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[Document name] Specification

[Title of Invention] Information Processing System, Information Processing Method, and Recording Medium

[Technical field]

[0001]

This disclosure relates to an information processing system, an information processing method, and a recording medium.

[Background Technology]

[0002]

Conventionally, methods have been used to measure a user's emotions in specific situations, estimate the object of those emotions, and provide feedback on those emotions.

[0003]

For example, Patent Literature 1 below discloses a method that obtains an estimate of the user's emotions and the source that caused those emotions. When the estimated user's emotions are positive, it presents the user with information to help maintain those emotions, and when the estimated user's emotions are negative, it presents the user with information to help remove the source of those emotions.

[0004]

In addition, Patent Literature 2 below relates to a technology for detecting positive and negative responses from the content of a conversation. Furthermore, Patent Literature 3 discloses a system that determines positive and negative mental states based on facial expressions. Also, Patent Literature 4 discloses an action control system that appropriately learns the appropriateness of robot actions based on user emotional changes by changing the degree of appropriateness associated with the determined robot action based on the user's emotional changes.

[0005]

Moreover, Patent Literature 5 discloses a dialogue system that estimates negative and positive emotions from the user's utterances and actions, and provides a response corresponding to those emotions, thereby making the user feel that the system is empathizing with them and creating a sense of trust between the user and the system.

[Prior art literature]

[Patent literature]

[0006]

[Patent Literature 1] Japanese Unexamined Patent Publication No. 2017-201499

[Patent Literature 2] Japanese Unexamined Patent Publication No. 2017-091570

[Patent Literature 3] Japanese Unexamined Patent Publication No. 2016-147006

[Patent Literature 4] Japanese Unexamined Patent Publication No. 2016-012340

[Patent Literature 5] Japanese Unexamined Patent Publication No. 2006-178063

[Summary of Invention]

[Problems to be Solved by the Invention]

[0007]

However, responses to user emotions have all been limited to responses that empathize with the user's emotions (that is, responses that show empathy) or responses that maintain the user's positive emotions, and have not considered how to further improve the user's state.

[0008]

Furthermore, while Patent Literature 1 discloses presenting information to remove the object causing a user to experience negative emotions, in this case, acquiring the object is essential, and if the object cannot be removed, it becomes difficult to improve the user's negative emotions.

[0009]

Therefore, this disclosure proposes an information processing system, an information processing method, and a recording medium that can improve the user's state and enhance their quality of life in accordance with the user's emotions.

[Means for Solving the Problems]

[0010]

[Means for solving the problems] This disclosure proposes an information processing system comprising a control unit that estimates whether a user is in a positive or negative state, and has one of the following functions: a function to promote the user's actions when the user is estimated to be in a positive state, a function to suppress the user's actions when the user is estimated to be in a negative state, and a function to present a positive interpretation of the user's situation or actions when the user is estimated to be in a negative state.

[0011]

This disclosure proposes an information processing method in which a processor estimates whether a user is in a positive or negative state, and performs one of the following functions: a function to promote the user's actions when the user is estimated to be in a positive state, a function to suppress the user's actions when the user is estimated to be in a negative state, and a function to present a positive interpretation of the user's situation or actions when the user is estimated to be in a negative state.

[0012]

This disclosure proposes a recording medium on which a program is recorded causing a computer to function as a control unit having one of the following functions: a function to estimate whether a user is in a positive or negative state, a function to promote the user's actions when the user is estimated to be in a positive state, a function to suppress the user's actions when the user is estimated to be in a negative state, and a function to present a positive interpretation of the user's situation or actions when the user is estimated to be in a negative state.

[Effects of the Present Invention]

[0013]

As described above, according to this disclosure, it is possible to improve the user's condition to a better state in accordance with the user's emotions and to improve the quality of life.

[0014]

Furthermore, the effects described above are not necessarily limited, and any of the effects described herein, or any other effects that can be inferred from this specification, may be achieved in conjunction with or in lieu of the effects described above.

[Brief Description of Drawings]

[0015]

[FIG. 1] This figure illustrates an overview of an information processing system according to one embodiment of the present disclosure.

[FIG. 2] This is a block diagram showing an example of the configuration of an information processing device according to the first embodiment.

[FIG. 3] This figure shows an example of the data structure of the judgment DB for (emotional) P/N judgment according to the first embodiment.

[FIG. 4] This figure shows an example of the data structure of the feedback DB for feedback determination according to the first embodiment.

[FIG. 5] This flowchart shows an example of the overall flow of FB processing in the information processing system according to the first embodiment.

[FIG. 6] This flowchart shows an example of the P/N determination process and P/N feedback determination process according to the first embodiment.

[FIG. 7] This is a block diagram showing an example of the configuration of an information processing device according to the second embodiment.

[FIG. 8] This figure shows an example of the data structure of the training database according to the second embodiment.

[FIG. 9] This flowchart shows an example of the learning process flow according to the second embodiment.

[FIG. 10] This is a block diagram showing an example of the configuration of an information processing device according to the third embodiment.

[FIG. 11] This flowchart shows an example of the brain stimulation process according to the third embodiment.

[FIG. 12] This figure shows an example of the data structure of the database for P/N determination according to the fourth embodiment.

[FIG. 13] This flowchart shows an example of the feedback process flow considering ethical P/N determination and legal P/N determination according to the fourth embodiment.

[FIG. 14] This figure shows an example of the data structure of a feedback DB for feedback determination, including a reframing FB according to the fifth embodiment.

[FIG. 15] This flowchart shows an example of a feedback process flow including reframing according to the fifth embodiment.

[FIG. 16] This figure shows an example of the data structure for a P/N determination database that takes into account ethical and legal P/N determinations according to the sixth embodiment.

[FIG. 17] This figure shows an example of the data structure of a feedback DB for feedback determination, including a reframing FB according to the sixth embodiment.

[Detailed Description of the Embodiments]

[0016]

Hereinafter, preferred embodiments of the present disclosure will be described in detail with reference to the attached drawings. In this specification and the drawings, components having substantially the same functional configuration are denoted by the same reference numerals, thus omitting redundant explanations.

[0017]

Furthermore, the description will be made in the following order.

1. Overview of an Information Processing System According to One Embodiment of This Disclosure

2. Each Embodiment

2-1. First Embodiment (Behavior Promotion, Suppression)

(2-1-1. Configuration Example)

(2-1-2. Operation Processing)

2-2. Second Embodiment (Database Learning)

(2-2-1. Configuration Example)

(2-2-2. Operation Processing)

2-3. Third Embodiment (Brain Stimulation)

(2-3-1. Configuration Example)

(2-3-2. Operation Processing)

2-4. Fourth Embodiment (Ethical and Legal Considerations)

(2-4-1. Configuration Example)

(2-4-2. Operation Processing)

2-5. Fifth Embodiment (Reframing)

(2-5-1. Configuration Example)

(2-5-2. Operation Processing)

(2-5-3. Addition of Empathetic Responses)

(2-5-4. Automatic Generation of Reframing)

2-6. Sixth Embodiment (Example of Application to Small Communities)

(2-6-1. Configuration Example)

(2-6-2. Operation Processing)

3. Summary

[0018]

<<1. Overview of an Information Processing System According to One Embodiment of This Disclosure>>

The information processing system according to this embodiment is an agent system that estimates the user's emotions based on the user's actions and circumstances, and improves the user's life to a better state, that is, improves the user's QOL (Quality of Life), by providing feedback corresponding to the estimated emotions. While it is necessary for people to experience negative emotions such as anger or sadness towards their environment, situations, or other people in order to detect and avoid danger, excessive negative emotions can lead to stress and negatively affect the immune system and other organs. On the other hand, having positive emotions has a positive effect on the immune system and other systems, making it a more desirable state.

[0019]

(Background)

In recent years, voice agents that recognize user speech and respond directly to user questions and requests in a short, single session (completion of request and response) have become increasingly popular. Such voice agents are implemented, for example, in dedicated speaker devices (so-called home agent devices) placed in kitchens, dining rooms, etc., as home agents for residential use.

[0020]

In addition, the conventional technologies mentioned above also propose voice agents that respond according to the estimated emotions of the user.

[0021]

However, in all cases, the system expresses the same emotions as the user to show empathy, and has not adequately considered the improvement of the user's state (including improvements in the user's life and living conditions over a long period of time), regardless of whether the emotions are positive or negative.

[0022]

Therefore, in this embodiment, by providing feedback that responds to the user's emotions, it is possible to improve the user's state and enhance their quality of life.

[0023]

Specifically, the information processing system (agent system) according to this embodiment recognizes the user's actions in a specific situation and estimates the emotions they experience at that time. Based on the estimated emotions, it provides feedback to promote (increase) or suppress (decrease) the actions at that time, thereby improving the user's life. For example, the information processing system according to this embodiment increases a user's behavior by providing positive feedback (a positive reinforcer based on behavioral analysis) to encourage that behavior when the user's emotions are positive. Furthermore, the information processing system according to this embodiment reduces negative behavior by providing negative feedback (a negative reinforcer based on behavioral analysis) to suppress the user's actions when their emotions are negative. In addition, the information processing system according to this embodiment can also transform a user's emotions into positive ones by performing reframing, which presents a positive interpretation of a situation or action that the user perceives negatively.

[0024]

Here, FIG. 1 shows an overview of the information processing system according to this embodiment. FIG. 1 is a diagram illustrating an example of reframing. As shown in FIG. 1, for example, if a user forgets to eat dessert (such as a cream puff or other food with a short shelf life) before going out and is feeling negative emotions, the agent can provide a positive interpretation such as, "I'm sure your child will enjoy eating it!" or "I'm sure your child will find it and enjoy eating it! and they'll think, 'Dad must have saved it for me!'" This makes it possible to improve the user's mood to a more positive state without changing the situation or behavior. Reframing by the agent may be presented only via audio through the earphones of the HMD (information processing device 10) worn by the user, and further, images of the agent character may be displayed in AR (Augmented Reality) on the display unit of the HMD.

[0025]

User situational awareness, behavioral recognition, and emotion estimation can be achieved using various sensing data, user input information (such as schedule information, emails, and messages posted on social networks), externally acquired information (such as date and time, maps, weather, and surveillance camera footage), or machine learning. Specific examples of sensing data will be discussed later, but for example, information detected by sensors such as cameras, microphones, accelerometers, gyroscopes, position information acquisition units, biosensors (e.g., body temperature, pulse, heart rate, sweating, blinking, brain waves), gaze sensors, or environmental sensors (e.g., temperature, humidity, illuminance, wind pressure) can be considered. These sensors may be provided on, for example, the information processing device 10, or they may be implemented by other wearable devices or smartphones that communicate with the information processing device 10.

[0026]

Furthermore, as envisioned in FIG. 1, if a user goes out without eating their dessert and experiences negative emotions, it is possible to obtain information such as the user's shopping records (e.g., credit card or electronic money usage history), the refrigerator's camera, the smartphone's camera, and social network posts, which indicate that the user purchased the dessert and put it in the refrigerator, as well as the dessert's expiration date. Next, it is possible to determine if the user is commuting based on their location, movements, date and time, etc. This allows the system to understand that the user left dessert at home (situational awareness) and then forgot to eat it before going out (behavioral awareness). Furthermore, if a user is experiencing negative emotions regarding their actions in such a situation, as mentioned above, providing a positive interpretation, such as "I'm sure your child is enjoying eating it!", can help improve their mood and bring them back to a more positive state.

[0027]

Whether a user is experiencing negative emotions can be determined, for example, from a pre-prepared database where emotions (negative/positive) are associated with situations and actions. Reframing can also be performed when the user takes an action such as "going out," or when their stomach rumbles, when they make a comment or post on social media about forgetting to eat dessert, when they sigh while staring at a restaurant or food sign, when they walk with their head down (suggesting they may have been upset), when eye movements or brainwaves suggest they are recalling something, or when blood glucose levels or brainwaves suggest they are hungry or thinking about food.

[0028]

The above describes an information processing system according to one embodiment of the present disclosure. The information processing system according to this embodiment (also referred to as an agent system) can be implemented using various devices. For example, the agent system according to this embodiment can be implemented using a dedicated terminal such as a smartphone, tablet, mobile phone, or home agent (speaker device), a projector, or an output device such as a wearable device such as an HMD (Head Mounted Display), smart band, smartwatch, or smart earphone. The HMD could, for example, be a glasses-type HMD equipped with earphones and a see-through display, which can be worn daily (see FIG. 1).

[0029]

Furthermore, the agent system according to this embodiment is an application that runs on these output devices or servers, and may be implemented by multiple devices. In addition, the agent system according to this embodiment may provide feedback from any output device as appropriate. For example, while the user is at home, the interaction may primarily be conducted using speaker devices or display devices in the room (such as a television set, projector, or large display device installed in the room), while the user is outside, the interaction may primarily be conducted using a smartphone, smart band, smart earphones, etc. In addition, feedback may be provided from multiple devices almost simultaneously.

[0030]

Furthermore, user feedback (facilitation, suppression, reframing) can be provided through audio output, image display, text display, or physical tactile or brain stimulation.

[0031]

Next, the information processing system according to this embodiment will be described in detail using several examples.

[0032]

<<2. Each Embodiment>>

<2-1. First Embodiment (Behavior Promotion, Inhibition)>

(2-1-1. Configuration Example)

FIG. 2 is a block diagram showing an example of the configuration of the information processing device 10a according to the first embodiment. As shown in FIG. 2, the information processing device 10a includes a control unit 100a, a communication unit 110, an input unit 120, an output unit 130, and a storage unit 140.

[0033]

The control unit 100a functions as an arithmetic processing unit and control unit, and controls the overall operation within 10a according to various programs. The control unit 100a is implemented by electronic circuits such as a CPU (Central Processing Unit) or a microprocessor. In addition, the control unit 100a may include a ROM (Read Only Memory) for storing the program and calculation parameters to be used, and a RAM (Random Access Memory) for temporarily storing parameters that change as needed.

