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(54) **Title:** FACILITATING DYNAMIC GAME SURFACE ADJUSTMENT

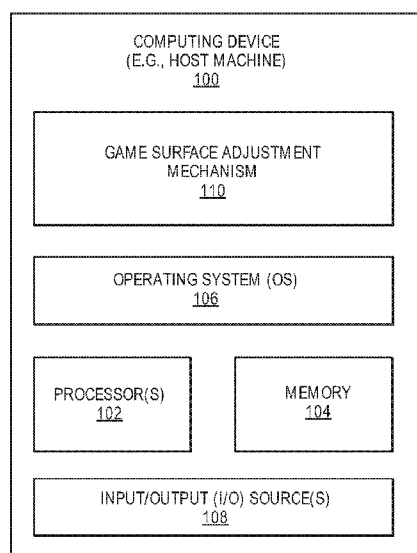


FIG. 1

(57) **Abstract:** A mechanism is described for facilitating dynamic game surface adjustment at smart play surfaces of smart play sets according to one embodiment. A method of embodiments, as described herein, includes receiving one or more inputs to perform an action at a portion of a play surface of a play set; evaluating the one or more inputs for generating an action plan to perform the action at the portion of the play surface, where the action plan is to affect one or more objects acting on the surface. The method may further include executing the action at the portion of the surface, wherein the action to adjust one or more properties of the play surface.





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FACILITATING DYNAMIC GAME SURFACE ADJUSTMENT

FIELD

Embodiments described herein generally relate to computers. More particularly,
5 embodiments relate to facilitating dynamic game surface adjustment.

BACKGROUND

Conventional techniques do not provide for adjustment of gaming surfaces (e.g.,
Beyblade™ arenas) and thus, users (e.g., game players) of such games are unable to enjoy full
10 gaming experience.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments are illustrated by way of example, and not by way of limitation, in the
figures of the accompanying drawings in which like reference numerals refer to similar elements.

15 **Figure 1** illustrates a computing device employing a game surface adjustment
mechanism according to one embodiment.

Figure 2A illustrates a game surface adjustment mechanism according to one
embodiment.

Figure 2B illustrates an architectural placement according to one embodiment.

20 **Figure 3** illustrates a use case scenario according to one embodiment.

Figure 4A illustrates a method for facilitating game surface adjustment according to
one embodiment.

Figure 4B illustrates a method for facilitating game surface adjustment according to one
embodiment.

25 **Figure 4C** illustrates a method for facilitating game surface adjustment according to
one embodiment.

Figure 5 illustrates computer environment suitable for implementing embodiments of
the present disclosure according to one embodiment.

Figure 6 illustrates a method for facilitating dynamic targeting of users and
30 communicating of message according to one embodiment.

DETAILED DESCRIPTION

In the following description, numerous specific details are set forth. However, embodiments, as described herein, may be practiced without these specific details. In other instances, well-known circuits, structures and techniques have not been shown in details in order not to obscure the understanding of this description.

Embodiments provide for a novel technique for dynamic interaction with surfaces to facilitate a surface to change its properties in real-time. Embodiments are not limited to any particular type of surface; however, for brevity, clarity, and ease of understanding, terms like “surface”, “game surface”, “toy surface”, “play surface”, “play arena” or simply “arena” are referenced interchangeably throughout this document.

For example, many of today’s toys, games, etc., involve movements of various objects on specific surfaces, such as electric cars racing in race tracks, trains running on train tracks, Beyblade™ tops to fight it out on battle arenas, Magic™ cards on play surfaces with graphics, etc. Embodiments provide for instrumentation of such play surfaces to enable the users to have a unique and new user experience where a surface can change its properties, such as generate a bump or a depression, etc., on-demand or as predetermined.

Figure 1 illustrates a computing device 100 employing a game surface adjustment mechanism 110 according to one embodiment. Computing device 100 serves as a host machine for hosting game surface adjustment mechanism (“surface mechanism”) 110 that includes any number and type of components, as illustrated in **Figure 2A**, to facilitate real-time and dynamic adjustment of properties of play surfaces as will be further described throughout this document.

Computing device 100 may include any number and type of data processing devices, such as large computing systems, such as server computers, desktop computers, etc., and may further include set-top boxes (e.g., Internet-based cable television set-top boxes, etc.), global positioning system (GPS)-based devices, etc. Computing device 100 may include mobile computing devices serving as communication devices, such as cellular phones including smartphones, personal digital assistants (PDAs), tablet computers, laptop computers (e.g., Ultrabook™ system, etc.), e-readers, media internet devices (MIDs), media players, smart televisions, television platforms, intelligent devices, computing dust, media players, head-mounted displays (HMDs) (e.g., wearable glasses, such as Google® glass™, head-mounted binoculars, gaming displays, military headwear, etc.), and other wearable devices (e.g., smartwatches, bracelets, smartcards, jewelry, clothing items, etc.), and/or the like.

Computing device 100 may include an operating system (OS) 106 serving as an interface between hardware and/or physical resources of the computer device 100 and a user. Computing device 100 further includes one or more processors 102, memory devices 104, network devices, drivers, or the like, as well as input/output (I/O) sources 108, such as
5 touchscreens, touch panels, touch pads, virtual or regular keyboards, virtual or regular mice, etc.

It is to be noted that terms like “node”, “computing node”, “server”, “server device”, “cloud computer”, “cloud server”, “cloud server computer”, “machine”, “host machine”, “device”, “computing device”, “computer”, “computing system”, and the like, may be used interchangeably throughout this document. It is to be further noted that terms like “application”,
10 “software application”, “program”, “software program”, “package”, “software package”, “code”, “software code”, and the like, may be used interchangeably throughout this document. Also, terms like “job”, “input”, “request”, “message”, and the like, may be used interchangeably throughout this document. It is contemplated that the term “user” may refer to an individual or a group of individuals using or having access to computing device 100.

Figure 2A illustrates a game surface adjustment mechanism 110 according to one embodiment. In one embodiment, surface mechanism 110 may include any number and type of components, such as (without limitation): detection/reception logic 201; management logic (“surface/AR logic”) 203 including sensors data processor 205; video/audio analytics logic (“analytics logic”) 207; application/execution logic 209; and communication/compatibility logic
20 211.

Computing device 100 may be part of smart play set 200, where “smart play set” may be interchangeably referred to as “play set”, “play device”, “play setup”, “game set”, “game”, “toy set”, or simply “toy” throughout this document. As illustrated, in some embodiments, play set 200 may further include various embedded, connected, and/or loose parts, such as moveable
25 objects/attachment (“objects”) 240, active play arena (“surface”) 250, etc. In some embodiments, objects 240, having object sensors 241, may include players’ toys, toy characters, pieces, add-ons, and/or other moveable objects or attachments that may be placed on surface 250, where surface 250 representing a play surface may include any number and type of components, such as (without limitation) surface sensors 251, surface actuators (actuators”) 253,
30 physical effects detectors (“detectors”) 255, etc. As aforementioned, throughout this document, active play arena 250 may be referred to as “surface”, “game surface”, “toy surface”, “play surface”, “play arena” or simply “arena”.

Computing device 100 may include input/out sources 108 including capturing/sensing components 221 and output components 223 which, as will be further described below, may also include any number and type of components, sensor arrays, etc. For example, capturing/sensing components 221 may include cameras (e.g., two-dimensional (2D) cameras, three-dimensional (3D) cameras, etc.), sensors array, etc. Similarly, output components 223 may include display screens, display/projection areas, projectors, etc.

Computing device 100 may be further in communication with any number and type of other computing devices, such as computing devices (also referred to as “personal devices”) 270A, 270B, 270C (e.g., mobile computer, such as tablet computer, smartphone, etc.), that may be accessed by their corresponding users (also referred to as “players” or “participants”) using user interfaces, such as user interface 271, to serve as input console to not only participate in playing the game, but also choose to alter or adjust surface 250.

It is contemplated that surface 250 is capable of interacting with other parts of play set 100, such as touch screen, joystick, and other input controls, etc., along with personal devices 270A-270C such that one or more properties of surface 250 may be altered using digital inputs from one or more players using their corresponding personal devices 270A-270C.

As will be further described in this document, in one embodiment, computing device 270A-270C may be used by their corresponding players to input commands or data to have surface 250 behave differently where certain properties of surface 250 may be altered (e.g., create a bump, a ditch, a bridge, an obstacle, etc.) such that one or more of other components, such as a projector, may be used to project or create AR visualizations to corresponding to the changes in surface 250. Such surface changes may be enabled and facilitated by surface mechanism 110. In one embodiment, play set 100 may be in communication with personal devices 270A-270C over communication medium 260, such as a Cloud network, the Internet, an intranet, a proximity network, etc.

In one embodiment, computing device 100 may be in communication with one or more repositories or data sources or databases, such as database 265, to obtain, communicate, store, and maintain any amount and type of data (e.g., media, metadata, templates, real-time data, historical contents, user and/or device identification tags and other information, resources, policies, criteria, rules, regulations, upgrades, etc.). In some embodiments, communication medium 260 may include any number and type of communication channels or networks, such as Cloud network, the Internet, intranet, Internet of Things (“IoT”), proximity network, Bluetooth,

etc.). It is contemplated that embodiments are not limited to any particular number or type of computing devices, media sources, databases, personal devices, networks, etc.

Computing device 100 may further include I/O sources 108 having any number and type of capturing/sensing components 221 (e.g., sensor array (such as context/context-aware sensors and environmental sensors, such as camera sensors, ambient light sensors, Red Green Blue (RGB) sensors, movement sensors, etc.), depth sensing cameras, 2D cameras, 3D cameras, image sources, audio/video/signal detectors, microphones, eye/gaze-tracking systems, head-tracking systems, etc.) and output components 223 (e.g., audio/video/signal sources, display planes, display panels, display screens/devices, projectors, display/projection areas, speakers, etc.).

Capturing/sensing components 221 may further include one or more of vibration components, tactile components, conductance elements, biometric sensors, chemical detectors, signal detectors, electroencephalography, functional near-infrared spectroscopy, wave detectors, force sensors (e.g., accelerometers), illuminators, eye-tracking or gaze-tracking system, head-tracking system, etc., that may be used for capturing any amount and type of visual data, such as images (e.g., photos, videos, movies, audio/video streams, etc.), and non-visual data, such as audio streams or signals (e.g., sound, noise, vibration, ultrasound, etc.), radio waves (e.g., wireless signals, such as wireless signals having data, metadata, signs, etc.), chemical changes or properties (e.g., humidity, body temperature, etc.), biometric readings (e.g., figure prints, etc.), brainwaves, brain circulation, environmental/weather conditions, maps, etc. It is contemplated that “sensor” and “detector” may be referenced interchangeably throughout this document. It is further contemplated that one or more capturing/sensing components 221 may further include one or more of supporting or supplemental devices for capturing and/or sensing of data, such as illuminators (e.g., infrared (IR) illuminator), light fixtures, generators, sound blockers, etc.

