



- (51) **International Patent Classification:**
G06F 3/01 (2006.01) *G06F 3/0481* (2013.01)
- (21) **International Application Number:**
PCT/US2015/066907
- (22) **International Filing Date:**
18 December 2015 (18.12.2015)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
62/093,493 18 December 2014 (18.12.2014) US
- (71) **Applicant:** OCULUS VR, LLC [US/US]; 1601 Willow Road, Menlo Park, CA 94025 (US).
- (72) **Inventors:** GROSSINGER, Nadan; c/o Oculus Vr, LLC, 1601 Willow Road, Menlo Park, CA 94025 (US). ALON, Emil; c/o Oculus Vr, LLC, 1601 Willow Road, Menlo Park, CA 94025 (US). BAR DAVID, Iddo; c/o Oculus Vr, LLC, 1601 Willow Road, Menlo Park, CA 94025 (US). SOLODNIK, Efrat; c/o Oculus Vr, LLC, 1601 Willow Road, Menlo Park, CA 94025 (US).
- (74) **Agents:** HULSE, Robert A. et al.; Fenwick & West LLP, Silicon Valley Center, 801 California Street, Mountain View, CA 94041 (US).

- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) **Title:** METHOD, SYSTEM AND DEVICE FOR NAVIGATING IN A VIRTUAL REALITY ENVIRONMENT

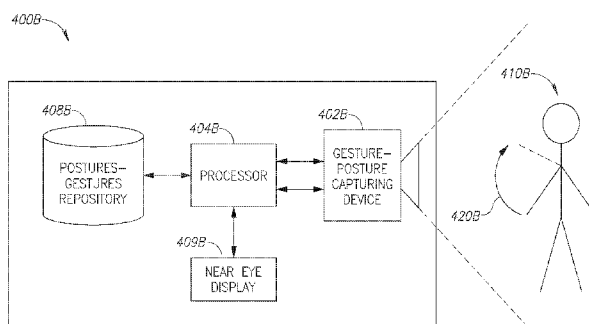


Figure 4

(57) **Abstract:** A method, a system, and a device for navigating in a virtual reality scene, using body parts gesturing and posturing are provided herein. The method may include: projecting a synthetic 3D scene, into both eyes of a user, via a near eye display, so as to provide a virtual reality view to the user; identifying at least one gesture or posture carried out by at least one body part of said user; measuring at least one metric of a vector associated with the detected gesture or posture; applying a movement or action of said user in virtual reality environment, based on the measured metrics; and modifying the virtual reality view so as to reflect the movement or action of said user in the virtual reality environment.



METHOD, SYSTEM AND DEVICE FOR NAVIGATING IN A VIRTUAL REALITY ENVIRONMENT

TECHNICAL FIELD

[0001] The present invention relates generally to virtual reality (VR) environment and more particularly, to a method, system, and device for navigating in a VR environment.

BACKGROUND OF THE INVENTION

[0002] Prior to the background of the invention being set forth, it may be helpful to set forth definitions of certain terms that will be used hereinafter.

[0003] The term 'Virtual Reality' (VR) as used herein is defined as a computer-simulated environment that can simulate physical presence in places in the real world or imagined worlds. Virtual reality could recreate sensory experiences, including virtual taste, sight, smell, sound, touch, and the like. Many traditional VR systems use a near eye display for presenting a 3D virtual environment.

[0004] The term 'Augmented Reality' (AR) as used herein is defined as a live direct or indirect view of a physical, real-world environment whose elements are augmented (or supplemented) by computer-generated sensory input such as sound, video, graphics or GPS data. It is related to a more general concept called mediated reality, in which a view of reality is modified (possibly even diminished rather than augmented), by a computer.

[0005] The term 'near eye display' as used herein is defined as a device which includes wearable projected displays, usually stereoscopic in the sense that each eye is presented with a slightly different field of view so as to create the 3D perception.

[0006] The term 'virtual reality headset' sometimes called 'goggles', is a wrap-around visual interface to display computer output. Commonly the computer display information is presented as a three-dimensional representation of real-world environments. The goggles may or may not include optics beyond the mere structure for holding the computer display (possibly in a form of a smartphone).

[0007] The term ‘Virtual Reality navigation’ as used herein is defined as moving throughout the virtual environment which results in a respective change of the scene projected onto the eyes of the user. It should be noted that VR systems do not usually maintain a one-to-one ratio between real-world movement and virtual-world movement (e.g., a step forward in the real world does not necessarily mean a step forward in the virtual world). Consequently, input devices of all types are used in order to allow VR navigation by the user.

[0008] **Figure 1** shows a traditional virtual reality (VR) system in which user **10** wears a head mounted stereoscopic display **12** (e.g., Oculus Rift™) which projects a synthetic image **15A** and **15B** of a scene (e.g., the Taj Mahal) onto each eye of user **10**. Each eye receives the synthetic scene at a slightly different angle so as to create a 3D perception in the brain of the user. Additionally, head mounted display **12** may be provided with sensors such as accelerometers or gyros (not shown) that may detect in real time the viewing angle or gaze direction of the user. As a result, the VR system may adjust images **15A** and **15B** to fit the new head orientation of the user. As this adjustment is carried out in real time, an illusion of the virtual reality imitating the head movements in the real world may be achieved.

[0009] Beyond tracking the view point of the user as explained above, VR systems provide a further interaction with the virtual world via input devices such as joystick **14** (or mouse, touchpad, or even a keyboard). Such an input device may enable user **10** to perform VR navigation using visual indicators. For example, the user may be presented with a visual indicator which he or she can move, for example a cursor **16A**, **16B** indicated on stereoscopic images **15A** and **15B** over the VR scene. Then, responsive to a further action by user **10** such as pulling a trigger on joystick **14**, the user advances in the virtual towards the location he or she pointed by the cursor. As user **10** is confined to moving one or two steps in the real world, in the virtual world he or she can move around and walk long distances. Input devices as explained above are currently being used in order to address the navigation problem in the virtual world. Naturally, the use of such traditional input devices undermines the overall user VR experience.

SUMMARY OF THE INVENTION

[0010] According to one embodiment of the present invention, a system which serves as an input device for navigating in a virtual reality scene, using postures and/or gestures is provided herein. The system may include: a near eye display configured to project a synthetic 3D scene, into both eyes of a user, to generate a virtual reality environment; a gesture-posture capturing device configured to derive gestures of at least one body part of said user; and a computer processor configured to translate the derived gestures of said body part into a movement or action of said user in said synthetic 3D scene and modify the viewpoint of the user of the virtual reality environment, based on the translated movement or action.

[0011] According to another embodiment of the present invention, a method for navigating in a virtual reality scene, using postures and gestures is provided herein. The method may include the following steps: projecting a synthetic 3D scene, into both eyes of a user, via a near eye display, so as to provide a virtual reality view to the user; identifying at least one gesture or posture carried out by at least one body part of said user; measuring at least one metric of a vector associated with the detected gesture or posture; applying a movement or action of said user in virtual reality environment, based on the measured metrics; and modifying the virtual reality view so as to reflect the movement or action of said user in the virtual reality environment.

[0012] These, additional, and/or other aspects and/or advantages of the embodiments of the present invention are set forth in the detailed description which follows; possibly inferable from the detailed description; and/or learnable by practice of the embodiments of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] For a better understanding of embodiments of the invention and to show how the same may be carried into effect, reference will now be made, purely by way of example, to the accompanying drawings in which like numerals designate corresponding elements or sections throughout.

[0014] In the accompanying drawings:

[0015] **Figure 1** is a schematic diagram illustrating a virtual reality system according to the prior art;

[0016] **Figure 2** is schematic diagram illustrating a virtual reality system according to some embodiments of the present invention;

[0017] **Figures 3A-3C** are diagrams illustrating aspects of a virtual reality system according to some embodiments of the present invention;

[0018] **Figure 4** is a block diagram illustrating a possible architecture in accordance with the virtual reality system of embodiments of the present invention;

[0019] **Figure 5** is flowchart diagram illustrating a method in accordance with embodiments of the present invention;

[0020] **Figures 6A and 6B** are diagrams illustrating more aspects according to some embodiments of the present invention;

[0021] **Figure 7** is a schematic diagram illustrating another aspect of some embodiments of the present invention;

[0022] **Figures 8A and 8B** are diagrams illustrating yet another aspect of some embodiments of the present invention;

[0023] **Figure 9** is a diagram illustrating yet another aspect of some embodiments of the present invention;

[0024] **Figure 10** is a flowchart diagram illustrating yet another aspect of a method according to some embodiments of the present invention; and

[0025] **Figure 11** is a diagram illustrating yet another aspect of some embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0026] With specific reference now to the drawings in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of the preferred embodiments of the present technique only, and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the present technique. In this regard, no attempt is made to show structural details of the present technique in more detail than is necessary for a fundamental understanding of the present technique, the description taken with the drawings making apparent to those skilled in the art how the several forms of the invention may be embodied in practice.

[0027] Before at least one embodiment of the present technique is explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The present technique is applicable to other embodiments or of being practiced or carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein is for the purpose of description and should not be regarded as limiting.

[0028] Some embodiments of the present invention provide a method, system, and a device for navigating in a virtual reality environment by carrying out various bodily postures and/or gestures that are intuitive to the user. More specifically, a user may move his or her body or body parts in a manner that is being translated in real time by embodiments of the present invention to a predefined navigation command. Thus, certain postures and/or gestures in the real world cause a corresponding movement in the virtual reality world.