[0034]

Furthermore, the control unit 100a in this embodiment also functions as a situation recognition unit 101, a behavior recognition unit 102, a determination unit 103, and a feedback determination unit 104.

[0035]

The situation recognition unit 101 recognizes the environment in which the user is located as a situation. Specifically, the situation recognition unit 101 recognizes the user's situation based on sensing data (such as voice, camera images, biometric information, and motion information) detected by the sensor unit 122. For example, the situation recognition unit 101 recognizes the vehicle (train, bus, car, bicycle, etc.) that the user is using based on the user's position, movement speed, and acceleration sensor data. In addition, the sensor unit 122 may also label the environment using linguistic AND conditions for situation recognition (for example, "train & crowded" (crowded train) or "room & child" (child's room), etc.).

[0036]

Furthermore, the situation recognition unit 101 may be configured to recognize the situation that the user actually perceives (experiences). For example, the situation recognition unit 101 can recognize the situation the user is actually perceiving by using only captured images taken in the direction of the user's gaze (for example, a camera on the HMD with the user's field of view as its imaging angle) or audio data collected by a microphone located near the user's ear. Alternatively, the situation recognition unit 101 may limit the data to situations in which the user is paying attention by sensing the opening and closing of the eyes and excluding data from when the eyes are closed for an extended period, or by sensing brain activity such as electroencephalograms and excluding data from when the user is not paying attention (concentrating).

[0037]

In addition, the situation recognition unit 101 is not limited to sensing data detected by the sensor unit 122, but may also recognize the situation by referring to information entered by the user (schedule information, email content, social network posts, etc.) or information acquired by the information processing device 10a (date and time, weather, traffic information, user purchase history, sensing data acquired from sensor devices installed in the surrounding area (surveillance cameras, surveillance microphones, etc.)).

[0038]

Furthermore, the situation recognition unit 101 may recognize not only the situation in the real world, but also the situation on social networks (for example, interactions, viewing, downloads, etc., within a music group the user is a part of) and the situation in the VR (Virtual Reality) world.

[0039]

In addition, the situation recognition unit 101 may use a neural network trained by deep learning, provided with sensing data and language labels as training data, as a method for recognizing the situation.

[0040]

The behavior recognition unit 102 recognizes the user's actions. Specifically, the behavior recognition unit 102 recognizes user behavior based on sensing data (such as voice, camera images, biometric information, and motion information) detected by the sensor unit 122. For example, the behavior recognition unit 102 recognizes actions such as "standing, sitting, walking, running, lying down, falling, and talking" in real time based on sensing data detected by an acceleration sensor, gyro sensor, microphone, etc.

[0041]

The determination unit 103 determines the user's emotions based on the user's situation recognized by the situation recognition unit 101 and the user's actions recognized by the behavior recognition unit 102. "Emotions" can be expressed using basic emotions such as joy or anger, but here, as an example, we may also use positive/negative (hereinafter also referred to as P/N). The positive/negative nature of emotions corresponds, for example, to the "pleasure/displeasure" axis in Russell's Circumplex Model, which organizes human emotions along two axes: "arousal" and "emotional pleasure/displeasure (valence)". Positive emotions include, for example, joy, happiness, excitement, relaxation, and satisfaction. Negative emotions include, for example, worry, anger, dissatisfaction, irritation, unpleasantness, sadness, depression, and boredom. In addition, the degree of positivity and negativity of emotions can be expressed as evokedness (valence), which can be normalized from -1 to 1. An evokedness score of "-1" indicates a negative emotion, a score of "0" indicates a neutral emotion, and a score of "1" indicates a positive emotion.

[0042]

The determination unit 103 in this embodiment may determine the user emotion (P/N) from the user behavior and user situation using a pre-generated P/N determination DB (database) 141. Here, FIG. 3 shows an example of the data structure of the determination DB141 for (emotional) P/N determination according to this embodiment. As shown in FIG. 3, the determination DB141 stores data in which an (emotion) P/N is pre-associated with situations and actions (1; positive, -1; negative). Based on this, the determination unit 103 determines whether the user's emotions are positive or negative, based on the user's situation and actions. In the table shown in FIG. 3, the "*" symbol means "don't care." If the user ID is "*", it indicates that the data can be applied to anyone. If the situation/behavior is "*", it indicates that the data can be applied to any situation/behavior. The P/N determination data stored in the determination DB141 may be pre-generated based on, for example, general knowledge, social norms, or survey results regarding user likes and dislikes or preferences, or it may be automatically generated by the learning process described below.

[0043]

Referring to the example shown in FIG. 3, the determination unit 103 estimates that any user, if they take action to give up their seat to someone else while sitting on a train (specifically, if they change from sitting to standing on a train), is "P/N; 1 (positive)". Also, referring to the example shown in FIG. 3, the determination unit 103 estimates that any user, regardless of the situation, will be "P/N; -1 (negative)" if it recognizes behaviors such as "shouting" or "hitting".

[0044]

In the example shown in FIG. 3, positive and negative emotions are represented by discrete values of "1" and "-1" as an example, but this embodiment is not limited to this, and may be represented by continuous values, for example.

[0045]

The feedback determination unit 104 has the function of determining the feedback to the user based on the determination result of the determination unit 103. Specifically, the feedback determination unit 104 determines the user feedback (hereinafter also referred to as "FB") based on the determination result of the determination unit 103, using the feedback DB 142. Here, FIG. 4 shows an example of the data configuration of the feedback DB142 for feedback determination according to this embodiment. As shown in FIG. 4, the feedback DB142 stores information about FB content (FB type, FB content, and priority) that is pre-associated with the user ID, situation, behavior, and (emotional) P/N. The type of feedback (FB) may include auditory (sound) and visual (image) stimuli as illustrated in Figure 4, as well as tactile stimuli (electricity, temperature, wind, pressure, etc.), olfactory (smell), etc. The feedback determination unit 104 determines the output method (audio output, display output, tactile stimulus output, etc.) according to the FB type. Furthermore, if there are multiple output devices, the feedback determination unit 104 can determine the appropriate output device according to the FB type. The feedback data stored in Feedback DB142 is pre-generated based on, for example, general knowledge, social norms, or survey results regarding user likes and dislikes and preferences.

[0046]

For positive behavior, feedback is provided that is pleasing to the user in order to reinforce that behavior, and for negative behavior, feedback is provided that is unpleasant to the user in order to suppress that behavior. FB can be run as a single instance or multiple instances. When selecting from multiple FB candidates, the decision may be made according to the priority shown in FIG. 4. The priorities shown in FIG. 4 are pre-set.

[0047]

In the example shown in FIG. 4, for instance, the user ID U1 is known to like dogs and dislike cats based on pre-obtained survey results. Therefore, when an action is determined to be associated with a positive emotion, the user is presented with sounds or animations of dogs that they like, thereby improving their mood and reinforcing that action. On the other hand, when a behavior is identified as a negative emotion, the user may be temporarily offended by being shown cat sounds or animations that the user dislikes. However, as the behavior decreases in the future, it will be possible to improve the user's state of mind over the long term. In addition, the "pleasant sounds" shown in FIG. 4 are generally considered to be music (melodies) that are pleasant to listen to, as well as music that provides relaxation, happiness, and satisfaction, such as the sound of a babbling brook. It could also be the voice of an animal or character the user likes, or music the user likes. On the other hand, "unpleasant sounds" can include sounds that people generally find unpleasant (for example, the sound of fingernails scratching a blackboard, high-pitched metallic sounds, warning sounds, sounds of a specific frequency, etc.) or sounds that the user personally finds unpleasant (for example, sound effects such as the sound of styrofoam rubbing together, the voices of animals or characters the user dislikes, or music the user dislikes).

[0048]

(Communication unit 110)

The communication unit 110 connects to an external device by wire or wireless connection and transmits and receives data with the external device. The communication unit 110 may communicate with external devices via a network, for example, a wired/wireless LAN (Local Area Network), Wi-Fi (registered trademark), Bluetooth (registered trademark), or a mobile communication network (LTE (Long Term Evolution), 3G (third-generation mobile communication system)).

[0049]

(Input unit 120)

The input unit 120 acquires input information for the information processing device 10a and outputs it to the control unit 100a. The input unit 120 includes, for example, an operation input unit 121 and a sensor unit 122.

[0050]

The operation input unit 121 detects operation input information from the user to the information processing device 10a. The operation input unit 121 may be, for example, a touch sensor, a pressure sensor, or a proximity sensor. Alternatively, the operation input section 121 may be a physical configuration such as a button, switch, or lever.

[0051]

The sensor unit 122 is a sensor that detects various sensing data for recognizing user conditions and user behavior. The sensor unit 122 could include, for example, a camera (stereo camera, visible light camera, infrared camera, depth camera, etc.), a microphone, a gyroscope, an accelerometer, a geomagnetic sensor, a biosensor (heart rate, body temperature, sweating, blood pressure, pulse, respiration, gaze, blinking, eye movement, staring time, electroencephalogram, body movement, body position, skin temperature, skin electrical resistance, MV (microvibration), electromyography, SpO2 (blood oxygen saturation), etc.), a position information acquisition unit such as GNSS (Global Navigation Satellite System), an environmental sensor (illuminance sensor, barometric pressure sensor, temperature (air temperature) sensor, humidity sensor, altitude sensor), an ultrasonic sensor, an infrared sensor, etc. The location information acquisition unit may detect location using methods other than GNSS, such as Wi-Fi (registered trademark), Bluetooth (registered trademark), transmission and reception with mobile phones, PHS phones, smartphones, etc., or short-range communication. There may be multiple sensors of each type. Additionally, the microphone may be a directional microphone.

[0052]

(Output unit 130)

The output unit 130 has the function of outputting feedback to the user in accordance with the control of the control unit 100a. The output unit 130 includes, for example, a display unit 131 and an audio output unit 132. The display unit 131 is a display device that displays images (still images or videos) and text. The display unit 131 is implemented by a display device such as a liquid crystal display (LCD) or an organic electroluminescent (EL) display. The output unit 130 may be, for example, a see-through display unit provided in a glasses-type HMD. In this process, display information such as feedback images is superimposed onto the real world and displayed using AR (Augmented Reality). The audio output unit 132 also outputs agent voice, music, melodies, sound effects, etc. There may be multiple display units 131 and audio output units 132. In addition, the audio output unit 132 may be a directional speaker.

[0053]

(Memory unit 140)

The memory unit 140 is implemented by a ROM (Read Only Memory) that stores programs and calculation parameters used in the processing of the control unit 100a, and a RAM (Random Access Memory) that temporarily stores parameters that change as needed.

[0054]

Furthermore, the memory unit 140 stores the determination DB 141 and the feedback DB 142. As explained with reference to FIG. 3, the determination DB141 contains data for determining whether user emotions are negative or positive based on the situation recognition results and the behavior recognition results. In addition, as explained with reference to FIG. 4, the feedback DB142 contains data for determining user feedback based on the P/N determination result. In this embodiment, as an example, based on behavioral analysis, positive reinforcers (rewards) are accumulated as positive feedback for promoting behavior, and negative reinforcers (punishments) are accumulated as negative feedback for inhibiting behavior.

[0055]

The configuration of the information processing device 10a according to this embodiment has been described in detail above. Note that the configuration of the information processing device 10a is not limited to the example shown in FIG. 2. The information processing device 10a may be implemented by multiple devices. For example, at least a part of the information processing device 10a may be located on a server on a network. Specifically, each function of the control unit 100a of the information processing device 10a and each DB of the storage unit 140 may be provided on the server. Furthermore, the sensor unit 122 may be provided on an external device, or it may be provided both on the information processing device 10a and externally.

[0056]

In addition, while FIG. 2 shows specific examples of the input unit 120 and output unit 130, this embodiment is not limited to these. Furthermore, the information processing device 10a may have an output unit 130 that does not include a display unit 131, or an audio output unit 132. In addition, the information processing device 10a may be equipped with either a behavior-promoting feedback function or a behavior-inhibiting feedback function.

[0057]

(2-1-2. Operation Processing)

Next, the FB processing of the information processing system according to this embodiment will be specifically explained with reference to FIGS. 5 and 6.

[0058]

FIG. 5 is a flowchart showing an example of the overall flow of FB processing in the information processing system according to this embodiment.

[0059]

As shown in FIG. 5, first, the information processing apparatus 10a performs situation recognition (step S103) and behavior recognition (step S106). These steps are not limited to the order shown in FIG. 5; they may be performed in reverse order or in parallel. In addition, these can be carried out continuously/periodically.

[0060]

Next, the information processing device 10a refers to the determination DB 141 based on the situation recognition result and the behavior recognition result and performs a P/N determination (step S109).

[0061]

Next, the information processing device 10a refers to the feedback DB 142 based on the P/N determination result and determines the feedback (step S112).

[0062]

Then, the information processing device 10a executes the determined feedback (step S115).

[0063]

The processes shown in steps S103 to S115 above are repeated until the system terminates (for example, by an explicit termination instruction from the user) (step S3118).

[0064]

Next, the flow of the P/N determination process and the P/N feedback determination process will be explained with reference to FIG. 6. FIG. 6 is a flowchart showing an example of the P/N determination process and the P/N feedback determination process.

[0065]

As shown in FIG. 6, first, the determination unit 103 of the information processing device 10a performs a P/N determination using the determination DB 141 based on the situation recognition result and the behavior recognition result (step S123).

