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Grant et al.

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(54) **SYSTEM AND METHOD FOR PROVIDING COMPLEX HAPTIC STIMULATION DURING INPUT OF CONTROL GESTURES, AND RELATING TO CONTROL OF VIRTUAL EQUIPMENT**

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A63F 9/24 (2006.01)

(52) **U.S. Cl.**
USPC **463/30**; 463/22

(58) **Field of Classification Search**
USPC 463/30, 22
See application file for complete search history.

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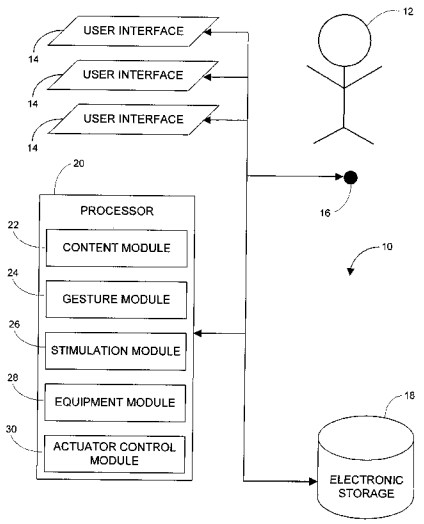
(57) **ABSTRACT**

A system is configured to provide haptic stimulation to a user. In one embodiment, the haptic stimulation is provided to the user in conjunction with the performance of one or more control gestures through which the user controls, for example, a game, a real world component or piece of equipment, and/or other entity. In one embodiment, the haptic stimulation is provided to the user in conjunction with control of virtual equipment by the user.

40 Claims, 13 Drawing Sheets



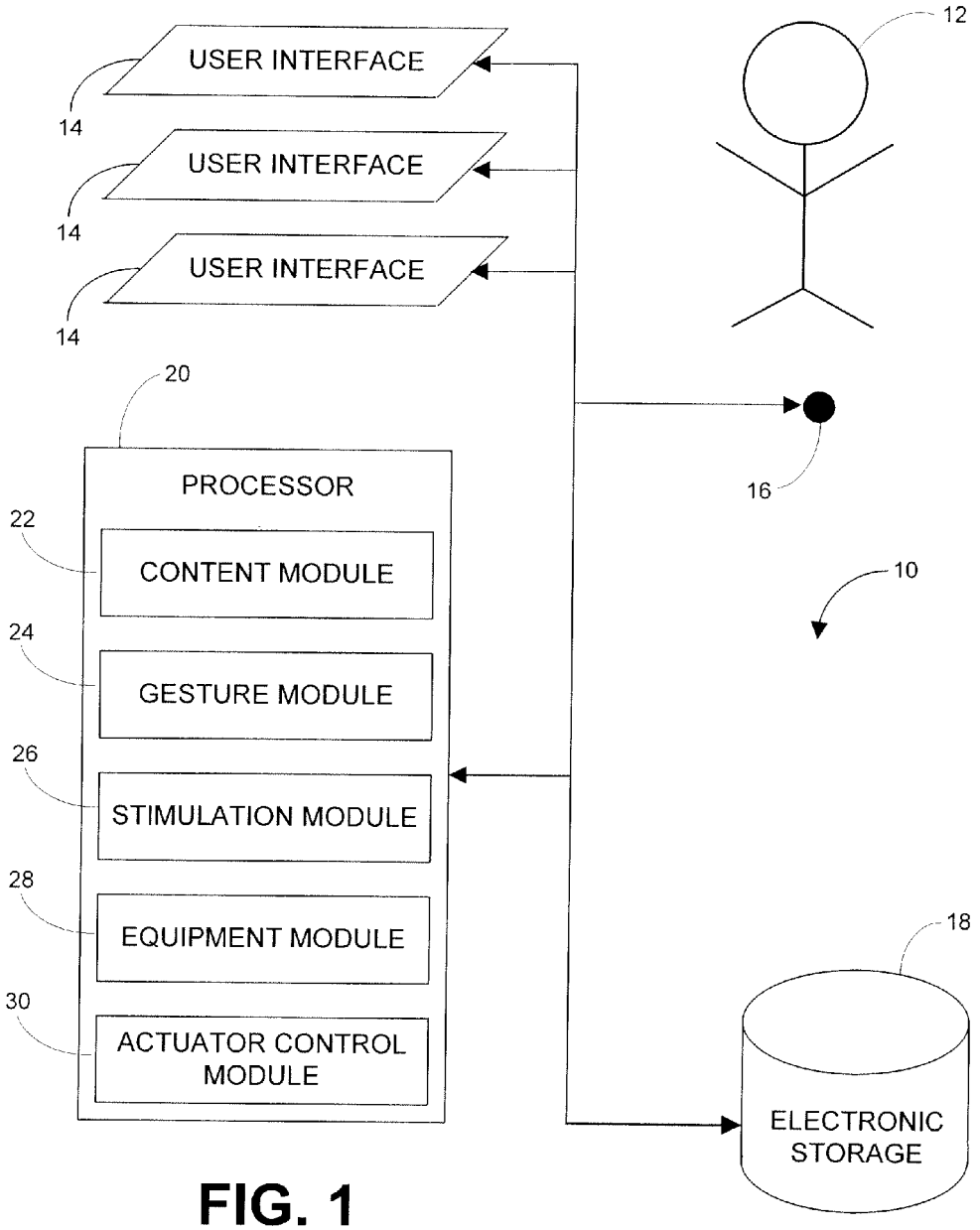

USER INTERFACE
USER INTERFACE
USER INTERFACE
14
14
14
12
20
PROCESSOR
22
CONTENT MODULE
24
GESTURE MODULE
26
STIMULATION MODULE
28
EQUIPMENT MODULE
30
ACTUATOR CONTROL MODULE
16
10
18
ELECTRONIC STORAGE

