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Information processing device and information processing method

Abstract

An information processing device that generates data to be displayed on a head-mounted display. The information processing device includes: a detection unit that detects a gesture by a first hand of a user; and a processing unit that switches, in a case where a specific gesture by the first hand is detected by the detection unit in a first operation mode in which first processing is executed in response to a first operation by a second hand of the user, to a second operation mode in which second processing different from the first processing is executed in response to the first operation by the second hand.

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Background/Summary

BACKGROUND OF THE INVENTION
Field of the Invention
(1) The present invention relates to an information processing device and an information processing method.
Description of the Related Art
(2) There have been mixed reality (MR) technologies to merge a real space and a virtual space together so that a person is enabled to sense a virtual object. In the MR technologies, a system combines a computer graphic (CG) expressing a virtual object with a real landscape to be presented, and expresses the contact between a real object and a virtual object.
(3) In the MR technologies, it is possible to move a virtual object overlapping a real landscape in accordance with a gesture by a user's hand. A user is enabled to perform the movement or the like of a CG object by a gesture without using a controller.
(4) Further, the user is also enabled to perform the input of characters or the drawing of lines, characters, graphics on a designated drawing area such as a whiteboard.
(5) Japanese Patent Application Laid-open No. 2018-151851 discloses a method for displaying an operation GUI and performing a function in accordance with a detected gesture. In Japanese Patent Application Laid-open No. 2018-151851, the operation GUI is displayed at a display position corresponding to the position of a detected gesture. The operation GUI is associated with gestures and functions. A function corresponding to the operation GUI is performed in accordance with a detected gesture.
(6) However, it is assumed in Japanese Patent Application Laid-open No. 2018-151851 that both gestures and operations through the GUI are performed by one hand. Therefore, when the gestures and the operations through the GUI are performed by one hand, operability is poor (inconvenience, reduced efficiency, botheration, or the like is caused).
SUMMARY OF THE INVENTION
(7) Therefore, an object of the invention is providing high operability for a user in a case where gestures are used in operations.
(8) An aspect of the invention is an information processing device that generates data used for a display on a head-mounted display, the information processing device including at least one memory and at least one processor that function as: a detection unit configured to detect a gesture by a first hand of a user; and a processing unit configured to switch, in a case where a specific gesture by the first hand is detected by the detection unit in a first operation mode in which first processing is executed in response to a first operation by a second hand of the user, to a second operation mode in which second processing different from the first processing is executed in response to the first operation by the second hand.
(9) An aspect of the invention is an information processing method for generating data used for a display on a head-mounted display, the information processing method including: detecting a gesture by a first hand of a user; and switching, in a case where a specific gesture by the first hand is detected in detecting in a first operation mode in which first processing is executed in response to a first operation by a second hand of the user, to a second operation mode in which second processing different from the first processing is executed in response to the first operation by the second hand.
(10) Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a block configuration diagram of a MR system according to a first embodiment;

(2) FIG. **2** is a hardware configuration diagram of the MR system according to the first embodiment;
(3) FIG. **3** is a block configuration diagram of a controller according to a second embodiment;
(4) FIG. **4** is a diagram for describing the connection between an HMD and a controller according to the second embodiment;
(5) FIGS. **5**A and **5**B are diagrams for describing the switching of an operation mode according to the first embodiment;
(6) FIGS. **6**A to **6**C are diagrams for describing drawing processing according to the first embodiment;
(7) FIG. **7** is a flowchart of switching processing relating to drawing according to the first embodiment;
(8) FIG. **8** is a flowchart of the outline of switching processing according to the first embodiment;
(9) FIG. **9** is a flowchart of the processing of a MR system according to the second embodiment;
(10) FIG. **10** is a diagram showing the relationship between hands and character groups according to a third embodiment;
(11) FIG. **11** is a diagram for describing the input of characters according to the third embodiment;
(12) FIG. **12** is a diagram for describing the input of characters according to a fourth embodiment;
(13) FIG. **13** is a diagram for describing the deletion of characters according to a fifth embodiment;
(14) FIG. **14** is a diagram for describing the conversion of character strings according to a sixth embodiment;
(15) FIG. **15** is a flowchart of the processing of a MR system according to the third embodiment;
(16) FIG. **16** is a flowchart of the processing of a MR system according to the fourth embodiment;
(17) FIG. **17** is a flowchart of the processing of a MR system according to the fifth embodiment; and
(18) FIG. **18** is a flowchart of the processing of a MR system according to a sixth embodiment.

DESCRIPTION OF THE EMBODIMENTS

(19) Hereinafter, embodiments of the present invention will be described in detail on the basis of the accompanying drawings. Note that each of the following embodiments is an example of the implementation unit of the present invention, and may be appropriately corrected or changed depending on the configurations or various conditions of a device to which the present invention is applied. Further, it is also possible to appropriately combine the respective embodiment together.

First Embodiment

(20) FIG. **2** shows the hardware configurations of a mixed reality system (MR system) **1** according to a first embodiment. FIG. **1** shows the block configurations of the MR system **1**.
(21) As shown in FIG. **2**, the MR system **1** has an image capturing unit **101**, a display unit **102**, a communication unit **110**, a CPU **200**, a RAM **201**, and a ROM **202**.
(22) The CPU **200** is a control unit that controls the whole MR system **1**. The CPU **200** controls the whole MR system **1** by performing an application used to operate the MR system **1**. Specifically, the CPU **200** performs an application after developing the application (program) stored in the ROM **202** into the RAM **201**. Respective units shown in FIG. **1** are realized by the CPU **200**. However, one or a plurality of configurations shown in FIG. **1** may be realized by hardware independent of the CPU **200**.
(23) As shown in FIG. **1**, the MR system **1** has an HMD **100** and an information processing device **103**.
(24) The HMD **100** is a display device (Head-Mounted Display) for wearing on a head. The HMD **100** is a video see-through display device. The HMD **100** has the image capturing unit **101** and the display unit **102**. Information (setting information) on the settings of the HMD **100** is stored in the ROM **202**.
(25) In the HMD **100**, the image capturing unit **101** is arranged in front of the eyes of a user wearing the HMD **100**. The display unit **102** displays an image (captured image) acquired when the

image capturing unit **101** captures an image of a surrounding area. In a video see-through HMD, the position and attitude of an image capturing unit **101** are generally handled as the position and attitude of an experiencing person. Note that the HMD **100** of the present embodiment is a video see-through HMD but is shown only as an example. For example, the present embodiment is also applicable to an HMD for virtual reality in which a captured image (image obtained by capturing an image of a real space) is not displayed on a display unit **102**. In this case, an image capturing unit **101** is used as, for example, a camera used to capture an image of a hand that is a measurement target.

