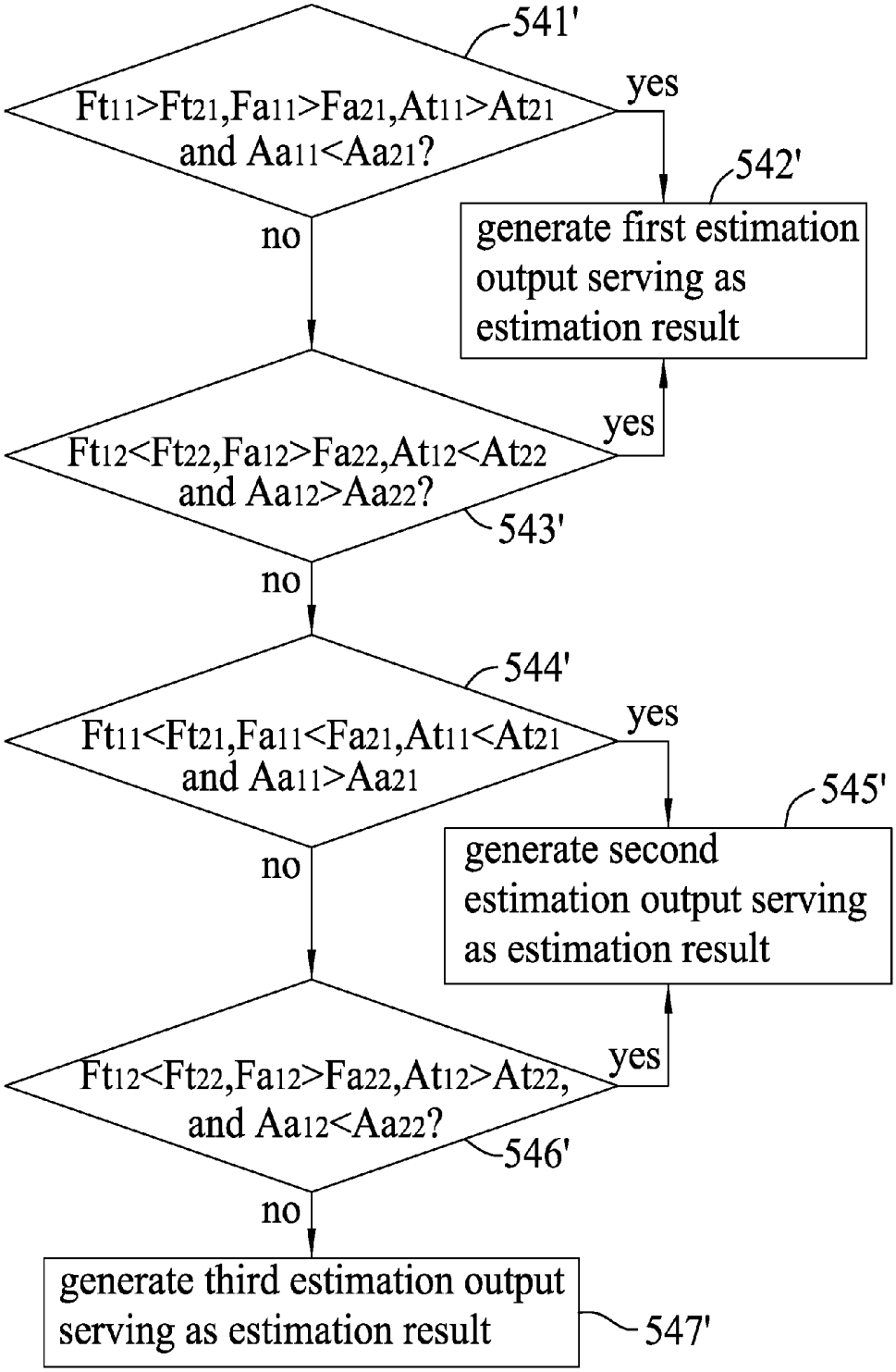

541'
Ft11>Ft21,Fa11>Fa21,At11>At21 and Aa11<Aa21?
yes
542'
generate first estimation output serving as estimation result
no
Ft12<Ft22,Fa12>Fa22,At12<At22 and Aa12>Aa22?
yes
543'
no
544'
Ft11<Ft21,Fa11<Fa21,At11<At21 and Aa11>Aa21
yes
545'
generate second estimation output serving as estimation result
no
Ft12<Ft22,Fa12>Fa22,At12>At22, and Aa12<Aa22?
yes
546'
no
generate third estimation output serving as estimation result
547'

FIG.5B

METHOD OF ESTIMATING INTERNET ACTIVITY DEPENDENCE OF A HUMAN SUBJECT

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority of Taiwanese Application No. 104118495, filed on Jun. 8, 2015.

FIELD

[0002] The disclosure relates to estimation of Internet activity dependence of a human subject, and more particularly to a method of estimating Internet activity dependence of a human subject.

BACKGROUND

[0003] In recent years, it has become very convenient to acquire and use the Internet. However, with such convenience come undesirable habitual behaviors, such as excessive Internet usage, and addiction to the Internet in gaming and shopping.

[0004] An Internet addict may always feel tired and/or have unstable emotions to cause an estranged relationship with his/her family members, and to be unable to concentrate, thereby adversely affecting, e.g., school or workplace performance. In view of the above problems, a topic to explore correlation between Internet activity dependence and Internet addiction has been taken seriously.

[0005] In a typical estimation method for Internet activity dependence of an Internet user, first of all, the Internet user is required to frequently fill out specific questionnaire throughout an entire span of the period of estimation, e.g., six months. Then, the Internet activity dependence of the Internet user corresponding to the period of estimation can be estimated based on all the questionnaires filled out by the Internet user during the period of estimation. Such estimation method is not only time-consuming, but also unsuitable for adequately estimating a current Internet activity dependence of the Internet user.

SUMMARY

[0006] Therefore, an object of the disclosure is to provide a method of estimating Internet activity dependence of a human subject that can overcome the drawbacks of the prior art.

[0007] According to the disclosure, there is provided a method of estimating Internet activity dependence of a human subject. The method is to be implemented by a system that includes a respiration sensing unit and a processing unit. The method includes the steps of:

[0008] A) by the respiration sensing unit, sensing respiration-caused thorax and abdomen movements of the human subject during a first time period, and during a subsequent second time period during which an emotional stimulation material played on a multimedia playing unit is being watched by the human subject, so as to generate a first thoracic respiratory signal and a first abdominal respiratory signal that correspond to the first time period, and a second thoracic respiratory signal and a second abdominal respiratory signal that correspond to the second time period; and

[0009] B) by the processing unit, generating an estimation result associated with the Internet activity dependence of the human subject based on a predetermined criterion associated with the emotional stimulation material, the first and second thoracic respiratory signals and the first and second abdominal respiratory signals.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Other features and advantages of the disclosure will become apparent in the following detailed description of the embodiments with reference to the accompanying drawings, of which:

[0011] FIG. **1** is a schematic block diagram illustrating a system that is configured for implementing the first embodiment of a method of estimating Internet activity dependence of a human subject according to the disclosure;

[0012] FIG. **2** is a flow chart illustrating the first embodiment of the disclosure;

[0013] FIG. **3** is a flow chart illustrating how a processing unit generates an estimation result based on a predetermined criterion associated with an emotional stimulation material including positive emotional content, and on respiratory signals (St_1, St_2, Sa_1, Sa_2) in the first embodiment;

[0014] FIG. **3**A is an exemplary flow chart illustrating how the processing unit generates, the estimation result based on a predetermined criterion associated with the emotional stimulation material including the positive emotional content, and on first data and second data in the first embodiment;

[0015] FIG. **3**B is another exemplary flow chart illustrating how the processing unit generates, the estimation result based on the predetermined criterion associated with the emotional stimulation material including the positive emotional content, and on the first and second data in the first embodiment;

[0016] FIG. **4** is a flow chart illustrating the second embodiment of a method of estimating Internet activity dependence of a human subject according to the disclosure;

[0017] FIG. **5** is a flow chart illustrating how the processing unit generates an estimation result based on a predetermined criterion associated with an emotional stimulation material including negative emotional content, and on respiratory signals (St_1, St_2, Sa_1, Sa_2) in the second embodiment;

[0018] FIG. **5**A is an exemplary flow chart illustrating how the processing unit generates, the estimation result based on the predetermined criterion associated with the emotional stimulation material including the negative emotional content, and on first data and second data in the second embodiment; and

[0019] FIG. **5**B is another exemplary flow chart illustrating how the processing unit generates the estimation result based on the predetermined criterion associated with the emotional stimulation material including the negative emotional content, and on the first and second data in the second embodiment.