It is further contemplated that in one embodiment, capturing/sensing components 221 may further include any number and type of context sensors (e.g., linear accelerometer) for sensing or detecting any number and type of contexts (e.g., estimating horizon, linear acceleration, etc., relating to a mobile computing device, etc.). For example, capturing/sensing components 221 may include any number and type of sensors, such as (without limitations): accelerometers (e.g., linear accelerometer to measure linear acceleration, etc.); inertial devices (e.g., inertial accelerometers, inertial gyroscopes, micro-electro-mechanical systems (MEMS) gyroscopes, inertial navigators, etc.); gravity gradiometers to study and measure variations in gravitation acceleration due to gravity, etc.

Further, for example, capturing/sensing components 221 may include (without limitations): audio/visual devices (e.g., cameras, microphones, speakers, etc.); context-aware sensors (e.g., temperature sensors, facial expression and feature measurement sensors working with one or more cameras of audio/visual devices, environment sensors (such as to sense background colors, lights, etc.), biometric sensors (such as to detect fingerprints, etc.), calendar maintenance and reading device), etc.; global positioning system (GPS) sensors; resource requestor; and trusted execution environment (TEE) logic. TEE logic may be employed separately or be part of resource requestor and/or an I/O subsystem, etc. Capturing/sensing components 221 may further include voice recognition devices, photo recognition devices, facial and other body recognition components, voice-to-text conversion components, etc.

Computing device 100 may further include one or more output components 223 in communication with one or more capturing/sensing components 221 and one or more components of surface mechanism 110 for facilitating playing and/or visualizing of varying contents, such as images, videos, texts, audios, animations, interactive representations, visualization of fingerprints, visualization of touch, smell, and/or other sense-related experiences, etc. For example, output components 223 may further include one or more telepresence projectors to project a real image's virtual representation capable of being floated in mid-air while being interactive and having the depth of a real-life object.

Further, output components 223 may include dynamic tactile touch screens having tactile effectors as an example of presenting visualization of touch, where an embodiment of such may be ultrasonic generators that can send signals in space which, when reaching, for example, human fingers can cause tactile sensation or like feeling on the fingers. Further, for example and in one embodiment, output components 223 may include (without limitation) one or more of light sources, display devices and/or screens, audio speakers, tactile components, conductance elements, bone conducting speakers, olfactory or smell visual and/or non/visual presentation devices, haptic or touch visual and/or non-visual presentation devices, animation display devices, biometric display devices, X-ray display devices, high-resolution displays, high-dynamic range displays, multi-view displays, and head-mounted displays (HMDs) for at least one of virtual reality (VR) and augmented reality (AR), etc.

For example, in case of play set 200 being a BeybladeTM toy, various spinning tops, such as objects 240, are configured by players using mechanical attachments and made to spin in arena, such as surface 250, that causes the tops to bump each other and the last remaining top wins the battle. In one embodiment, applying surface mechanism 110 to a BeybladeTM-like

arena, such as surface 250, may facilitate surface 250 to actively participate in the game by allowing the players to strategize by, for example, connecting various objects 240 (e.g., other players' spinning tops, obstacles, lights, additional weapons, etc.) to best battle the opponent player's style of top and facilitating surface 250 or one or more portions of it to behave in certain ways, such as turn soft, erect a hill, build a bridge, blow up, turn into a hole, create a bump, etc., making the game more exciting and/or challenging by having these changes made to surface 250 serve as favorable to the player, obstacles to other players, or remain neutral, such as serving as a passive scenery or equally challenging obstacles, etc.

Similarly, play device 200 may include other forms of toys, games, setup, etc., such as a train set having a set of train tracks serving as surface 250, race cars having a race track serving as surface 250, sailboats having an area of water serving as surface 250, airplanes having a runway serving as surface 250, etc., where these various forms of surface 250 may be altered, on-demand or as predetermined, to become an active part of using a game/toy, such as play device 100, in order to obtain a unique user experience as facilitated by surface mechanism 110.

In one embodiment, detection/reception logic 201 may be used to receive users requests, such as placed via user interface 271 of personal device 270A over communication medium 260, to modify one or more properties of one or more portions of surface 250, such as generating bumps in surface 250 for increased difficulty for one or more opponent players or all players, etc. Similarly, in another embodiment, detection/reception logic 201 may detect predetermined criteria to be applied to surface 250, where such criteria may set forth any number of information and rules regarding the type of changes to be applied to surface 250, what time and for how long they the changes may be applied, any other features (e.g., lights) are to be turned-on or turned off before, after, or during the application of those changes, and/or the like.

In one embodiment, these predetermined criteria and any applicable or relevant rules may be stored at database 265. For example and in some embodiments, the rules may be used to define any number and type of features, such as how many actions or changes to be applied to surface 250, what actions, what time an action may be activated by a player, etc. Further, these rules at database 265 may be player-specific or play-specific, such as a player with a high record may get to have and apply more actions per game to surface 250, a player may earn and/or buy additional actions or a right to have more actions per play, and/or the like.

Upon receiving the user request or detecting predetermined criteria along with detecting and accessing any relevant rules at database 265, this information may then be forwarded on to surface/AR logic 203 for further processing. In one embodiment, surface/AR logic 203 may be

used to control and manage surface characteristics and/or AR effects based on user inputs, surface sensor measurements as determined by surface sensors 251, video recognition results, and sensor readings from one or more movement objects 240 placed on surface 250 as facilitated by their corresponding movement sensors 241 and surface sensors 251, respectively. For example, sensors data processor 205 of surface/AR logic 203 may be used to process any amount and type of data received from sensors 241, 251, detector 253, one or more sensors of sensor array of capturing/sensing components 221, etc., which may then be used by surface/AR logic 203 to perform its various tasks.

Further, in one embodiment, surface 250 may employ actuators 253 (such as under or beneath surface 250) and physical effects detectors 255 to appropriately facilitate changes in properties relating to surface 250, such as tilting, creating bumps, applying various physical effects (e.g., magnetic field, air jets), etc., with precision and in accordance with one or more of user requests, predetermined criteria, and/or rules at database 265. For example, actuators 253 and detectors 255 may be placed under surface 250, where actuators 253 may be used to translate and actualize the requested/predetermined actions (such as based on user inputs, predetermined criteria, rules, etc.) to ensure that surface 250 behaves accordingly, such as vibrate, tilt to the right, etc. Similarly, in one embodiment, detectors 255 may be used to detect and project the corresponding physical effects, such as increased or decreased lighting or sound, creating augmented reality around and at surface 250, and/or the like, and then communicate this information with actuators 253 so they may perform their tasks.

Further in one embodiment, play surface 250 may be a surface upon which one or more people may operate. For example, a person may wear or hold an object that is monitored by surface mechanism 110 such that play surface 250 may be adjusted in some way to affect the play of the game, such as a surface change on surface 250 may be caused to move a ball that the person is trying to pick up during the game.

Further, in one embodiment, any data collected by camera, sensors, etc., of capturing/sensing components 221 and by any other sensors, such as sensors 241, 251, detectors 255, etc., may be forwarded on to surface/AR logic 203, via sensors data processor 205, to determine an appropriate action and corresponding augmented reality to be performed at surface 250 using actuators 253 and one or more output components 223, such as a projectors, tactile displays, etc. For example, in some embodiment, in an AR-enabled system, such as play set 200, a project of output components 223 may be used to project images, videos, etc., on and around surface 250 during the execution of an action, as facilitated by application/execution logic 209,

to create a more realistic user experience, such as making AR characters, such as moveable objects 240, blend in with the chosen environment or scenery (such as choosing beach, downtown, mountains, etc., for racing cars, etc.) for the game for a convincingly realistic experience.

5 In one embodiment, one or more cameras (e.g., 2D/3D cameras) of capturing/sensing components 221 may be used to capture images, videos, etc., of AR characters, such as moveable objects 240, placed on surface 250; similarly, any relevant and surrounding sounds or audio may be captured by one or more microphones of capturing/sensing components 221 subsequently, these images, videos, sounds, etc., may be forwarded on to analytics logic 207 to
10 identify one or more movable objects 240 to determine their relevant environmental characteristics, such as recognizing horizontal levels of surface 250 to bind any AR character actions of objects 240 so that, for example, they do not fall through the floor of surface 250.

 In one embodiment, movable objects 240 may be sensed using their corresponding sensors 241, and/or identified using a Radio Frequency Identification (RFID) technique to scan
15 any embedded RFID tags of movable objects 240. In one embodiment, objects 240 may be sensed directly by detection/reception logic 201 and their report may then be provided to sensor data processor 205 or, in another embodiment, sensors 241 may report directly to sensors data processor 205 of the movements of their corresponding objects 240. For example, sensors 241 may be embedded into their corresponding moveable objects 240 and each time these objects
20 240 move, their sensors 241 may sense their movements and provide movement reports to sensor data processor 205 for further processing, where these movement reports may include data relating to direction, rotation, velocity, etc., of movable objects 240.

 Further, as illustrated, personal devices 270A-C, may include user interfaces, such as user interface 271 at personal device 270A, to serve as user input controls for accepting requests,
25 commands, inputs, etc., by various users/players, where each user interface 271 may include a dedicated built-in touch screen, and where such personal devices 270A-C may include any number and type of computing device, such as desktop computers, laptops, tablet computers, smartphones, wearable devices (e.g., wearable glasses, bracelets, etc.) connected over communication medium 260 (e.g., WiFi, Bluetooth link, etc.).

30 Further, as aforementioned and in one embodiment, output components 223 may include tactile displays to create special vibration patterns, use electrostatic approaches, dynamic surface morphing (such as using microfluidics, etc.) to allow for proper sensation of contours and raised surfaces on flat screens. Moreover, such tactile display may include dynamic tactile

touch displays that use raised bumps may appear and disappear based on electrical charges across a special surface, such as surface 250.

In one embodiment, upon having various components, such as surface/AR logic 203, analytics logic 207, etc., perform their corresponding tasks, such as analyzed and evaluated all the available and/or relevant data detected or obtained from sensors 241, 251, detectors 255, capturing/sensing components 221 (e.g., cameras, sensor arrays, etc.), user inputs via physical devices 270A-270C, predetermined criteria and/or rules being maintained at database 265, etc., surface/AR logic 203 may then forward the evaluation results of these findings to application/execution logic 209 which may then be triggered to apply these results and execute any corresponding actions at surface 250.