FIG. 1

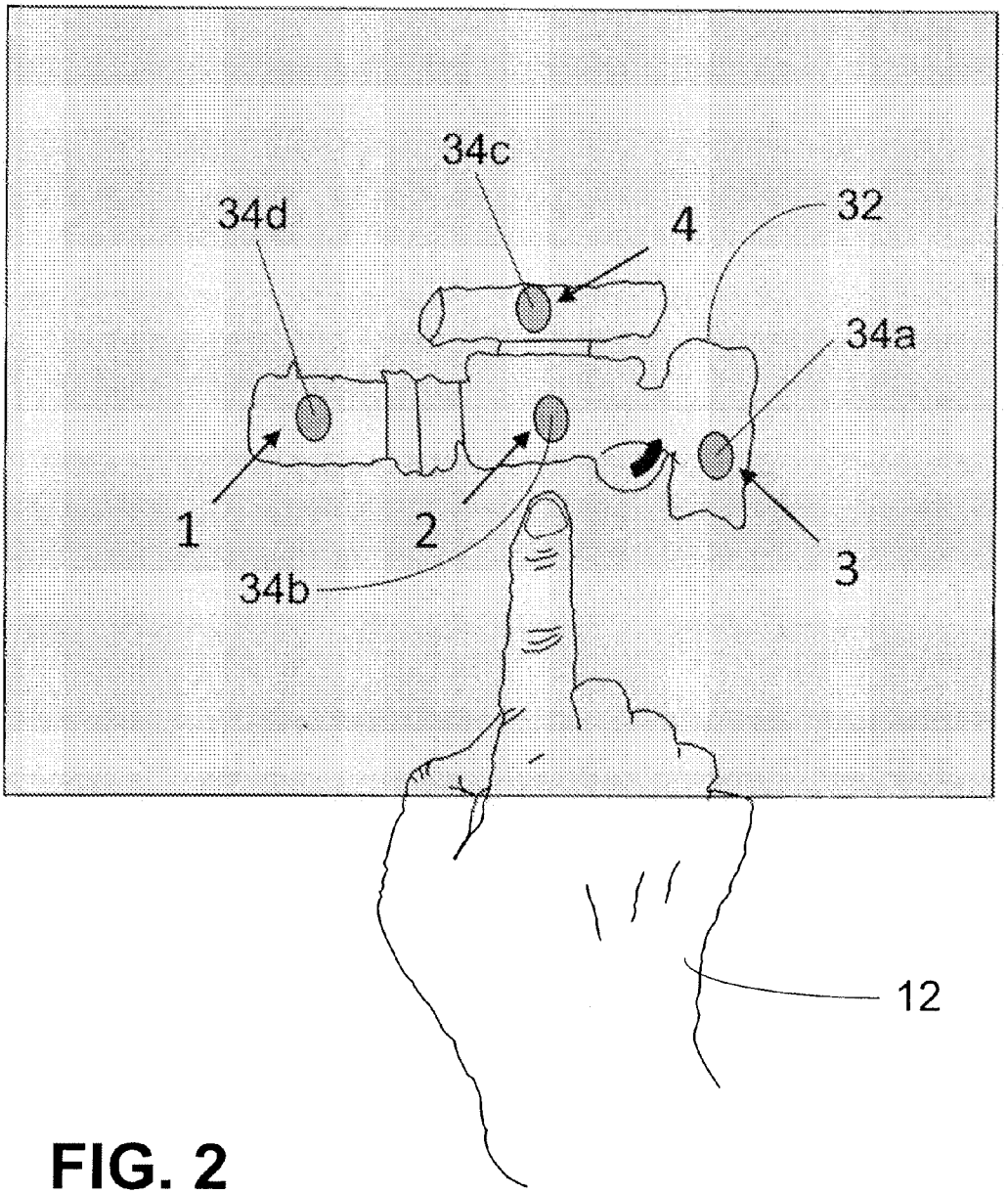


FIG. 2

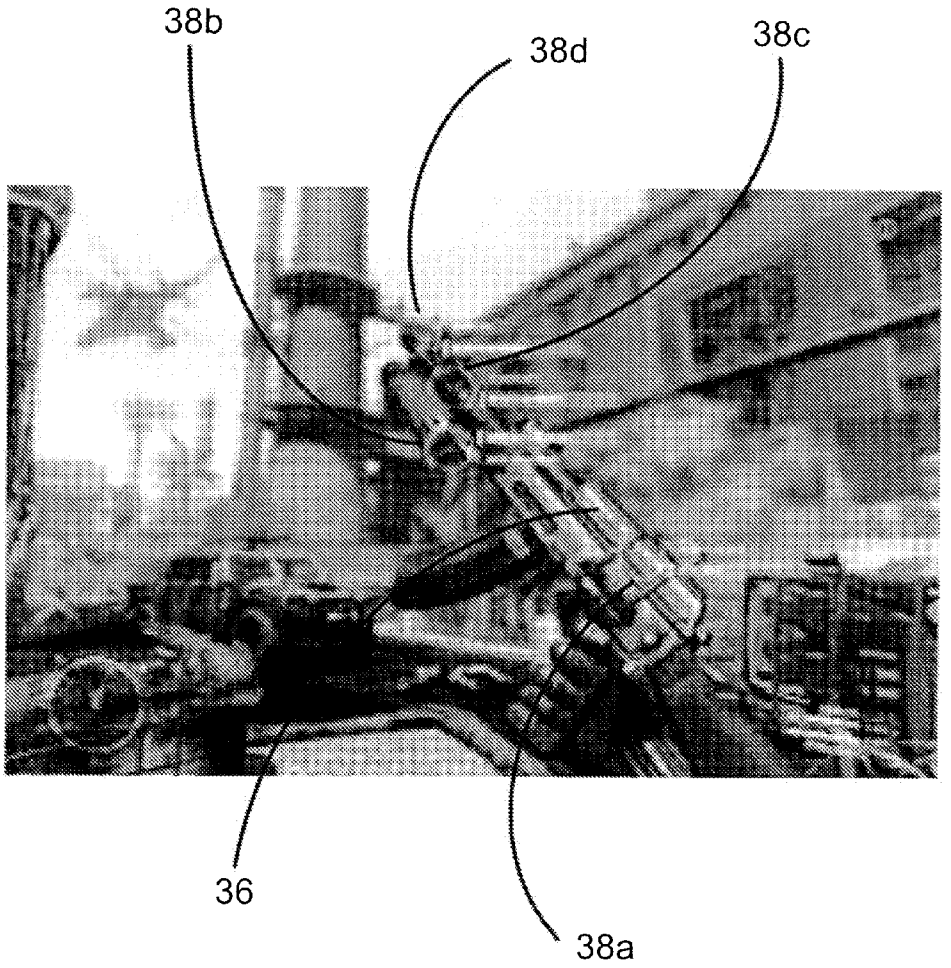


FIG. 3

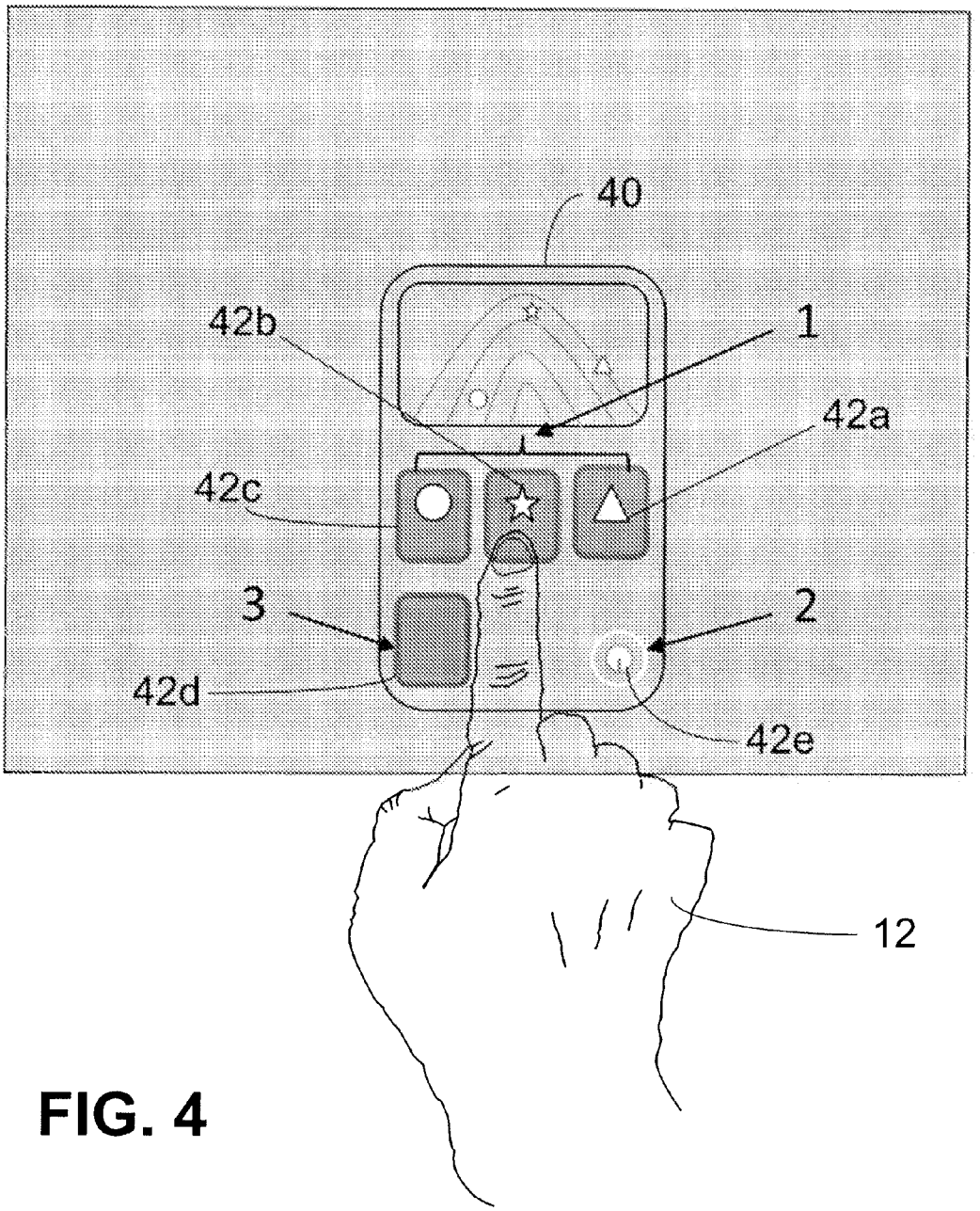


FIG. 4

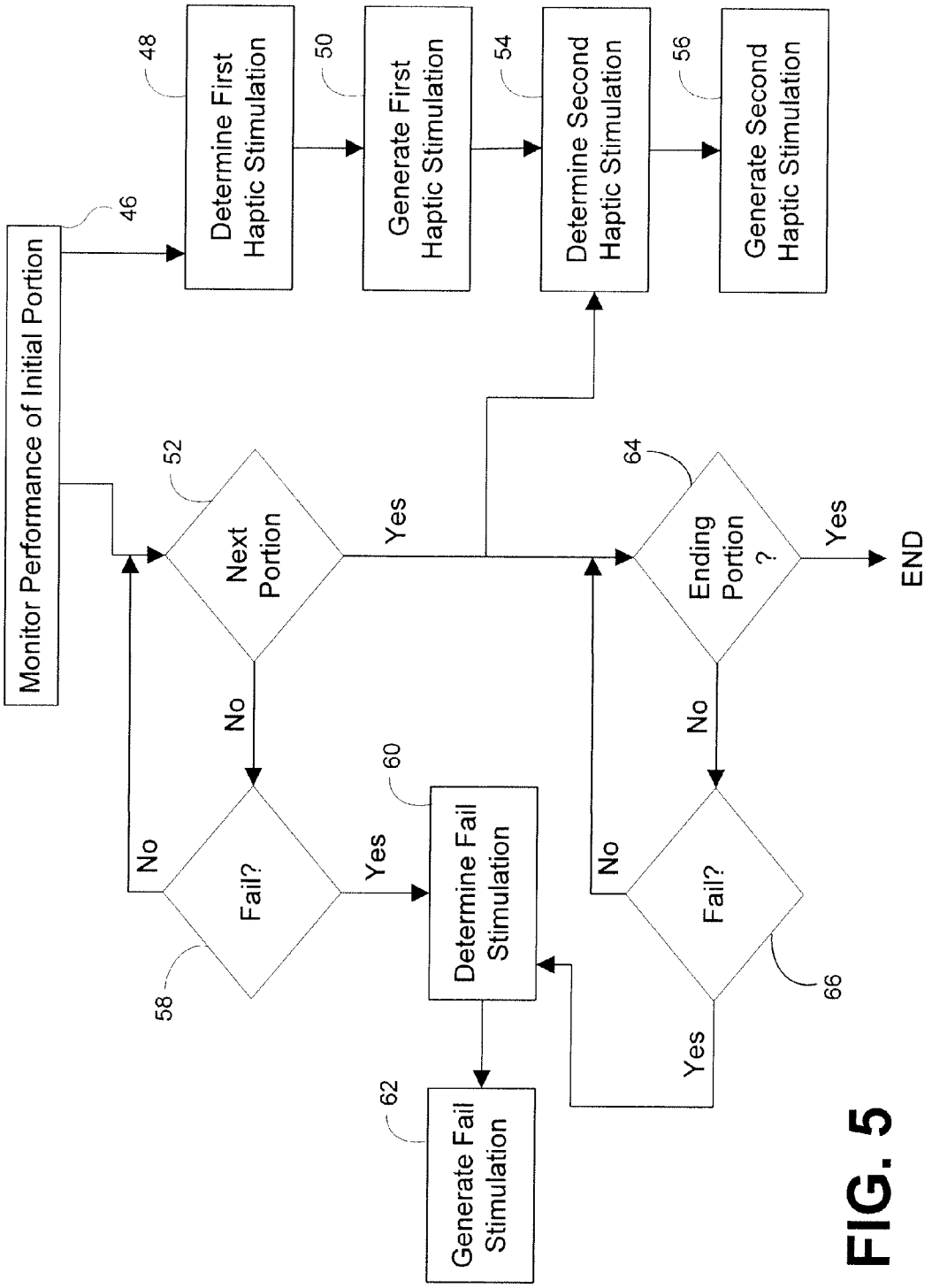

Monitor Performance of Initial Portion
46
Determine First Haptic Stimulation
48
Generate First Haptic Stimulation
50
Determine Second Haptic Stimulation
54
Generate Second Haptic Stimulation
56
Next Portion
52
Yes
No
Fail?
58
No
Yes
Determine Fail Stimulation
60
Generate Fail Stimulation
62
Ending Portion ?
64
Yes
END
No
Fail?
66
No
Yes

FIG. 5

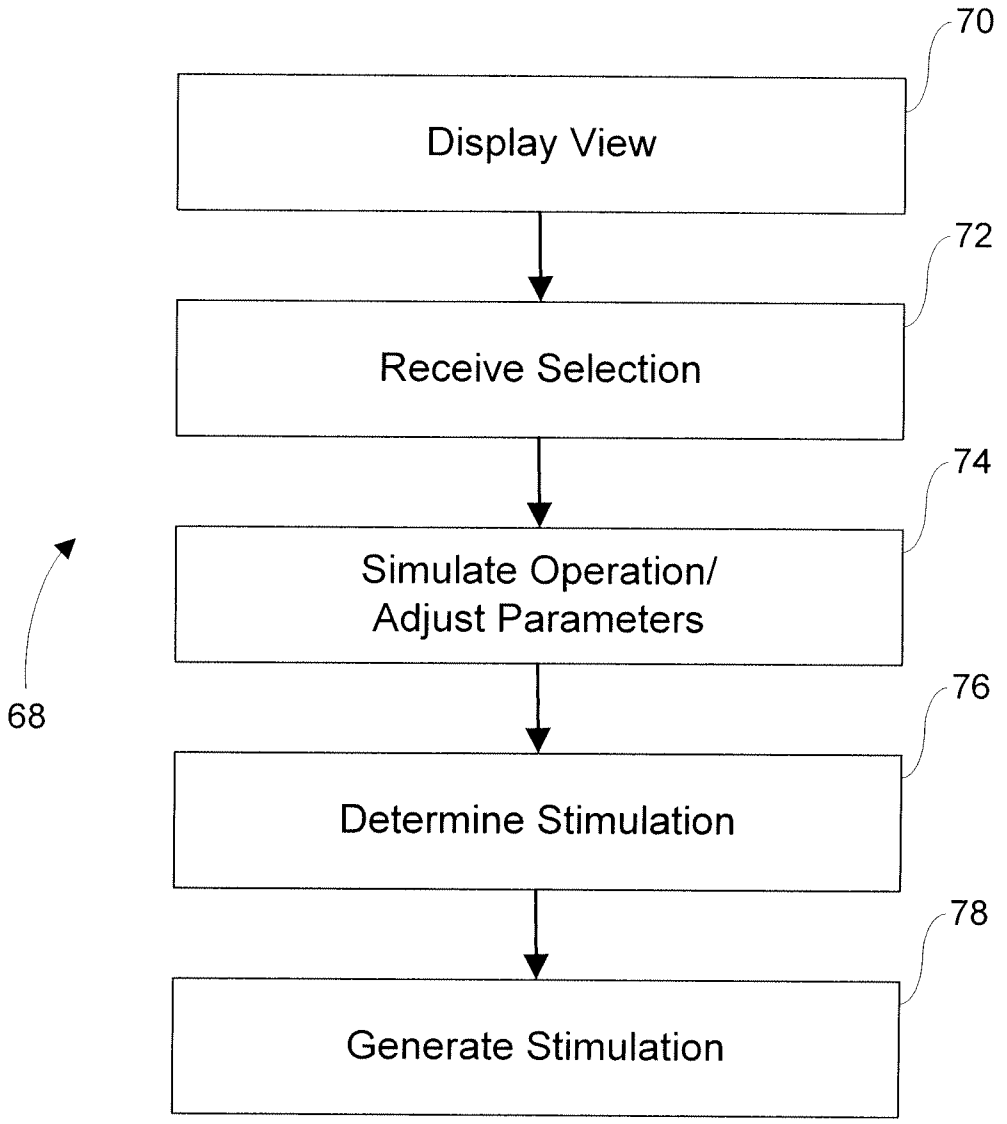

70
Display View
72
Receive Selection
74
Simulate Operation/
Adjust Parameters
68
76
Determine Stimulation
78
Generate Stimulation