[0029] Some embodiments of the present invention first detect the predefined posture or gesture applied by the user and then goes on the measure quantitative metric associated with the gesture or the posture. These metrics may relate to a vector that is associated with the posture or gesture and may include its length and spatial angles. In some embodiments, the metrics of the vector are translated to quantitative navigation

commands in the virtual reality world usually in a continuous manner. Thus, the navigation command in the virtual reality does not change unless a predefined terminating act has been performed by the user. Such a terminating act may include resuming a basic posture or some kind of hand maneuver.

[0030] **Figure 2** is a perspective view of a device **210** in accordance with some embodiments of the present invention packed and attached to its immediate environment **200** being a virtual reality (VR) headset **240** (goggles) configured for use with a mobile device such as smartphone **220**. Device **210** may include an illuminator (e.g. laser transmitter) such as an infra-red (IR) pattern illuminator **212**, a camera such as an IR camera **214**. Device **210** may further include a pre-processor (not shown) configured to carry out initial image processing. Device **210** is further configured to physically and electronically interface with both smartphone **220**, and the near eye display **240** that form together the VR headset. Such a VR headset (goggles) may be arranged for use with smartphones, as is known in the art, and usually includes a optics which can transmit the display of the smartphone (not shown - facing opposite side), a sleeve **250** for accommodating smartphone **220** which may include a camera **222**, and a strap **230** for fastening the VR headset (goggles) onto the head of the user. It is understood, however, that device **210** may interface with near eye displays such as Google Glass TM and Oculus RiftTM.

[0031] In operation, device **210** may serve as a means for providing VR navigation commands using intuitive posturing and gesturing of one or more body parts of the user as will be detailed hereinafter.

[0032] **Figures 3A-3C** are diagrams illustrating aspects of a virtual reality system according to some embodiments of the present invention. **Figure 3A** is a schematic diagram illustrating a VR navigation device **300** in operation according to one embodiment of the present invention. User **10** wears a near eye display **330** on which VR navigation device **300** may be mounted possibly but not exclusively as an add-on as explained above. VR navigation device **300** may include an illuminator (e.g., laser transmitter) **320** having a field of view (FOV) **322** and a capturing unit (e.g., camera) **310**

having a FOV **312**. Advantageously, both FOVs are large enough to include the immediate surroundings of the user. For practical purposes it is important for the FOVs to cover any movement of both hands, including extending both hands wide open to both sides of the body. Therefore, a 'landscape' orientation of both illuminator and camera are beneficial although a 'portrait' orientation is also possible. A non-limiting configuration can include a 55° horizontal FOV and 43° vertical FOV for 'landscape' orientation and 55° vertical FOV and 43° horizontal FOV for 'portrait' orientation.

[0033] In operation, near eye display **330** may be configured, possibly via an external computer processor such as of a mobile device (not shown) to project a synthetic scene onto both eyes of user **10**. Illuminator **310** may illuminate a vicinity of user **10** and/or user **10** with patterned light **324**. Reflections of the patterned light may be captured by the capturing unit **310** and then analyzed by a computer processor (not shown here). The computer processor may derive the type of posture or gesture that is being carried out by user **10**. Here, an erected pointing finger **14** of hand **12** of user **10** is being lowered from position **14A** to position **14B** along vector **340**. Once the lowering of the pointing finger is being detected as such, metrics associated with vector **340** are being further analyzed in order to translate the metrics of the vector (in the real world) such as direction and displacement, into corresponding navigation movements (in the virtual world). **Figure 3B** illustrates what user **10** views when his pointing finger is at position **14A** while **Figure 3B** illustrates advancement forward in the virtual world as the pointing finger of user **10** has moved to position **14B**.

[0034] **Figure 4** is block diagram illustrating a VR system **400B** according to some embodiments of the present invention. System **400B** may include or may be in operative association with a gesture-posture capturing device **402B** which may be configured to capture various changes over time in the position and orientation of various bodily parts of a user or user-held objects. The position and orientation is denoted herein as 'posture' while the change over time of the postures is denoted herein as 'gesture'.

[0035] In one non-limiting example, gesture-posture capturing device **402B** may be based on one or more visible light cameras that capture a stereoscopic view of the scene.

The video images are then being processed using various image processing algorithms executed by processor **404B** for deriving the movement of the user. Another possible implementation is the use of patterned light as described above where reflections coming back from the scene are being analyzed for generating a depth map from which postures and/or gestured are being deduced.

[0036] Processor **404B** may be configured to receive raw data from gesture-posture capturing device **402B** (such as multiple video images or patterned reflections, depending on the technology) and using classifying algorithms executed thereon, to identify the posture or the gesture, based on predefined criteria (or database). Once the specific posture or gesture is identified, postures-gestures repository **408B** may be used in order to determine which form of VR movement or VR navigation activity is associated with the detected posture or gesture.

[0037] Thus, based on a dictionary stored at postures-gestures repository **408B**, processor **404B** may instruct near-eye display **409B** to adjust the viewing point of the VR scene, as presented to the user, to comply with the corresponding VR navigation activity. For example, user **410B** may wave his or her hand in a gesture **420B** that may be interpreted by processor **404B** and repository **208B** as 'move forward' in the VR scene. As a result, processor **204B** may instruct near-eye display **209B** to advance forward the viewing point of user **410B** as viewed by near eye display **409B**. As will be explained and illustrated below in detail, waving the hand **420B** can be replaced with any other manipulation that imitates moving forward in the VR world (e.g., swimming movements). It also should be noted that not only gestures may be used to invoke VR navigation activity but also static predefined postures may do so. For example, the waving of the hand of user **410B** ends when his or her hand is inclined upwards at a specific angle. This posture may be interpreted - if so predefined - as a navigation activity command denoting 'go forward' and as long as the hand is inclined at approximately the specific angle, the user will keep moving forward in the VR world. As discussed above, in at least some embodiments, gesture-posture capturing device **402B** is external to system **400B** and can provide the raw data relating to the position and orientation, from a remote location.

[0038] **Figure 5** is flowchart diagram illustrating a method **500** in accordance with some embodiments of the present invention. The process starts off with identifying a posture of an object **510**. Then, once the posture is detected – a vector is derived from the object so that the vector spatially represents the detected posture. Transferring the vector into a navigation movement in the virtual reality, a continuous movement which is based on the length and the angle of the vector is applied in the virtual world **530**. The method then checks repeatedly whether a termination act or trigger has been identified **540**. In case a termination act has been identified, the movement in the virtual world ends **550**. In case a termination act has not been identified, the continuous movement is being applied repeatedly **530** until such a termination act is being identified. It is noted that the above description is also applicable to gestures and not only postures. Applying it to postures is unique in the sense that even static postures may invoke movements in the virtual world.

[0039] **Figure 6A** is a diagram illustrating an aspect relating to postures in accordance with the VR system of embodiments of the present invention. A series of torso inclinations is depicted. Posture **611C** is the base posture from which all other gestures or postures are derived. In posture **612C** the user leans forward, an action in the real world which may be interpreted as a VR navigation command in the VR navigation domain. As noted above, it can be either the shift from **611C** to **612C** (e.g., gesture) or merely the static occurrence of **612C** (e.g., posture) defining an angle α that invokes the predefined VR navigation activity.

[0040] Similarly, a further lean forward in posture **613C** may act as an accelerator of the already operative VR navigation activity so that the movement will go faster as the angle here is β being greater than angle α . Going back to the base posture **614C** may be regarded as a termination act and will usually eliminate the VR navigation activity, based on the context, or at least reduce its impact.

[0041] **Figure 6B** is diagram illustrating another aspect relating to postures in accordance with the VR system embodiments of the present invention. Here, the base posture is the two palms of hands **621D** positioned at a specific distance **D1** apart from each other. Once the posture type is being identified (e.g., two palms extended side by side), a VR

navigation activity may be invoked in accordance with the measured value of that distance, which in posture **622D** becomes **D2**. As noted above, either the absolute value of **D2** or alternatively the difference between **D1** and **D2** may serve as the metric that corresponds with the VR navigation activity, as predefined by the repository.

[0042] In posture **623D** the distance between the hands **D2** remains the same and so, in accordance with some embodiments, this may be interpreted as an ongoing navigation command although the hands are static and do not move at all. In posture **624D**, the horizontal distance between the hands **D3** is being used as the metric that is being translated to a VR navigation activity. It is understood that ratios, distances, and angles between two or more body parts can all be used as metrics that are interpreted as corresponding VR navigation commands or activities.

[0043] **Figure 7** illustrates yet another manner by which user **700A** may invoke a movement or displacement in the virtual world. User **700A** may tilt his body forward from position **720** to position **710** thereby defining a lean-forward angle α . The leaning forward movement in real world may be translated to a forward advancement movement in the virtual world possibly in a manner which is similar to controlling a Segway™.

[0044] Specifically, as long as the torso of user **700A** defines a non-zero angle α between position **710** and base position **720**, the forward advance movement in the virtual world continues. The value of angle α may affect the speed of advancement. As graph **700B** illustrates that the movement in the real world and the corresponding virtual world movement do not exhibit a linear relationship. Rather, as graph **700B** illustrates, minor inclination of the torso does not affect the virtual world and only beyond a predefined angle α , the movement in the virtual world begins. Then, once movement in the virtual world begins, minor inclinations are sufficient to advance in the virtual world. Beyond a specific angle the sensitivity to torso inclinations is again being reduced so that an upper bound for forward speed is effectively imposed.

[0045] In some embodiments, the inclination of the torso of the used is detected by analyzing a difference in a depth map generated by the device in position **722** and the depth map as generated by the device at position **712**. Specifically, as the view point in

the real world changes during the move from position 720 to position 720 so does the depth map generated by the device. Analyzing the change in the depth map may be used to deduce the torso inclination in an indirect manner. It is understood that such a gesture may sometimes need a remote-external camera (not shown here) looking at the user.