In one embodiment, an action that may be performed to alter properties, conditions, etc., at surface 250 may include a player choosing a power play to change one or more portions of surface 250 such that they are inhibited or constrained for opponent players, where such changing surface conditions may include (without limitation) haptic/vibration beneath surface 250 near the opponent's top, tilt to part of surface 250, generate physical bumps on surface 250, create adjustable magnetic fields under surface 250 to slow the top, and/or the like. Similarly, in some embodiments, other actions may include (without limitation): 1) vibration under a specific area of surface 250, which may be achieved through one or more projectors of output components 223 which may be used to project a texture on that specific area of surface 250 so that the specific area appears rough; 2) player scores, which may be achieved by having one or more projectors of output components 223 project or indicate the score at a particular spot of scoring on surface 250; and 3) top moves across surface 250, which may be achieved by having one or more projectors of output components 223 project a path of top that is previous or anticipated; and/or the like.

Moreover, in one embodiment, communication/compatibility logic 211 may include various components relating to communication, messaging, compatibility, etc., such as connectivity and messaging logic, to facilitate communication and exchange of messages and data, etc., between surface mechanism 110 at computing device 100, movable objects 240, surface 250, personal devices 270A-270C, and/or the like.

Communication/compatibility logic 211 may be used to facilitate dynamic communication and compatibility between computing device 100, personal devices 270A-C, database(s) 265, etc., and any number and type of other computing devices (such as wearable computing devices, mobile computing devices, desktop computers, server computing devices,

etc.), processing devices (e.g., central processing unit (CPU), graphics processing unit (GPU), etc.), capturing/sensing components (e.g., non-visual data sensors/detectors, such as audio sensors, olfactory sensors, haptic sensors, signal sensors, vibration sensors, chemicals detectors, radio wave detectors, force sensors, weather/temperature sensors, body/biometric sensors, scanners, etc., and visual data sensors/detectors, such as cameras, etc.), user/context-awareness components and/or identification/verification sensors/devices (such as biometric sensors/detectors, scanners, etc.), memory or storage devices, data sources, and/or database(s) (such as data storage devices, hard drives, solid-state drives, hard disks, memory cards or devices, memory circuits, etc.), network(s) (e.g., Cloud network, the Internet, intranet, cellular network, proximity networks, such as Bluetooth, Bluetooth low energy (BLE), Bluetooth Smart, Wi-Fi proximity, Radio Frequency Identification (RFID), Near Field Communication (NFC), Body Area Network (BAN), etc.), wireless or wired communications and relevant protocols (e.g., Wi-Fi®, WiMAX, Ethernet, etc.), connectivity and location management techniques, software applications/websites, (e.g., social and/or business networking websites, business applications, games and other entertainment applications, etc.), programming languages, etc., while ensuring compatibility with changing technologies, parameters, protocols, standards, etc.

Throughout this document, terms like "logic", "component", "module", "framework", "engine", "tool", and the like, may be referenced interchangeably and include, by way of example, software, hardware, and/or any combination of software and hardware, such as firmware. Further, any use of a particular brand, word, term, phrase, name, and/or acronym, such as "play set", "play device", "surface", "arena", "movable objects", "attachments", "game surface adjustment", Beyblade™, "personal device", "toy", "game", "player", "smart device", "mobile computer", "wearable device", etc., should not be read to limit embodiments to software or devices that carry that label in products or in literature external to this document.

It is contemplated that any number and type of components may be added to and/or removed from surface mechanism 110 to facilitate various embodiments including adding, removing, and/or enhancing certain features. For brevity, clarity, and ease of understanding of surface mechanism 110, many of the standard and/or known components, such as those of a computing device, are not shown or discussed here. It is contemplated that embodiments, as described herein, are not limited to any particular technology, topology, system, architecture, and/or standard and are dynamic enough to adopt and adapt to any future changes.

Figure 2B illustrates an architectural placement 280 according to one embodiment. As an initial matter, for brevity, clarity, and ease of understanding, many of the components and

processes discussed above with reference to **Figures 1-2A** may not be repeated or discussed hereafter.

It is contemplated and to be noted that embodiments are not limited to any particular architecture setup, such as architectural placement 280, or as described with reference to **Figure 2A**, and that any number and type of components may be employed, placed, and used in any manner or form to perform the relevant tasks for facilitating game surface adjustment.

As illustrated here, in one embodiment, surface mechanism 110 may include any number and type of components, such as (without limitation): surface/AR logic 203; V/A logic 207; sensors data processor 205; and application/execution logic 209. As further illustrated and previously described with reference to **Figure 2A**, in one embodiment, surface mechanism 110 includes communication/compatibility logic 211 which includes connectivity and messaging module 281 for performing various tasks relating to connectivity and messaging between various components of surface mechanism 110 as well as other components and devices, such as moveable objects 240, surface 250, personal device 270A, communication medium 260 of **Figure 2A**, etc.

Similarly, as illustrated and described with reference to **Figure 2A**, detection/reception logic 201 may include user input console 283 to allow a user/player to provide inputs, place requests, set preferences, etc., in addition to or in lieu of using personal device 270A. As further illustrated, in one embodiment, database 265, serving as rules database/storage, may be part of surface mechanism 110 at computing device 100 of **Figure 2A**.

In some embodiments, other components include 2D/3D camera 291 of capture/sensing components 221, and projector 293 of output components 223 of **Figure 2A**. Similarly, as illustrated, additional components include moveable objects/attachments 240 having sensors 241, and active play arena/surface 250 having surface sensors 251, actuators 253, and physical effects detectors 255 as previously described with reference to **Figure 2A**.

Figure 3 illustrates a use case scenario 300 according to one embodiment. As an initial matter, for brevity, clarity, and ease of understanding, many of the components and processes discussed above with reference to **Figures 1-2B** may not be repeated or discussed hereafter. Further, it is contemplated and to be noted that embodiments are not limited to this particular use case scenario 300 any of its particular components, such as BeybladeTM-like games, toys, surfaces, etc., and that any number and type of other play sets and components may be used for facilitating game surface adjustment as facilitated by surface mechanism 110 of **Figure 2A**. As aforementioned, some examples of other play sets using surface mechanism 110 may include

(without limitation) train sets, race car sets, boating sets, plane sets, Hot Wheel® race track sets, Matchbox® track sets, and even board games like Chutes and Ladders™, etc.

Referring now to the illustrated embodiment, for example, a Beyblad™-like play set may be used where surface 250 is shown to have a couple of spinning tops, such as moveable objects 240. In this embodiment and as discussed with reference to **Figure 2A**, various command for actions being performed at surface 250 may be received from moveable objects 240, such as using their sensors 241 of **Figure 2A**, and/or from user 301 placing one or more commands directly using user interface 271 of physical device 270 A of **Figure 2A** and/or user input console 283 of detection/reception logic 201 of **Figure 2B**. In one embodiment, such commands may then be processed by various components of surface mechanism 110 of **Figure 2B**, resulting in an action is performed with respect to one or more characteristics/properties of surface 250, such as (as illustrated) projecting an image, such as projected surface image 303, on a particular area of surface 250 using projector 293 and actuating the action within the area using one or more actuators 253 that are typically placed beneath surface 250.

Figure 4A illustrates a method 400 for facilitating game surface adjustment according to one embodiment. Method 400 may be performed by processing logic that may comprise hardware (e.g., circuitry, dedicated logic, programmable logic, etc.), software (such as instructions run on a processing device), or a combination thereof. In one embodiment, method 400 may be performed by surface mechanism 110 of **Figure 2A**. The processes of method 400 are illustrated in linear sequences for brevity and clarity in presentation; however, it is contemplated that any number of them can be performed in parallel, asynchronously, or in different orders. For brevity, many of the details discussed with reference to the previous figures may not be discussed or repeated hereafter.

Method 400 begins with block 401 with one or more sensors, such as moveable object sensors, surface sensors, cameras, etc., tracking location of a game piece, such as a moveable object, on a surface of a play set. At block 403, a determination is made as to whether the tracked location triggers an effect of an action being performed on the surface. If not, method 400 continues with the process of block 401. If yes, method 400 continues at block 405 with an application of the effect to facilitate the action on the surface.

Figure 4B illustrates a method 430 for facilitating game surface adjustment according to one embodiment. Method 430 may be performed by processing logic that may comprise hardware (e.g., circuitry, dedicated logic, programmable logic, etc.), software (such as instructions run on a processing device), or a combination thereof. In one embodiment, method

430 may be performed by surface mechanism 110 of **Figure 2A**. The processes of method 430 are illustrated in linear sequences for brevity and clarity in presentation; however, it is contemplated that any number of them can be performed in parallel, asynchronously, or in different orders. For brevity, many of the details discussed with reference to the previous figures may not be discussed or repeated hereafter.

Method 430 begins at block 431 with a player using a play set initiating and placing a command (e.g., spell command) to facilitate an action at a surface of the play set. At block 433, the command is detected and, at block 435, the effect (e.g., spell effect) is looked up. At block 437, the effect is implemented to facilitated the action at the surface of the play set.

Figure 4C illustrates a method 450 for facilitating game surface adjustment according to one embodiment. Method 450 may be performed by processing logic that may comprise hardware (e.g., circuitry, dedicated logic, programmable logic, etc.), software (such as instructions run on a processing device), or a combination thereof. In one embodiment, method 450 may be performed by surface mechanism 110 of **Figure 2A**. The processes of method 450 are illustrated in linear sequences for brevity and clarity in presentation; however, it is contemplated that any number of them can be performed in parallel, asynchronously, or in different orders. For brevity, many of the details discussed with reference to the previous figures may not be discussed or repeated hereafter.

Method 450 beings at block 451 with one or more components of surface mechanism 110 of **Figure 2B** receiving or detecting user inputs/commands and/or predetermined criteria relating to an action to be performed on a surface of a play set and continues, at block 453, with detection or reception of sensory data, as retrieved by various sensors, detectors, cameras, etc. At block 455, the user inputs/commands, predetermined criteria, and/or sensor data are evaluated and, as a result, at block 457, an action (e.g., AR-based action) plan to facilitate the action on the surface is prepared. At block 459, the action plan is applied and the action is executed at the surface of the play set.

Figure 5 illustrates an embodiment of a computing system 500 capable of supporting the operations discussed above. Computing system 500 represents a range of computing and electronic devices (wired or wireless) including, for example, desktop computing systems, laptop computing systems, cellular telephones, personal digital assistants (PDAs) including cellular-enabled PDAs, set top boxes, smartphones, tablets, wearable devices, etc. Alternate computing systems may include more, fewer and/or different components. Computing device 500 may be the same as or similar to or include computing devices 100 described in reference to **Figure 1**.

Computing system 500 includes bus 505 (or, for example, a link, an interconnect, or another type of communication device or interface to communicate information) and processor 510 coupled to bus 505 that may process information. While computing system 500 is illustrated with a single processor, it may include multiple processors and/or co-processors, such as one or more of central processors, image signal processors, graphics processors, and vision processors, etc. Computing system 500 may further include random access memory (RAM) or other dynamic storage device 520 (referred to as main memory), coupled to bus 505 and may store information and instructions that may be executed by processor 510. Main memory 520 may also be used to store temporary variables or other intermediate information during execution of instructions by processor 510.

