

DESCRIPTION

TITLE OF INVENTION: INFORMATION PROCESSING DEVICE, SYSTEM, AND PROGRAM

TECHNICAL FIELD

[0001] The present invention relates to an information processing apparatus, a system, and a program.

BACKGROUND ART

[0002] Education for researchers is always necessary for the development of industry. Patent Document 1 discloses a method of educational guidance in which anyone can improve their performance without difficulty by fundamentally tracing back to unclear points in educational content and ensuring understanding thereof.

PRIOR ART DOCUMENTS

Patent Document

[0003] [Patent Document 1] Patent Application Publication No. 2000-347559

SUMMARY OF INVENTION

Problems to be Solved by Invention

[0004] However, in a site where multiple people execute individual tasks simultaneously, there are cases where new tasks that have never been executed before may be executed, or where workers with low proficiency even in conventional tasks may be in charge. Further, in a situation where multiple people are sharing "space", "object", and "utility" and people are operating for their own purposes, since it is a huge complex system in which multiple scenarios coexist in time and space, in addition to human disasters such as accidents that occur when the worker's own operation is incorrect, human disasters may also occur even when the worker's own operation is correct, or human disasters may occur with contents and severity of damage that are unexpected from the worker's own operation. In this situation, the education (training) method adopted in industry is mainly focused on standardization of work procedure for occupational safety and health management and thorough implementation thereof, which is unable to cope with the huge complex system described above.

[0005] Currently, although experiential learning materials are being actively produced in the industrial world, they only reproduce the accident phenomenon when a person makes an operational error beforehand, which is essentially different from the materials that allow

people to understand the principle of the accident. In addition, the materials are not designed to reproduce accidents caused not by the worker's own operation but by the operation errors of surrounding workers, or accident phenomena caused by the interaction of multiple workers and the operations of multiple people in the vicinity. Hereinafter, the worker who actually executes the work and the person present in a position to be affected in the event of an accident (inappropriate event) will be referred to together as a party concerned.

[0006] The present invention has been made in view of the above circumstances and provided an information processing apparatus, a system and a program capable of understanding accidents caused by interactions among multiple parties even when multiple scenarios coexist in time and space.

Means for Solving Problems

[0007] According to the present invention, provided is an information processing apparatus configured to communicate with a first input/output device and a second input/output device, comprising: a storage unit storing VR space information and an inappropriate operation database, wherein the VR space information is information defining VR space shared and accessed by a first user that uses the first input/output device and a second user that uses the second input/output device, and the inappropriate operation database is a database defining inappropriate operation information, the inappropriate operation information being information representing an inappropriate operation that can cause an invisible inappropriate event; a reception unit configured to receive first operation information from the first input/output device and second operation information from the second input/output device, wherein the first operation information is information representing a first operation in a real space of the first user, and the second operation information is information representing a second operation in a real space of the second user; a determination unit configured to determine whether the first operation and the second operation configuring the inappropriate operation based on the VR space information, the first operation information, the second operation information, and the inappropriate operation information; and a transmission unit configured to transmit occurrence information representing the occurrence of the inappropriate event to the first input/output device or the second input/output device when it is determined that the inappropriate operation is configured.

[0008] The information processing apparatus according to the present invention can prepares the inappropriate operation database (a database that defines an inappropriate operation in the VR space) and determines the occurrence of the invisible inappropriate event based on the VR space information, the first and second operation information

representing the operations in the real space of the first and second users, and the inappropriate operation information. Therefore, accidents caused by interaction between multiple parties can be understood even if multiple scenarios by the first and second users coexist in time and space.

BRIEF DESCRIPTION OF DRAWINGS

- [0009] [FIG. 1] is a functional block diagram of a system 100 according to an embodiment.
- [FIG. 2] is a schematic diagram showing VR space realized by the system 100.
- [FIG. 3] is an example of information stored in an inappropriate database.
- [FIG. 4] is an example of a flowchart showing a processing realized by the system 100.