[0046] Figures 8A and 8B are diagrams illustrating yet another aspect of some embodiments of the present invention. Figure 8A shows a user in position 800A with two hands 810A and 820A extended forward and adjacent to each other. Figure 8B shows a user in position 800B with two hands 810B and 820B defining an angle γ between them. Once the type of posture of two hands extended forward is identified, the corresponding metric of the angle γ can be measured and be used as guidance for the navigation command in the virtual world.

[0047] Figure 9 is a diagram illustrating yet another aspect of some embodiments of the present invention. Here, virtual reality navigation is invoked by raising the shoulders of user 900 possibly from position 920 to position 910 defining a displacement 930 that may be measured and translated into a corresponding navigation command in the virtual reality world. It is understood that such a gesture as described herein may require a remote camera 940 which is positioned at the scene, directed at user 900.

[0048] Figure 10 is a high level flowchart illustrating an aspect according to some embodiments of the present invention. One challenge of embodiments of the present invention is to differentiate between the change in gaze direction or the orientation of the head and a deliberate gesturing or posturing that affect the head position which should be interpreted as a VR navigation command. This differentiating can be carried out by subtracting from the overall bodily gesture what is perceived to be related to moving the head of the user for changing view point purposes only.

[0049] According to some embodiments of the present invention, analyzing reflections of the patterned light may include subtracting movement components affiliated with head movements of the user, to retrieve gestures of the body part, relative to the head of the user. The retrieved movements will be so-called “pure gestures” eliminating the undesirable head movements.

[0050] According to a possible non-limiting implementation, once a movement is identified based on the reflections **1010**, the flow goes on to check whether the head of the user has moved **1020**. In case it did, it is further checked whether the hand has moved in a similar manner **1022**. In case the hand did, no action needs to be taken **1030**. In case they moved differently, a subtraction of the head movement and the hand movement is carried out **1040**. In a case that that the head did not move, a check whether the hand has moved is made **1024**. In case the hand did not, no action is taken **1030**. In case it did, a subtraction of the head movement and the hand movement is carried out **1040**.

[0051] **Figure 11** is a schematic diagram illustrating the system and the environment according to one embodiment of the present invention. User **10** wears a near eye display **1100** which further includes an illuminator **1120** and a capturing device **1110**. In operation, near eye display **1130** is configured to project a synthetic scene onto both eyes of user **10**. Illuminator **1110** may illuminate a vicinity of user **10** and/or user **10** himself or herself with patterned light **1122** reflections of the patterned light may be captured by capturing device **1110** and then analyzed by a computer processor **1130** within near eye display **1100**, to yield position and orientation as changed in real-time. In a case that user **10** performs a predefined gesture, a virtual input device such as a joystick **18A/18B** appear in image. User then can grab the virtual joystick in the virtual world and control it using gestures in the real world wherein the change of the orientation of the joystick is apparent in **Figures 19A** and **19B** as seen at **20A/20B**. It is important to note that no real joystick is involved here – but rather a completely virtual one that may be any input device being virtualized. The postures and gestures carried out by the user imitating gripping and controlling a joystick are at the focus of this embodiment enabling an intuitive body gesturing.

[0052] In the above description, an embodiment is an example or implementation of the inventions. The various appearances of "one embodiment," "an embodiment" or "some embodiments" do not necessarily all refer to the same embodiments.

[0053] Although various features of the invention may be described in the context of a single embodiment, the features may also be provided separately or in any suitable

combination. Conversely, although the invention may be described herein in the context of separate embodiments for clarity, the invention may also be implemented in a single embodiment.

[0054] Reference in the specification to "some embodiments", "an embodiment", "one embodiment" or "other embodiments" means that a particular feature, structure, or characteristic described in connection with the embodiments is included in at least some embodiments, but not necessarily all embodiments, of the inventions.

[0055] It is to be understood that the phraseology and terminology employed herein is not to be construed as limiting and are for descriptive purpose only.

[0056] The principles and uses of the teachings of the present invention may be better understood with reference to the accompanying description, figures and examples.

[0057] It is to be understood that the details set forth herein do not construe a limitation to an application of the invention.

[0058] Furthermore, it is to be understood that the invention can be carried out or practiced in various ways and that the invention can be implemented in embodiments other than the ones outlined in the description above.

[0059] It is to be understood that the terms "including", "comprising", "consisting" and grammatical variants thereof do not preclude the addition of one or more components, features, steps, or integers or groups thereof and that the terms are to be construed as specifying components, features, steps or integers.

[0060] If the specification or claims refer to "an additional" element, that does not preclude there being more than one of the additional element.

[0061] It is to be understood that where the claims or specification refer to "a" or "an" element, such reference is not to be construed that there is only one of that element.

[0062] It is to be understood that where the specification states that a component, feature, structure, or characteristic "may", "might", "can" or "could" be included, that particular component, feature, structure, or characteristic is not required to be included.

[0063] Where applicable, although state diagrams, flow diagrams or both may be used to describe embodiments, the invention is not limited to those diagrams or to the corresponding descriptions. For example, flow need not move through each illustrated box or state, or in exactly the same order as illustrated and described.

[0064] Methods of the present invention may be implemented by performing or completing manually, automatically, or a combination thereof, selected steps or tasks.

[0065] The descriptions, examples, methods and materials presented in the claims and the specification are not to be construed as limiting but rather as illustrative only.

[0066] Meanings of technical and scientific terms used herein are to be commonly understood as by one of ordinary skill in the art to which the invention belongs, unless otherwise defined.

[0067] The present invention may be implemented in the testing or practice with methods and materials equivalent or similar to those described herein.

[0068] While the invention has been described with respect to a limited number of embodiments, these should not be construed as limitations on the scope of the invention, but rather as exemplifications of some of the preferred embodiments. Other possible variations, modifications, and applications are also within the scope of the invention. Accordingly, the scope of the invention should not be limited by what has thus far been described, but by the appended claims and their legal equivalents.

CLAIMS

1. A method comprising:
 - projecting a synthetic 3D scene, into both eyes of a user, so as to provide a virtual reality view to the user;
 - identifying at least one gesture or posture carried out by at least one body part of said user;
 - measuring at least one metric of a vector associated with the identified gesture or posture;
 - applying a movement or action of said user in virtual reality environment, based on the measured metrics; and
 - modifying the virtual reality view so as to reflect the movement or action of said user in the virtual reality environment.
2. The method according to claim 1, wherein the identifying of the at least one gesture or posture is carried out by applying a classifier in view of a database of predefined postures and gestures.
3. The method according to claim 1, wherein the applying a movement or action of said user in virtual reality environment is carried out continuously as long as the measured metric maintains a value beyond a predefined threshold.
4. The method according to claim 1, wherein the applying a movement or action of said user in virtual reality environment is terminated responsive to a detection of a predefined termination act.
5. The method according to claim 1, wherein the applying a movement or action of said user in virtual reality environment is terminated responsive to a detection of a return of the body part to a basic posture position.
6. The method according to claim 1, wherein the identified posture is leaning forward a torso of the user.

7. The method according to claim 1, wherein the identified posture is raising shoulders of the user.
8. The method according to claim 1, wherein the identified posture is defined by a spatial relationship between at least two body parts, and wherein the measured metrics comprise angles between the at least two body parts.
9. The method according to claim 1, wherein the at least one metric of the vector associated with the detected gesture or posture comprise: a length of the vector, a spatial direction angle of the vector.
10. The method according to claim 1, wherein the identifying of the least one gesture or posture carried out by at least one body part of said user, further comprises subtracting movement component affiliated with head movements of the user, so as to only retrieve postures and gestures of the body part, that are relative to the head of the user.
11. The method according to claim 1, wherein in a case that a specific gesture is detected, the method further comprises superimposing a virtual user-interface object into the synthetic 3D scene enabling the user to apply gestures and postures relative to the virtual user-interface object.
12. A system comprising:
 - a device configured to project a synthetic 3D scene, into both eyes of a user, so as to provide a virtual reality view to the user; and
 - a computer processor configured to:
 - identify at least one gesture or posture carried out by at least one body part of said user;
 - measure at least one metric of a vector associated with the identified gesture or posture;
 - apply a movement or action of said user in virtual reality environment, based on the measured metrics; and

modify the virtual reality view so as to reflect the movement or action of said user in the virtual reality environment.

13. The system according to claim 12, wherein the identifying of the at least one gesture or posture is carried out by applying a classifier in view of a database of predefined postures and gestures.

14. The system according to claim 12, wherein the applying a movement or action of said user in virtual reality environment is carried out continuously as long as the measured metric maintains a value beyond a predefined threshold.

15. The system according to claim 12, wherein the applying a movement or action of said user in virtual reality environment is terminated responsive to a detection of a predefined termination act.

16. The system according to claim 12, wherein the applying a movement or action of said user in virtual reality environment is terminated responsive to a detection of a return of the body part to a basic posture position.