Computing system 500 may also include read only memory (ROM) and/or other storage device 530 coupled to bus 505 that may store static information and instructions for processor 510. Data storage device 540 may be coupled to bus 505 to store information and instructions. Data storage device 540, such as magnetic disk or optical disc and corresponding drive may be coupled to computing system 500.

Computing system 500 may also be coupled via bus 505 to display device 550, such as a cathode ray tube (CRT), liquid crystal display (LCD) or Organic Light Emitting Diode (OLED) array, to display information to a user. User input device 560, including alphanumeric and other keys, may be coupled to bus 505 to communicate information and command selections to processor 510. Another type of user input device 560 is cursor control 570, such as a mouse, a trackball, a touchscreen, a touchpad, or cursor direction keys to communicate direction information and command selections to processor 510 and to control cursor movement on display 550. Camera and microphone arrays 590 of computer system 500 may be coupled to bus 505 to observe gestures, record audio and video and to receive and transmit visual and audio commands.

Computing system 500 may further include network interface(s) 580 to provide access to a network, such as a local area network (LAN), a wide area network (WAN), a metropolitan area network (MAN), a personal area network (PAN), Bluetooth, a cloud network, a mobile network (e.g., 3rd Generation (3G), etc.), an intranet, the Internet, etc. Network interface(s) 580 may include, for example, a wireless network interface having antenna 585, which may represent one or more antenna(e). Network interface(s) 580 may also include, for example, a wired network interface to communicate with remote devices via network cable 587, which may be, for example, an Ethernet cable, a coaxial cable, a fiber optic cable, a serial cable, or a parallel cable.

Network interface(s) 580 may provide access to a LAN, for example, by conforming to IEEE 802.11b and/or IEEE 802.11g standards, and/or the wireless network interface may provide access to a personal area network, for example, by conforming to Bluetooth standards. Other wireless network interfaces and/or protocols, including previous and subsequent versions of the standards, may also be supported.

In addition to, or instead of, communication via the wireless LAN standards, network interface(s) 580 may provide wireless communication using, for example, Time Division, Multiple Access (TDMA) protocols, Global Systems for Mobile Communications (GSM) protocols, Code Division, Multiple Access (CDMA) protocols, and/or any other type of wireless communications protocols.

Network interface(s) 580 may include one or more communication interfaces, such as a modem, a network interface card, or other well-known interface devices, such as those used for coupling to the Ethernet, token ring, or other types of physical wired or wireless attachments for purposes of providing a communication link to support a LAN or a WAN, for example. In this manner, the computer system may also be coupled to a number of peripheral devices, clients, control surfaces, consoles, or servers via a conventional network infrastructure, including an Intranet or the Internet, for example.

It is to be appreciated that a lesser or more equipped system than the example described above may be preferred for certain implementations. Therefore, the configuration of computing system 500 may vary from implementation to implementation depending upon numerous factors, such as price constraints, performance requirements, technological improvements, or other circumstances. Examples of the electronic device or computer system 500 may include without limitation a mobile device, a personal digital assistant, a mobile computing device, a smartphone, a cellular telephone, a handset, a one-way pager, a two-way pager, a messaging device, a computer, a personal computer (PC), a desktop computer, a laptop computer, a notebook computer, a handheld computer, a tablet computer, a server, a server array or server farm, a web server, a network server, an Internet server, a work station, a mini-computer, a main frame computer, a supercomputer, a network appliance, a web appliance, a distributed computing system, multiprocessor systems, processor-based systems, consumer electronics, programmable consumer electronics, television, digital television, set top box, wireless access point, base station, subscriber station, mobile subscriber center, radio network controller, router, hub, gateway, bridge, switch, machine, or combinations thereof.

Embodiments may be implemented as any or a combination of: one or more microchips or integrated circuits interconnected using a parentboard, hardwired logic, software stored by a memory device and executed by a microprocessor, firmware, an application specific integrated circuit (ASIC), and/or a field programmable gate array (FPGA). The term "logic" may include, by way of example, software or hardware and/or combinations of software and hardware.

Embodiments may be provided, for example, as a computer program product which may include one or more machine-readable media having stored thereon machine-executable instructions that, when executed by one or more machines such as a computer, network of computers, or other electronic devices, may result in the one or more machines carrying out operations in accordance with embodiments described herein. A machine-readable medium may include, but is not limited to, floppy diskettes, optical disks, CD-ROMs (Compact Disc-Read Only Memories), and magneto-optical disks, ROMs, RAMs, EPROMs (Erasable Programmable Read Only Memories), EEPROMs (Electrically Erasable Programmable Read Only Memories), magnetic or optical cards, flash memory, or other type of media/machine-readable medium suitable for storing machine-executable instructions.

Moreover, embodiments may be downloaded as a computer program product, wherein the program may be transferred from a remote computer (e.g., a server) to a requesting computer (e.g., a client) by way of one or more data signals embodied in and/or modulated by a carrier wave or other propagation medium via a communication link (e.g., a modem and/or network connection).

References to "one embodiment", "an embodiment", "example embodiment", "various embodiments", etc., indicate that the embodiment(s) so described may include particular features, structures, or characteristics, but not every embodiment necessarily includes the particular features, structures, or characteristics. Further, some embodiments may have some, all, or none of the features described for other embodiments.

In the following description and claims, the term "coupled" along with its derivatives, may be used. "Coupled" is used to indicate that two or more elements co-operate or interact with each other, but they may or may not have intervening physical or electrical components between them.

As used in the claims, unless otherwise specified the use of the ordinal adjectives "first", "second", "third", etc., to describe a common element, merely indicate that different instances of like elements are being referred to, and are not intended to imply that the elements

so described must be in a given sequence, either temporally, spatially, in ranking, or in any other manner.

Figure 6 illustrates an embodiment of a computing environment 600 capable of supporting the operations discussed above. The modules and systems can be implemented in a variety of different hardware architectures and form factors including that shown in Figure 4.

The Command Execution Module 601 includes a central processing unit to cache and execute commands and to distribute tasks among the other modules and systems shown. It may include an instruction stack, a cache memory to store intermediate and final results, and mass memory to store applications and operating systems. The Command Execution Module may also serve as a central coordination and task allocation unit for the system.

The Screen Rendering Module 621 draws objects on the one or more multiple screens for the user to see. It can be adapted to receive the data from the Virtual Object Behavior Module 604, described below, and to render the virtual object and any other objects and forces on the appropriate screen or screens. Thus, the data from the Virtual Object Behavior Module would determine the position and dynamics of the virtual object and associated gestures, forces and objects, for example, and the Screen Rendering Module would depict the virtual object and associated objects and environment on a screen, accordingly. The Screen Rendering Module could further be adapted to receive data from the Adjacent Screen Perspective Module 607, described below, to either depict a target landing area for the virtual object if the virtual object could be moved to the display of the device with which the Adjacent Screen Perspective Module is associated. Thus, for example, if the virtual object is being moved from a main screen to an auxiliary screen, the Adjacent Screen Perspective Module 2 could send data to the Screen Rendering Module to suggest, for example in shadow form, one or more target landing areas for the virtual object on that track to a user's hand movements or eye movements.

The Object and Gesture Recognition System 622 may be adapted to recognize and track hand and arm gestures of a user. Such a module may be used to recognize hands, fingers, finger gestures, hand movements and a location of hands relative to displays. For example, the Object and Gesture Recognition Module could for example determine that a user made a body part gesture to drop or throw a virtual object onto one or the other of the multiple screens, or that the user made a body part gesture to move the virtual object to a bezel of one or the other of the multiple screens. The Object and Gesture Recognition System may be coupled to a camera or camera array, a microphone or microphone array, a touch screen or touch surface, or a pointing device, or some combination of these items, to detect gestures and commands from the user.

The touch screen or touch surface of the Object and Gesture Recognition System may include a touch screen sensor. Data from the sensor may be fed to hardware, software, firmware or a combination of the same to map the touch gesture of a user's hand on the screen or surface to a corresponding dynamic behavior of a virtual object. The sensor data may be used to momentum and inertia factors to allow a variety of momentum behavior for a virtual object based on input from the user's hand, such as a swipe rate of a user's finger relative to the screen. Pinching gestures may be interpreted as a command to lift a virtual object from the display screen, or to begin generating a virtual binding associated with the virtual object or to zoom in or out on a display. Similar commands may be generated by the Object and Gesture Recognition System using one or more cameras without benefit of a touch surface.

The Direction of Attention Module 623 may be equipped with cameras or other sensors to track the position or orientation of a user's face or hands. When a gesture or voice command is issued, the system can determine the appropriate screen for the gesture. In one example, a camera is mounted near each display to detect whether the user is facing that display. If so, then the direction of attention module information is provided to the Object and Gesture Recognition Module 622 to ensure that the gestures or commands are associated with the appropriate library for the active display. Similarly, if the user is looking away from all of the screens, then commands can be ignored.

The Device Proximity Detection Module 625 can use proximity sensors, compasses, GPS (global positioning system) receivers, personal area network radios, and other types of sensors, together with triangulation and other techniques to determine the proximity of other devices. Once a nearby device is detected, it can be registered to the system and its type can be determined as an input device or a display device or both. For an input device, received data may then be applied to the Object Gesture and Recognition System 622. For a display device, it may be considered by the Adjacent Screen Perspective Module 607.

The Virtual Object Behavior Module 604 is adapted to receive input from the Object Velocity and Direction Module, and to apply such input to a virtual object being shown in the display. Thus, for example, the Object and Gesture Recognition System would interpret a user gesture and by mapping the captured movements of a user's hand to recognized movements, the Virtual Object Tracker Module would associate the virtual object's position and movements to the movements as recognized by Object and Gesture Recognition System, the Object and Velocity and Direction Module would capture the dynamics of the virtual object's movements, and the Virtual Object Behavior Module would receive the input from the Object and Velocity

and Direction Module to generate data that would direct the movements of the virtual object to correspond to the input from the Object and Velocity and Direction Module.

The Virtual Object Tracker Module 606 on the other hand may be adapted to track where a virtual object should be located in three dimensional space in a vicinity of an display, and which body part of the user is holding the virtual object, based on input from the Object and Gesture Recognition Module. The Virtual Object Tracker Module 606 may for example track a virtual object as it moves across and between screens and track which body part of the user is holding that virtual object. Tracking the body part that is holding the virtual object allows a continuous awareness of the body part's air movements, and thus an eventual awareness as to whether the virtual object has been released onto one or more screens.

The Gesture to View and Screen Synchronization Module 608, receives the selection of the view and screen or both from the Direction of Attention Module 623 and, in some cases, voice commands to determine which view is the active view and which screen is the active screen. It then causes the relevant gesture library to be loaded for the Object and Gesture Recognition System 622. Various views of an application on one or more screens can be associated with alternative gesture libraries or a set of gesture templates for a given view. As an example in Figure 1A a pinch-release gesture launches a torpedo, but in Figure 1B, the same gesture launches a depth charge.

