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(54) **GAMING OBJECT WITH BIOFEEDBACK SENSOR FOR INTERACTING WITH A GAMING APPLICATION AND METHODS FOR USE THEREWITH**

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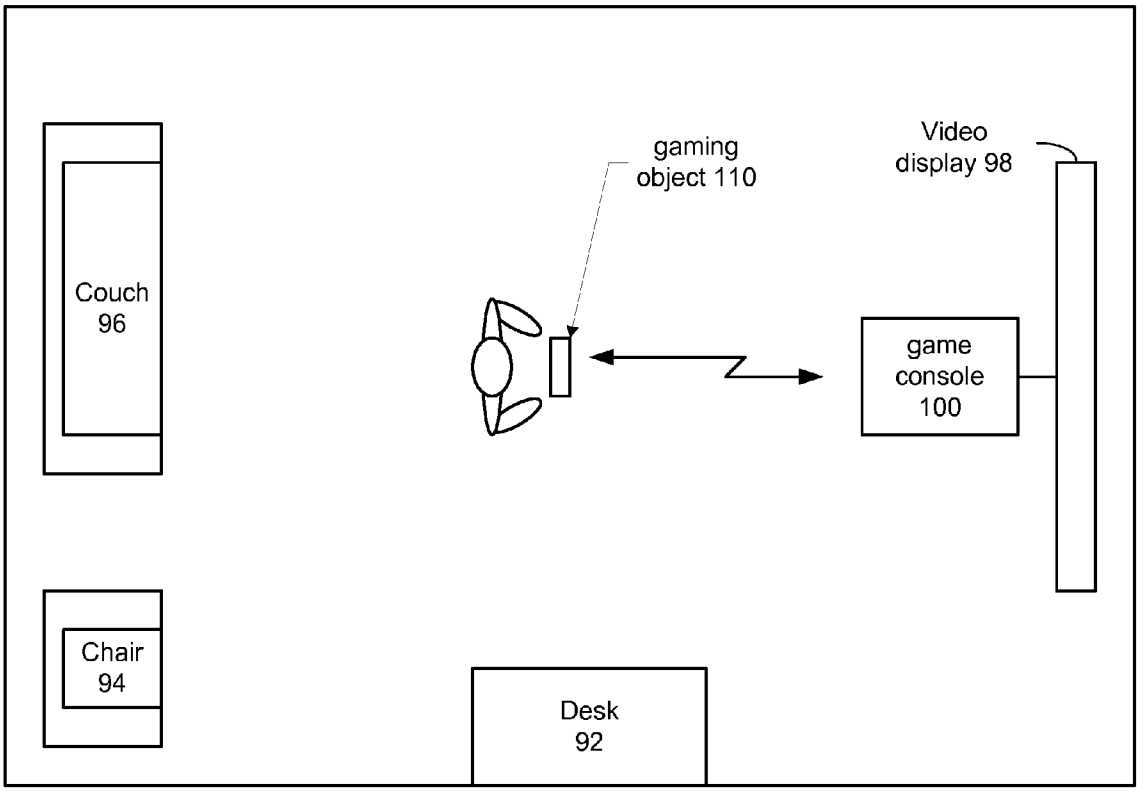
A63F 9/24 (2006.01)

(52) **U.S. Cl.** **463/29**; 463/39

(57) **ABSTRACT**

A gaming object includes a sensor that generates biofeedback data in response to an action of a user. A transceiver is coupled to send an RF signal to a game device, that indicates the biofeedback data. A game device executes a gaming application that is based the biofeedback data.



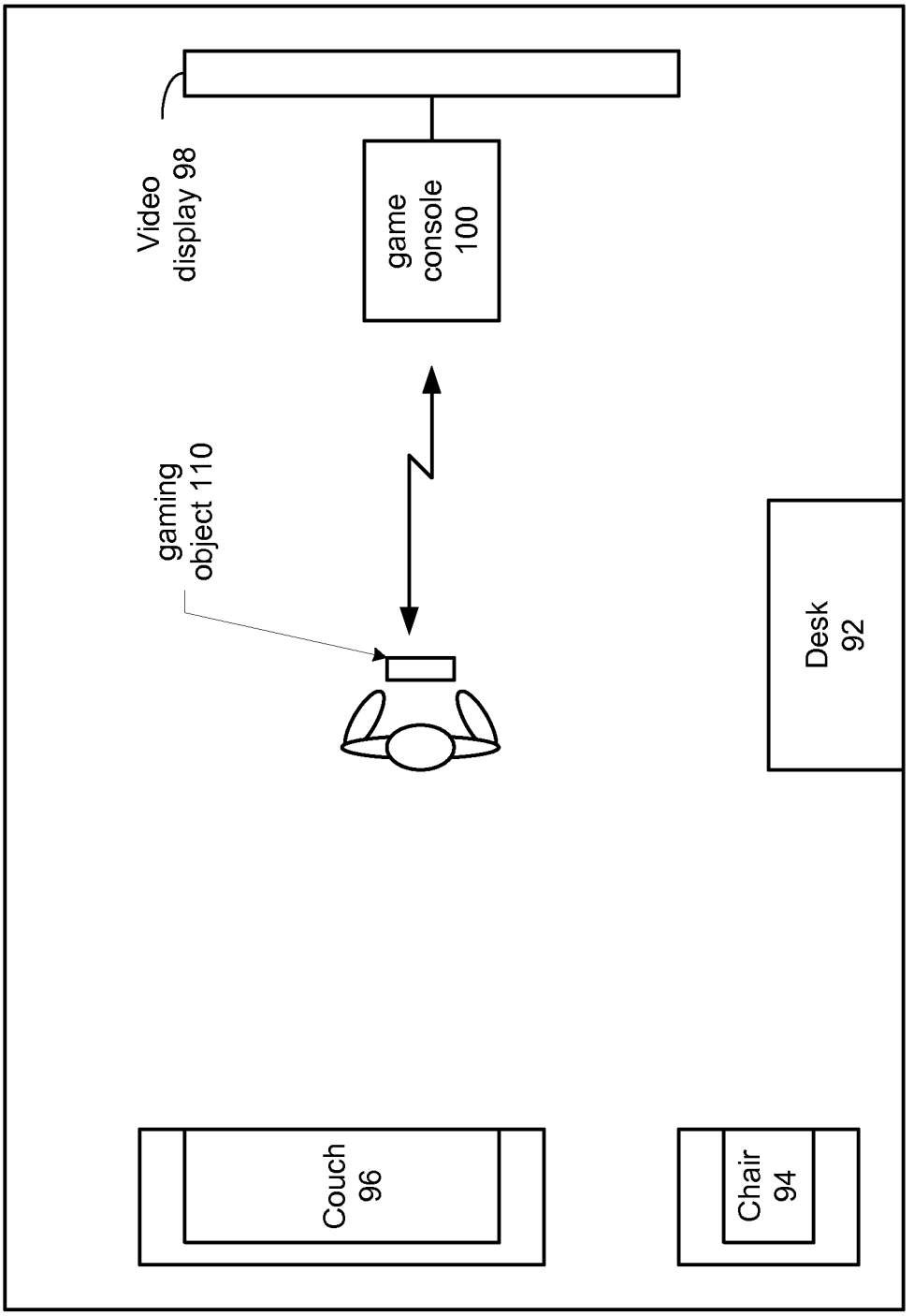

Video display 98
game console 100
gaming object 110
Desk 92
Couch 96
Chair 94

FIG. 1

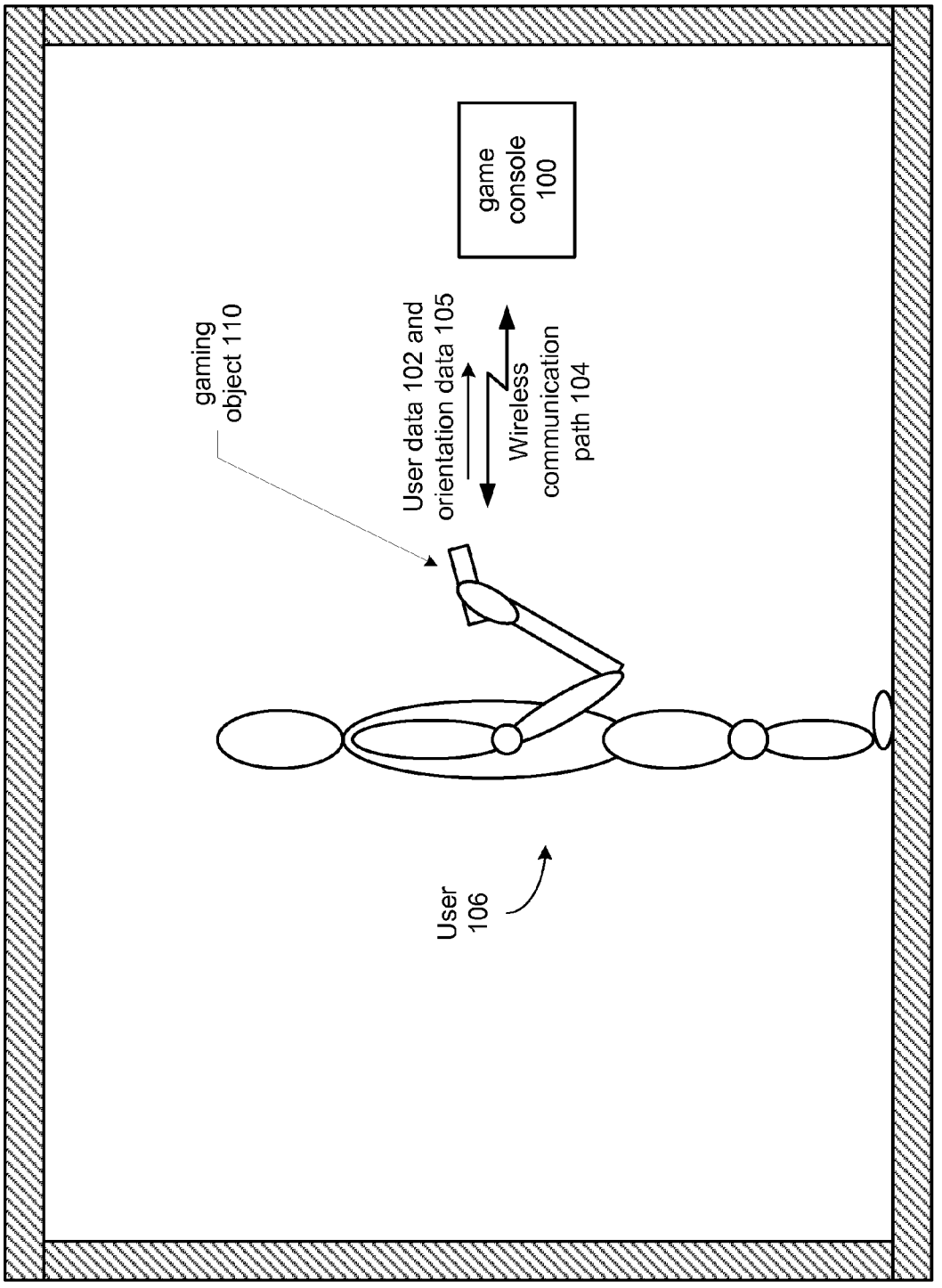

game console 100
gaming object 110
User data 102 and orientation data 105
Wireless communication path 104
User 106

FIG. 2

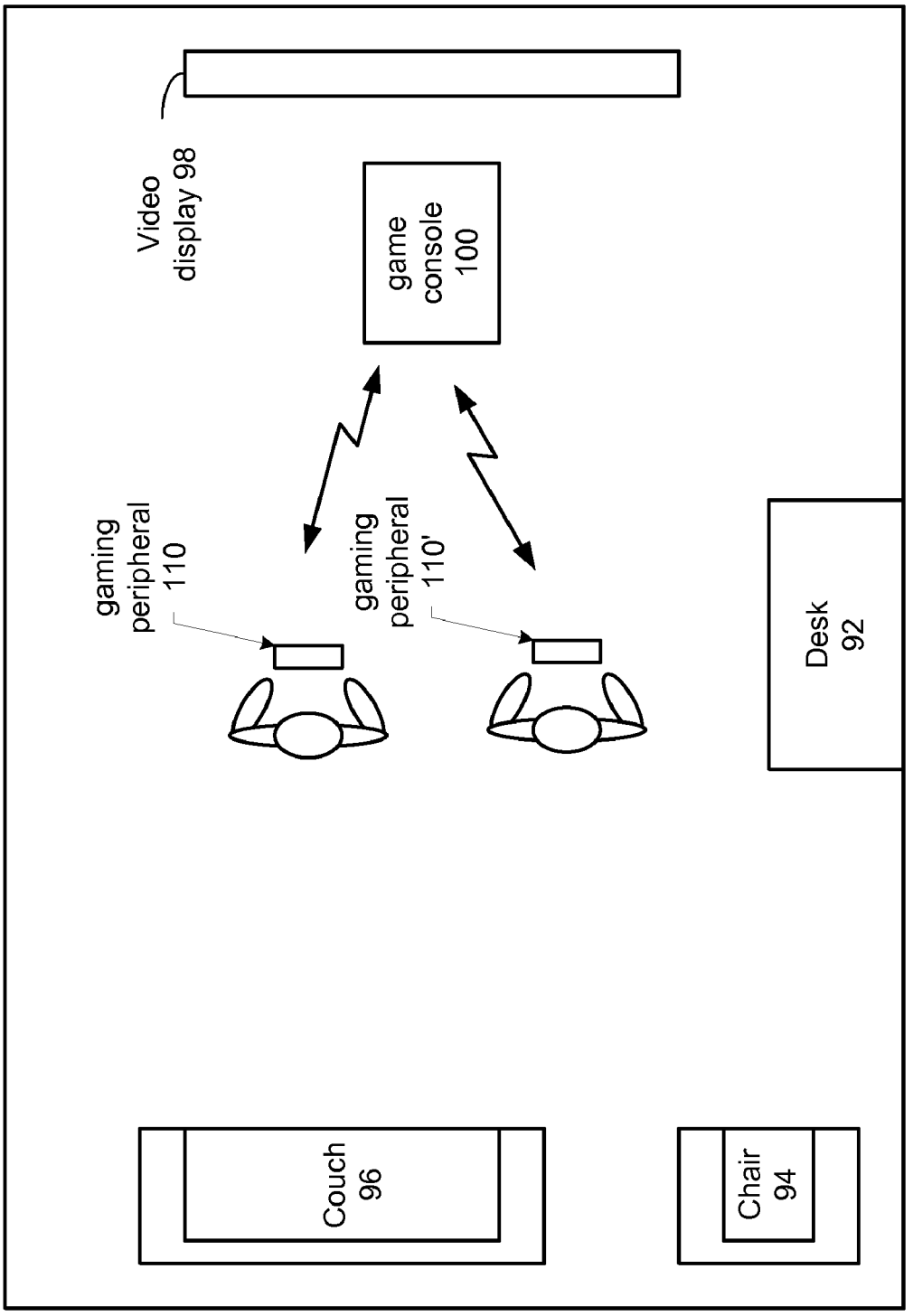

Video display 98
game console 100
gaming peripheral 110
gaming peripheral 110'
Desk 92
Couch 96
Chair 94