FIG. 6

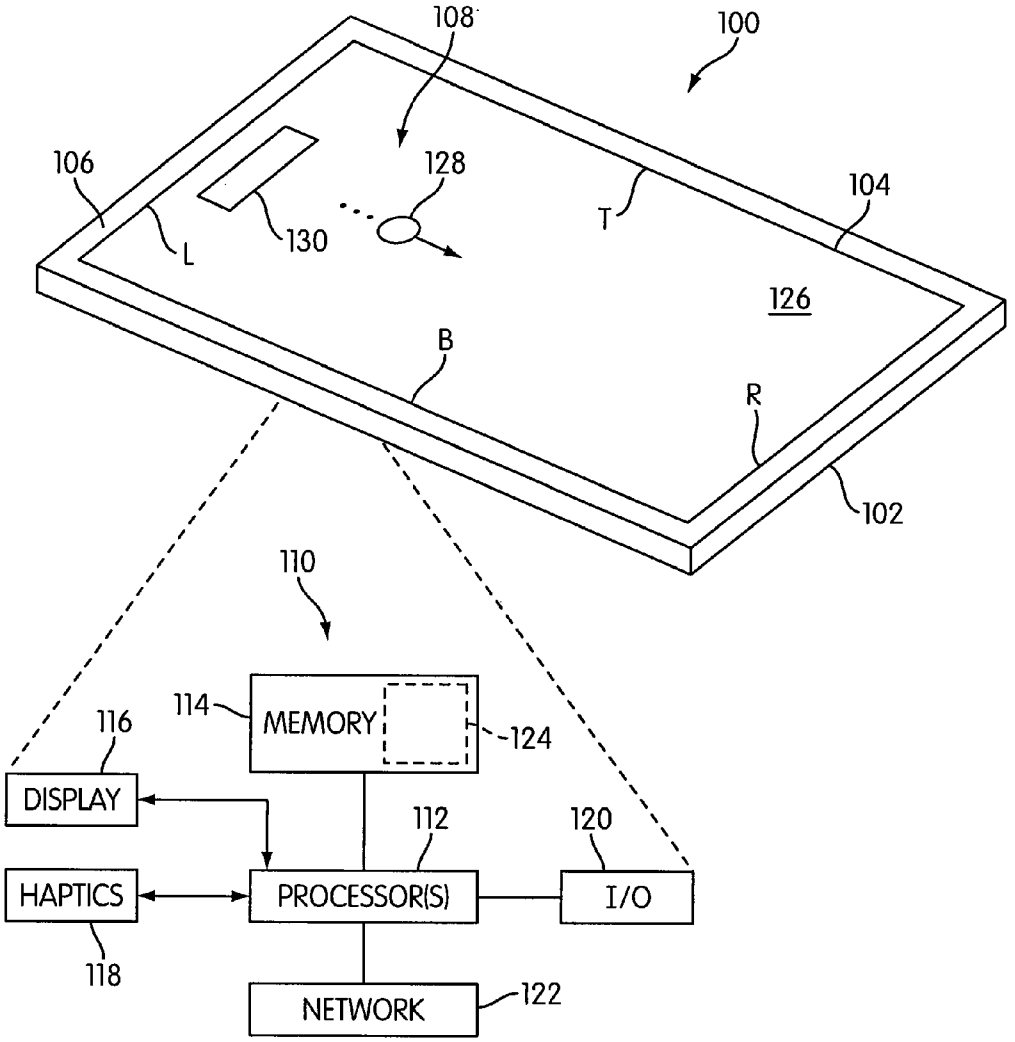

108
100
106
128
104
L
130
T
126
B
R
102
110
114
MEMORY
124
116
DISPLAY
112
120
HAPTICS
PROCESSOR(S)
I/O
118
NETWORK
122

FIG. 7

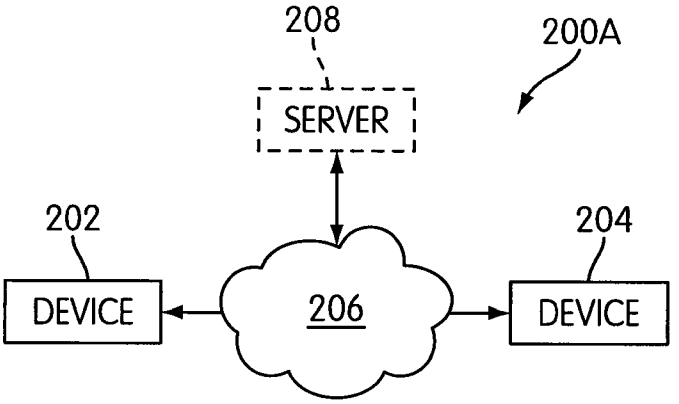

208
200A
SERVER
202
204
DEVICE
206
DEVICE

FIG. 8A

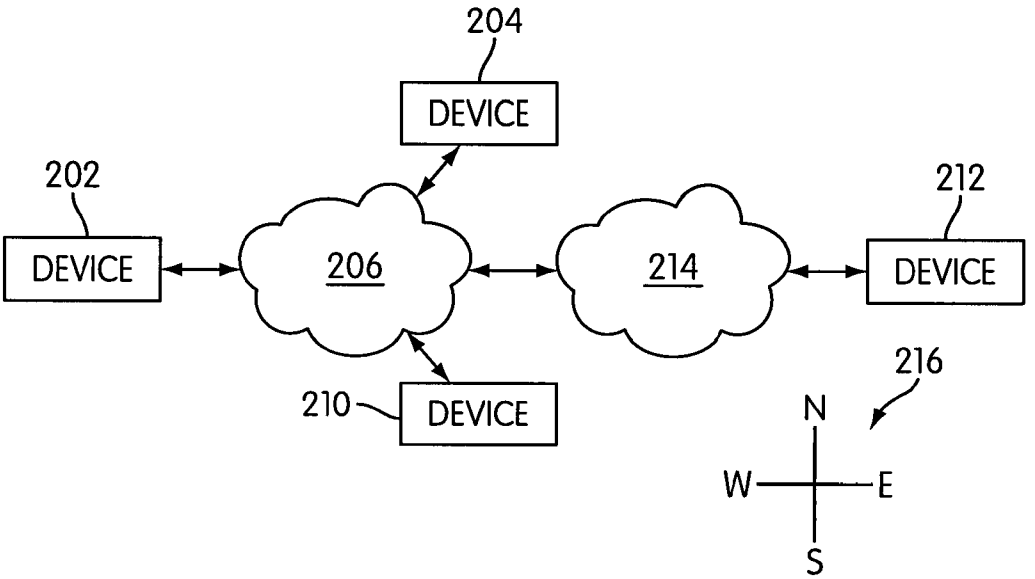

204
DEVICE
202
212
DEVICE
206
214
DEVICE
216
210
DEVICE
N
W
E
S

FIG. 8B

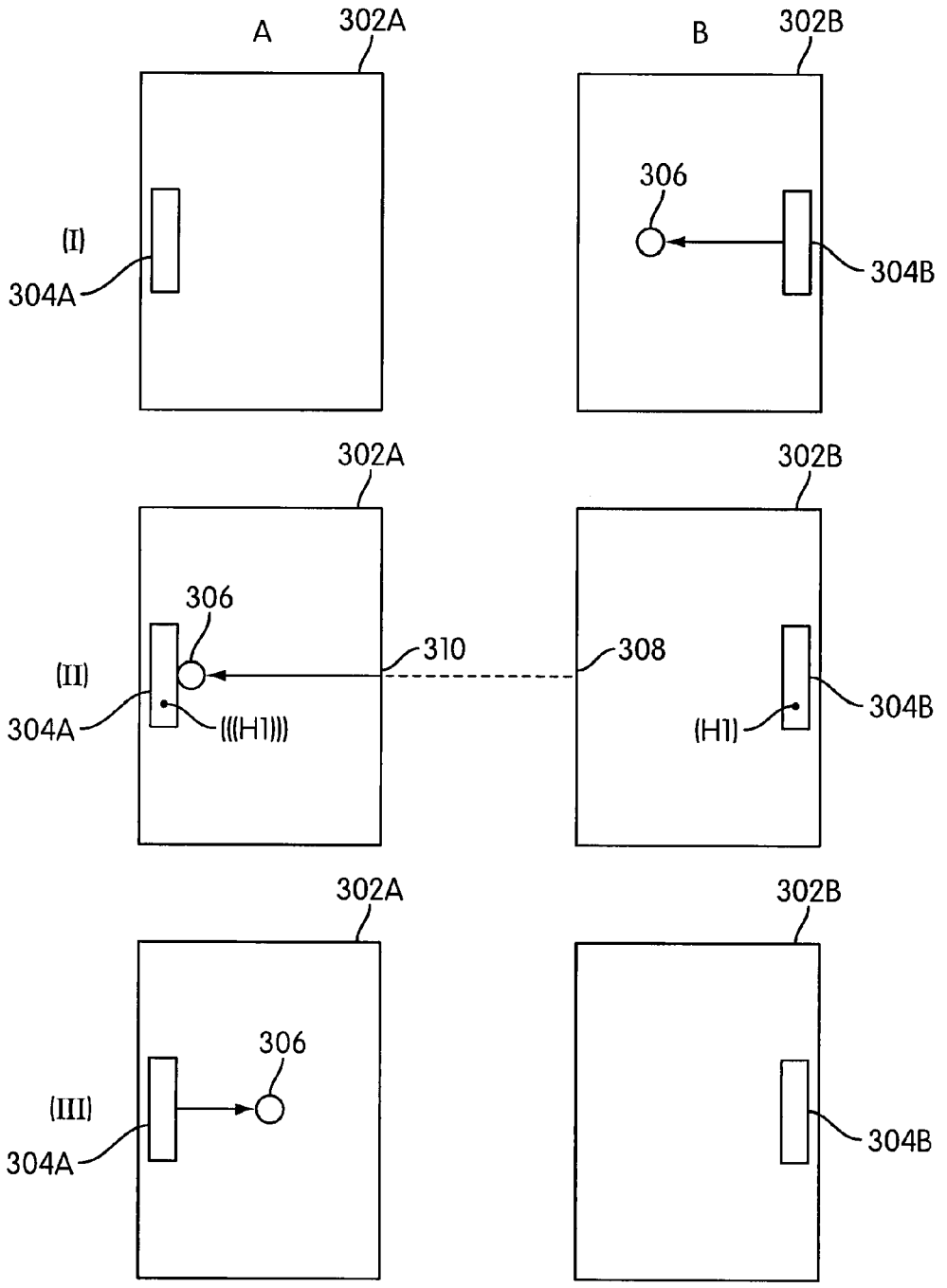

A
302A
B
302B
306
(I)
304A
304B
302A
302B
306
310
308
(II)
304A
(((H1)))
(H1)
304B
302A
302B
306
(III)
304A
304B

FIG. 9

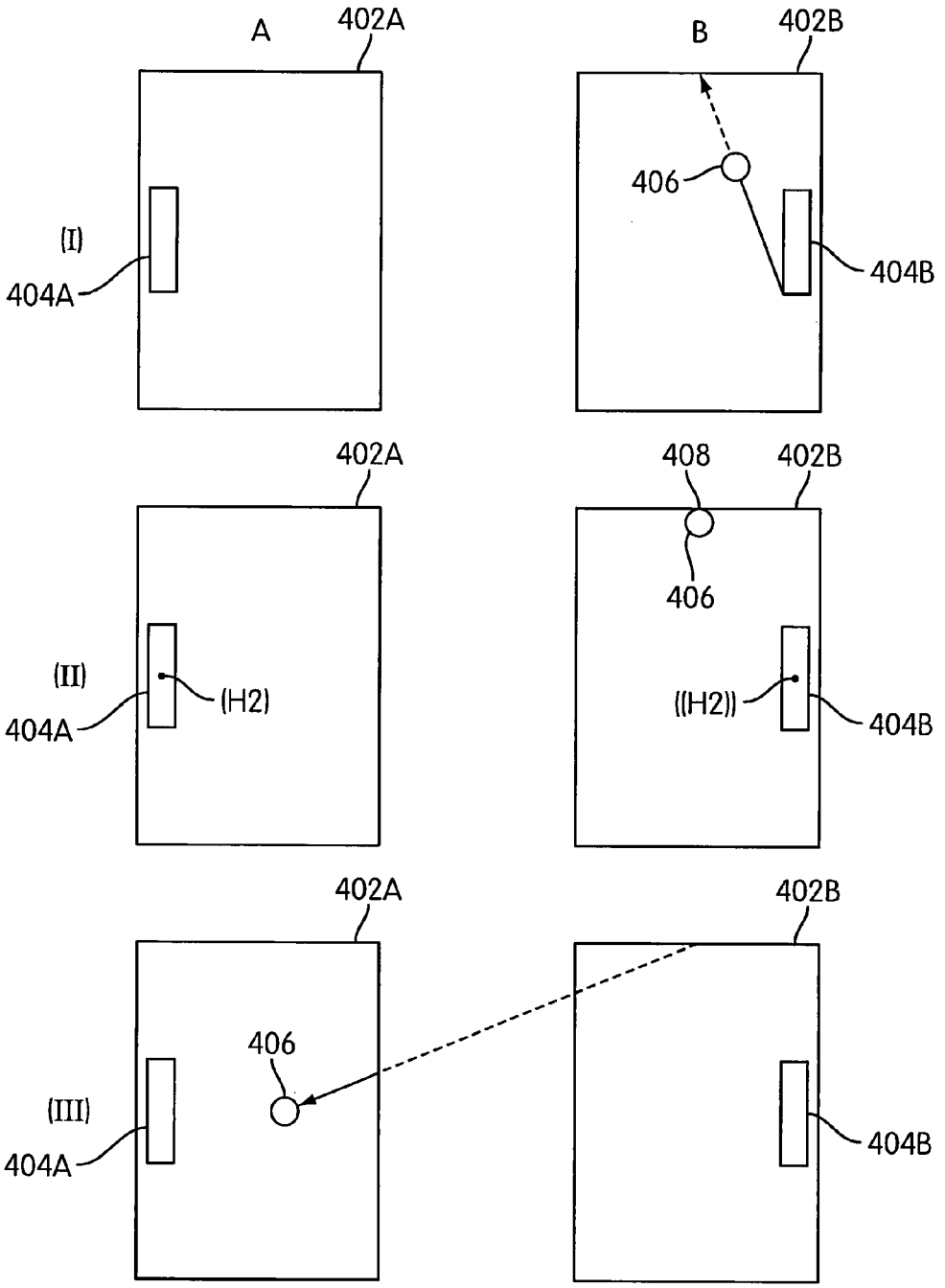
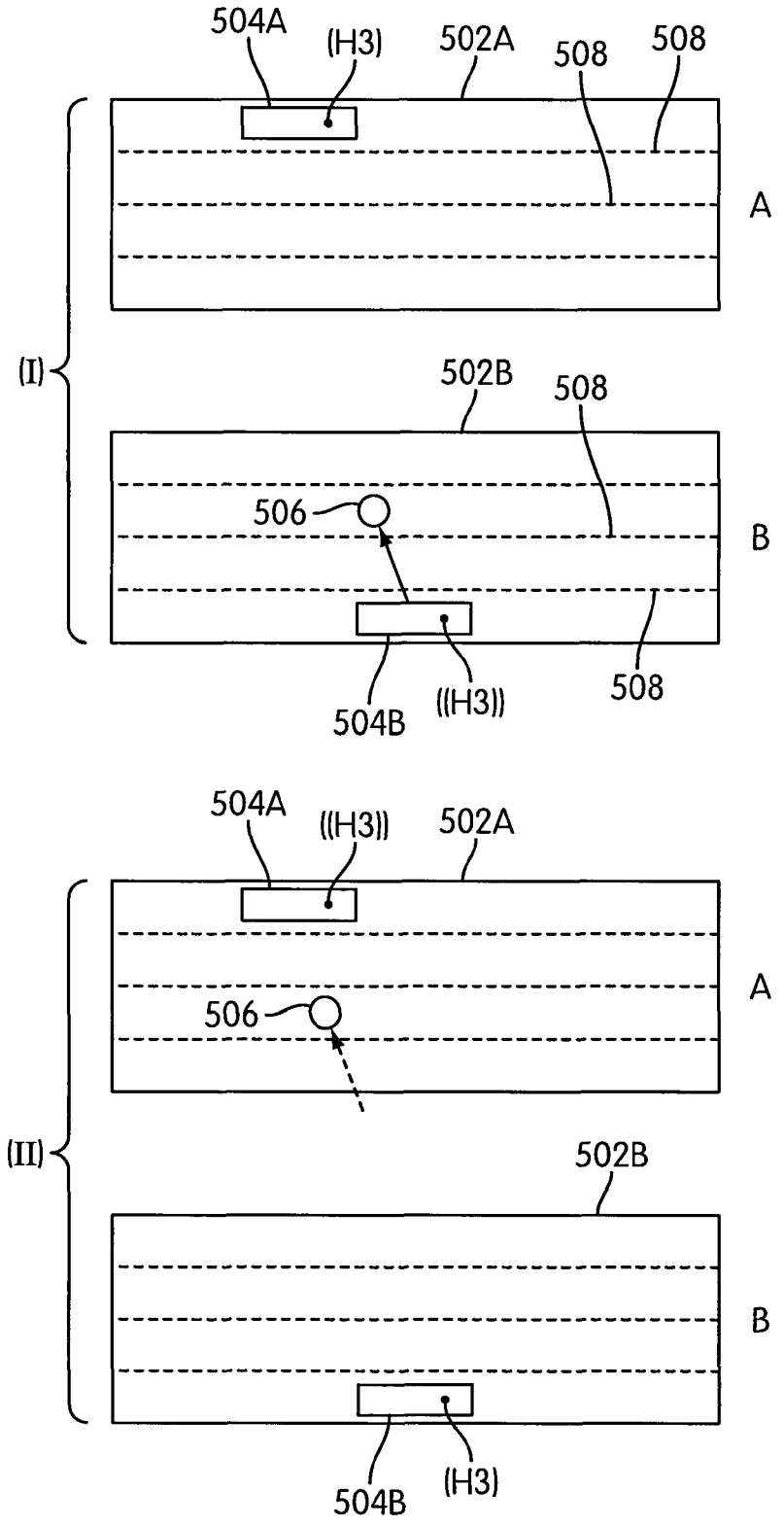

A
402A
B
402B
406
(I)
404A
404B
402A
408
402B
406
(II)
(H2)
((H2))
404A
404B
402A
402B
406
(III)
404A
404B

FIG. 10


504A
(H3)
502A
508
508
A
(I)
502B
508
506
B
504B
((H3))
508
504A
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502A
A
506
(II)
502B
B
504B
(H3)

FIG. 11

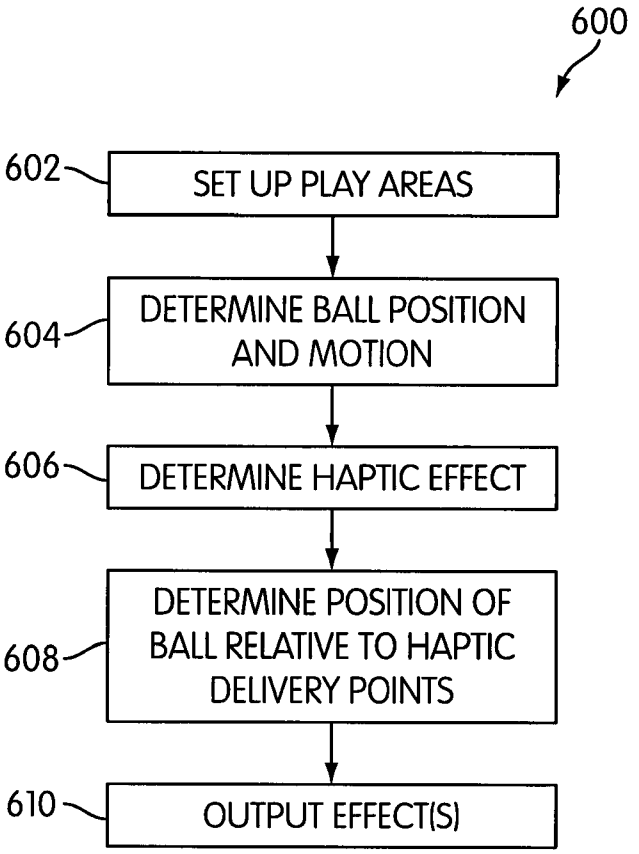
600
602
SET UP PLAY AREAS
604
DETERMINE BALL POSITION AND MOTION
606
DETERMINE HAPTIC EFFECT
608
DETERMINE POSITION OF BALL RELATIVE TO HAPTIC DELIVERY POINTS
610
OUTPUT EFFECT(S)