The Adjacent Screen Perspective Module 607, which may include or be coupled to the Device Proximity Detection Module 625, may be adapted to determine an angle and position of one display relative to another display. A projected display includes, for example, an image projected onto a wall or screen. The ability to detect a proximity of a nearby screen and a corresponding angle or orientation of a display projected therefrom may for example be accomplished with either an infrared emitter and receiver, or electromagnetic or photo-detection sensing capability. For technologies that allow projected displays with touch input, the incoming video can be analyzed to determine the position of a projected display and to correct for the distortion caused by displaying at an angle. An accelerometer, magnetometer, compass, or camera can be used to determine the angle at which a device is being held while infrared emitters and cameras could allow the orientation of the screen device to be determined in relation to the sensors on an adjacent device. The Adjacent Screen Perspective Module 607 may, in this way, determine coordinates of an adjacent screen relative to its own screen coordinates. Thus, the Adjacent Screen Perspective Module may determine which devices are in proximity to each other, and further potential targets for moving one or more virtual object's across screens. The

Adjacent Screen Perspective Module may further allow the position of the screens to be correlated to a model of three-dimensional space representing all of the existing objects and virtual objects.

5 The Object and Velocity and Direction Module 603 may be adapted to estimate the dynamics of a virtual object being moved, such as its trajectory, velocity (whether linear or angular), momentum (whether linear or angular), etc. by receiving input from the Virtual Object Tracker Module. The Object and Velocity and Direction Module may further be adapted to estimate dynamics of any physics forces, by for example estimating the acceleration, deflection, degree of stretching of a virtual binding, etc. and the dynamic behavior of a virtual object once
10 released by a user's body part. The Object and Velocity and Direction Module may also use image motion, size and angle changes to estimate the velocity of objects, such as the velocity of hands and fingers

The Momentum and Inertia Module 602 can use image motion, image size, and angle changes of objects in the image plane or in a three-dimensional space to estimate the velocity
15 and direction of objects in the space or on a display. The Momentum and Inertia Module is coupled to the Object and Gesture Recognition System 622 to estimate the velocity of gestures performed by hands, fingers, and other body parts and then to apply those estimates to determine momentum and velocities to virtual objects that are to be affected by the gesture.

The 3D Image Interaction and Effects Module 605 tracks user interaction with 3D
20 images that appear to extend out of one or more screens. The influence of objects in the z-axis (towards and away from the plane of the screen) can be calculated together with the relative influence of these objects upon each other. For example, an object thrown by a user gesture can be influenced by 3D objects in the foreground before the virtual object arrives at the plane of the screen. These objects may change the direction or velocity of the projectile or destroy it entirely.
25 The object can be rendered by the 3D Image Interaction and Effects Module in the foreground on one or more of the displays.

The following clauses and/or examples pertain to further embodiments or examples. Specifics in the examples may be used anywhere in one or more embodiments. The various features of the different embodiments or examples may be variously combined with some
30 features included and others excluded to suit a variety of different applications. Examples may include subject matter such as a method, means for performing acts of the method, at least one machine-readable medium including instructions that, when performed by a machine cause the

machine to performs acts of the method, or of an apparatus or system for facilitating hybrid communication according to embodiments and examples described herein.

Some embodiments pertain to Example 1 that includes an apparatus to facilitate dynamic game surface adjustment, comprising: detection/reception logic to receive one or more inputs to perform an action at a portion of a play surface of the apparatus; management logic to evaluate the one or more inputs for generating an action plan to perform the action at the portion of the play surface, wherein the action plan is to affect one or more objects acting on the surface; and application/execution logic to execute the action at the portion of the surface, wherein the action to adjust one or more properties of the play surface.

Example 2 includes the subject matter of Example 1, wherein the play surface to host the one or more objects including one or more moveable objects having object sensors, wherein the play surface includes at least one of surface sensors, actuators, and physical effects detectors, wherein the apparatus includes a play set comprising one or more of a smart toy, a smart game set, a smart field, and a smart play area, and wherein the play surface includes a play arena associated with the play set, and wherein the play surface is further to host one or more users holding or wearing the one or more moveable objects.

Example 3 includes the subject matter of Example 1, wherein the sensory input comprises at least one of surface-related sensory data as retrieved via one or more of the surface sensors, moveable object-related sensory data as retrieved via one or more of the object sensors, and physical effects-related information at the surface as retrieved via one or more of the physical effects detectors, and wherein the one or more inputs include at least one of a user command, a predetermined criterion, a sensory input, and an audio/visual input.

Example 4 includes the subject matter of Example 1 or 2, wherein an actuator of the actuators to activate the portion of the play surface to trigger the action at the portion of the play surface, wherein the actuator is placed beneath the portion of the play surface, and wherein the actuator is further to activate other one or more actions of the action plan on the play surface, wherein the other one or more actions include at least one of vibrating, moving, swinging, tilting, booming, sinking, and bumping of the play surface.

Example 5 includes the subject matter of Example 1, further comprising sensors data processor of the management logic to process the sensory input prior to evaluating the one or more inputs to generate the action plan.

Example 6 includes the subject matter of Example 1, further comprising video/audio analytics logic to evaluate the audio/video input to analyze activities of the one or more

moveable objects operating on the surface, wherein the audio/video input includes at least one of sounds, images, and videos relating to the activities of the one or more moveable objects, wherein the audio/video input is captured via at least one of a two-dimensional (2D) camera, a three-dimensional (3D) camera, a microphone of capturing/sensing components.

5 Example 7 includes the subject matter of Example 1 or 6, further comprising output components including one or more projectors to facilitate a projection at the portion of the play surface, wherein the projection to reflect an environment relevant to the action, wherein the projection includes one or more of numbers, letters, characters, messages, lights, images, videos, and colors.

10 Example 8 includes the subject matter of Example 1, wherein the user command is placed by a user via an user interface at a computing device over a communication medium, wherein the communication medium includes at least one of a Cloud network, an intranet, a proximity network, and the Internet.

 Example 9 includes the subject matter of Example 1 or 8, further comprising a database
15 to store the one or more inputs, wherein the database to further store rules or policies relating to at least one of the user, the action, and the play surface, wherein the database includes at least one of a Cloud database or a non-Cloud database.

 Some embodiments pertain to Example 10 that includes a method for facilitating dynamic game surface adjustment, comprising: receiving one or more inputs to perform an
20 action at a portion of a play surface of a play set; evaluating the one or more inputs for generating an action plan to perform the action at the portion of the play surface, wherein the action plan is to affect one or more objects acting on the surface; and executing the action at the portion of the surface, wherein the action to adjust one or more properties of the play surface.

 Example 11 includes the subject matter of Example 10, wherein the play surface to host
25 the one or more objects including one or more moveable objects having object sensors, wherein the play surface includes at least one of surface sensors, actuators, and physical effects detectors, wherein the play set comprises one or more of a smart toy, a smart game set, a smart field, and a smart play area, and wherein the play surface includes a play arena associated with the play set, and wherein the play surface is further to host one or more users holding or wearing the one or
30 more moveable objects.

 Example 12 includes the subject matter of Example 10, wherein the sensory input comprises at least one of surface-related sensory data as retrieved via one or more of the surface sensors, moveable object-related sensory data as retrieved via one or more of the object sensors,

and physical effects-related information at the surface as retrieved via one or more of the physical effects detectors, and wherein the one or more inputs include at least one of a user command, a predetermined criterion, a sensory input, and an audio/visual input.

Example 13 includes the subject matter of Example 10 or 12, wherein an actuator of the
5 actuators to activate the portion of the play surface to trigger the action at the portion of the play surface, wherein the actuator is placed beneath the portion of the play surface, and wherein the actuator is further to activate other one or more actions of the action plan on the play surface, wherein the other one or more actions include at least one of vibrating, moving, swinging, tilting, booming, sinking, and bumping of the play surface.

10 Example 14 includes the subject matter of Example 10, further comprising processing, via sensors data processor, the sensory input prior to evaluating the one or more inputs to generate the action plan.

Example 15 includes the subject matter of Example 10, further comprising evaluating
15 the audio/video input to analyze activities of the one or more moveable objects operating on the surface, wherein the audio/video input includes at least one of sounds, images, and videos relating to the activities of the one or more moveable objects, wherein the audio/video input is captured via at least of a two-dimensional (2D) camera, a three-dimensional (3D) camera, a microphone of capturing/sensing components.

Example 16 includes the subject matter of Example 10 or 15, further comprising
20 facilitating, via one or more projectors of output components, a projection at the portion of the play surface, wherein the projection to reflect an environment relevant to the action, wherein the projection includes one or more of numbers, letters, characters, messages, lights, images, videos, and colors.

Example 17 includes the subject matter of Example 10, further comprising storing, at a
25 database, the one or more inputs, wherein the database to further store rules or policies relating to at least one of the user, the action, and the play surface, wherein the database includes at least one of a Cloud database or a non-Cloud database.

Example 18 includes the subject matter of Example 10 or 17, wherein the user
30 command is placed by a user via an user interface at a computing device over a communication medium, wherein the communication medium includes at least one of a Cloud network, an intranet, a proximity network, and the Internet.

Example 19 includes at least one machine-readable medium comprising a plurality of instructions, when executed on a computing device, to implement or perform a method or realize an apparatus as claimed in any preceding claims or examples.

5 Example 20 includes at least one non-transitory or tangible machine-readable medium comprising a plurality of instructions, when executed on a computing device, to implement or perform a method or realize an apparatus as claimed in any preceding claims or examples.

Example 21 includes a system comprising a mechanism to implement or perform a method or realize an apparatus as claimed in any preceding claims or examples.

10 Example 22 includes an apparatus comprising means to perform a method as claimed in any preceding claims or examples.

Example 23 includes a computing device arranged to implement or perform a method or realize an apparatus as claimed in any preceding claims or examples.

Example 24 includes a communications device arranged to implement or perform a method or realize an apparatus as claimed in any preceding claims or examples.

15 Some embodiments pertain to Example 25 includes a system comprising a storage device having instructions, and a processor to execute the instructions to facilitate a mechanism to perform one or more operations comprising: receiving one or more inputs to perform an action at a portion of a play surface of a play set; evaluating the one or more inputs for generating an action plan to perform the action at the portion of the play surface, wherein the action plan is to
20 affect one or more objects acting on the surface; and executing the action at the portion of the surface, wherein the action to adjust one or more properties of the play surface.

Example 26 includes the subject matter of Example 25, wherein the play surface to host the one or more objects including one or more moveable objects having object sensors, wherein the play surface includes at least one of surface sensors, actuators, and physical effects detectors,
25 wherein the play set comprises one or more of a smart toy, a smart game set, a smart field, and a smart play area, and wherein the play surface includes a play arena associated with the play set, and wherein the play surface is further to host one or more users holding or wearing the one or more moveable objects.

