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(54) Keksinnön nimitys - Uppfinningens benämning - Title of the invention
Virtuaalitodellisuusjärjestelmä
System för virtuell verklighet
Virtual reality system

(56) Viitejulkaisut - Anförda publikationer - References cited
US 2014016100 A1, US 2016165196 A1, JP 2014085413 A, US 2013250251 A1

(57) Tiivistelmä - Sammandrag - Abstract

Esillä olevan keksinnön esimerkinäkökohdan mukaisesti on aikaansaatu, että virtuaalitodellisuusjärjestelmällä määritetään (202), vasteena syötteen vastaanottamiseen käyttäjältä käyttäjäsyötelaitteella, ovatko projektorit ja projektoriohjainyksikkö kytketty päälle vai pois päältä. Virtuaalitodellisuusjärjestelmällä kytketään (204) projektorit ja projektoriohjainyksikkö päälle, kun projektorit ja projektoriohjainyksikkö on kytketty pois päältä.

According to an example aspect of the present invention, there is provided determining (202), by a virtual reality system a, in response to receiving an input from a user by a user input device, whether projectors and a projector controller are turned on or off. Turning on (204), by the virtual reality system, the projectors and projector controller unit, when the projectors and the projector controller unit are turned off.

202 determining, by the virtual reality system a, in response to receiving an input from the user by the user input device, whether the projectors and the projector controller are turned on or off

204 turning on, by the virtual reality system, the projectors and projector controller unit, when the projectors and the projector controller unit are turned off

VIRTUAL REALITY SYSTEM

FIELD

[0001] The present invention relates to a virtual reality system and particularly to
5 controlling the virtual reality system.

BACKGROUND

[0002] Virtual reality systems are used in diverse environments and by people that
may have not been used such systems before. A virtual reality system is a complex system,
10 which includes projectors and a projector control unit. Typically the virtual reality system
can be controlled by a user operating the projector control unit over a control application
executed on an operating system running on the projector control unit. The projectors are
installed to locations near the roof, for unobstructed projection of the virtual reality
environment. For successfully operating the virtual reality system, a user should be trained
15 to use the control application on the projector control unit and troubleshoot any problems
with the projectors, projector control unit and the control application. Since the projectors
are typically near the roof and out of sight, a closer inspection for troubleshooting the
projectors is difficult. Remote controls can provide control of the projectors, however, only
one-by-one.

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SUMMARY OF THE INVENTION

[0003] The invention is defined by the features of the independent claims. Some
specific embodiments are defined in the dependent claims.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIGURE 1 illustrates an example of virtual reality system in accordance of at
least some embodiments of the present invention;

[0005] FIGURE 2 illustrates an example of a method for a virtual reality system in accordance with at least some embodiments;

[0006] FIGURE 3 illustrates an example of a method for a virtual reality system in accordance with at least some embodiments;

5 [0007] FIGURE 4 illustrates an example of a sequence in accordance with at least some embodiments;

[0008] FIGURE 5 illustrates an example of a view generated by the virtual reality system on a surface arrangement;

[0009] FIGURE 6 illustrates an example of user input device installed to a virtual
10 reality system in accordance with at least some embodiments.

EMBODIMENTS

[0010] FIGURE 1 illustrates an example of virtual reality system (VRS) 100 in
15 accordance of at least some embodiments of the present invention. The virtual reality system comprises a projector system comprising a projector controller unit 104 and projectors 106a, 106b, 106c controlled by the projector controller unit for projecting a virtual reality environment on a surface arrangement comprising at least three surfaces. The virtual reality system comprises a user input device 108 operatively connected to the
20 projector system for receiving an input from a user for controlling the projector system.

[0011] It should be appreciated that the VRS may further comprise one or more additional devices 110, 112 of the VRS. The additional devices that may be utilized for complementing the virtual reality environment provided by the VRS. The additional devices may be capable of adjusting and/or improving a true-to-life experience provided by
25 the VRS to a user viewing the virtual reality environment. Additionally or alternatively the additional devices may be or serve for user input devices and/or user output devices.

[0012] Examples of the user input devices 108 comprise devices that are capable of receiving user input such as touch or voice and capable of causing cause a command to the

VRS in response to the user input. A user input device capable of receiving touch of the user may be a button, a push-button, a switch, a key, a keypad or touch screen. A user input device capable of receiving voice of the user may be a microphone. The user input device may be incorporated in another device for example a computing device such as a tablet computer or a smart phone. In this way the user input device may serve for both using the applications and/or operating system of the computing device as well as the virtual reality system.

