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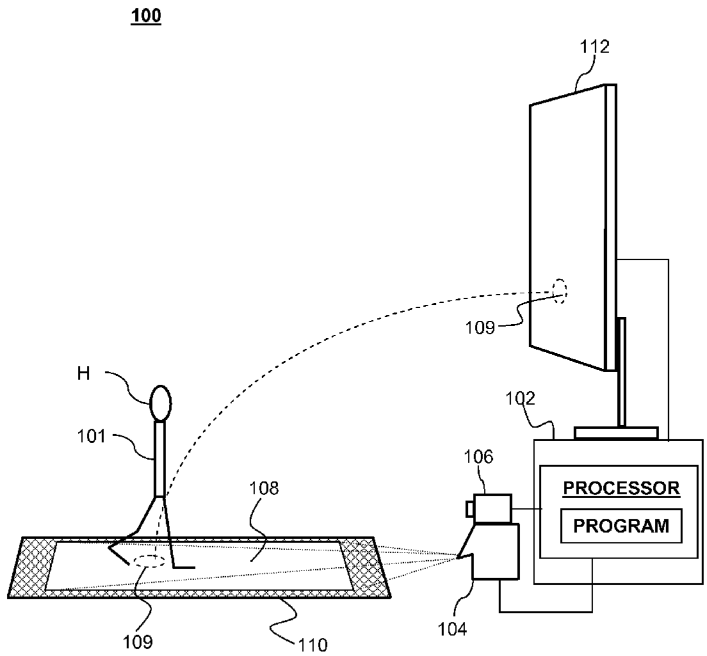

FIG. 1B

(57) Abstract: An interactive video system includes a processor unit configured to provide output signals to a short throw projector. The output signals cause the short throw projector to project images on a projection area located on or parallel to a floor. The processor can receive input signals from one or more user input devices. The input signals represent a simulated user interaction with the images projected on the projection area. The processor can also alter one or more of the images projected on the projection area in response to the input signals. It is emphasized that this abstract is provided to comply with the rules requiring an abstract that will allow a searcher or other reader to quickly ascertain the subject matter of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims.

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INTERACTIVE VIDEO SYSTEM

FIELD OF THE INVENTION

Embodiments of the present invention are generally directed to the field of interactive video systems and more particularly to interactive video systems that use a projector.

BACKGROUND OF THE INVENTION

Video games are a popular form of interactive entertainment in which a user can interact with images that are presented on a screen or projected on a surface. Video game systems are sometimes in the form of a special purpose computer, sometimes referred to as a console. The console system runs game software that governs interactions that take place in a simulated environment. The console is operably connected to a video screen, such as a television set and some form of controller. The simulated environment is represented by images or graphical symbols that are presented on the video screen. A user can interact with the environment through inputs that are provided by the controller.

Advances in graphics and controllers have added to the appeal of video games. Motion controllers can track a user's movements in order to generate the inputs to the console. This can increase the realism of the interaction between the user and the simulated environment. The increased realism can enhance the user experience with the video game. One challenge to video systems is expanding the space of interaction. With a simple screen or projector, the portion of the simulated environment that the user sees is located "behind" the screen. The user cannot reach through the screen to interact with (or simulate interaction with) the game environment.

One approach to expanding the game space is to provide graphics on floor in front of the display to provide a virtual experience with virtual objects a user can interact with. This normally requires a ceiling mounted projector that projects images of the virtual objects downward onto the floor. A drawback of such a system is that because the projector is located above the user, the user often casts a shadow on the projected images.

An alternative to overhead projection is a flat panel video screen that be placed flat on the floor in front of the main display. A user can interact with the screen on the floor using the same controller that is normally used for interaction with the console. Unfortunately, a video screen placed on the floor may be damaged or destroyed if it is inadvertently stepped or kicked.

It is within this context that embodiments of the present invention arise.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGs. 1A-1B are schematic diagrams illustrating examples of an interactive video system in accordance with embodiments of the present invention.

FIG. 2 is a schematic diagram illustrating a three-dimensional short throw projector that may be used in conjunction with an embodiment of the present invention.

FIG. 3 is a block diagram illustrating an interactive video system according to an embodiment of the present invention.

DESCRIPTION OF THE SPECIFIC EMBODIMENTS

In the following Detailed Description, reference is made to the accompanying drawings, which form a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. In this regard, directional terminology, such as "top," "bottom," "front," "back," "leading," "trailing," etc., may be used with reference to the orientation of the figure(s) being described. Because components of embodiments of the present invention can be positioned in a number of different orientations, the directional terminology is used for purposes of illustration and is in no way limiting. It is to be understood that other embodiments may be utilized and structural or logical changes may be made without departing from the scope of the present invention. The following detailed description, therefore, is not to be taken in a limiting sense, and the scope of the present invention is defined by the appended claims.

Projectors have the benefit that they can create a large display area on a surface that is safe to stand or even jump on. The problem of where to mount the projector may be solved by “ultra-short-throw” projectors (or possibly other technology like laser “pico” projectors) that make it possible to place the projector near the television, with the projector aimed down but with a very short lateral throw.

Embodiments of the present invention may use a “short-throw” projector to display graphics on the floor in front of a television, and also use a depth camera to track the player’s body over that area. These types of projectors can be placed very close to a wall, e.g., about 2-3 feet or even a few inches and project a large image on the wall. There are a number of different types of commercially available short throw projector technologies that can be easily adapted to project images on a floor or a surface more or less parallel to the floor.