[0066]

Next, if the determination unit 103 determines that the result is positive (step S126/Yes), the feedback determination unit 104 determines that the reinforcer FB is positive (step S129). For example, if the user U1 takes the action of "greeting" in a situation where they "meet someone" and this is judged as positive, then the feedback IDs R2 and R4 shown in FIG. 4 are appropriate. The feedback determination unit 104, for example, might display an image of a dog happily wagging its tail on the display unit 131 of the see-through HMD worn by user U1, or play a pleasant sound from the HMD's audio output unit 132. If only one feedback is performed, only the highest priority ID; R4 will be provided as feedback. In this way, by using positive reinforcers (FB) such as playing pleasant sounds, providing pleasant vibrations, playing favorite music, showing videos of favorite animals, or having favorite characters speak positive words, users will feel better, and this "greeting" behavior will be reinforced.

[0067]

On the other hand, if a negative result is determined (step S132/Yes), the feedback determination unit 104 determines a negative reinforcer FB (step S135). For example, let's consider the case where the user U2 is walking while looking down. The situation recognition unit 101 recognizes from user U2's location information that user U2 is commuting, moving between home and work. The behavior recognition unit 102 recognizes from the acceleration sensor that user U2 is walking and from the head acceleration sensor that user U2 is looking down, and recognizes that user U2 is walking while looking down.

[0068]

The determination unit 103 determines whether the behavior of walking with one's head down during one's commute is positive or negative. Specifically, refer to the judgment DB141. Since walking with one's head down can easily lead to feelings of depression, the judgment DB141 has already assigned the behavior of "walking with one's head down" to P/N; -1, i.e., negative emotion, as shown in ID; D5 in FIG. 4. Therefore, the determination unit 103 determines that the result is negative based on ID; D5. Next, the feedback determination unit 104 determines that user U2 is "looking down and walking" in a "commuting" situation, resulting in a negative judgment (P/N; -1). Therefore, it refers to an example of the feedback DB 142 shown in FIG. 4 and determines P/N feedback with ID; R1 and ID; R5. The feedback determination unit 104 may, for example, display images of insects that are generally disliked on the display unit 131 of the see-through HMD worn by user U2, or play unpleasant sounds from the audio output unit 132 of the HMD. If only one feedback is performed, only the highest priority ID; R5 will be provided as feedback.

[0069]

In this way, by using negative reinforcers (FB) such as playing unpleasant sounds, applying unpleasant vibrations, showing videos of disliked animals, or having a favorite character say negative words, it is possible to weaken, or suppress, the user U2's "walking with their head down" behavior. Furthermore, by providing reinforcement, such as playing favorite music, as feedback while walking with one's head held high, the behavior of walking with one's head held high can be encouraged, and the behavior of walking with one's head held low can be further suppressed.

[0070]

Note that neutral emotions may also be present, and so if the emotion does not fall under either positive or negative (Step S132/No), no feedback will be given.

[0071]

<2-2. Second Embodiment (Database Learning)>

Next, a second embodiment will be described with reference to FIGS. 7 to 9. The data for the determination DB141 and feedback DB142 used in the first embodiment described above can also be generated through learning.

[0072]

More specifically, the information processing system according to this embodiment is characterized by recognizing user emotions based on user sensing data, and recording the emotion recognition result in a database along with the situation and actions at the time, thereby enabling data learning for the determination DB141 and feedback DB142. The configuration and operation of the information processing device 10b according to this embodiment will be described in detail below.

[0073]

(2-2-1. Configuration Example)

FIG. 7 is a block diagram showing an example of the configuration of the information processing device 10b according to this embodiment. As shown in FIG. 7, the information processing device 10b includes a control unit 100b, a communication unit 110, an input unit 120, an output unit 130, and a storage unit 140b. The components with the same reference numerals as those described in FIG. 2 are as described above, and so their explanation here will be omitted.

[0074]

The control unit 100b functions as an arithmetic processing unit and control unit, and controls the overall operation within 10b according to various programs. Furthermore, the control unit 100b also functions as a situation recognition unit 101, an behavior recognition unit 102, a determination unit 103, a feedback determination unit 104, an emotion recognition unit 105, and a learning unit 106.

[0075]

The memory unit 140b stores the determination DB 141, the feedback DB 142, and the learning DB 143.

[0076]

The emotion recognition unit 105 recognizes user emotions based on sensing data acquired by the sensor unit 122, etc. For example, the emotion recognition unit 105 may recognize emotions by analyzing facial expressions from captured images of the user's face, or it may recognize emotions by analyzing biosensor data such as heart rate and pulse rate. There are no particular limitations on the emotion recognition algorithm. Furthermore, while emotion recognition may be expressed using basic emotions such as joy and anger, it may also be expressed using evokedness (valence) as an example, similar to the first embodiment described above, and normalized from -1 to 1. An evokedness score of "-1" indicates a negative emotion, a score of "0" indicates a neutral emotion, and a score of "1" indicates a positive emotion. For example, the emotion recognition unit 105 compares the value of the biosensor data with a predetermined threshold, calculates the evokedness (pleasant/unpleasant emotion), and recognizes the emotion. Here, an example of representing the emotion with discrete values such as "-1", "0", and "1" has been described, but this embodiment is not limited to this and may also be represented with continuous values. For example, sensing data (analog values) such as biosensor data may be accumulated and quantified as an emotion value.

[0077]

The emotion recognition results from the emotion recognition unit 105 are stored in the learning DB 143 along with the situation recognition results from the situation recognition unit 101 and the behavior recognition results from the behavior recognition unit 102 at the same time.

[0078]

The learning DB143 stores the situation recognition results from the situation recognition unit 101, the behavior recognition results from the behavior recognition unit 102, and the emotion recognition results from the emotion recognition unit 105, along with the time. Here, an example of the data structure of the training DB143 is shown in FIG. 8. In the example shown in FIG. 8, the emotion recognition result is expressed in terms of evokedness. As shown in FIG. 8, for example, in the situation where the user U1 "encountered a dog while commuting," the emotion recognition result when taking actions such as "walking" or "stopping" was recorded as "evokedness: 1" (i.e., positive emotion). On the other hand, when the user u1 encountered a cat during their commute and performed the action of "walking," the recorded emotion recognition result was "evokedness: -1" (i.e., negative emotion). The data stored in the learning DB143 is used by the learning unit 106 when it performs data learning on the determination DB141 and the feedback DB142.

[0079]

The learning unit 106 can use the data stored in the learning DB 143 to perform data learning on the determination DB 141 and the feedback DB 142. Further details will be provided in the flowchart shown in FIG. 9.

[0080]

(2-2-2. Operation Processing)

FIG. 9 is a flowchart showing an example of the learning process flow according to this embodiment. As shown in FIG. 9, the learning unit 106 determines whether or not training data has been added to the training DB 143 (step S203). If training data has been added (step S203/Yes), it performs P/N determination data learning by adding data to the determination DB 141 (step S206) or P/N FB data learning by adding data to the feedback DB 142 (step S209). The learning unit 106 may perform the learning process each time learning data is added to the learning DB 143, or it may perform the learning process at regular intervals based on newly added learning data.

[0081]

First, a specific example of P/N determination data learning in the determination DB 141 will be explained using the table shown in FIG. 8. For example, as shown in ID; L1 and ID; L3 in FIG. 8, if the user U1's emotion becomes positive more than a certain number of times when greeting in the neighborhood, the learning unit 106 generates data indicating that the user U1's emotion becomes positive when greeting in the neighborhood, and adds this data to the determination DB141. For example, as shown in FIG 3 with ID; D4, [User ID: U1, Situation: Neighborhood, Action: Greet, P/N: 1] is added as P/N determination data.

[0082]

Furthermore, when the learning unit 106 adds such P/N determination data for the user U1, if there is already P/N determination data [U2, neighbor, greet, 1] indicating that another user, for example the user U2, also becomes positive when greeted by a neighbor, the learning unit 106 may generalize these two P/N determination data to generate P/N determination data [*, neighbor, greet, 1] indicating that anyone becomes positive when greeted by a neighbor, and then organize the data.

[0083]

In addition, to accommodate situations where learning has not yet taken place, the initial determination DB141 may contain P/N determination data based on general knowledge or P/N determination data based on the results of a user preference survey.

[0084]

Next, a specific example of P/N feedback data learning in the feedback DB142 will be explained using the table shown in FIG. 8. For example, as shown in FIG. 8, if we take the AND conditions for the situation and the action from data of the user U1 with the same emotion, such as ID; L2 [U1, Commute & Meet a dog,

Walk, 1] and ID; L4 [U1, Neighborhood & Meet a dog, Stop, 1], we can see that the emotion becomes positive when encountering a dog (we could also add P/N determination data to the determination DB141 as [U1, Meet a dog, *, 1] for further learning). In this case, "dog" can be used as feedback (positive reinforcer) for the user U1's positive behavior, and so it is possible to generate feedback data [U1, *, *, 1, dog] as shown in ID: R2 in FIG. 4.

[0085]

Furthermore, when the learning unit 106 adds such P/N feedback data for user U1, if there is already feedback data [User ID: U2, Situation: *, Behavior: *, P/N: 1, FB content: dog] indicating that another user, for example user U2, can also use "dog" as positive feedback, the learning unit 106 may generalize these two sets of feedback data to generate positive reinforcer feedback data [User ID: *, Situation: *, Behavior: *, P/N: 1, FB content: dog] indicating that "dog" can be used as positive feedback for anyone, and then organize the data.

[0086]

In addition, to accommodate situations where learning is not yet underway, the initial feedback DB142 may contain feedback data from general knowledge or feedback data based on the results of surveys asking users about their preferences, such as likes and dislikes.

[0087]

The above describes the second embodiment, which involves learning a database. The determination unit 103 may perform a P/N determination based on the emotion recognition result from the emotion recognition unit 105.

[0088]

2-3. Third Embodiment (Brain Stimulation)

The feedback for promoting or inhibiting behavior according to this embodiment is not limited to providing positive or negative reinforcers based on behavioral analysis, but can also be promoted or inhibited by directly stimulating the brain, such as with tDCS (Transcranial Direct Current Stimulation). tDCS makes it possible to stimulate or inhibit perception and behavior by applying a weak direct current to the head. Specifically, it is known that anodic stimulation promotes motor functions such as jumping, and cathode stimulation suppresses sensations such as itching.

[0089]

Therefore, in this embodiment, by applying anode or cathode stimulation to the user's brain, it is possible to provide feedback that promotes or inhibits the user's behavior.

[0090]

(2-3-1. Configuration Example)

FIG. 10 is a block diagram showing an example of the configuration of the information processing device 10c according to this embodiment. As shown in FIG. 10, the information processing device 10c has a brain stimulation unit 133 as an output unit 130c.

[0091]

The brain stimulation unit 133 can provide feedback that promotes the user's behavior by applying anode stimulation to the user's brain, and inhibits the user's behavior by applying cathode stimulation to the user's brain. The brain stimulation unit 133 is implemented, for example, by electrodes. The brain stimulation unit 133 may be provided, for example, on a headband worn on the user's head (a band that goes around the entire circumference of the head, or a band that passes over the temporal region and/or the top of the head), on the surface that contacts the head between the two ears. The brain stimulation unit 133 (electrodes) are arranged in multiple locations, for example, to contact the sensorimotor cortex on both sides of the user's head when the headband is worn. In addition, the information processing device 10c may be implemented by an HMD equipped with such a headband. There are no specific restrictions on the shape of the headband or HMD.

[0092]

The other components are the same as in the first embodiment. In addition, the second embodiment (database learning function) may be applied to this embodiment. Furthermore, the determination unit 103 may perform a P/N determination based on the emotion recognition result from the emotion recognition unit 105 described in the second embodiment.

[0093]

(2-3-2. Operation Processing)

FIG. 11 illustrates an example of the brain stimulation processing flow according to this embodiment. As shown in FIG. 11, first, the information processing apparatus 10c performs situation recognition (step S303) and behavior recognition (step S306). These steps are not limited to the order shown in FIG. 11; they may be performed in reverse order or in parallel. In addition, these can be carried out continuously/periodically.

[0094]

Next, the information processing device 10c refers to the judgment DB 141 based on the situation recognition result and the behavior recognition result and performs a P/N determination (step S309).

[0095]

Next, the information processing device 10c provides brain stimulation feedback according to the P/N determination result (step S312). Specifically, if the information processing device 10c determines that the behavior is positive, it provides brain feedback of anode stimulation via the brain stimulation unit 133 to promote the behavior, and if the behavior is negative, it provides brain feedback of cathode stimulation via the brain stimulation unit 133 to suppress the behavior. For example, when the information processing device 10c recognizes that a user has greeted someone in a pleasant manner in their neighborhood (recognition of the situation, action, and positive emotion), it can simultaneously provide anodic stimulation as brain feedback to further promote that greeting behavior. Furthermore, the information processing device 10c can suppress negative emotions, for example, when a user sees a cat that has been hit by a car and is motionless at an intersection and feels sad and negative emotions, by applying cathode stimulation via the brain stimulation unit 133. The behavior recognition unit 102 uses outward-facing cameras and gaze sensors (such as infrared sensors) provided on the HMD to determine the user's gaze, point of fixation, and object of fixation, and can recognize that the user is looking at (perceiving) an animal that has been hit by a car and is no longer moving.

[0096]

The processes shown in steps S303 to S312 above are repeated until the system terminates (for example, by an explicit termination instruction from the user) (step S315).

[0097]

<2-4. Fourth Embodiment (Ethical and Legal Considerations)>

Next, a fourth embodiment of the present invention will be described with reference to FIGS. 12 and 13. In each of the embodiments described above, feedback is provided to promote behaviors that make the user feel positive, but in some cases, such behaviors may be reinforced even if they are ethically or legally undesirable. In this case, not only will the user ultimately suffer a disadvantage, but they will also cause trouble for those around them.

[0098]

Therefore, in this embodiment, in addition to determining whether the emotion is positive or negative, we also check whether the behavior is ethically or legally negative, and if there is no problem, we provide behavioral support feedback.