(26) The image capturing unit **101** captures an image of a real space at a predetermined frame rate (for example, 30 frames/second). The image capturing unit **101** is fixed to the housing of the HMD **100**. The image capturing unit **101** has two actual cameras. An actual camera for a left eye and an actual camera for a right eye are arranged at positions close to both eyes of a user. A pair of right and left images obtained by capturing images by the image capturing unit **101** may also be called "stereo camera images".

(27) The information processing device **103** generates, on the basis of a captured image acquired by the image capturing unit **101**, data to be displayed on the display unit **102**. The information processing device **103** may be included in the HMD **100**, or may be hardware independent of the HMD **100**. The information processing device **103** has a captured-image storage unit **104**, a contour-point extraction unit **105**, a three-dimensional position calculation unit **106**, a calculation unit **107**, an image drawing unit **108**, a processing computation unit **109**, and a communication unit **110**.

(28) The captured-image storage unit **104** stores a captured image acquired by capturing an image by the image capturing unit **101**. The captured-image storage unit **104** is realized by the RAM **201**. Therefore, a captured image is stored in the RAM **201**.

(29) The contour-point extraction unit **105** extracts the contour points of a finger from a captured image according to an image recognition technology.

(30) The three-dimensional position calculation unit **106** calculates the three-dimensional positions (x, y, and z coordinates) of the contour points of a finger extracted by the contour-point extraction unit **105**. The x-coordinate and the y-coordinate are coordinates set when the lower left of the VRAM region of a captured image is assumed as an origin (0, 0). The coordinates of the origin are not limited to the lower left of the VRAM region but may be freely determined by a user. The z-coordinate is a coordinate that shows a distance from the HMD **100** and is acquirable on the basis of a captured image.

(31) Note that in order to correctly display the depth of a hand (the value of a z-coordinate), a method in which the region of the hand is extracted from a captured image obtained by capturing an image of the hand by a stereo camera to calculate the depth value of the hand with respect to the stereo camera may be used. As such, a method in which depth values are calculated by triangulation for all the corresponding points of a captured image of an extracted contour line of a hand as shown in Japanese Patent Application Laid-open No. 2012-13514 may be used. In Japanese Patent Application Laid-open No. 2012-13514, stereo cameras mounted in a video see-through HMD (display device for presenting a mixed reality feeling) are used.

(32) Note that Leap Motion by Leap Motion company is capable of measuring the position and attitude of a hand including the position and attitude of a finger of the hand. The Leap Motion is capable of detecting the region of a hand by using a stereo camera (image capturing unit **101**). Note that a depth (distance sensor) sensor may be installed in the HMD **100** since the estimation of the position and attitude of a finger of a hand is enabled by the depth sensor.

(33) In the present embodiment, the three-dimensional position calculation unit **106** determines any one point from contour points extracted by the contour-point extraction unit **105**, and calculates the three-dimensional position of the contour point of the one determined point. Information on the position of the contour point of the one determined point is stored in the RAM **201** as information

on a reference position. Further, information on a new three-dimensional position is periodically stored in the RAM **201** in accordance with the movement of a finger.
(34) The calculation unit **107** calculates the position and attitude of a hand in a captured image stored in the captured-image storage unit **104**. As a method for calculating the position and attitude of a hand, a method using deep learning or a method using an existing library open to the public may be used.
(35) The image drawing unit **108** draws, on the basis of the processing result of the processing computation unit **109**, an image to be displayed on the display unit **102** of the HMD **100**.
(36) The processing computation unit **109** compares a three-dimensional position (coordinate value) calculated by the three-dimensional position calculation unit **106** with a value (coordinate value) measured by an external sensor (such as a sensor **303** that will be described later). The value measured by the sensor is a value acquired from the controller **300** (small operation device) or the like through Bluetooth™ communication. Specifically, the processing computation unit **109** determines whether a change in the coordinates of a hand detected by the HMD **100** matches a change in the coordinates of the controller **300**. The processing computation unit **109** determines that the hand detected by the HMD **100** and the hand with the controller **300** attached thereto are identical with each other (that is, the hand of the user wearing the HMD **100**) when the two changes in the coordinates match each other. Note that coordinates acquired by the sensor are generally deviated from actual coordinates. Therefore, the processing computation unit **109** may determine that the two changes in the coordinates match each other when the difference between the two changes in the coordinates falls within a certain error rate (for example, within 5%). Note that the error rate may be arbitrarily determined by the user.
(37) Here, in order to obtain a value to be compared with a three-dimensional position calculated by the three-dimensional position calculation unit **106**, the processing computation unit **109** may perform computation processing on IMU information (inertial information) received from the controller **300**. Meanwhile, a control unit **301** of the controller **300** may transmit "information obtained by performing computation processing on the IMU information" to the HMD **100**.
(38) The communication unit **110** has, for example, an antenna for wireless communication, a modulation/demodulation circuit (circuit for processing a wireless signal), and a communication controller. The communication unit **110** outputs a modulated wireless signal from an antenna, or demodulates a wireless signal received by the antenna. Thus, the communication unit **110** realizes short-range wireless communication in compliance with the IEEE802.15 standard (so called Bluetooth™). In the present embodiment, Bluetooth Low Energy version 5.1 having low power consumption is employed as Bluetooth communication.
(39) FIGS. **5**A and **5**B are diagrams for describing the switching of an operation mode in the first embodiment. Hereinafter, one hand for switching an operation mode by a gesture will be called a "gesture hand". Further, the other hand that does not serve as the "gesture hand" among two hands will be called a "processing hand". Further, in the first embodiment, it can be said that a gesture is "a kind of a user operation" since the operation of the HMD **100** is controlled by the gesture.
(40) In FIG. **5**A, a user draws characters by a gesture (hand gesture) using a right hand as a hand (processing hand **501**) to perform drawing processing on a drawing area **500**. Here, the user uses a left hand as a hand (gesture hand **502**) to perform "a gesture to switch an operation mode". Thereby, the user can switch processing (execution processing) that is being performed by the processing hand **501** to another processing. In FIG. **5**B, processing that is performed by the processing hand **501** is switched from a "character drawing mode" to a "character deletion mode" by a gesture by the gesture hand **502**. Note that operation modes after switching (and processing executable in the operation modes) are associated with (assigned to) respective gestures in advance in order to switch an operation mode by a gesture.
(41) Outline of Switching Processing
(42) Hereinafter, the outline of the switching processing of an operation mode by the CPU **200** of