The player could interact with the projected graphics, and a depth map could be used to black out areas of the projection in order to avoid projecting graphics on the player's body. The technique could also be paired with a method for precise head-tracking. One could also apply a "fish-tank virtual reality" technique to the graphics projected on the floor, creating the illusion of pits or objects above the floor. A special surface may be needed for the projection, which could have buttons or pressure sensing to facilitate interaction with the projected images.

As shown in FIG. 1 and FIG. 1B, an interactive video system **100** may include a processor unit **102**, and a short throw projector **104** and image capture device **106** coupled to the processor unit. The short throw projector **104** is configured to project images on a projection area **108** located on or parallel to a floor. In general, it is desirable for the short throw projector **104** to be configured to project horizontally and vertically with respect to a location of the short throw projector. This avoids the need to mount the projector **104** to the ceiling and allows for a more convenient location of the projector. This allows the projection area **108** to be located between the projector **108** and a user while still allowing images to be projected onto a projection area parallel to and close to the floor. For a projector **104** having a very short throw, e.g., a few inches, it may even be possible to place the projector on or close to floor level.

One advantage of a short throw projector is that it can be placed very close to the plane of the projection area **108**, e.g., close to the floor. Such placement can greatly reduce the likelihood that the beam from the projector **104** will project into the eyes of a user **101**. A similar advantage may be achieved if the projection area is on a wall or ceiling. Another advantage short throw projectors over ceiling mounted projectors is that if the projection area is on the floor there is less likelihood that the user **101** will block the projector beam and cast a shadow. Since the projector **104** can be located in front of the user rather than behind the user the user is unlikely to see any shadow due to the user's body blocking the projector beam.

Although some examples are illustrated and described in terms of projecting images on a floor or projection area parallel to a floor embodiments of the present invention are not limited to such implementations. For example, the system described above may be modified to make use of projectors that project images onto floors, walls or ceilings. Images projected by such projectors can enhance the "atmospherics" of a video game, e.g., by projecting images that fit with the theme of a game. For example, jungle vegetation could be projected on the floors, walls and ceiling for an adventure game that takes.

The processor unit **102** may be configured to provide output signals to the short throw projector **104**. The output signals may be configured to cause the short throw projector to project images on the projection area **108**. The processor **102** may be further configured to receive input signals from one or more user input devices. The input signals may represent a simulated interaction by a user **101** with the images projected on the projection area **108**. The processor **102** may also be configured to alter one or more of the images projected on the projection area **108** in response to the input signals.

In some implementations, the processor unit **102** may be configured to analyze images of the projection area **108** that have been obtained with the image capture device **106**, wherein the images obtained with the image capture device include portions of images projected by the short throw projector **104**. The processor may also be configured analyze the images and determine whether a portion of a projected image is occluded by an object and to cut out projection of the portion of the projected image that is occluded. By tracking the user **101**, it is possible for the processor **102** to control the projection of images by the projector **104** in a way that avoids projecting the images onto the player. For example, the processor **102** may compare a known configuration for the graphics when projected on the display area to the actual configuration of the projected graphics in images obtained by the image capture device **106**. If the configuration of the projected graphics is known, the processor can determine distortions of the graphics when they are projected onto the user **101**. Analysis of the distortions can be used to track the user **101** or to cut out portions of the projected images that are projected onto the user. The images projected on the projection area **108** can be thought of as a type of structured light that doubles as a visible image.

In some implementations, the system **100** may further include a touch sensor array **110** coupled to the processor unit **102**. The touch sensor array **110** may include resistive or capacitive sensors or other types of sensors that respond to the contact by or proximity of a user. The sensors may be arranged in a regular pattern so that each sensor in the array has a known location relative to the array. Each sensor in the touch sensor array **110** may generate signals in response to a user's contact with or proximity. The processor unit **102** may be configured to analyze inputs from the touch sensor array in response to user interaction with the touch sensor array and to analyze images of the touch sensor array **110** obtained by the image capture device **106** and alter one or more images projected on the touch display area in response to the inputs from the touch sensor array. The processor unit **102** may optionally be configured to analyze images of the touch sensor array **110** obtained by the image capture device **106** and adjust projection of images projected by the projector **104** such that the projected images align with the touch sensor array in a predetermined manner.

In some embodiments projector screen material may be placed on the projection area **108**. Under some lighting conditions, e.g., a home during the day, the projected images may exhibit poor. Some projector screen materials are engineered to mostly reflect red, green, and blue light wavelengths used by projectors, and perhaps such a surface could help improve contrast. The touch sensor array **110** may optionally be incorporated into a sheet of such projector screen material.

The user can interact with the images projected on the projection area **108** by tracking the player's hands or feet or even the user's whole body. There are a number of tracking technologies that can be used for this purpose. For example, some technologies project a "grid" of infrared light. The image capture device **106** may be (or may include) an infrared camera that can capture infrared images. In images that contain the grid and the user, the grid of infrared light may be distorted where it intersects a user relative to a reference image of the grid without the user. The distortion of the grid may be analyzed to track parts of the user's body.

Other image-based tracking techniques may use e.g., a range-finding depth sensor or stereo camera to track the user.

Still other techniques may track a controller that the user holds or that is attached to the user's hands, feet, body, or clothing. The position and/or orientation of the controller may also be tracked optically, e.g., by including a light source on the controller. The light source may be diffused by a spherically-shaped diffuser to produce of diffuse light of fixed size. Images of the diffuse light source may be captured by a digital camera that is coupled to the processor **102** and the images may be analyzed to determine the location of the light source in three dimensions. The location of the light source in the image plane can be readily determined by analyzing the images for the location of patterns characteristic of the light source. The location of the light source relative to a direction perpendicular to the image plane can be determined from the relative size of the light source, which changes as the light source moves closer to or further away from the camera.