[0099]

(2-4-1. Configuration Example)

The configuration of the information processing device 10d in this embodiment may be any of the configurations of the information processing devices 10a, 10b, and 10c described in the first to third embodiments above. In other words, this embodiment can be combined with the first embodiment, the second embodiment, or the third embodiment. Alternatively, the determination unit 103 may perform a P/N determination based on the emotion recognition result by the emotion recognition unit 105 described in the second embodiment.

[0100]

In this embodiment, the information processing device 10d performs an emotional P/N determination using the determination unit 103, as well as an ethical P/N determination and a legal P/N determination. The data for determining the ethical P/N determination and the legal P/N determination is stored, for example, in the determination DB 141.

[0101]

Here, FIG. 12 shows an example of the data structure of the determination database for ethical P/N determination and legal P/N determination according to this embodiment. As data for ethical P/N determination, ethically positive (desirable) actions and negative (undesirable) actions that are generally considered to be acceptable according to social norms are pre-registered. Furthermore, legally positive (legal) actions and negative (illegal) actions are pre-registered as data for legal P/N determination. Moreover, since the criteria for ethical P/N determination and legal P/N determination may differ from country to country or region to region, it is advisable to include "region" as a data item, as shown in FIG. 12. This allows the system to determine the country or region where the user is currently located, for example, by identifying the user's location from GPS, and thus enables P/N determinations based on the ethics and laws of that country or region.

[0102]

(2-4-2. Operation Processing)

FIG. 13 is a flowchart showing an example of the feedback process flow considering ethical P/N determination and legal P/N determination according to this embodiment.

[0103]

As shown in FIG. 13, first, the determination unit 103 of the information processing device 10d refers to the display unit 131 (for example, the table shown in FIG. 3) based on the situation recognition result and the action recognition result, and performs an emotion P/N determination (step S403).

[0104]

Next, if a positive result is determined (step S406/Yes), the determination unit 103 refers to the display unit 131 (for example, the table shown in FIG. 12) based on the situation recognition result and the action recognition result, and performs a legal P/N determination (step S409). For example, the act of hitting someone, regardless of the circumstances, is legally considered negative behavior (problematic behavior).

[0105]

Next, if it is determined that the action is not legally negative (step S412/No), the determination unit 103 refers to the display unit 131 (for example, the table shown in FIG. 12) based on the situation recognition result and the action recognition result, and makes an ethical P/N determination (step S415). For example, actions such as shouting loudly may not be legally negative, but they are considered ethically negative (problematic) behavior.

[0106]

The ethical P/N determination (step S409) and legal P/N determination (step S415) described above can be performed if a positive determination is made in the emotional P/N determination (step S403). For example, even if yelling or hitting someone evokes positive emotions in that user, these actions are ethically or legally negative and should not be encouraged. On the other hand, if yelling or hitting evokes negative emotions in the user, feedback (FB) will be provided to suppress such behavior without the need for ethical P/N or legal P/N checks. Therefore, in the flowchart shown in FIG. 13, ethical P/N and legal P/N checks are performed only when the emotion is determined to be positive.

[0107]

Next, if the emotion is determined to be negative (Step S421/Yes), or even if the emotion is determined to be positive (Step S406/Yes), if it is determined to be legally negative (Step S412/Yes), or ethically negative (Step S418/Yes), the feedback decision unit 104 decides on a negative reinforcer FB to suppress the behavior (Step S424).

[0108]

On the other hand, if the emotion is determined to be positive (step S421/Yes), and further determined not to be legally or ethically negative (i.e., positive) (step S412/No, step S418/No), the feedback determination unit 104 determines that the feedback for the behavior is a positive reinforcer (step S427).

[0109]

As a result, in the information processing system according to this embodiment, for example, if the user U2 is a person who derives pleasure from violence such as hitting people, even if they impulsively hit someone who bumps into them on a train and feel pleasure from it, such behavior is not ethically or legally desirable, so it is possible to suppress such behavior with the negative reinforcer FB. Furthermore, actions such as punching someone can be recognized, for example, by analyzing sensing data from an acceleration sensor (an example of a sensor unit 122) provided on the HMD (information processing device 10d) worn by user U2, and video footage from a camera (an example of a sensor unit 122) provided on the HMD. Specifically, for example, the behavior recognition unit 102 can recognize that the user has punched someone if it analyzes the acceleration sensor's sensing data to find that there is a change in acceleration specific to the act of punching someone, and if it also analyzes from the camera image that an arm extending from the user's side has made contact with the other person.

[0110]

<2-5. Fifth Embodiment (Reframing)>

Next, a fifth embodiment according to this embodiment will be described. In this embodiment, by performing reframing, which presents a positive interpretation of an action that the user perceived as emotionally negative, it is possible to reduce the user's negative emotions and reverse and promote positive actions.

[0111]

The following is a specific example of the reframing effect. For example, a user, tired from walking, manages to find a seat on the train home and stands up thinking they have arrived at their nearest station, only to realize they are still at the previous station. When the user turns around to sit down again, they find someone else has already taken the seat, causing them to feel exhausted and a little disappointed. Having no other choice, they remain standing when they hear an agent's voice from the HMD's earphone speaker saying, "You made a mistake and stood up, but you did a good thing by giving up your seat to someone else." The agent's words can help users see things in a more positive light, making them think, "Did I do something good?", which can alleviate feelings of depression and lighten their mood.

[0112]

In this case, the system recognizes that the user is on a train, for example, based on GPS location information and acceleration sensor information from the HMD (information processing device 10e) worn by the user. Furthermore, the information processing device 10e analyzes the acceleration sensor information and recognizes that the user has transitioned from a seated state to a standing state (behavior recognition). Next, the information processing device 10e recognizes that the user remains standing and has not gotten off the train. In addition, the information processing device 10e recognizes that the user's emotions are in a negative state based on the user's facial expressions and pulse rate data acquired by the camera. Then, the information processing device 10e refers to the feedback DB142 based on the user's situation, that they were sitting in a seat on the train, and that they stood up from their seat but did not get off at the station, and the determination result that their emotions were negative. If there is corresponding reframing feedback (for example, a phrase like the one described above), it performs the reframing feedback (for example, output by agent voice from the voice output unit 132).

[0113]

(2-5-1. Configuration Example)

The configuration of the information processing device 10e in this embodiment may be any of the configurations of the information processing devices 10a, 10b, and 10c described in the first to fourth embodiments above. In other words, this embodiment can be combined with any of the first, second, third, or fourth embodiments. Alternatively, the determination unit 103 may perform a P/N determination based on the emotion recognition result by the emotion recognition unit 105 described in the second embodiment.

[0114]

In this embodiment, the information processing device 10e, using the feedback determination unit 104, refers to the feedback DB142 and determines the feedback to the user (behavior-promoting FB, behavior-suppressing FB, or reframing FB) according to the P/N determination result of the emotion. Here, FIG. 14 shows an example of the data structure of the feedback DB142 for feedback determination, including the reframing FB according to this embodiment.

[0115]

Among the feedback data shown in FIG. 14, ID;R6 and ID;R7 provide examples of reframing feedback. All FB types are languages, and are fundamentally intended to present a positive interpretation by shifting the evaluation criteria in response to a user's interpretation that evokes negative emotions. Such shifts in evaluation criteria could include a shift from self-interested evaluation to altruistic evaluation, a shift from subjective evaluation to objective evaluation, or a shift in the evaluation criteria for relative evaluation.

[0116]

For example, if a train is delayed and the user is about to be late for work, causing them to experience negative emotions (frustration, worry, etc.), the information processing device 10e may use the feedback DB142 to obtain information from the train delay information indicating that there was no accident involving a person, and then present an altruistic, positive interpretation such as, "It's inconvenient when the train is delayed, but it's good that no one seems to have been injured". Alternatively, if someone bumps into the user or steps on their foot on a train and the user experiences negative emotions, the information processing device 10e may use the feedback DB142 to present an altruistic, positive interpretation such as, "It's a good thing the other person didn't fall".

[0117]

To make such altruistic and positive interpretations more acceptable to users, the information processing device 10e may present them only when the recipient is vulnerable, such as the elderly, children, injured people, or pregnant women.

[0118]

Furthermore, when a user sees a place cleaned by someone else and feels negative emotions such as "it's still dirty," the information processing device 10e may perform reframing to shift from subjective evaluation to objective evaluation, such as presenting an objective evaluation like the degree of cleanliness, or encouraging the user to compare the result with the state before cleaning rather than comparing it to the result of their own cleaning.

[0119]

As described above, the information processing device 10e according to this embodiment may extract and present to the user reframing feedback (FB) that matches the conditions of situation, action, and emotion based on feedback data pre-registered in the feedback DB142, or it may automatically generate reframing according to the situation, or it may automatically add (learn) data from the feedback DB142. The automatic generation of such reframing will be discussed later. In addition, the information processing device 10e may be equipped with at least a reframing FB function among the behavior-promoting FB function, behavior-suppressing FB function, and reframing FB function.

[0120]

(2-5-2. Operation Processing)

FIG. 15 is a flowchart showing an example of the feedback process flow, including reframing, according to this embodiment.

[0121]

As shown in FIG. 15, the determination unit 103 of the information processing device 10e makes a P/N determination of emotion based on the situation recognition result and the action recognition result, by referring to the display unit 131 (for example, the table shown in FIG. 3) (step S503). Alternatively, the determination unit 103 may perform a P/N determination of emotion based on the recognition result of the emotion recognition unit 105.

[0122]

Next, if a positive result is determined (step S506/Yes), the feedback determination unit 104 refers to the feedback DB142 and determines the corresponding positive reinforcer FB (step S509). For example, ID; R2, ID; R4, etc., in the table shown in FIG. 14.

[0123]

On the other hand, if a negative result is determined (step S 512/Yes), the feedback determination unit 104 refers to the feedback DB142 and determines whether there is a reframing FB corresponding to the perceived situation, behavior, and emotion (step S 515).

[0124]

Next, if there is reframing feedback (step S515/Yes), the feedback determination unit 104 determines the corresponding reframing feedback (step S521). For example, ID; R6, ID; R7, etc., in the table shown in FIG. 14.

[0125]

On the other hand, if there is no reframing FB (step S515/No), the feedback determination unit 104 determines the corresponding negative reinforcer FB (step S518). For example, ID;R1, ID;R3, ID;R5, etc., in the table shown in FIG. 14.

[0126]

(2-5-3. Addition of Empathetic Responses)

In the examples described above, the system performs reframing without addressing the user's negative emotions. However, by adding empathetic responses to negative emotions, the system could more effectively alleviate the user's negative feelings and transform them into positive interpretations. For example, the conditions for reframing feedback could be made more specific, and the content of the corresponding reframing feedback could be modified to include responses that show empathy for negative emotions.

[0127]

More specifically, for example, in the table shown in FIG. 14, if the condition for ID; R6, "Situation", is set to "Tired & Train & Sitting", then the content of the reframing feedback would be, "I'm tired today, so standing is tough". Nevertheless, by saying something like, "But it was a good thing that you gave up your seat to someone else", it becomes possible to provide a highly empathetic response to the user's negative emotions. The "tired" status can be determined by, for example, the situation recognition unit 101 calculating the calories consumed on the day from acceleration sensor data and comparing it to the average (for example, the user's average daily calories consumed). If it exceeds a predetermined threshold (for example, 120%), the system may determine that the user is tired.

[0128]

(2-5-4. Automatic Generation of Reframing)

The information processing device 10e according to this embodiment applies the configuration of the second embodiment described above, and for example, it is possible to learn the feedback DB 142, including the reframing FB, using the learning DB143.

[0129]

• Transformation to an altruistic interpretation

For example, the information processing device 10e has pre-defined rules for corresponding actions such as "dropped/misplaced vs. picked up/used," "standing vs. sitting," and "used vs. not used." If the learning database 143 contains similar situations (on a train, in a conference room, at home, at work, etc.) where the corresponding action is taken and the emotions are the exact opposite, it can automatically generate reframing feedback.

[0130]

For example, among the data stored in the learning DB143 shown in FIG. 8, ID;L6 [U1, home & chocolate, eat, 1] and ID;L7 [U2, home & cake, forget, -1] correspond to the corresponding behaviors of 'forgetting' and 'using (eating)', and their emotions are contradictory. This data suggests that while some people experience negative emotions when they misplace food, others (such as family members) may experience positive emotions if they eat the misplaced food. Based on this data, the learning unit 106 can generate reframing feedback content (text) such as [User ID: *, Situation: [Food], Action: Forgotten, P/N: -1, FB Type: Language, FB Content: "It's sad that I forgot the [Food], but the person who finds it might be happy to be able to eat [Food]"].

[0131]

Furthermore, among the data stored in the learning DB143 shown in FIG. 8, ID;L8 [U3, Company & Umbrella, Forgot it, -1] and ID;L9 [U4, Company & Umbrella, Use it, 1] also correspond to the same behaviors, “forgot it” and “use it”, and the emotions are contradictory. This data suggests that while some people feel negative emotions when they forget their umbrella, others may feel positive emotions when someone else (such as a colleague or family member, assuming an environment where some degree of sharing of belongings is possible) is able to use the umbrella they left behind. Based on this data, the learning unit 106 can generate reframing feedback content (text) such as [User ID: *, Situation: [item], Action: Forgotten, P/N: —1, FB type: Language, FB content: "It's sad that you forgot [item], but the person who finds it might be happy [to be able to use] it."].