[0013] Examples of the user output devices comprise devices that are capable of displaying viewable information to the user or capable of haptic communications with the user. The user output device may be a display or touch screen. The user output devices may be capable of outputting information to the user in response to an operational state of the VRS and/or a user input. Additionally or alternatively the additional devices may comprise sensors. Examples of the sensors comprise temperature sensors, optical sensors, still cameras and video cameras.

[0014] The user input device 108, the additional devices 110, 112, the projector controller 104 and the projectors 106a, 106b, 106c may be connected to a control system 114 of the VRS. The control system may be a dedicated system and physically separate from the projector controller. On the other hand the control system may be integrated into the projector controller, whereby the projector controller may control all the devices in the VRS.

[0015] Connections illustrated in FIGURE 1 by straight lines between the devices of the VRS may be implemented by cable connections or wireless connections that are capable of data communications for transfer of information such as messages and commands between the devices. Examples of the cable connections comprise an Ethernet connection and an RS-323 serial port connection. Examples of the wireless connections comprise a wireless local area network connection according to IEEE 802.11, Zigbee and Bluetooth. Connections (not illustrated) between the projectors and the projector controller may be capable of communications of video signal for projecting the virtual reality environment by the projectors. Examples of the connections between the projectors and the projector controller comprise composite video, SCART, Video Graphics Array (VGA), Digital visual interface, High-Definition Multimedia Interface and Mobile High-Definition Link connections.

[0016] The VRS 100 may be a virtual cave. A virtual cave refers to a room, part of a room or a part of a space in a building, where a virtual reality view may be presented viewable to a person within the virtual reality cave on the surface arrangement comprising at least three surfaces. The surfaces may comprise one or more wall surfaces, a floor surface and/or a ceiling surface. In an example, three planar wall surfaces may be hinged together to form a corner and a floor surface in front of the wall surfaces may serve as the fourth surface of the VRS for presenting a virtual reality view. The projector controller may serve as a source of video signal for the projectors such that when the video signals are received by the projectors and projected to the surfaces, a virtual reality environment may be generated. The video signals may be stereo video signals, for example. The virtual reality view may be viewed by a person, when the person is observing the projections on the wall, floor and/or ceiling surfaces. The virtual cave may have a viewing location. The viewing location is a location on the floor space of the virtual cave, where the virtual reality view may be optimally viewed by a person. The VRS may comprise a virtual reality viewing accessory for viewing the virtual reality view. The virtual reality viewing accessory may be worn by the person for viewing the virtual reality view. Examples of the virtual reality viewing accessory comprise virtual reality glasses. Virtual reality glasses may be adapted for viewing the projected stereo video signal. For example, the virtual reality glasses may comprise different colors of lenses/films in front of the left and right eyes.

[0017] FIGURE 2 illustrates an example of a method for a virtual reality system in accordance with at least some embodiments. The method may be performed by a control system of the virtual reality system illustrated in FIGURE 1 for example. Phase 202 comprises determining, by the virtual reality system, in response to receiving an input from the user by the user input device, whether the projectors and the projector controller are turned on or off. Phase 204 comprises turning on, by the virtual reality system, the projectors and projector controller unit, when the projectors and the projector controller unit are turned off. In this way a single input by the user may be used to determine current operational states, e.g. turned on or turned off, of the projectors and projector controller unit, and the current operational states may be used to determine a next operational state that is applied to the projectors and projector controller unit.

[0018] FIGURE 3 illustrates an example of a method for a virtual reality system in accordance with at least some embodiments. The method may be performed by a control system of the VRS after the VRS or at least part of the virtual reality system is turned on, for example according to the method of FIGURE 2. Phase 302 comprises receiving a user input from the user by the user input device. Phase 304 comprises determining, whether the projectors and the projector controller are turned on or off similar to phase 202. It should be appreciated that each of the projectors and the projector controller may be turned on or off. Accordingly, all or only a part of the projectors and the projector controller may be turned on. On the other hand, all or only a part of the projectors and the projector controller may be turned on or turned off. In an example, the projectors and the projector controller unit may be turned on after phase 204.

[0019] Phase 306 comprises turning off, by the virtual reality system, the projectors and projector controller unit, when the projectors and the projector controller unit or at least part of the projectors and the projector controller unit are turned on.

[0020] On the other hand, when at least part of the projectors and the projector controller unit are not turned on, for example when all the projectors and the projector controller unit are turned off, the phase 308 may be performed and the projectors and projector controller unit may be turned on by the virtual reality system in accordance with phase 204.

[0021] In an embodiment, phase 306 is performed in response to receiving a subsequent user input after a first user input within a time limit in phase 310. Phase 310 may follow after the projectors and the projector controller unit or at least part of the projectors and the projector controller unit are turned on. Accordingly, the method may comprise determining in phase 310, whether the time limit has passed since a previous input from the user by the user input device in phase 302. If the time limit has not passed the method may proceed to phase 306 for turning off the projectors and the projector controller unit in response to the subsequent user input. On the other hand if the time limit has passed, the turning off may be omitted and the method may proceed from phase 310 to phase 304 to determine whether the projectors and the projector controller are turned on or off.