In some techniques the controller may include one or more inertial sensors, e.g., one or more accelerometers or one or more gyroscopes, or some combination of accelerometers and gyroscopes. Signals from the inertial sensor(s) may be generated in response to changes in position and/or orientation of the controller. These signals may be analyzed to determine the position and/or orientation of the controller. In some cases, such as the Move® controller from Sony Computer Entertainment of Tokyo Japan, a diffuse spherical light source may be combined with one or more inertial sensors.

Other options for tracking the user include using microphone arrays to track the user and/or a controller.

In addition to tracking the user **101**, in certain embodiments of the present invention, it may be useful to determine the position of the projector **104** relative to the location of the projection area **108** and/or the camera **106**. The location of the display area can be determined if the configuration of the projected image is known. The image as seen by the camera can be compared to a reference image for known relative locations of the projection area and the camera. The differences between the image as seen by the camera and the reference image can be used to determine the relative location of the projection area **108**. However, this assumes a known positional relationship between the camera and the projector.

One possible way to determine the position of the projector relative to the camera would be to maintain a fixed relationship between the camera and projector. One possible way to do this would be to incorporate the projector **104** and the camera **106** into the same device in such a way that the camera optics and projector optics are in a known positional and relationship with respect to each other. The camera optics and projector optics may be fixed relative to each other or they may be movable. In the case of moveable optics, the projector and or camera may include sensors that can detect relative position and or orientation between the projector and camera.

Alternatively, the relative position and orientation may be determined if the camera and projector are located fairly close together such that that the camera **106** can see all the areas where the projector **104** might place the projection area **108**. There may be a directional difference between the camera and projector; however, this may be taken into account by a calibration step that detects the location and shape of the projection in the camera image.

In some embodiments, the user's experience may be enhanced through the use of augmented reality in conjunction with a display **112**, which may be used in addition to the projector 104. The processor **102** can combine an image of the user with virtual objects to display an augmented image that includes the user and the virtual objects. For example, an object **109** in an image projected on the display area **108** and an image of the user could be combined in a synthetic image presented on the display **112**, as shown in FIG. 1A. In the image on the display **112**, the image of the user **101** may be obtained with the image capture device **106** and the image of the object **109** may be synthetically generated by the processor **102**. The user **101** can thereby interact with virtual objects in the projected images in the display area **108** and watch the interaction on the display **112**.

The use of images projected on the projection area **108** in conjunction with the display presents interesting opportunities for coordination of projected graphics and displayed graphics. For example, objects could follow trajectories from the projection area **108** to the display **112** or vice versa. By way of example, the processor **102** may analyze the user's interaction with the images in the projection area **108** and compute a trajectory of an object **109** in one or more of the projected images. The trajectory may be a three dimensional trajectory. The processor **102** can animate the object **109** so that it follows the calculated trajectory. The processor **102** can determine when and where the trajectory intersects the display unit **112**.

To illustrate this concept, consider the example depicted in FIG. 1B, in which the object **109** in the image projected on the projection area is a ball. The user interacts with the object by kicking it. The processor **102** analyzes images of the projection area **108** obtained with the image capture device **106** to detect the kick and calculates a trajectory **113** for the ball **109**. The user can follow the trajectory of the ball through the images projected in the projection area **108** and presented on the display **112**.

In another embodiment, the projection area **108** may be treated as a window into a 3D world. An example of such an embodiment is shown in FIG. 1C. The projector **104** may be configured to project three dimensional images. The user's head **H** may be tracked and images may be modified accordingly to change the three-dimensional view seen by the user **101** as the user views the projection area **108** from different angles. The projector **104** could project images on the projection area containing features that have depth. Examples of such features include pits that appear to have depth below the level of the projection area **108** or projections that appear to extend above the level of the projection area.

By way of example, and not by way of limitation, the projector **104** could be configured to project 3D images using conventional stereo 3D projection technology and polarized 3D glasses. FIG. 2 Illustrates an example of how such a system would work. In this example, an interactive video system **200** includes a short throw stereo projector **204** and a camera **206** coupled to a processor **202**. The stereo projector **204** includes two sets of projection optics **205A**, **205B** that project left eye and right eye images **208A**, **208B** of the same scene from vantage points that are slightly offset laterally with respect to each other. Each set of projection optics includes a polarizing filter. The polarizing filter in each set of optics imparts a different polarization to the light forming the left eye image **208A** and right eye image **208B**. A pair of 3D viewing glasses **210** has correspondingly polarized left and right lenses **212A**, **212B**. When the images **208A**, **208B** are viewed through the glasses the left lens **212A** filters out the right eye image **208B** and the right lens **212B** filters out the left eye image **208A**. As a result, a three dimensional image is perceived. If the user's head **H** is tracked, e.g., by tracking the glasses **210** with the camera **206**, the processor **202** can adjust the lateral offset between the images **208A**, **208B** and modify the images as the user's point of view changes with respect to the location of the images.

There are a number of different possible configurations for the processor and other components that are used in the systems described herein. By way of example, and not by way of limitation, FIG. 3 depicts a block diagram illustrating the components of an interactive video system **300** according to an embodiment of the present invention. By way of example, and without loss of generality, certain elements of the system **300** may be implemented with a computer system, such as a personal computer, video game console, audio player, tablet computer, cellular phone, portable gaming device, or other digital device.