the MR system **1** according to the first embodiment will be described with reference to the flowchart of FIG. **8**.
(43) Note that the CPU **200** is capable of detecting, as a detection unit, gestures by respective right and left hands from a captured image (image acquired by the image capturing unit **101**). Then, the CPU **200** is capable of switching, as a processing unit, an operation mode as described above in accordance with a gesture by the left hand or the right hand.
(44) In step S**800**, the CPU **200** determines whether a hand has been detected from a captured image (image acquired by the image capturing unit **101**). The CPU **200** controls, for example, the contour-point extraction unit **105** and the three-dimensional position calculation unit **106** to determine whether the hand has been detected from the captured image. When it is determined that the hand has been detected, the processing proceeds to step S**801**. When it is determined that the hand has not been detected, the processing of step S**800** is repeatedly performed.
(45) In step S**801**, the CPU **200** determines whether the hand detected in step S**800** is a gesture hand. When it is determined that the detected hand is the gesture hand, the processing proceeds to step S**802**. When it is determined that the detected hand is not the gesture hand, the processing returns to step S**800**.
(46) For example, when an operation device or the like is attached to the detected hand, the CPU **200** determines that the detected hand is the gesture hand. Further, on the menu screen of system settings or the like, a user may set a right hand or a left hand as the gesture hand in advance. For example, when the left hand is set as the gesture hand in advance, the CPU **200** determines whether the hand detected in step S**800** is the left hand.
(47) In step S**802**, the CPU **200** determines whether a gesture by the hand (gesture hand) detected in step S**800** has been detected. When it is determined that the gesture has been detected, the processing proceeds to step S**803**. When it is determined that the gesture has not been detected, the processing of step S**802** is repeatedly performed.
(48) In step S**803**, the CPU **200** switches to an operation mode associated with the detected gesture (operation mode in which processing associated with the gesture is performed). The CPU **200** associates gestures with operation modes in advance, and switches to an operation mode associated with a detected gesture. Note that in the first embodiment, processing performed by a gesture by a processing hand is different when an operation mode is different.
(49) Examples of Drawing
(50) FIGS. **6**A to **6**C are diagrams each describing an example in which a user performs drawing using the HMD **100** according to the first embodiment.
(51) In FIG. **6**A, the user performs drawing on a drawing area **600** by a right hand **601** (processing hand) while standing up. When there is no need to switch an operation mode, a left hand **602** serving as a gesture hand may not particularly move while the right hand **601** performs the drawing. Therefore, the left hand **602** is lowered in FIG. **6**A.
(52) FIG. **6**B shows a state in which the user performs “a gesture to switch an operation mode” by the left hand **602**. At this time, the left hand **602** is needed to be included in the imaging range of the image capturing unit **101** of the HMD **100** in order to determine the gesture by the left hand **602**. Therefore, the user raises the left hand **602** so as to be included in the imaging range of the image capturing unit **101** of the HMD **100**.
(53) Meanwhile, FIG. **6**C shows a state in which the user performs drawing while sitting down after the drawing area **600** is set on the desk. When the user sits down, a state in which the left hand **602** is positioned on the drawing area **600** is likely to occur even in a case where there is no need to switch an operation mode by a gesture. Therefore, it is highly likely that the left hand **602** is included in the imaging range of the image capturing unit **101**. Accordingly, when the user performs drawing on the desk while sitting down, the switching of an operation mode by a gesture is needed to be restricted.
(54) Note that when the user performs drawing or the like while sitting down, the HMD **100** faces

downward from a horizontal direction. Therefore, when the HMD **100** faces downward from the horizontal direction by a certain angle θ (by an amount larger than the certain angle θ), the HMD **100** may determine that the user performs drawing on the desk while sitting down.
(55) With reference to the flowchart of FIG. **7**, switching processing performed by the CPU **200** of the MR system **1** (for example, the CPU **200** of the information processing device **103**) when a user performs drawing on a drawing area will be described. That is, the flowchart of FIG. **7** is a flowchart for describing in further detail the flowchart of FIG. **8** in a case where drawing processing is performed. Note that in order to detect a gesture by the HMD **100**, both hands are needed to be included in a drawing area in a real space (area in which the function of a whiteboard or the like is set).
(56) In step S**700**, the CPU **200** determines, on the basis of an image obtained by capturing an image of a drawing area by the image capturing unit **101**, whether both hands are positioned in the drawing area. When it is determined that both hands are not positioned in the drawing area, the processing of step S**700** is repeatedly performed. When it is determined that both hands are positioned in the drawing area, the processing proceeds to step S**701**.
(57) In step S**701**, the CPU **200** determines whether a user (HMD **100**) faces downward. For example, when the HMD **100** tilts toward a negative direction (downward direction) by an amount larger than a certain angle θ (see FIG. **6**C) with respect to a horizontal direction, the CPU **200** determines that the user faces downward. On the other hand, when the HMD **100** tilts by an amount smaller than the certain angle θ, the CPU **200** may determine that the user performs a drawing operation using a wall, an aerial region, or the like as a drawing area.
(58) When it is determined that the user faces downward, the CPU **200** detects feature points from the captured image acquired by the image capturing unit **101** and detects a plane in a real space on the basis of the feature points. Then, the processing proceeds to step S**702**. On the other hand, when it is determined that the user does not face downward, the processing proceeds to step S**706**.
(59) In step S**702**, the CPU **200** determines whether the distance between both hands detected in step S**700** and the plane (plane detected in step S**701**) is shorter than a predetermined distance. When it is determined that the distance between both hands and the plane is shorter than the predetermined distance, the processing proceeds to step S**703**. When it is determined that the distance between both hands and the plane is at least the predetermined distance, the processing proceeds to step S**706**.
(60) In step S**703**, the CPU **200** invalidates the switching of an operation mode by a gesture by a gesture hand. This aims to prevent, except when the user intends to switch an operation mode, the switching of the operation mode as a gesture is detected when the gesture hand is included in an imaging range.
(61) In step S**704**, the CPU **200** determines whether a predetermined gesture (gesture for validating the switching of an operation mode by a gesture) has been detected. Here, the predetermined gesture is set in advance. When it is determined that the predetermined gesture has been detected, the processing proceeds to step S**705**. When it is determined that the predetermined gesture has not been detected, the processing of step S**704** is repeatedly performed. Note that when a controller or the like is attached to a hand, a "predetermined operation with respect to the controller" may be used instead of the "predetermined gesture".
(62) In step S**705**, the CPU **200** validates "the switching of an operation mode by a gesture by the gesture hand" (cancels "the invalidation of the switching of the operation mode by the gesture by the gesture hand").
(63) In step S**706**, the CPU **200** determines, on the basis of a captured image, whether the gesture by the gesture hand has been detected. When it is determined that the gesture by the gesture hand has been detected, the processing proceeds to step S**707**. When it is determined that the gesture by the gesture hand has not been detected, the processing of step S**706** is repeatedly performed.
(64) In step S**707**, the CPU **200** switches to an operation mode associated with the gesture detected

in step S**706**. Thus, the CPU **200** switches processing (execution processing) to be executed in accordance with an operation by a processing hand. Therefore, in a case where a certain gesture has been performed by the gesture hand, first processing is executed when a certain operation is performed by the processing hand. On the other hand, in a case where another gesture has been performed by the gesture hand, second processing different from the first processing is executed when the same certain operation is performed by the processing hand.