[0022] It should be appreciated that, when a user input or information indicating user input is received e.g. by the user input device or the control system, the time of user input may be registered for facilitating the determining of whether the time limit has passed when a subsequent user input or information indicating user input is received.

5 **[0023]** FIGURE 4 illustrates an example of a sequence in accordance with at least some embodiments. The sequence is illustrated with reference to the items of FIGURE 1. Phase 404 comprises receiving, by a control system 114, information indicating a user input from a user input device 108. The user input may be received for example as described in phase 302. The information indicating the user input may comprise analog or
10 digital data. The data may be a message indicating input of the user. Phase 406 may comprise determining operational states of one or more devices of the VRS. An operational state may comprise information indicating whether a device is turned on, a device is turned off, a device is in standby and/or a device has an error. Accordingly, the phase 406 may be performed in accordance with phase 202 and phase 304.

15 **[0024]** When the device is turned on, the device may be operational in the VRS. When the device is operational in the VRS it may contribute directly or indirectly to generating the virtual reality environment and/or supporting the operation of the VRS. In this state, the device is consuming electrical power. On the other hand, when the device is turned off, the device does not contribute directly or indirectly to generating the virtual
20 reality environment and/or supporting the operation of the VRS, and the device is not consuming electrical power. When the device is in standby, the device may not contribute directly or indirectly to generating the virtual reality environment and/or supporting the operation of the VRS, but however, the device may be turned on more quickly than if the device was turned off. In the standby state the power consumption of the device is less than
25 if the device was turned on, but higher than if the device was turned off. In an example, in the standby state of the device a startup sequence of the device from the standby state to the turned on state may be shorter in time than a startup sequence of the device from a turned off state to the turned on state. The shorter time may be achieved by maintaining at least part of the parts of the device powered in the standby state such that a number of
30 operations in the startup sequence from the standby state to the turned on state is less than the number of operations in the startup sequence from the turned off state to the turned on

state. When the device has an error at least part of the functionalities of the device available in a non-error state may be unavailable at the device.

[0025] In an embodiment, determining the operational state in phase 406 may comprise determining whether the projectors and the projector controller are turned on or off similar to phase 202. Alternatively or additionally one or more other states may be determined. It should be appreciated that instead or in additionally states of other devices such as the additional devices 112, 114 of the VRS may be determined.

[0026] After phase 406 a next operational state for one or more of the devices of the VRS may be applied in phase 410 on the basis of the determined operational states in phase 406. In an example, phase 410 may comprise turning on the projectors and projector controller unit, when the projectors and the projector controller unit are turned off. In an example phase 410 may comprise turning off the projectors and projector controller unit, when the projectors and the projector controller unit or at least part of the projectors and the projector controller unit are turned on.

[0027] Phase 408 may comprise receiving a subsequent user input within a time limit. In this way phase 410 may comprise turning off the projectors and projector controller unit in response to receiving the subsequent user input in phase 408. Since the devices are turned off in response to the user input within a time limit, turning off the devices is essentially confirmed by the user by the subsequent user input before the phase 410 is executed. If the user input is not received within the time limit, the phase 410 may be omitted and the user input may be determined as a first user input, for example the user input communicated in phase 404.

[0028] It should be appreciated that phases 406 and 410 may comprise messaging for obtaining information such as information indicating operational states and commands for applying next operational states. The messaging may comprise requests and responses. Responses may be omitted for example for a command to a device to apply a next operational state.

[0029] FIGURE 5 illustrates an example of a view 502 generated by the virtual reality system on a surface arrangement. The view may comprise a message 504 indicating the user that a confirmation of a user input is needed. The message may read for example “Do you want to turn off the system?”. The message may be displayed for example after a

first user input is received and it is determined that the projectors and the projector controller unit or at least part of the projectors and the projector controller unit are turned on, for example in accordance with phase 304. Accordingly, the message may be displayed by the virtual reality system during a time limit for receiving a subsequent user input for turning off the projectors and the projector controller. If the subsequent user input is received within the time limit from the user, the projectors and projector control unit may be turned off, for example in accordance with phase 306 and 410. However, if the time limit is passed without the subsequent user input, the message may be removed. In this way the virtual reality system displays a message during the time limit for indicating a need for the subsequent user input, whereby the user may be guided to give a further user input by the user input device to confirm that the devices are turned off. It should be appreciated that additionally or alternatively the devices in the VRS may be other devices than the projectors and the projector control unit, and the next operational state may be another state than a turned off state. Examples of the operational states comprise turned on, a device is turned off, a device is in standby and/or a device has an error.