FIG. 12

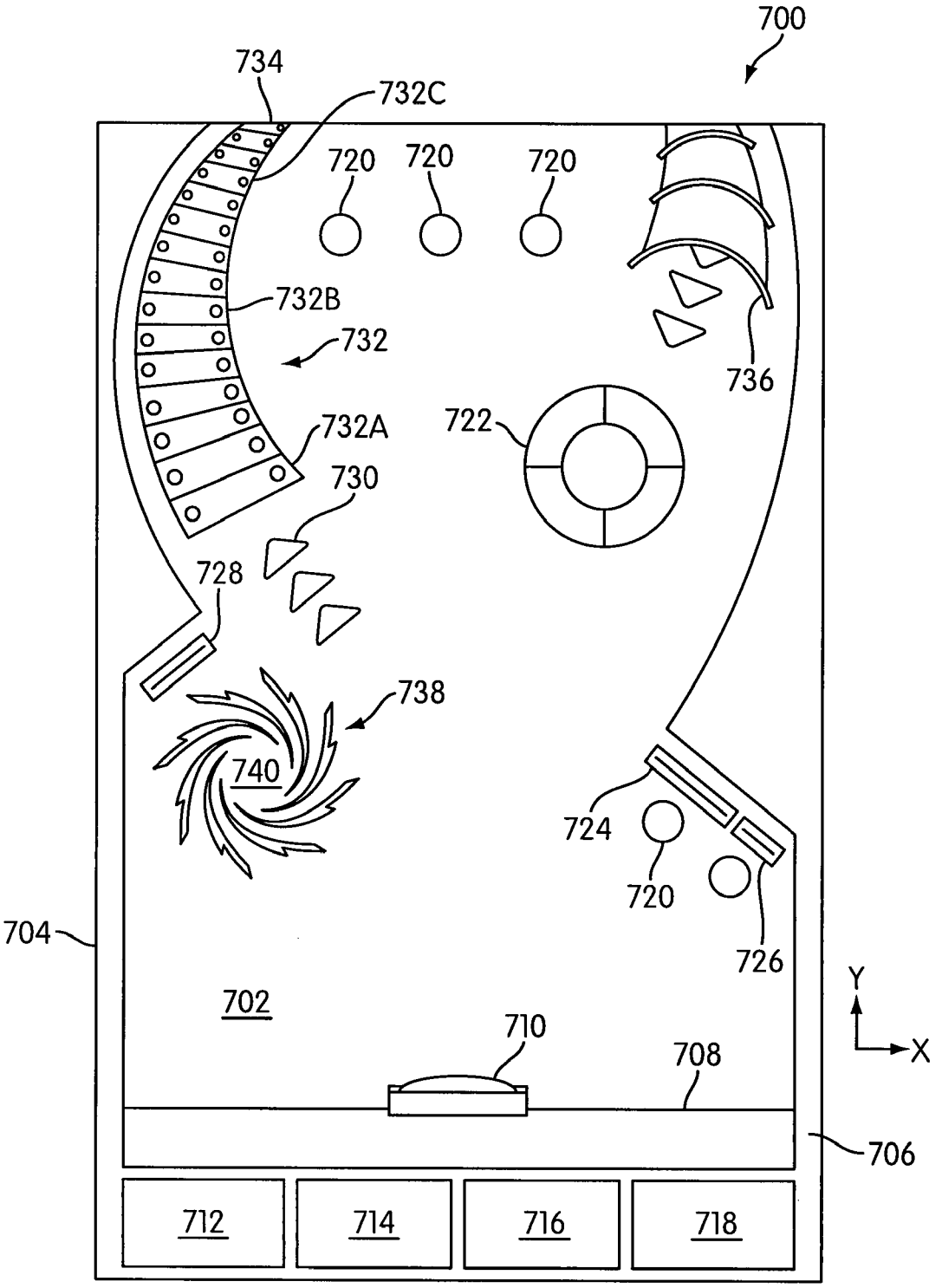
700
734
732C
720
720
720
732B
732
736
722
732A
730
728
738
740
724
720
726
704
702
710
708
Y
X
706
712
714
716
718

FIG. 13

SYSTEM AND METHOD FOR PROVIDING COMPLEX HAPTIC STIMULATION DURING INPUT OF CONTROL GESTURES, AND RELATING TO CONTROL OF VIRTUAL EQUIPMENT

RELATED APPLICATIONS

This application claims priority from U.S. Provisional Patent Application No. 61/227,645, filed Jul. 22, 2009, and entitled "Interactive Touch Screen Gaming Metaphors With Haptic Feedback. The U.S. Provisional Patent Application No. 61/227,645 is hereby incorporated by reference in its entirety into the present application.

FIELD OF THE INVENTION

The invention relates to a system and method of providing haptic stimulation to a user during performance of a complex control gesture, and/or during the control of virtual equipment.

BACKGROUND OF THE INVENTION

Provision of haptic stimulation to users is known. Haptic stimulation provide a physical sensation to users. Haptic stimulation is used in the context of games, and virtual worlds, and in real world control systems. Such haptic stimulation may be generated to provide feedback to users that a control input has been received, that another user has input a command, that virtual or real objects have collided, exploded, or imploded, that an ambient force is present (e.g., simulated or real wind, rain, magnetism, and/or other virtual forces), and/or that other phenomena have occurred. In conventional systems, the parameters of such stimulation is typically static and provides a simple mechanism for instructing a user that a corresponding phenomena has occurred (or will occur).

Conventional game and/or virtual world systems that enable a user to control virtual equipment are known. The control and feedback schemes for interacting with virtual equipment in these conventional systems tend to be limited, and to not correlate strongly with real world control and/or feedback of corresponding real world equipment.

Although basic haptic effects (e.g., vibrate) have been used in mobile and other computing devices, numerous challenges remain for developers to engage users and provide feedback to enhance the user experience

SUMMARY

One aspect of the invention relates to a system configured to provide haptic stimulation to a user of a game. In one embodiment, the system comprises a user interface, an actuator, and one or more processors configured to execute computer program modules. The user interface is configured to generate output signals related to the gestures of a user. The actuator is configured to generate haptic stimulation to the user. The computer program modules comprise a gesture module, a stimulation module and an actuator control module. The gesture module is configured to monitor performance of a control gesture by the user based on the output signals of the user interface. The control gesture is a gesture associated with a command input to the game, and includes an initial portion, a first intermediate portion, and an ending portion. The stimulation module is configured to receive information related to performance of the control gesture from the gesture module, and to determine haptic stimulation

to be generated for the user associated with the control gesture. The haptic stimulation includes a first stimulation determined responsive to performance of the initial portion of the control gesture, and a second stimulation that is different from the first stimulation and is determined responsive to performance of the first intermediate portion of the control gesture. The actuator control module is configured to control the actuator to generate the stimulation determined by the stimulation module.

Another aspect of the invention relates to a method of providing haptic stimulation to a user of a game. In one embodiment, the method comprises monitoring performance of a control gesture by a user, wherein the control gesture is a gesture associated with a command input to the game, and includes an initial portion, a first intermediate portion, and an ending portion; determining haptic stimulation associated with performance of the control gesture to be generated for the user, wherein the haptic stimulation includes a first stimulation determined responsive to performance of the initial portion of the control gesture, and a second stimulation that is different from the first stimulation and is determined responsive to performance of the first intermediate portion of the control gesture; and generating the determined stimulation during performance of the control gesture.

Yet another aspect of the invention relates to a system configured to provide stimulation to a user of a game. In one embodiment, the system comprises a touch sensitive electronic display, an actuator, and one or more processors configured to execute computer program modules. The touch sensitive electronic display has an interface surface that is accessible for engagement by the user, and the touch sensitive user interface is configured to generate output signals related to the position at which the interface surface is engaged, and to present views of the game to the user through the interface surface. The views presented through the interface surface include views of virtual equipment having user selectable sections that are selectable by the user to interact with the virtual equipment by engaging the interface surface at the user selectable sections of the views of the virtual equipment. The actuator is configured to generate haptic stimulation to the user. The computer program modules comprise an equipment module, a stimulation module, and an actuator control module. The equipment module is configured to determine the operating parameters of the virtual equipment in the views, and to simulate operation of the virtual equipment. The equipment module determines the operating parameters of the virtual equipment and/or simulates operation of the virtual equipment based on selections by the user of the user selectable sections of the views of the virtual equipment. The stimulation module is configured to determine haptic stimulation to be generated for the user associated with the operating parameters of the virtual equipment and/or simulated operation of the virtual equipment. The actuator control module is configured to control the actuator to generate the stimulation determined by the stimulation module.

Still another aspect of the invention relates to a method of providing stimulation to a user of a game. In one embodiment, the method comprises presenting views of a game through an interface surface of a touch sensitive electronic display that is accessible for engagement by a user, wherein the views presented through the interface surface include views of virtual equipment having user selectable sections that are selectable by the user to interact with the virtual equipment by engaging the interface surface at the user selectable sections of the views of the virtual equipment; receiving selection of one of the user selectable sections via an by the user engagement of the selected user selectable section on the interface surface;

determining the operating parameters of the virtual equipment in the views and/or simulating operation of the virtual equipment based on the received selection; determining, responsive to the received selection, haptic stimulation to be generated for the user associated with the operating parameters of the virtual equipment and/or simulated operation of the virtual equipment; and generating the determined haptic stimulation.

A still further aspect of the invention relates to a system and method for providing a game on one or more portable computing device in which a virtual object (e.g., a ball) travels through views of the game displayed on the interfaces of the one or more portable computing devices. Haptic effects corresponding to the travel of the virtual object (or virtual objects) through the views are provided on the individual portable computing devices. The haptic effects may be determined based on one or more parameters of the travel of the virtual object (e.g., speed, direction, acceleration, etc.), one or more parameters of objects and/or features with which the virtual object interacts (e.g., walls, flippers, blockers, bumpers, etc.), and/or other parameters. The haptic effects may include haptic effects to be provided on portable computing devices that are not currently displaying the virtual object corresponding to the haptic effects. This may enhance the interactivity of the game for a group of users playing the game together on separate portable computing devices.

These and other objects, features, and characteristics of the present invention, as well as the methods of operation and functions of the related elements of structure and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures. It is to be expressly understood, however, that the drawings are for the purpose of illustration and description only and are not intended as a definition of the limits of the invention. As used in the specification and in the claims, the singular form of "a", "an", and "the" include plural referents unless the context clearly dictates otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a system configured to provide haptic stimulation to a user, in accordance with one or more embodiments of the invention.

FIG. **2** illustrates a view of a piece of virtual equipment, in accordance with one or more embodiments of the invention.

FIG. **3** illustrates a view of a piece of virtual equipment, in accordance with one or more embodiments of the invention.

FIG. **4** illustrates a view of a piece of virtual equipment, in accordance with one or more embodiments of the invention.

FIG. **5** illustrates a method of providing haptic feedback to a user, according to one or more embodiments of the invention.

FIG. **6** illustrates a method of providing haptic feedback to a user, according to one or more embodiments of the invention.

FIG. **7** illustrates a portable computing device, in accordance with one or more embodiments of the invention.

FIG. **8**A illustrates an example of the use of a game to support multi-user play, according to one or more embodiments of the invention.

FIG. **8**B illustrates an example of the use of a game to support multi-user play, according to one or more embodiments of the invention.

FIG. **9** illustrates an example of play areas for two respective users over a plurality of time intervals, in accordance with one or more embodiments of the invention.

FIG. **10** illustrates an example of play and depicts the virtual object ricocheting off the border of a play area, according to one or more embodiments of the invention.

FIG. **11** illustrate a use of haptic effects to simulate a continuous effect, in accordance with one or more embodiments of the invention.

FIG. **12** illustrates a method for providing a game, according to one or more embodiments of the invention.

FIG. **13** illustrates an example of an interface for an instance of a game, in accordance with one or more embodiments of the invention.

DETAILED DESCRIPTION

FIG. **1** illustrates a system **10** configured to provide haptic stimulation to a user **12**. In one embodiment, the haptic stimulation is provided to user **12** in conjunction with the performance of one or more control gestures through which user **12** controls, for example, a game, a real world component or piece of equipment, and/or other entity. The haptic stimulation is provided to user **12** such that as performance of a given control gesture continues, the haptic stimulation associated with the control gesture changes in accordance with the progression of the control gesture. In one embodiment, the haptic stimulation is provided to user **12** in conjunction with control of virtual equipment by user **12**. The haptic stimulation corresponds to control inputs provided to system **10** in controlling the virtual equipment. In one embodiment, system **10** includes one or more user interfaces **14**, one or more actuators **16**, electronic storage **18**, one or more processors **20**, and/or other components.

Although this disclosure primarily describes the provision of haptic stimulation in conjunction with control gestures performed to control a game, this is not limiting. The provision of haptic stimulation in accordance with the principles set forth herein may be extended to other contexts in which a user provides input in the form of a control gesture (e.g., controlling a television, a computer, an automobile, a remote control vehicle or vessel, etc.). In implementations involving the control of real world components or systems, haptic stimulation may be used to enhance the performance of complex control gestures by users, enhance the user experience, teach users to perform control gestures, and/or provide other enhancement over conventional real world control systems. Implementations involving control of real world components or systems may include instances in which a user is present at the component being controlled (e.g., a control panel in a car, on a microwave, etc.), and/or instances in which a user is located remotely from the component being controlled. Control of a remote real world component or system may be accompanied by other sensory stimulation informing the user of the state of the component being controlled. Such other sensory stimulation may include, for example, real-time (or near real-time) video, audio, and/or still images provided to the user.

Several embodiments are described herein as though user **12** were the only user for whom haptic stimulus is being provided. This is not limiting. Expansion of the principles and embodiments described herein is within the ability of one of ordinary skill in the art, and the description of a single user embodiment would enable the person of ordinary skill in the art to make and/or user a multiple user embodiment providing the same features to a plurality of users. A multiple user embodiment may include the provision of haptic stimulation

to "passive users" (e.g., users not performing a control gesture) related to the performance of a control gesture by an "active user" (e.g., the user performing the control gesture). The haptic stimulation may further provide feedback to the passive and/or active users of other phenomena present in the multi-user environment.

As used herein, a "control gesture" refers to a gesture made by a user that is a single and discrete control input having separate portions. The separate portions must be performed in specific order and/or with a specific timing to effectively achieve the control input associated with the "control gesture." Performance of the separate portions, on their own, will not result in the control input associated with the "control gesture" as a whole (e.g., a "control gesture" is not merely a combination of other gestures, each associated with its own control input). In some examples, a "control gesture" is an abstract gesture that does not correlate with exactness to the control input to which it corresponds. Some non-limiting examples of a "control gesture" are described below.

The user interface **14** includes one or more input and/or output devices configured to communicate information to and/or receive information from user **12**. The user interface **14** may include, for example, one or more content delivery devices that convey content to user **12**. This content may include audio content, video content, still images, and/or other content. The content delivery devices may include, for example, electronic displays (e.g., including touch-sensitive displays), audio speakers, and/or other content delivery devices. The user interface **14** may include one or more control input devices configured to generate an output signal indicating input from the user to system **10**. For example, user interface **14** may include a game controller, a remote control, a keypad, a button, a switch, a keyboard, a knob, a lever, a microphone, a position detecting device (e.g., an image sensor, a pressure sensor, an optical position detector, an ultrasonic position detector, a touch sensitive surface, and/or other position detecting devices), an accelerometer, a gyroscope, a digital compass, and/or other control input devices. The user interface **14** may be embodied in, or associated with, a computing device, and/or may be embodied in a control peripheral. A computing device may include one or more of a desktop computer, a laptop computer, a handheld computer, a personal digital assistant, a Smartphone, a personal music player, a portable gaming console, a gaming console, and/or other computing devices.

It will be appreciated that although user interface **14** is shown in FIG. **1** as a single entity, this is for illustrative purposes only. In one embodiment, user interface **14** includes a plurality of actuators. The plurality of user interfaces **14** may be included in, carried by, and/or in contact with a single object or device. Or, the plurality of user interfaces **14** may include user interfaces included in and/or carried by a plurality of separate objects or devices.

The actuators **16** are configured to generate haptic stimulus for user **12**. As such, at least some of actuators **16** are in contact with the users, or in contact with objects that contact the users, during conveyance of the sensory content to the users by user interface **14**. By way of non-limiting example, one or more of actuators **16** may be positioned in or on a floor surface supporting the users (e.g., installed in the floor, carried by a mat lying on the floor, etc.), one or more of actuators **16** may be carried by a brace or other wearable item worn by the users, one or more of the actuators **16** may be carried by objects that are carried by the users (e.g., carried by a controller), one or more of actuators **16** may be carried by furniture on which the users are seated or lying, one or more of actuators **16** may be carried by user interface **14**, and/or one or more of the actuators **16** may be carried by or disposed in or on other objects that contact the users.