(65) Here, operation efficiency is poor if the execution, switching, and the like of processing is performed only by the processing hand in a case where it is desired that the processing performed by a processing hand (hand by which the processing is executed) be frequently switched. On the other hand, operation efficiency (operability) is improved in the present embodiment since the switching of an operation mode is realized by a gesture by another hand not serving as a processing hand.

Second Embodiment

(66) A second embodiment will describe a method for setting a processing hand and a gesture hand in advance using a controller **300** that is retained by or attached to a hand of a user.

(67) FIG. **3** shows the block configurations of the controller **300**. The controller **300** is an operation device formed in such a shape as to be attachable to a finger of a hand. However, the controller **300** is not necessarily formed in such a shape as to be attachable to a finger but may be formed in any shape retainable by a user with a hand. The controller **300** has a control unit **301**, an operation unit **302**, a sensor **303**, a work memory **304**, a power control unit **305**, and a communication unit **306**.

(68) The control unit **301** controls the controller **300** (whole device) in accordance with an input signal or program. Note that instead of the control of the whole device by the control unit **301**, a plurality of hardware may share processing with each other to control the whole device.

(69) The operation unit **302** receives instructions to the controller **300** from a user. The operation unit **302** includes, for example, a power button (button for providing instructions by the user to turn ON/OFF main power besides supplying power to the control unit **301** of the controller **300**) and a mode switching button (button for switching an operation mode), or the like. In addition, the operation unit **302** includes a button for starting communication with external equipment such as an HMD **100** via the communication unit **306**.

(70) The sensor **303** is, for example, a sensor for acquiring information (hereinafter called “sensor information”) such as inertial measurement unit (IMU) information. The sensor **303** is capable of calculating, on the basis of an angular speed (value detected by a gyro sensor) and acceleration (value detected by an accelerometer), a change in attitude, the direction (relative direction), and the position of the controller **300**.

(71) The work memory **304** is used as a buffer memory (memory that temporarily stores sensor information acquired by the sensor **303**), the work region of the control unit **301**, or the like.

(72) The power control unit **305** supplies power for operating the controller **300**.

(73) The communication unit **306** has, for example, an antenna for wireless communication, a modulation/demodulation circuit for processing a wireless signal, and a communication controller like the communication unit **110** of the HMD **100**. The communication unit **306** realizes short-range wireless communication in compliance with the IEEE802.15 standard.

(74) FIG. **4** shows the connection configuration of the HMD **100** and the controller **300**. The HMD **100** and the controller **300** are connected to each other through Bluetooth communication.

(75) For example, sensor information acquired by the sensor **303** is transmitted to the communication unit **110** of the HMD **100** via the communication unit **306** of the controller **300**. In the data communication between the HMD **100** and the controller **300**, not only Bluetooth communication but also other communication methods may be used.

(76) Note that the movement of a hand to which the controller **300** is attached is distinguishable from the movement (sensor information) of the controller **300**. Therefore, a hand to which the controller **300** is attached may not be necessarily included in the imaging range of an image

capturing unit **101**.

(77) Here, sensor information acquired by the sensor **303** is transmitted to the communication unit **110** of the HMD **100** via the communication unit **306**. Then, the HMD **100** is enabled to detect the movement of the controller **300** on the basis of the sensor information of the sensor **303**. Therefore, the HMD **100** is capable of more accurately acquiring the movement of a hand using the sensor information of the sensor **303**, other than using a method in which the movement of the hand is acquired on the basis of a captured image. Further, the HMD **100** is capable of acquiring the movement of a hand on the basis of both a captured image and sensor information. Accordingly, when the controller **300** is attached, a hand to which the controller **300** is attached is used as a processing hand to enable the fine control of processing.

(78) With reference to the flowchart of FIG. **9**, processing by a CPU **200** of a MR system **1** according to the second embodiment will be described. Hereinafter, with reference to FIG. **9**, processing to set a gesture hand (hand for performing a gesture) and a processing hand (hand for performing processing) will be described.

(79) In step S**900**, the CPU **200** determines whether the controller **300** is attached to a hand of a user. When it is determined that the controller **300** is attached to the hand of the user, the processing proceeds to step S**901**. When it is determined that the controller **300** is not attached to the hand of the user, the processing proceeds to step S**902**.

(80) Here, when both hands are reflected in an image (imaging range) obtained when the image capturing unit **101** captures an image of the imaging range, the CPU **200** is capable of determining whether the controller **300** is attached to the hand from the captured image. On the other hand, when only one hand is reflected in the captured image, the CPU **200** determines whether the controller **300** is attached to the reflected hand from the captured image. Further, in a case where the HMD **100** has performed communication with the controller **300**, the CPU **200** may determine that the controller **300** is attached to the hand of the user even if at least one hand is not reflected in the captured image.

(81) In step S**901**, the CPU **200** sets a hand to which the controller **300** is not attached as a gesture hand. Further, the CPU **200** sets the hand to which the controller **300** is attached as a processing hand.

(82) In step S**902**, the CPU **200** sets one of right and left hands as a gesture hand and the other thereof as a processing hand in accordance with a user operation in a system menu. That is, in a case where the controller **300** is not attached, the CPU **200** sets one of the right and left hands as a gesture hand according to the same method as that of the first embodiment.

(83) In the second embodiment, a hand to which the controller **300** is attached is handled as a processing hand. Thus, the user is capable of performing processing with a hand of which the movement is easily detected with accuracy. Therefore, processing intended by the user is easily realized.

(84) Note that the processing of the flowchart shown in FIG. **7** or **8** in the first embodiment is performed after a processing hand and a gesture hand are set. Further, in a case where the controller **300** needed to be gripped by a hand is used, the user has a difficulty in performing fine processing with the hand holding the controller **300**. In this case, the CPU **200** may therefore set a hand not holding the controller **300** as a processing hand and a hand holding the controller **300** as a gesture hand.