[0030] FIGURE 6 illustrates an example of user input device installed to a virtual reality system in accordance with at least some embodiments. The virtual reality system may be in accordance with the virtual reality system described with FIGURE 1. The VRS may comprise a surface arrangement comprising surfaces 602 on which video signal from projectors may be projected. A user input device 604 may be installed to a side 606 of at least one of the surfaces. In this way the video signal is not projected on the user input device and user contact to the surface in connection with operating the user input device may be prevented. The side of the surface 602 may be a vertical side of the surface. The side may be facing into a direction that is away from the projectors.

[0031] An embodiment concerns a computer program comprising executable code, which when executed by a virtual reality system comprising a projector system comprising a projector controller unit and projectors controlled by the projector controller unit for projecting a virtual reality environment on a surface arrangement comprising at least three surfaces and a user input device connected to the projector system is configured to cause one or more functionalities according to an embodiment.

[0032] An apparatus, virtual reality system, control system and projector control unit according to an embodiment may comprise memory and processor. Memory may comprise

random-access memory and/or permanent memory. Memory may comprise at least one RAM chip. Memory may comprise solid-state, magnetic, optical and/or holographic memory, for example. Memory may be at least in part accessible to processor, a computer or other means for controlling. Memory may be at least in part comprised in processor.

5 Memory may be means for storing information. Memory may be non-transitory computer readable medium. Memory may comprise computer instructions that processor is configured to execute. The computer instructions may be executable code of a computer program. When computer instructions configured to cause processor to perform certain actions are stored in memory, and apparatus overall is configured to run under the direction

10 of processor using computer instructions from memory, processor and/or its at least one processing core may be considered to be configured to perform said certain actions. Memory may be at least in part comprised in processor. Memory may be at least in part external to device but accessible to device. Processor may comprise, for example, a single- or multi-core processor wherein a single-core processor comprises one processing core and

15 a multi-core processor comprises more than one processing core. Processor may comprise more than one processor. A processing core may comprise, for example, a Cortex-A8 processing core manufactured by ARM Holdings or a Steamroller processing core produced by Advanced Micro Devices Corporation. Processor may comprise for example Qualcomm Snapdragon and/or Intel Atom processor. Processor may comprise at least one

20 application-specific integrated circuit, ASIC. Processor may comprise at least one field-programmable gate array, FPGA. Processor may be means for performing method steps in device. Processor may be configured, at least in part by computer instructions, to perform actions.

[0033] It is to be understood that the embodiments of the invention disclosed are not

25 limited to the particular structures, process steps, or materials disclosed herein, but are extended to equivalents thereof as would be recognized by those ordinarily skilled in the relevant arts. It should also be understood that terminology employed herein is used for the purpose of describing particular embodiments only and is not intended to be limiting.

[0034] Reference throughout this specification to “one embodiment” or “an embodiment” means that a particular feature, structure, or characteristic described in

30 connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases “in one embodiment” or “in an embodiment”

in various places throughout this specification are not necessarily all referring to the same embodiment.

[0035] As used herein, a plurality of items, structural elements, compositional elements, and/or materials may be presented in a common list for convenience. However, 5 these lists should be construed as though each member of the list is individually identified as a separate and unique member. Thus, no individual member of such list should be construed as a de facto equivalent of any other member of the same list solely based on their presentation in a common group without indications to the contrary. In addition, various embodiments and example of the present invention may be referred to herein along 10 with alternatives for the various components thereof. It is understood that such embodiments, examples, and alternatives are not to be construed as de facto equivalents of one another, but are to be considered as separate and autonomous representations of the present invention.

[0036] Furthermore, the described features, structures, or characteristics may be 15 combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided, such as examples of lengths, widths, shapes, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention can be practiced without one or more of the specific details, or with other methods, components, materials, 20 etc. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

[0037] While the forgoing examples are illustrative of the principles of the present invention in one or more particular applications, it will be apparent to those of ordinary skill in the art that numerous modifications in form, usage and details of implementation 25 can be made without the exercise of inventive faculty, and without departing from the principles and concepts of the invention. Accordingly, it is not intended that the invention be limited, except as by the claims set forth below.

[0038] The verbs “to comprise” and “to include” are used in this document as open limitations that neither exclude nor require the existence of also un-recited features. The 30 features recited in depending claims are mutually freely combinable unless otherwise explicitly stated. Furthermore, it is to be understood that the use of "a" or "an", i.e. a singular form, throughout this document does not exclude a plurality.