The system **300** may include a processor unit **301** configured to run software applications and optionally an operating system. The processor unit **301** may include one or more processing cores. By way of example and without limitation, the processor unit **301** may be a parallel processor module that uses one or more main processors, sometimes and (optionally) one or more co-processor elements. In some implementations the co-processor units may include dedicated local storage units configured to store data and or coded instructions. Alternatively, the processor unit **301** may be any single-core or multi-core (e.g., dual core or quad core) processor.

A non-transitory storage medium, such as a memory **302** may be coupled to the processor unit **301**. The memory **302** may store program instructions and data for use by the processor unit **301**. The memory **302** may be in the form of an integrated circuit, e.g., RAM, DRAM, ROM, and the like). A computer program **303** and data **307** may be stored in the memory **302** in the form of instructions that can be executed on the processor unit **301**. The program **303** may include instructions configured to implement, amongst other things, a method for interactive video, e.g., as described above. For example, the system **300** may be configured, e.g., through appropriate instructions in the program **303** to synchronize images projected by a projector to game activity that is displayed on a display.

The system **300** may also include well-known support functions **310**, such as input/output (I/O) elements **311**, power supplies (P/S) **312**, a clock (CLK) **313** and cache **314**. The system **300** may further include a storage device **315** that provides an additional non-transitory storage medium for processor-executable instructions and data. The storage device **315** may be used for temporary or long-term storage of information. By way of example, the storage device **315** may be a fixed disk drive, removable disk drive, flash memory device, tape drive, CD-ROM, DVD-

ROM, Blu-ray, HD-DVD, UMD, or other optical storage devices. The storage device **315** may be configured to facilitate quick loading of the information into the memory **302**.

One or more user interfaces **318** may be used to communicate user inputs from one or more users to the computer device **300**. By way of example, one or more of the user input devices **318** may be coupled to the client device **300** via the I/O elements **311**. Examples of suitable input device **320** include keyboards, mice, joysticks, game controllers, touch pads, touch screens, light pens, still or video cameras, and/or microphones. In addition, the headset **319** may be coupled to the device **300** via the I/O elements **311**.

The system may include a short-throw projector **316**, which may be configured as described above and a video camera **317**, which may be a two-dimensional or three-dimensional camera. The projector **316** and camera **317** may be coupled to the processor via the I/O elements **311**.

The client device **300** may include a network interface **325** to facilitate communication via an electronic communications network **327**. The network interface **325** may be configured to implement wired or wireless communication over local area networks and wide area networks such as the Internet. The client device **300** may send and receive data and/or requests for files via one or more message packets **326** over the network **327**.

In some embodiments, the device **300** may further comprise a graphics subsystem **330**, which may include a graphics processing unit (GPU) **335** and graphics memory **340**. The graphics memory **340** may include a display memory (e.g., a frame buffer) used for storing pixel data for each pixel of an output image. The graphics memory **340** may be integrated in the same device as the GPU **335**, connected as a separate device with GPU **335**, and/or implemented within the memory **306**. Pixel data may be provided to the graphics memory **340** directly from the processor unit **301**. Alternatively, the processor unit **301** may provide the GPU **335** with data and/or instructions defining the desired output images, from which the GPU **335** may generate the pixel data of one or more output images. The data and/or instructions defining the desired output images may be stored in memory **310** and/or graphics memory **340**. In an embodiment, the GPU **335** may be configured (e.g., by suitable programming or hardware configuration) with 3D rendering capabilities for generating pixel data for output images from instructions and data defining the geometry, lighting, shading, texturing, motion, and/or camera parameters for a scene. The GPU **335** may further include one or more programmable execution units capable of executing shader programs.

The graphics subsystem **330** may periodically output pixel data for an image from the graphics memory **340** to be displayed by the projector **316** or on a separate video display device **350**. The video display device **350** may be any device capable of displaying visual information in response to a signal from the client device **300**, including CRT, LCD, plasma, and OLED displays. The computer client device **300** may provide the display device **350** with an analog or digital signal. By way of example, the display **350** may include a cathode ray tube (CRT) or flat panel screen that displays text, numerals, graphical symbols or images.

The components of the device **300**, including the CPU **305**, memory **306**, support functions **310**, data storage **315**, user input devices **320**, network interface **325**, audio processor **355**, and an optional geo-location device **356** may be operably connected to each other via one or more data buses **360**. These components may be implemented in hardware, software or firmware or some combination of two or more of these.

While the above is a complete description of the preferred embodiments of the present invention, it is possible to use various alternatives, modifications, and equivalents. Therefore, the scope of the present invention should be determined not with reference to the above description but should, instead, be determined with reference to the appended claims, along with their full scope of equivalents. Any feature, whether preferred or not, may be combined with any other feature, whether preferred or not. In the claims that follow, <u>the indefinite article "A" or "An"</u> refers to a quantity of one or more of the item following the article, except where expressly stated otherwise. The appended claims are not to be interpreted as including means-plus-function limitations, unless such a limitation is explicitly recited in a given claim using the phrase "means for". Any element in a claim that does not explicitly state "means for" performing a specified function, is not to be interpreted as a "means" or "step" clause as specified in 35 USC § 112, ¶ 6.

WHAT IS CLAIMED IS:

1. An interactive video system, comprising:
a processor unit;
a short throw projector coupled to the processor unit, wherein the short throw projector is configured to project images on a projection area located on or parallel to a floor; and
one or more user input devices coupled to the processor, wherein the processor is further configured to receive input signals from the one or more user input devices, wherein the input signals represent a simulated user interaction with the images projected on the projection area, wherein the processor is configured to modify the images projected by the projector in response to the input signals.

2. The system of claim 1, wherein the short throw projector is configured to project horizontally and vertically with respect to a location of the short throw projector.