DETAILED DESCRIPTION

[0020] Before the disclosure is described in greater detail, it should be noted that like elements are denoted by the same reference numerals throughout the disclosure.

[0021] Referring to FIG. **1**, a system **1** is used to implement the first embodiment of a method of estimating Internet activity dependence of a human subject **100** according to the disclosure. The system **1** includes a respiration sensing unit **13**, a multimedia playing unit **11**, an input unit **14**, and a

processing unit **12** coupled to the multimedia playing unit **11**, the input unit **14** and the respiration sensing unit **13**.

[0022] The respiration sensing unit **13** is, for example, attached to two belts **130** bonded around the torso **101** of the human subject **100** or to a smart garment (not shown) worn on the human subject **100**. Herein, the respiration sensing unit **13** is wiredly connected to the processing unit **12**. Alternatively, the respiration sensing unit **13** may communicate with the processing unit **12** using wireless communications. It is noted that the respiration sensing unit **13** includes a first respiration sensor **131** attached to the chest of the human subject **100** for sensing respiration-caused thorax movements of the human subject **100**, and a second respiration sensor **132** attached to the abdomen of the human subject **100** for sensing respiration-caused abdomen movements of the human subject **100**. The input unit **14** is manually operable by a user (not shown) to generate an input that is associated with an emotional stimulation material to be played on the multimedia playing unit **11**. The multimedia playing unit **11** is controlled by the processing unit **12** to play the emotional stimulation material thereon. The emotional stimulation material may include either positive emotional content that tends to stimulate positive emotions in a viewer thereof or negative emotional content that tends to stimulate negative emotions in a viewer thereof.

[0023] In some embodiments, the multimedia playing unit **11**, the processing unit **12** and the input unit **14**, may be cooperatively implemented into, for example, a smart phone, a tablet computer, a personal computer or the like. The processing unit **12** may be installed with a software application (not shown) that includes instructions executable by the processing unit **12** to implement related steps of the method of the first embodiment of the disclosure.

[0024] FIG. **2** is a flow chart illustrating the process of the first embodiment of the disclosure.

[0025] In step **20**, the respiration sensing unit **13** senses respiration-caused thorax and abdomen movements of the human subject **100** during a predetermined first time period so as to generate one set of signals, including a first thoracic respiratory signal (St_1) and a first abdominal respiratory signal (Sa_1) and corresponding to the predetermined first time period.

[0026] In step **21**, upon receipt of the input from the input unit **14**, the processing unit **12** controls, in response to the input, the multimedia playing unit **11** to play the emotional stimulation material to the human subject **100** during a predetermined second time period subsequent to the predetermined first time period. The emotional stimulation material may be provided by the processing unit **12** or a storage medium (not shown) installed in the multimedia playing unit **11**. In this embodiment, for example, the processing unit **12** provides, in response to the input from the input unit **14**, the emotional stimulation material, which includes the positive emotional content, to the multimedia playing unit **11**.

[0027] In step **22**, as the emotional stimulation material displayed on the multimedia playing unit **11** is being displayed for view by the human subject **100**, the respiration sensing unit **13** senses respiration-caused thorax and abdomen movements of the human subject **100** during the predetermined second time period so as to generate another set of signals, including a second thoracic respiratory signal (St_2) and a second abdominal respiratory signal (Sa_2) and corresponding to the predetermined second time period.

[0028] In step **23**, the processing unit **12** generates an estimation result associated with the Internet activity dependence of the human subject **100** based on a predetermined criterion associated with the emotional stimulation material including the positive emotional content, on the first and second thoracic respiratory signals (St_1, St_2), and on the first and second abdominal respiratory signals (Sa_1, Sa_2).

[0029] FIG. **3** is a flow chart illustrating how the processing unit **12** generates the estimation result based on the predetermined criterion associated with the emotional stimulation material including the positive emotional content, on the first and second thoracic respiratory signals (St_1, St_2), and on the first and second abdominal respiratory signals (Sa_1, Sa_2).

[0030] In step **31**, the processing unit **12** filters out noises in the first and second thoracic respiratory signals respiratory signals (Sa_1, Sa_2). In this embodiment, the noises filtered out by the processing unit **12** have frequencies higher than, for example, 50 Hz or lower than, for example, 0.01 Hz.

[0031] In step **32**, the processing unit **12** divides, using a decomposition method, the first thoracic respiratory signal (St_1) into a first signal component (St_{11}) and a second signal component (St_{12}) whose frequencies differ from each other, the first abdominal respiratory signal (Sa_1) into a first signal component (Sa_{11}) and a second signal component (Sa_{12}) whose frequencies differ from each other, the second thoracic respiratory signal (St_2) into a first signal component (St_{21}) and a second signal component (St_{22}) whose frequencies differ from each other, and the second abdominal respiratory signal (Sa_2) into a first signal component (Sa_{21}) and a second signal component (Sa_{22}) whose frequencies differ from each other. In this embodiment, the decomposition method is associated with, for example, a complementary ensemble empirical model proposed in an article by H. M. Ji, et al., entitled "Muscle cluster extraction of inspiratory movement by using complimentary ensemble empirical mode decomposition". Since the feature of this disclosure does not reside in the decomposition method, details of the same are omitted herein for the sake of brevity.

[0032] In step **33**, the processing unit **12** calculates an average frequency (Ft_{11}) and an average amplitude (At_{11}) of the first signal component (St_{11}), an average frequency (Ft_{12}) and an average amplitude (At_{12}) of the second signal component (St_{12}), an average frequency (Fa_{11}) and an average amplitude (Aa_{11}) of the first signal component (Sa_{11}), an average frequency (Fa_{12}) and an average amplitude (Aa_{12}) of the second signal component (Sa_{12}), an average frequency (Ft_{21}) and an average amplitude (At_{21}) of the first signal component (St_{21}), an average frequency (Ft_{22}) and an average amplitude At_{22}) of the second signal component (St_{22}), an average frequency (Fa_{21}) and an average amplitude (Aa_{21}) of the first signal component (Sa_{21}), and an average frequency (Fa_{22}) and an average amplitude (Aa_{22}) of the second signal component (Sa_{22}). In this embodiment, the average frequencies (Ft_{11}, Fa_{11}, Ft_{21}, Fa_{21}) and the average amplitudes (At_{11}, Aa_{11}, At_{21}, Aa_{21}) cooperatively constitute first data, and the average frequencies (Ft_{12}, Fa_{12}, Ft_{22}, Fa_{22}) and the average amplitudes (At_{12}, Aa_{12}, At_{22}, Aa_{22}) cooperatively constitute second data.

[0033] For example, the average amplitudes (At_{11}, At_{12}, At_{21}, At_{22}) and the average amplitudes (Aa_{11}, Aa_{12}, Aa_{21}, Aa_{22}) can be obtained respectively by the following equations (1) and (2):

$$At_{jk} = \frac{1}{s}\sum_{n=1}^{s} St_{jk}(n),\ 1 \leqq j, k \leqq 2 \quad (1)$$

$$Aa_{jk} = \frac{1}{s}\sum_{n=1}^{s} Sa_{jk}(n),\ 1 \leqq j, k \leqq 2, \quad (2)$$

where s represents a sample size of each of the first and second signal components, $St_{jk}(n)$ represents an amplitude of an n^{th} sample in the first/second signal component St_{jk}, $Sa_{jk}(n)$ represents an amplitude of an n^{th} sample in the first/second signal component Sa_{jk}.