DESCRIPTION OF EMBODIMENTS

- [0010] Hereinafter, embodiments of the present invention will be described with reference to the drawings. Various features described in the embodiment below can be combined with each other. In particular, the “unit” in the present invention may include, for instance, a combination of hardware resources implemented by circuits in a broad sense and information processing of software that can be concretely realized by these hardware resources. Further, although various information is executed in the present embodiment, this information can be represented by high and low signal values as a bit set of binary numbers composed of 0 or 1, and communication/calculation can be executed on a circuit in a broad sense.
- [0011] Further, the circuit in a broad sense is a circuit realized by combining at least an appropriate number of a circuit, a circuitry, a processor, a memory, and the like. In other words, it is a circuit includes Application Specific Integrated Circuit (ASIC), Programmable Logic Device (e.g., Simple Programmable Logic Device (SPLD), Complex Programmable Logic Device (CPLD), and Field Programmable Gate Array (FPGA)), and the like.
- [0012] 1. Configuration of system 100
 As shown in FIG. 1, a system 100 comprises an information processing apparatus 1, a first input/output device 4, and a second input/output device 6. In the present embodiment, the system 100 further comprises a reproduction apparatus 9. The information processing apparatus 1 is configured to communicate with the first input/output device 5, the second input/output device 6, and the reproduction apparatus 9 via a network NW.
- [0013] The information processing apparatus 1 is configured of, for instance, a server. The information processing apparatus 1 may transmit and receive information via the network NW. In other words, it does not have to be in the same space as a user’s workplace and

can be a cloud server. The first input/output device 5 and the second input/output device 6 are configured of a head-mounted display or a smart glass combined with any position information acquisition means. The reproduction apparatus 9 reproduces an inappropriate event and allows the user to experience the inappropriate event in a pseudo manner. The reproduction apparatus 9 is configured of a device capable of reproducing temperature, airflow, odor, sound, color, light, or the like.

[0014] (1-1) Information processing apparatus 1

The information processing apparatus 1 comprises a controller 10, a reception unit 20, a transmission unit 30, and a storage unit 40. Further, the controller 10 comprises a conversion unit 11, a determination unit 12, and a reflection unit 13.

[0015] <Storage unit 40>

The storage unit 40 stores various programs and data, and is configured of, for instance, a memory, a hard disk, a SSD, or the like. In the present embodiment, the storage unit 40 stores VR space information and an inappropriate operation database. Here, the VR space information is information defining the VR space shared and accessed by a first user U1 that uses the first input/output device 5 and a second user U2 that uses the second input/output device 6. The VR space is defined by a two-dimensional or three-dimensional space. In the present embodiment, the VR space reproduces a research laboratory or an experimental laboratory. The inappropriate operation database is a database defining inappropriate operation information. The inappropriate operation information is information representing an inappropriate operation that can cause an invisible inappropriate event. Here, the invisible inappropriate event is, for instance, the generation of toxic gas by mixing a specific substance, ignition by starting a burner when a specific gas is generated, or the like. The inappropriate event is specifically, but not limited to, an undesirable event that may occur under an experiment using inorganic or organic solvent or other chemicals. In addition, as shown in FIG. 1, the storage unit 40 comprises an appropriate operation database, which is a database that defines appropriate operation information, and it is possible to define the operation that may cause the invisible inappropriate event harmfully affecting oneself or others among the operations that deviate from the appropriate operation database as the inappropriate operation.

[0016] The VR space can include a first space and a second space. The first space and the second spaces are different from each other. Then, the first and the second spaces are integrated to form one VR space. For instance, if the first space is a virtual space including a work desk and the second space is a virtual space including a lab. coat storage area, the first space in which the work desk is arranged and the second space in which

the lab. coat is arranged are reproduced in the VR space as if they are adjacent to each other as real space. As a result, it is possible for operations of the first user U1 and the second user U2 to influence each other in the VR space even if, for instance, the first user U1 is conducting experimental training using the first space and the second user U2 is conducting experimental training using the second space. Each work of the first user U1 and the second user U2 can be performed according to work instructions of a trainer T who directs the entire work, or according to the scenario set in the information processor 1 in advance without the trainer T.