FIG. 3

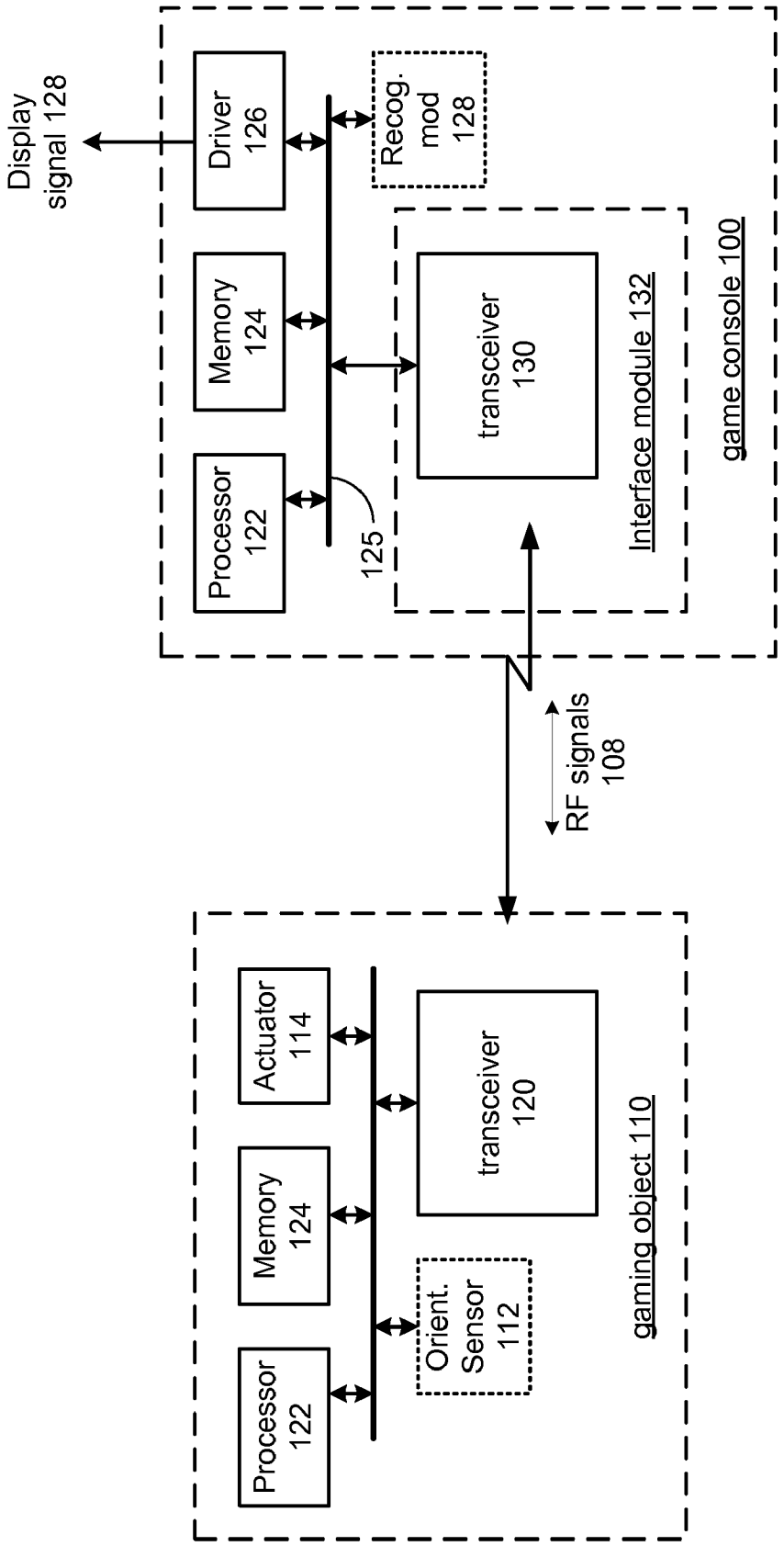

Display signal 128
Driver 126
Recog. mod 128
Memory 124
transceiver 130
Processor 122
125
Interface module 132
game console 100
RF signals 108
Actuator 114
transceiver 120
Memory 124
Orient. Sensor 112
Processor 122
gaming object 110

FIG. 4

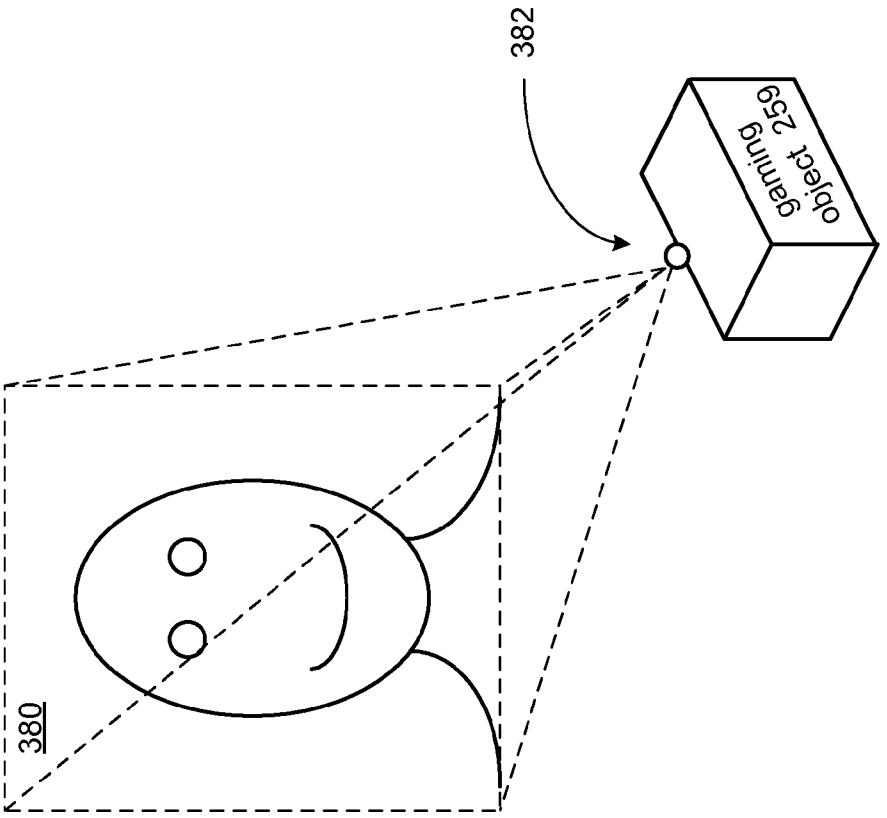


FIG. 5

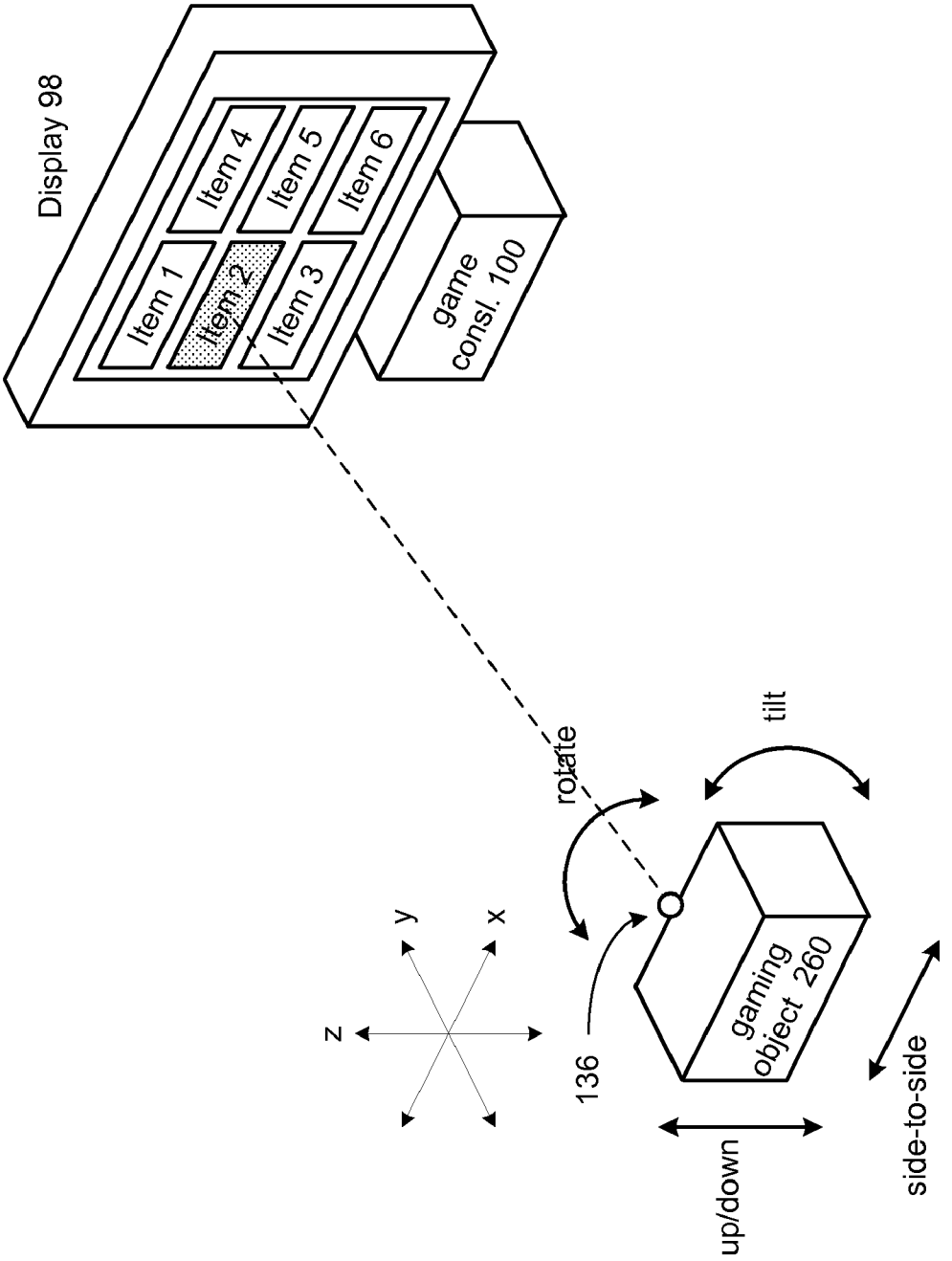

Display 98
Item 1
Item 2
Item 3
Item 4
Item 5
Item 6
game consl. 100
rotate
tilt
y
x
z
136
gaming object 260
up/down
side-to-side