[0132]

Alternatively, the information processing device 10e can extract posts from social media where text and audio are posted by numerous users, including interpretations of similar situations where conflicting emotions are expressed, and create a database of these posts to generate reframing Facebook content (text). For example, if the information processing device 10e extracts posts from social media that include "I couldn't get a seat on the train (situation) - I wanted to sit down because I'm very tired today (interpretation) - I'm annoyed (emotion)" and posts that include "I couldn't get a seat on the train (situation) - but it seems like some people were able to sit down (interpretation) - I guess that's good (emotion)", it will present users who are experiencing negative emotions in similar situations with interpretations from other users who are experiencing positive emotions. Specifically, for example, when a user is feeling negative because they cannot find a seat on a train, the information processing device 10e can, based on the aforementioned posts collected from social media, present a positive interpretation such as, "But it looks like some people were able to find seats".

[0133]

In addition, the information processing device 10e may acquire user evaluations of reframing FB (explicit evaluations and emotion recognition results (whether the emotion actually changed to a positive one)), and learn effective reframing techniques.

[0134]

- Presentation of relative evaluation

Furthermore, when the information processing device 10e has a knowledge database containing keywords related to "comparison," such as "strong," "tall," "big," and "beautiful," and the user utters these keywords while also experiencing negative emotions, it can present relative evaluations and perform reframing. The reframing content can be generated, for example, by extracting posts from social media that contain keywords related to "comparison", along with conflicting emotions and evaluations (interpretations) of similar situations. For example, if we extract posts containing "children's clothes are dirty (situation [object of evaluation]) - laundry will be a hassle (evaluation) - anger (emotion)" and posts containing "children's clothes are dirty (situation [object of evaluation]) - they are playing happily (evaluation) - happy (emotion)," it becomes possible to present a positive interpretation with a shifted evaluation criterion to users who are experiencing negative emotions based on similar relative evaluations. Specifically, for example, when a user is feeling negative about their child's clothes being dirty, the information processing device 10e can, based on the aforementioned posts collected from social media, present a positive interpretation such as, "But they're playing happily!"

[0135]

<2-6. Sixth Embodiment (Example of Application to Small Communities)>

The information processing system according to this embodiment can also provide positive behavior promotion feedback, negative behavior suppression feedback, and reframing feedback in small communities such as families, companies, departments, school classes, and neighborhood associations. In small communities, the limited number of members and locations allows for more accurate situational awareness and behavioral recognition.

[0136]

For example, imagine a situation where a child is cleaning their room. The goal is to encourage cleaning while simultaneously suppressing behaviors such as playing during the cleaning process. Furthermore, when children do a poor job of cleaning, parents often scold them, which further discourages the children from cleaning. Reframing helps to improve these negative parental emotions.

[0137]

(2-6-1. Configuration Example)

The configuration of the information processing device 10f in this embodiment may be any of the configurations of the information processing devices 10a to 10e in the first to fifth embodiments described above. In other words, this embodiment can be combined with any of the first, second, third, fourth, or fifth embodiments. Alternatively, the determination unit 103 may perform a P/N determination based on the emotion recognition result by the emotion recognition unit 105 described in the second embodiment.

[0138]

In this embodiment, the information processing device 10f, via the feedback determination unit 104, refers to the feedback DB142 and determines the feedback to the user (child or parent) (behavior-promoting FB, behavior-suppressing FB, or reframing FB) according to the P/N determination result of the emotion. In addition, the feedback determination unit 104 may decide on the feedback to the user (child or parent) taking into consideration the ethical P/N determination and the legal P/N determination described in the fourth embodiment.

[0139]

Here, FIG. 16 shows an example of the data structure for a P/N determination database that takes into account ethical and legal P/N determinations according to this embodiment. For example, as shown in ID; D3 in FIG. 16, playing while cleaning is enjoyable for a child, resulting in a positive emotional P/N ratio, but ethically it is a negative (undesirable) state. Here, FIG. 17 shows an example of the data structure of the feedback DB142 for feedback determination, including the reframing FB according to this embodiment. For example, as shown in ID; R1 in FIG. 17, since a child cleaning their room is a positive state, feedback that encourages the child's cleaning behavior, such as the robot being pleased, is registered.

[0140]

(2-6-2. Operation Processing)

Next, a specific operation process according to this embodiment will be described. In this embodiment, for example, the operation processing shown in FIG. 15 can be applied to perform action promotion/suppression processing based on P/N determination, as well as reframing processing.

[0141]

For example, the information processing device 10e uses the situation recognition unit 101 to recognize that a parent and child are in the child's room based on the video footage from cameras installed in each room of the house. Furthermore, the information processing device 10e, using the camera image, recognizes that a child is cleaning via the behavior recognition unit 102.

[0142]

Next, the determination unit 103 of the information processing device 10e refers to the determination DB141 and performs a P/N determination to determine whether a child is cleaning in the child's room (step S503 shown in FIG. 15). Specifically, for example, from ID; D2 in FIG. 16, it is determined that the cleaning behavior is negative emotionally (emotional P/N rating; -1), legally compliant (legal P/N rating; 0), and ethically positive (1; ethical P/N rating; 1). In this case, the determination unit 103 prioritizes ethical judgment and determines it to be positive.

[0143]

Next, the feedback determination unit 104 of the information processing device 10e determines that the P/N of the child's cleaning behavior in the child's room is (ethically) positive (step S506/Yes shown in FIG. 15), and therefore sends a control signal to, for example, a robot placed in the child's room to perform a joyful action according to the FB that promotes the behavior, for example, ID;R1 shown in FIG. 17 (step S509 shown in FIG. 15). Children are expected to be more likely to clean spontaneously because the robot is pleased when they clean.

[0144]

On the other hand, when the information processing device 10e detects that the child has stopped cleaning and started playing with toys, it determines from ID; D3 in FIG. 16 that playing while cleaning is ethically wrong (step S503 shown in FIG. 15).

[0145]

In this case, the feedback determination unit 104 of the information processing device 10e determines that the P/N of the child's behavior of playing while cleaning is (ethically) negative (step S512/Yes shown in FIG. 15), and therefore sends a control signal to a robot in the child's room (for example, a robot dog that the child likes) to perform a sad action according to a FB that suppresses the behavior, for example, ID;R2 shown in FIG. 17 (step S518 shown in FIG. 15). Children are expected to refrain from playing while the robot is cleaning, as this will make the robot sad.

[0146]

Next, we will explain how to reframe a situation where, after the child has finished cleaning, the parent feels the room is still messy and scolds them, saying something like, "It's not clean at all!" The situation recognition unit 101 of the information processing device 10e can analyze the video footage from a camera installed in the child's room to recognize the degree of clutter in the child's room before cleaning (such as the appearance of scattered objects) and the condition of the room after cleaning. The situation recognition unit 101 can compare video footage of the child cleaning before and after the cleaning and calculate the degree of cleaning success (for example, the decrease in the number of scattered items, the percentage increase in the floor area where no items are placed, etc.).

[0147]

In addition, the behavior recognition unit 102 of the information processing device 10e can analyze the parent's speech collected from the microphone and recognize that the parent is scolding the child. Furthermore, the emotion recognition unit 105 of the information processing device 10e can determine that the parent's emotions are negative based on the parent's facial expressions analyzed from the video footage of a camera installed in the room, the pulse rate obtained from a smart band worn by the mother, and the speech recognition results of spoken voice data obtained from a microphone installed in the room or worn by the parent.

[0148]

Thus, in a situation where a child has cleaned, and the parent scolds the child and the parent's emotions become negative, the feedback determination unit 104 of the information processing device 10e refers to the feedback DB142 and, if there is a reframing FB, executes it (steps S515/Yes, S521 shown in FIG. 15). For example, the feedback determination unit 104 of the information processing device 10e, according to ID; R4 shown in FIG. 17, if, for example, the degree of cleaning achievement has improved by a predetermined value or more, may present an objective evaluation as reframing, such as, "OO's cleaning isn't perfect, but it's OO% cleaner than before you started". This helps to calm the parent's anger and allows them to objectively assess the results of the cleaning, enabling them to praise their children or teach them areas where they feel they need improvement. In addition, children won't be scolded for cleaning, thus avoiding the suppression of cleaning behavior.

[0149]

<<3. Summary>>

As described above, the information processing system according to the embodiment of this disclosure makes it possible to improve the user's state to a better state in response to the user's emotions, thereby improving the quality of life. The information processing system according to this embodiment can perform at least one of the behavior-promoting FB, behavior-suppressing FB, and reframing FB functions described above.

[0150]

Preferred embodiments of the present disclosure have been described in detail above with reference to the attached drawings, but the present technology is not limited to such examples. It is clear to any person with ordinary skill in the art of this disclosure that various variations or modifications can be conceived within the scope of the technical idea set forth in the claims, and these will naturally be understood to fall within the technical scope of this disclosure.

[0151]

For example, it is also possible to create computer programs that enable the CPU, ROM, RAM, and other hardware components built into the information processing device 10 to perform its functions. Furthermore, a computer-readable storage medium containing the computer program is also provided.

[0152]

Moreover, the effects described herein are merely descriptive or illustrative and not limiting. In other words, the technology relating to this disclosure may produce, in addition to or in lieu of the effects described above, other effects that will be obvious to those skilled in the art from the description herein.

[0153]

Furthermore, this technology can also be configured as follows.

(1)

An information processing system comprising a control unit that estimates whether a user is in a positive or negative state, a control unit that estimates whether a user is in a positive or negative state, and has one of the following functions: a function to promote the user's actions when the user is estimated to be in a positive state, and a function to present a positive interpretation of the user's situation or actions when the user is estimated to be in a negative state.

(2)

The information processing system according to (1), wherein the control unit estimates whether the user is in a positive or negative state based on the user's situation and/or behavior, using pre-learned data indicating a relationship between at least one of the situation and behavior, and a positive or negative emotional state during that situation or behavior.

(3)

The information processing system according to (1), wherein the control unit estimates whether the user is in a positive or negative state by estimating the user's emotions.

(4)

The information processing system according to (3), wherein the control unit estimates whether the user's emotion is positive or negative based on sensing data of the user.

(5)

The information processing system according to any one items of (1) to 4, wherein the control unit controls an agent that interacts with the user, and when the user is estimated to be positive, the agent provides positive feedback to the user as a function to promote the user's actions.

(6)

The information processing system according to (5), wherein the control unit presents the user with at least one of a predetermined pleasant sound, image, or vibration as positive feedback.

(7)

The information processing system according to any one items of (1) to (6), wherein the control unit provides anode stimulation to the user's brain as a function to promote the user's behavior when the user is presumed to be positive.

(8)

The information processing system according to any one items of (1) to (7), wherein the control unit controls an agent that interacts with the user, and when the user is estimated to be in a negative state, the agent provides negative feedback to the user as a function to suppress the user's behavior.

(9)

The information processing system according to (8), wherein the control unit presents the user with at least one of a predetermined unpleasant sound, image, or vibration as negative feedback.

(10)

The information processing system according to any one of items (1) to (9), wherein the control unit provides a cathode stimulus to the user's brain as a function to suppress the user's behavior when the user is presumed to be in a negative state.

(11)

The information processing system according to any one of items (1) to (10), wherein the control unit, when the user is estimated to be in a positive state, provides positive feedback to promote the user's behavior if the behavior is determined to have no legal or ethical issues.

(12)

The information processing system according to any one of items (1) to (11), wherein the control unit controls an agent that interacts with the user, and when the user is presumed to be in a negative state, if text representing the user's situation or behavior and a positive interpretation of that situation or behavior is stored, the control unit controls the agent to present the text representing the positive interpretation.

(13)

The information processing system according to (12), wherein the control unit generates text representing the positive interpretation based on information indicating conflicting emotions for similar or corresponding actions in similar situations, and controls the system to present this text to the user.

(14)

An information processing method comprising: a processor estimating whether a user is in a positive or negative state; a control unit that estimates whether a user is in a positive or negative state, and has one of the following functions: a function to promote the user's actions when the user is estimated to be in a positive state, and a function to present a positive interpretation of the user's situation or actions when the user is estimated to be in a negative state.

(15)

A recording medium on which a program is recorded causing a computer to function as a control unit having one of the following functions: a control unit that estimates whether a user is in a positive or negative state, and has one of the following functions: a function to promote the user's actions when the user is estimated to be in a positive state, a function to suppress the user's actions when the user is estimated to be in a negative state, and a function to present a positive interpretation of the user's situation or actions when the user is estimated to be in a negative state.

[Reference Signs List]

[0154]

10, 10a - 10f Information processing device

100 Control unit

101 Situation recognition unit

102 Behavior recognition unit

103 Determination unit

104 Feedback determination unit

105 Emotion recognition unit

106 Learning unit

110 Communication unit

120 Input unit

121 Operation input unit

122 Sensor unit

130 Output unit

131 Display unit

132 Audio output unit

133 Brain stimulation unit

140 Memory unit

141 Determination DB

142 Feedback DB

143 Learning DB

[Document name] Scope of patent claims

[Claim 1]

An information processing system comprising a control unit that estimates whether a user is in a positive or negative state, and has one of the following functions: a function to promote the user's actions when the user is estimated to be in a positive state, a function to suppress the user's actions when the user is estimated to be in a negative state, and a function to present a positive interpretation of the user's situation or actions when the user is estimated to be in a negative state.

[Claim 2]

The information processing system according to Claim 1, wherein the control unit estimates whether the user is in a positive or negative state based on the user's situation and/or behavior, using pre-learned data indicating a relationship between at least one of the situation and behavior, and based on pre-learned data showing the relationship between at least one of the situation and the behavior and the positive or negative emotional state during that situation or behavior.

[Claim 3]

The information processing system according to Claim 1, wherein the control unit estimates whether the user is positive or negative by estimating the user's emotions.

[Claim 4]

The information processing system according to Claim 3, wherein the control unit estimates whether the user's emotions are positive or negative based on the user's sensing data.

[Claim 5]

The information processing system according to Claim 1, wherein the control unit controls an agent that interacts with the user, and when the user is estimated to be in a positive state, the agent provides positive feedback to the user as a function to promote the user's actions.