Third Embodiment

(85) A third embodiment will describe a MR system **1** that performs the input of characters in accordance with the movement of hands.

(86) FIG. **10** is a schematic diagram showing the relationship between hands and character groups. In the third embodiment, a user selects one of character groups **1000** each including a plurality of characters using a processing hand **501**. Then, the user selects one character from among the characters of the selected character group **1000** using a gesture hand **502**. Thus, the input of the

character selected by the user is performed. Note that the plurality of characters included in each of the character groups **1000** are set in advance.
(87) For example, in FIG. **10**, each of the plurality of character groups **1000** includes a plurality of alphabets.
(88) Here, when a calculation unit **107** detects a first gesture by the processing hand **501** and also detects the rotation of the processing hand **501**, a CPU **200** switches a selected character group **1000**. Note that the rotation of a hand is also a kind of a gesture by the hand.
(89) Then, when the calculation unit **107** detects a second gesture by the gesture hand **502**, the CPU **200** selects a character from among the characters of the selected character group **1000**. Further, the CPU **200** switches the selected character after detecting the rotation of the gesture hand **502**. For example, when the calculation unit **107** detects a gesture other than the second gesture by the gesture hand **502**, the CPU **200** performs the input (fixation) of a character. The first gesture and the second gesture are needed to be set in advance. Hereinafter, a description will be given assuming that both a first gesture and a second gesture are gestures for performing pinching with fingers (see FIG. **10**). However, the first gesture and the second gesture may be gestures different from each other.
(90) With reference to the flowchart of FIG. **15**, processing performed by the CPU **200** of the MR system **1** according to the third embodiment will be described.
(91) In step S**1500**, the CPU **200** determines whether the processing hand **501** has performed a first gesture. When it is determined that the processing hand **501** has performed the first gesture, the processing proceeds to step S**1501**. When it is determined that the processing hand **501** has not performed the first gesture, the processing of step S**1500** is repeatedly performed.
(92) In step S**1501**, the CPU **200** switches an operation mode to a "character-group selection mode". When the operation mode is switched to the "character-group selection mode", the CPU **200** displays a character input region **1100** on a display unit **102** so as to overlap a real space as shown in (**1**) of FIG. **11**. Note that the character input region **1100** is displayed at, for example, a position higher by a predetermined distance than a higher one of the position of the processing hand **501** and the position of the gesture hand **502**. Further, the CPU **200** selects one character group **1000** (for example, the first character group **1000**) set in advance.
(93) In step S**1502**, the CPU **200** displays a group selection screen **1107** on the display unit **102** as shown in (**2**) of FIG. **11**. The group selection screen **1107** is a screen in which a character group **1000** is selected. As shown in FIG. **11**, the selected character group **1000** or a character is surrounded by a thick frame.
(94) In step S**1503**, the CPU **200** determines whether the processing hand **501** (the wrist of the processing hand **501**) has rotated by at least a predetermined angle (threshold) (for example, whether the processing hand **501** has been formed in a predetermined shape). When it is determined that the processing hand **501** has rotated by at least the predetermined angle, the processing proceeds to step S**1504**. When it is determined that the processing hand **501** has not rotated by at least the predetermined angle, the processing proceeds to step S**1505**.
(95) In step S**1504**, the CPU **200** switches the selected character group **1000** in accordance with the rotating direction of the processing hand **501** (the wrist of the processing hand **501**) as shown in (**3**) of FIG. **11**. For example, when the processing hand **501** has rotated clockwise, the CPU **200** selects a character group **1000** just on the right side of the currently-selected character group **1000** in the group selection screen **1107**.
(96) In step S**1505**, the CPU **200** determines whether the gesture hand **502** has performed a second gesture. When it is determined that the gesture hand **502** has performed the second gesture, the processing proceeds to step S**1506**. When it is determined that the gesture hand **502** has not performed the second gesture, the processing proceeds to step S**1503**.
(97) In step S**1506**, the CPU **200** switches the operation mode to a "character selection mode" in which one character is selected from among the characters of the selected character group **1000**. At

this time, the CPU **200** selects, for example, the first character from among the characters of the selected character group **1000**.
(98) In step S**1507**, the CPU **200** displays a character selection screen **1108** (screen in which the plurality of characters included in the selected character group **1000** are arranged in a line) on a display unit **102** as shown in (**4**) of FIG. **11**.
(99) In step S**1508**, the CPU **200** determines whether the gesture hand **502** (the wrist of the gesture hand **502**) has rotated by at least a predetermined angle (for example, whether the gesture hand **502** has been formed in a predetermined shape). When it is determined that the gesture hand **502** has rotated by at least the predetermined angle, the processing proceeds to step S**1509**. When it is determined that the gesture hand **502** has not rotated by at least the predetermined angle, the processing proceeds to step S**1510**.
(100) In step S**1509**, the CPU **200** switches the selected character in accordance with the rotating direction of the gesture hand **502** as shown in (**5**) of FIG. **11**. For example, when the hand has rotated clockwise, the CPU **200** selects a character just on the right side of the currently-selected character on the character selection screen **1108**.
(101) In step S**1510**, the CPU **200** determines whether the gesture hand **502** has performed a second operation (specific operation other than the second gesture). When it is determined that the gesture hand **502** has performed the second operation, the processing proceeds to step S**1511**. When it is determined that the gesture hand **502** has not performed the second operation, the processing proceeds to step S**1508**. Here, the second operation may be a gesture by the gesture hand **502** or an operation on a controller or the like attached to the gesture hand **502**.
(102) In step S**1511**, the CPU **200** inputs the currently-selected character to the character input region **1100**. That is, the CPU **200** fixes the selection of the currently-selected character.
(103) In step S**1512**, the CPU **200** switches from the “character selection mode” to the “character-group selection mode”.
(104) In step S**1513**, the CPU **200** ends the display of the character selection screen **1108** (hides the character selection screen **1108**) as shown in (**6**) of FIG. **11**.
(105) In step S**1514**, the CPU **200** determines whether the processing hand **501** has performed a first operation (operation other than the first gesture). When it is determined that the processing hand **501** has performed the first operation, the processing proceeds to step S**1515**. When it is determined that the processing hand **501** has not performed the first operation, the processing proceeds to step S**1501**. Here, the first operation may be a gesture by the processing hand **501** or an operation on a controller or the like attached to the processing hand **501**.
(106) In step S**1515**, the CPU **200** ends the “character-group selection mode”.
(107) In step S**1516**, the CPU **200** ends the display of the group selection screen **1107** as shown in (**7**) of FIG. **11**.
(108) In the example shown in FIG. **11**, the group selection screen **1107** is displayed (step S**1502**) as shown in (**2**) of FIG. **11** when the processing hand **501** has performed the first gesture (YES in step S**1500**). Next, the selected character group **1000** is switched (step S**1504**) as shown in (**3**) of FIG. **11** in accordance with the rotation of the processing hand **501** (YES in step S**1503**). The character selection screen **1108** is displayed (step S**1507**) as shown in (**4**) of FIG. **11** when the gesture hand **502** has performed the second gesture (YES in step S**1505**).
(109) Then, the character selected in the character selection screen **1108** is switched (step S**1509**) as shown in (**5**) of FIG. **11** in accordance with the rotation of the gesture hand **502** (YES in S**1508**). The selected character is input to the character input region **1100** (step S**1511**) as shown in (**6**) of FIG. **11** when the gesture hand **502** has performed the second operation (YES in step S**1510**). Then, the group selection screen **1107** is hidden (step S**1516**) as shown in (**7**) of FIG. **11** when the processing hand **501** has performed the first operation (YES in step S**1514**).
(110) According to the third embodiment, a user is capable of performing the input of characters without contacting an operation member such as a keyboard and a touch panel. Therefore, the user