[0017] In addition, the inappropriate operation may also be configured by a combination of the first operation and the second operation. Here, the first operation information is information representing a first operation in a real space of the first user U1. Further, the second operation information is information representing a second operation in a real space of the second user.

[0018] Furthermore, the first operation or the second operation may include an operation of operating an actual object in the real space corresponding to the VR space. The actual object is a space definition member SD shown in FIG. 2. In the present embodiment, the system 100 can comprise the space definition member SD. The space definition member SD is a member that is arranged in a real space corresponding to the VR space and can be actually touched by a user experiencing the VR space. Specifically, the space definition member SD can be a work desk, a fume hood or a cylinder stand reproduced by a work desk, a lab. coat storage area, a model of a flask made of plastic, or the like. By using the space definition member SD, it is possible to obtain the sense of touch of the real object even during training using the VR space, which makes it possible to receive more realistic training. At this time, the first operation information and the second operation information include the operation of operating the space definition member SD.

[0019] <Reception unit 20>

The reception unit 20 receives various data from the outside. In the present embodiment, the reception unit 20 is configured to receive the first operation information from the first input/output device 5 and the second operation information from the second input/output device 6. Here, the first operation information is information representing the first operation in the real space of the first user U1, and the second operation information is information representing the second operation in the real space of the second user U2. The operation information includes position information acquired by detecting the movement of each user in the real space in real time. Then, the operation information representing the operation in the real space can be converted into information representing the movement in the VR space corresponding to the real space.

[0020] <Transmission unit 30>

The transmission unit 30 transmits various data to the outside. In the present embodiment, the transmission unit 30 is configured to transmit occurrence information representing the occurrence of the inappropriate event to the first input/output device 5 or the second input/output device 6. Here, the content of the occurrence information is not particularly limited and can include, for instance, an image, a sound, and a smell representing the name of the inappropriate event that has occurred or a description thereof, the cause of the inappropriate event that has occurred, the countermeasures to the inappropriateness, or the like.

[0021] The transmission unit 30 transmits the VR space information to the first input/output device 5 and the second input/output device 6. Here, the VR space information can be stored in a memory of the first input/output device 5 and the second input/output device 6 in advance.

[0022] <Controller 10>

The controller 10 controls other components of the information processing apparatus 1, and is configured by a combination of a chip, a processor, a program, or the like. In the present embodiment, the controller 10 includes the conversion unit 11, the determination unit 12, and the reflection unit 13.

[0023] <Conversion unit 11>

The conversion unit 11 converts the first operation information and the second operation information into information representing the operation in the VR space. In other words, the conversion unit 11 converts the operation in the real space into the operation in the VR space.

[0024] <Determination unit 12>

The determination unit 12 is configured to be able to determine whether the first and second operations constitute inappropriate operations based on the VR space information, the first operation information, the second operation information, and the inappropriate operation information. Specifically, the first operation information and the second operation information are converted into operations in the VR space, and when the first operation and the second operation are performed in the VR space, it is judged whether the combination of these operations constitutes an inappropriate operation stored in the inappropriate operation database. This allows us to detect the occurrence of unintended accidents, for instance, even when the first user U1 and the second user U2 have different experimental training from each other, by combining their respective operations.

[0025] <Reflection unit 13>

The reflection unit 13 is configured to reflect the first operation in the first space to

the second space. As a result, the operations of the first user U1 and the second user U2 interact with each other in the VR space even when they use the system 100 in different rooms.

[0026] (1-2) First input/output device 5 and second input/output device 6

Since the first input/output device 5 and the second input/output device 6 have the similar function, the first input/output device 5 will be described hereinafter.