FIG. 6

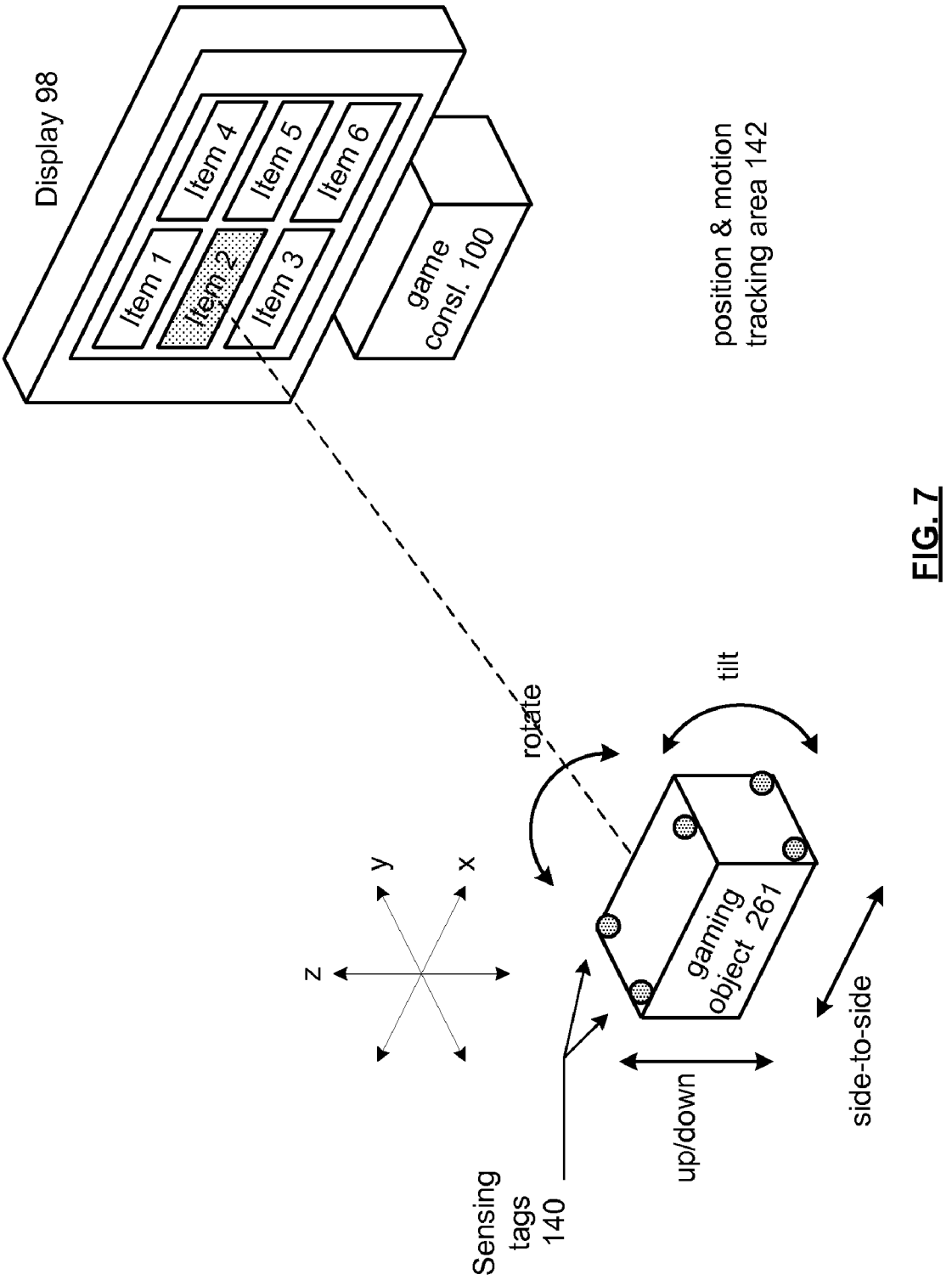

Display 98
Item 1
Item 2
Item 3
Item 4
Item 5
Item 6
game consl. 100
position & motion tracking area 142
rotate
tilt
y
x
z
gaming object 261
Sensing tags 140
up/down
side-to-side

FIG. 7

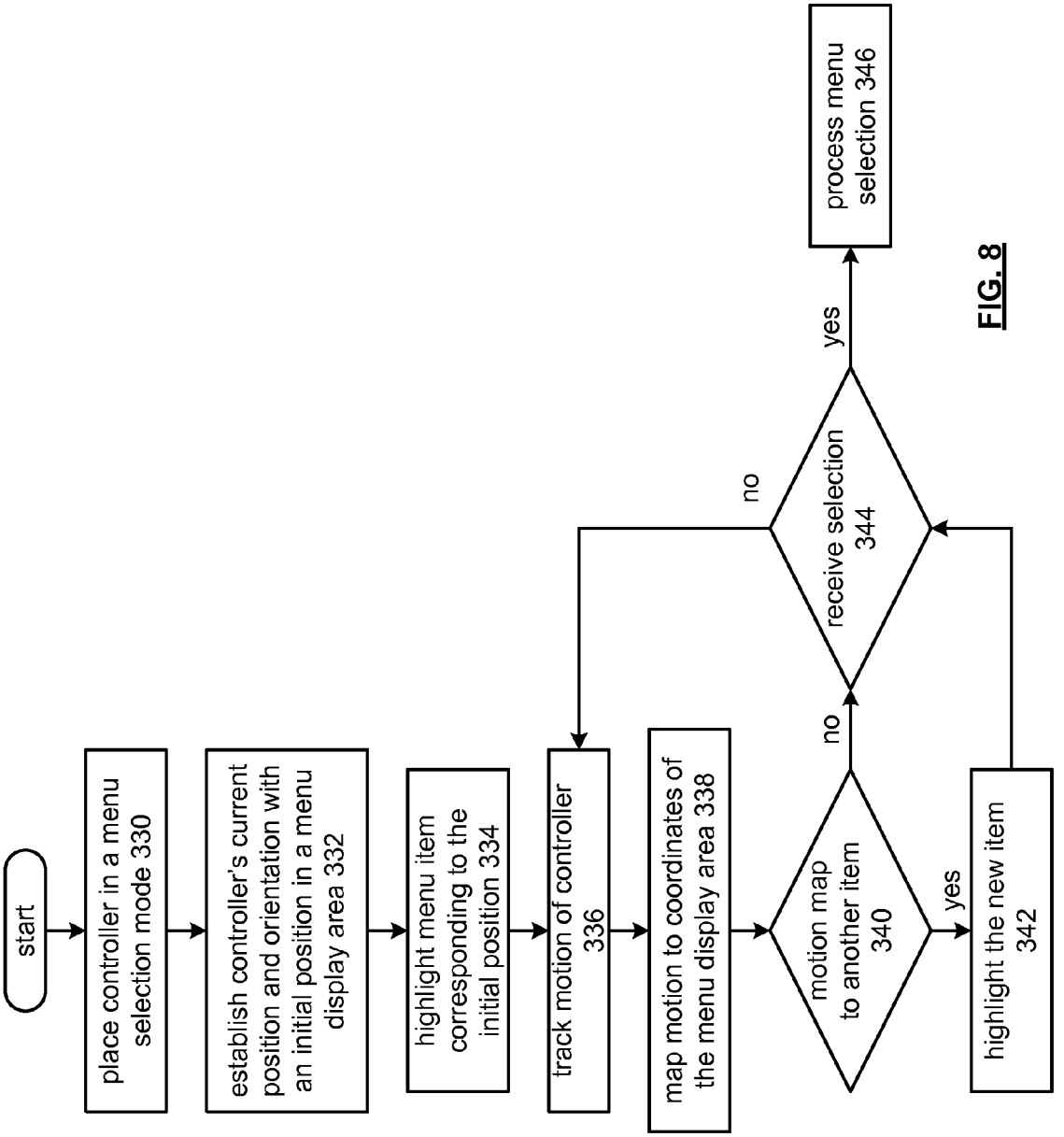

start
place controller in a menu selection mode 330
establish controller's current position and orientation with an initial position in a menu display area 332
highlight menu item corresponding to the initial position 334
track motion of controller 336
map motion to coordinates of the menu display area 338
motion map to another item 340
yes
highlight the new item 342
no
receive selection 344
yes
process menu selection 346
no

FIG. 8

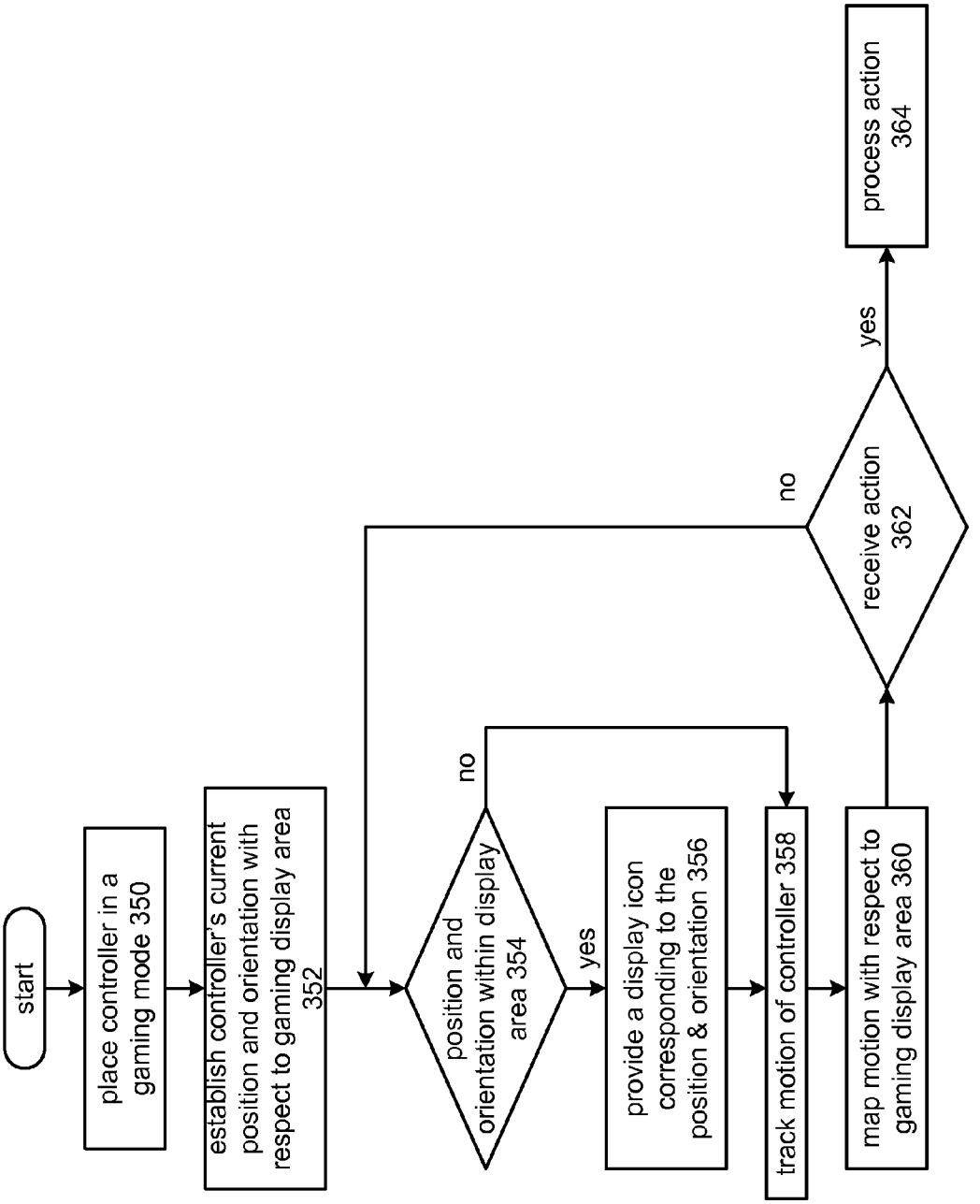

start
place controller in a gaming mode 350
establish controller's current position and orientation with respect to gaming display area 352
position and orientation within display area 354
no
yes
provide a display icon corresponding to the position & orientation 356
track motion of controller 358
map motion with respect to gaming display area 360
receive action 362
no
yes
process action 364