[0034] It is noted that average frequencies (Ft_{11}, Fa_{11}, Ft_{21}, Fa_{21}) of the first signal components (St_{11}, Sa_{11}, St_{21}, S_{21}) are all in a first frequency band, for example, higher than 1 Hz but not higher than 50 Hz. In addition, average frequencies (Ft_{12}, Fa_{12}, Ft_{22}, Fa_{22}) of the second signal components (St_{12}, Sa_{12}, St_{22}, Sa_{22}) are all in a second frequency band, for example, higher than 0.01 Hz but not higher than 1 Hz.

[0035] In step **34**, the processing unit **12** generates, the estimation result based on the predetermined criterion associated with the emotional stimulation material including the positive emotional content, the first data and the second data.

[0036] FIG. **3**A is an exemplary flow chart illustrating how the processing unit **12** generates the estimation result based on the predetermined criterion associated with the emotional stimulation material including the positive emotional content, the first data and the second data in the first embodiment.

[0037] In step **341**, the processing unit **12** determines whether the average frequency (Ft_{11}) is greater than the average frequency (Ft_{21}), whether the average frequency (Fa_{11}) is greater than the average frequency (Fa_{21}), whether the average amplitude (At_{11}) is smaller than the average amplitude (At_{21}) and whether the average amplitude (Aa_{11}) is smaller than the average amplitude (Aa_{21}) so as to generate a first determination output. Furthermore, the processing unit **12** determines whether the average frequency (Ft_{12}) is greater than the average frequency (Ft_{22}), whether the average frequency (Fa_{12}) is smaller than the average frequency (Fa_{22}), whether the average amplitude (At_{12}) is greater than the average amplitude (At_{22}) and whether the average amplitude (Aa_{12}) is greater than the average amplitude (Aa_{22}) so as to generate a second determination output. When the first determination output generated by the processing unit **12** indicates that $Ft_{11}>Ft_{21}$, $Fa_{11}>Fa_{21}$, $At_{11}<At_{21}$ and $Aa_{11}<Aa_{21}$ while the second determination output generated by the processing unit **12** indicates that $Ft_{12}>Ft_{22}$, $Fa_{12}<Fa_{22}$, $At_{12}>At_{22}$ and $Aa_{12}>Aa_{22}$, the flow proceeds to step **342**. Otherwise, the flow goes to step **343**.

[0038] In step **342**, the processing unit **12** generates a first estimation output which indicates that the human subject **100** is relatively highly dependent on Internet activity and which serves as the estimation result.

[0039] In step **343**, the processing unit **12** determines whether the average frequency (Ft_{11}) is greater than the average frequency (Ft_{21}), whether the average frequency (Fa_{11}) is smaller than the average frequency (Fa_{21}), whether the average amplitude (At_{11}) is greater than the average amplitude (At_{21}) and whether the average amplitude (Aa_{11}) is greater than the average amplitude (Aa_{21}) so as to generate a third determination output. Furthermore, the processing unit **12** determines whether the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}), whether the average frequency (Fa_{12}) is smaller than the average frequency (Fa_{22}), whether the average amplitude (At_{12}) is smaller than the average amplitude (At_{22}) and whether the average amplitude (Aa_{12}) is smaller than the average amplitude (Aa_{22}) so as to generate a fourth determination output. When the third determination output generated by the processing unit **12** indicates that $Ft_{11}>Ft_{21}$, $Fa_{11}<Fa_{21}$, $At_n>At_{21}$ and $Aa_{11}>Aa_{21}$ while the fourth determination output generated by the processing unit **12** indicates that $Ft_{12}<Ft_{22}$, $Fa_{12}<Fa_{22}$, $At_{12}<At_{22}$ and $Aa_{12}<Aa_{22}$, the flow proceeds to step **344**. Otherwise, the flow goes to step **345**.

[0040] In step **344**, the processing unit **12** generates a second estimation output which indicates that the human subject **100** is relatively lowly dependent on Internet activity and which serves as the estimation result.

[0041] In this example, each of the first and third determination outputs can be regarded as a corresponding first comparison result associated with the average frequencies (Ft_{11}, Ft_{21}, Fa_{11}, Fa_{22}) and the average amplitudes (At_{11}, At_{21}, Aa_{11}, Aa_{21}) Each of the second and fourth determination outputs can be regarded as a corresponding second comparison result associated with the average frequencies (Ft_{12}, Ft_{22}, Fa_{12}, Fa_{22}) and the average amplitudes (At_{12}, At_{22}, Aa_{12}, Aa_{22}).

[0042] In step **345**, the processing unit **12** generates a third estimation output indicating inconclusive result as to Internet activity dependence of the human subject **100** and serving as the estimation result.

[0043] Therefore, Table 1 built in accordance with this example of FIG. **3**A can serve as a lookup table that is adopted by the processing unit **12** to estimate the Internet activity dependence of the human subject **100** in the first embodiment.

TABLE 1

		positive emotional content			
		average frequency		average amplitude	
		thorax	abdomen	thorax	abdomen
first data second data	first estimation output (relatively highly dependent)	$Ft_{11} > Ft_{21}$ $Ft_{12} > Ft_{22}$	$Fa_{11} > Fa_{21}$ $Fa_{12} < Fa_{22}$	$At_{11} < At_{21}$ $At_{12} > At_{22}$	$Aa_{11} < Aa_{21}$ $Aa_{12} > Aa_{22}$
first data second data	second estimation output (relatively lowly dependent)	$Ft_{11} > Ft_{21}$ $Ft_{12} < Ft_{22}$	$Fa_{11} < Fa_{21}$ $Fa_{12} < Fa_{22}$	$At_{11} > At_{21}$ $At_{12} < At_{22}$	$Aa_{11} > Aa_{21}$ $Aa_{12} < Aa_{22}$

[0044] FIG. **3**B is another exemplary flow chart illustrating how the processing unit **12** generates the estimation result based on the predetermined criterion associated with

the emotional stimulation material including the positive emotional content, the first data and the second data in the first embodiment.

[0045] In step **341'**, the processing unit **12** determines whether the average frequency (Ft_{11}) is greater than the average frequency (Ft_{21}), whether the average frequency (Fa_{11}) is greater than the average frequency (Fa_{21}), whether the average amplitude (At_{11}) is smaller than the average amplitude (At_{21}) and whether the average amplitude (Aa_{11}) is smaller than the average amplitude (Aa_{21}) so as to generate a first determination output. When the first determination output generated by the processing unit **12** indicates that $Ft_{11}>Ft_{21}$, $Fa_{11}>Fa_{21}$, $At_{11}<At_{21}$ and $Aa_{11}<Aa_{21}$, the flow proceeds to step **342'**. Otherwise, the flow goes to step **343'**.

[0046] In step **342'**, similar to step **342** of FIG. **3**A, the processing unit **12** generates the first estimation output serving as the estimation result.

[0047] In step **343'**, the processing unit **12** determines whether the average frequency (Ft_{12}) is greater than the average frequency (Ft_{22}), whether the average frequency (Fa_{12}) is smaller than the average frequency (Fa_{22}), whether the average amplitude (At_{12}) is greater than the average amplitude (At_{22}) and whether the average amplitude (Aa_{12}) is greater than the average amplitude (Aa_{22}) so as to generate a second determination output. When the second determination output generated by the processing unit **12** indicates that $Ft_{12}>Ft_{22}$, $Fa_{12}<Fa_{22}$, $At_{12}>At_{22}$ and $Aa_{12}>Aa_{22}$, the flow goes back to step **342'**. Otherwise, the flow proceeds to step **344'**.