[0027] The first input/output device 5 is configured to output the first operation information representing the operation of the first user U1 to the information processing apparatus 1, and to input the occurrence information transmitted from the information processing apparatus 1. In the present embodiment, the first input/output device 5 is configured by a first head-mounted display 51 and a first glove 52. The first head-mounted display 51 is an arbitrary head-mounted display, which displays the VR space on a display unit and immerses the user in the VR space. Then, image information among the occurrence information received from the information processing apparatus 1 is displayed on the display unit of the head-mounted display. If the occurrence information is sound, odor, warm air, or the like, an information generator may be provided on the head-mounted display, or another device may be arranged in the work space as long as it is within a range detectable by the user. Specifically, if the generated information is sound, the sound may be output from a speaker provided on the first head-mounted display 51, or another speaker may be arranged in the work space. In the case of warm air or odor, it is also possible to employ the similar configuration in which an information generator is provided in the head-mounted display or another device is arranged.

[0028] The first glove 52 acquires the first operation information. Although the configuration of the first glove 52 is not particularly limited, it is capable of mounting with a device that can acquire position information such as a beacon, Wi-Fi (registered trademark), Blue tooth (registered trademark), or GPS, and a sensor such as an acceleration sensor, a gyroscope, or a pressure sensor. Although the glove worn on a hand is shown here as a specific example, the operation information acquisition area is not limited to the hand, and any part of the body of the user affecting the work content can be a target of the operation information acquisition.

[0029] Here, the first input/output device 5 can be realized by arbitrary configuration without necessarily requiring the first glove 52. For instance, various apparatus and sensors may be mounted on a stick-shaped device instead of the first glove 52. In addition, a marker may be given to a hand of the first user U1, and a trajectory of the marker may be tracked by a camera arranged in the real space to acquire the first operation information. Here, the marker is not necessarily required when using image processing to acquire the first

operation information.

[0030] Similar to the first input/output device 5, the second input/output device 6 is configured by a second head-mounted display 61 and a second glove 62. Then, the second operation information representing the operation of the second user U2 is output by the second input/output device 6.

[0031] (1-3) Reproduction apparatus 9

The reproduction apparatus 9 reproduces an inappropriate event and allows the user to experience the inappropriate event in a simulated manner. The reproduction apparatus 9 is configured by an apparatus capable of reproducing temperature, wind, warm air, odor, sound, color, light, or the like. For instance, when a toxic gas is generated as an invisible inappropriate event because of the inappropriate operation, the odor and color of the gas using ingredient that is harmless to the human body are reproduced. As a result, the user can experience the inappropriate event in a realistic manner.

[0032] 2. About the shared VR space

FIG. 2 is a schematic diagram showing a VR space shared by multiple users. In the example of FIG. 2, the first user U1 to a fourth user U4 each wears an input/output device and share one VR space. In the present embodiment, the case where the first user U1 to the fourth user U4 are undergoing experimental training in a first laboratory to a fourth laboratory, respectively, will be described. Here, it is assumed that the third user U3 and the fourth user U4 are wearing a third input/output device 7 (configured by a third head-mounted display 71 and a third glove 72) and a fourth input/output device 8 (configured by a fourth head-mounted display 81 and a fourth glove 82), respectively.

[0033] The first space to a fourth space are displayed on the first input/output device 5 to the fourth input/output device 8, respectively. The first space to the fourth space are then integrated together to form one VR space. As a result, operations of the multiple users existing at distant positions affects each other in the VR space experienced by each user.

[0034] For instance, the first space can be reproduced as an environment handling an inorganic solvent, the second space can be reproduced as an environment handling an organic solvent, the third space can be reproduced as an environment handling fire, and the fourth space can be reproduced as an environment generating a toxic gas. Then, the inappropriate event will occur as the operation in a particular space affects another space.