REFERENCE SIGNS LIST

		Projector system
	104	Projector control unit
	106a, 106b, 106c	Projectors
5	108	User input device
	110, 112	Additional devices
	114	Control system of the VRS
	202, 204	Phases of the method of FIGURE 2
	302- 310	Phases of the method FIGURE 3
10	404 to 410	Phases of the sequence in FIGURE 4
	502	View generated by the virtual reality system
	504	Message
	602	Surface
	604	User input device
15	606	Side

CLAIMS:

1. A virtual reality system, comprising:
 - 5 a projector system comprising a projector controller unit and projectors controlled by the projector controller unit for projecting a virtual reality environment on a surface arrangement comprising at least three surfaces;
 - a user input device operatively connected to the projector system, **characterized** in that the virtual reality system is configured to cause:
 - 10 determining (202), by the virtual reality system, in response to receiving an input from the user by the user input device, whether the projectors and the projector controller are turned on or off;
 - turning on (204), by the virtual reality system, the projectors and projector controller unit, when the projectors and the projector controller unit are turned off.
- 15 2. A virtual reality system according to claim 1, wherein the virtual reality system is configured to cause:
 - turning off , by the virtual reality system, the projectors and projector controller unit, when the projectors and the projector controller unit or at least part of the projectors and the
 - 20 projector controller unit are turned on.
3. A virtual reality system according to claim 2, wherein the projectors and projector controller unit are turned off in response to receiving a subsequent user input within a time limit.
- 25 4. A virtual reality system according to claim 3, wherein the virtual reality system displays a message during the time limit for indicating a need for the subsequent user input.
5. A virtual reality system according to any of claims 1 to 4, wherein the virtual reality
- 30 system is configured to cause:
 - turning on, in response to the user input, the projectors and the control unit, when all the projectors and the control unit are turned off.

6. A method for a virtual reality system comprising a projector system comprising a projector controller unit and projectors controlled by the projector controller unit for projecting a virtual reality environment on a surface arrangement comprising at least three surfaces;

5 a user input device connected to the projector system, **characterized** in that the method comprises:

determining (202), by the virtual reality system, in response to receiving an input from the user by the user input device, whether the projectors and the projector controller are turned on or off;

10 turning on (204), by the virtual reality system, the projectors and projector controller unit, when the projectors and the projector controller unit are turned off.

7. A computer program comprising executable code, which when executed by a virtual reality system comprising a projector system comprising a projector controller unit and projectors controlled by the projector controller unit for projecting a virtual reality environment on a surface arrangement comprising at least three surfaces and a user input device connected to the projector system, is **characterized** by causing:

15 determining (202), by the virtual reality system, in response to receiving an input from the user by the user input device, whether the projectors and the projector controller are turned on or off;

20 turning on (204), by the virtual reality system, the projectors and projector controller unit, when the projectors and the projector controller unit are turned off.

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PATENTTIVAATIMUKSET:

1. Virtuaalitodellisuusjärjestelmä, joka käsittää:
projektorijärjestelmän, joka käsittää projektoriohjainyksikön ja projektoriohjainyksikön
5 ohjaamia projektoreja virtuaalitodellisuusympäristön projisoimiseksi pintajärjestelylle,
joka käsittää ainakin kolme pintaa;
käyttäjäsytelaitteen, joka on toiminnallisesti yhdistetty projektorijärjestelmään, **tunnettu**
siitä, että virtuaalitodellisuusjärjestelmä on konfiguroitu aikaansaamaan:
määritetään (202), virtuaalitodellisuusjärjestelmällä, vasteena syötteen vastaanottamiseen
10 käyttäjältä käyttäjäsytelaitteella, ovatko projektorit ja projektoriohjainyksikkö kytketty
päälle vai pois päältä;
kytketään (204), virtuaalitodellisuusjärjestelmällä, projektorit ja projektoriohjainyksikkö
päälle, kun projektorit ja projektoriohjainyksikkö on kytketty pois päältä.
- 15 2. Patenttivaatimuksen 1 mukainen virtuaalitodellisuusjärjestelmä, jolloin
virtuaalitodellisuusjärjestelmä on konfiguroitu aikaansaamaan:
kytketään, virtuaalitodellisuusjärjestelmällä, projektorit ja projektoriohjainyksikkö pois
päältä, kun projektorit ja projektoriohjainyksikkö tai projektoreista ja
projektoriohjainyksiköstä ainakin osa on päälle kytkettynä.
- 20 3. Patenttivaatimuksen 2 mukainen virtuaalitodellisuusjärjestelmä, jolloin projektorit ja
projektoriohjainyksikkö on kytketty pois päältä vasteena seuraavan käyttäjäsytteen
vastaanottamiseen aikarajan sisällä.
- 25 4. Patenttivaatimuksen 3 mukainen virtuaalitodellisuusjärjestelmä, jolloin
virtuaalitodellisuusjärjestelmä esittää viestin aikarajan sisällä seuraavan käyttäjäsytteen
tarpeen osoittamiseksi.
5. Jonkin Patenttivaatimuksen 1-4 mukainen virtuaalitodellisuusjärjestelmä, joka
30 virtuaalitodellisuusjärjestelmä on konfiguroitu aikaansaamaan:
kytketään, vasteena käyttäjäsytteeseen, projektorit ja projektoriohjainyksikkö päälle, kun
kaikki projektorit ja projektoriohjainyksikkö on kytketty pois päältä.