[0048] In step **344'**, the processing unit **12** determines whether the average frequency (Ft_{11}) is greater than the average frequency (Ft_{21}), whether the average frequency (Fa_{11}) is smaller than the average frequency (Fa_{21}), whether the average amplitude (At_{11}) is greater than the average amplitude (At_{21}) and whether the average amplitude (Aa_{11}) is greater than the average amplitude (Aa_{21}) so as to generate a third determination output. When the third determination output generated by the processing unit **12** indicates that $Ft_{11}>Ft_{21}$, $Fa_{11}<Fa_{21}$, $At_{11}>At_{21}$ and $Aa_{11}>Aa_{21}$, the flow proceeds to step **345'**. Otherwise, the flow goes to step **346'**.

[0049] In step **345'**, similar to step **344** of FIG. **3**A, the processing unit **12** generates the second estimation output serving as the estimation result.

[0050] In step **346'**, the processing unit **12** determines whether the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}), whether the average frequency (Fa_{12}) is smaller than the average frequency (Fa_{22}), whether the average amplitude (At_{12}) is smaller than the average amplitude (At_{22}) and whether the average amplitude (Aa_{12}) is smaller than the average amplitude (Aa_{22}) so as to generate a fourth determination output. When the fourth determination output generated by the processing unit **12** indicates that $Ft_{12}<Ft_{22}$, $Fa_{12}<Fa_{22}$, $At_{12}<At_{22}$ and $Aa_{12}<Aa_{22}$, the flow goes back to step **345'**. Otherwise, the flow proceeds to step **347'**.

[0051] In this example, similar to the example shown in FIG. **3**A, each of the first and third determination outputs can be regarded as a corresponding first comparison result associated with the average frequencies (Ft_{11}, Ft_{21}, Fa_{11}, Fa_{21}) and the average amplitudes (At_{11}, At_{21}, Aa_{11}, Aa_{21}) Each of the second and fourth determination outputs can be regarded as a corresponding second comparison result associated with the average frequencies (Ft_{12}, Ft_{22}, Fa_{12}, Fa_{22}) and the average amplitudes (At_{12}, At_{22}, Aa_{12}, Aa_{22}).

[0052] In step **347'**, similar to step **345** of FIG. **3**A, the processing unit **12** generates the third estimation output serving as the estimation result.

[0053] Therefore, Table 2 built in accordance with this example of FIG. **3**B can serve as another lookup table that is adopted by the processing unit **12** to estimate the Internet activity dependence of the human subject **100** in the first embodiment.

TABLE 2

		positive emotional content			
		average frequency		average amplitude	
		thorax	abdomen	thorax	abdomen
first data	first estimation output (relatively highly dependent)	$Ft_{11} > Ft_{21}$	$Fa_{11} > Fa_{21}$	$At_{11} < At_{21}$	$Aa_{11} < Aa_{21}$
	second estimation output (relatively lowly dependent)	$Ft_{11} > Ft_{21}$	$Fa_{11} < Fa_{21}$	$At_{11} > At_{21}$	$Aa_{11} > Aa_{21}$
second data	first estimation output (relatively highly dependent)	$Ft_{12} > Ft_{22}$	$Fa_{12} < Fa_{22}$	$At_{12} > At_{22}$	$Aa_{12} > Aa_{22}$
	second estimation output (relatively lowly dependent)	$Ft_{12} < Ft_{22}$	$Fa_{12} < Fa_{22}$	$At_{12} < At_{22}$	$Aa_{12} < Aa_{22}$

[0054] FIG. **4** is a flow chart illustrating how the system of FIG. **1** implements the second embodiment of a method of estimating Internet activity dependence of a human subject **100** according to the disclosure. The process of the second embodiment is a modification of that of the first embodiment of FIG. **2**. Steps **40**, **42** and **43** are similar respectively to steps **20**, **22** and **23** of the first embodiment (FIG. **2**).

[0055] However, in step **41**, unlike step **21** of the first embodiment (FIG. **2**), the processing unit **12** controls, in response to the input from the input unit **14**, the multimedia playing unit **11** to play the emotional stimulation material that includes the negative emotional content to the human subject **100** during the predetermine second time period.

[0056] FIG. **5** is a flow chart illustrating how the processing unit **12** generates an estimation result based on a predetermined criterion associated with the emotional stimulation material including the negative emotional content, on the first and second thoracic respiratory signals (St_1, St_2), and on the first and second abdominal respiratory signals (Sa_1, Sa_2). In this embodiment, steps **51**, **52** and **53** are similar respectively to steps **31**, **32** and **33** of the first embodiment (FIG. **3**). However, in step **54**, unlike step **34** of the first embodiment (FIG. **3**), the processing unit **12** generates the estimation result based on the predetermined

criterion associated with the emotional stimulation material including the negative emotional content, the first data and the second data.

[0057] FIG. **5**A is an exemplary flow chart illustrating how the processing unit **12** generates the estimation result based on the predetermined criterion associated with the emotional stimulation material including the negative emotional content, the first data and the second data in the second embodiment.

[0058] In step **541**, the processing unit **12** determines whether the average frequency (Ft_{11}) is greater than the average frequency (Ft_{21}), whether the average frequency (Fa_{11}) is greater than the average frequency (Fa_{21}), whether the average amplitude (At_{11}) is greater than the average amplitude (At_{21}) and whether the average amplitude (Aa_{11}) is smaller than the average amplitude (Aa_{21}) so as to generate a first determination output. Furthermore, the processing unit **12** determines whether the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}), whether the average frequency (Fa_{12}) is greater than the average frequency (Fa_{22}), whether the average amplitude (At_{12}) is smaller than the average amplitude (At_{22}) and whether the average amplitude (Aa_{12}) is greater than the average amplitude (Aa_{22}) so as to generate a second determination output. When the first determination output generated by the processing unit **12** indicates that $Ft_{11}>Ft_{21}$, $Fa_{11}>Fa_{21}$, $A_{11}>At_{21}$ and $Aa_{11}<Aa_{21}$ while the second determination output generated by the processing unit **12** indicates that $Ft_{12}<Ft_{22}$, $Fa_{12}>Fa_{22}$, $At_{12}<At_{22}$ and $Aa_{12}>Aa_{22}$, the flow proceeds to step **542**. Otherwise, the flow goes to step **543**.

[0059] In step **542**, similar to step **342** of the first embodiment (FIG. **3**A), the processing unit **12** generates the first estimation output serving as the estimation result.

[0060] In step **543**, the processing unit **12** determines whether the average frequency (Ft_{11}) is smaller than the average frequency (Ft_{21}), whether the average frequency (Fa_{11}) is smaller than the average frequency (Fa_{21}), whether the average amplitude (At_{11}) is smaller than the average amplitude (At_{21}) and whether the average amplitude (Aa_{11}) is greater than the average amplitude (Aa_{21}) so as to generate a third determination output. Furthermore, the processing unit **12** determines whether the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}), whether the average frequency (Fa_{12}) is greater than the average frequency (Fa_{22}), whether the average amplitude (At_{12}) is greater than the average amplitude (At_{22}) and whether the average amplitude (Aa_{12}) is smaller than the average amplitude (Aa_{22}) so as to generate a fourth determination output. When the third determination output generated by the processing unit **12** indicates that $Ft_{11}<Ft_{21}$, $Fa_{11}<Fa_{21}$, $A_{11}<At_{21}$ and $Aa_{11}>Aa_{21}$ while the fourth determination output generated by the processing unit **12** indicates that $Ft_{12}<Ft_{22}$, $Fa_{12}>Fa_{22}$, $At_{12}>At_{22}$ and $Aa_{12}<Aa_{22}$, the flow proceeds to step **544**. Otherwise, the flow goes to step **545**.

[0061] In step **544**, similar to step **344** of the first embodiment (FIG. **3**A), the processing unit **12** generates the second estimation output serving as the estimation result.