[0035] Here, by arranging the space definition members SD (work desks) in the first laboratory to the fourth laboratory (real spaces corresponding to the VR space), each user can actually touch the space definition member SD (work desk) in the VR space and

can achieve a more realistic experience. In the example shown in FIG. 2, a work desk is arranged as a space definition member SD, and another equipment (fume hood, cylinder stand, or lab. coat storage area) is represented in the VR space. Here, the equipment arranged in the VR space (equipment other than the space definition member SD: hereinafter, referred to as “virtual equipment”) may be represented as a simple image, or may be represented as the virtual equipment in the VR space by arranging multiple work desks in the laboratory (real space) and represented as virtual equipment in the VR space. Moreover, when the virtual equipment is represented as a simple image, the first input/output device 5 may be mounted with a tactile feedback function to convey a sense of touch to the user when the virtual equipment is touched in the VR space.

[0036] 3. Inappropriate operation database

FIG. 3 shows an example of the inappropriate operation database. The inappropriate operation database is a database summarizing causes of the inappropriate event that has been clarified based on theory and past experience. Although the example in FIG. 3 is shown in table format, the storing method of the database is not limited to this.

[0037] In the present embodiment, the inappropriate operation is defined as an operation in the laboratory for (1) to (3) below. It is unnecessary to create a database for all of (1) to (3) but to create a database for at least one of (1) to (3).

- (1) A combination of a plurality of predetermined objects
- (2) A combination of a plurality of predetermined operations
- (3) A combination of a plurality of predetermined objects and operations

[0038] (1) can be defined for at least one of “an arrangement distance of a particular object among the plurality of objects”, or “a state change of a particular object among the plurality of objects”.

(2) can be defined for at least one of “an execution order of a particular operation among the plurality of operations”, or “an execution interval of the particular operation”.

(3) can be defined for at least one of “that the operation is executed within a predetermined range from the object”, or “that the operation is executed within a predetermined time after the object is opened”.

[0039] In the example shown in FIG. 3, (1) in the case of “arrangement distance”, “(reagent A, reagent B) 0cm” indicates that “toxic gas generation”, an inappropriate event, may occur if reagent A and reagent B are placed in contact with each other. Further, in the case of (1) “change of state”, “(reagent A, reagent E > 30°C)” indicates that when reagent

E is raised to 30°C or higher in the vicinity of reagent A, "toxic gas generation" may occur due to the reaction of a volatile component of reagent E with reagent A. Further, "(reagent F > 300°C)" indicates that "spontaneous combustion" may occur when reagent F is heated to 300°C or higher. Furthermore, "(flame, reagent G > 150°C)" indicates that "ignition" may occur when reagent G is heated to 150°C or higher in the vicinity of a flame. More precisely, the above inappropriate event occurrence conditions can be represented as a function of temperature and arrangement distance, or as a table reference in each case. In addition, the predetermined "objects" here include other than reagents. For instance, in the case of (1) "arrangement distance", "(reagent C, reagent D) 0cm" indicates that "spontaneous combustion", an inappropriate event, may occur when reagent C (e.g., metallic sodium) touches reagent D (e.g., water). Further, "(reagent E, instrument X) 0cm" indicates that "burn", an inappropriate event, may occur if reagent E (e.g., nitric acid) is touched without using instrument X (e.g., rubber gloves). In FIG. 3(1), although the arrangement distance of 0cm (touch) is shown as an example, a value other than 0cm can also be set, such as "ignition", an inappropriate event, may occur when reagent F (e.g., ether) overflows while instrument Y (e.g., gas burner) is within a certain distance (arrangement distance of 100cm) from reagent F (e.g., ether) without any barrier such as a wall, as shown below. A value other than 0cm can also be set in the case of effect of biological or radiation.

[0040] (2) In the case of "execution order", "(operation A → operation B)" indicates that if operation B is performed after operation A, an inappropriate event "burn by scattering" may occur. Further, in the case of (2) "execution interval", "(operation A, operation D) 10S" indicates that if operation A and operation B are performed within 10 seconds, an inappropriate event "burn by scattering" may occur.