3. The system of claim 1, wherein the one or more user input devices include an image capture device coupled to the processor unit wherein the processor unit is configured to analyze images obtained with the image capture device and to alter one or more images projected on the projection area in response to the resulting analysis of the images.

4. The system of claim 1, wherein the one or more user input devices include an image capture unit coupled to the processor, wherein the processor unit is configured to analyze images of the display area obtained with the image capture device, wherein the images obtained with the image capture device include portions of images projected by the short throw projector, wherein the processor is configured to determine whether a portion of a projected image is occluded by an object and to cut out projection of the portion of the projected image that is occluded.

5. The system of claim 1, wherein the one or more user input devices include a touch sensor array coupled to the processor.

6. The system of claim 1, wherein the one or more user input devices include a touch sensor array and an image capture device coupled to the processor unit, wherein the processor unit is configured to analyze images of the touch sensor array obtained by the image capture device and adjust projection of images projected by the projector such that the projected images align with the touch sensor array in a predetermined manner.

7. The system of claim 1, wherein the one or more user input devices include a touch sensor array and an image capture device coupled to the processor unit, wherein the processor unit is configured to analyze images of the touch sensor array obtained by the image capture device and inputs from the touch sensor array in response to user interaction with the touch sensor array and alter one or more images projected on the touch sensor array in response to the inputs from the touch sensor array.

8. The system of claim 1, further comprising a display unit coupled to the processor, wherein the processor is configured to co-ordinate projection of images on the projection area with presentation of images on the display.

9. The system of claim 8, wherein the processor is configured to co-ordinate projection of images on the projection area with presentation of images on the display by calculating a trajectory of an object in an image projected on the projection area and projecting images on the projection area and the display that track the object from the projection area to the display.

10. The system of claim 8, wherein the processor is configured to co-ordinate projection of images on the projection area with presentation of images on the display by calculating a trajectory of an object in an image presented on the display and projecting images on the projection area and the display that track the object from the display to the projection area.

11. The system of claim 1, wherein the image capture device and the short throw projector are incorporated into the same unit such that there is a fixed relationship between relative locations of the image capture device and the short throw projector.

12. The system of claim 1, wherein the short throw projector is a stereo projection system configured to co-operate with polarized 3D glasses.

13. An interactive video system, comprising:

a processor unit,

wherein the processor unit is configured to provide output signals to a short throw projector, wherein the output signals are configured to cause the short throw projector to project images on a projection area located on or parallel to a floor;

and wherein the processor is further configured to receive input signals from one or more user input devices, wherein the input signals represent a simulated user interaction with the images projected on the projection area; and

wherein the processor is configured to alter one or more of the images projected on the projection area in response to the input signals.

14. The system of claim 13, further comprising a short throw projector coupled to the processor, wherein the short throw projector is configured to project images on a projection area located on or parallel to a floor.

15. The system of claim 14, wherein the short throw projector is configured to project horizontally and vertically with respect to a location of the short throw projector.

16. The system of claim 13, further comprising one or more input devices coupled to the processor, wherein one or more input devices are configured to generate the input signals that represent the simulated user interaction with the images projected on the projection area.

17. The system of claim 13, wherein the one or more input devices include an image capture device.

18. The system of claim 13, wherein the one or more input devices include a touch sensor array, wherein the touch sensor array includes an array of sensors, wherein each sensor in the array has a known location in the array, and wherein each sensor in the array is configured to generate an input signal in response to a user’s contact with or proximity to the sensor.

19. The system of claim 13, wherein the short throw projector is configured to project three-dimensional images.

20. The system of claim 19, wherein the short throw projector is a stereo projection system configured to co-operate with polarized 3D glasses.