[0062] In this example, similar to the example of FIG. **3**A, each of the first and third determination outputs can be regarded as a corresponding first comparison result associated with the average frequencies (Ft_{11}, Ft_{21}, Fa_{11}, Fa_{21}) and the average amplitudes (At_{11}, At_{21}, Aa_{11}, Aa_{21}). Each of the second and fourth determination outputs can be regarded as a corresponding second comparison result associated with the average frequencies (Ft_{12}, Ft_{22}, Fa_{12}, Fa_{22}) and the average amplitudes (At_{12}, At_{22}, Aa_{12}, Aa_{22}).

[0063] In step **545**, similar to step **343** of the first embodiment (FIG. **3**A), the processing unit **12** generates the third estimation output serving as the estimation result.

[0064] Therefore, Table 3 built in accordance with this example of FIG. **5**A can serve as a lookup table that is adopted by the processing unit **12** to estimate the Internet activity dependence of the human subject **100** in the second embodiment.

TABLE 3

		negative emotional content			
		average frequency		average amplitude	
		thorax	abdomen	thorax	abdomen
first data	first estimation output (relatively highly dependent)	$Ft_{11}>Ft_{21}$	$Fa_{11}>Fa_{21}$	$At_{11}>At_{21}$	$Aa_{11}<Aa_{21}$
second data		$Ft_{12}<Ft_{22}$	$Fa_{12}>Fa_{22}$	$At_{12}<At_{22}$	$Aa_{12}>Aa_{22}$
first data	second estimation output (relatively lowly dependent)	$Ft_{11}<Ft_{21}$	$Fa_{11}<Fa_{21}$	$At_{11}<At_{21}$	$Aa_{11}>Aa_{21}$
second data		$Ft_{12}<Ft_{22}$	$Fa_{12}>Fa_{22}$	$At_{12}>At_{22}$	$Aa_{12}<Aa_{22}$

[0065] FIG. **5**B is another exemplary flow chart illustrating how the processing unit **12** generates the estimation result based on the predetermined criterion associated with the emotional stimulation material including the negative emotional content, the first data and the second data in the second embodiment.

[0066] In step **541'**, the processing unit **12** determines whether the average frequency (Ft_{11}) is greater than the average frequency (Ft_2), whether the average frequency (Fa_{11}) is greater than the average frequency (Fa_{21}), whether the average amplitude (At_{11}) is greater than the average amplitude (At_{21}) and whether the average amplitude (Aa_{11}) is smaller than the average amplitude (Aa_{21}) so as to generate a first determination output. When the first determination output generated by the processing unit **12** indicates that $Ft_{11}>Ft_{21}$, $Fa_{11}>Fa_{21}$, $At_{11}>At_{21}$ and $Aa_{11}<Aa_{21}$, the flow proceeds to step **542'**. Otherwise, the flow goes to step **543'**.

[0067] In step **542'**, similar to step **342'** of the first embodiment (FIG. **3**B), the processing unit **12** generates the first estimation output serving as the estimation result.

[0068] In step **543'**, the processing unit **12** determines whether the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}), whether the average frequency (Fa_{12}) is greater than the average frequency (Fa_{22}), whether the average amplitude (At_{12}) is smaller than the average amplitude (At_{22}) and whether the average amplitude (Aa_{12}) is greater than the average amplitude (Aa_{22}) so as to generate a second determination output. When the second determination output generated by the processing unit **12** indicates that $Ft_{12}<Ft_{22}$, $Fa_{12}>Fa_{22}$, $At_{12}<At_{22}$ and $Aa_{12}>Aa_{22}$, the flow goes back to step **542'**. Otherwise, the flow proceeds to step **544'**.

[0069] In step **544'**, the processing unit **12** determines whether the average frequency (Ft_{11}) is smaller than the average frequency (Ft_{21}), whether the average frequency (Fa_{11}) is smaller than the average frequency (Fa_{21}), whether the average amplitude (At_{11}) is smaller than the average amplitude (At_{21}) and whether the average amplitude (Aa_{11}) is greater than the average amplitude (Aa_{21}) so as to generate a third determination output. When the third determination output generated by the processing unit **12** indicates that $Ft_{11}<Ft_{21}$, $Fa_{11}<Fa_{21}$, $At_{11}<At_{21}$ and $Aa_{11}>Aa_{21}$, the flow proceeds to step **545'**. Otherwise, the flow goes to step **546'**.

[0070] In step **545'**, similar to step **345'** of the first embodiment (FIG. **3**B), the processing unit **12** generates the second estimation output serving as the estimation result.

[0071] In step **546'**, the processing unit **12** determines whether the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}) whether the average frequency (Fa_{12}) is greater than the average frequency (Fa_{22}), whether the average amplitude (At_{12}) is greater than the average amplitude (At_{22}) and whether the average amplitude (Aa_{12}) is smaller than the average amplitude (Aa_{22}) so as to generate a fourth determination output. When the fourth determination output generated by the processing unit **12** indicates that $Ft_{12}<Ft_{22}$, $Fa_{12}>Fa_{22}$, $At_{12}>At_{22}$ and $Aa_{12}<Aa_{22}$, the flow goes back to step **545'**. Otherwise, the flow proceeds to step **547'**.

[0072] In this example, similar to the example shown in FIG. **5**A, each of the first and third determination outputs can be regarded as a corresponding first comparison result associated with the average frequencies (Ft_{11}, Ft_{21}, Fa_{11}, Fa_{21}) and the average amplitudes (At_{11}, At_{21}, Aa_{11}, Aa_{21}) Each of the second and fourth determination outputs can be regarded as a corresponding second comparison result associated with the average frequencies (Ft_{12}, Ft_{22}, Fa_{12}, Fa_{22}) and the average amplitudes (At_{12}, At_{22}, Aa_{12}, Aa_{22}).

[0073] In step **547'**, similar to step **347'** of the first embodiment (FIG. **3**B), the processing unit **12** generates the third estimation output serving as the estimation result.

[0074] Therefore, Table 4 built in accordance with this example of FIG. **5**B can serve as another lookup table that is adopted by the processing unit **12** to estimate the Internet activity dependence of the human subject **100** in the second embodiment.

TABLE 4

		negative emotional content			
		average frequency		average amplitude	
		thorax	abdomen	thorax	abdomen
first data	first estimation output (relatively highly dependent)	$Ft_{11} > Ft_{21}$	$Fa_{11} > Fa_{21}$	$At_{11} > At_{21}$	$Aa_{11} < Aa_{21}$
	second estimation output (relatively lowly dependent)	$Ft_{11} < Ft_{21}$	$Fa_{11} < Fa_{21}$	$At_{11} < At_{21}$	$Aa_{11} > Aa_{21}$
second data	first estimation output (relatively highly dependent)	$Ft_{12} < Ft_{22}$	$Fa_{12} > Fa_{22}$	$At_{12} < At_{22}$	$Aa_{12} > Aa_{22}$
	second estimation output (relatively lowly dependent)	$Ft_{12} < Ft_{22}$	$Fa_{12} > Fa_{22}$	$At_{12} > At_{22}$	$Aa_{12} < Aa_{22}$

[0075] It is noted that partially combining the first and second embodiments may result in the third embodiment of a method of estimating Internet activity dependence of a human subject **100** according to the disclosure.

[0076] The following describes the process of the third embodiment implemented by the system of FIG. **1**.

[0077] For example, firstly, steps **20**, **21** and **22** of the first embodiment (FIG. **2**) are sequentially performed, thereby generating a first set of signals including a first thoracic respiratory signal (St_1) and a first abdominal respiratory signal (Sa_1), and a second set of signals including a second thoracic respiratory signal (St_2) and a second abdominal respiratory signal (Sa_2) and associated with the emotional stimulation material including the positive emotional content. After a while, for example, 3 minutes or longer, steps **41** and **42** of the second embodiment (FIG. **4**) are sequentially performed, thereby generating a third set of signals including a second thoracic respiratory signal (St_2') and a second abdominal respiratory signal (Sa_2') and associated with another emotional stimulation material including the negative emotional content.