[0041] (3) In the case of "range", "(reagent A, operation A) 50cm" indicates that if operation A is performed within a range of 50cm from reagent A, an inappropriate event "cut by substrate piece" may occur. In the case of (3) "time", "(reagent A, operation E) 20S" indicates that "spontaneous combustion", an inappropriate event, may occur if operation B is performed within 10 seconds after Reagent A is opened.

[0042] Here, FIG. 3 is an example of the inappropriate operation database, and the database can be constructed from a perspective different from (1) to (3). The data may also be collected from an external database.

[0043] 4. Flowchart

Next, the processing executed by the system 100 will be described with reference to FIG. 4. For simplicity of description, the interaction between the first input/output device 5 and the second input/output device 6 will be described below.

- [0044] First, in S1, the VR space information is transmitted to the first input/output device 5 and the second input/output device 6 by the transmission unit 30, and the VR space information is set in the first input/output device 5 and the second input/output device 6. Here, if the VR space information is stored in the first input/output device 5 and the second input/output device 6 in advance, the transmission of the VR space information from the transmission unit 30 can be omitted.
- [0045] Next, in S2, the first space is reproduced in the first input/output device 5, the second space is reproduced in the second input/output device 6, and one VR space is generated in a state where the first space and the second space are adjacent to each other. As a result, the VR space is shared by the first user U1 and the second user U2. Then, the first user U1 and the second user U2 perform predetermined operations in the respective virtual spaces. The predetermined operation includes, but is not limited to, the action of using various instruments and reagents to execute the experiments given by the trainer T.
- [0046] Next, in S3, the first operation information and the second operation information are received by the reception unit 20. Then, the first operation information and the second operation information are converted into operations in the VR space by the conversion unit 11. In addition, the reflection unit 13 reflects the operation corresponding to the first operation information in the first space to the second space, and the operation corresponding to the second operation information in the second space to the first space.
- [0047] Next, in S4, the determination unit 12 determines whether the first operation and the second operation configuring the inappropriate operation. At this time, the inappropriate operation database is referred to identify which inappropriate operation is applicable. If it is determined that the first operation and the second operation configure the inappropriate operations (YES), the processing proceeds to S5.
- [0048] Next, in S5, the occurrence information representing the occurrence of the inappropriate event is transmitted to the first input/output device 5 or the second input/output device 6 by the transmission unit 30. The first input/output device 5 or the second input/output device 6 displays various information on the display unit based on the received occurrence information. Here, the occurrence information may be transmitted to the first input/output device 5 and the second input/output device 6.
- [0049] Then, in S6, the reproduction apparatus 9 reproduces the inappropriate event. As a result, the first user U1 and the second user U2 can feel the inappropriate event vicariously.
- [0050] On the other hand, in S4, if it is determined that the first operation and the second operation do not configure the inappropriate operation (NO), the processing returns to

S3 again.

[0051] As a result, the operations in the first space and the second space which are different from each other interact in the VR space, and the first user U1 and the second user U2 can actually feel the inappropriate event that should not occur alone.

[0052] Therefore, according to the system 100 comprising the information processing apparatus 1, it is possible to reproduce the inappropriate event (accident phenomenon) that occur by the interaction of the operations of multiple people. As a result, the information processing apparatus 1 or the system 100 can be used as an educational material for understanding "received accident" caused by the interaction of each party. With such technology, beyond compliance with rules and regulations by students, researchers and faculty members, it is possible to realize rational, effective, and concrete environmental safety education for the researchers themselves to recognize environmental safety as their own problem and to consider spontaneously.

[0053] 5. Others

The present invention may be implemented in various aspects as described below.