Example 27 includes the subject matter of Example 25, wherein the sensory input
30 comprises at least one of surface-related sensory data as retrieved via one or more of the surface sensors, moveable object-related sensory data as retrieved via one or more of the object sensors, and physical effects-related information at the surface as retrieved via one or more of the

physical effects detectors, and wherein the one or more inputs include at least one of a user command, a predetermined criterion, a sensory input, and an audio/visual input.

Example 28 includes the subject matter of Example 25 or 27, wherein an actuator of the actuators to activate the portion of the play surface to trigger the action at the portion of the play surface, wherein the actuator is placed beneath the portion of the play surface, and wherein the actuator is further to activate other one or more actions of the action plan on the play surface, wherein the other one or more actions include at least one of vibrating, moving, swinging, tilting, booming, sinking, and bumping of the play surface.

Example 29 includes the subject matter of Example 25, wherein the one or more operations further comprise processing, via sensors data processor, the sensory input prior to evaluating the one or more inputs to generate the action plan.

Example 30 includes the subject matter of Example 25, wherein the one or more operations further comprise evaluating the audio/video input to analyze activities of the one or more moveable objects operating on the surface, wherein the audio/video input includes at least one of sounds, images, and videos relating to the activities of the one or more moveable objects, wherein the audio/video input is captured via at least of a two-dimensional (2D) camera, a three-dimensional (3D) camera, a microphone of capturing/sensing components.

Example 31 includes the subject matter of Example 25 or 30, wherein the one or more operations further comprise facilitating, via one or more projectors of output components, a projection at the portion of the play surface, wherein the projection to reflect an environment relevant to the action, wherein the projection includes one or more of numbers, letters, characters, messages, lights, images, videos, and colors.

Example 32 includes the subject matter of Example 25, wherein the one or more operations further comprise storing, at a database, the one or more inputs, wherein the database to further store rules or policies relating to at least one of the user, the action, and the play surface, wherein the database includes at least one of a Cloud database or a non-Cloud database.

Example 33 includes the subject matter of Example 25 or 32, wherein the user command is placed by a user via an user interface at a computing device over a communication medium, wherein the communication medium includes at least one of a Cloud network, an intranet, a proximity network, and the Internet.

Some embodiments pertain to Example 34 includes an apparatus comprising: means for receiving one or more inputs to perform an action at a portion of a play surface of a play set; means for evaluating the one or more inputs for generating an action plan to perform the action

at the portion of the play surface, wherein the action plan is to affect one or more objects acting on the surface; and means for executing the action at the portion of the surface, wherein the action to adjust one or more properties of the play surface.

Example 35 includes the subject matter of Example 34, wherein the play surface to host
5 the one or more objects including one or more moveable objects having object sensors, wherein the play surface includes at least one of surface sensors, actuators, and physical effects detectors, wherein the play set comprises one or more of a smart toy, a smart game set, a smart field, and a smart play area, and wherein the play surface includes a play arena associated with the play set, and wherein the play surface is further to host one or more users holding or wearing the one or
10 more moveable objects.

Example 36 includes the subject matter of Example 34, wherein the sensory input comprises at least one of surface-related sensory data as retrieved via one or more of the surface sensors, moveable object-related sensory data as retrieved via one or more of the object sensors, and physical effects-related information at the surface as retrieved via one or more of the
15 physical effects detectors, and wherein the one or more inputs include at least one of a user command, a predetermined criterion, a sensory input, and an audio/visual input.

Example 37 includes the subject matter of Example 34 or 36, wherein an actuator of the actuators to activate the portion of the play surface to trigger the action at the portion of the play surface, wherein the actuator is placed beneath the portion of the play surface, and wherein the
20 actuator is further to activate other one or more actions of the action plan on the play surface, wherein the other one or more actions include at least one of vibrating, moving, swinging, tilting, booming, sinking, and bumping of the play surface.

Example 38 includes the subject matter of Example 34, further comprising means for processing, via sensors data processor, the sensory input prior to evaluating the one or more
25 inputs to generate the action plan.

Example 39 includes the subject matter of Example 34, further comprising means for evaluating the audio/video input to analyze activities of the one or more moveable objects operating on the surface, wherein the audio/video input includes at least one of sounds, images, and videos relating to the activities of the one or more moveable objects, wherein the
30 audio/video input is captured via at least of a two-dimensional (2D) camera, a three-dimensional (3D) camera, a microphone of capturing/sensing components.

Example 40 includes the subject matter of Example 34 or 39, further comprising means for facilitating, via one or more projectors of output components, a projection at the portion of

the play surface, wherein the projection to reflect an environment relevant to the action, wherein the projection includes one or more of numbers, letters, characters, messages, lights, images, videos, and colors.

Example 41 includes the subject matter of Example 34, further comprising means for storing, at a database, the one or more inputs, wherein the database to further store rules or policies relating to at least one of the user, the action, and the play surface, wherein the database includes at least one of a Cloud database or a non-Cloud database.

Example 42 includes the subject matter of Example 34 or 41, wherein the user command is placed by a user via an user interface at a computing device over a communication medium, wherein the communication medium includes at least one of a Cloud network, an intranet, a proximity network, and the Internet.

Example 43 includes at least one non-transitory or tangible machine-readable medium comprising a plurality of instructions, when executed on a computing device, to implement or perform a method as claimed in any of claims or examples 10-18.

Example 44 includes at least one machine-readable medium comprising a plurality of instructions, when executed on a computing device, to implement or perform a method as claimed in any of claims or examples 10-18.

Example 45 includes a system comprising a mechanism to implement or perform a method as claimed in any of claims or examples 10-18.

Example 46 includes an apparatus comprising means for performing a method as claimed in any of claims or examples 10-18.

Example 47 includes a computing device arranged to implement or perform a method as claimed in any of claims or examples 10-18.

Example 48 includes a communications device arranged to implement or perform a method as claimed in any of claims or examples 10-18.

The drawings and the forgoing description give examples of embodiments. Those skilled in the art will appreciate that one or more of the described elements may well be combined into a single functional element. Alternatively, certain elements may be split into multiple functional elements. Elements from one embodiment may be added to another embodiment. For example, orders of processes described herein may be changed and are not limited to the manner described herein. Moreover, the actions any flow diagram need not be implemented in the order shown; nor do all of the acts necessarily need to be performed. Also, those acts that are not dependent on other acts may be performed in parallel with the other acts.

The scope of embodiments is by no means limited by these specific examples. Numerous variations, whether explicitly given in the specification or not, such as differences in structure, dimension, and use of material, are possible. The scope of embodiments is at least as broad as given by the following claims.

5

CLAIMS

What is claimed is:

- 5 1. An apparatus facilitating dynamic game surface adjustment, comprising:
detection/reception logic to receive one or more inputs to perform an action at a portion
of a play surface of the apparatus;
management logic to evaluate the one or more inputs to generate an action plan to
perform the action at the portion of the play surface, wherein the action plan is to affect one or
10 more objects acting on the surface; and
application/execution logic to execute the action at the portion of the surface, wherein the
action to adjust one or more properties of the play surface.
2. The apparatus of claim 1, wherein the play surface to host the one or more objects
including one or more moveable objects having object sensors, wherein the play surface includes
15 at least one of surface sensors, actuators, and physical effects detectors,
wherein the apparatus includes a play set comprising one or more of a smart toy, a smart
game set, a smart field, and a smart play area, and wherein the play surface includes a play arena
associated with the play set, and
wherein the play surface is further to host one or more users holding or wearing the one
20 or more moveable objects.
3. The apparatus of claim 1, wherein the sensory input comprises at least one of
surface-related sensory data as retrieved via one or more of the surface sensors, moveable object-
related sensory data as retrieved via one or more of the object sensors, and physical effects-
related information at the surface as retrieved via one or more of the physical effects detectors,
25 and
wherein the one or more inputs include at least one of a user command, a predetermined
criterion, a sensory input, and an audio/visual input.
4. The apparatus of claim 2, wherein an actuator of the actuators to activate the
portion of the play surface to trigger the action at the portion of the play surface, wherein the
30 actuator is placed beneath the portion of the play surface, and
wherein the actuator is further to activate other one or more actions of the action plan on
the play surface, wherein the other one or more actions include at least one of vibrating, moving,
swinging, tilting, booming, sinking, and bumping of the play surface.

5. The apparatus of claim 1, further comprising sensors data processor of the management logic to process the sensory input prior to evaluating the one or more inputs to generate the action plan.

6. The apparatus of claim 1 or 2, further comprising video/audio analytics logic to evaluate the audio/video input to analyze activities of the one or more moveable objects operating on the surface, wherein the audio/video input includes at least one of sounds, images, and videos relating to the activities of the one or more moveable objects, wherein the audio/video input is captured via at least of a two-dimensional (2D) camera, a three-dimensional (3D) camera, a microphone of capturing/sensing components.

7. The apparatus of claim 6, further comprising output components including one or more projectors to facilitate a projection at the portion of the play surface, wherein the projection to reflect an environment relevant to the action, wherein the projection includes one or more of numbers, letters, characters, messages, lights, images, videos, and colors.

8. The apparatus of claim 1, wherein the user command is placed by a user via an user interface at a computing device over a communication medium, wherein the communication medium includes at least one of a Cloud network, an intranet, a proximity network, and the Internet.

9. The apparatus of claim 1 or 8, further comprising a database to store the one or more inputs, wherein the database to further store rules or policies relating to at least one of the user, the action, and the play surface, wherein the database includes at least one of a Cloud database or a non-Cloud database.

10. A method for facilitating dynamic game surface adjustment, comprising:
receiving one or more inputs to perform an action at a portion of a play surface of a play set;

evaluating the one or more inputs for generating an action plan to perform the action at the portion of the play surface, wherein the action plan is to affect one or more objects acting on the surface; and

executing the action at the portion of the surface, wherein the action to adjust one or more properties of the play surface.

11. The method of claim 10, wherein the play surface to host the one or more objects including one or more moveable objects having object sensors, wherein the play surface includes at least one of surface sensors, actuators, and physical effects detectors,

wherein the play set comprises one or more of a smart toy, a smart game set, a smart
5 field, and a smart play area, and wherein the play surface includes a play arena associated with the play set, and

wherein the play surface is further to host one or more users holding or wearing the one or more moveable objects.

12. The method of claim 10, wherein the sensory input comprises at least one of
10 surface-related sensory data as retrieved via one or more of the surface sensors, moveable object-related sensory data as retrieved via one or more of the object sensors, and physical effects-related information at the surface as retrieved via one or more of the physical effects detectors, and

wherein the one or more inputs include at least one of a user command, a predetermined
15 criterion, a sensory input, and an audio/visual input.