[0078] Thus, the processing unit **12** generates an estimation result associated with the Internet activity dependence of the human subject **100** based on the predetermined criterion associated with the emotional stimulation material including the positive emotional content, the predetermined criterion associated with the emotional stimulation material including the negative emotional content, on the thoracic respiratory signals (St_1, St_2, St_2'), and on the abdominal respiratory signals (Sa_1, Sa_2, Sa_2').

[0079] In this embodiment, similar to steps **31**, **32** and **33** of the first embodiment (FIG. **3**) or steps **51**, **52** and **53** of the second embodiment (FIG. **5**), the processing unit **12** filters out noises in the thoracic respiratory signals (St_1, St_2, St_2') and the abdominal respiratory signals (Sa_1, Sa_2, Sa_2'), divides each of the thoracic respiratory signals (St_1, St_2, St_2') and the abdominal respiratory signals (Sa_1, Sa_2, Sa_2') into a first signal component (St_{11}, St_{21}, St_{21}', Sa_{11}, Sa_{21}, Sa_{21}') and a second signal component (St_{12}, St_{22}, St_{22}', Sa_{12}, Sa_{22}, Sa_{22}') using the aforesaid decomposition method, and calculates an average frequency (Ft_{11}, Ft_{21}, Ft_{21}', Fa_{11}, Fa_{21}, Fa_{21}', Ft_{12}, Ft_{22}, Ft_{22}', Fa_{12}, Fa_{22}, Fa_{22}') and an average amplitude (At_{11}, At_{21}, At_{21}', Aa_{11}, Aa_{21}, Aa_{21}', At_{12}, At_{22}, At_{22}', Aa_{12}, Aa_{22}, Aa_{22}') of each of the first and second signal components (St_{11}, St_{21}, St_{21}', Sa_{11}, Sa_{21}, Sa_{21}', St_{12}, St_{22},

St_{22}', Sa_{12}, Sa_{22}, Sa_{22}'). It is noted that the average frequencies (Ft_{11}, Fa_{11}, Ft_{21}, Fa_{21}, Ft_{21}', Fa_{21}') and the average amplitudes (At_{11}, Aa_{11}, At_{21}, Aa_{21}, At_{21}, Aa_{21}) cooperatively constitute first data, and the average frequencies (Ft_{12}, Fa_{12}, Ft_{22}, Fa_{22}, Ft_{22}', Fa_{22}') and the average amplitudes (At_{12}, Aa_{12}, At_{22}, Aa_{22}, At_{22}', Aa_{22}') cooperatively constitute second data.

[0080] Therefore, Table 5, which is generated based on Tables 1 and 3, can serve as an exemplary lookup table that is adopted by the processing unit **12** to estimate the Internet activity dependence of the human subject **100** in the third embodiment.

TABLE 5

		positive emotional content		negative emotional content	
		thorax	abdomen	thorax	abdomen
first data	first estimation output (relatively highly dependent)	average frequency			
		Ft_{11} > Ft_{21}	Fa_{11} > Fa_{21}	Ft_{11} > Ft_{21}'	Fa_{11} > Fa_{21}'
		average amplitude			
		At_{11} < At_{21}	Aa_{11} < Aa_{21}	At_{11} > At_{21}'	Aa_{11} < Aa_{21}'
second data		average frequency			
		Ft_{12} > Ft_{22}	Fa_{12} < Fa_{22}	Ft_{12} < Ft_{22}'	Fa_{12} > Fa_{22}'
		average amplitude			
		At_{12} > At_{22}	Aa_{12} > Aa_{22}	At_{12} < At_{22}'	Aa_{12} > Aa_{22}'
first data	second estimation output (relatively lowly dependent)	average frequency			
		Ft_{11} > Ft_{21}	Fa_{11} < Fa_{21}	Ft_{11} < Ft_{21}'	Fa_{11} < Fa_{21}'
		average amplitude			
		At_{11} > At_{21}	Aa_{11} > Aa_{21}	At_{11} < At_{21}'	Aa_{11} > Aa_{21}'
second data		average frequency			
		Ft_{12} < Ft_{22}	Fa_{12} < Fa_{22}	Ft_{12} < Ft_{22}'	Fa_{12} > Fa_{22}'
		average amplitude			
		At_{12} < At_{22}	Aa_{12} < Aa_{22}	At_{12} > At_{22}'	Aa_{12} < Aa_{22}'

[0081] In addition, Table 6, which is generated based on Tables 2 and 4, can serve as another exemplary lookup table that is adopted by the processing unit **12** to estimate the Internet activity dependence of the human subject **100** in the third embodiment.

TABLE 6

		positive emotional content		negative emotional content	
		thorax	abdomen	thorax	abdomen
first data	first estimation output (relatively highly dependent)	average frequency			
		Ft_{11} > Ft_{21}	Fa_{11} > Fa_{21}	Ft_{11} > Ft_{21}'	Fa_{11} > Fa_{21}'
		average amplitude			
		At_{11} < At_{21}	Aa_{11} < Aa_{21}	At_{11} > At_{21}'	Aa_{11} < Aa_{21}'
	second estimation output (relatively lowly dependent)	average frequency			
		Ft_{11} > Ft_{21}	Fa_{11} < Fa_{21}	Ft_{11} < Ft_{21}'	Fa_{11} < Fa_{21}'
		average amplitude			
		At_{11} > At_{21}	Aa_{11} > Aa_{21}	At_{11} < At_{21}'	Aa_{11} > Aa_{21}'

TABLE 6-continued

		positive emotional content		negative emotional content	
		thorax	abdomen	thorax	abdomen
second data	first estimation output (relatively highly dependent)	average frequency			
		Ft_{12} > Ft_{22}	Fa_{12} < Fa_{22}	Ft_{12} < Ft_{22}'	Fa_{12} > Fa_{22}
		average amplitude			
		At_{12} > At_{22}	Aa_{12} > Aa_{22}	At_{12} < At_{22}'	Aa_{12} > Aa_{22}'
	second estimation output (relatively lowly dependent)	average frequency			
		Ft_{12} < Ft_{22}	Fa_{12} < Fa_{22}	Ft_{12} < Ft_{22}'	Fa_{12} > Fa_{22}'
		average amplitude			
		At_{12} < At_{22}	Aa_{12} < Aa_{22}	At_{12} > At_{22}'	Aa_{12} < Aa_{22}'

[0082] In Tables 5 and 6, each of the first and second estimation outputs generated by the processing unit **12** can serve as the estimation result. When other comparison results associated with the first and second data are not listed in Table 5 or Table 6, similar to steps **345** and **347'** of the first embodiment (FIGS. **3**A and **3**B) and steps **545** and **547'** of the second embodiment (FIGS. **5**A and **5**B), the processing unit **12** generates the third estimation output indicating inconclusive result as to as to Internet activity dependence of the human subject **100** and serving as the estimation result.

[0083] In this embodiment, steps **21** and **22** of the first embodiment (FIG. **2**) are performed prior to steps **41** and **42** of the second embodiment (FIG. **4**). However, in some embodiments, steps **41** and **42** of the second embodiment (FIG. **4**) may be performed prior to steps **21** and **22** of the first embodiment (FIG. **2**).

[0084] In view of the above, the processing unit **12** can easily generate the estimation result associated with the Internet activity dependence of the human subject **100** based on the predetermined criterion associated with one emotional stimulation material including positive or negative emotional content or the predetermined criterion associated with each of two emotional stimulation materials respectively including positive and negative contents, and on the corresponding respiratory signal (St_1, St_2, St_2', Sa_1, Sa_2, Sa_2') sensed from the subject human **100** during the predetermined first and second time periods without filling out the time-consuming questionnaires as required in the prior art. Therefore, a current estimation result of the subject human **100** can be obtained using the method of the disclosure in a relatively short amount of time, for example, several minutes, and may be used as reference information by a doctor to diagnose whether the human subject **100** is addictive to the Internet.