17. The system according to claim 12, wherein the identified posture is leaning forward a torso of the user.

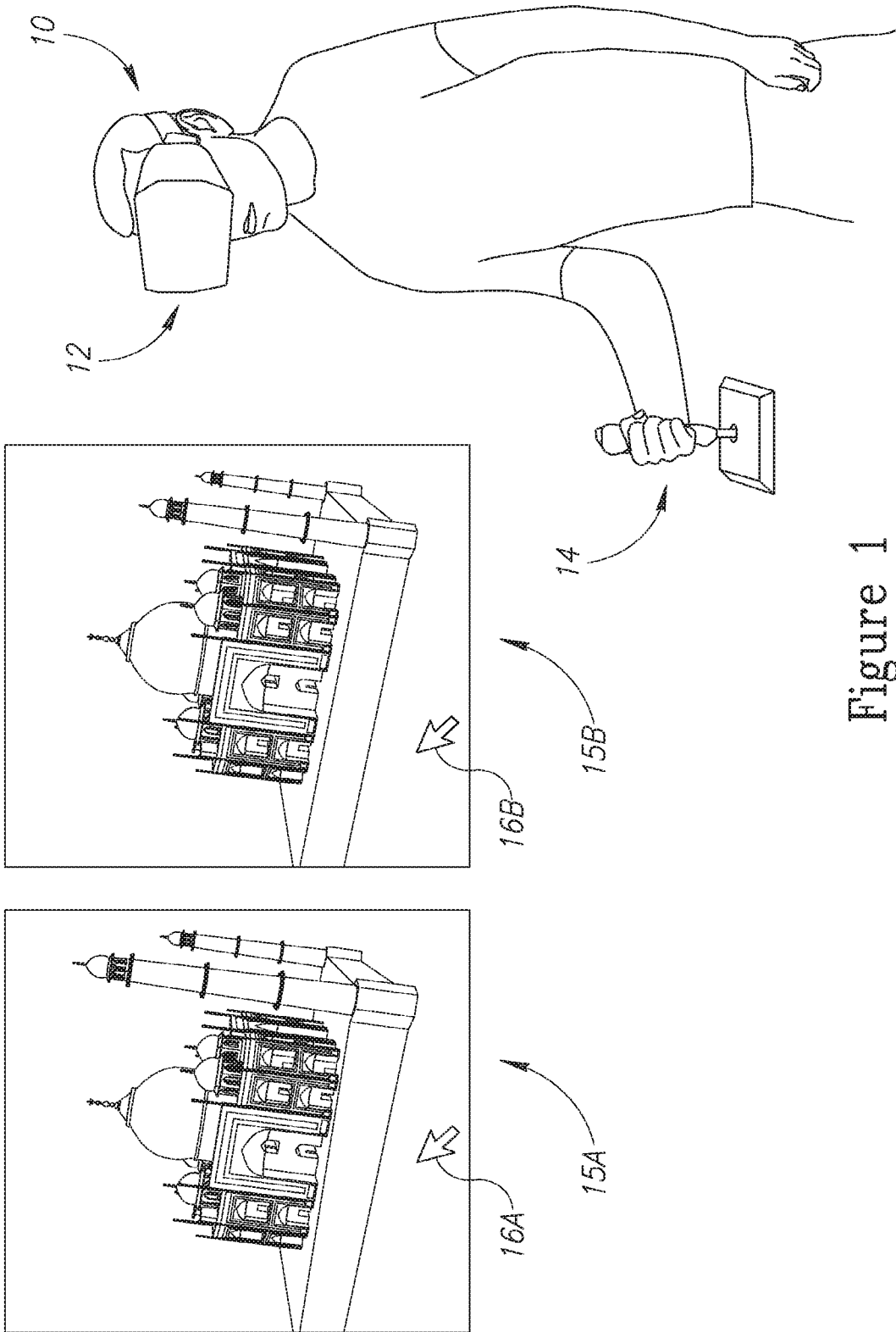
18. The system according to claim 12, wherein the identified posture is raising shoulders of the user.

19. The system according to claim 12, wherein the identified posture is defined by a spatial relationship defined at least two body parts, and wherein the measured metrics comprise angles between the at least two body parts.

20. The system according to claim 12, wherein the at least one metric of the vector associated with the detected gesture or posture comprise: a length of the vector, a spatial direction angle of the vector.

21. The system according to claim 12, wherein the identifying of the least one gesture or posture carried out by at least one body part of said user, further comprises subtracting movement component affiliated with head movements of the user, so as to only retrieve postures and gestures of the body part, that are relative to the head of the user.

22. The system according to claim 12, wherein in a case that a specific gesture is detected, the method further comprises superimposing a virtual user-interface object into the synthetic 3D scene enabling the user to apply gestures and postures relative to the virtual user-interface object.