FIG. 9

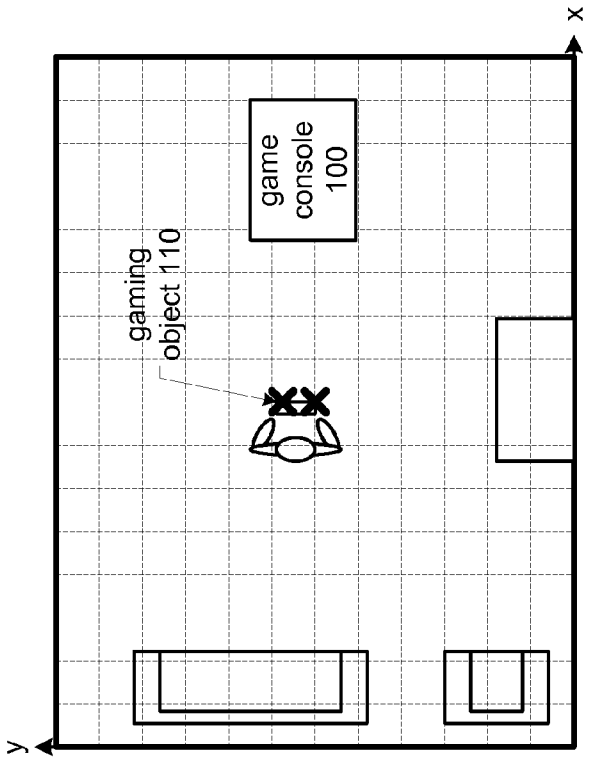


FIG. 11

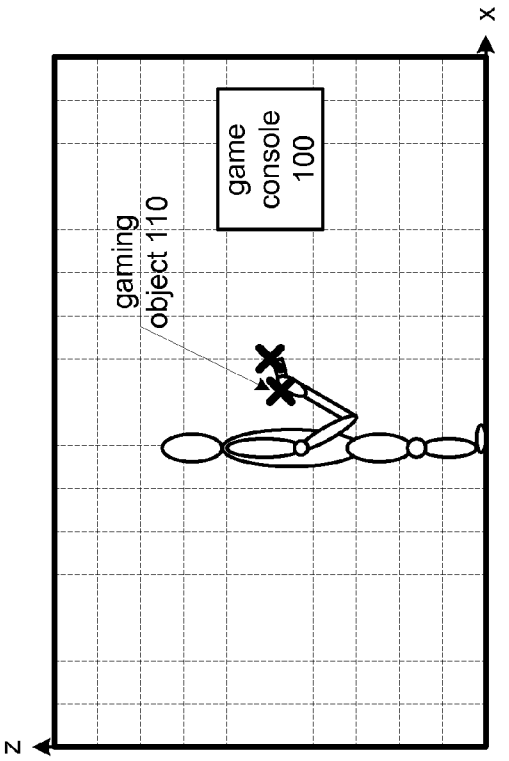


FIG. 12

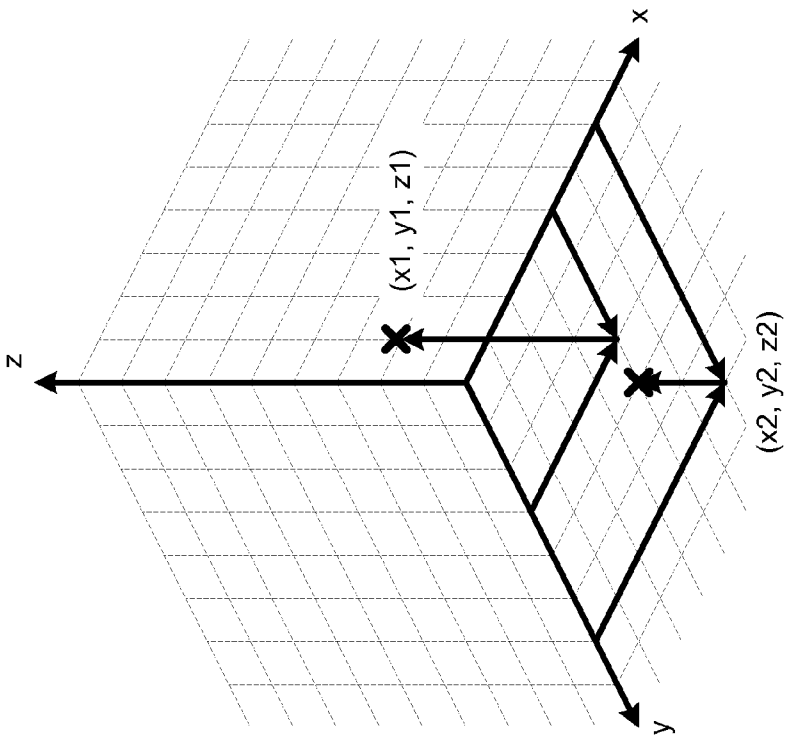


FIG. 10

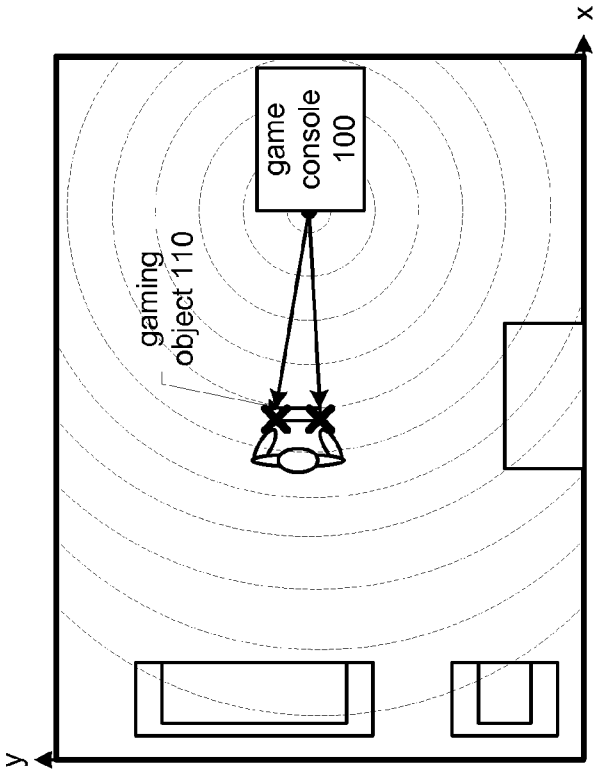


FIG. 14

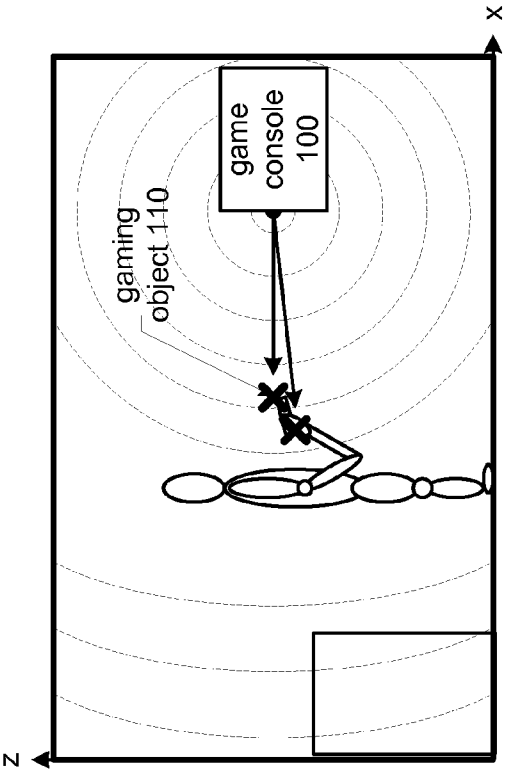


FIG. 15

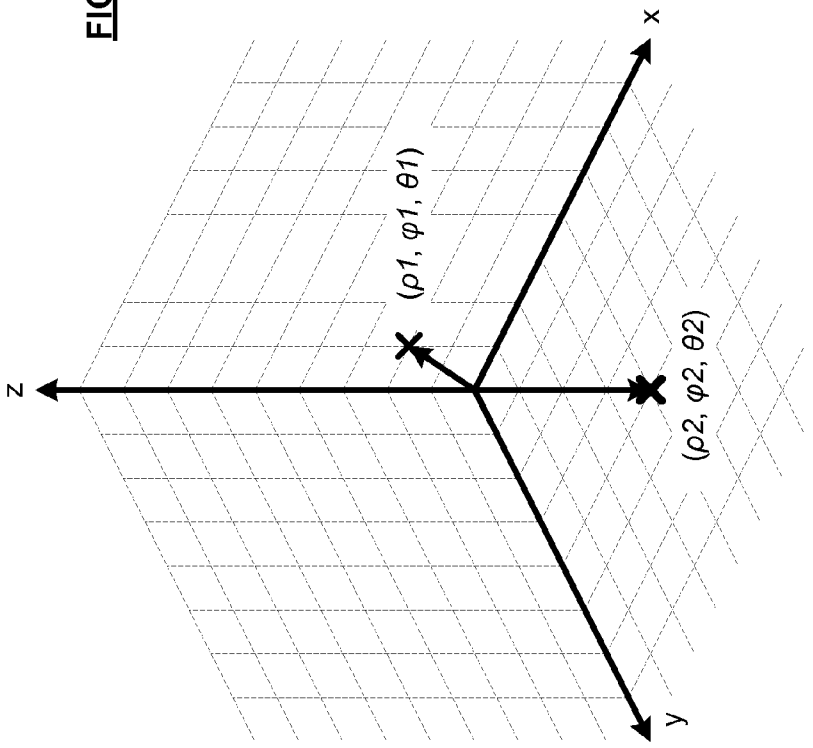


FIG. 13

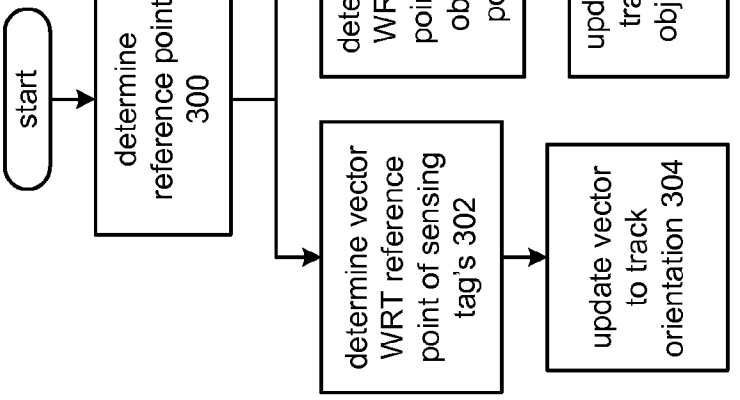


FIG. 16

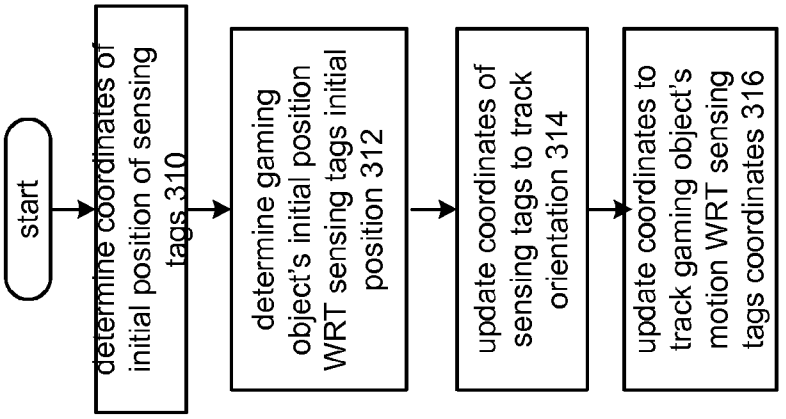


FIG. 17

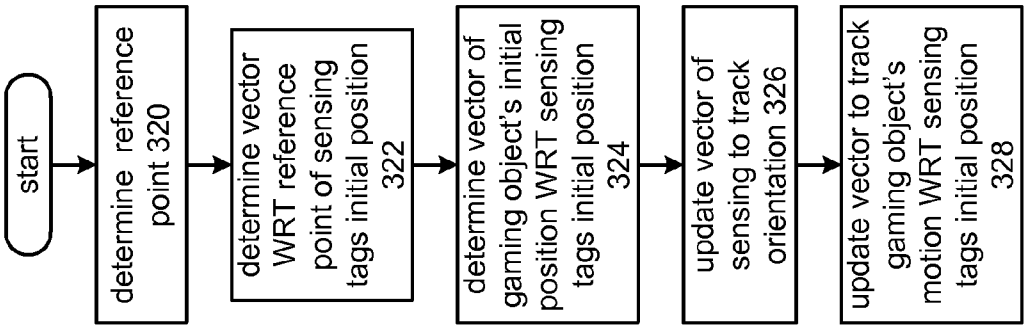


FIG. 18

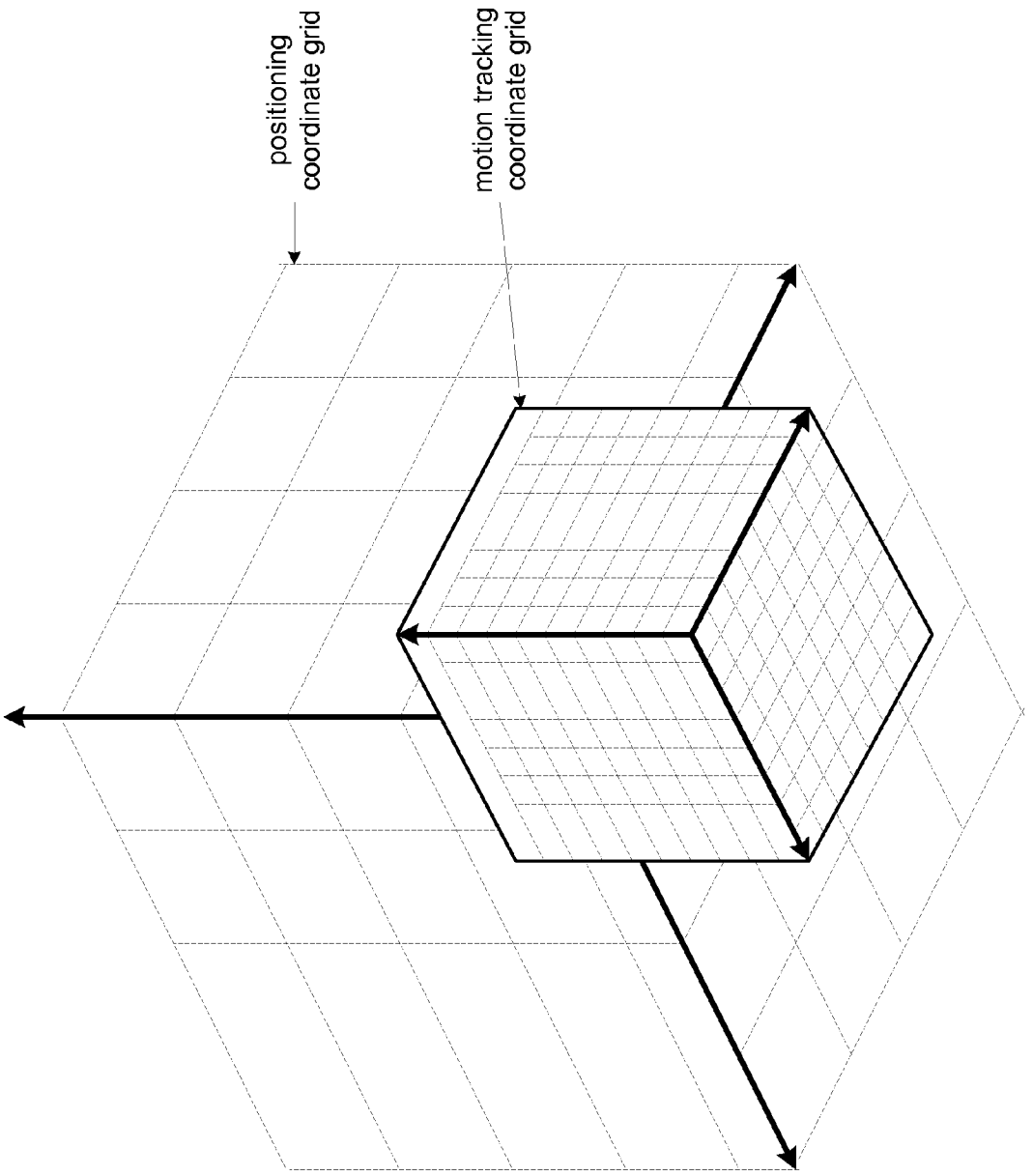

positioning
coordinate grid
motion tracking
coordinate grid

FIG. 19

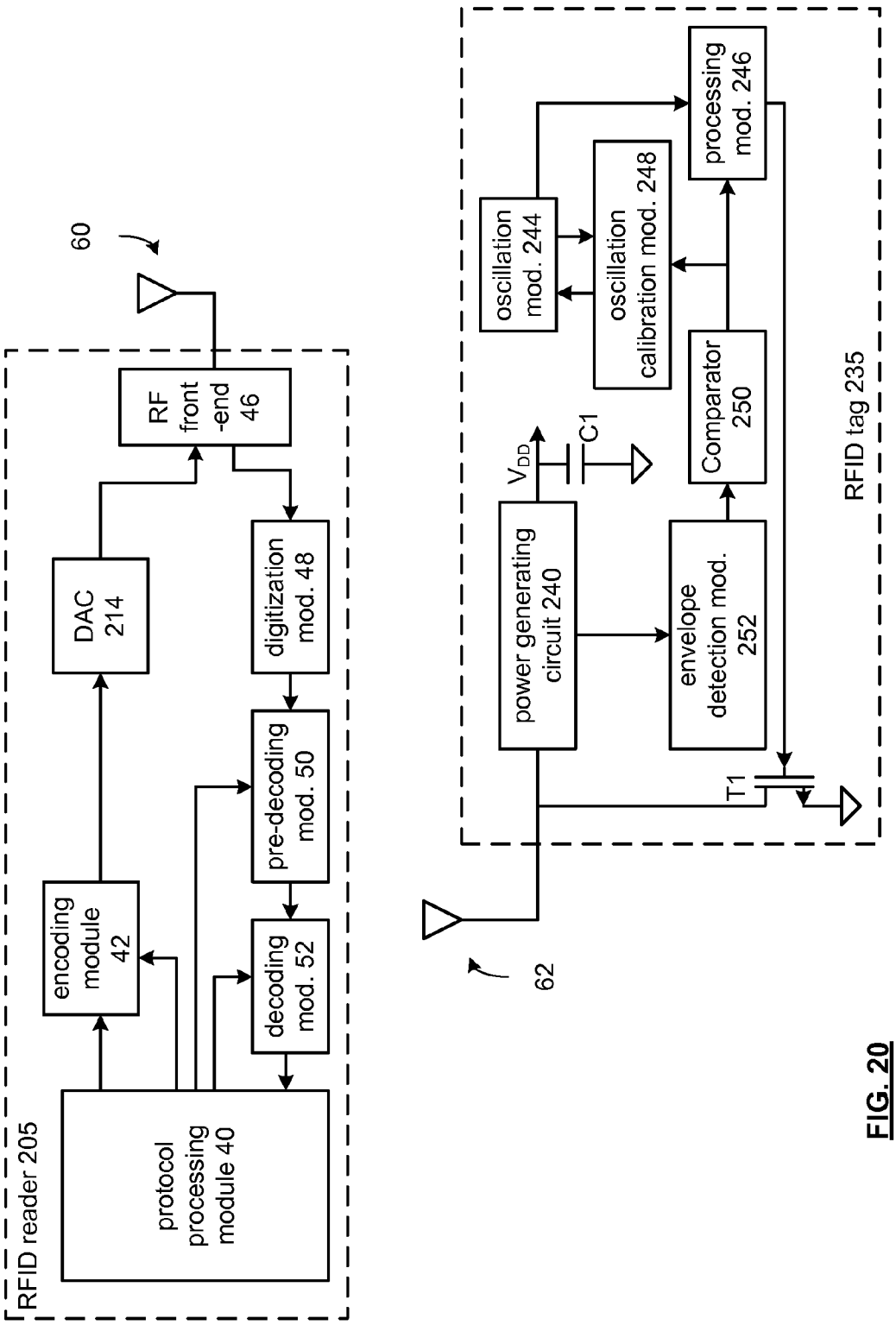

60
RF front -end 46
DAC 214
digitization mod. 48
pre-decoding mod. 50
encoding module 42
decoding mod. 52
protocol processing module 40
RFID reader 205
oscillation mod. 244
oscillation calibration mod. 248
processing mod. 246
Comparator 250
V_{DD}
C1
power generating circuit 240
envelope detection mod. 252
T1
RFID tag 235
62

FIG. 20

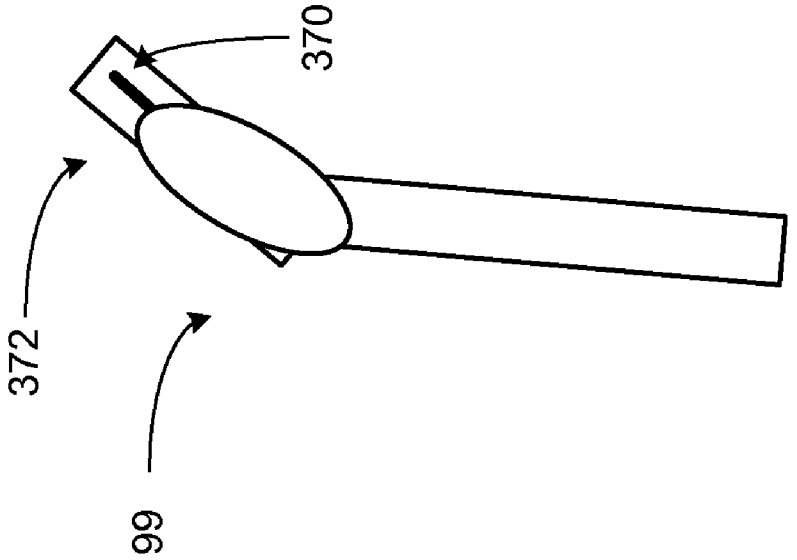


FIG. 22

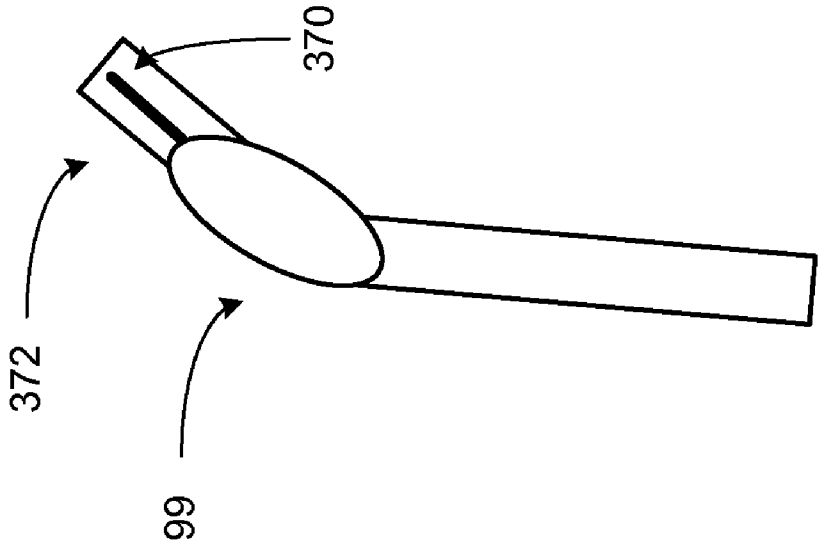


FIG. 21

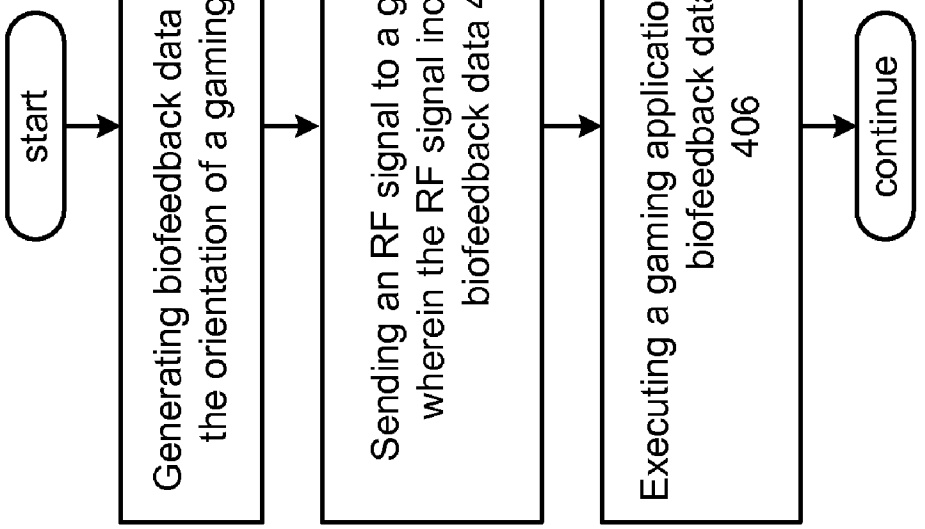

start
Generating biofeedback data in response to the orientation of a gaming object 400
Sending an RF signal to a game device, wherein the RF signal indicates the biofeedback data 404
Executing a gaming application based on the biofeedback data 406
continue

FIG. 23

GAMING OBJECT WITH BIOFEEDBACK SENSOR FOR INTERACTING WITH A GAMING APPLICATION AND METHODS FOR USE THEREWITH

CROSS REFERENCE TO RELATED PATENTS

[0001] This invention is claiming priority under 35 USC §119(e) to a provisionally filed patent application having the title VIDEO GAMING SYSTEM WITH POSITION AND MOTION TRACKING, a filing date of Jun. 22, 2007, and an application number of 60/936,724.

BACKGROUND OF THE INVENTION

[0002] 1. Technical Field of the Invention

[0003] This invention relates generally to gaming systems and more particularly to game controllers used for interacting with a game console and an associated display.

[0004] 2. Description of Related Art

[0005] Home gaming systems typically include a game controller that includes one or more buttons or a joy stick that allows a user to provide input to a game console that runs one or more games. The game console is coupled to a display device such as a television set to provide audio and video output from the game.

[0006] In IR communication systems, an IR device includes a transmitter, a light emitting diode, a receiver, and a silicon photo diode. In operation, the transmitter modulates a signal, which drives the LED to emit infrared radiation which is focused by a lens into a narrow beam. The receiver, via the silicon photo diode, receives the narrow beam infrared radiation and converts it into an electric signal.

[0007] IR communications are used video games to detect the direction in which a game controller is pointed. As an example, an IR sensor is placed near the game display, where the IR sensor to detect the IR signal transmitted by the game controller. If the game controller is too far away, too close, or angled away from the IR sensor, the IR communication will fail.

[0008] Further advances in video gaming include three accelerometers in the game controller to detect motion by way of acceleration. The motion data is transmitted to the game console via a Bluetooth wireless link. The Bluetooth wireless link may also transmit the IR direction data to the game console and/or convey other data between the game controller and the game console.

[0009] While the above technologies allow video gaming to include motion sensing, it does so with limitations. As mentioned, the IR communication has a limited area in which a player can be for the IR communication to work properly. Further, the accelerometer only measures acceleration such that true one-to-one detection of motion is not achieved. Thus, the gaming motion is limited to a handful of directions (e.g., horizontal, vertical, and a few diagonal directions.

BRIEF SUMMARY OF THE INVENTION

[0010] The present invention is directed to apparatus and methods of operation that are further described in the following Brief Description of the Drawings, the Detailed Description of the Invention, and the claims. Other features and advantages of the present invention will become apparent from the following detailed description of the invention made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