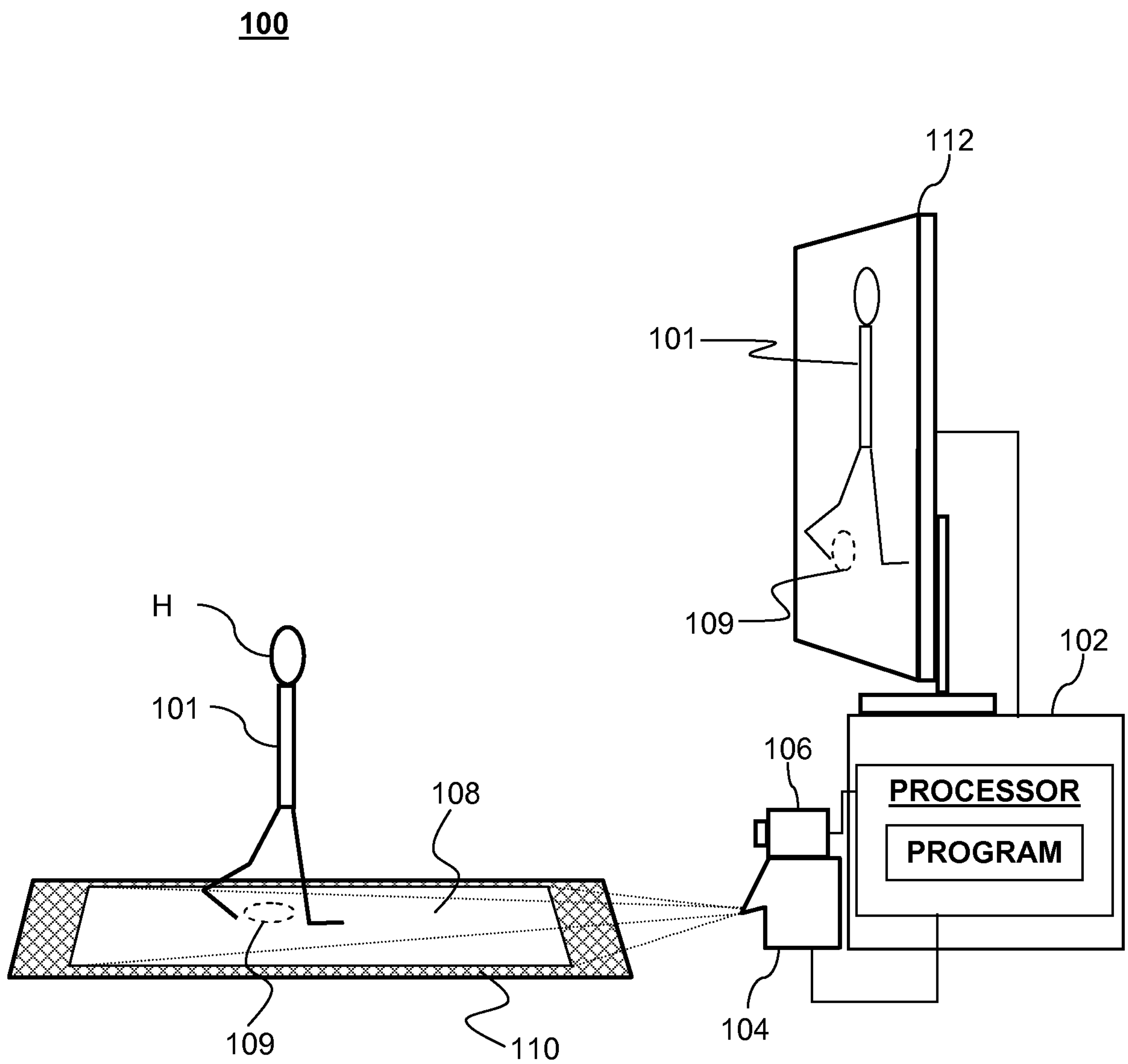

100
112
101
109
102
H
101
106
PROCESSOR
PROGRAM
108
109
110
104

FIG. 1A

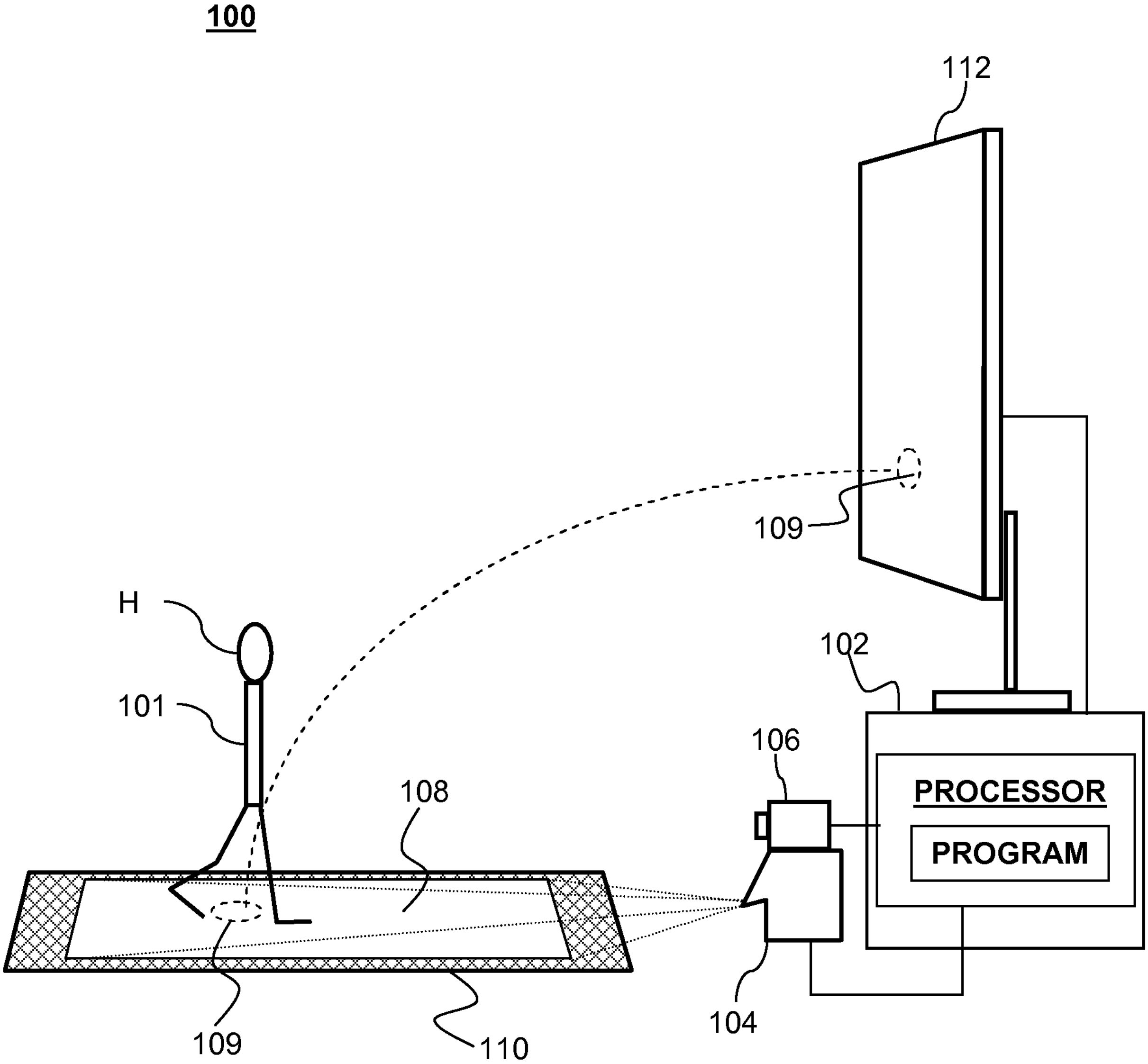


FIG. 1B

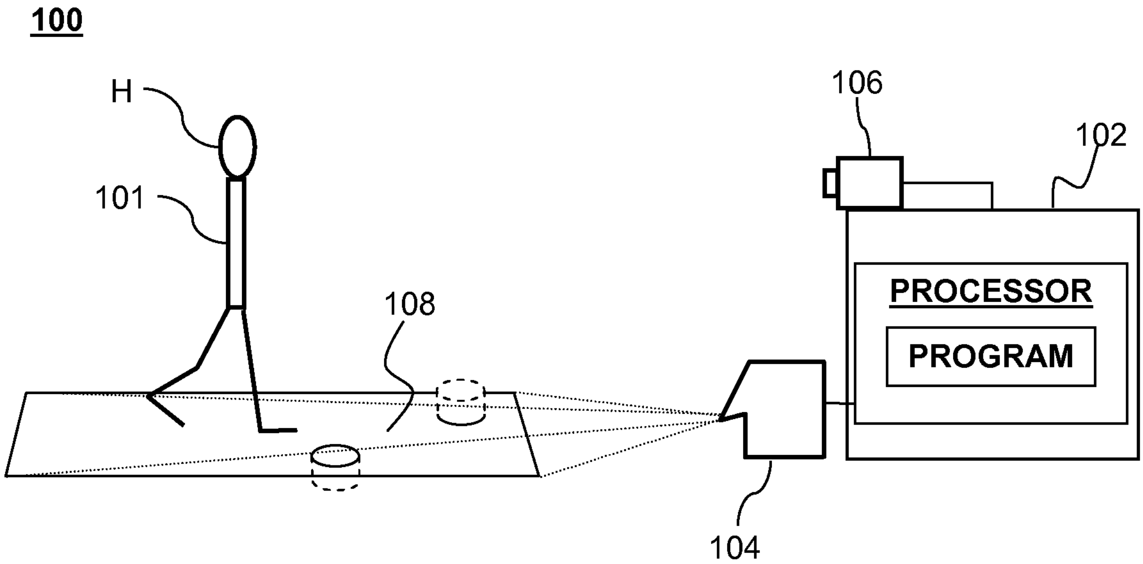