[0085] While the disclosure has been described in connection with what are considered the exemplary embodiments, it is understood that this disclosure is not limited to the disclosed embodiments but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

What is claimed is:

1. A method of estimating Internet activity dependence of a human subject, to be implemented by a system that includes a respiration sensing unit and a processing unit, said method comprising the steps of:

A) by the respiration sensing unit, sensing respiration-caused thorax and abdomen movements of the human subject during a first time period, and a subsequent second time period during which an emotional stimulation material played on a multimedia playing unit is being watched by the human subject so as to generate a first thoracic respiratory signal (St_1) and a first abdominal respiratory signal (Sa_1) that correspond to the first time period, and a second thoracic respiratory signal (St_2) and a second abdominal respiratory signal (Sa_2) that correspond to the second time period; and

B) by the processing unit, generating an estimation result associated with the Internet activity dependence of the human subject based on a criterion associated with the emotional stimulation material, the first and second thoracic respiratory signals (St_1, St_2), and the first and second abdominal respiratory signals (Sa_1, Sa_2).

2. The method as claimed in claim **1**, wherein step B) includes the sub-steps of:

B-1) by the processing unit, dividing the first thoracic respiratory signal (St_1) into a first signal component (St_{11}) and a second signal component (St_{12}) whose frequencies differ from each other, the first abdominal respiratory signal (Sa_1) into a first signal component (Sa_{11}) and a second signal component (Sa_{12}) whose frequencies differ from each other, the second thoracic respiratory signal (St_2) into a first signal component (St_{21}) and a second signal component (St_{22}) whose frequencies differ from each other, and the second abdominal respiratory signal (Sa_2) into a first signal component (Sa_{21}) and a second signal component (Sa_{22}) whose frequencies differ from each other;

B-2) by the processing unit, calculating an average frequency (Ft_{11}) and an average amplitude (At_{11}) of the first signal component (St_{11}), an average frequency (Ft_{12}) and an average amplitude (At_{12}) of the second signal component (St_{12}), an average frequency (Fa_{11}) and an average amplitude (Aa_{11}) of the first signal component (Sa_{11}), an average frequency (Fa_{12}) and an average amplitude (Aa_{12}) of the second signal component (Sa_{12}), an average frequency (Ft_{21}) and an average amplitude (At_{21}) of the first signal component (St_{21}), an average frequency (Ft_{22}) and an average amplitude (At_{22}) of the second signal component (St_{22}), an average frequency (Fa_{21}) and an average amplitude (Aa_{21}) of the first signal component (Sa_{21}), and an average frequency (Fa_{22}) and an average amplitude (Aa_{22}) of the second signal component (Sa_{22}), the average frequencies (Ft_{11}, Fa_{11}, Ft_{21}, Fa_{21}) and the average amplitudes (At_{11}, Aa_{11}, At_{21}, Aa_{21}) cooperatively constituting first data, the average frequencies (Ft_{12}, Fa_{12}, Ft_{22}, Fa_{22}) and the average amplitudes (At_{12}, Aa_{12}, At_{22}, Aa_{22}) cooperatively constituting second data; and

B-3) by the processing unit, generating the estimation result based on at least one of the first data and the second data, and on the emotional stimulation material.

3. The method as claimed in claim **2**, wherein step B) further includes, prior to step B-1), the sub-step of:

B-0) by the processing unit, filtering out noises, which have frequencies higher than 50 Hz or lower than 0.01 Hz, in the first and second thoracic respiratory signals (St_1, St_2), and in the first and second abdominal respiratory signals (Sa_1, Sa_2).

4. The method as claimed in claim **2**, wherein, in sub-step B-1), the processing unit obtains the first signal components (St_{11}, Sa_{11}, St_{21}, Sa_{21}) and the second signal components (St_{12}, Sa_{12}, St_{22}, Sa_{22}) using a decomposition method associated with a complementary ensemble empirical model.

5. The method as claimed in claim **2**, wherein:

in step A), the emotional stimulation material includes positive emotional content that tends to stimulate positive emotions in a viewer thereof; and

sub-step B-3) includes

by the processing unit, comparing the average frequency (Ft_{11}) with the average frequency (Ft_{21}), the average frequency (Fa_{11}) with the average frequency (Fa_{21}), the average amplitude (At_{11}) with the average amplitude (At_{21}), and the average amplitude (Aa_{11}) with the average amplitude (Aa_{21}) so as to generate a first comparison result, and

by the processing unit, generating the estimation result based on the criterion associated with the emotional stimulation material and on the first comparison result.

6. The method as claimed in claim **5**, wherein:

when the first comparison result indicates that the average frequency (Ft_{11}) is greater than the average frequency (Ft_{21}), that the average frequency (Fa_{11}) is greater than the average frequency (Fa_{21}), that the average amplitude (At_{11}) is smaller than the average amplitude (At_{21}) and that the average amplitude (Aa_{11}) is smaller than the average amplitude (Aa_{21}), the processing unit generates a first estimation output indicating that the human subject is relatively highly dependent on Internet activity and serving as the estimation result; and

when the first comparison result indicates that the average frequency (Ft_{11}) is greater than the average frequency (Ft_{21}), that the average frequency (Fa_{11}) is smaller than the average frequency (Fa_{21}), that the average amplitude (At_{11}) is greater than the average amplitude (At_{21}) and that the average amplitude (Aa_{11}) is greater than the average amplitude (Aa_{21}), the processing unit generates a second estimation result indicating that the human subject is relatively lowly dependent on Internet activity and serving as the estimation result.

7. The method as claimed in claim **5**, wherein:

sub-step B-3) further includes, prior to generation of the estimation result, by the processing unit, comparing the average frequency (Ft_{12}) with the average frequency (Ft_{22}), the average frequency (Fa_{12}) with the average frequency (Fa_{22}), the average amplitude (At_{12}) with the average amplitude (At_{22}), and the average amplitude (Aa_{12}) with the average amplitude (Aa_{22}) so as to generate a second comparison result; and

the processing unit generates the estimation result based on the criterion associated with the emotional stimulation material and the first comparison result and further on the second comparison result.

8. The method as claimed in claim **7**, wherein:

when the first comparison result indicates that the average frequency (Ft_{11}) is greater than the average frequency (Ft_{21}), that the average frequency (Fa_{11}) is greater than the average frequency (Fa_{21}), that the average amplitude (At_{11}) is smaller than the average amplitude (At_{21}) and that the average amplitude (Aa_{11}) is smaller than the average amplitude (Aa_{21}), while the second comparison result indicates that the average frequency (Ft_{12}) is greater than the average frequency (Ft_{22}), that

the average frequency (Fa_{12}) is smaller than the average frequency (Fa_{22}), that the average amplitude (At_{12}) is greater than the average amplitude (At_{22}) and that the average amplitude (Aa_{12}) is greater than the average amplitude (Aa_{22}), the processing unit generates, a first estimation output indicating that the human subject is relatively highly dependent on Internet activity and serving as the estimation result; and

when the first comparison result indicates that the average frequency (Ft_{11}) is greater than the average frequency (Ft_{21}), that the average frequency (Fa_{11}) is smaller than the average frequency (Fa_{21}), that the average amplitude (At_{11}) is greater than the average amplitude (At_{21}) and that the average amplitude (Aa_{11}) is greater than the average amplitude (Aa_{21}), while the second comparison result indicates that the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}), that the average frequency (Fa_{12}) is smaller than the average frequency (Fa_{22}), that the average amplitude (At_{12}) is smaller than the average amplitude (At_{22}) and that the average amplitude (Aa_{12}) is smaller than the average amplitude (Aa_{22}), the processing unit generates, a second estimation output indicating that the human subject is relatively lowly dependent on Internet activity and serving as the estimation result.