6. Menetelmä virtuaalitodellisuusjärjestelmälle, joka käsittää projektorijärjestelmän, joka käsittää projektoriohjainyksikön ja projektoriohjainyksikön ohjaamia projektoreja virtuaalitodellisuusympäristön projisoimiseksi pintajärjestelylle, joka käsittää ainakin kolme pintaa; käyttäjäsyötelaitteen, joka on kytketty projektorijärjestelmään, **tunnettu** siitä, että menetelmä käsittää:
- määritetään (202), virtuaalitodellisuusjärjestelmällä, vasteena syötteen vastaanottamiseen käyttäjältä käyttäjäsyötelaitteella, ovatko projektorit ja projektoriohjainyksikkö kytketty päälle vai pois päältä;
- 10 kytketään (204), virtuaalitodellisuusjärjestelmällä, projektorit ja projektoriohjainyksikkö päälle, kun projektorit ja projektoriohjainyksikkö on kytketty pois päältä.

7. Tietokoneohjelma, joka käsittää suoritettavaa koodia, joka suoritettaessa virtuaalitodellisuusjärjestelmällä, joka käsittää projektorijärjestelmän, joka käsittää projektoriohjainyksikön ja projektoriohjainyksikön ohjaamia projektoreja virtuaalitodellisuusympäristön projisoimiseksi pintajärjestelylle, joka käsittää ainakin kolme pintaa ja käyttäjäsyötelaitteen, joka on yhdistetty projektorijärjestelmään, on **tunnettu** aikaansaamaan:
- määritetään (202), virtuaalitodellisuusjärjestelmällä, vasteena syötteen vastaanottamiseen käyttäjältä käyttäjäsyötelaitteella, ovatko projektorit ja projektoriohjainyksikkö kytketty päälle vai pois päältä;
- 20 kytketään (204), virtuaalitodellisuusjärjestelmällä, projektorit ja projektoriohjainyksikkö päälle, kun projektorit ja projektoriohjainyksikkö on kytketty pois päältä.