13. The method of claim 12, wherein an actuator of the actuators to activate the portion of the play surface to trigger the action at the portion of the play surface, wherein the actuator is placed beneath the portion of the play surface, and

wherein the actuator is further to activate other one or more actions of the action plan on
20 the play surface, wherein the other one or more actions include at least one of vibrating, moving, swinging, tilting, booming, sinking, and bumping of the play surface.

14. The method of claim 10, further comprising processing, via sensors data processor, the sensory input prior to evaluating the one or more inputs to generate the action plan.

15. The method of claim 10, further comprising evaluating the audio/video input to
25 analyze activities of the one or more moveable objects operating on the surface, wherein the audio/video input includes at least one of sounds, images, and videos relating to the activities of the one or more moveable objects, wherein the audio/video input is captured via at least of a two-dimensional (2D) camera, a three-dimensional (3D) camera, a microphone of
30 capturing/sensing components.

16. The method of claim 15, further comprising facilitating, via one or more projectors of output components, a projection at the portion of the play surface, wherein the

projection to reflect an environment relevant to the action, wherein the projection includes one or more of numbers, letters, characters, messages, lights, images, videos, and colors.

17. The method of claim 10, further comprising storing, at a database, the one or more inputs, wherein the database to further store rules or policies relating to at least one of the user, the action, and the play surface, wherein the database includes at least one of a Cloud database or a non-Cloud database.

18. The method of claim 10, wherein the user command is placed by a user via an user interface at a computing device over a communication medium, wherein the communication medium includes at least one of a Cloud network, an intranet, a proximity network, and the Internet.

19. At least one machine-readable medium comprising a plurality of instructions, when executed on a computing device, to implement or perform a method as claimed in any of claims 10-18.

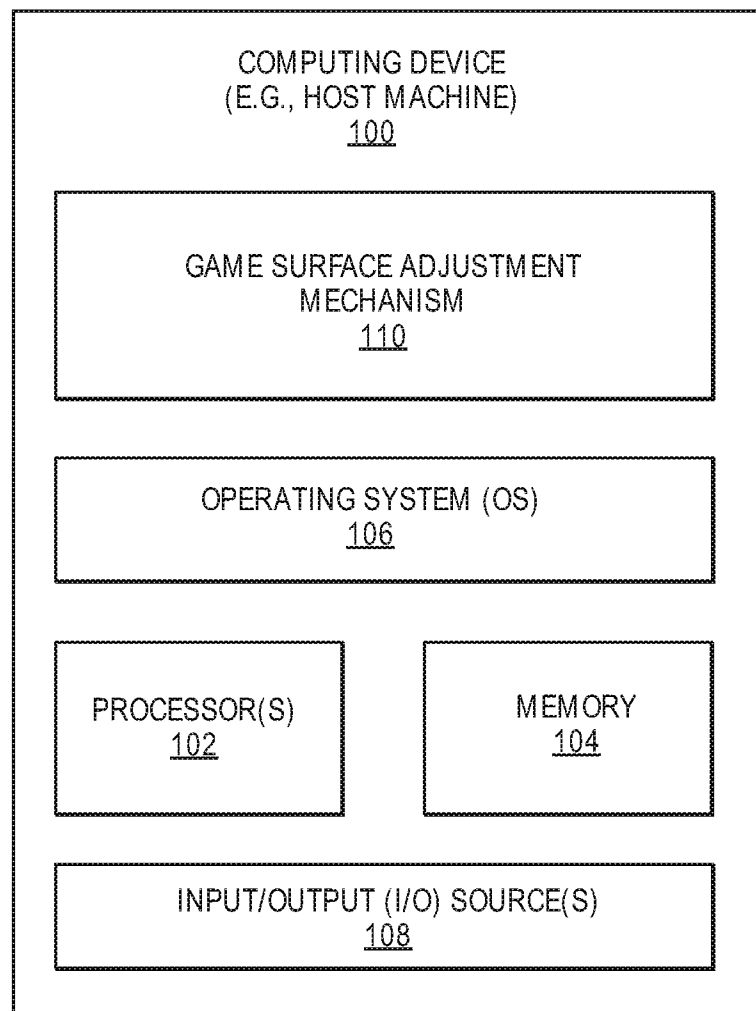
20. A system comprising a mechanism to implement or perform a method as claimed in any of claims 10-18.

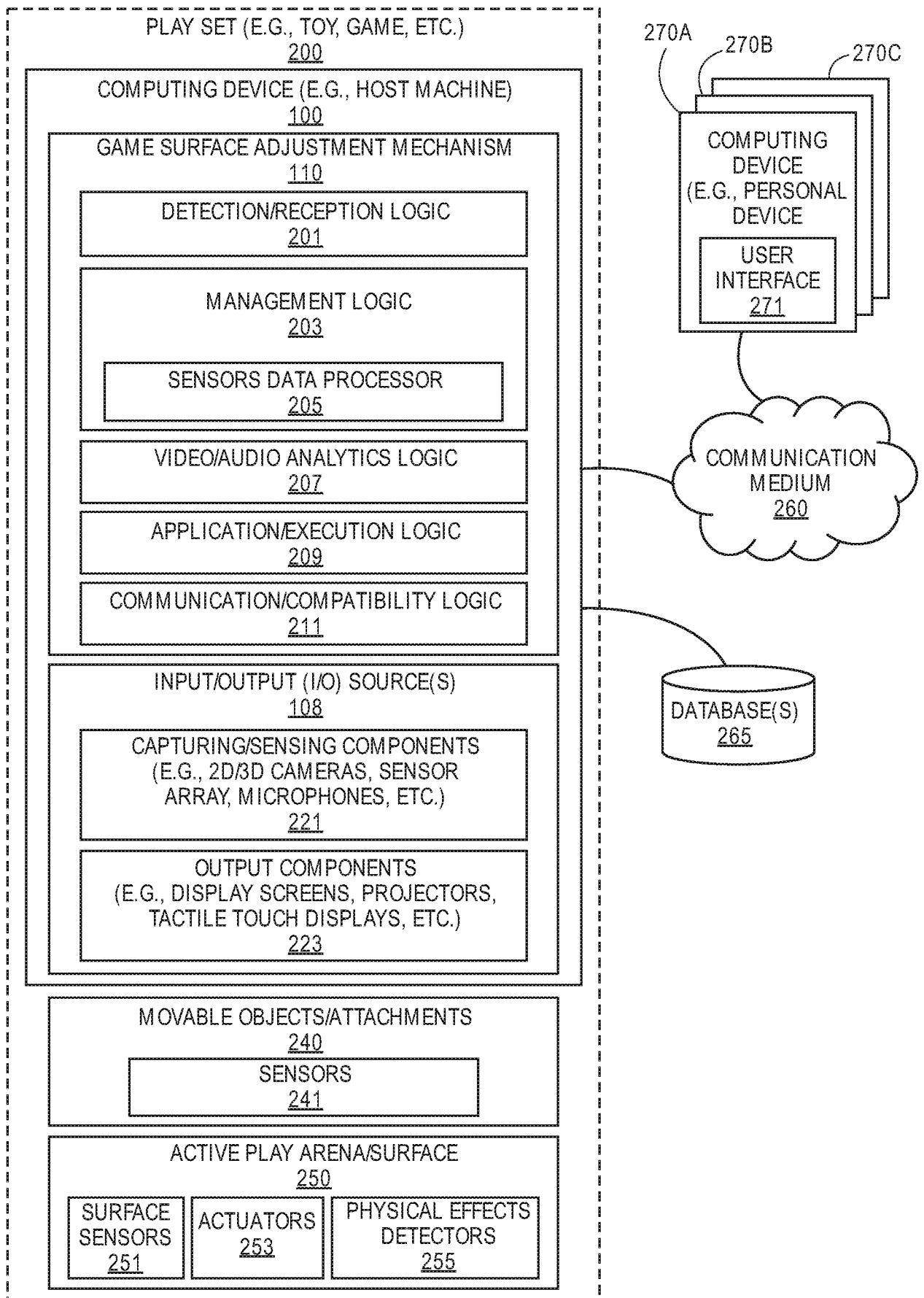
21. An apparatus comprising means for performing a method as claimed in any of claims 10-18.