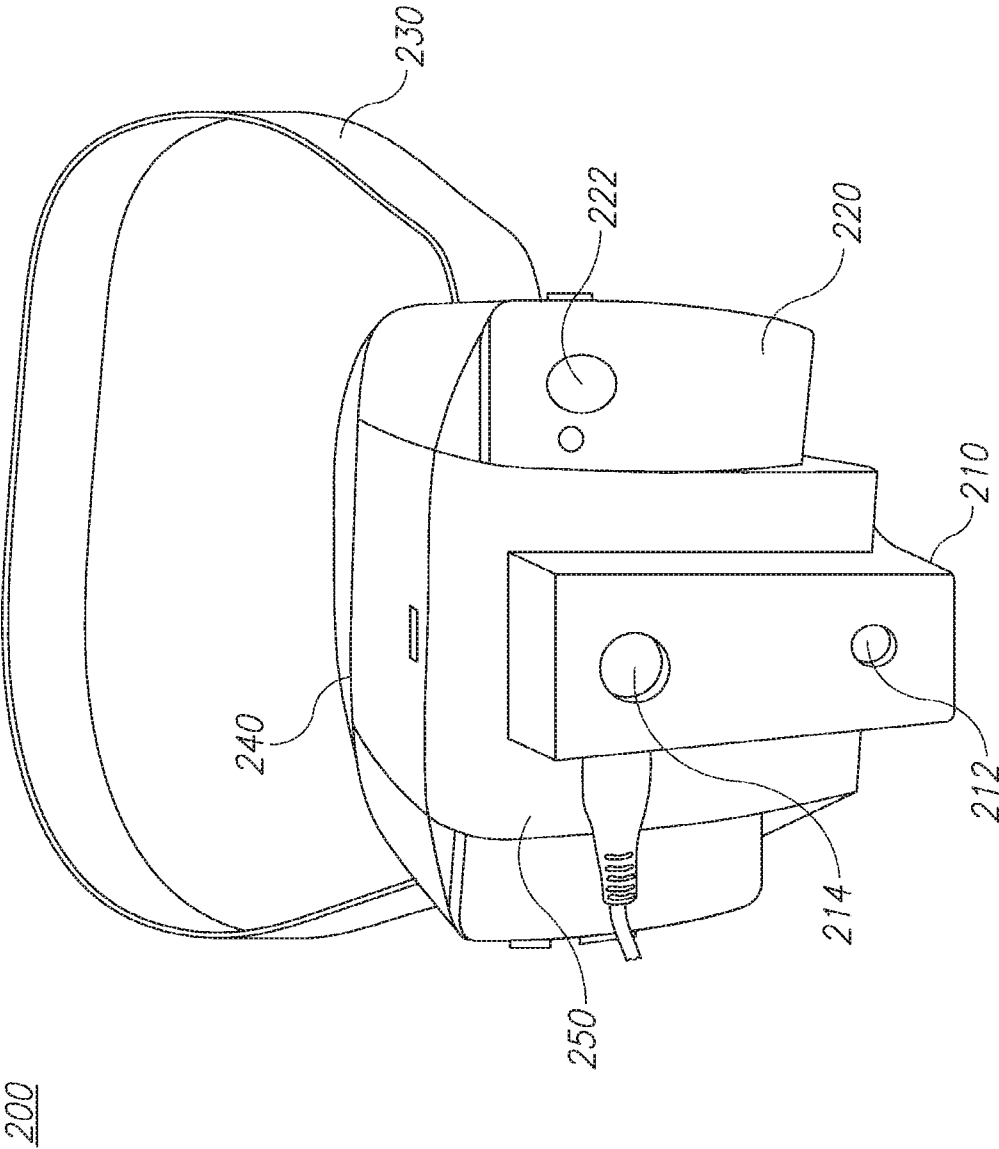


Figure 2

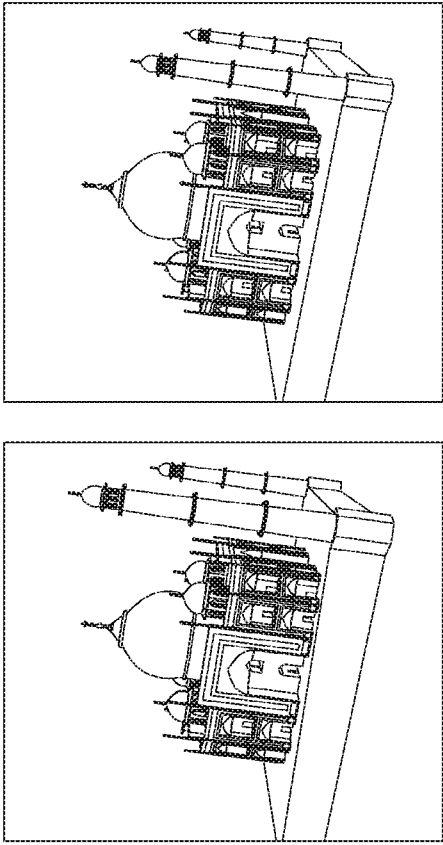


Figure 3B

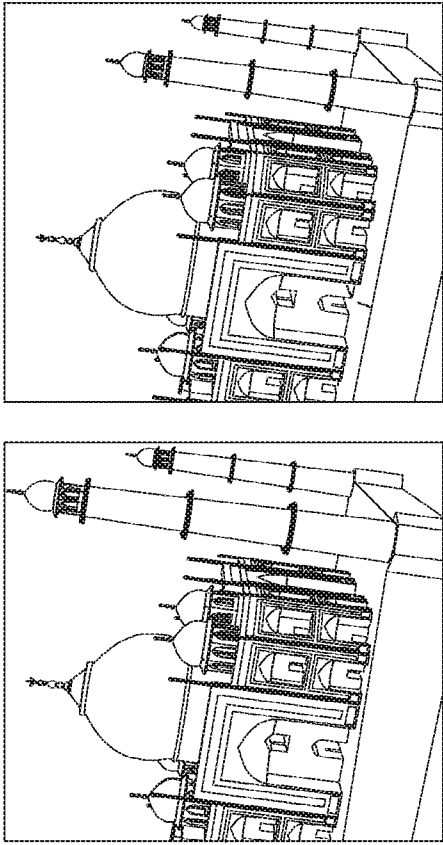


Figure 3C

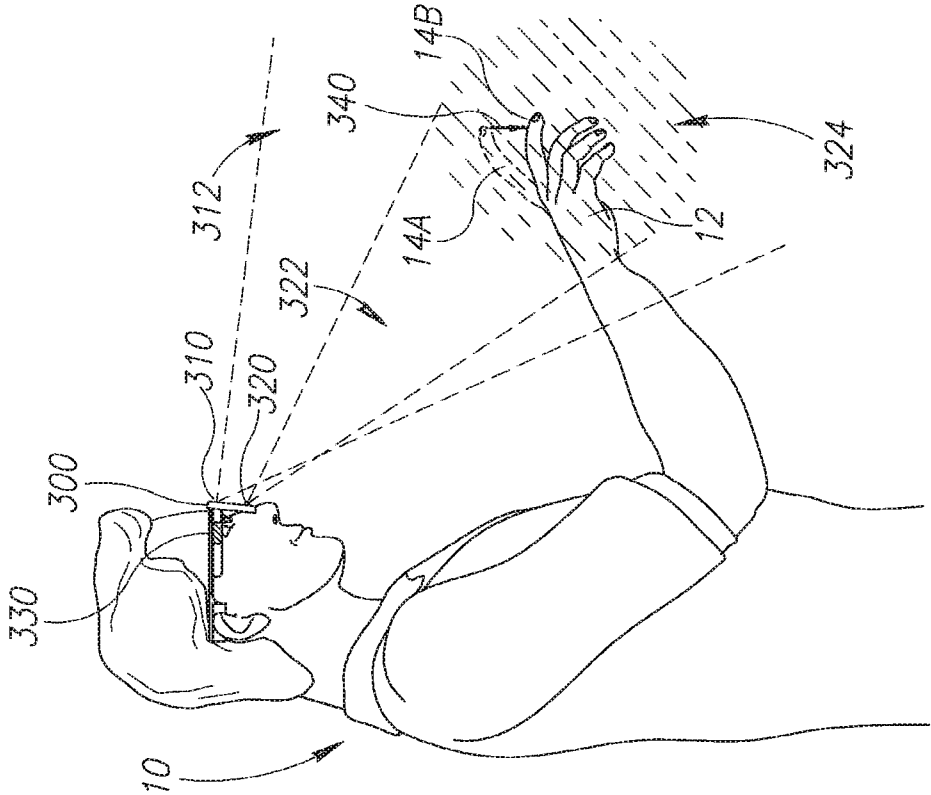


Figure 3A

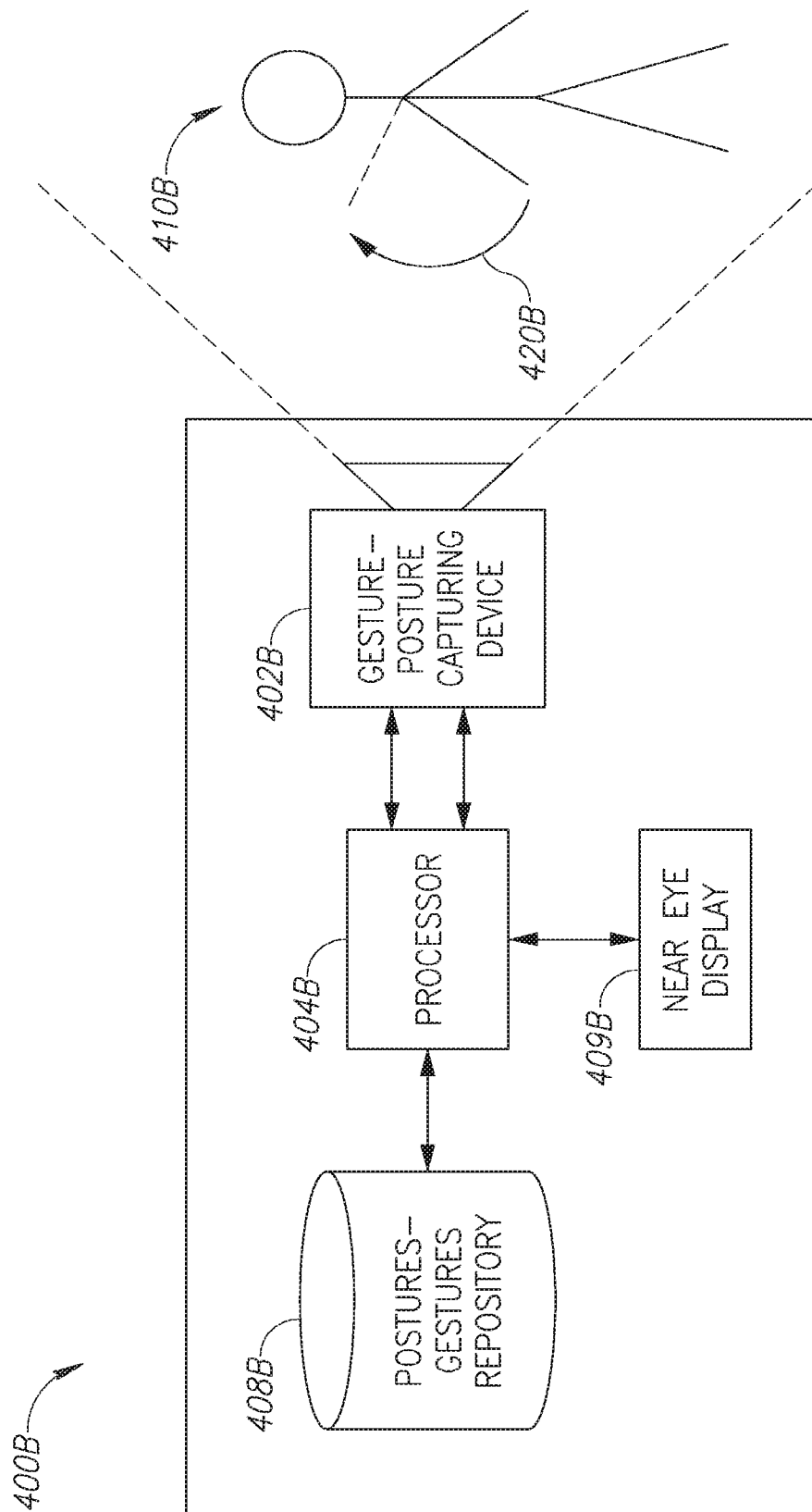


Figure 4

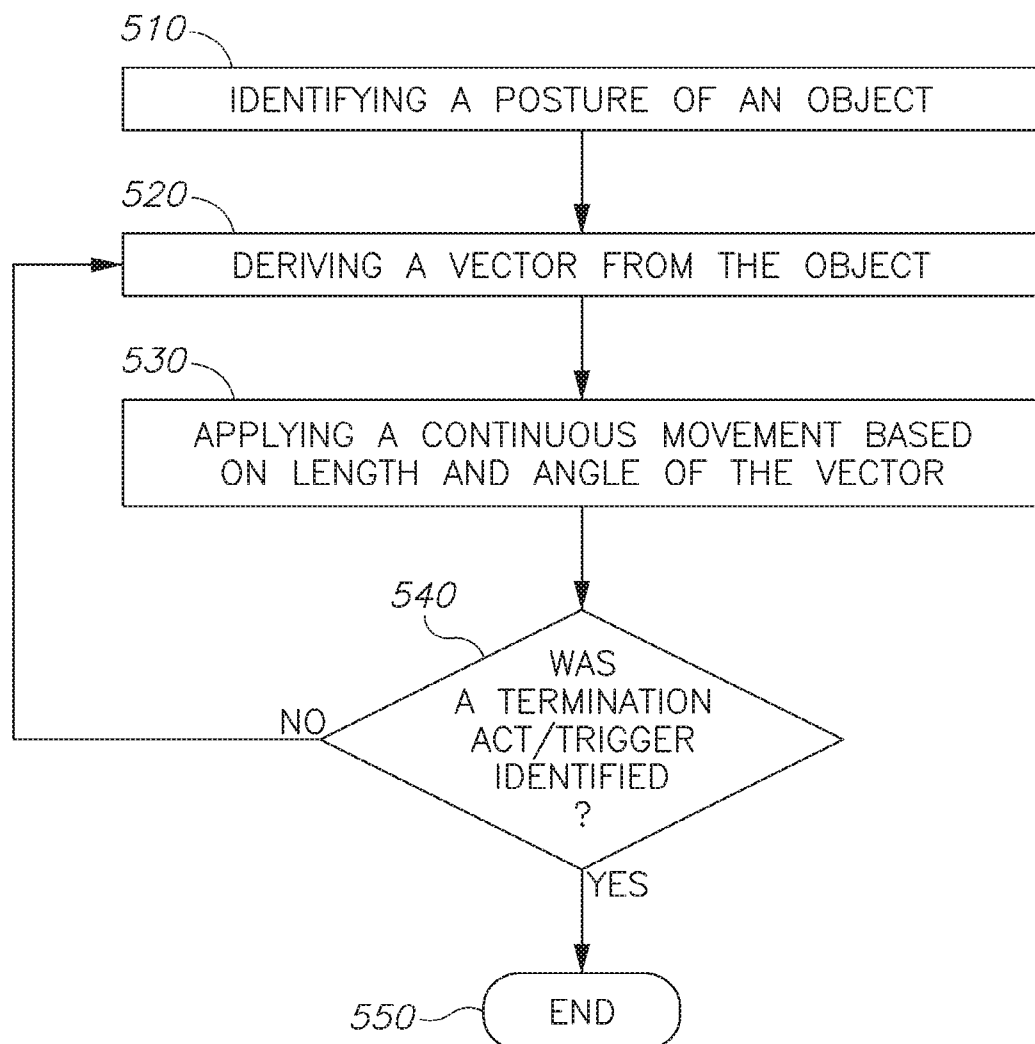
500

Figure 5

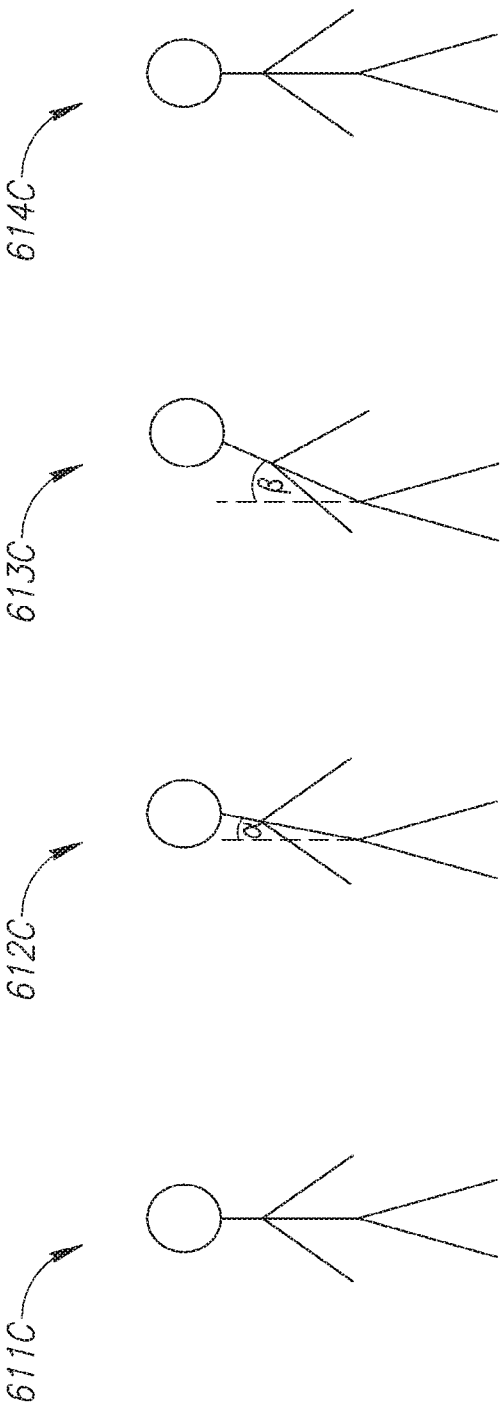


Figure 6A

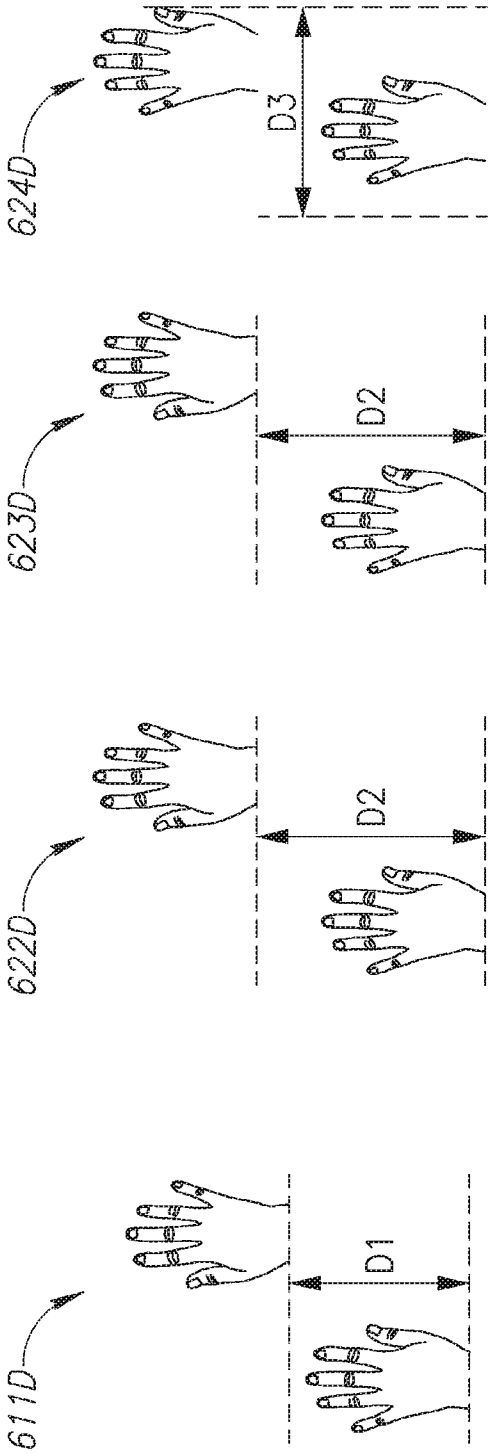


Figure 6B

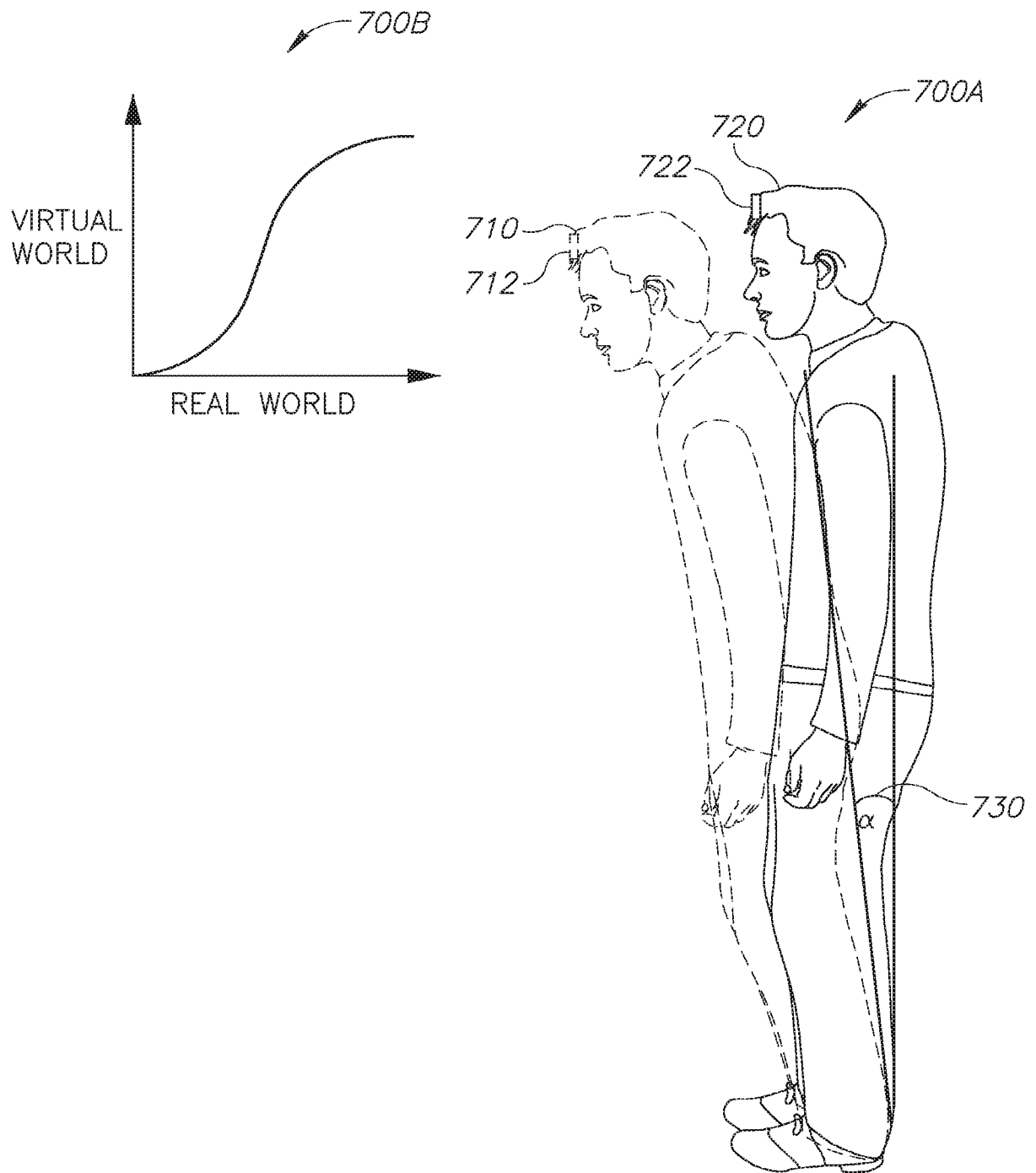


Figure 7

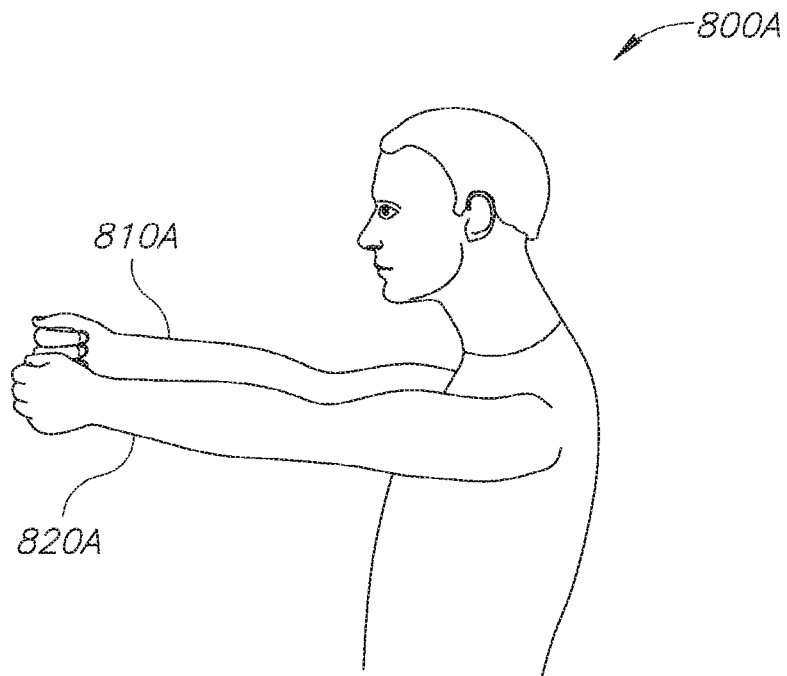


Figure 8A

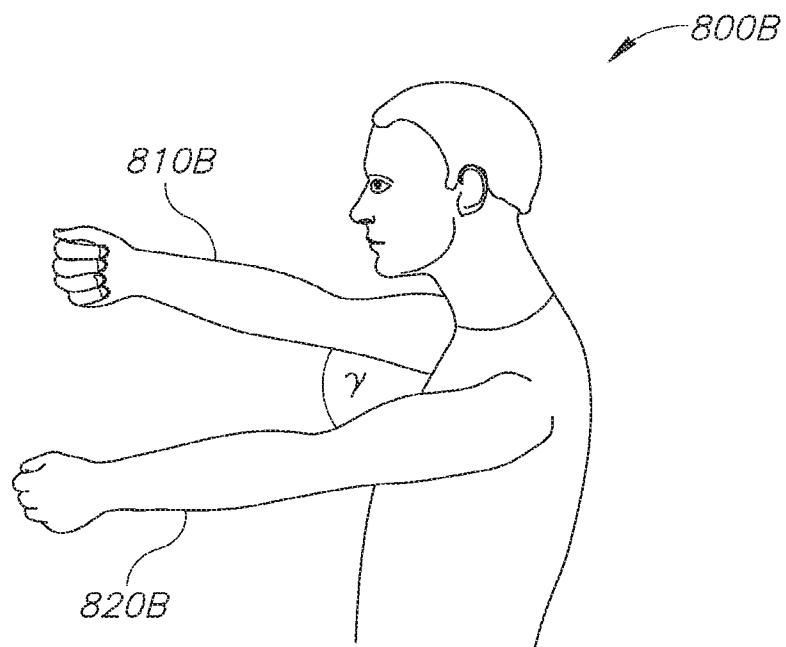


Figure 8B

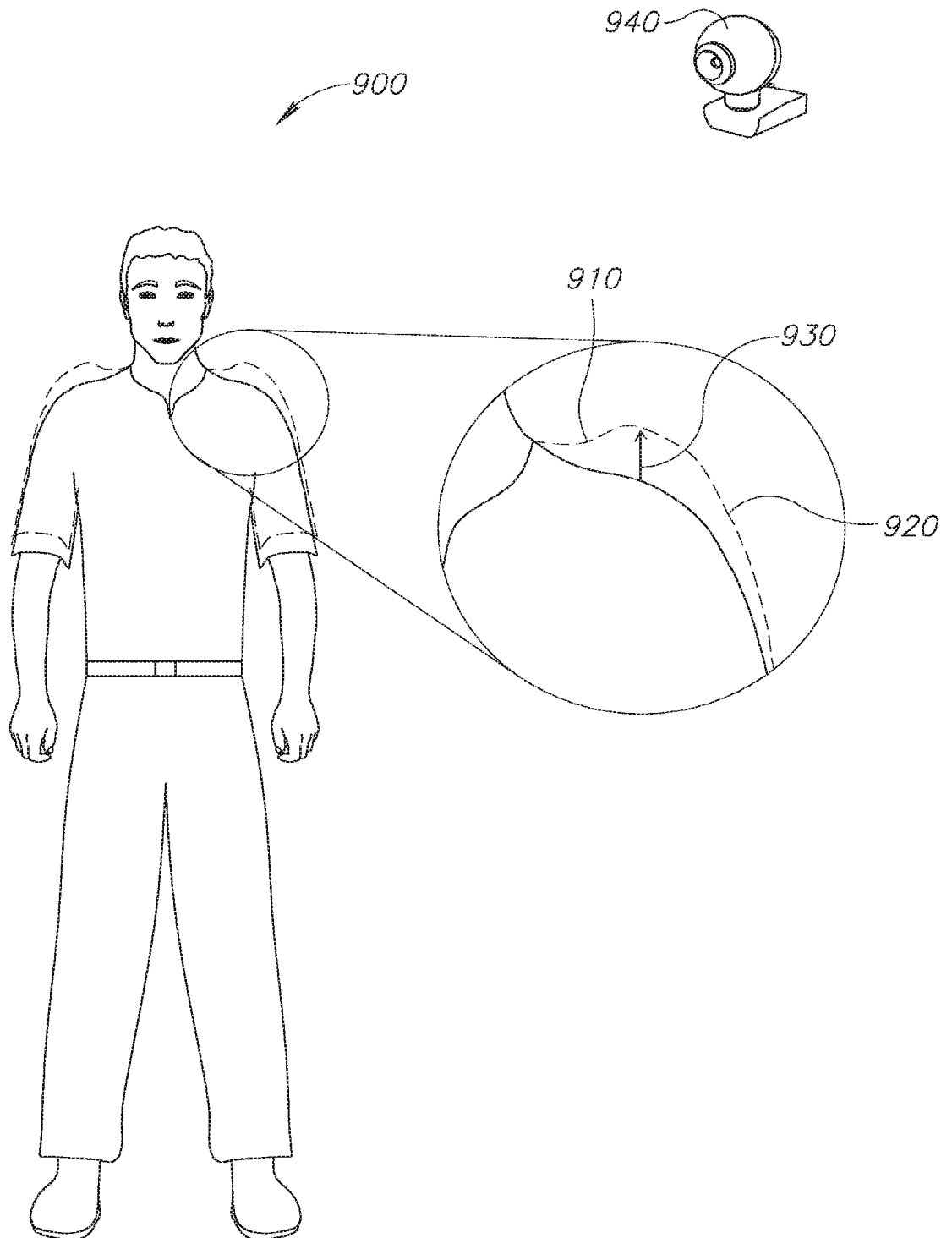


Figure 9

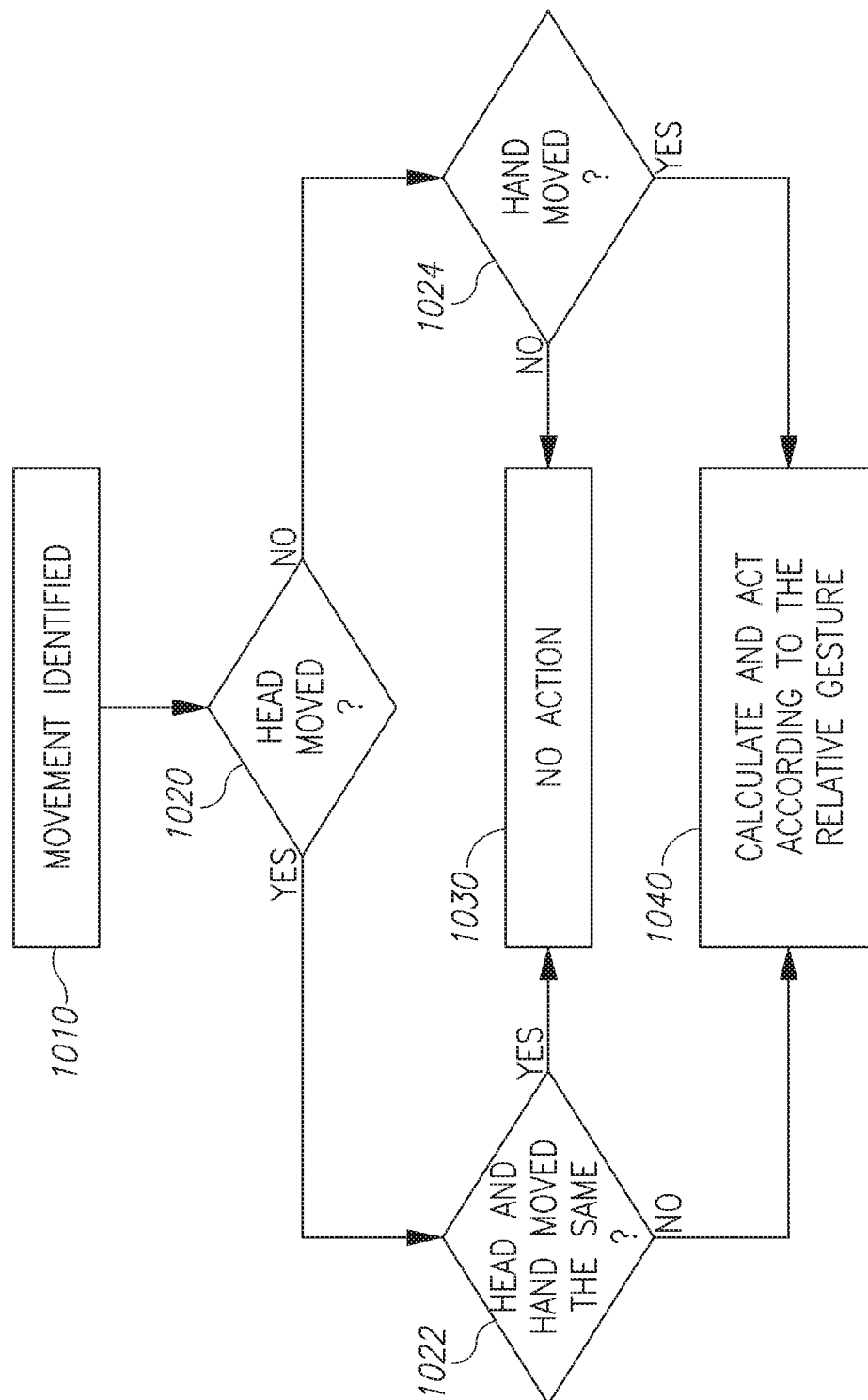


Figure 10

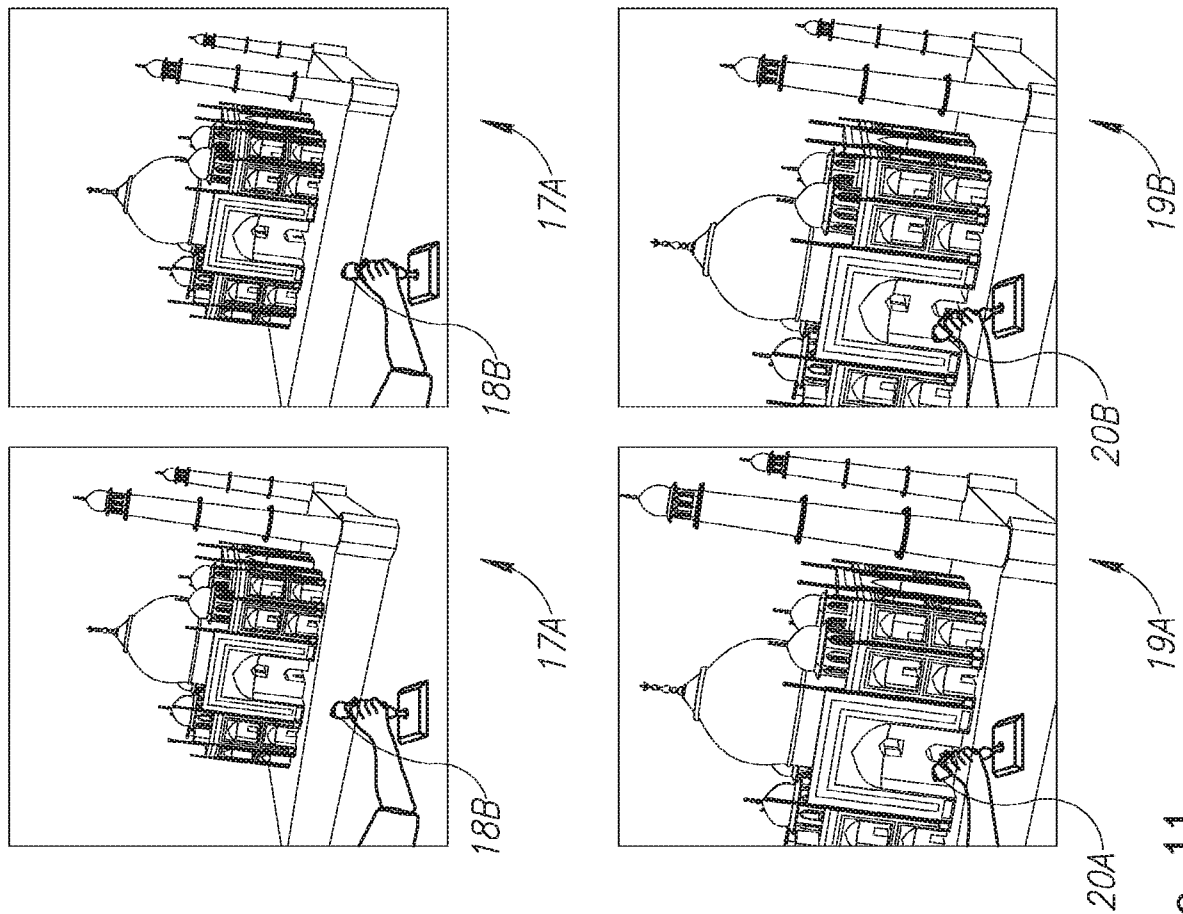
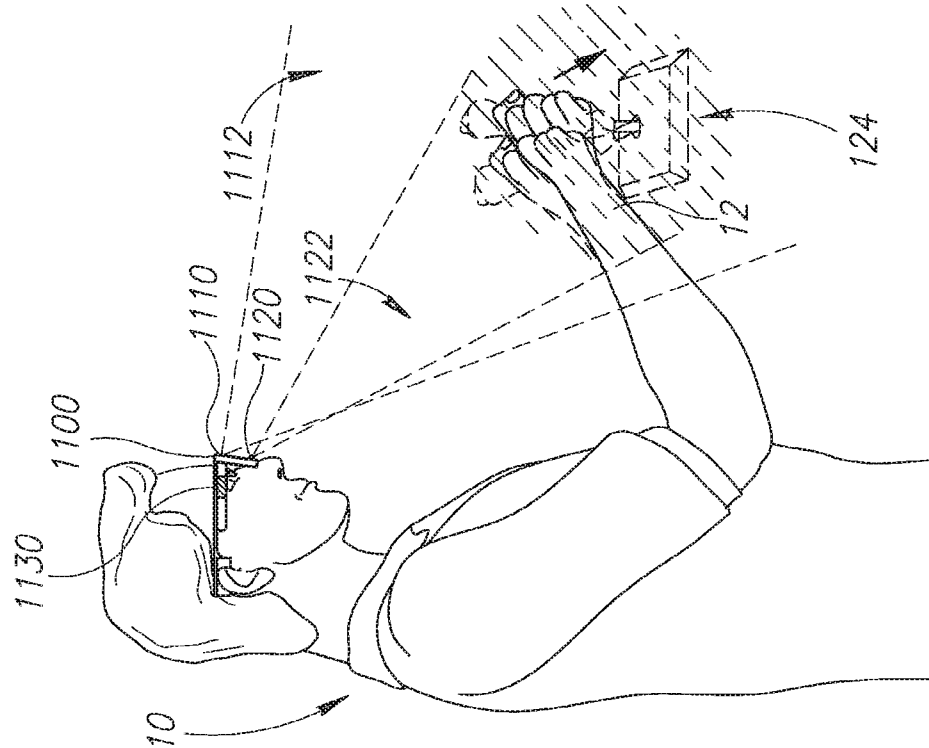