is enabled to sanitarily perform the input of characters. Furthermore, since roles are assigned to respective right and left hands, the user is enabled to realize the input of characters without performing complicated gestures or the like by one hand.

Fourth Embodiment

(111) A fourth embodiment will describe a MR system **1** that enables switching to a sub-group associated with a character group **1000**. Here, the sub-group is a group including characters associated with respective characters included in the character group **1000**. For example, when a character group **1000** includes a plurality of hiragana characters in Japanese, a sub-group includes the voiced sound characters of the plurality of hiragana characters.

(112) FIG. **12** is a diagram for describing processing according to the fourth embodiment. For example, in a case where a character is selected from among the characters of a character group **1000**, the selected character group **1000** is switched to a sub-group associated with the character group **1000** when the rotation of a processing hand **501** is detected. For example, FIG. **12** shows a state in which a character group **1000** showing “E, F, G, H” is switched to a sub-group showing “e, f, g, h” as the rotation of the processing hand **501** is detected.

(113) The fourth embodiment (the flowchart of FIG. **16**) is different from the flowchart of FIG. **15** in that the processing of steps S**1610** and S**1611** is added to the processing of the flowchart of FIG. **15** according to the third embodiment. Therefore, only the processing of steps S**1610** and S**1611** will be described. The processing of step S**1610** starts when it is determined in step S**1508** that a gesture hand **502** has not rotated by at least a predetermined angle or when the processing of step S**1509** ends.

(114) In step S**1610**, the CPU **200** determines whether the processing hand **501** has rotated by at least a predetermined angle. When it is determined that the processing hand **501** has rotated by at least the predetermined angle, the processing proceeds to step S**1611**. When it is determined that the processing hand **501** has not rotated by at least the predetermined angle, the processing proceeds to step S**1510**.

(115) In step S**1611**, the CPU **200** switches a selected character group **1000** to a sub-group associated with the character group **1000** in a character selection screen **1108**. Then, the CPU **200** selects a character from among the characters of the sub-group corresponding to a character currently selected in the character group **1000**.

(116) According to the fourth embodiment, it is possible to intuitively perform the input of special characters such as voiced sound characters in Japanese or small letters or symbols in English.

Fifth Embodiment

(117) In a fifth embodiment, a MR system **1** also performs the deletion of characters.

(118) FIG. **13** is a diagram for describing the deletion of a character in the fifth embodiment. When the selection of a character is performed from among the characters of a character group **1000**, the character is deleted as the rotation of a gesture hand **502** is detected in a direction in which no characters exist as viewed from the currently-selected character. During the deletion of the character, a character deletion item **1302** is displayed, and the character continues to be deleted. The deletion of the character ends as the rotation of the gesture hand **502** is detected in a direction in which characters exist as viewed from the character deletion item **1302**. Note that the deletion of a character may be performed when “any gesture by the gesture hand **502** to indicate a direction in which no characters exist as viewed from the currently-selected character among directions in which characters are arranged side by side in a character selection screen **1108**” is detected. For example, the deletion of a character may be performed when a gesture by the gesture hand **502** to indicate a left direction with an index finger is detected in a state in which no characters exist in the left direction of the currently-selected character.

(119) FIG. **13** shows a state in which a character “E” is deleted from characters “IMAGE” input to a character input region **1100** as the counterclockwise rotation of the gesture hand **502** is detected (a gesture indicating a left direction has been performed).

(120) With reference to the flowchart of FIG. **17**, processing performed by a CPU **200** of the MR system **1** according to the fifth embodiment will be described. In the processing according to the fifth embodiment, the processing of steps S**1710** to S**1712** as shown in the flowchart of FIG. **17** is added to the processing of the flowchart of FIG. **15**. Therefore, only the processing of steps S**1710** to S**1712** will be described hereinafter.
(121) The processing of step S**1710** starts when it is determined in step S**1508** that a gesture hand **502** has rotated by at least a predetermined angle.
(122) In step S**1710**, the CPU **200** determines whether characters exist in the rotating direction of the gesture hand **502** as viewed from a character selected in a character selection screen **1108**. When it is determined that no characters exist in the rotating direction of the hand as viewed from the selected character, the processing proceeds to step S**1711**. When it is determined that the characters exist in the rotating direction of the hand as viewed from the selected character, the processing proceeds to step S**1509**.
(123) In step S**1711**, the CPU **200** performs the deletion of the last character input to the character input region **1100**. Further, the CPU **200** displays a character deletion item **1302**.
(124) In step S**1712**, the CPU **200** determines whether characters exist in the rotating direction of the gesture hand **502** as viewed from the character deletion item **1302** when newly detecting the rotation of the gesture hand **502** by at least a predetermined angle. When it is determined that the characters exist in the rotating direction of the gesture hand **502**, the processing proceeds to step S**1510**. Otherwise, the processing proceeds to step S**1711**.
(125) For example, a state shown in (**2**) of FIG. **13** changes to a state shown in (**3**) of FIG. **13** as the gesture hand **502** is rotated by at least a predetermined angle in a direction (clockwise direction) in which characters exist during the deletion of a character in the character input region **1100**, and the deletion of the character ends.
(126) According to the fifth embodiment, a user is enabled to perform not only the input of characters but also the deletion of characters by gestures by right and left hands.
Sixth Embodiment
(127) In a sixth embodiment, an MR system **1** detects the shapes and rotation of both hands of a user, and converts character strings (characters) input to a character input region **1100**.
(128) FIG. **14** is a diagram for describing the conversion of character strings in the sixth embodiment. FIG. **14** is a diagram showing an example of converting English words into the synonymous words of the English words.
(129) The MR system **1** selects a conversion candidate **1407** for a character string (character string after conversion) after detecting a second gesture by a gesture hand **502**. The MR system **1** changes the character string to be converted when detecting a first gesture by a processing hand **501**, and ends character conversion when detecting a second operation by the gesture hand **502**.
(130) With reference to the flowchart of FIG. **18**, processing by a CPU **200** of the MR system **1** according to the sixth embodiment will be described.
(131) In step S**1800**, the CPU **200** determines whether the gesture hand **502** has performed a second gesture. When it is determined that the second gesture has been performed, the processing proceeds to step S**1801**. When it is determined that the second gesture has not been performed, the processing of step S**1800** is repeatedly performed.
(132) In step S**1801**, the CPU **200** switches an operation mode to a “character conversion mode” in which a character string is converted.
(133) In step S**1802**, the CPU **200** displays (selects) the first (beginning) character string in a character input region **1100** as a character string **1408** to be converted. At this time, the CPU **200** displays a plurality of conversion candidates **1407** for the character string **1408** to be converted as shown in (**2**) of FIG. **14**. Further, the CPU **200** selects, for example, a conversion candidate **1407** on the most upper-left side.
(134) In step S**1803**, the CPU **200** determines whether the gesture hand **502** has rotated by at least a