[0011] FIG. **1** is a schematic block diagram of an overhead view of an embodiment of a gaming system in accordance with an embodiment of the present invention;

[0012] FIG. **2** is a schematic block diagram of a side view of an embodiment of a gaming system in accordance with an embodiment of the present invention;

[0013] FIG. **3** is a schematic block diagram of an overhead view of another embodiment of a gaming system in accordance with an embodiment of the present invention;

[0014] FIG. **4** is a block diagram representation of a gaming system in accordance with an embodiment of the present invention.

[0015] FIG. **5** is a diagram of an example of the collection of image data by the gaming object **259** in accordance with an embodiment of the present invention;

[0016] FIG. **6** is a diagram of an example of positioning and/or motioning of a game controller to interact with an item on the display of a game console in accordance with an embodiment of the present invention;

[0017] FIG. **7** is a diagram of an example of positioning and/or motioning of a game controller to interact with an item on the display of a game console in accordance with another embodiment of the present invention;

[0018] FIG. **8** is a diagram of a method for processing a position and/or motion based selection in accordance with an embodiment of the present invention;

[0019] FIG. **9** is a diagram of a method for processing a position and/or motion based gaming action in accordance with an embodiment of the present invention;

[0020] FIGS. **10-12** are diagrams of an embodiment of a coordinate system of a gaming system in accordance with an embodiment of the present invention;

[0021] FIGS. **13-15** are diagrams of another embodiment of a coordinate system of a gaming system in accordance with an embodiment of the present invention;

[0022] FIG. **16** is a diagram of a method for determining position and/or motion tracking in accordance with an embodiment of the present invention;

[0023] FIG. **17** is a diagram of another method for determining position and/or motion tracking in accordance with an embodiment of the present invention;

[0024] FIG. **18** is a diagram of another method for determining position and/or motion tracking in accordance with an embodiment of the present invention;

[0025] FIG. **19** is a diagram of another embodiment of a coordinate system of a gaming system in accordance with an embodiment of the present invention;

[0026] FIG. **20** is a schematic block diagram of an embodiment of an RFID reader and an RFID tag in accordance with an embodiment of the present invention;

[0027] FIG. **21** is a schematic block diagram of a user's hand grasping a gaming object with a capacitive sensor in a first manner is accordance with an embodiment the present invention;

[0028] FIG. **22** is a schematic block diagram of a user's hand grasping a gaming object with a capacitive sensor in a second manner is accordance with an embodiment the present invention; and

[0029] FIG. **23** is a flowchart representation of a method in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0030] FIG. **1** is a schematic block diagram of an overhead view of an embodiment of a gaming system that includes a game console and a gaming object. A video display **98** is shown that can be coupled to game console **100** to display video generated by game console **100** in conjunction with the set-up and playing of the game and to provide other user interface functions of game console **100**. It should also be noted that game console **100** can include its own integrated video display that displays, either directly or via projection, video content in association with any of the functions described in conjunction with video display **98**.

[0031] The gaming system has an associated physical area in which the game console and the gaming object are located. The physical area may be a room, portion of a room, and/or any other space where the gaming object and game console are proximally co-located (e.g., airport terminal, at a gaming center, on an airplane, etc.). In the example shown the physical area includes desk **92**, chair **94** and couch **96**.