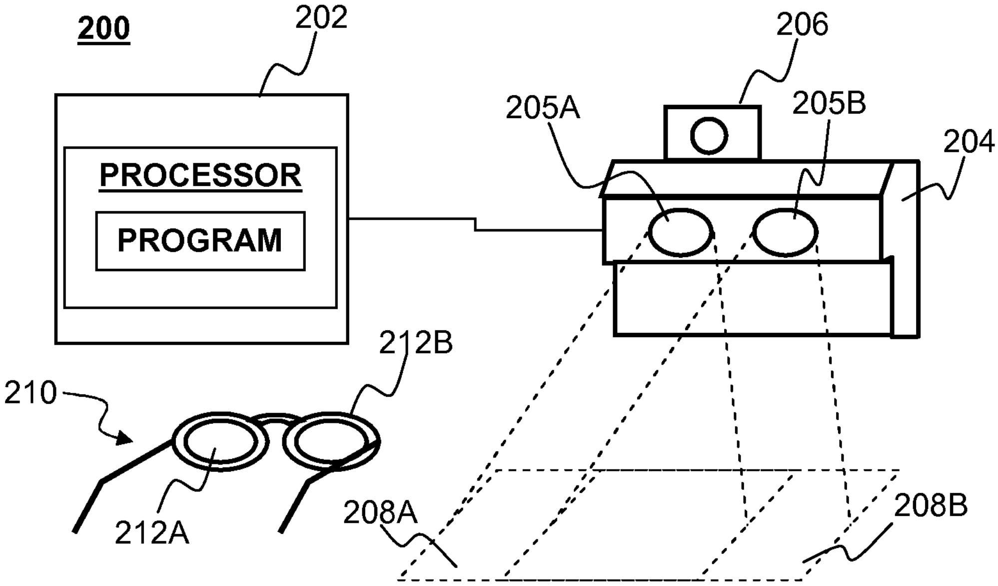

100
H
101
108
106
102
PROCESSOR
PROGRAM
104

FIG. 1C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202
PROCESSOR
PROGRAM
206
205A
205B
204
212B
210
212A
208A
208B