9. The method as claimed in claim **2**, wherein:

in step A), the emotional stimulation material includes positive emotional content that tends to stimulate positive emotions in a viewer thereof; and

sub-step B-3) includes

by the processing unit, comparing the average frequency (Ft_{12}) with the average frequency (Ft_{22}), the average frequency (Fa_{12}) with the average frequency (Fa_{22}), the average amplitude (At_{12}) with the average amplitude (At_{22}), and the average amplitude (Aa_{12}) is with the average amplitude (Aa_{22}) so as to generate a comparison result, and

by the processing unit, generating the estimation result based on the criterion associated with the emotional stimulation material and on the comparison result.

10. The method as claimed in claim **9**, wherein:

when the comparison result indicates that the average frequency (Ft_{12}) is greater than the average frequency (Ft_{22}), that the average frequency (Fa_{12}) is smaller than the average frequency (Fa_{22}), that the average amplitude (At_{12}) is greater than the average amplitude (At_{22}) and that the average amplitude (Aa_{12}) is greater than the average amplitude (Aa_{22}), the processing unit generates a first estimation output indicating that the human subject is relatively highly dependent on Internet activity and serving as the estimation result; and

when the comparison result indicates that the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}), that the average frequency (Fa_{12}) is smaller than the average frequency (Fa_{22}), that the average amplitude (At_{12}) is smaller than the average amplitude (At_{22}) and that the average amplitude (Aa_{12}) is smaller than the average amplitude (Aa_{22}), the processing unit generates a second estimation result indicating that the human subject is relatively lowly dependent on Internet activity and serving as the estimation result.

11. The method as claimed in claim **2**, wherein:

in step A), the emotional stimulation material includes negative emotional content that tends to stimulate negative emotions in a viewer thereof; and

sub-step B-3) includes

by the processing unit, comparing the average frequency (Ft_{11}) with the average frequency (Ft_{21}), the average frequency (Fa_{11}) with the average frequency (Fa_{21}), the average amplitude (At_{11}) with the average amplitude (At_{21}), and the average amplitude (Aa_{11}) with the average amplitude (Aa_{21}) so as to generate a first comparison result, and

by the processing unit, generating the estimation result based on the criterion associated with the emotional stimulation material and on the first comparison result.

12. The method as claimed in claim **11**, wherein:

when the first comparison result indicates that the average frequency (Ft_{11}) is greater than the average frequency (Ft_{21}), that the average frequency (Fa_{11}) is greater than the average frequency (Fa_{21}), that the average amplitude (At_{11}) is greater than the average amplitude (At_{21}) and that the average amplitude (Aa_{11}) is smaller than the average amplitude (Aa_{21}), the processing unit generates a first estimation output indicating that the human subject is relatively highly dependent on Internet activity and serving as the estimation result; and

when the first comparison result indicates that the average frequency (Ft_{11}) is smaller than the average frequency (Ft_{21}), that the average frequency (Fa_{11}) is smaller than the average frequency (Fa_{21}), that the average amplitude (At_{11}) is smaller than the average amplitude (At_{21}) and that the average amplitude (Aa_{11}) is greater than the average amplitude (Aa_{21}), the processing unit generates a second estimation result indicating that the human subject is relatively lowly dependent on Internet activity and serving as the estimation result.

13. The method as claimed in claim **11**, wherein:

sub-step B-3) further includes, prior to generation of the estimation result, by the processing unit, comparing the average frequency (Ft_{12}) with the average frequency (Ft_{22}), the average frequency (Fa_{12}) with the average frequency (Fa_{22}), the average amplitude (At_{12}) with the average amplitude (At_{22}), and the average amplitude (Aa_{12}) with the average amplitude (Aa_{22}) so as to generate a second comparison result; and

the processing unit generates the estimation result based on the criterion associated with the emotional stimulation material and the first comparison result and further on the second comparison result.

14. The method as claimed in claim **13**, wherein:

when the first comparison result indicates that the average frequency (Ft_{11}) is greater than the average frequency (Ft_{21}), that the average frequency (Fa_{11}) is greater than the average frequency (Fa_{21}), that the average amplitude (At_{11}) is greater than the average amplitude (At_{21}) and that the average amplitude (Aa_{11}) is smaller than the average amplitude (Aa_{21}) while the second comparison result indicates that the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}), that the average frequency (Fa_{12}) is greater than the average frequency (Fa_{22}), that the average amplitude (At_{12}) is smaller than the average amplitude (At_{22}) and that the average amplitude (Aa_{12}) is greater than the average amplitude (Aa_{22}), the processing unit generates a first

estimation output indicating that the human subject is relatively highly dependent on Internet activity and serving as the estimation result; and

when the first comparison result indicates that the average frequency (Ft_{11}) is smaller than the average frequency (Ft_{21}), that the average frequency (Fa_{11}) is smaller than the average frequency (Fa_{21}), that the average amplitude (At_{11}) is smaller than the average amplitude (At_{21}) and that the average amplitude (Aa_{11}) is greater than the average amplitude (Aa_{21}) while the second comparison result indicates that the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}), that the average frequency (Fa_{12}) is greater than the average frequency (Fa_{22}), that the average amplitude (At_{12}) is greater than the average amplitude (At_{22}) and that the average amplitude (Aa_{12}) is smaller than the average amplitude (Aa_{22}), the processing unit generates a second estimation output indicating that the human subject is relatively lowly dependent on Internet activity and serving as the estimation result.

15. The method as claimed in claim **2**, wherein:

in step A), the emotional stimulation material includes negative emotional content that tends to stimulate negative emotions in a viewer thereof; and

sub-step B-3) includes

by the processing unit, comparing the average frequency (Ft_{12}) with the average frequency (Ft_{22}), the average frequency (Fa_{12}) with the average frequency (Fa_{22}), the average amplitude (At_{12}) with the average amplitude (At_{22}), and the average amplitude (Aa_{12}) with the average amplitude (Aa_{22}) so as to generate a comparison result, and

by the processing unit, generating the estimation result based on the criterion associated with the emotional stimulation material and on the comparison result.

16. The method as claimed in claim **15**, wherein:

when the comparison result indicates that that the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}), that the average frequency (Fa_{12}) is greater than the average frequency (Fa_{22}), that the average amplitude (At_{12}) is smaller than the average amplitude (At_{22}) and that the average amplitude (Aa_{12}) is greater than the average amplitude (Aa_{22}), the processing unit generates a first estimation output indicating that the human subject is relatively highly dependent on Internet activity and serving as the estimation result; and

when the comparison result indicates that that the average frequency (Ft_{12}) is smaller than the average frequency (Ft_{22}), that the average frequency (Fa_{12}) is greater than the average frequency (Fa_{22}), that the average amplitude (At_{12}) is greater than the average amplitude (At_{22}) and that the average amplitude (Aa_{12}) is smaller than the average amplitude (Aa_{22}), the processing unit generates a second estimation result indicating the human subject is relatively lowly dependent on Internet activity and serving as the estimation result.

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专利名称(译)	估计人类受试者的互联网活动依赖性的方法		
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发明人	HSIAO, TZU-CHIEN JI, HONG-MING HSIEH, DAI-LING		
IPC分类号	A61B5/16 A61B5/00 A61B5/113		
CPC分类号	A61B5/16 A61B5/1135 A61B5/742 A61B5/6802 A61B5/7203 A61B5/7246 A61B5/7278 A61B5/0816 A61B5/165 A61B5/6823 A61B5/7253		
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摘要(译)

在估计人类对象的因特网活动依赖性的方法中，呼吸感测单元在第一时间段和随后的第二时间段期间感测人类对象的呼吸引起的胸部和腹部运动，在所述第二时间段期间，多媒体播放单元被人类对象观看，以便产生分别对应于第一和第二时间段的两组胸和腹部呼吸信号。处理单元基于情绪刺激材料和胸和腹部呼吸信号的集合生成与因特网活动相关性相关联的估计结果。