[Claim 6]

The information processing system according to Claim 5, wherein the control unit presents the user with at least one of a predetermined pleasant sound, image, or vibration as positive feedback.

[Claim 7]

The information processing system according to Claim 1, wherein the control unit, when it is estimated that the user is in a positive state, provides anode stimulation to the user's brain as a function to promote the user's behavior.

[Claim 8]

The information processing system according to Claim 1, wherein the control unit controls an agent that interacts with the user, and when the user is estimated to be in a negative state, the agent provides negative feedback to the user as a function to suppress the user's behavior.

[Claim 9]

The information processing system according to Claim 8, wherein the control unit presents the user with at least one of a predetermined unpleasant sound, image, or vibration as the negative feedback.

[Claim 10]

The information processing system according to Claim 1, wherein the control unit, when it is estimated that the user is in a negative state, provides a cathode stimulus to the user's brain as a function to suppress the user's behavior.

[Claim 11]

The information processing system according to Claim 1, wherein the control unit provides positive feedback to promote the user's behavior when the user is presumed to be in a positive state and the user's behavior is judged to be legally and ethically acceptable.

[Claim 12]

The information processing system according to Claim 1, wherein the control unit controls an agent that interacts with the user, and when the user is presumed to be in a negative state, if the user's situation or behavior and text representing a positive interpretation of that situation or behavior are stored, the control unit controls the agent to present the text representing the positive interpretation.

[Claim 13]

The information processing system according to Claim 12, wherein the control unit generates text representing the positive interpretation based on information indicating conflicting emotions for similar or corresponding actions in similar situations, and controls the system to present this text to the user.

[Claim 14]

An information processing method comprising of a processor estimating whether a user is in a positive or negative state; a control unit that estimates whether a user is in a positive or negative state, and has one of the following functions: a function to promote the user's actions when the user is estimated to be in a positive state, and a function to present a positive interpretation of the user's situation or actions when the user is estimated to be in a negative state.

[Claim 15]

A recording medium on which a program is recorded causing a computer to function as a control unit having one of the following functions: a control unit that estimates whether a user is in a positive or negative state, and has one of the following functions: a function to promote the user's actions when the user is estimated to be in a positive state, a function to suppress the user's actions when the user is estimated to be in a negative state, and a function to present a positive interpretation of the user's situation or actions when the user is estimated to be in a negative state.

[Document name] Summary

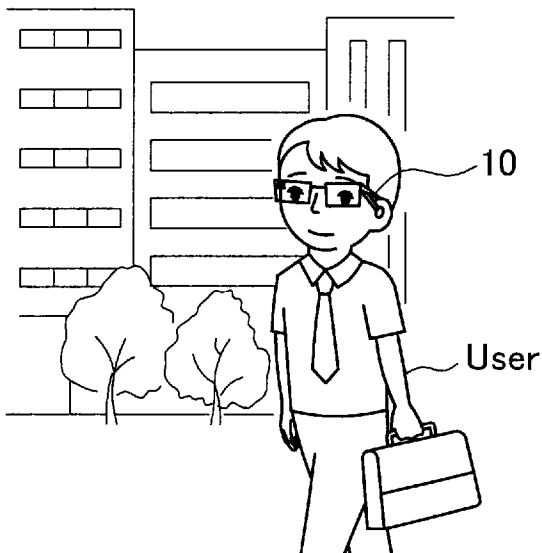
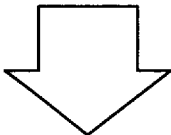
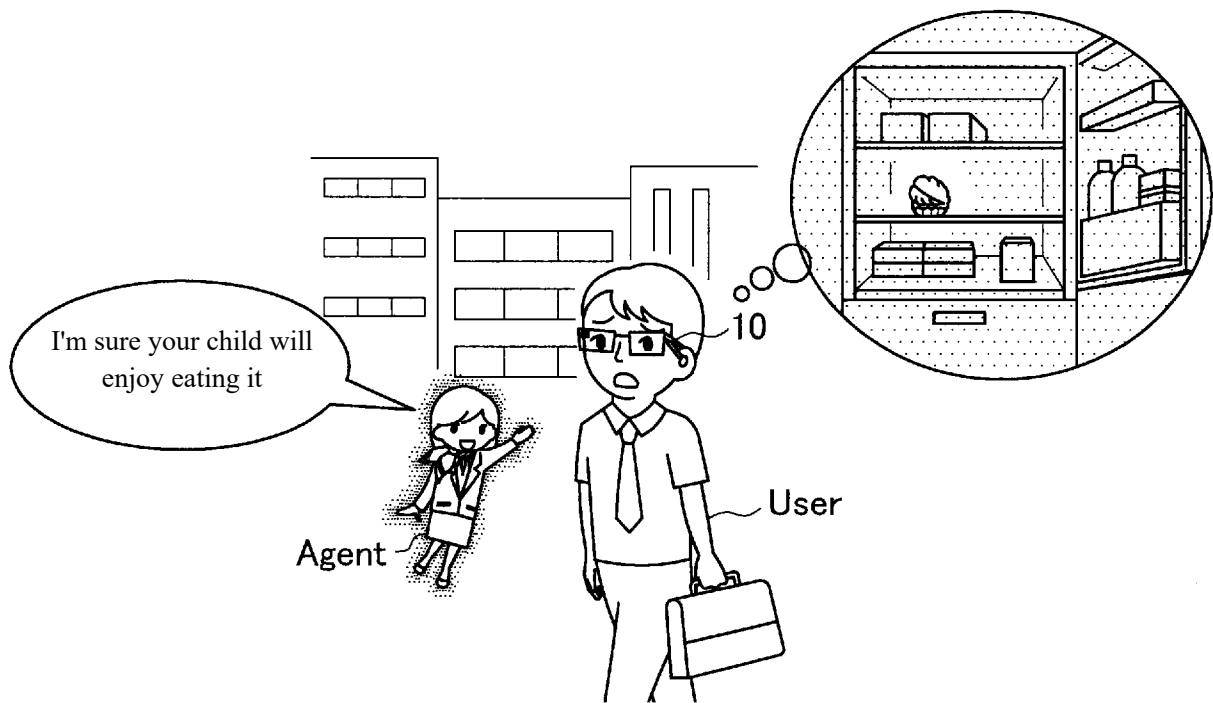
[Abstract]

[Problem to be solved] To provide an information processing system, an information processing method, and a recording medium that can improve the user's condition in accordance with the user's emotions and improve the quality of life.

[Means for solving the problems] Provided is an information processing system comprising a control unit that estimates whether a user is in a positive or negative state, and has one of the following functions: a function to promote the user's actions when the user is estimated to be in a positive state, a function to suppress the user's actions when the user is estimated to be in a negative state, and a function to present a positive interpretation with regard to the user's situation or actions when the user is estimated to be in a negative state.

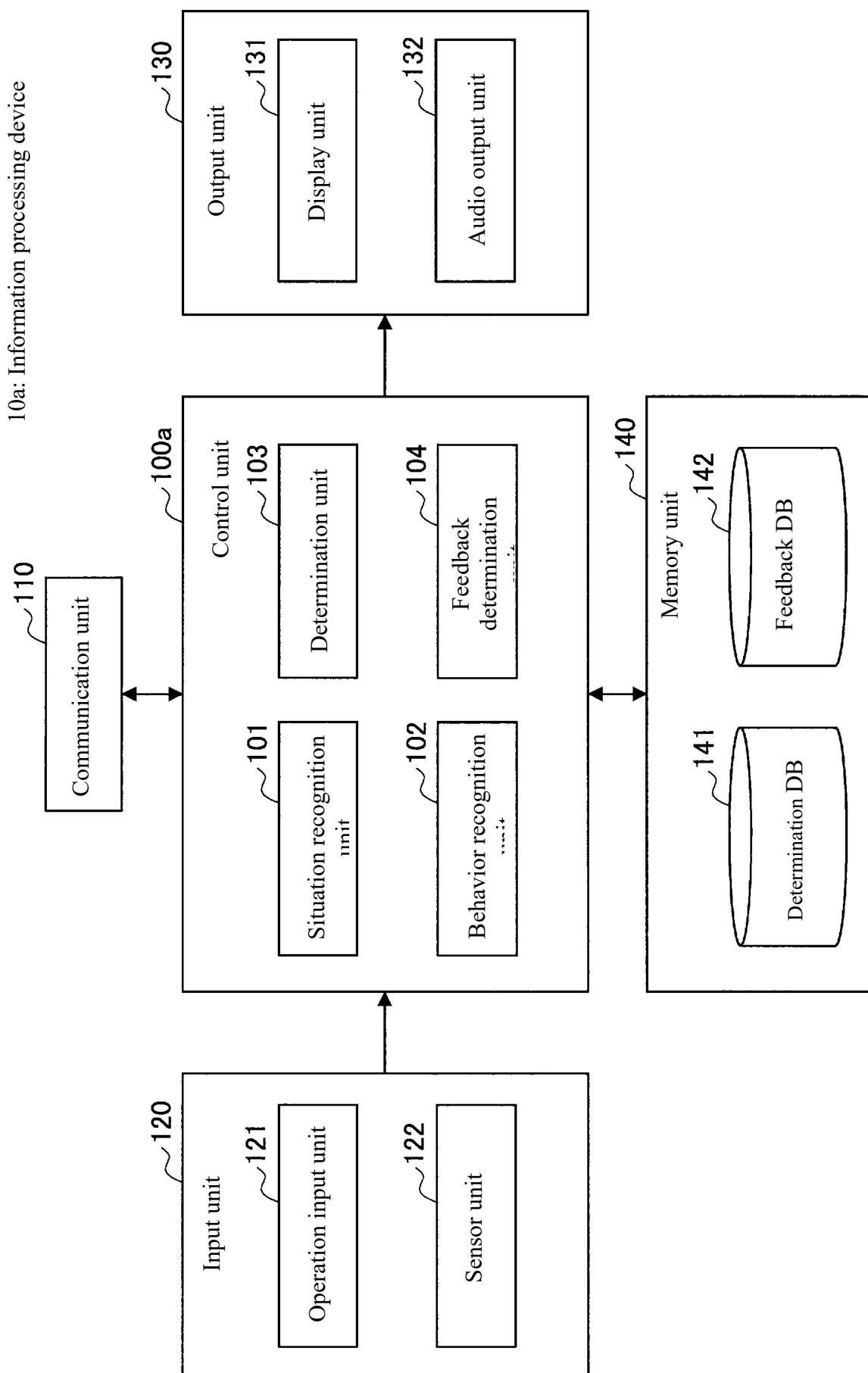
[Representative drawing] FIG. 1

[FIG. 1]



[FIG. 2]

10a: Information processing device



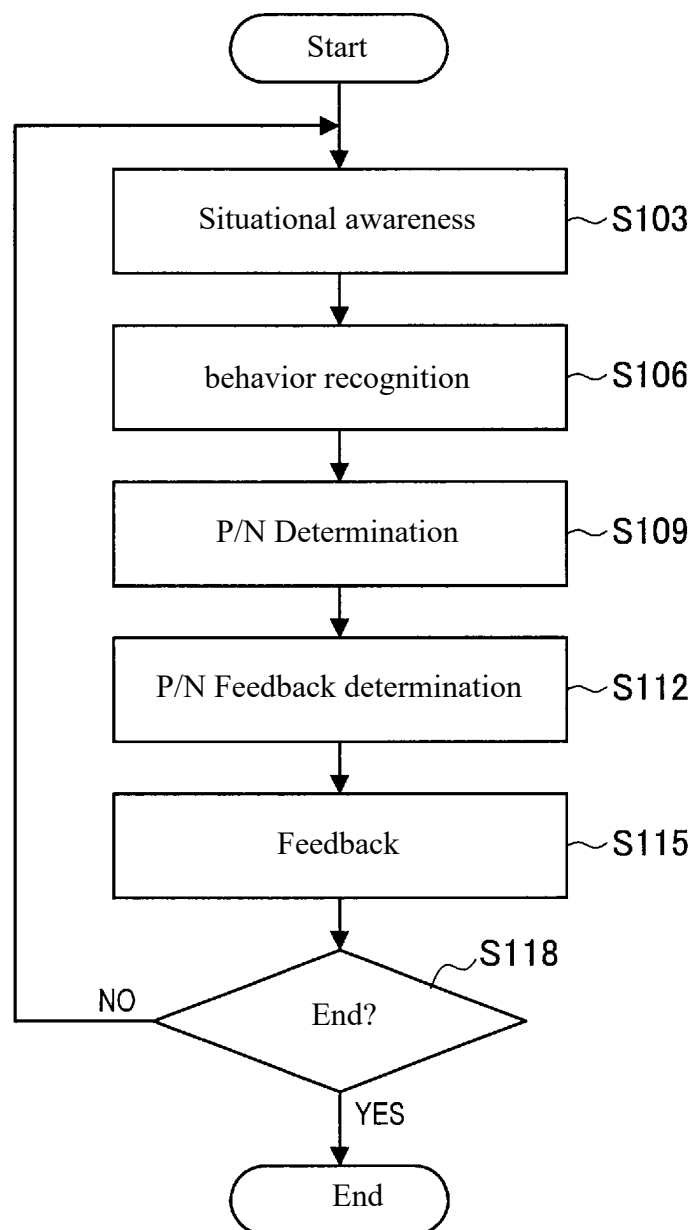
[FIG. 3]

ID	User ID	Status	Action	P/N
D1	*	Train & Sitting	Give up your seat	1
D2	*	*	Hitting	-1
D3	*	*	Shouting	-1
D4	U1	Neighborhood	Greet	1
D5	*	*	Looking down and walking	-1
...	...	...	...	...