As used herein, the term "haptic stimulus" refers to tactile feedback that is applied to the users. For example, such feedback may include one or more of vibrations, forces, and/or motions that are applied physically to the user by the actuators **16** and/or the objects with which both actuators **16** and the user are in contact. The actuators **16** may include any device configured to generate such feedback for application to the users. For example, actuators **16** may include one or more of a piezoelectric actuator, a pneumatic actuator, a central mass actuator, an electroactive polymer actuator, an electrostatic surface actuator, macro-fiber composite actuator, and/or other actuators. For example, a touch sensitive surface (and/or other surfaces) may be actuated to move relative to a user by an electrostatic actuator. The surface actuated by actuators **16** may be rigid, semi-rigid, flexible, and/or deformable.

It will be appreciated that although actuators **16** are shown in FIG. **1** as a single entity, this is for illustrative purposes only. In one embodiment, actuators **16** include a plurality of actuators. The plurality of actuators may be included in, carried by, and/or in contact with a single object or device. Or, the plurality of actuators may include actuators included in, carried by, and/or in contact with a plurality of separate objects or devices.

In one embodiment, electronic storage **18** comprises electronic storage media that electronically stores information. The electronic storage media of electronic storage **18** may include one or both of system storage that is provided integrally (i.e., substantially non-removable) with system **10** and/or removable storage that is removably connectable to system **10** via, for example, a port (e.g., a USB port, a firewire port, etc.) or a drive (e.g., a disk drive, etc.). Electronic storage **18** may include one or more of optically readable storage media (e.g., optical disks, etc.), magnetically readable storage media (e.g., magnetic tape, magnetic hard drive, floppy drive, etc.), electrical charge-based storage media (e.g., EEPROM, RAM, etc.), solid-state storage media (e.g., flash drive, etc.), and/or other electronically readable storage media. Electronic storage **18** may store software algorithms, information determined by processor **20**, information received via user interface **14**, and/or other information that enables system **10** to function properly. Electronic storage **18** may be a separate component within system **10**, or electronic storage **18** may be provided integrally with one or more other components of system **10** (e.g., processor **20**).

Processor **20** is configured to provide information processing capabilities in system **10**. As such, processor **20** may include one or more of a digital processor, an analog processor, a digital circuit designed to process information, an analog circuit designed to process information, a state machine, and/or other mechanisms for electronically processing information. Although processor **20** is shown in FIG. **1** as a single entity, this is for illustrative purposes only. In some implementations, processor **20** may include a plurality of processing units. These processing units may be physically located within the same device, or processor **20** may represent processing functionality of a plurality of devices operating in coordination.

As is shown in FIG. **1**, processor **20** may be configured to execute one or more computer program modules. The one or more computer program modules may include one or more of a content module **22**, a gesture module **24**, a stimulation module **26**, an equipment module **28**, an actuator control module **30**, and/or other modules. Processor **20** may be configured to execute modules **22**, **24**, **26**, **28**, and/or **30** by software; hardware; firmware; some combination of soft-

ware, hardware, and/or firmware; and/or other mechanisms for configuring processing capabilities on processor **20**.

It should be appreciated that although modules **22**, **24**, **26**, **28**, and **30** are illustrated in FIG. **1** as being co-located within a single processing unit, in implementations in which processor **20** includes multiple processing units, one or more of modules **22**, **24**, **26**, **28**, and/or **30** may be located remotely from the other modules. The description of the functionality provided by the different modules **22**, **24**, **26**, **28**, and/or **30** described below is for illustrative purposes, and is not intended to be limiting, as any of modules **22**, **24**, **26**, **28**, and/or **30** may provide more or less functionality than is described. For example, one or more of modules **22**, **24**, **26**, **28**, and/or **30** may be eliminated, and some or all of its functionality may be provided by other ones of modules **22**, **24**, **26**, **28**, and/or **30**. As another example, processor **38** may be configured to execute one or more additional modules that may perform some or all of the functionality attributed below to one of modules **22**, **24**, **26**, **28**, and/or **30**.

The content module **22** is configured to control the provision of content to user **12** via user interface **14**. If the content includes computer generated images (e.g., in a game, virtual world, simulation, etc.), content module **22** is configured to generate the images and/or views for display to user **12** through user interface **14**. If the content includes video and/or still images, content module **22** is configured to access the video and/or still images and to generate views of the video and/or still images for display on user interface **14**. If the content includes audio content, content module **22** is configured to generate the electronic signals that will drive user interface **14** to output the appropriate sounds. The content, or information from which the content is derived, may be obtained by content module **22** from electronic storage **18**.

In one embodiment, the content provided by content module **22** is content associated with a game. In this embodiment content module **22** is configured to render views of the game for display to user **12** via user interface **14**. The content module **22** further provides audio associated with the views in accordance with the machine readable-program code associated with the game.

The gesture module **24** is configured to receive one or more output signals generated by user interface **14** indicating control inputs received from user **12**. Based on the received one or more output signals, gesture module **24** monitors performance of one or more control gestures by user **12**. In one embodiment, a control gesture being monitored by gesture module **24** includes an initial portion, one or more intermediate portions, and an ending portion.

In an embodiment in which user interface **14** includes a touch-sensitive surface through which input is received from user **12**, an initial portion of a control gesture may include initiating contact with the touch-sensitive surface at one or more locations. The control gesture may dictate a location (or locations for a multi-touch control gesture) at which contact is initiated, a pressure with which contact is initiated, and/or other parameters of the initial contact between user **12** and the touch sensitive surface. If user **12** is already in contact with the touch-sensitive surface, the initial portion of the control gesture may include moving to one or more locations corresponding to the control gesture, maintaining contact (at specific location(s), or generally) with the touch-sensitive surface, motioning in one or more specific directions, making one or more specific shapes, ending contact at one or more locations on the touch-sensitive surface, and/or other actions. The one or more intermediate portions of the control gesture may include one or more of maintaining contact at one or more points without moving, motioning in a specific direction, making a specific shape, halting motion, contacting the touch-sensitive surface at one or more additional locations, ending contact at one or more locations on the touch-sensitive surface, pressing harder or softer on the touch-sensitive surface, and/or other actions. The ending portion may include one or more of ending contact at one or more locations on the touch-sensitive surface, halting motion at one or more locations, motioning in a specific direction, making a specific shape, contacting the touch-sensitive surface at one or more additional locations, pressing harder or softer on the touch-sensitive surface, and/or other actions.

One or more of the actions dictated by the initial portion, the one or more intermediate portions, and/or the ending portion of the control gesture that are location-based may be associated with static locations (e.g., at the same location every time), dynamic locations that do not change during the corresponding portion (e.g., the location may move between performances of the control gesture, but remains fixed while the portion corresponding to the location is performed), dynamic locations that change during the corresponding portion, and/or other types of locations.

In the embodiment in which user interface **14** includes a touch-sensitive surface, one of the most simple examples of a control gesture would include an initial portion of in which user **12** contacts the touch-sensitive surface. The intermediate portion may include holding the contact made during the initial portion of the control gesture. The ending portion may include removing the contact made during the initial portion of the control gesture, and maintained during the intermediate portion of the control gesture.

In an embodiment in which user interface **14** includes one or more sensors configured to monitor motion of user **12** in space (e.g., an imaging sensor, a pressure sensor, an accelerometer, and/or other sensors), an initial portion of a control gesture may include one or more of facing a specific direction, motioning or moving in a specific direction, motioning with a specific one or more appendages, positioning body parts with respect to each other in a specific manner (e.g., holding hands in a predetermined configuration, and/or other configurations of body parts), motioning or moving in a specific shape, motioning for a specific amount of time, motioning or moving at (or above, or below) a specific rate and/or acceleration), changing a direction of motion or movement in a specific manner, and/or other actions. The one or more intermediate portions may include one or more of changing orientation of the head, and/or other body parts to a specific direction, motioning or moving in a specific direction, motioning with a specific one or more appendages, motioning with body parts to move in a specific relationship to each other, motioning or moving in a specific shape, motioning for a specific amount of time, motioning or moving at (or above, or below) a specific rate and/or acceleration), changing a direction of motion or movement in a specific manner, halting motion or movement by one or more body parts, and/or other actions. The ending portion of the control gesture may include may include one or more of changing orientation of the head, and/or other body parts to a specific direction, motioning or moving in a specific direction, motioning with a specific one or more appendages, motioning with body parts to move in a specific relationship to each other, motioning or moving in a specific shape, motioning for a specific amount of time, motioning or moving at (or above, or below) a specific rate and/or acceleration), changing a direction of motion or movement in a specific manner, halting motion or movement by one or more body parts, and/or other actions.

The gesture module **24** is configured to monitor performance of the control gestures by obtaining the output signal

of user interface **14** indicating movement and/or motion of user **12**, and comparing the movement and/or motion of user **12** with the control gestures. One or more of the control gestures may be a function of the content being conveyed to user **12** via user interface **14** by content module **22**. For example, one or more of the control gestures may be a function of a game being conveyed to user **12** via user interface **14**. One or more of the control gestures may be independent from the content being provided to user **12** via user interface **14**. For example, one or more of the control gestures may control function of user interface **14**, processor **20**, and/or other components.

The stimulation module **26** is configured to receive information related to performance of control gestures from gesture module **24**, and to determine haptic stimulation to be generated for user **12** associated with the control gestures. The haptic stimulation determined by stimulation module **26** includes haptic stimulation that is responsive to performance of the control gestures separate from the context in which they are performed. For example, in the context of a game haptic stimulation responsive to performance of a control gesture includes haptic stimulation that is not dependent on other variables within the game other than performance of the control gesture.

The haptic stimulation determined by stimulation module **26** is complex and rich beyond the haptic stimulation typically associated with control gestures. For example, in conventional systems, haptic stimulation associated with control gestures tends to include a single stimulation that is provided during and/or after a control gesture. This haptic stimulation provides confirmation of the control gesture. The haptic stimulation determined by stimulation module **26**, by contrast, tracks more closely with performance of the control gesture to increase the immersive experience provided by the haptic stimulation.

In one embodiment, the haptic stimulation determined by stimulation module **26** corresponding to a control gesture includes a first stimulation, a second stimulation, and/or other stimulations. The first stimulation is different from the second stimulation. This means that one or more parameters of the first stimulation is different from the second stimulation. The one or more parameters may include one or more of, for example, periodicity, force, directionality, location, and/or other parameters of haptic stimulation. Variation of the one or more parameters between the first stimulation and the second stimulation (and/or other stimulations) may be smooth, and/or may be discrete so as to create a distinct step in the parameter(s) of haptic stimulation between the first stimulation and the second stimulation.

The stimulation module **26** is configured to correlate provision of the first stimulation and the second stimulation with performance of the control gesture to which the first stimulation and the second stimulation correspond. In one embodiment, the first stimulation is determined by stimulation module **26** responsive to performance of the initial portion of the control gesture and the second stimulation is determined by stimulation module **26** responsive to performance of one or more intermediate portions of the control gesture. Responsive to the ending portion of the control gesture, stimulation module **26** may determined another stimulation (e.g., a third stimulation), or may cease the provision of haptic stimulation associated with the control gesture.

In one embodiment, stimulation module **26** determines haptic stimulation associated with a control gesture such that the stimulation is different between intermediate portions of the control gesture. This may result in a smooth changes in the haptic stimulation as performance of the control gesture proceeds, and/or in discrete changes in the haptic stimulation as performance of the control gesture transitions between intermediate portions.

The haptic stimulation determined by stimulation module **26** may be provided to give user **12** some feedback about performance of a control gesture. This may include stimulation that informs user **12** that a portion of the control gesture has begun and/or is currently ongoing, stimulation that prompts user **12** to begin a next portion of the control gesture, and/or stimulation that provides other information about performance of the control gesture to user **12**.

In one embodiment stimulation module **26** provides haptic stimulation to user **12** that indicates to user **12** that performance of a control gesture has failed. In this embodiment, responsive to failure by user **12** to perform a portion of a control gesture, or failing to properly transition from one portion of the control gesture to another portion of the control gesture, stimulation module **26** determines a stimulation for provision to user **12** that is indicative of the failure. For example, the failure stimulation may include a fizzle, and/or other stimulation.

Some illustrative examples of control gestures and corresponding haptic stimulation are presented hereafter. The examples given correspond to some classes of game characters commonly found in games that include combat between players and/or between players and non-player characters. Specifically, the examples given below correspond to "casters", "close combat warriors", and "ranged combat warriors." It will be appreciated that these classes of characters are not limiting. Other classes of characters, and/or hybrids included characteristics of a plurality of the classes, may be implemented in accordance with the principles set forth herein.

A "caster" is a character that casts spells (or other similar attacks and/or defenses) during combat. Examples of caster characters include wizards, priests, warlocks, engineers, and/or other characters. To control a caster to cast a given spell, user **12** may be required to perform a control gesture that corresponds to the given spell. As user **12** progresses through the portions of the control gesture, the haptic stimulation determined by stimulation module **26** corresponding to the control gesture may inform user **12** as to the progress of the control gesture. The haptic stimulation associated with the control gesture may further provide information about the power of the spell being cast (e.g., greater the force and/or more rapid periodicity may indicate a more powerful spell).

In one embodiment, as the control gesture proceeds between the portions of the control gesture, the force and/or rapidity of the haptic stimulation determined by stimulation module **26** may increase. This increase may be gradual as the control gesture proceeds and/or in discrete steps (e.g., at transitions between the portions of the control gesture). This is not intended to be limiting, as other parameters of the haptic stimulation may be changed to indicate the progress of the control gesture. The haptic stimulation may provide feedback about the (thus far) successful progress of the control gesture, and/or prompt user **12** with respect to future performance of the control gesture (e.g., to proceed to the next portion, to maintain the current portion, etc.). Upon performing the final portion of the control gesture, stimulation module **26** may determine haptic stimulation that indicates the spell being successfully cast. In one embodiment, user **12** may perform portions of the control gesture that effectively "store" the spell for discharge. This may store the spell for an indefinite period, or for some predetermined maximum storage time. During storage, stimulation module **26** may determine haptic stimulation that confirms the ongoing storage of the spell. If the storage period has a maximum storage time, the haptic

stimulation may indicate the status of the storage period with respect to the maximum storage time.

A "close combat warrior" is a character configured to fight enemies at close quarters (e.g., hand-to-hand combat). Such a character may be armed with swinging weapons (e.g., clubs, maces, etc.), stabbing and/or slashing weapons (e.g., knife, axe, sword, etc.), and/or other close quarter weapons. As user **12** controls the character to, for example, wield a blow, stimulation module **26** may determine haptic stimulation that mimics some real-world properties of such attacks. For example, as user **12** strikes into an opponent or object, a first feedback may mimic the striking and/or cutting sensation. As user **12** withdraws a weapon after such a blow, a second feedback may mimic the withdrawal of the weapon from the object or opponent. As another example, as user **12** swings a weapon in a ready position (e.g., swinging a ball on a chain) a first feedback determined by stimulation module **26** may mimic the real world sensation that would be the result of such an activity in real life. Releasing the weapon from the ready position (e.g., striking an opponent or object with the swinging ball) may result in the determination by stimulation module **26** of a second stimulation that mimics the feel of such an attack. The intensity of an attack may be determined based on an amount of time a control gesture (or some portion thereof) is performed, the range of motion of a control gesture, a speed of motion during a control gesture, pressure of the contact between the user and a touch screen included in user interface **14**, and/or other parameters of a control gesture (or some portion thereof).