[0054] A system, comprising: an information processing apparatus, a first input/output device, and a second input/output device, wherein: the information processing apparatus is configured to communicate with a first input/output device and a second input/output device, having a storage unit storing VR space information and an inappropriate operation database, wherein the VR space information is information defining VR space shared and accessed by a first user that uses the first input/output device and a second user that uses the second input/output device, and the inappropriate operation database is a database defining inappropriate operation information, the inappropriate operation information being information representing an inappropriate operation that can cause an invisible inappropriate event; a reception unit configured to receive first operation information from the first input/output device and second operation information from the second input/output device, wherein the first operation information is information representing a first operation in a real space of the first user, and the second operation information is information representing a second operation in a real space of the second user; a determination unit configured to determine whether the first operation and the second operation configuring the inappropriate operation based on the VR space information, the first operation information, the second operation information, and the inappropriate operation information; and a transmission unit configured to transmit occurrence information representing the occurrence of the inappropriate event to the first input/output device or the second input/output device when it is determined that the inappropriate operation is configured, wherein the first input/output device and the

second input/output device are configured to present the occurrence information to the first user and the second user.

[0055] A program configured to allow a computer capable of communicating with a first input/output device and a second input/output device to function as: a storage unit storing VR space information and an inappropriate operation database, wherein the VR space information is information defining VR space shared and accessed by a first user that uses the first input/output device and a second user that uses the second input/output device, and the inappropriate operation database is a database defining inappropriate operation information, the inappropriate operation information being information representing an inappropriate operation that can cause an invisible inappropriate event; a reception unit configured to receive first operation information from the first input/output device and second operation information from the second input/output device, wherein the first operation information is information representing a first operation in a real space of the first user, and the second operation information is information representing a second operation in a real space of the second user; a determination unit configured to determine whether the first operation and the second operation configuring the inappropriate operation based on the VR space information, the first operation information, the second operation information, and the inappropriate operation information; and a transmission unit configured to transmit occurrence information representing the occurrence of the inappropriate event to the first input/output device or the second input/output device when it is determined that the inappropriate operation is configured.

[0056] Finally, various embodiments of the present invention have been described, but these are presented as examples and are not intended to limit the scope of the invention. The novel embodiment can be implemented in various other forms, and various omissions, replacements, and changes can be made without departing from the abstract of the invention. The embodiment and its modifications are included in the scope and abstract of the invention and are included in the scope of the invention described in the claims and the equivalent scope thereof.

REFERENCE SIGNS LIST

[0057] 1 : Information processing apparatus
 5 : First input/output device
 6 : Second input/output device
 7 : Third input/output device
 8 : Fourth input/output device

9	: Reproduction apparatus
10	: Controller
11	: Conversion unit
12	: Determination unit
13	: Reflection unit
20	: Reception unit
30	: Transmission unit
40	: Storage unit
51	: First head mounted display
52	: First glove
61	: Second head mounted display
62	: Second glove
71	: Third head mounted display
72	: Third glove
81	: Fourth head mounted display
82	: Fourth glove
100	: System
SD	: Space definition member
U1	: First user
U2	: Second user
U3	: Third user
U4	: Fourth user
T	: Trainer

CLAIMS

- [Claim 1] An information processing apparatus configured to communicate with a first input/output device and a second input/output device, comprising:
- a storage unit storing VR space information and an inappropriate operation database, wherein
- the VR space information is information defining VR space shared and accessed by a first user that uses the first input/output device and a second user that uses the second input/output device, and
- the inappropriate operation database is a database defining inappropriate operation information, the inappropriate operation information being information representing an inappropriate operation that can cause an invisible inappropriate event;
- a reception unit configured to receive first operation information from the first input/output device and second operation information from the second input/output device, wherein
- the first operation information is information representing a first operation in a real space of the first user, and
- the second operation information is information representing a second operation in a real space of the second user;
- a determination unit configured to determine whether the first operation and the second operation configuring the inappropriate operation based on the VR space information, the first operation information, the second operation information, and the inappropriate operation information; and
- a transmission unit configured to transmit occurrence information representing the occurrence of the inappropriate event to the first input/output device or the second input/output device when it is determined that the inappropriate operation is configured.
- [Claim 2] The information processing apparatus according to the claim 1, wherein:
- the inappropriate operation is configured by a combination of the first operation and the second operation.
- [Claim 3] The information processing apparatus according to claim 1 or 2, wherein:
- the first operation or the second operation includes an operation of operating an actual object in the real space corresponding to the VR space.