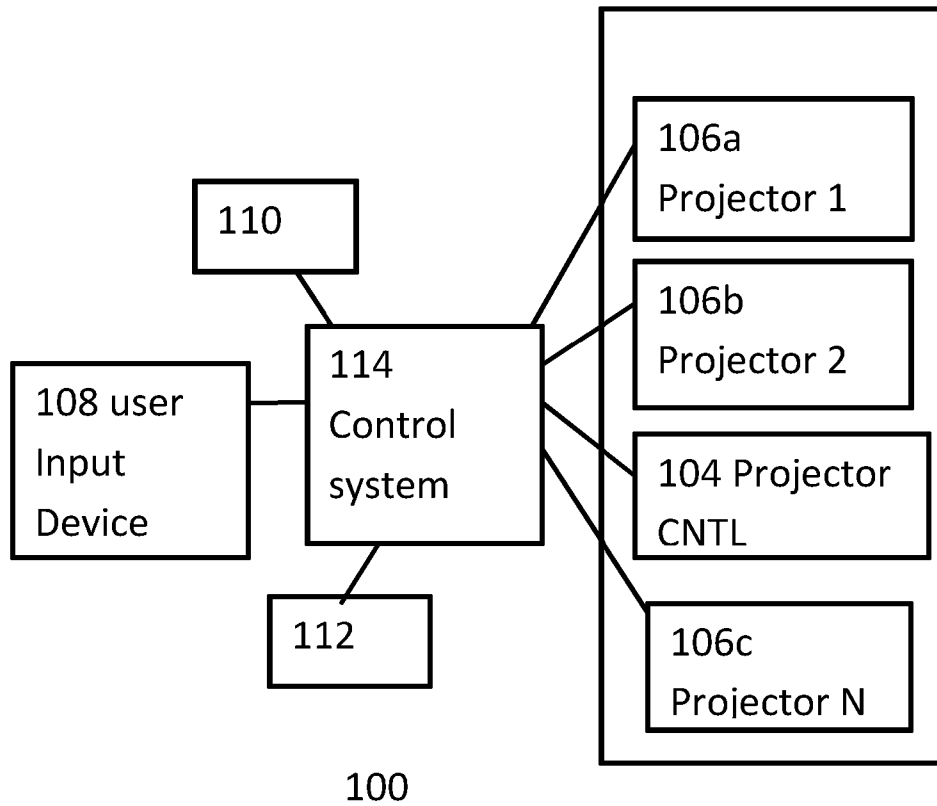


FIG. 1

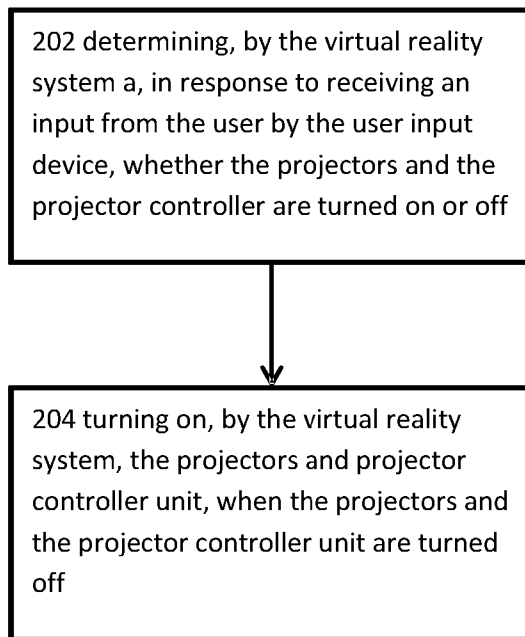


FIG. 2

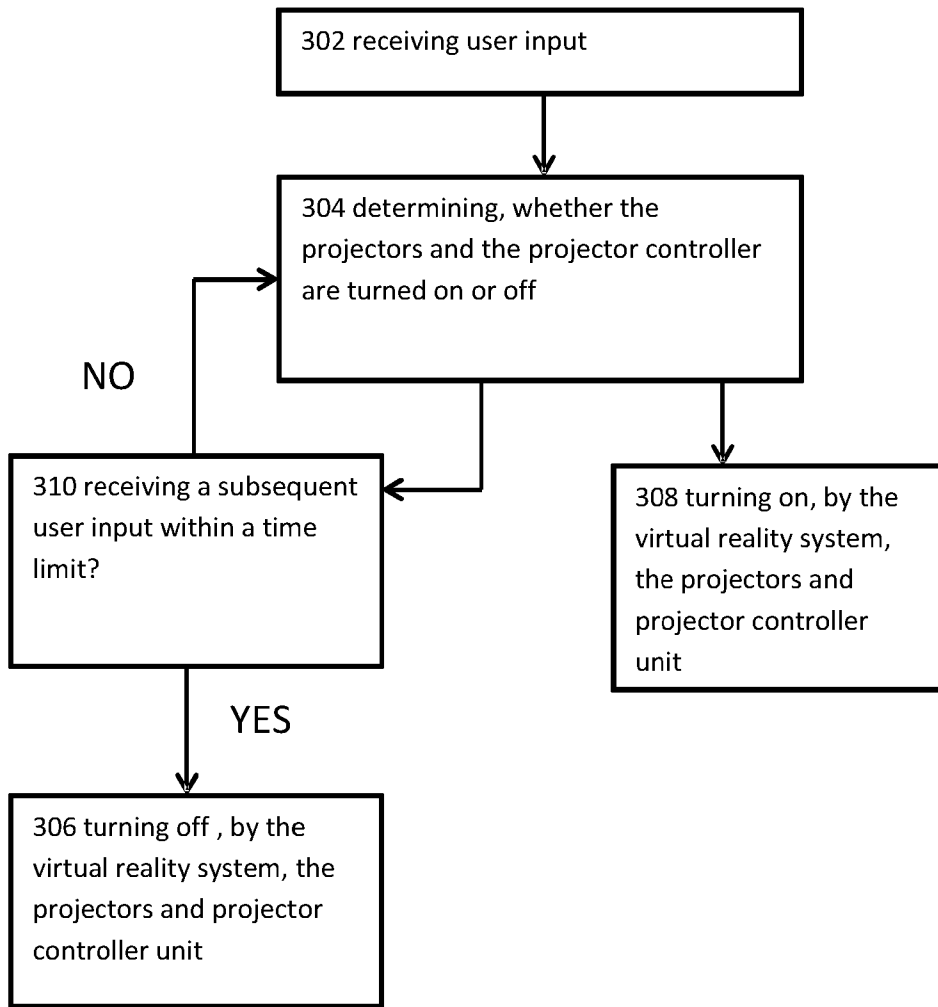


FIG. 3