Figure 11



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/066907**A. CLASSIFICATION OF SUBJECT MATTER****G06F 3/01(2006.01)i, G06F 3/0481(2013.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06F 3/01; G09B 5/00; A63F 13/02; G02B 27/01; A63F 9/24; G09G 5/00; H04N 13/04; G06F 3/0481

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: 3D, virtual, reality, project, gesture, posture, measure, calculate, vector, HMD

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2012-0212400 A1 (JOHN N. BORDER et al.) 23 August 2012 See paragraphs [0008], [0288], [0351], [0373], [0377]–[0378], [0402], [0710]; and figure 10.	1–22
Y	US 2012-0309535 A1 (ADAM JETHRO LANGRIDGE et al.) 06 December 2012 See paragraphs [0043], [0060], [0064], [0074]; and figures 2, 9–11.	1–22
A	US 2013-0137076 A1 (KATHRYN STONE PEREZ et al.) 30 May 2013 See paragraphs [0002], [0083]; and figure 1B.	1–22
A	WO 2014-033306 A1 (SENSOMOTORIC INSTRUMENTS GESELLSCHAFT FUR INNOVATIVE SENSORIK MBH) 06 March 2014 See page 5, lines 5–21; and figure 1a.	1–22
A	US 2002-0075286 A1 (HIROKI YONEZAWA et al.) 20 June 2002 See paragraphs [0007], [0077]; and figure 3.	1–22



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

29 March 2016 (29.03.2016)

Date of mailing of the international search report

01 April 2016 (01.04.2016)

Name and mailing address of the ISA/KR

International Application Division

Korean Intellectual Property Office

189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea

Facsimile No. +82-42-481-8578

Authorized officer

BYUN, Sung Cheal

Telephone No. +82-42-481-8262



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2015/066907

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012-0212400 A1	23/08/2012	US 8488246 B2	16/07/2013
US 2012-0309535 A1	06/12/2012	CN 103608750 A	26/02/2014
		EP 2714216 A2	09/04/2014
		EP 2714216 A4	14/01/2015
		US 8657683 B2	25/02/2014
		WO 2012-166772 A2	06/12/2012
		WO 2012-166772 A3	11/04/2013
US 2013-0137076 A1	30/05/2013	CN 103064188 A	24/04/2013
		EP 2600331 A1	05/06/2013
		WO 2013-082049 A1	06/06/2013
WO 2014-033306 A1	06/03/2014	CN 104603673 A	06/05/2015
		EP 2893388 A1	15/07/2015
		IN 682KON2015 A	17/07/2015
		US 2015-0288944 A1	08/10/2015
US 2002-0075286 A1	20/06/2002	JP 2002-157607 A	31/05/2002