[0032] In an embodiment of the present invention, the gaming object **110** may be a wireless game controller and/or any object used or worn by the player to facilitate play of a video game. For example, the gaming object **110** may include a simulated sword, a simulated gun, a paddle, racquet, bat, or other sporting good, a helmet, a vest, a hat, shoes, socks, pants, shorts, gloves, or other element of a costume or article of clothing, a guitar, baton, keyboard, or other music related item, etc. It should be noted that the gaming object **110** may represent or resemble another object from the game, may be coupled to an object that is worn or otherwise coupled to a user or be as simple as a standard box, pod or other object that is held by the user. Further, the functionally of game object **110** can be included in a multi-function device such as a mobile telephone, personal digital assistant, or other personal electronic device that performs other non-gaming functions.

[0033] In this system, the game console **100** optionally determines the orientation of the gaming object **110** within the physical area using one or more orientation sensors. In addition, the game console **110** can further track the motion of the gaming object using one or more motion tracking techniques to facilitate video game play. In this embodiment, the game console may determine an initial orientation and/or position of the gaming object **110** within a tolerance (e.g., within a meter an/or within 1-5 degrees) at an update rate (e.g., once every second or once every few seconds) and tracks the motion or changes in the orentation within a motion tracking tolerance (e.g., within a few millimeters) at a tracking update rate (e.g., once every 10-100 milliseconds) based on motion data and/or orientation data generated in response to the actions of a user.

[0034] In addition, the gaming object **110** can be an object that can include a joystick, touch pad, touch screen, wheel, one or more buttons and/or other sensor, actuator or other user interface device that generates other user data in response to the actions of a user. In operation, the gaming object **110** and gaming console **100** communicate via wireless transceivers over a wireless communication link that will be described in greater detail in conjunction with FIG. **4**. Game console **100** generates display data for display on a display device such as video display **98**. While shown as a home game console **100**, gaming object **110** can optionally communicate with other game devices such as an arcade game, a game server that is connected to a local area network, a communication network or public data network such as the Internet, or other game devices. Further while the communication between gaming object **110**, is shown as direct communication, gaming object may optionally communicate with a base station or access point that transfers communications to and from the gaming object **110** to the gaming object via a local area network, a communication network or public data network such as the Internet.

[0035] In an embodiment of the present invention, the video display **98** displays one or more interactive items in the set-up or execution of at least one game or otherwise in association with a gaming application executed by the game console **100**. These interactive items are interactive in response to the orientation data generated based on one or more orientation sensors and other interaction data. For instance, during the initiation of a game, one or more menu items can be displayed on the video display **98** for selection by the user via pointing the gaming object at the menu item and selecting the menu item by the press of a button. In another example, the user can "shoot" at an interactive item on the video display **98**, such as a clay pigeon displayed in conjunction with a skeet shooting game, by pointing the gaming object **110** at the clay pigeon and pressing a button or trigger to initiate a shot.

[0036] Further, the gaming object **110** includes a sensor that generates user data in the form of biofeedback data in response to an action of a user. The gaming objects sends an RF signal that indicates the biofeedback data to a game device such as game console **100**. The game device executes a gaming application that is based the biofeedback data. In this fashion, the set-up, user authentication, and/or operation of a game can be adjusted based on the biofeedback data.

[0037] Further details including many optional functions and features are described in conjunction with FIGS. **2-23** that follow.

[0038] FIG. **2** is a schematic block diagram of a side view of an embodiment of a gaming system of FIG. **1**. In particular, a user **106** is represented schematically as holding a particular gaming object **110** in his or her hand or hands. User data **102** and orientation data is generated by the gaming object **110** and communicated via a wireless communication path **104** with the game console **100**. The user data **102** and orientation data **105** can include user selections, commands, position data indicating the position, orientation, and/or motion of the gaming object **110** or other user data that is generated based on the actions of the user in conjunction with the playing, and set-up of a particular game, and/or the user's other interactions with the game console **100**.

[0039] FIG. **3** is a schematic block diagram of an overhead view of another embodiment of a gaming system that includes a game console, a plurality of players and a plurality of gaming objects. In this instance, game console **100** communicates with both gaming object **110** and gaming object **110'**and receives corresponding user data and orientation data, such as user data **102** and orientation data **105**, from each gaming object. In an embodiment of the present invention, game console **100** operates on a separate frequency for each device, however, time division multiplexing, carrier sense multiple access collision avoidance (CSMA/CA) or other multiple access techniques can likewise be used.

[0040] FIG. **4** is a block diagram representation of a gaming system in accordance with an embodiment of the present invention. In particular, a gaming system is shown that

includes game console **100** and gaming object **110**. Gaming object **110** includes an actuator **114** for generating user data, such as user data **102** in response to the actions of a user, such as user **106**.

[0041] Actuator **114** can include a microphone, button, joy stick, wheel, keypad, keyboard, a resistive strip, touch pad or touch screen, and/or a motion sensor (such as an on-chip gyrator or accelerometer or other position or motion sensing device) along with other driver circuitry for generating user data **102** based on the actions of the user **106**.

[0042] In an embodiment of the present invention, the actuator **114** includes a capacitive or resistive sensor, such as a resistive or capacitive touchpad or touch screen. By touching the touchpad or touch screen, particularly in response to soft keys or other visual queues displayed by a touch screen or other display, the resistive capacitive sensor can be operable to generate user data **102** that includes an audio output command, such as to change a volume setting, to select, enable or disable background music or other audio effects; an audio input command, that enables or disables voice commands, sets an input level or an input device. In a similar fashion, the capacitive sensor can generate set-up commands, gaming data, preferences data, product registration data, and/or authentication data or other user data **102** in response to the actions of a user, such as user **106**.

[0043] In an embodiment of the present invention, the actuator **114** includes a resistive sensor, capacitive sensor, microphone, optical sensor or other sensor that generates user data **102** that includes biofeedback data that can be used by game console **100** to adjust a game parameter of the gaming application based on the biofeedback data. For instance in an adventure game, an excitement level of the game can be reduced in response to biofeedback indicating a heart rate or level of perspiration that is too high or increasing too rapidly. In another embodiment, the game can sense the fear of a user via biofeedback that indicates a high heart rate or level of perspiration. In a sports game, biofeedback can indicate a level of fatigue of the user based on heart rate or perspiration levels and take action to taunt the player in a light-heated way or otherwise adjust the level of difficulty of the game based on the user's fatigue.

[0044] Optional orientation sensor **112** can include a photosensor that generates the orientation data **105** based on an optical signal from a video display such as a video display integrated in game console **100** or separate video display **98**. In this fashion, the optical signal can be used to generate orientation data **105** that represents the orientation of the gaming object **110**. In a further embodiment, orientation sensor **112** includes a plurality of sensors such as motion sensors, RF tags or other that generate orientation data that indicates the orientation of the gaming object **110** based on the relative positions of the plurality of sensors.

[0045] Transceiver **120** sends data, such as user data **102** and orientation data **105** to transceiver **130** of game console **100** via RF signals **108**. In addition, gaming object **110** optionally receives RF signals **108** from game console **100** that contain other gaming data such as control data, optional display data for display on a touch screen or other display screen incorporated in gaming object **110**.

[0046] Gaming object **110** optionally contains a processor **122'**, memory **120'** and bus **125'**. When included, processor **122'** can execute one or more application to perform the operation of a smart gaming controller, to facilitate the generation and transmission of user data **102** and orientation data **105**, to perform other gaming operations and to optionally perform non-gaming functions and applications. Transceiver **120** can communicate with transceiver **130** via a wireless telephony protocol operating in a short range or low power mode, via a Bluetooth standard interface, via a 802.11 or other wireless local area network protocol, or via another wireless protocol.

[0047] In another embodiment, transceiver **120** is coupled to receive an RF signal **108** initiated by game console **100**, such as a 60 GHz RF signal or other RF signal. In a similar fashion to a passive RFID tag, transceiver **120** converts energy from the RF signal **108** into a power signal for powering the transceiver **120** or all or some portion of the gaming object **110**. By the gaming object **110** deriving power, in while or in part, based on RF signal **108**, gaming object **110** can optionally be portable, small and light. Transceiver **120** conveys the user data **102** and orientation data **105** back to the game console **100** by backscattering the RF signal **108** based on user data **102** and orientation data **105**.

[0048] Game console **100** includes an interface module **132** for coupling to the gaming object **110**. In particular, interface module **132** includes transceiver **130** that communicates with transceiver **120** either directly or via a network. Game console **100** further includes a memory **124** and processor **122** that are coupled to interface module **132** via a bus **125**. In operation, processor **122** executes one or more routines such as an operating system, utilities, and one or more applications such as video game applications or other gaming applications that produce video information that is converted to display signal **128** via driver **126**.

[0049] Processors **122** and **122'** can each include a dedicated or shared processing device. Such a processing device may be a microprocessor, micro-controller, digital signal processor, microcomputer, central processing unit, field programmable gate array, programmable logic device, state machine, logic circuitry, analog circuitry, digital circuitry, and/or any device that manipulates signals (analog and/or digital) based on operational instructions. The memories **124** and **124'** can each be a single memory device or a plurality of memory devices. Such a memory device may be a read-only memory, random access memory, volatile memory, non-volatile memory, static memory, dynamic memory, flash memory, and/or any device that stores digital information. Note that when the processors **122** or **122'** implement one or more of their functions via a state machine, analog circuitry, digital circuitry, and/or logic circuitry, the memory storing the corresponding operational instructions is embedded with the circuitry comprising the state machine, analog circuitry, digital circuitry, and/or logic circuitry. While particular bus architectures are shown, alternative bus architectures including architectures having two or more buses or direct connectivity between the various modules of game console **100** and gaming object **110**, can likewise be employed within the broad scope of the present invention.

[0050] As discussed in conjunction with FIG. **1** the game console **100** can generate display data for display on a display device that contains at least one interactive item that is interactive in response to the orientation data **105** and interaction data included in user data **102**. For instance, an optic sensor in a gaming object **110** that simulates a gun can generate optical feedback to determine if the "gun" is pointed at a particular object, such as a clay pigeon, that is displayed on the screen. If interaction data is generated, such as by the user **106** simulating the pull of a trigger, when the gaming object **110** is

pointed at the interactive item, the interaction can result. In the case of the clay pigeon discussed above, the clay pigeon can be shown to be broken by the simulated "shot" from the simulated gun. In a similar fashion, game console can display an interactive menu having menu items that are selectable by pointing the gaming object **110** at the menu item and generating interaction that indicates the user's intent to select the item.

[0051] Game console **100** optionally includes a recognition module **128** that operates to recognize one or more patterns in biofeedback data, such as voice data, image data or other biofeedback data and to generate a recognition signal in response thereto. For example, when biofeedback data includes voice data, recognition module **128** can perform pattern recognition on the voice data to recognize and/or authenticate the speaker as corresponding to a particular registered user. In operation, the gaming object **110** can prompt the user to generate voice samples used to train a speaker recognition routine included in recognition module **128**. When the voice signals received as part of user data **102** are recognized as part of an authentication routine as corresponding to a particular user, the recognition module **128** can respond by generating a recognition signal to processor **122** that indicates this correspondence.

[0052] In a further example, when biofeedback data includes voice data, recognition module **128** can perform pattern recognition on the voice data to recognize voice commands such as game commands, set-up commands, other commands or other biofeedback via either speaker dependent speech recognition that operates based on training data received from gaming object **110** or via speaker independent speech recognition. When the voice signals received as part of user data **102** are recognized as corresponding to a particular command, the recognition module **128** can respond by generating a recognition signal to processor **122** that indicates this correspondence for use by the gaming application. In this fashion, a user can issue voice commands such as "jump", "stop", "go back", "commence firing" or any other commands used in conjunction with a gaming application. Further, a shout generated by the user can be recognized as a shout and used by a game to alert characters of the game, to modify an anger or fear level or other emotional state of the user's character in the game or other characters in the game, or to modify one or other game parameters.

[0053] In another example, when biofeedback data includes image data corresponding to a portion of the user such as the face, fingerprint, palm print, retina or other portion of the user, recognition module **128** can perform pattern recognition on the image data to recognize and/or authenticate the image as corresponding to a particular registered user. In operation, the gaming object **110** can prompt the user to generate image samples used to train an image recognition routine included in recognition module **128**. When the image data received as part of user data **102** are recognized as part of an authentication routine as corresponding to a particular user, the recognition module **128** can respond by generating a recognition signal to processor **122** that indicates this correspondence.

[0054] In yet another example, when biofeedback data includes image data corresponding to a portion of the user, such as the face, recognition module **128** can perform pattern recognition on the image data to recognize portions of the image as corresponding to an emotional response of particular registered user. In particular, analysis of the user's expression based on the eyes, mouth, eyebrows, brow or other features can be used to determine if the user is fatigued, afraid, angry, sad, disappointed, excited, etc. The recognition of one or more of these emotional states by recognition module **128** can be used to generate a corresponding recognition signal that can be used by processing module **122** to modify the emotional state of the user's character in the game or other characters in the game, or to modify one or other game parameters.

[0055] FIG. **5** is a diagram of an example of the collection of image data by the gaming object **110** in accordance with an embodiment of the present invention. In particular, a gaming object **259**, such as gaming object **110**, is shown that includes an image sensor **382**. Image sensor **382** can be a charge coupled device (CCD) or other image sensor that generates image data in the form of either a still image or video. As shown, image sensor **382** operates by capturing an image that can be used to generate user data **102** in the form of image data. While the image **380** is shown to correspond to a head shot of a user, such as user **106**, the image can correspond to a fingerprint, palm print, face, retina or other portion of a user's body.

[0056] As discussed in conjunction with FIG. **4**, this image data can be used as biofeedback data for authentication, modifying game parameters or for other purposes in conjunction with the set-up or execution of one or more gaming applications.