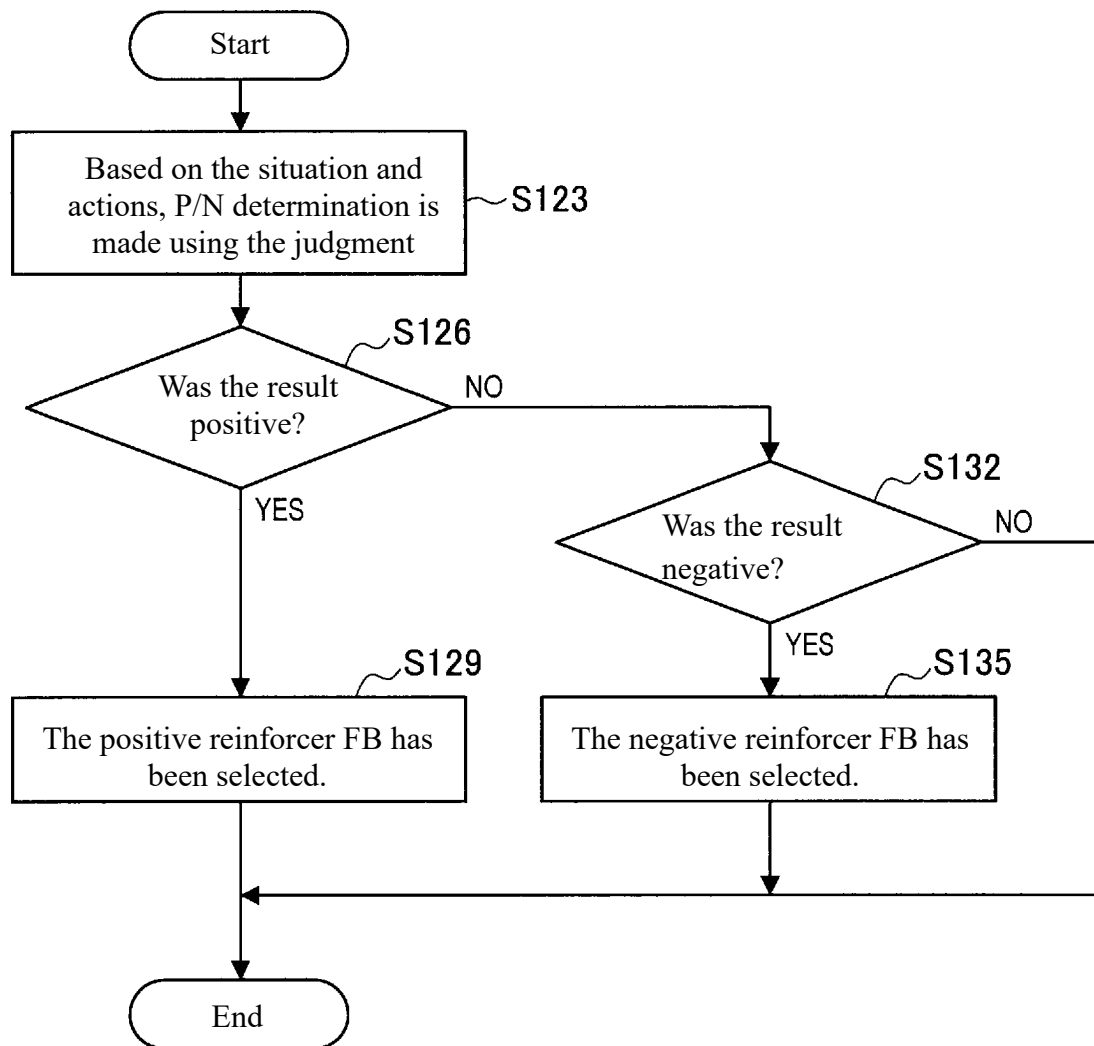
[FIG. 4]

ID	User ID	Status	Action	P/N	Feedback		
					Type	Content	Priority
R1	*	*	*	-1	Hearing	Unpleasant sound	0.2
R2	U1	*	*	1	Vision	Image of a dog	0.7
R3	U1	*	*	-1	Vision	Image of a cat	0.5
R4	*	Meeting people	Greeting	1	Hearing	Pleasant sound	0.8
R5	*	*	Looking down and walking	-1	Vision	Image of an insect	0.7
...	...	...	...	...	...	...	...

[FIG. 5]

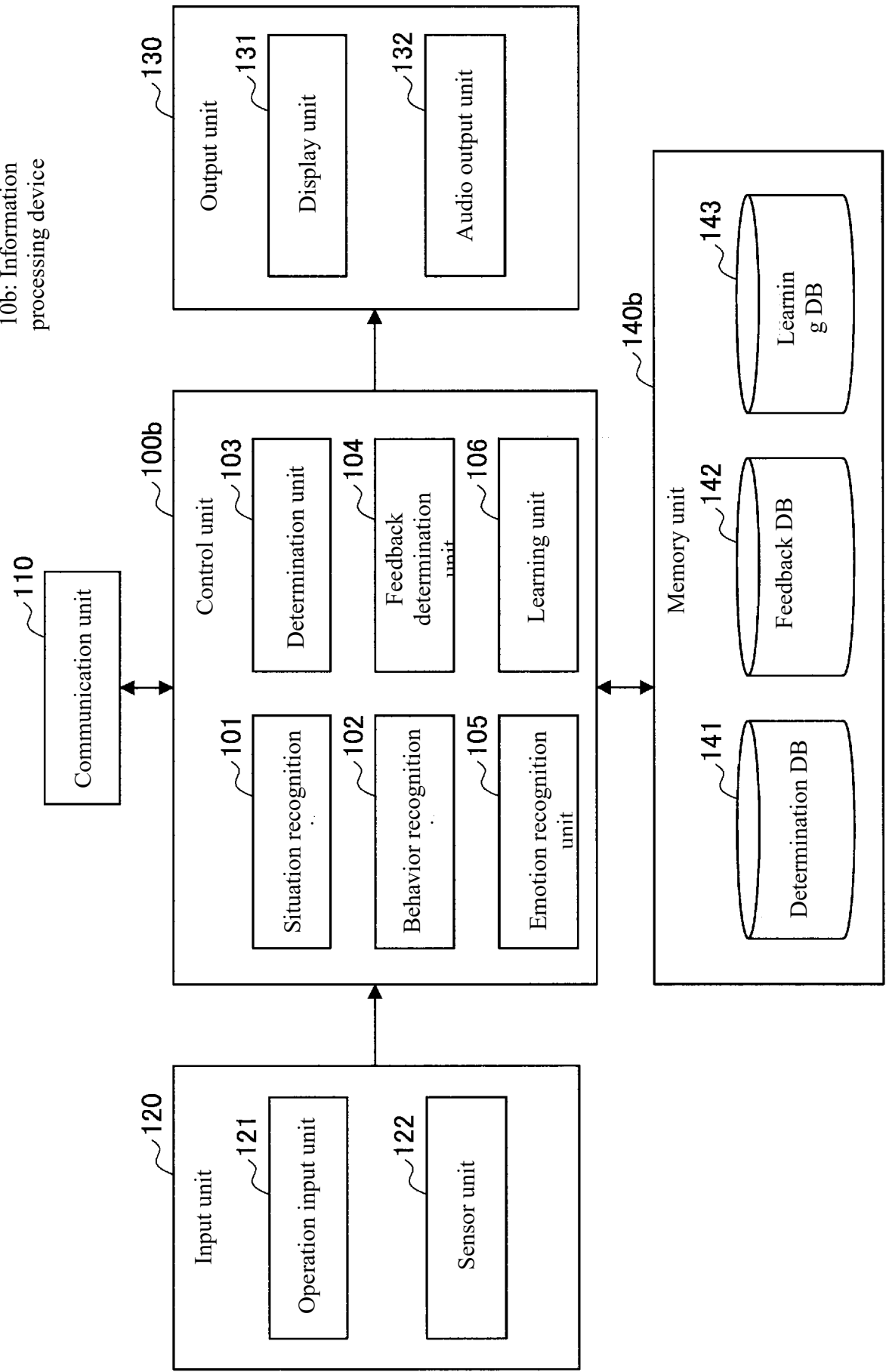


[FIG. 6]



[FIG. 7]

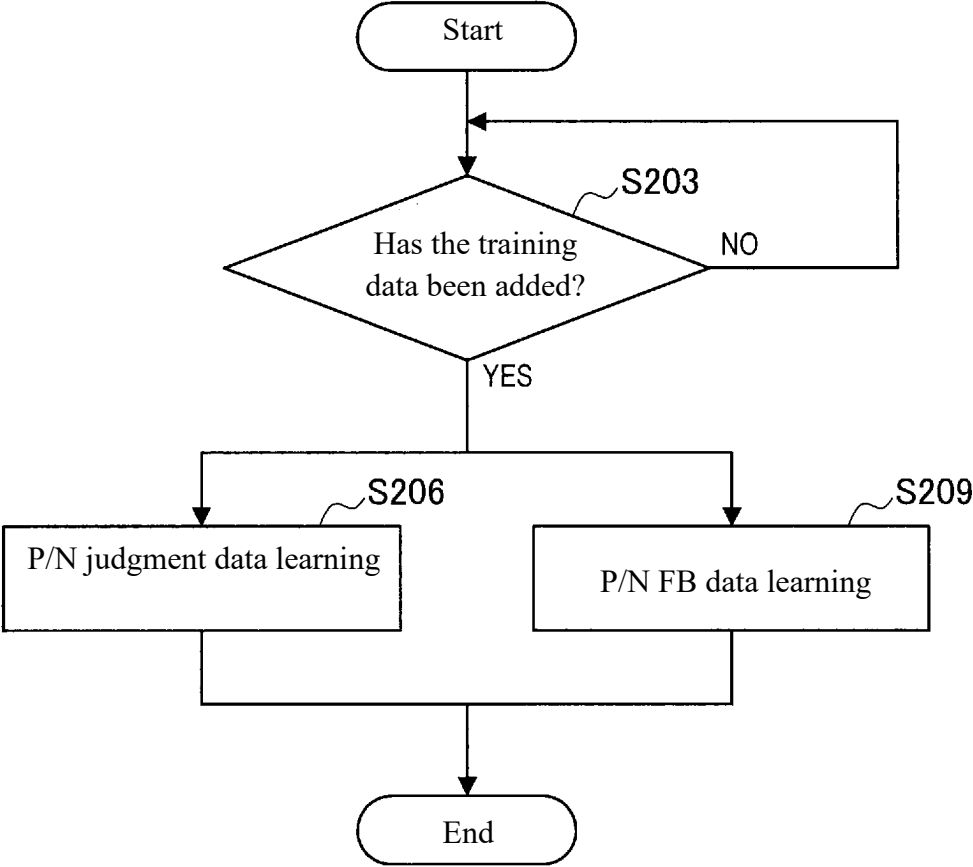
10b: Information processing device



[FIG. 8]

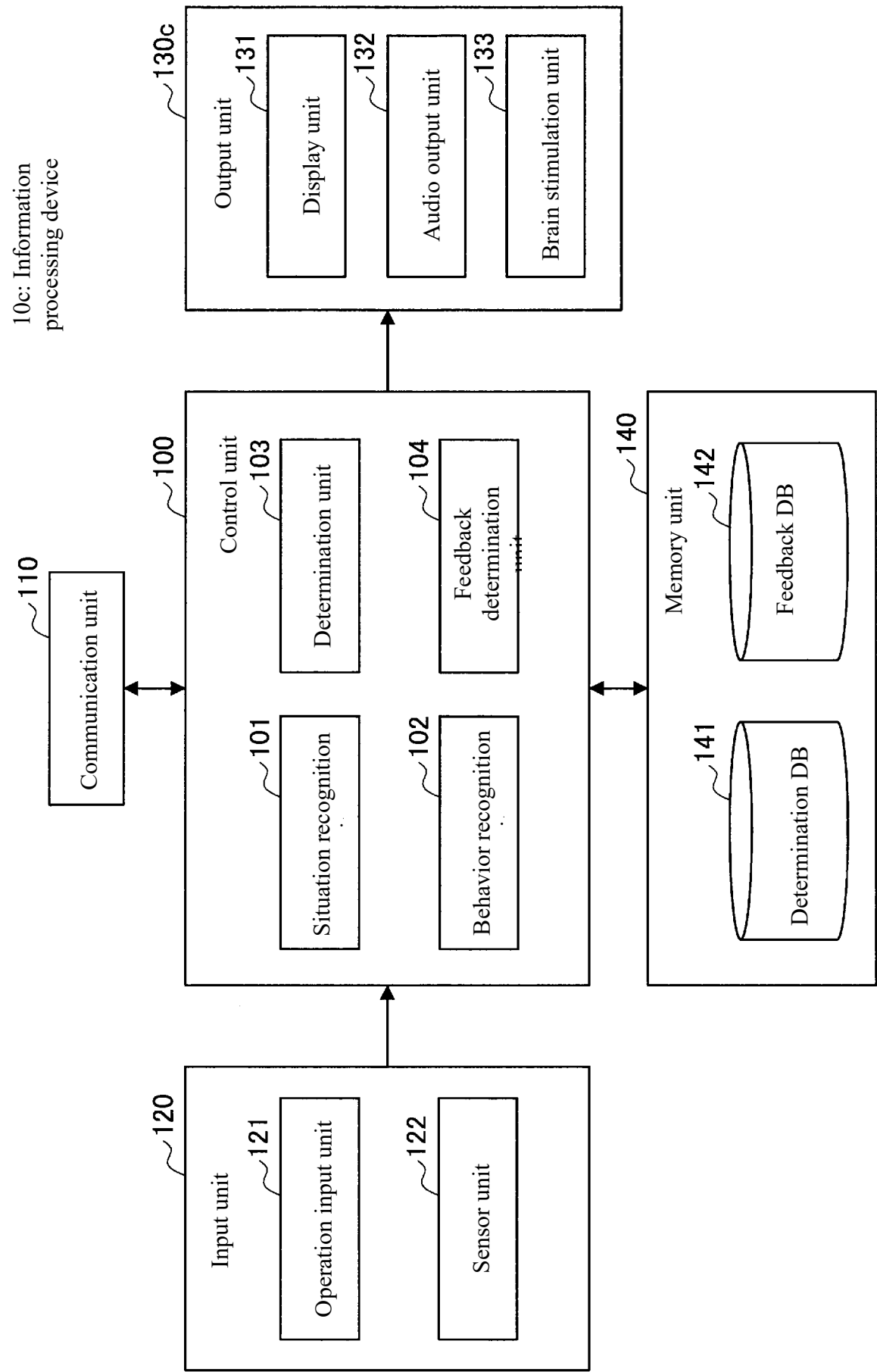
ID	Time	User ID	Situation recognition result	Behavior recognition result	Emotion recognition result
L1	t1	U1	Neighborhood	Greeting	1
L2	t2	U1	Commuting & meeting a dog	Walking	1
L3	t3	U1	Neighborhood	Greeting	1
L4	t4	U1	Meeting neighbors and dogs	Stop	1
L5	t5	U1	Meeting neighbors and cats	Walking	-1
L6	t6	U1	Home & Chocolate	Eating	1
L7	t7	U2	Home & Cake	Leave it behind	-1
L8	t8	U3	Company & umbrella	Leave it behind	-1
L9	t9	U4	Company & umbrella	Use	1
...	...	...	...	...	...