In some implementations, the user interface **14** includes a touch screen in which displays of the content associated with a game is presented by content module **22**. In such implementations, the location at which the control gesture is made impacts the manner in which the game is controlled and/or the haptic stimulation determined by stimulation module **26** (for the user inputting the gesture and/or other users). For example, in controlling a close combat warrior, a user may input an attacking control gesture in a manner that indicates a specific portion of an enemy at which the attack should be directed (e.g., a leg, an arm, the head, the torso, etc.). Similarly, in controlling a close combat warrior, a user may input a defense or blocking control gesture in a manner that indicates a specific portion of a character being controlled that should be defended or blocked (e.g., a leg, an arm, the head, the torso, etc.). This location-based aspect of the control gesture may be taken into account in determining the success and/or impact of the corresponding control, and/or in determining the haptic stimulation that corresponds to the control gesture. Multiple attacks may be triggered by touching multiple locations on the touch screen of user interface **14**.

A "ranged combat warrior" is a character that is configured and armed for attacking enemies from a range. This may include characters armed, for example, to release projectiles such as arrows, stones, bullets, rockets, and/or other projectiles. By way of non-limiting example, user **12** may control a ranged combat warrior to fire a bow and arrow. In this example, different haptic stimulation may be determined by stimulation module **26** for notching the arrow, drawing the bow (and varying the haptic stimulation to indicate increasing string tension), releasing the string, the bowstring striking the forearm of the character upon release, and/or other portions of the control gesture associated with firing an arrow. The intensity and/or speed of an attack or projectile may be determined based on an amount of time a control gesture (or some portion thereof) is performed, the range of motion of a control gesture, a speed of motion during a control gesture, pressure of the contact between the user and a touch screen included in user interface **14**, and/or other parameters of a control gesture (or some portion thereof).

The target at which a ranged attack is directed and/or the path of a projectile emitted as part of a ranged attack may be determined based on a control gesture. For example, if user interface includes a touch screen, the user performing a control gesture may contact a portion of the touch screen on which the target of the ranged attack is displayed (e.g., as part of the control gesture). Similarly, the user may trace on the touch screen a path of a projectile emitted during a ranged attack. The tracing of the path of the projectile may form at least part of the control gesture initiating the attack. The target and/or the path indicated by the control gesture may impact the determination of the corresponding haptic stimulation determined by stimulation module **26**.

Game content may include boxes, rooms, gates, vehicles, and/or other objects or items that are "locked", and must be opened through performance of some control gesture. In some implementations, in response to a user selecting such an object or item, stimulation module **26** may determine haptic stimulation indicating to the user that the selected object or item is locked. Performance by the user of a control gesture to unlock the object or item may result in the determination of haptic stimulation by stimulation module **26** corresponding to the control gesture.

In one embodiment, the haptic stimulation determined stimulation module **26** for a given control gesture may vary based on characteristics of a character in a game being controlled by user **12**. For example, the haptic stimulation may vary as a function of character skill, character fatigue, character injury, weapon type, weapon disrepair, and/or other characteristics.

Changing the haptic stimulation based on character fatigue and/or injury may be a way of handicapping user **12** as a character that was fatigued or injured would be. This may include altering the force, periodicity, and/or other parameters of the haptic stimulation to inhibit precise control by user **12** (e.g., by increasing the force), to inhibit perception of cues and prompts in the haptic stimulation (e.g., by reducing force, increasing the force of portions of the haptic stimulation that do not provide cues and prompts, reducing response time to cues and/or prompts, etc.), and/or otherwise handicapping user **12**.

Varying the haptic stimulation based on character skill may provide a gradual and/or graduated "unlocking" of skills and abilities. For a character with more training and/or skill in a given ability, stimulation module **26** may determine haptic stimulation that provides more clear and/or more easily followed guide to performing a control gesture corresponding to the given ability. For example, as the skill of the character increases, the haptic stimulation determined by stimulation module **26** for the character may provide more definite cues and/or prompts (e.g., see the examples above with respect to character fatigue) that guide user **12** through the control gesture. This enables user **12** to utilize the control gesture without being fully trained in the corresponding ability, but may impact the reproducibility of the control gesture for the user unless further training and/or other skill-building is sought.

Altering the haptic stimulation determined for a control gesture based on the equipment of a character may incentivize maintaining repair of equipment and/or obtaining upgraded equipment without making such activities mandatory. Instead of a digital determination of whether a control gesture is available to user **12**, the stimulation module **26** provides haptic stimulation that makes the control gesture easier and/or more enjoyable with "better" virtual equipment.

The equipment module **28** is configured to provide control over virtual equipment for user **12**. Within the context of a game being provided to user **12** by system **10**, user **12** may control virtual equipment (e.g., directly or through a character that is using the virtual equipment. In such cases, content module **22** provides to user **12**, via user interface **14** views of the virtual equipment. The equipment module **28** is configured to determine the operating parameters of the virtual equipment, and to simulate its operation.

In one embodiment in which user interface **14** includes a touch sensitive electronic display, equipment module **28** determines the operating parameters of the virtual equipment and/or simulates operation of the virtual equipment based on selections by user **12** of user selectable sections of the views of the virtual equipment. The user selectable sections of the virtual equipment may be located in the views of the virtual equipment that correspond to sections of the virtual equipment analogous to sections of equipment that would be engaged in real life to configure operating parameters of equipment and/or to operate equipment. The operating parameters of the virtual equipment that are configurable by engaging user selectable sections of the views of the virtual equipment include one or more of an amount of loaded rounds of ammunition, a level of disrepair, a stopping power, a projectile velocity, an ammunition type, a noise level, and/or other operating parameters.

By way of illustration, FIG. **2** shows a view of a piece of virtual equipment **32** (e.g., a gun). In the view shown in FIG. **2**, piece of virtual equipment **32** includes a plurality of selectable sections **34** (illustrated in FIG. **2** as section **34***a*, section **34***b*, section **34***c*, and section **34***d*). By selecting section **34***a*, user **12** may configure the handle/stock of piece of virtual equipment **32**. By selecting section **34***b*, user **12** may configure the ammunition of piece of virtual equipment **32**. By selecting section **34***c*, user **12** may configure the sights of piece of virtual equipment **32**. By selecting section **34***d*, user **12** may configure the barrel/muzzle of piece of virtual equipment **32**.

Selection of one of selectable sections **34** to configure piece of virtual equipment **32** may include simply selecting the desired selectable section **34**, and then selecting a new configuration for the selected section **34**. In one embodiment, reconfiguration is made through a touch and drag type of interaction. For example, user **12** may engage an area on user interface **14** that corresponds to ammunition and "drag" the ammunition to section **34***b* to reload piece of virtual equipment **32**. Similarly, user **12** may select and drag a silencer (and/or other muzzle or barrel feature) to section **34***d* of piece of virtual equipment **32** to change the sound characteristics of piece of virtual equipment **32** (and/or other characteristics).

As another illustrative example, FIG. **3** shows a view of a virtual firearm **36** having a plurality of selectable sections **38** (shown in FIG. **3** as section **38***a*, section **38***b*, section **38***c*, and section **38***d*). The selectable sections **38** of stimulation module **26** may be selected in a fashion similar to the one discussed above with respect to FIG. **2**.

As yet another illustrative example, FIG. **4** shows a view of a piece of virtual equipment **40** configured to show the proximity of various items to a user (or to a character being controlled by a user) in a game. The piece of virtual equipment **40** includes a plurality of selectable sections **42** (shown in FIG. **4** as section **42***a*, section **42***b*, section **42***c*, section **42***d*, and section **42***e*). Individual ones of selectable sections **42** correspond to individual modes of piece of virtual equipment **40** such that selection of one of selectable sections **42** results in piece of virtual equipment **40** operating in accordance with the selected mode. For example, in a first mode piece of virtual equipment **40** may provide an indication of the proximity of other characters, in a second mode piece of virtual equipment **40** may provide an indication of the proximity of enemies, in a third mode piece of virtual equipment **40** may provide an indication of the proximity of one or more resources (e.g., gold, food, ammunition, power-ups, etc.).

Returning now to FIG. **1**, in one embodiment, stimulation module **26** is configured to determine haptic stimulation to be generated for the user that is associated with the operating parameters of the virtual equipment and/or the simulated operation of the virtual equipment. This may include, for example, varying the haptic stimulation based on the current operating parameters of a piece of virtual equipment, determining haptic stimulation during the reconfiguration of a piece of virtual equipment to reflect changes being made in the piece of virtual equipment, and/or other aspects of configuration and/or operation of virtual equipment.

By way of non-limiting example, if a virtual firearm is reloaded by user **12**, stimulation module **26** determines haptic feedback indicating the reload. The new ammunition is different from previously used ammunition, stimulation module **26** determines haptic feedback upon firing of the firearm that is different from the haptic stimulation determined during firing of the previously used ammunition.

In one embodiment, actuators **16** are configured to actuate the touch sensitive electronic display that presents the views of the virtual equipment to user **12**. In this embodiment, delivery of the haptic stimulation determined by stimulation module **26** to user **12** as user **12** engages the touch sensitive electronic display results in a more immersive virtual equipment control experience. For example, as user **12** engages the touch sensitive display to reload a gun, or to switch out a piece of equipment, haptic stimulation is provided to user **12** through the touch sensitive surface that corresponds to the control being exerted over the gun.

The actuator control module **30** is configured to control actuators **16** to generate the haptic stimulus determined by stimulation module **26**. This includes communicating the haptic stimulus to be generated from processor **22** to actuators **16**. The haptic stimulus to be generated may be communicated over wired communication links, wireless communication links, and/or other communication links between processor **22** and actuators **16**.

FIG. **5** illustrates a method **44** of determining and/or providing haptic stimulation to a user. The haptic stimulation may be determined and/or provided to the user in conjunction with a game, and/or in other contexts. The operations of method **44** presented below are intended to be illustrative. In some embodiments, method **44** may be accomplished with one or more additional operations not described, and/or without one or more of the operations discussed. Additionally, the order in which the operations of method **44** are illustrated in FIG. **5** and described below is not intended to be limiting.

In some embodiments, method **44** may be implemented in one or more processing devices (e.g., a digital processor, an analog processor, a digital circuit designed to process information, an analog circuit designed to process information, a state machine, and/or other mechanisms for electronically processing information). The one or more processing devices may include one or more devices executing some or all of the operations of method **44** in response to instructions stored electronically on an electronic storage medium. The one or more processing devices may include one or more devices configured through hardware, firmware, and/or software to be specifically designed for execution of one or more of the operations of method **44**.

At an operation **46**, performance of an initial portion of a control gesture by a user is monitored. Performance of the initial portion of the control gesture may be monitored based on the output signal of a user interface similar to or the same as user interface **14** (shown in FIG. **1** and described above). In one embodiment, operation **46** is performed by a gesture module similar to or the same as gesture module **24** (shown in FIG. **1** and described above).

At an operation **48**, responsive to performance of the initial portion of the control gesture, a first haptic stimulation is determined. The first haptic stimulation corresponds to the initial portion of the control gesture. In one embodiment, operation **48** is performed by a stimulation module **26** similar to or the same as stimulation module **26** (shown in FIG. **1** and described above).

At an operation **50**, the first haptic stimulation is generated for the user. In one embodiment, operation **50** is performed by one or more actuators similar to or the same as actuators **16** (shown in FIG. **1** and described above).

At an operation **52**, a determination is made as to whether a first intermediate portion of the control gesture has been performed by the user. Responsive to the first intermediate portion of the control gesture having been performed, method **44** proceeds to an operation **54**. In one embodiment operation **52** is performed by a gesture module similar to or the same as gesture module **24** (shown in FIG. **1** and described above).

At operation **54**, a second haptic stimulation is determined. The second haptic stimulation corresponds to the first intermediate portion of the control gesture. In one embodiment, operation **54** is performed by a stimulation module similar to or the same as stimulation module **26** (shown in FIG. **1** and described above).

At an operation **56**, the second haptic stimulation is generated for the user. In one embodiment, operation **56** is performed by one or more actuators similar to or the same as actuators **16** (shown in FIG. **1** and described above).

Referring back to operation **52**, responsive to the first intermediate portion of the control gesture not having been performed, method **44** proceeds to an operation **58** at which a determination is made as to whether the control gesture has failed. This may be determined based on the output signal of a user interface similar to or the same as user interface **14** (shown in FIG. **1** and described above). The determination of whether the control gesture has failed may be made, for example, based on an amount of time since performance of the initial portion of the control gesture, if actions not included in the control gesture have been performed since performance of the initial portion of the control gesture, and/or other factors. In one embodiment, operation **58** is performed by a gesture module similar to or the same as gesture module **24** (shown in FIG. **1** and described above).

Responsive to a determination at operation **58** that the control gesture has not failed, method **44** returns to operation **52**. Responsive to a determination at operation **58** that the control gesture has failed, method **44** proceeds to an operation **60**. At operation **60**, haptic stimulation is determined that indicates failure of the control gesture. In one embodiment, operation **60** is performed by a stimulation module similar to or the same as stimulation module **26** (shown in FIG. **1** and described above).

Upon determination of the haptic stimulation at operation **60**, the determined haptic stimulation is generated for the user at operation **62**. In one embodiment, operation **62** is performed by one or more actuators similar to or the same as actuators **16** (shown in FIG. **1** and described above).

Referring back to operation **52**, further responsive to determination that the first intermediate portion of the control gesture has been performed, method **44** proceeds to an operation **64**. At operation **64**, a determination is made as to whether an ending portion of the control gesture has been performed. Responsive to a determination that the control gesture has ended, method **44** ends the provision of haptic stimulation associated with the control gesture. In one embodiment, a final haptic stimulation associated with the completion of the control gesture is further determined and generated. In one embodiment, operation **64** is performed by a gesture module similar to or the same as gesture module **24** (shown in FIG. **1** and described above).

Responsive to a determination at operation **64** that the ending portion of the control gesture has not yet been performed, method **44** proceeds to an operation **66**. At operation **66**, a determination is made as to whether the control gesture has failed. This may be determined based on the output signal of a user interface similar to or the same as user interface **14** (shown in FIG. **1** and described above). The determination of whether the control gesture has failed may be made, for example, based on an amount of time since performance of the first intermediate portion of the control gesture, if actions not included in the control gesture have been performed since performance of the first intermediate portion of the control gesture, and/or other factors. In one embodiment, operation **66** is performed by a gesture module similar to or the same as gesture module **24** (shown in FIG. **1** and described above).

Responsive to a determination at operation **66** that the control gesture has not failed, method **44** returns to operation **64**. Responsive to a determination at operation **66** that the control gesture has failed, method **44** proceeds to operations **60** and **62**.

In one embodiment, the control gesture includes more than one intermediate portion. In this embodiment, method **44** is expanded between operations **52** and **64** to monitor the additional intermediate portion(s) and generate corresponding haptic stimulation in a manner similar to that shown and described for the first intermediate portion.

FIG. **6** illustrates a method **68** of determining and/or providing haptic stimulation to a user. The haptic stimulation may be determined and/or provided to the user in conjunction with a game, and/or in other contexts. The operations of method **68** presented below are intended to be illustrative. In some embodiments, method **68** may be accomplished with one or more additional operations not described, and/or without one or more of the operations discussed. Additionally, the order in which the operations of method **68** are illustrated in FIG. **6** and described below is not intended to be limiting.

In some embodiments, method **68** may be implemented in one or more processing devices (e.g., a digital processor, an analog processor, a digital circuit designed to process information, an analog circuit designed to process information, a state machine, and/or other mechanisms for electronically processing information). The one or more processing devices may include one or more devices executing some or all of the operations of method **68** in response to instructions stored electronically on an electronic storage medium. The one or more processing devices may include one or more devices configured through hardware, firmware, and/or software to be specifically designed for execution of one or more of the operations of method **68**.

At an operation **70**, a view of virtual equipment is presented to the user via a touch sensitive electronic display. The view includes selectable sections that are selectable by the user to interact with the virtual equipment shown in the view. In one embodiment, the view of the virtual equipment is determined by a content module similar to or the same content module **22** (shown in FIG. **1** and described above).