FIG. 2

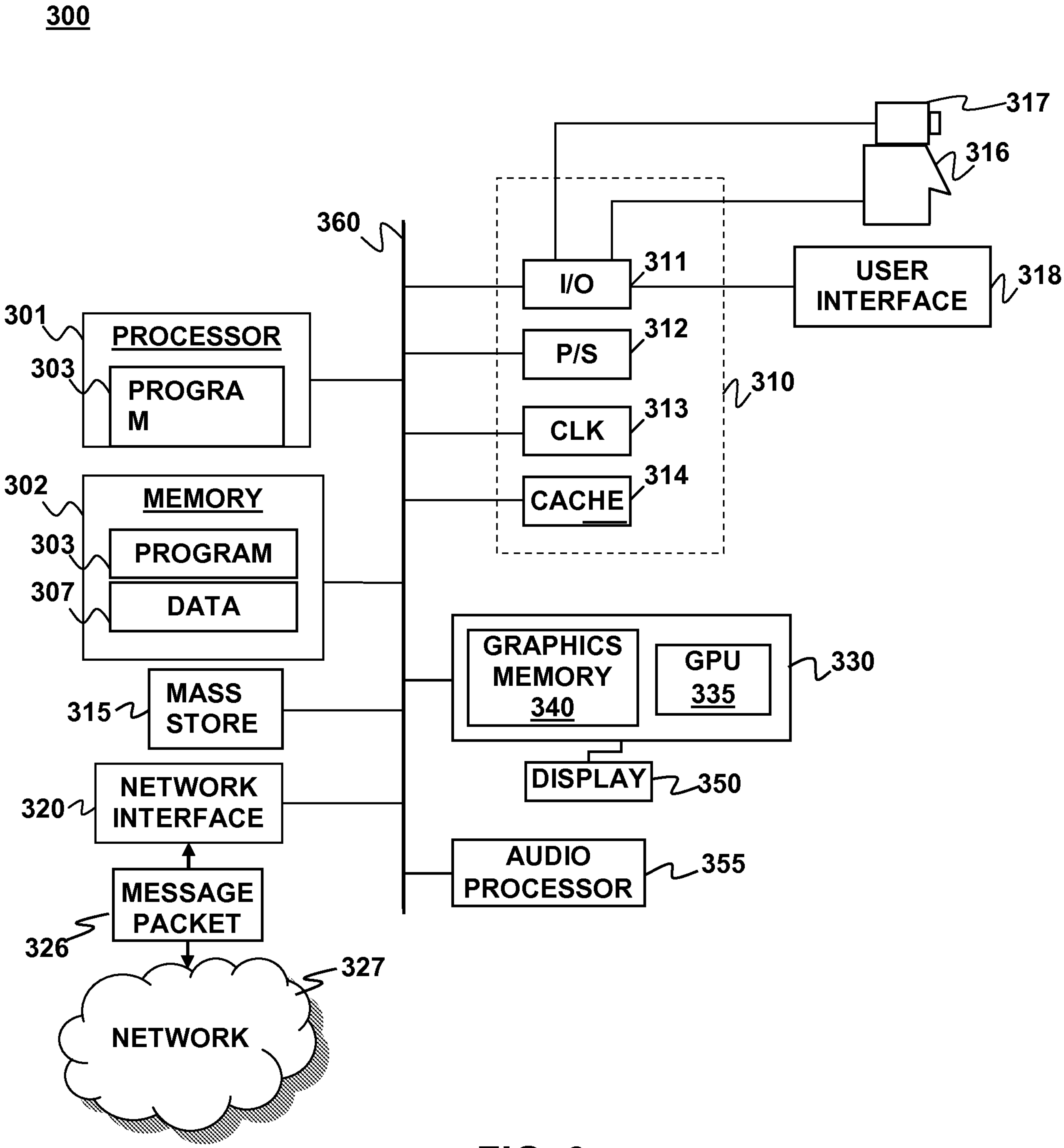
300
317
316
360
311
I/O
USER INTERFACE
318
301
PROCESSOR
303
PROGRA M
312
P/S
310
313
CLK
302
MEMORY
314
CACHE
303
PROGRAM
307
DATA
GRAPHICS MEMORY 340
GPU 335
330
315
MASS STORE
DISPLAY
350
320
NETWORK INTERFACE
AUDIO PROCESSOR
355
MESSAGE PACKET
326
327
NETWORK

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2013/038130

A. CLASSIFICATION OF SUBJECT MATTER
G06T 13/00 (2001.01) *H04N 13/02 (2006.01)*
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) H04N 3/00-3/14, 13/00, 13/02, G06F 7/00-7/04, G06T 15/00-15/70, 13/00-13/80
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatSearch (RUPTO internal), USPTO, PAJ, Esp@cenet, Information Retrieval System of FIPS (http://www.fips.ru)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MOHAMMAD Ardavan et al. Interactive Floor. Design Project Report. Interaction Design, IT-University. Chalmers University of Technology [online] 27 May 2009. Retrieved from the Internet: <URL: http://web.student.chalmers.se/groups/idp09-9/report.pdf>, par. 1-4	1, 3, 4, 13, 14, 17
Y		2, 5-12, 15, 16, 18-20
Y	US 2002/0186221 A1 (REACTRIX SYSTEMS, INC.) 12.12.2002, par. [0031], [0032], [0052], [0075], [0079], fig. 1	2, 8, 9, 10, 15
Y	WO 2007/024621 A2 (TEXAS INSTRUMENTS INCORPORATED et al.) 01.03.2007, abstract	11
Y	US 2010/0194525 A1 (INTERNATIONAL BUSINESS MACHINES CORPORATION) 05.08.2010, abstract, fig. 1	5, 6, 7, 16, 18

[X] 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

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"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	Date of mailing of the international search report
15 July 2013 (15.07.2013)	29 August 2013 (29.08.2013)
Name and mailing address of the ISA/ FIPS Russia, 123995, Moscow, G-59, GSP-5, Berezhkovskaya nab., 30-1 Facsimile No. +7 (499) 243-33-37	Authorized officer D. Gudilin Telephone No. (499) 240-25-91

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Clearing the 3D Confusion: What You Need to Know. The Project Expert White Paper Series. Optoma Technology, Inc., 2011 [online]. Retrieved from the Internet: <URL: http://http://www.optomausa.com/emarketing/download/white_paper/optoma_clearing-the-3d-confusion.pdf>, p. 3, par. Playing Games, p. 4,	12, 19, 20