[FIG. 9]

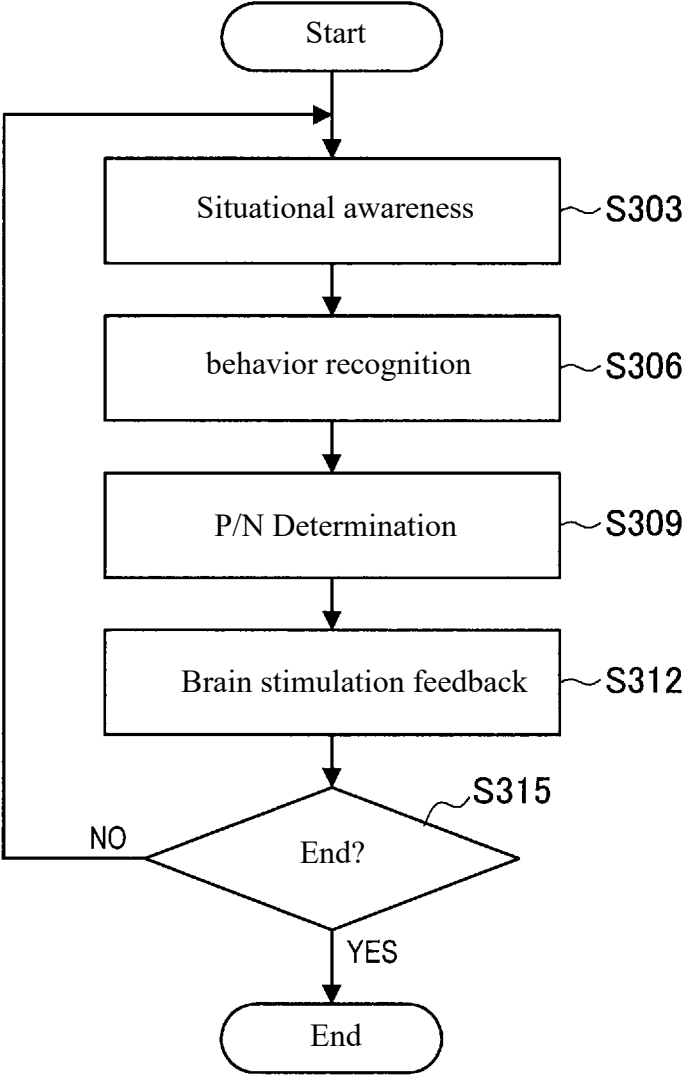


[FIG. 10]

10c: Information processing device



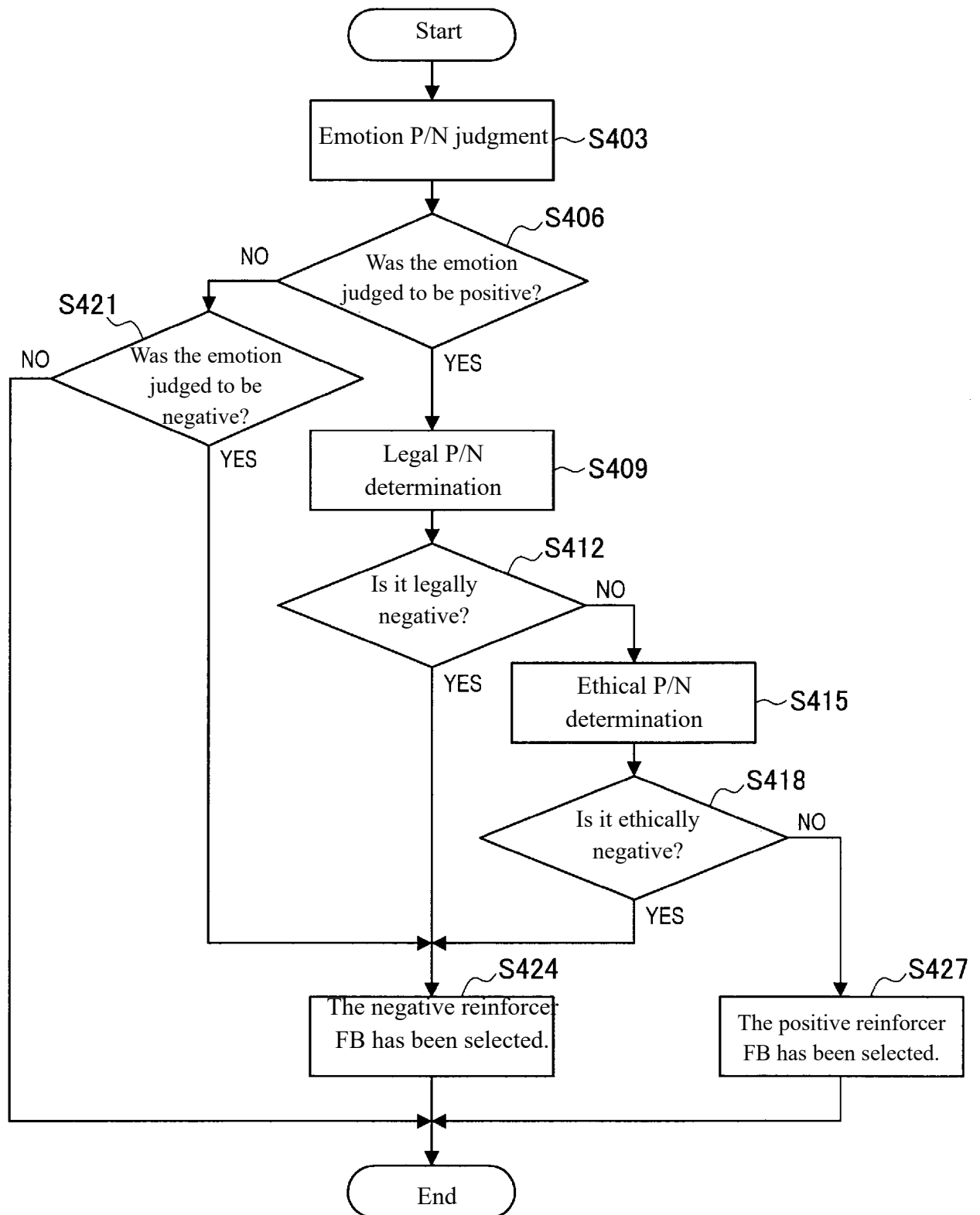
[FIG. 11]



[FIG. 12]

ID	Status	Action	Ethical P/N	Legal P/N	Region
D1	Train & Sitting	Give up your seat to someone	1	0	*
D2	*	Hitting someone	-1	-1	*
D3	*	Shouting loudly	-1	0	Japan
...	...	...	...	...	...

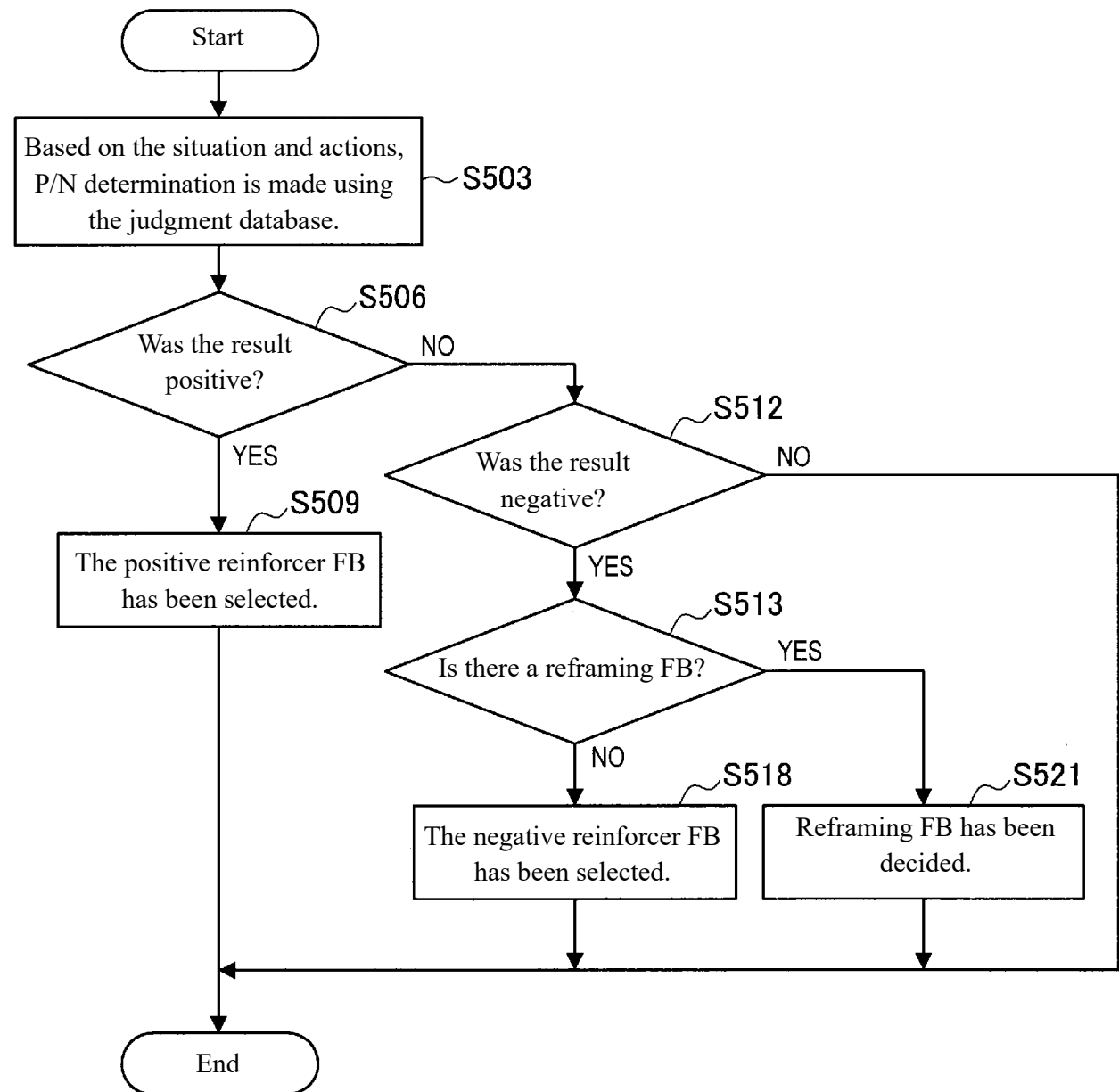
[FIG. 13]



[FIG. 14]

ID	User ID	Status	Action	P/N	Feedback		
					Type	Content	Priority
R1	*	*	*	-1	Hearing	Unpleasant sound	0.2
R2	U1	*	*	1	Vision	Image of a dog	0.7
R3	U1	*	*	-1	Vision	Image of a cat	0.5
R4	*	Meeting people	Greeting	1	Hearing	Pleasant sound	0.8
R5	*	*	Looking down and walking	-1	Vision	Image of an insect	0.7
R6	*	Train & Sitting	Standing up & not getting down	-1	Language	"You made a mistake and stood up, but you did a good thing by giving up your seat to someone else."	0.9
R7	*	Train & Delay	*	-1	Language	"It's inconvenient when the train is delayed, but it's good that no one seems to have been injured."	0.5
...	...	...	...	...	...	...	...

[FIG. 15]



[FIG. 16]

ID	User ID	Status	Action	Emotional P/N	Ethical P/N	Legal P/N
D1	*	First encounter of the day	Greeting	1	1	0
D2	*	*	Cleaning	-1	1	0
D3	Child	Cleaning in progress	Playing	1	-1	0
...	...	...	...	...	...	...

[FIG. 17]

						Feedback		
ID	User ID	Status	Action	P/N	Type	Content	Priority	
R1	Child	Children's room	Cleaning	1	Vision	The robot will be happy	0.8	
R2	Child	Children's room & Cleaning in progress	Playing	-1	Vision	The robot is sad.	0.6	
R3	Child	First encounter of the day	Greeting	1	Hearing	Pleasant sound	0.7	
R4	Parent	Child cleaning & cleaning achievement improved by [X]%	Scolding a child	-1	Language	"[name]'s cleaning isn't perfect, but it's [X]% cleaner than before you started."	0.8	
...	...	...	...	...	...	...	...	...

Applicant registration

000002185

20070129

Address Change

1-7-1 Konan, Minato-ku, Tokyo

Sony Corporation