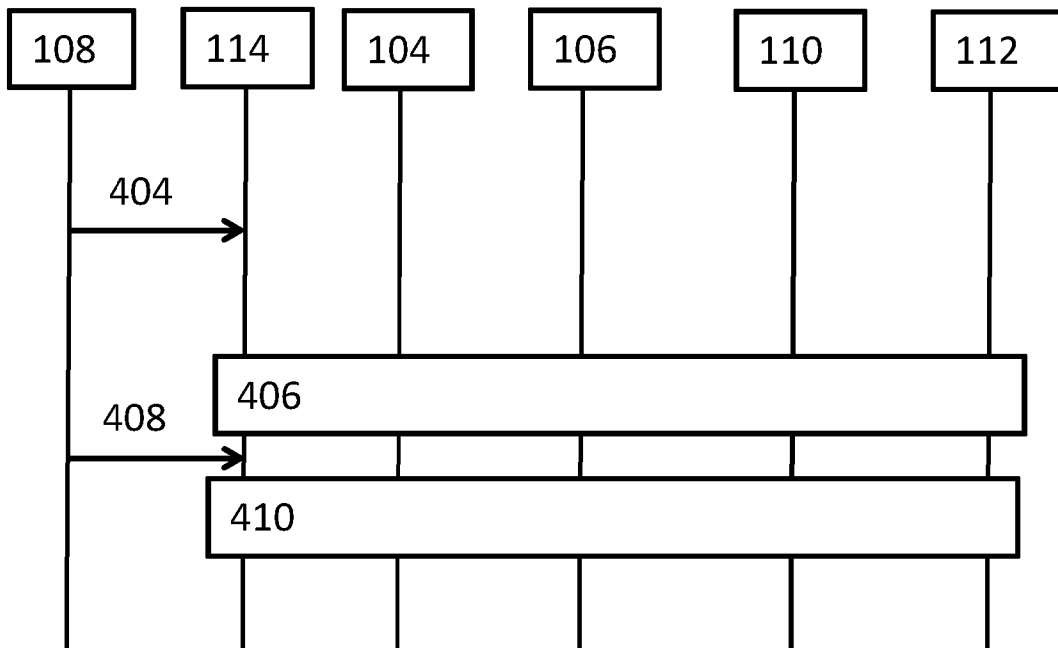


FIG. 4

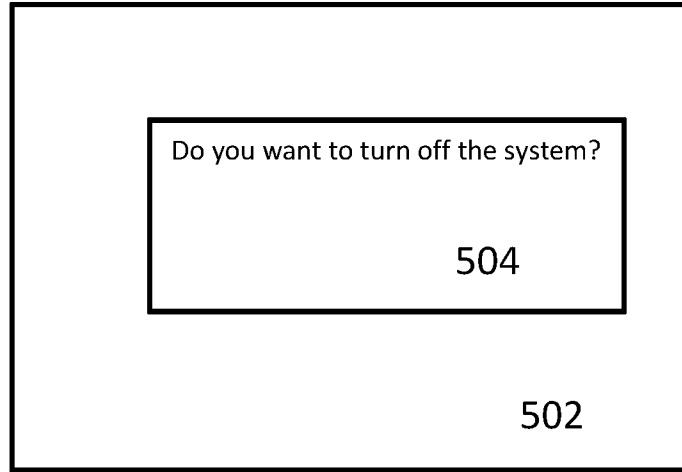


FIG. 5

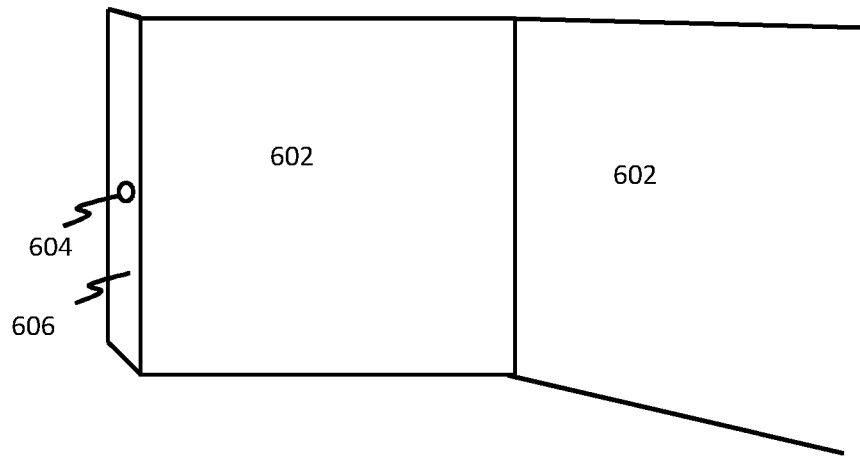


FIG. 6