At an operation **72**, selection of one of the selectable sections of the view of the virtual equipment is received. The selection may be received through the touch sensitive electronic display through which the view is presented.

At an operation **74**, operation of the virtual equipment is simulated and/or one or more parameters of the virtual equipment is adjusted based on the selection received at operation **72**. In one embodiment, operation **74** is performed by an equipment module similar to or the same as equipment module **28** (shown in FIG. **1** and described above).

At an operation **76**, haptic stimulation associated with the operation of the virtual equipment and/or the adjustment of the operating parameters of the virtual equipment effected at operation **74** is determined. In one embodiment, operation **76** is performed by a stimulation module similar to or the same as stimulation module **26** (shown in FIG. **1** and described above).

At an operation **78**, the haptic stimulation determined at operation **76** is generated for the user. In one embodiment, operation **78** is performed by one or more actuators similar to or the same as actuators **16** (shown in FIG. **1** and described above).

As was mentioned above, the description of complex haptic stimulation in response to gesture-based control for a single user is not intended to be limiting. Haptic stimulation generated in response to gesture-based control in a multi-user environment is also contemplated. The haptic stimulation provided to a given user may include haptic feedback that is responsive to gesture-based controls of another user and/or other phenomena.

FIG. **7** is a diagram illustrating an example **100** of a portable computing device configured in accordance with one or more aspects of the present invention. Particularly, a tablet computer **102** is shown. Tablet computer **102** includes a screen **104** mounted to a body **106**, with the top surface **108** representing a surface with which a user interacts. In this example, top surface **108** is bordered by body **106**, but the screen area could extend all the way to the edges of the tablet. Tablet computer **102** can use any number or type of touch-sensing technologies to determine when a user has touched on or near surface **106**. For example, surface **108** may include a resistance or capacitance-based touch sensing system and/or an optical touch sensing system.

Although a tablet computer is shown in this example, it can be understood that any touch-enabled computing device can be used. For instance, a smaller device such as a cellular telephone or media player may feature a touch-enabled display and can provide haptic outputs in accordance with the present subject matter. As another example, a haptically-enabled display surface associated with and interfaced to another computing device (e.g., a desktop or server computer) can be used. For example, surface **108** may represent a larger touch-enabled surface such as a table upon which a screen image is projected from above or below. A flat surface is depicted here, although the present subject matter could be applied for use in devices with curved surface and/or non-smooth surfaces. Gestures input to the computer (or other computing device) via touch may be control gestures. It will be appreciated that the description of gestures involving touch are not intended to limit the scope of control gestures discussed herein. Control gestures may include (with or without touch gestures) manipulation of a component or body (e.g., "tilt" controls), manipulation of one or more stick controls, manipulation of one or more buttons, manipulation of one or more switches, and/or manipulation of or interaction with other interface features.

FIG. **7** illustrates an example of the architecture of a computing device **102** at **110**. Computing device **102** comprises one or more processors **112** configured to execute computer program modules, a memory **114** such as RAM, ROM, or other memory technology, a display interface **116**, a haptic interface **118**, I/O interface **120**, and network interface **122**. Any suitable display technology can be used. In some embodiments, an LCD display is used.

Haptic interface **118** can comprise suitable components for driving one or more actuators used to play back haptic effects so as to provide a physical sensation to a user of device **102**. For example, some or all of display **104** may include embedded actuators so that targeted physical output can be provided to a portion of the display to provide a physical effect where the user touches surface **108**. Additional actuators may be used to provide haptic output via other surfaces of tablet **102**, such as its sides and the surface opposite surface **108** (i.e., the back of the device). It will be appreciated that the location of the actuator relative to the desired physical effect can vary. For example, in order to produce an effect at a first part of the screen, an actuator at a second part of the screen (or elsewhere in the device) may be driven so that the properties of intervening components of the screen and/or device influence what is felt at the first part of the screen.

In one embodiment, the tablet comprises an actuator having an eccentric rotating mass motor. The actuator is coupled either directly or indirectly to a surface of the tablet housing. Powering the motor causes vibration on the surface that a user can feel. By varying the magnitude and freq of the signal sent to the actuator, various effects are possible. As another example, an actuator may be used to raiser or lower sections of the screen to create ridges, troughs, or other features. As a further example, an actuator can comprise a piezoelectric. For example, a piezoelectric actuator can be embedded, at least partially, in an inorganic polymer matrix, such as silicone. As yet a further example, an actuator may comprise a macro-fiber composite actuator or piezocomposite actuator. Such actuators may be formed as a thin layer of piezoelectric fibers suspended in a matrix (e.g., epoxy). The fibers may communicate electrically with polyimide electrodes. Many other types of actuators may be used, and so this exemplary description of actuators is not meant to be limiting.

I/O interface **120** can be used by processor(s) **112** to receive input and provide output using any suitable components. For example, I/O interface **120** may link to speakers and/or a microphone for receiving voice input and providing audio output. As another example, I/O interface **120** may provide a connection to peripheral devices such as a mouse or stylus used to provide input to the device, or to an imaging sensor used to capture still images and/or video.

Network interface **122** can be used to link device **102** to a network using one or more networking technologies. For instance interface **122** may provide a connection to suitable components for connecting to an IEEE 802.11 (Wi-Fi) or 802.16 (Wimax) network, or a connection using Bluetooth technology. As another example, interface **122** may allow communication via a telephone, Ethernet, or other wired connection or may support other wireless technology such as communication via an IR port.

Computing device **102** can comprise additional components—for example, one or more storage components (e.g., magnetic or solid-state hard disk drives) can be included. If computing device **102** comprises a cellular telephone, appropriate RF components may be included as well.

Memory **114** tangibly embodies one or more program components that configure computing device **102** to operate in an intended manner. For example, memory **114** can include

one or more applications, an operating system, and can also include stored data. As illustrated, memory **114** also includes a program component **124** for providing an interactive game in accordance with one or more aspects noted below.

Generally, the game can configure computing device **102** to present a play area **126** via display **104**, track the movement of a virtual object **128** (e.g., a ball) in the play area, and respond to user interactions to launch and deflect the virtual object during play using paddle **130**. Additionally, the game can be configured to play back haptic effects as the virtual object moves through and encounters features of the play area. The haptic effects can be selected to provide a sensation that differs based on the particular features that are encountered. In this example, play area includes a top T, bottom B, left side L, and right side R. The game can be configured so that the virtual object is deflected by paddle **130** prior to reaching left side L. If multiple players are involved, the virtual object may exit at one or more sides T, B, or R and pass to another user's screen as noted below.

FIG. **8**A illustrates an example **200**A of the use of a game to support multi-user play. The game program can support sending and receiving data to facilitate tracking the position of the virtual object in a play area that comprises multiple screens. In this example a first device **202** is interfaced to a second device **204** via a network **206**. Network **206** may comprise a local area network, a wide area network, or may represent a direct connection between devices **202** and **204**. By interfacing multiple devices running an instance of the game, a user can experience haptic effects when the virtual object encounters features in another user's screen. Such haptic effects may include haptic effects determined in accordance with a control gesture input on another user's screen.

For example, if the play area **126** of FIG. **7** is used, then when virtual object **128** exits at right side R of a first device it may enter the screen at right side R of the second device. As another example, the devices may have mirror-image layouts; that is, device **202** may feature paddle **130** along left side L while device **204** includes paddle **130** along right side R. In that case, when the virtual object reaches right side R of the play area of the first device, it may enter the play area at left side L of the other device, headed towards right side R and paddle **130** in the play area of the other device.

Server **208** is depicted to illustrate that in some embodiments, multi-user play may be facilitated by a server. However, as noted above, in some embodiments game program is configured to directly interface with other instances without need of a server.

FIG. **8**B illustrates another example **200**B of a multi-user play. In this example, three devices **202**, **204**, and **210** are interfaced via a first network **206**. A second network **214** facilitates interaction with a fourth device **212**. For example, network **206** may comprise a local area network connection while network **214** may comprise a wide-area network connection. Compass **216** is illustrated to show that in some embodiments the relative position of multiple players can be considered. For example, as the "westmost" player, device **202** may include paddle **130** at left side L. Device **204** may have its paddle positioned along top side T, since device **204** is "northmost." Device **210** may have its paddle positioned along bottom side B, while device **212** may have its paddle positioned along right side R. Alternatively, the paddle may remain on the same side of the screen for each user but with appropriate mapping between edges to maintain the relative position of the users around the shared play area.

It will be understood that in various embodiments the game can be configured to dynamically adjust the behavior and connections between the play areas based on factors such as each device's orientation, the relative position of the players, and other considerations such as the relative size of screen areas. As will be noted below, the virtual object can move from one screen to another in other manners in addition to or instead of encountering the boundaries of the play area.

FIG. **9** illustrates an example of play areas **302**A and **302**B for two respective users A and B over a plurality of time intervals (I), (II), and (III). Each play area **302** includes a respective paddle **304**. At time interval (I), virtual object **306** has been launched or deflected from paddle **304**B towards the boundary of play area **302**B. As shown at time interval (II), exit point **308** from play area **302**B is mapped to an entry point **310** in play area **302**A. The mapping may allow the virtual object to pass instantly between the play areas or there may be a delay based on the distance between the players (e.g., as determined by GPS and/or other triangulation or proximity detection techniques). In any event, time interval (II) depicts virtual object **306** encountering paddle **304**A. For example, user A may have moved paddle **304**A by sliding his or her fingers along the display surface of his device to intercept virtual object **306**.

When virtual object **306** encounters paddle **304**A, a haptic effect H**1** is selected and played back. As illustrated, haptic effect H**1** is localized to the point at which user A touches paddle **304**A (and/or another part of play area **302**). As was noted above, the sensation can be generated by commanding one or more actuators to provide motion or another effect; the actuators may be located at the point at which the effect is intended to be felt and/or elsewhere. FIG. **9** shows effect H**1** as "(((H**1**)))" in play area **302**A and as "(H**1**)" in play area **302**B since the effect is also played back for player B and localized to player B's touch point. However, as indicated the intensity of effect H**1** differs as between players A and B.

The haptic effect can be selected based on the simulated physics of the game. For example, the paddles **304** may represent a hard surface, and so effect H**1** may comprise a strong, sharp effect. Since a deflection is meant to represent a "hit," effect H**1** may be the strongest effect in the game. The "hit" is played back to user B to alert user B that the virtual object will be returned and user B can prepare to deflect the incoming virtual object. The hit may be played back to player B with a suitable indicator of direction—for instance, the effect may be designed to feel like it originated from the left, rather than the top or bottom; this may be helpful when three of more users are playing together.

By playing back the haptic effect even for a collision (or other event) occurring in a different player's screen, the game can enhance the perception that the players are sharing a space even though the players cannot view one another's play areas. Thus, the players may become more immersed in the game and may have a more compelling game experience.

FIG. **10** illustrates another example of play and depicts the virtual object ricocheting off the border of a play area. Particularly, three time intervals (I), (II), and (III) are again shown. Play areas **402**A and **402**B correspond to players A and B, while paddles **404** and virtual object **406** are also illustrated. As shown at time interval (I), virtual object **406** is launched with a trajectory towards a point **408** at the top boundary of play area **402**. Interval (II) illustrates when virtual object **406** encounters point **408**. A "bounce" haptic effect H**2** is played back to players A and B, localized to their touch points at respective paddles **404**A and **404**B.

Since the "bounce" occurs in play area **402**B and is at a closer distance to paddle **404**B than paddle **404**A, it is depicted as "((H**2**))" in play area **402**B and "(H**2**)" in play area **402**A since the bounce is "louder" for player B. As shown at time interval (III), after the bounce the virtual object

passes to play area **402**A. Alerted to the bounce, player A may attempt to intercept the virtual object and prevent it from reaching the goal area behind paddle **404**A.

FIG. **11** is a diagram illustrating another aspect of the present subject matter. In addition to or instead of haptic effects played in response to events changing the virtual object trajectory or other "discrete" events, haptic effects can be played back to simulate a continuous effect. In this example, play areas **502** for two players A and B are shown in a time interval (I) and a time interval (II). For purposes of illustration, play areas **502** are shown in a "landscape," rather than "portrait" orientation. Each play area features a respective paddle **504** as well, and virtual object **506** is depicted.

Each play area of this example also includes seams **508** represented by dotted lines. For example, seams **508** may represent boundaries between planks in a wooden surface depicted in the play area. To simulate a wood panel back ground, a continuous low rumble effect to correlate with the virtual object rolling across the surface can be combined with click effects to correlate with the virtual object encountering seams **508**. This effect is shown as "H**3**" in FIG. **11**. At time interval (I), the effect is shown as "((H**3**))" for players B and "(H**3**)" for player A since the virtual object is closer to paddle **504**B than paddle **504**A. At time interval (II), effect H**3** is louder for paddle **504**A since virtual object **506** is moving towards player A. Although the background effect is shown in conjunction with seams **508**, a background effect could be included to simulate a surface alone (i.e. a continuous surface) or could vary as the simulated background surface changes (e.g., from a wood area to a metal area to a concrete area, etc.).

FIG. **12** is a flowchart illustrating illustrative steps in a method **600** for providing a game in accordance with the present subject matter. Block **602** represents setting up one or more play areas. For example, if two users desire to play, respective play areas can be initialized and mappings between the shared boundaries (and/or other entry-exit points) can be determined.

Block **604** occurs while play continues. At least one instance of the game can track the position and motion of the virtual object based on interaction with paddles, obstacles, and characteristics of the play area based on a model simulating physics of the game. For example, the model can provide for changes in the virtual object's speed and direction based on simulating momentum, mass, and material characteristics of the virtual object and the other items in the play area.

At block **606**, based on the position and motion of the virtual object at, before, and/or after an event, one or more haptic effects to play back can be determined. For example, if the virtual object encounters a boundary or other object in the play area, a haptic effect associated with the physical interaction between the virtual object and boundary/object can be selected for playback. Different boundaries/objects may result in different effects. For example, a border or paddle may result in a "hard" effect, while obstacles included in the play area may have "soft" effects. Simulated properties of the virtual object can be taken into account as well—the game may support a mode with a hard (e.g., steel) virtual object or a soft (e.g., rubber) virtual object with appropriate changes in the haptic output scheme.

Additionally or alternatively the haptic effect can relate to a background effect. For instance, as was noted above, a continuous haptic effect simulating passage of the virtual object over a simulated surface can be provided based on characteristics of that surface. As another example, the surface may include material or an obstacle for the virtual object to pass through and a suitable haptic effect can be provided to simulate passage through the material/obstacle.

At block **608**, the game determines the position of the virtual object relative to the haptic delivery point(s) to adjust how the haptic effect is to be output. For instance, a haptic delivery point can include the point at which a user touches the screen of a device. The "loudness" (i.e., intensity) of the haptic effect can be inversely proportional to the distance between the delivery point and the virtual object. Directionality may also be applied. For example, if a ricochet occurs on another screen, the haptic effect that is presented may include a directional component or may be otherwise be presented to give an indication of where the ricochet occurred.

At block **610**, suitable signals are sent to the actuators to generate the haptic effect(s) having the desired volume. For example, the game can consult a library of signal patterns for use in generating different haptic effects and use the signal patterns to command one or more actuators embedded in the screen and/or other portions of the device. The haptic effects may include sounds and/or visual elements as well.

For multi-user play, each respective instance of the game can determine the virtual object's position and motion while in that instance's play area and pass that information to the other instances. When the virtual object exits the play area, information regarding the virtual object's motion (e.g., a vector with direction and speed) can be used to continue tracking by the instance of the game whose play area is to receive the virtual object.