predetermined angle. When it is determined that the gesture hand **502** has rotated by at least the predetermined angle, the processing proceeds to step S**1804**. When it is determined that the gesture hand **502** has not rotated by at least the predetermined angle, the processing proceeds to step S**1805**.

(135) In step S**1804**, the CPU **200** switches the selected conversion candidate **1407** to a character string existing in a direction corresponding to a rotating direction of the gesture hand **502** among right and left directions. For example, (**3**) of FIG. **14** shows a state in which "PICTURE" selected as the conversion candidate **1407** for a character string "IMAGE" is switched to "PHOTOGRAPH" as the gesture hand **502** is rotated clockwise.

(136) In step S**1805**, the CPU **200** determines whether the processing hand **501** has rotated by at least a predetermined angle. When it is determined that the processing hand **501** has rotated by at least the predetermined angle, the processing proceeds to step S**1806**. When it is determined that the processing hand **501** has not rotated by at least the predetermined angle, the processing proceeds to step S**1803**.

(137) In step S**1806**, the CPU **200** switches the selected conversion candidate **1407** to a character string existing in a direction corresponding to a rotating direction among upper and lower directions as shown in (**4**) of FIG. **14**.

(138) In step S**1807**, the CPU **200** determines whether the processing hand **501** has performed a first gesture. When it is determined that the first gesture has been performed, the processing proceeds to step S**1808**. When it is determined that the first gesture has not been performed, the processing proceeds to step S**1803**.

(139) In step S**1808**, the CPU **200** switches the operation mode to a "target switching mode" in which the character string **1408** to be converted is switched.

(140) In step S**1809**, the CPU **200** determines whether the processing hand **501** has rotated by at least a predetermined angle. When it is determined that the processing hand **501** has rotated by at least the predetermined angle, the processing proceeds to step S**1810**. When it is determined that the processing hand **501** has not rotated by at least the predetermined angle, the processing proceeds to step S**1811**. Note that the rotation of the gesture hand **502** may be determined instead of the rotation of the processing hand **501**.

(141) In step S**1810**, the CPU **200** switches the character string **1408** to be converted in accordance with a rotating direction of the processing hand **501** as shown in (**5**) of FIG. **14**.

(142) In step S**1811**, the CPU **200** determines whether the processing hand **501** has performed a first operation (operation other than the first gesture). When it is determined that the first operation has been performed, the processing proceeds to step S**1812**. When it is determined that the first operation has not been performed, the processing proceeds to step S**1809**.

(143) In step S**1812**, the CPU **200** determines that the conversion of a currently-selected character string **1408** is to be performed (the currently-selected character string **1408** is regarded as a conversion target). The CPU **200** switches the operation mode to the "character conversion mode".

(144) In step S**1813**, the CPU **200** displays a plurality of conversion candidates **1407** for the character string **1408** determined in step S**1812**.

(145) In step S**1814**, the CPU **200** determines whether the gesture hand **502** has performed a second operation (operation other than a specific gesture). When it is determined that the second operation has been performed, the processing proceeds to step S**1815**. When it is determined that the second operation has not been performed, the processing proceeds to step S**1801**.

(146) In step S**1815**, the CPU **200** ends the "character conversion mode".

(147) In step S**1816**, the CPU **200** ends the display of conversion candidates **1407** for a character string as shown in (**6**) of FIG. **14**.

(148) According to the sixth embodiment, it is possible to convert characters input in the third embodiment by the same operation as in the input of the characters without performing special operations.

(149) “Alternatives” such as “marks” and “illustrations” may be used instead of “characters” described in the third to fifth embodiments. Further, groups including a plurality of alternatives may be used instead of “character groups”.
(150) Note that the processing of the flowcharts of the respective embodiments is performed by the CPU **200** of the MR system **1** as described above but the CPU **200** may be included in the HMD **100** or the information processing device **103**. Further, the information processing device **103** may include the HMD **100**. Further, the processing performed by the gestures by the processing hands may be performed by operations (such as pressing or sliding) on a specific operation member by the processing hands.
(151) In addition, some of the gestures by the gesture hands may be performed by the processing hands in the respective embodiments. Some of the gestures by the processing hands may be performed by the gesture hands. That is, in some of the steps of the respective flowcharts, the “gesture hands” may be replaced by the “processing hands”, or the “processing hands” may be replaced by the “gesture hands”.
(152) Using a gesture by one hand detected from an image captured by the image capturing unit **101** of the HMD **100**, a function associated with the other hand (processing performed by the operation of the other hand) may be switched as described in the above respective embodiments.
(153) According to the present invention, high operability is attainable for a user when gestures are used in operations.
(154) Further, in the above descriptions, “processing proceeds to step S**1** when A is at least B, and proceeds to step S**2** when A is smaller (lower) than B” may be read as “processing proceeds to step S**1** when A is larger (higher) than B, and proceeds to step S**2** when A is not more than B”. Conversely, “processing proceeds to step S**1** when A is larger (higher) than B, and proceeds to step S**2** when A is not more than B” may be read as “processing proceeds to step S**1** when A is at least B, and proceeds to step S**2** when A is smaller (lower) than B”. Therefore, the expression “at least A” may be replaced with “equal to A or larger (higher, longer, or greater) than A”, or may be read as or replaced with “larger (higher, longer, or greater) than A” so long as no contradiction arises. Meanwhile, the expression “not more than A” may be replaced with “equal to A or smaller (lower, shorter, or less) than A”, or may be replaced with or read as “smaller (lower, shorter, or less) than A”. Further, “larger (higher, longer, or greater) than A” may be read as “at least A”, and “smaller (lower, shorter, or less) than A” may be read as “not more than A”.
(155) The present invention is described in detail above on the basis of its preferred embodiments but is not limited to these specific embodiments. The present invention also includes various modes without departing from its gist. Some of the embodiments described above may be appropriately combined together.