[0057] FIG. **6** is a diagram of an example of positioning and/or motioning of a game controller to select an item on the display of a game console. In an embodiment, a game controller **260** such as gaming object **110**, and console utilize tracking of the orientation of the controller to provide a selection of a menu item displayed on a video display associated with game console **100**. Gaming object **260**, such as a geometric solid such as a handheld device that can be positioned and oriented in three dimensional space. In operation, the gaming object **260** can have three dimensional coordinates (x, y, z) and be oriented along roll, pitch and yaw axes based on, for instance, up/down and side-to-side motion, rotation, tilt and translation and rotation about other axes.

[0058] In this embodiment, gaming object **136** includes an orientation sensor **112**, such as optical sensor **136** that generates orientation data **105** when the orientation of gaming object **260** corresponds to an orientation in alignment with the menu item. In this case, the light emitted by "item 2" in the menu is received by the optical sensor and used to generate orientation data **105**. In response, the game console **100** can highlight the menu item when the orientation of the gaming object **260** corresponds to an orientation aligned with the menu item.

[0059] In the example shown, the "item 2" is highlighted when the gaming object is pointed at this menu item. This provides visual feedback to a user of gaming object **260** of hat item the gaming object **260** is pointed at. If the user indicates his or her selection of the highlighted item, via an actuator **114** (such as by the click of a button), game console **100** can respond by performing the function associated with this menu item in conjunction with the particular menu displayed.

[0060] In an embodiment of the present invention, the orientation data is preprocessed in the optical sensor **136** or processing module **122'** based on an image generated therefrom to generate orientation data **105**. In the alternative, orientation data **105** corresponding to the image or other optical output is sent to game console **100** for processing by process-

ing module **122** to determine which the orientation data corresponds to any of the menu items being displayed based on timing of the signal in correspondence to the timing of the displayed image, or based on a recognition of an image or portion of an image corresponding to the displayed item or a portion thereof.

[0061] While presented in conjunction with the selection of a menu item, in concert with the clay pigeon/gun example previously presented, the interactive item displayed on display **98** can alternatively be a graphics item displayed in conjunction with a game. In this embodiment, an interaction is generated, such as the breaking of the clay pigeon, when the orientation of the gaming object **260** corresponds to an orientation in alignment with the graphics item on display **98**.

[0062] FIG. **7** is a diagram of an example of positioning and/or motioning of a game controller to interact with an item on the display of a game console in accordance with another embodiment of the present invention. In this embodiment, gaming object **261**, such as gaming object **110**, is implemented with sensing tags **140** for use in generating orientation data **105** that indicates the orientation of the gaming object **261**. In particular, the relative position of the sensing tags **140** in three-dimensional space can be used to determine the orientation of the gaming object **261**.

[0063] In this embodiment, the positioning of the sensing tags can be determined within a positioning tolerance (e.g., within a meter) at a positioning update rate (e.g., once every second or once every few seconds) the motion of the sensing tags **140** can be tracked within a motion tracking tolerance (e.g., within a few millimeters) at a motion tracking update rate (e.g., once every 10-100 milliseconds) within a position and motion tracking area that is range of game console **100**.

[0064] In an embodiment of the present invention, each of the sensing tags **140** is implemented via an RF tag. In this mode of operation, the game console **100** sends one or more RF signals **108** on a continuous basis and reads the orientation data **105** generated by each of the sensing tags **140** periodically (e.g., once every 10-100 milliseconds) to update the positioning of sensing tags **140**. In another mode of operation, the game console **100** generates the sends one or more RF signals **108** periodically (e.g., once every 10-100 milliseconds) and reads the orientation data **105** generated by each of the sensing tags **140** only when required to update the orientation of game object **261**. In a further mode of operation, the sensing tags **140** can be RF tags that contain motion sensors or other position sensors and the game object **261** itself reads the position of each of the sensing tags **140** and generates orientation data **105** that is compiled and sent to the game console **100**.

[0065] FIG. **8** is a diagram of a method for processing a position and/or motion that begins by placing the controller and/or gaming console in a menu selection mode as shown in step **330**. In this mode, the controller is set up to process a menu selection as opposed to a gaming function. The method continues by establishing the gaming object **100**'s current position and orientation with respect to an initial position in a display area as shown in step **332**. For example, regardless of the current position and orientation (assuming it is in range), the gaming object **100**'s current position and orientation is processed to correspond to a particular location on the menu display.

[0066] The method proceeds by highlighting the menu item corresponding to the initial position (e.g., a start menu button) as shown in step **334**. The method then continues by tracking the motion of the gaming object and mapping the motion to coordinates of the menu display area (e.g., in an embodiment, the mapping of the motion will be limited to somewhere with the menu display area) as shown in steps **336** and **338**. The method continues by determining whether the motion has moved to another item in the menu list as shown in step **340**. If yes, the method proceeds by highlighting the new item as shown in step **342**.

[0067] The method then proceeds by determining whether a selection of the highlighted item is received as shown in step **344**. If not, the process continues by tracking the motion in step **336**. If a selection is received, the process continues by processing the menu selection as shown in step **346**. This may be done in a convention manner.

[0068] FIG. **9** is a diagram of a method for processing a position and/or motion based gaming action that begins by placing the gaming object (e.g., a controller) and/or game console in a gaming mode as shown in step **350**. The method continues by establishing the gaming object's current position and orientation with respect to an initial position in a gaming display area as shown in step **352**. For example, if the game being played is a shooting arcade game and the gaming object is functioning as a gun, this step determines the initial aiming of the gun.

[0069] The method continues by determining whether the position and orientation of the gaming object is within the gaming display area as shown in step **354**. If yes, the method continues by providing a display icon corresponding to the position and orientation as shown in step **356**. For example, the icon may be cross hairs of a gun to correspond to the aiming of the video game gun. The method continues by tracking the motion of the gaming object and mapping the motion to the gaming display area as shown in steps **358** and **360**.

[0070] The method continues by determining whether an action has been received as shown in step **362**. For example, has the trigger of the gun been pulled? If not, the process repeats as shown. If yes, the process continues by processing the action as shown in step **364**. For example, the processing may include mapping the shooting of the gun in accordance with the aiming of the gun.

[0071] FIGS. **10-12** are diagrams of an embodiment of a coordinate system of a localized physical area that may be used for a gaming system. In these figures an xyz origin is selected to be somewhere in the localized physical area and each point being tracked and/or used for positioning on the player and/or on the gaming object **110** is determined based on its Cartesian coordinates (e.g., x1, y1, z1). As the player and/or gaming object moves, the new position of the tracking and/or positioning points are determined in Cartesian coordinates with respect to the origin. As discussed in conjunction with FIG. **9**, the positions of the sensing tags **140** can be used to determine an orientation of the gaming object **110**.

[0072] FIGS. **13-15** are diagrams of another embodiment of a coordinate system of a localized physical area that may be used for a gaming system. In these figures an origin is selected to be somewhere in the localized physical area and each point being tracked, such as the position of each sensing tag **140** or other position used for determining the positioning or orientation of the gaming object **110** is determined based on its vector, or spherical, coordinates (ρ, ϕ, θ), which are defined as: $\rho \geqq 0$ is the distance from the origin to a given point P. $0 \leqq \phi \leqq 180°$ is the angle between the positive z-axis and the line formed between the origin and P. $0 \leqq \theta \leqq 360°$ is the angle

between the positive x-axis and the line from the origin to the P projected onto the xy-plane. ϕ is referred to as the zenith, colatitude or polar angle, while θ is referred to as the azimuth.ϕ and θ lose significance when $\rho=0$ and θ loses significance when $\sin(\phi)=0$ (at $\phi=0$ and $\phi=180°$). To plot a point from its spherical coordinates, go ρ units from the origin along the positive z-axis, rotate ϕ about the y-axis in the direction of the positive x-axis and rotate θ about the z-axis in the direction of the positive y-axis. As the sensing tags and/or gaming object **110** moves, the new position of the tracking and/or positioning points are determined in vector, or spherical, coordinates with respect to the origin that can be used to determine not only the position of the gaming object **110** but its orientation as well.

[0073] While FIGS. **10-15** illustrate two types of coordinate systems, other three-dimensional coordinate systems may be used for tracking motion and/or establishing position and orientation within a gaming system.

[0074] FIG. **16** is a diagram of another method for determining position and/or motion tracking that begins in step **300** by determining a reference point within a coordinate system (e.g., the vector coordinate system of FIGS. **9-11**). The reference point may be the origin or any other point within the localized physical area. In particular, the reference point can be the location of the game console **100**, the location of the game object **110** at a particular time, such as a set-up time, the location of one of a plurality of sensing tags **140**, however, other reference points can likewise be used.

[0075] The method continues in one or more branches. Along one branch, a vector with respect to the reference point is determined to indicate the initial position of the gaming object **110** and/or the sensing tags **140** based on the reference point as shown in step **302**. This branch continues by updating the positions to track the motion and/or orientation of gaming object **110** based on orientation data **105** as shown in step **304**.

[0076] The other branch includes determining a vector with respect to the reference point for the gaming object **110** to establish its initial position as shown in step **306**. This branch continues by updating the gaming object **110**'s position to track the gaming object's motion using orientation data as shown in step **308**. Note that the rate of tracking the motion of the player and/or gaming object may be done at a rate based on the video gaming being played and the expected speed of motion. Further note that a tracking rate of 10 milliseconds provides 0.1 mm accuracy in motion tracking.

[0077] FIG. **17** is a diagram of another method for determining position and/or motion tracking that begins in step **310** by determining the coordinates of the sensing tags position in the physical area. The method then continues by determining the coordinates of a gaming object's initial position as shown in step **312**. The method then proceeds by updating the coordinates of the sensing tags position in the physical area to track the game objects orientation as shown in step **314**. The method also continues by updating the coordinates of a gaming object's position to track its motion as shown in step **316**.

[0078] FIG. **18** is a diagram of another method for determining position and/or motion tracking that begins in step **320** by determining a reference point within the physical area in which the gaming object lays and/or in which the game system lays. The method then proceeds by determining a vector for the sensing tags initial position with respect to a reference point of a coordinate system (e.g., one of the systems shown in FIGS. **12-14**) as shown in step **322**. As an example, if the physical area is a room, a point in the room is selected as the origin and the coordinate system is applied to at least some of the room.

[0079] The method then continues by determining a vector of a gaming object **110**'s initial position as shown in step **324**. The method then proceeds by updating the vector of the sensing tag's position in the physical area to track the gaming object's orientation as shown in step **326**. The method also continues by updating the vector of the gaming object's position to track its motion as shown in step **328**.

[0080] FIG. **19** is a diagram of another embodiment of a coordinate system of a gaming system that is an extension of the coordinate systems discussed above. In this embodiment, the coordinate system includes a positioning coordinate grid and a motion tracking grid, where the motion tracking grid is of a finer resolution than the positioning coordinate grid. In general, the player or gaming object **110**'s position within the physical area can have a first tolerance (e.g., within a meter) and the motion tracking of the player and/or the gaming object has a second tolerance (e.g., within a few millimeters). As such, the position of the player and/or gaming object can be updated infrequently in comparison to the updating of the motion (e.g., the position can be updated once every second or so while the motion may be updated once every 10 milliseconds).

[0081] FIG. **20** is a schematic block diagram of an embodiment of an RFID reader and an RFID tag. In particular, RFID reader **205** represents a particular implementation of transceiver **130** and RFID tag **235** represents a particular implementation of transceiver **120**. In addition, RFID tag can be used in an implementation of sensing tags **140** in communication with RFID reader **235** incorporated in game console **100**. As shown, RFID reader **205** includes a protocol processing module **40**, an encoding module **42**, an RF front-end **46**, a digitization module **48**, a predecoding module **50** and a decoding module **52**, all of which together form components of the RFID reader **205**. RFID **205** optionally includes a digital-to-analog converter (DAC) **44**.

[0082] The protocol processing module **40** is operably coupled to prepare data for encoding in accordance with a particular RFID standardized protocol. In an exemplary embodiment, the protocol processing module **40** is programmed with multiple RFID standardized protocols to enable the RFID reader **205** to communicate with any RFID tag, regardless of the particular protocol associated with the tag. In this embodiment, the protocol processing module **40** operates to program filters and other components of the encoding module **42**, decoding module **52**, pre-decoding module **50** and RF front end **46** in accordance with the particular RFID standardized protocol of the tag(s) currently communicating with the RFID reader **205**. However, if a plurality of RFID tags **235** each operate in accordance with a single protocol, this flexibility can be omitted.

[0083] In operation, once the particular RFID standardized protocol has been selected for communication with one or more RFID tags, such as RFID tag **235**, the protocol processing module **40** generates and provides digital data to be communicated to the RFID tag **235** to the encoding module **42** for encoding in accordance with the selected RFID standardized protocol. This digital data can include commands to power up the RFID tag **235**, to read user data or other commands or data used by the RFID tag in association with its operation. By way of example, but not limitation, the RFID protocols may include one or more line encoding schemes, such as

Manchester encoding, FM0 encoding, FM1 encoding, etc. Thereafter, in the embodiment shown, the digitally encoded data is provided to the digital-to-analog converter **44** which converts the digitally encoded data into an analog signal. The RF front-end **46** modulates the analog signal to produce an RF signal at a particular carrier frequency that is transmitted via antenna **60** to one or more RFID tags, such as RF ID rag **235**.

[0084] The RF front-end **46** further includes transmit blocking capabilities such that the energy of the transmitted RF signal does not substantially interfere with the receiving of a back-scattered or other RF signal received from one or more RFID tags via the antenna **60**. Upon receiving an RF signal from one or more RFID tags, the RF front-end **46** converts the received RF signal into a baseband signal. The digitization module **48**, which may be a limiting module or an analog-to-digital converter, converts the received baseband signal into a digital signal. The predecoding module **50** converts the digital signal into an encoded signal in accordance with the particular RFID protocol being utilized. The encoded data is provided to the decoding module **52**, which recaptures data, such as user data **102** and/or orientation data **105** therefrom in accordance with the particular encoding scheme of the selected RFID protocol. The protocol processing module **40** processes the recovered data to identify the object(s) associated with the RFID tag(s) and/or provides the recovered data to the processing module **122** for further processing.