In some embodiments, when an event occurs and/or when background effects are provided, the haptic effect is selected by the instance of the game whose play area contains the virtual object when the haptic effect is to be triggered and that information is provided to the other instances of the game. For example, in a game involving player A and player B, if the virtual object collides with an obstacle, border, or paddle in player A's play area, the instance of the game on player A's device can provide player B's device the desired haptic effect along with information about the collision and position thereof for use by the instance of the game on player B's device in determining a volume or directionality for the effect.

FIG. **13** is a diagram illustrating an example of an interface **700** for an instance of a game configured in accordance with aspects of the present subject matter. In this example, a pinball-like game is presented in which the play area **702** includes a border **704**, **706** that extends inward from the screen boundaries. The objective of the game is to prevent a virtual object (not shown), such as a ball or other object, from reaching **708** by deflecting the virtual object using paddle **710**. To begin play, the virtual object may be launched from paddle **710** or may appear elsewhere in play area **702**.

Interface **700** includes a plurality of control buttons **712**, **714**, **716**, and **718** which may be used to provide inputs and access menus. For example, buttons **712** and **714** may comprise play and pause buttons, while button **716** provides a "launch" command and button **718** exits the game or launches a menu for configuring, saving, or exiting the game. In some embodiments, control buttons **712**-**718** may be provided with suitable haptic effects to simulate pushing a physical button.

Turning to play area **702**, a plurality of simulated lights **720** can be provided to enhance the visual experience; the lights may or may not act as obstacles. A bumper **722** may cause the virtual object to "bounce" in response to a collision in a manner different from a ricochet from border **704**, **706**. For example, border **704**, **706** may be presented as a simulated metal border which causes a sharp ricochet effect. Bumper **722** may feature an initial amount of "give" before imparting

force on the virtual object in a manner similar to that of a pinball machine bumper. Accordingly, when the virtual object encounters border **704**, **706** or bumper **722**, different respective haptic effects may be played back at the point(s) at which the user contacts the screen to provide different sensations in accordance with the simulated physical response of the borders/bumper. Additionally, as was noted above, the intensity of the effect can depend on distance from the point(s) at which the user contacts the screen.

This example features metal bars **724**, **726**, and **728**, which may provide a still further response to collisions with a virtual object and may be assigned their own respective haptic effect. Arrows **730** may comprise a visual effect and/or may result in an acceleration of the virtual object into xylophone structure **732**. In this example, xylophone structure **732** comprises a plurality of keys (**732**A, **732**B, **732**C identified), with each ascending key having its own associated haptic effect. For example, as the virtual object moves from key **732**A to **732**B to **732**C, the haptic effect may increase in pitch along with corresponding xylophone sound effects. At the same time, the haptic effect may decrease in intensity as the virtual object moves away.

In some embodiments, point **734** represents an exit from the play area and into a second user's play area, which is identical to play area **702**. When the virtual object enters play area **702**, it may be returned via chute **736** along with an accompanying "rattle" representing passage through the chute. As was noted above, each haptic effect in one user's play area can also be played back in the other user's (or users') play area(s) but with a corresponding decrease in intensity based on the separation from the site of the event causing the haptic effect and the user's point of contact with the screen.

Some embodiments feature one or more instances of a vortex as shown at **738**. Vortex **738** can comprise a portion of play area **702** that attracts the virtual object toward opening **740**. If the virtual object reaches opening **740**, the virtual object may pass into another play area. When the virtual object initially contacts vortex **738**, a first haptic effect representing the "pull" of the vortex may be played back, with the effect becoming stronger until (and if) the virtual object reaches opening **740**. At that point, an "exit" effect may be played back to represent the virtual object's exit from the vortex in another play area. This can, for instance, alert the user of the play area receiving the virtual object to move his or her paddle **710** into position.

In some embodiments, if the virtual object is not deflected from goal area **708**, a haptic effect representing entry of area **708** is presented, such as absorption of the virtual object or an explosion. At that point, depending upon the rules of the game, the virtual object may be provided for launch again via paddle **710** for another round. In some embodiments, the game proceeds until one player reaches a predetermined score level (e.g., 7 goals) and/or score differential (ahead by 3 goals). As another example, point values may be associated with hitting certain obstacles (e.g., bumper **722**, bars **724**, **726**, **728**, lights **720**) or passing through all keys of xylophone structure **732**. Embodiments may support moving or destroying obstacles (e.g., breaking through bricks) during the course of play, with suitable haptic effects provided based on motion or destruction of the obstacles.

In some embodiments, a computing device may be sensitive to distance of a user's fingers or stylus from the touch screen and/or touch pressure. These features may be used during play of the game and/or in configuring the game application. For instance, if the device indicates that the user is not touching the screen or another haptically-enabled area, haptic effects can be turned off to reduce power consumption. As another example, the user may be able to hover to provide input. For instance, the area at which buttons **712**-**716** are presented may ordinarily appear as brushed metal, but the buttons may appear in response to a user hovering or touching the area.

In several examples above, game play proceeded based on movement of a paddle using touch. Additionally or alternatively, gameplay may depend on tilt sensors and/or accelerometers. For example, users may be able to tilt or swing their devices to affect the movement of the virtual object and/or paddle position. Haptic effects can be delivered at the point(s) at which the users grip their respective devices. In some embodiments, the game may use multiple paddles per user or may use no paddles at all, with all input based on tilt/acceleration.

Several examples of multi-user play were provided. In some embodiments, single-user play is also supported. For example, a play area may be completely closed, with the virtual object returning towards the paddle and goal area. As another example, single user play may proceed with one or more other players simulated, with the other players having a respective simulated play area and with corresponding haptic feedback when the virtual object enters the simulated play area.

Although the invention has been described in detail for the purpose of illustration based on what is currently considered to be the most practical and preferred embodiments, it is to be understood that such detail is solely for that purpose and that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover modifications and equivalent arrangements that are within the spirit and scope of the appended claims. For example, it is to be understood that the present invention contemplates that, to the extent possible, one or more features of any embodiment can be combined with one or more features of any other embodiment.

What is claimed is:

1. A system configured to provide haptic stimulation to a user, the system comprising:

a user interface configured to generate output signals related to the gestures of a user;

a haptic device configured to generate haptic stimulation to the user; and

one or more processors configured to execute computer program modules, the computer program modules comprising:

a gesture module configured to monitor performance of a control gesture by the user based on the output signals of the user interface,

wherein the control gesture is a gesture associated with a command input to the system, and includes an initial portion, a first intermediate portion, and an ending portion;

a stimulation module configured to receive information related to performance of the control gesture from the gesture module, and to determine haptic stimulation to be generated for the user associated with the control gesture,

wherein the haptic stimulation includes a first stimulation determined responsive to performance of the initial portion of the control gesture, and a second stimulation that is different from the first stimulation and is determined responsive to performance of the first intermediate portion of the control gesture; and

a control module configured to control the haptic device to generate the stimulation determined by the stimulation module.

2. The system of claim 1, wherein the stimulation module is configured such that the haptic stimulation associated with the control gesture includes a third stimulation different from the first stimulation and the second stimulation that is determined responsive to performance of the ending portion of the control gesture.

3. The system of claim 1, wherein the control gesture further includes a second intermediate portion, and wherein the stimulation module is configured such that the haptic stimulation associated with the control gesture includes a third stimulation different from the first stimulation and the second stimulation that is determined responsive to performance of the second intermediate portion of the control gesture.

4. The system of claim 3, wherein the second stimulation is determined to signal to the user that the second intermediate portion of the control gesture should be commenced.

5. The system of claim 1, wherein the command input associated with the control gesture is a single, discrete command.

6. The system of claim 1, wherein the second stimulation is determined by adjusting one or more parameters of the first stimulation.

7. The system of claim 6, wherein the one or more parameters of the first stimulation that are adjusted to determine the second stimulation include one or more of periodicity, force, directionality, or location.

8. The system of claim 1, wherein the first intermediate portion of the control gesture includes maintaining contact with a touch sensitive surface for a predetermined period of time.

9. The system of claim 1, wherein the gesture module is configured to identify a control gesture failure responsive to the users commencing performance of the control gesture and not successfully performing all of the portions of the control gesture, and wherein the stimulation module is configured such that the haptic stimulation associated with the control gesture includes a third stimulation different from the first stimulation and the second stimulation that is determined responsive to identification of a control gesture failure by the gesture module.

10. The system of claim 1, wherein the stimulation module is configured such that the first stimulation and/or the second stimulation are determined in part based on one or more of a skill-level, fatigue, or injury of a character in a game under the control of the user.

11. A computer-implemented method of providing haptic stimulation to a user of a system, the method being implemented in the system which includes a haptic device and one or more physical processors configured to execute computer program modules, the method comprising:

monitoring, on the one or more processors, performance of a control gesture by a user,

wherein the control gesture is a gesture associated with a command input to the system, and includes an initial portion, a first intermediate portion, and an ending portion;

determining, on the one or more processors, haptic stimulation associated with performance of the control gesture to be generated for the user,

wherein the haptic stimulation includes a first stimulation determined responsive

to performance of the initial portion of the control gesture, and a second stimulation that is different from the first stimulation and is determined responsive to performance of the first intermediate portion of the control gesture; and

generating, with the haptic device, the determined stimulation during performance of the control gesture.

12. The method of claim 11, wherein the haptic stimulation associated with the control gesture includes a third stimulation different from the first stimulation and the second stimulation that is determined responsive to performance of the ending portion of the control gesture.

13. The method of claim 11, wherein the control gesture further includes a second intermediate portion, and wherein the haptic stimulation associated with the control gesture further includes a third stimulation different from the first stimulation and the second stimulation that is determined responsive to performance of the second intermediate portion of the control gesture.

14. The method of claim 13, wherein the second stimulation is determined by the one or more processors to signal to the user that the second intermediate portion of the control gesture should be commenced.

15. The method of claim 11, wherein the command input associated with the control gesture is a single, discrete command.

16. The method of claim 11, wherein the second stimulation is determined by the one or more processors by adjusting one or more parameters of the first stimulation.

17. The method of claim 16, wherein the one or more parameters of the first stimulation that are adjusted to determine the second stimulation include one or more of periodicity, force, directionality, or location.

18. The method of claim 11, wherein the first intermediate portion of the control gesture includes maintaining contact with an interface surface of a touch sensitive surface for a predetermined period of time.

19. The method of claim 11, wherein responsive to identification of a control gesture failure during monitoring of performance of the control gesture the haptic stimulation associated with the control gesture includes a third stimulation different from the first stimulation and the second stimulation.

20. The method of claim 11, wherein the first stimulation and/or the second stimulation are determined by the one or more processors in part based on one or more of a skill-level, fatigue, or injury of a character in a game under the control of the user.

21. A system configured to provide stimulation to a user of a game, the system comprising:

a touch sensitive electronic display having an interface surface accessible for engagement by the user, the touch sensitive user interface being configured to generate output signals related to the position at which the interface surface is engaged, and to present views of the game to the user through the interface surface,

wherein the views presented through the interface surface include views of virtual equipment having user selectable sections that are selectable by the user to interact with the virtual equipment by engaging the interface surface at the user selectable sections of the views of the virtual equipment;

a haptic device configured to generate haptic stimulation to the user; and

one or more processors in operative communication with the touch sensitive electronic display and the haptic device, the one or more processors being configured to execute computer program modules, the computer program modules comprising:

an equipment module configured to determine the operating parameters of the virtual equipment in the views, and to simulate operation of the virtual equipment,

wherein the equipment module determines the operating parameters of the virtual equipment and/or simulates operation of the virtual equipment based on selections by the user of the user selectable sections of the views of the virtual equipment;

a stimulation module configured to determine haptic stimulation to be generated for the user associated with the operating parameters of the virtual equipment and/or simulated operation of the virtual equipment,

a control module configured to control the haptic device to generate the stimulation determined by the stimulation module.

22. The system of claim **21**, wherein the virtual equipment includes a projectile weapon.

23. The system of claim **22**, wherein the operating parameters of the virtual equipment based on selections by the user of the user selectable sections of the views of the virtual equipment include one or more of an amount of loaded rounds of ammunition, a level of disrepair, a stopping power, a projectile velocity, an ammunition type, or a noise level.

24. The system of claim **21**, wherein the haptic device is configured to actuate the touch sensitive electronic display.

25. The system of claim **21**, wherein the haptic device is configured to actuate the interface surface.

26. The system of claim **21**, wherein the operating parameters of the virtual equipment include activation and deactivation of individual pieces of virtual equipment.

27. The system of claim **21**, wherein the user selectable sections of the views of the virtual equipment correspond to sections of the virtual equipment analogous to sections of equipment that would be engaged in real life to configure operating parameters and/or operate the equipment.

28. The system of claim **21**, wherein the equipment module is configured to add or remove one or more components of a piece of virtual equipment based on the user engaging user selectable sections of a view of the piece of virtual equipment.

29. The system of claim **28**, wherein the removal and/or addition of one or more components of the piece of virtual equipment are reflected in the views of virtual equipment presented to the user through the interface surface.

30. The system of claim **21**, wherein equipment module is configured to change equipment modes of a piece of virtual equipment based on the user engaging user selectable section of a view of the piece of virtual equipment.

31. A computer-implemented method of providing stimulation to a user of a game, the method being implemented in a system including a haptic device, a touch sensitive electronic display, and one or more physical processors configured to execute computer program modules, the method comprising:

presenting views of a game through an interface surface of the touch sensitive electronic display that is accessible for engagement by a user,

wherein the views presented through the interface surface include views of virtual equipment having user selectable sections that are selectable by the user to interact with the virtual equipment by engaging the interface surface at the user selectable sections of the views of the virtual equipment;

receiving selection of one of the user selectable sections via an by the user engagement of the selected user selectable section on the interface surface;

determining, on the one or more processors, the operating parameters of the virtual equipment in the views and/or simulating operation of the virtual equipment based on the received selection;

determining on the one or more processors, responsive to the received selection, haptic stimulation to be generated for the user associated with the operating parameters of the virtual equipment and/or simulated operation of the virtual equipment; and

generating the determined haptic stimulation with the haptic device.

32. The method of claim **31**, wherein the virtual equipment includes a projectile weapon.

33. The method of claim **32**, wherein the operating parameters of the virtual equipment determined based on selection of the selected user selectable section include one or more of an amount of loaded rounds of ammunition, a level of disrepair, a stopping power, a projectile velocity, an ammunition type, or a noise level.

34. The method of claim **31**, wherein the haptic stimulation is generated to actuate the touch sensitive electronic display.

35. The method of claim **31**, wherein the haptic stimulation is generated to actuate the interface surface.

36. The method of claim **31**, wherein the operating parameters of the virtual equipment determined based on selection of the selected user selectable section include activation and deactivation of individual pieces of virtual equipment.

37. The method of claim **31**, wherein the user selectable sections of the views of the virtual equipment correspond to sections of the virtual equipment analogous to sections of equipment that would be engaged in real life to configure operating parameters and/or operate the equipment.

38. The method of claim **31**, further comprising adding or removing one or more components of a piece of virtual equipment based on the user engaging user selectable sections of a view of the piece of virtual equipment.

39. The method of claim **38**, wherein the removal and/or addition of one or more components of the piece of virtual equipment are reflected in the views of virtual equipment presented to the user through the interface surface.

40. The method of claim **31**, further comprising changing equipment modes of a piece of virtual equipment based on the user engaging user selectable section of a view of the piece of virtual equipment.

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