- [Claim 4] The information processing apparatus according to any one of claims 1 to 3, wherein:
 the VR space includes a first space and a second space,
 the first space and the second space are difference spaces and each integrally configure one VR space; further comprising:
 a reflection unit configured to reflect the first operation in the first space to the second space.
- [Claim 5] The information processing apparatus according to any one of claims 1 to 4, wherein:
 the inappropriate operation is an operation in an environment having factors that may cause harmful effect on human body, and is defined for at least one of (1) to (3),
 (1) a combination of a plurality of predetermined objects,
 (2) a combination of a plurality of predetermined operations,
 (3) a combination of the predetermined object and operation.
- [Claim 6] The information processing apparatus according to claim 5, wherein:
 the (1) is defined for at least one of an arrangement distance of a particular object among the plurality of objects, or a state change of a particular object among the plurality of objects.
- [Claim 7] The information processing apparatus according to claim 5 or 6, wherein:
 the (2) is defined for at least one of an execution order of a particular operation among the plurality of operations, or an execution interval of the particular operation.
- [Claim 8] The information processing apparatus according to any one of claims 5 to 7, wherein:
 the (3) is defined for at least one of that the operation is executed within a predetermined range from the object, or that the operation is executed within a predetermined time after the object is opened.
- [Claim 9] A system, comprising:
 an information processing apparatus, a first input/output device, and a second

input/output device, wherein:

the information processing apparatus is configured to communicate with a first input/output device and a second input/output device, having

a storage unit storing VR space information and an inappropriate operation database, wherein

the VR space information is information defining VR space shared and accessed by a first user that uses the first input/output device and a second user that uses the second input/output device, and

the inappropriate operation database is a database defining inappropriate operation information, the inappropriate operation information being information representing an inappropriate operation that can cause an invisible inappropriate event;

a reception unit configured to receive first operation information from the first input/output device and second operation information from the second input/output device, wherein

the first operation information is information representing a first operation in a real space of the first user, and

the second operation information is information representing a second operation in a real space of the second user;

a determination unit configured to determine whether the first operation and the second operation configuring the inappropriate operation based on the VR space information, the first operation information, the second operation information, and the inappropriate operation information; and

a transmission unit configured to transmit occurrence information representing the occurrence of the inappropriate event to the first input/output device or the second input/output device when it is determined that the inappropriate operation is configured, wherein

the first input/output device and the second input/output device are configured to present the occurrence information to the first user and the second user.

[Claim 10] The system according to claim 9, comprising:

a space definition member configured to be arranged in a real space corresponding to the VR space, wherein:

the first operation and the second operation include an operation of operating the space definition member.

[Claim 11] A program configured to allow a computer capable of communicating with a first input/output device and a second input/output device to function as:

- a storage unit storing VR space information and an inappropriate operation database, wherein
 - the VR space information is information defining VR space shared and accessed by a first user that uses the first input/output device and a second user that uses the second input/output device, and
 - the inappropriate operation database is a database defining inappropriate operation information, the inappropriate operation information being information representing an inappropriate operation that can cause an invisible inappropriate event;
- a reception unit configured to receive first operation information from the first input/output device and second operation information from the second input/output device, wherein
 - the first operation information is information representing a first operation in a real space of the first user, and
 - the second operation information is information representing a second operation in a real space of the second user;
- a determination unit configured to determine whether the first operation and the second operation configuring the inappropriate operation based on the VR space information, the first operation information, the second operation information, and the inappropriate operation information; and
- a transmission unit configured to transmit occurrence information representing the occurrence of the inappropriate event to the first input/output device or the second input/output device when it is determined that the inappropriate operation is configured.