[0085] The processing module **40** may be a single processing device or a plurality of processing devices. Such a processing device may be a microprocessor, micro-controller, digital signal processor, microcomputer, central processing unit, field programmable gate array, programmable logic device, state machine, logic circuitry, analog circuitry, digital circuitry, and/or any device that manipulates signals (analog and/or digital) based on hard coding of the circuitry and/or operational instructions. The processing module may have an associated memory element, which may be a single memory device, a plurality of memory devices, and/or embedded circuitry of the processing module. Such a memory device may be a read-only memory, random access memory, volatile memory, non-volatile memory, static memory, dynamic memory, flash memory, cache memory, and/or any device that stores digital information. Note that when the processing module **40** implements one or more of its functions via a state machine, analog circuitry, digital circuitry, and/or logic circuitry, the memory element storing the corresponding operational instructions may be embedded within, or external to, the circuitry comprising the state machine, analog circuitry, digital circuitry, and/or logic circuitry.

[0086] RFID tag **235** that includes a power generating circuit **240**, an oscillation module **244**, a processing module **246**, an oscillation calibration module **248**, a comparator **250**, an envelope detection module **252**, a capacitor C**1**, and a transistor T**1**. The oscillation module **244**, the processing module **246**, the oscillation calibration module **248**, the comparator **250**, and the envelope detection module **252** may be a single processing device or a plurality of processing devices. Such a processing device may be a microprocessor, micro-controller, digital signal processor, microcomputer, central processing unit, field programmable gate array, programmable logic device, state machine, logic circuitry, analog circuitry, digital circuitry, and/or any device that manipulates signals (analog and/or digital) based on hard coding of the circuitry and/or operational instructions. One or more of the modules **244**, **246**, **248**, **250**, **252** may have an associated memory element, which may be a single memory device, a plurality of memory devices, and/or embedded circuitry of the module. Such a memory device may be a read-only memory, random access memory, volatile memory, non-volatile memory, static memory, dynamic memory, flash memory, cache memory, and/or any device that stores digital information. Note that when the modules **244**, **246**, **248**, **250**, **252** implement one or more of their functions via a state machine, analog circuitry, digital circuitry, and/or logic circuitry, the memory element storing the corresponding operational instructions may be embedded within, or external to, the circuitry comprising the state machine, analog circuitry, digital circuitry, and/or logic circuitry.

[0087] In operation, the power generating circuit **240** generates a supply voltage (V_{DD}) from a radio frequency (RF) signal that is received via antenna **254**. The power generating circuit **240** stores the supply voltage V_{DD} in capacitor C**1** and provides it to modules **244**, **246**, **248**, **250**, **252**.

[0088] When the supply voltage V_{DD} is present, the envelope detection module **252** determines an envelope of the RF signal, which includes a DC component corresponding to the supply voltage V_{DD}. In one embodiment, the RF signal is an amplitude modulation signal, where the envelope of the RF signal includes transmitted data. The envelope detection module **252** provides an envelope signal to the comparator **250**. The comparator **250** compares the envelope signal with a threshold to produce a stream of recovered data.

[0089] The oscillation module **244**, which may be a ring oscillator, crystal oscillator, or timing circuit, generates one or more clock signals that have a rate corresponding to the rate of the RF signal in accordance with an oscillation feedback signal. For instance, if the RF signal is a 900 MHz signal, the rate of the clock signals will be n*900 MHz, where "n" is equal to or greater than 1.

[0090] The oscillation calibration module **248** produces the oscillation feedback signal from a clock signal of the one or more clock signals and the stream of recovered data. In general, the oscillation calibration module **248** compares the rate of the clock signal with the rate of the stream of recovered data. Based on this comparison, the oscillation calibration module **248** generates the oscillation feedback to indicate to the oscillation module **244** to maintain the current rate, speed up the current rate, or slow down the current rate.

[0091] The processing module **246** receives the stream of recovered data and a clock signal of the one or more clock signals. The processing module **246** interprets the stream of recovered data to determine a command or commands contained therein. The command may be to store data, update data, reply with stored data, verify command compliance, read user data, an acknowledgement, etc. If the command(s) requires a response, the processing module **246** provides a signal to the transistor T**1** at a rate corresponding to the RF signal. The signal toggles transistor T**1** on and off to generate an RF response signal that is transmitted via the antenna. In one embodiment, the RFID tag **235** utilizing a back-scattering RF communication. Note that the resistor R**1** functions to decouple the power generating circuit **240** from the received RF signals and the transmitted RF signals.

[0092] The RFID tag **235** may further include a current reference (not shown) that provides one or more reference, or bias, currents to the oscillation module **244**, the oscillation calibration module **248**, the envelope detection module **252**,

and the comparator **250**. The bias current may be adjusted to provide a desired level of biasing for each of the modules **244**, **248**, **250**, and **252**.

[0093] FIG. **21** is a schematic block diagram of a user's hand grasping a gaming object with a capacitive sensor in a first manner is accordance with an embodiment the present invention. In this embodiment gaming object **372**, such as gaming object **110**, includes a resistive or capacitive sensor **370** shown as a sensing strip. When a user grasps the gaming object **372** in his or her hand **99**, the hand **99** comes in contact with the sensor **370**.

[0094] In an embodiment of the present invention, the sensor **370** can be a capacitive sensor that includes a layer that can store an electrical charge. When a user touches the sensor a portion of the charge is transferred to the user reducing the charge in the capacitive layer. The sensor **370** includes a driver that differences in charge from end to end of the strip to determine the amount and location of the touch that can be output as user data, such as user data **102**. In another embodiment, the sensor **370** can be a resistive sensor, such as four or five wire tough pad or strip or other resistive sensor.

[0095] The sensor **370** can isolate biofeedback data such as a user's heart rate, a level of perspiration, or other biometric data that can be included in user data **102**. In an embodiment of the present invention, the sensor **370** generates user data **102** that includes biofeedback data that can be used by game console **100** to adjust a game parameter of the gaming application based on the biofeedback data. For instance in a adventure game, an excitement level of the game can be reduced in response to biofeedback indicating a heart rate or level of perspiration that is too high or increasing too rapidly. In another embodiment, the game can sense the fear of a user via biofeedback that indicates a high heart rate or level of perspiration. In a sports game, biofeedback can indicate a level of fatigue of the user based on heart rate or perspiration levels and take action to taunt the player in a light-heated way or otherwise adjust the level of difficulty of the game based on the user's fatigue.

[0096] In a further embodiment of the present invention, the user data **102** generated by the sensor **370** can indicate the manner in which the user grasps the gaming object, in terms of the level of tightness, the position of the hand on the gaming object **372**, etc. each of these parameters can be included in user data **102** and the game console **100** can adjust one or more game parameters in response.

[0097] For instance, in a tennis game, the gaming object **372** may be used to simulate a tennis racquet in a user's hand. The game may attribute more power to the user's serve if the gaming object is held near one end, signifying greater simulated racquet extension during the serve. However, if the position of the gaming object is not shifted to a more normal position near the center of the gaming object for a ground stroke shot, a greater probability of a "miss-hit" shot can attributed based on the user data **102**. Similarly, in a baseball game, a bunt by a user may require the user to shift his or her hand position on the gaming controller to simulate "choking-up" on the simulated bat.

[0098] It should be noted that these examples are merely illustrative of the many possible applications of the use of user data **102** generated in the context of a game.

[0099] FIG. **22** is a schematic block diagram of a user's hand grasping a gaming object with a capacitive sensor in a second manner is accordance with an embodiment the present invention. As compared with FIG. **21**, the user's hand **99** is in a different position on the gaming object **372** covering more of the sensor **370**. As discussed in conjunction with FIG. **20**, this change in the manner in which the gaming object **372** is grasped can be indicated via user data **102** and used to adjust one or more parameters of a game.

[0100] FIG. **23** is a flowchart representation of a method in accordance with an embodiment of the present invention. In particular a method is presented for use in conjunction with one or more functions and features presented in conjunction with FIGS. **1-22**. In step **400**, biofeedback data is generated in response to an action of a user. In step **402**, an RF signal is sent to a game device, wherein the RF signal indicates the biofeedback data. In step **404**, a gaming application is generated based the biofeedback data.

[0101] In an embodiment of the present invention, the biofeedback data includes image data corresponding to an image of the user. The gaming application can recognize the user based on the image data. The biofeedback data can includes voice data generated by the user that is used to recognizes the user based on the voice data and/or to recognize a game command based on the voice data.

[0102] In an embodiment of the present invention, the biofeedback data can indicate a heart rate of the user and/or a perspiration level of the user. The gaming application can adjust a game parameter based on the biofeedback data. Further, the biofeedback data can indicate a manner in which the user grasps the gaming object.

[0103] As may be used herein, the terms "substantially" and "approximately" provides an industry-accepted tolerance for its corresponding term and/or relativity between items. Such an industry-accepted tolerance ranges from less than one percent to fifty percent and corresponds to, but is not limited to, component values, integrated circuit process variations, temperature variations, rise and fall times, and/or thermal noise. Such relativity between items ranges from a difference of a few percent to magnitude differences. As may also be used herein, the term(s) "coupled to" and/or "coupling" and/or includes direct coupling between items and/or indirect coupling between items via an intervening item (e.g., an item includes, but is not limited to, a component, an element, a circuit, and/or a module) where, for indirect coupling, the intervening item does not modify the information of a signal but may adjust its current level, voltage level, and/or power level. As may further be used herein, inferred coupling (i.e., where one element is coupled to another element by inference) includes direct and indirect coupling between two items in the same manner as "coupled to". As may even further be used herein, the term "operable to" indicates that an item includes one or more of power connections, input(s), output(s), etc., to perform one or more its corresponding functions and may further include inferred coupling to one or more other items. As may still further be used herein, the term "associated with", includes direct and/or indirect coupling of separate items and/or one item being embedded within another item. As may be used herein, the term "compares favorably", indicates that a comparison between two or more items, signals, etc., provides a desired relationship. For example, when the desired relationship is that signal **1** has a greater magnitude than signal **2**, a favorable comparison may be achieved when the magnitude of signal **1** is greater than that of signal **2** or when the magnitude of signal **2** is less than that of signal **1**.

[0104] While the transistors in the above described figure (s) is/are shown as field effect transistors (FETs), as one of

ordinary skill in the art will appreciate, the transistors may be implemented using any type of transistor structure including, but not limited to, bipolar, metal oxide semiconductor field effect transistors (MOSFET), N-well transistors, P-well transistors, enhancement mode, depletion mode, and zero voltage threshold (VT) transistors.

[0105] The present invention has also been described above with the aid of method steps illustrating the performance of specified functions and relationships thereof. The boundaries and sequence of these functional building blocks and method steps have been arbitrarily defined herein for convenience of description. Alternate boundaries and sequences can be defined so long as the specified functions and relationships are appropriately performed. Any such alternate boundaries or sequences are thus within the scope and spirit of the claimed invention.

[0106] The present invention has been described above with the aid of functional building blocks illustrating the performance of certain significant functions. The boundaries of these functional building blocks have been arbitrarily defined for convenience of description. Alternate boundaries could be defined as long as the certain significant functions are appropriately performed. Similarly, flow diagram blocks may also have been arbitrarily defined herein to illustrate certain significant functionality. To the extent used, the flow diagram block boundaries and sequence could have been defined otherwise and still perform the certain significant functionality. Such alternate definitions of both functional building blocks and flow diagram blocks and sequences are thus within the scope and spirit of the claimed invention. One of average skill in the art will also recognize that the functional building blocks, and other illustrative blocks, modules and components herein, can be implemented as illustrated or by discrete components, application specific integrated circuits, processors executing appropriate software and the like or any combination thereof.

What is claimed is:

1. A gaming object comprising:

a sensor that generates biofeedback data in response to an action of a user; and

a transceiver coupled to send an RF signal to a game device, wherein the RF signal indicates the biofeedback data;

wherein the game device executes a gaming application that is based the biofeedback data.

2. The gaming object of claim **1** wherein the sensor includes an image sensor and the biofeedback data includes image data corresponding to an image of the user.

3. The gaming object of claim **2** wherein the game device recognizes the user based on the image data.

4. The gaming object of claim **1** wherein the sensor includes a microphone and the biofeedback data includes voice data generated by the user.

5. The gaming object of claim **4** wherein the game device recognizes the user based on the voice data.

6. The gaming object of claim **4** wherein the game device recognizes a game command based on the voice data.

7. The gaming object of claim **1** wherein the sensor includes a heart rate sensor and the biofeedback data indicates a heart rate of the user.

8. The gaming object of claim **1** wherein the sensor includes a perspiration sensor and the biofeedback data indicates a perspiration level of the user.

9. The gaming object of claim **1** wherein the game device adjusts a game parameter of the gaming application based on the biofeedback data.

10. The gaming object of claim **1** wherein the sensor generates biofeedback data that indicates a manner in which a user grasps the gaming object.

11. A method for use in a gaming system, the method comprising:

generating biofeedback data in response to an action of a user;

sending an RF signal to a game device, wherein the RF signal indicates the biofeedback data; and

executing a gaming application based the biofeedback data.

12. The method of claim **1** wherein biofeedback data includes image data corresponding to an image of the user.

13. The method of claim **2** wherein the gaming application recognizes the user based on the image data.

14. The method of claim **1** wherein the biofeedback data includes voice data generated by the user.

15. The method of claim **4** wherein the gaming application recognizes the user based on the voice data.

16. The method of claim **4** wherein the gaming application recognizes a game command based on the voice data.

17. The method of claim **1** wherein the biofeedback data indicates a heart rate of the user.

18. The method of claim **1** wherein the biofeedback data indicates a perspiration level of the user.

19. The method of claim **1** wherein the gaming application adjusts a game parameter based on the biofeedback data.

20. The method of claim **1** wherein the biofeedback data indicates a manner in which the user grasps the gaming object.

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