OTHER EMBODIMENTS

(156) Embodiment(s) of the present invention can also be realized by a computer of a system or apparatus that reads out and executes computer executable instructions (e.g., one or more programs) recorded on a storage medium (which may also be referred to more fully as a ‘non-transitory computer-readable storage medium’) to perform the functions of one or more of the above-described embodiment(s) and/or that includes one or more circuits (e.g., application specific integrated circuit (ASIC)) for performing the functions of one or more of the above-described embodiment(s), and by a method performed by the computer of the system or apparatus by, for example, reading out and executing the computer executable instructions from the storage medium to perform the functions of one or more of the above-described embodiment(s) and/or controlling the one or more circuits to perform the functions of one or more of the above-described embodiment(s). The computer may comprise one or more processors (e.g., central processing unit (CPU), micro processing unit (MPU)) and may include a network of separate computers or separate processors to read out and execute the computer executable instructions. The computer executable instructions may be provided to the computer, for example, from a network or the storage medium.

The storage medium may include, for example, one or more of a hard disk, a random-access memory (RAM), a read only memory (ROM), a storage of distributed computing systems, an optical disk (such as a compact disc (CD), digital versatile disc (DVD), or Blu-ray Disc (BD)™), a flash memory device, a memory card, and the like.
(157) While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.
(158) This application claims the benefit of Japanese Patent Application No. 2022-161612, filed on Oct. 6, 2022, which is hereby incorporated by reference herein in its entirety.

Claims

1. An information processing device that generates data used for a display on a head-mounted display, the information processing device comprising at least one memory and at least one processor that function as: a detection unit configured to detect a gesture by a first hand of a user and a gesture by a second hand of the user; and a processing unit configured to switch, in a case where a specific gesture by the first hand is detected by the detection unit in a first operation mode in which first processing is executed in response to a first operation by the second hand, to a second operation mode in which second processing different from the first processing is executed in response to the first operation by the second hand, and switch, in a case where a specific gesture by the second hand is detected by the detection unit in the second operation mode, to the first operation mode, wherein the first operation mode is an operation mode in which one of a plurality of groups each including a plurality of alternatives is selected, the second operation mode is an operation mode in which one alternative is selected from among a plurality of alternatives of the selected group, and the processing unit switches, in the first operation mode, a selected group as the first hand or the second hand rotates by an amount larger than a threshold, and switches, in the second operation mode, a selected alternative as the first hand or the second hand rotates by an amount larger than the threshold.
2. The information processing device according to claim 1, wherein the at least one memory and the at least one processor further function as a control unit configured to control the head-mounted display so that a specific region in which an alternative is to be input is displayed overlapping a real space including the first hand and the second hand, and the processing unit inputs a currently-selected alternative to the specific region in accordance with a second operation in a case where one alternative is selected in the second operation mode.
3. The information processing device according to claim 2, wherein the control unit controls the head-mounted display so that the specific region is displayed at a position higher by a predetermined distance than a higher one of a position of the first hand and a position of the second hand.
4. The information processing device according to claim 2, wherein the control unit controls, in the second operation mode, the head-mounted display so that a plurality of alternatives included in a selected group are displayed to be arranged side by side, the processing unit deletes, in the second operation mode, at least one input alternative from the specific region in a case where the gesture by the first hand or the second hand to indicate a first direction is detected, and the first direction is a direction in which no alternatives exist as viewed from the selected alternative among directions in which the plurality of alternatives are arranged side by side.
5. The information processing device according to claim 1, wherein at least any of the plurality of groups is each associated with a sub-group including a plurality of alternatives, and the processing unit switches, in a case where one alternative is selected from among a plurality of alternatives of a first group associated with a first sub-group, the first group to the first sub-group in accordance

with the gesture by the first hand or the second hand.

6. The information processing device according to claim 1, wherein the first operation mode is an operation mode in which a character string is converted, and the second operation mode is an operation mode in which a character string to be converted is switched.

7. The information processing device according to claim 6, wherein the processing unit switches, in the first operation mode, a character string after conversion in accordance with at least any of the gesture by the first hand and the gesture by the second hand detected by the detection unit.

8. An information processing method for generating data used for a display on a head-mounted display, the information processing method comprising: detecting a gesture by a first hand of a user and a gesture by a second hand of the user; switching, in a case where a specific gesture by the first hand is detected in detecting in a first operation mode in which first processing is executed in response to a first operation by the second hand, to a second operation mode in which second processing different from the first processing is executed in response to the first operation by the second hand; and switching, in a case where a specific gesture by the second hand is detected in detecting in the second operation mode, to the first operation mode, wherein the first operation mode is an operation mode in which one of a plurality of groups each including a plurality of alternatives is selected, the second operation mode is an operation mode in which one alternative is selected from among a plurality of alternatives of the selected group, in the first operation mode, a selected group is switched as the first hand or the second hand rotates by an amount larger than a threshold, and in the second operation mode, a selected alternative is switched as the first hand or the second hand rotates by an amount larger than the threshold.

9. A non-transitory computer readable medium that stores a program, wherein the program causes a computer to execute an information processing method for generating data used for a display on a head-mounted display, the information processing method comprising: detecting a gesture by a first hand of a user and a gesture by a second hand of the user; and switching, in a case where a specific gesture by the first hand is detected in detecting in a first operation mode in which first processing is executed in response to a first operation by the second hand, to a second operation mode in which second processing different from the first processing is executed in response to the first operation by the second hand; and switching, in a case where a specific gesture by the second hand is detected in detecting in the second operation mode, to the first operation mode, wherein the first operation mode is an operation mode in which one of a plurality of groups each including a plurality of alternatives is selected, the second operation mode is an operation mode in which one alternative is selected from among a plurality of alternatives of the selected group, in the first operation mode, a selected group is switched as the first hand or the second hand rotates by an amount larger than a threshold, and in the second operation mode, a selected alternative is switched as the first hand or the second hand rotates by an amount larger than the threshold.