22. A computing device arranged to implement or perform a method as claimed in any of claims 10-18.

23. A communications device arranged to implement or perform a method as claimed in any of claims 10-18.

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**FIG. 1**

**FIG. 2A**

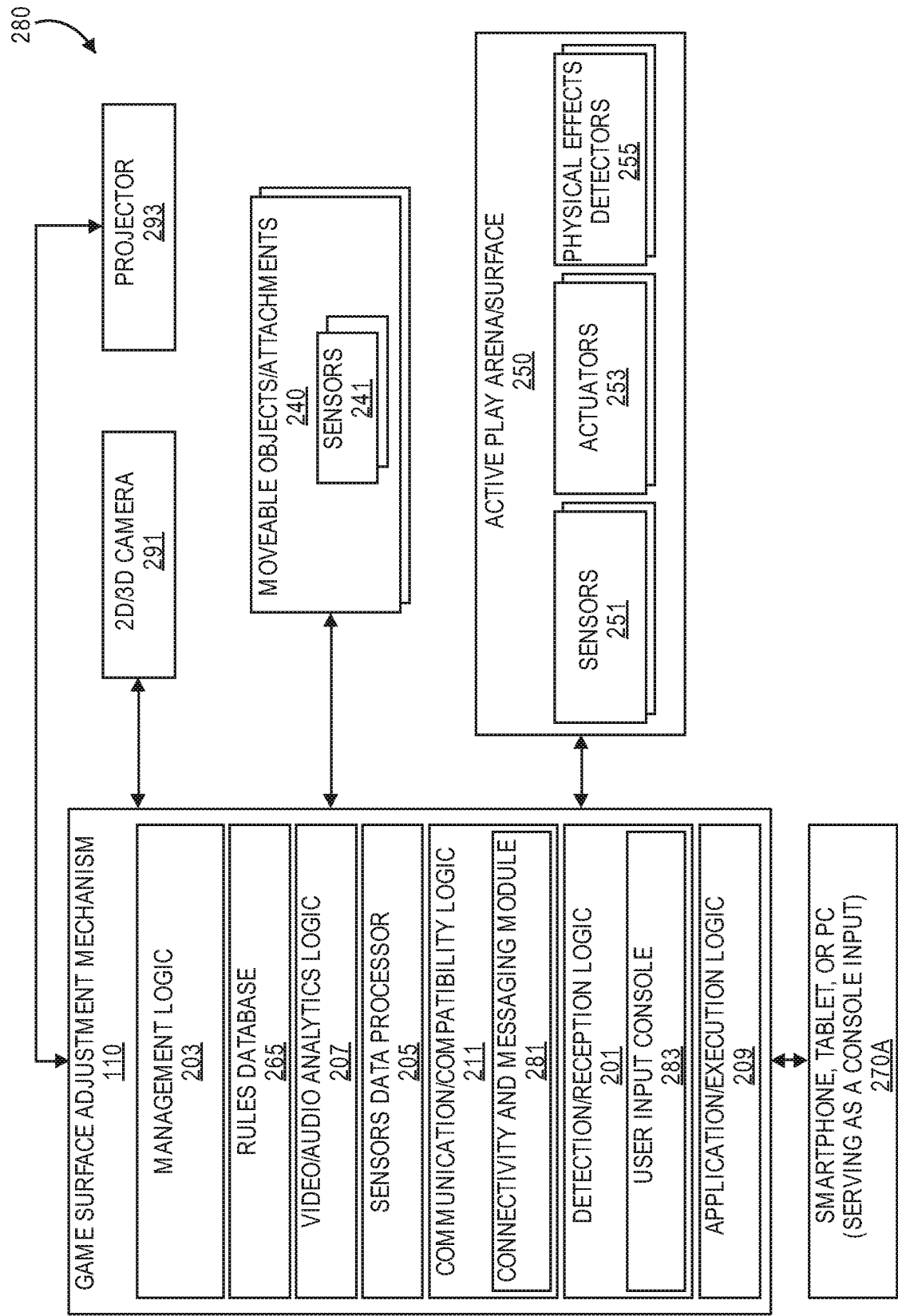


FIG. 2B

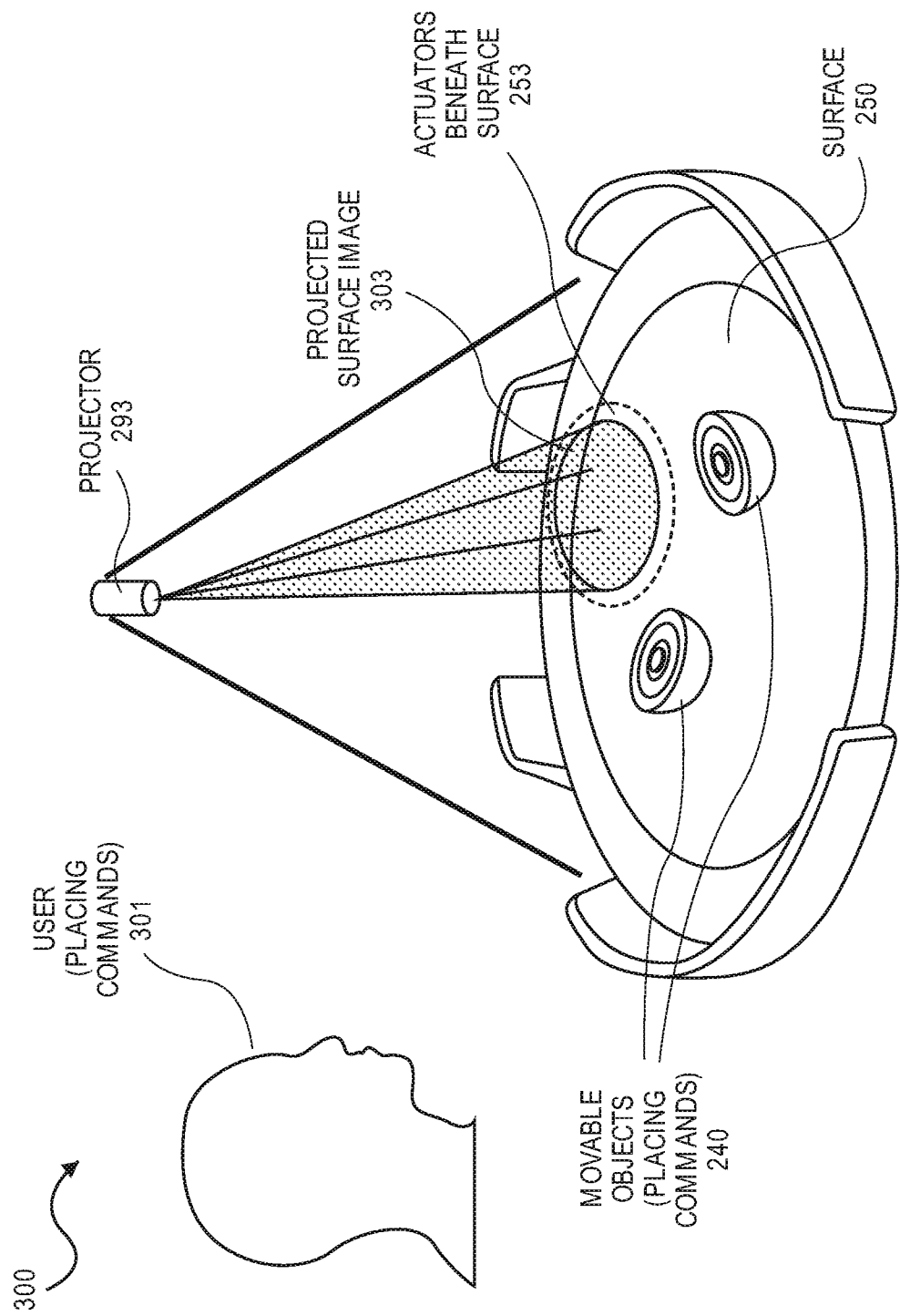
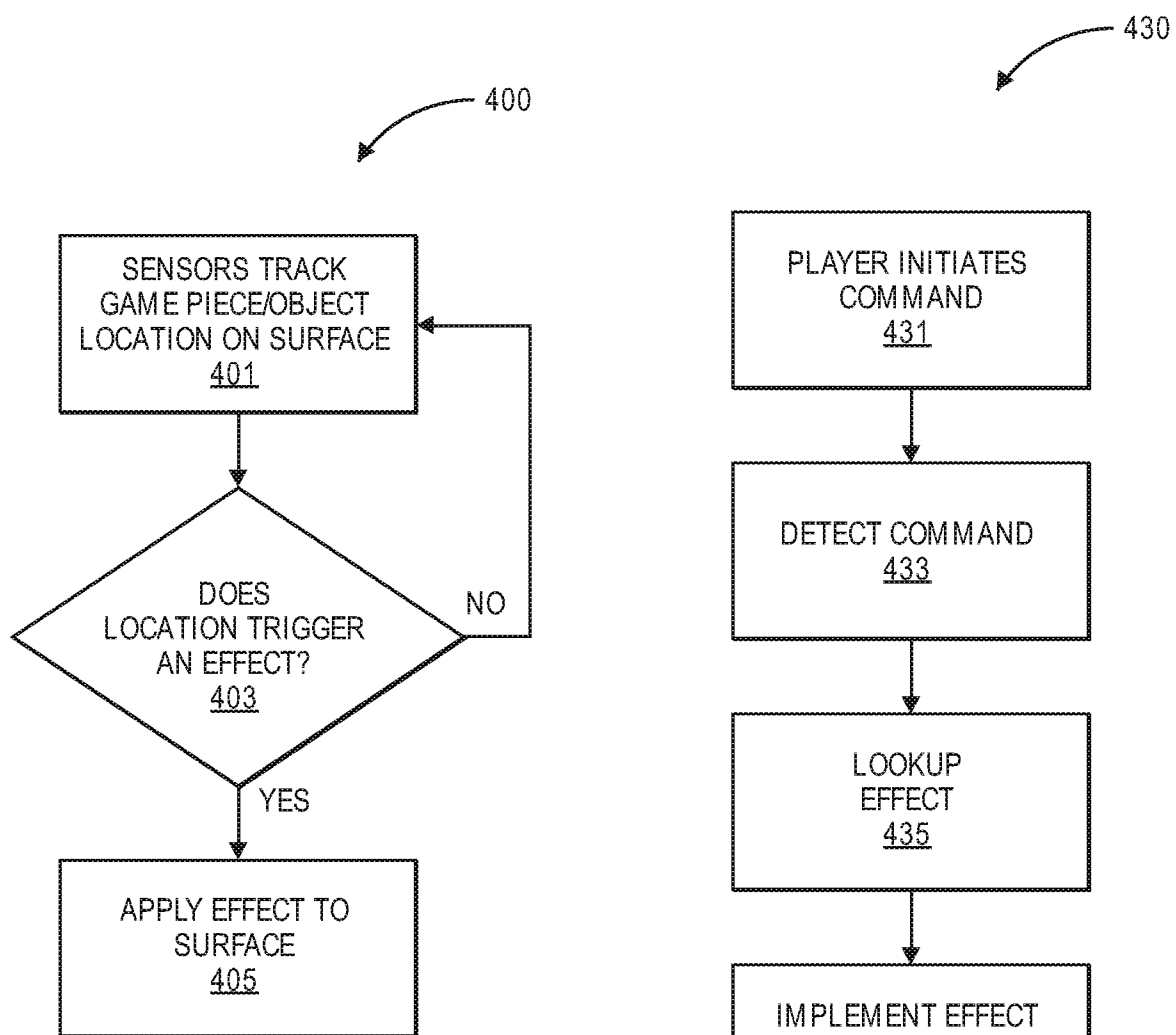
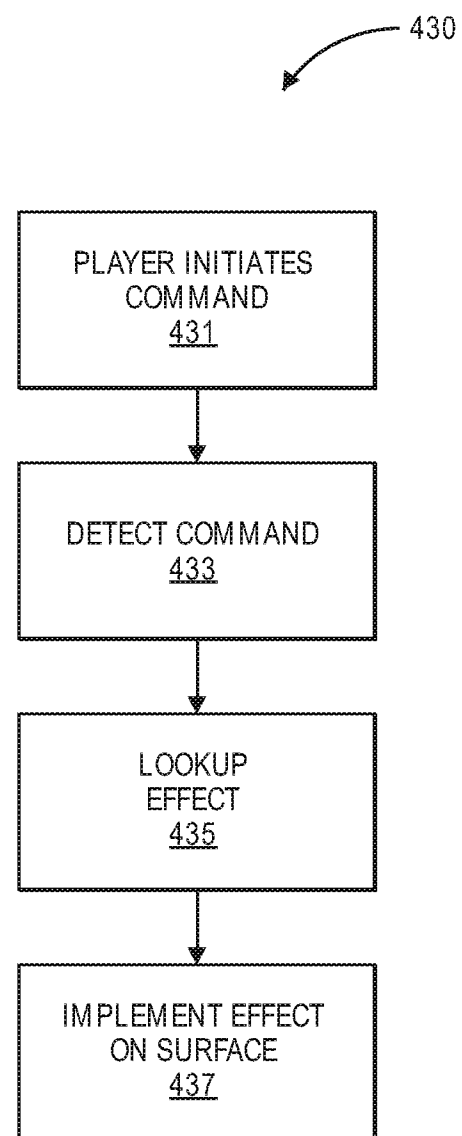
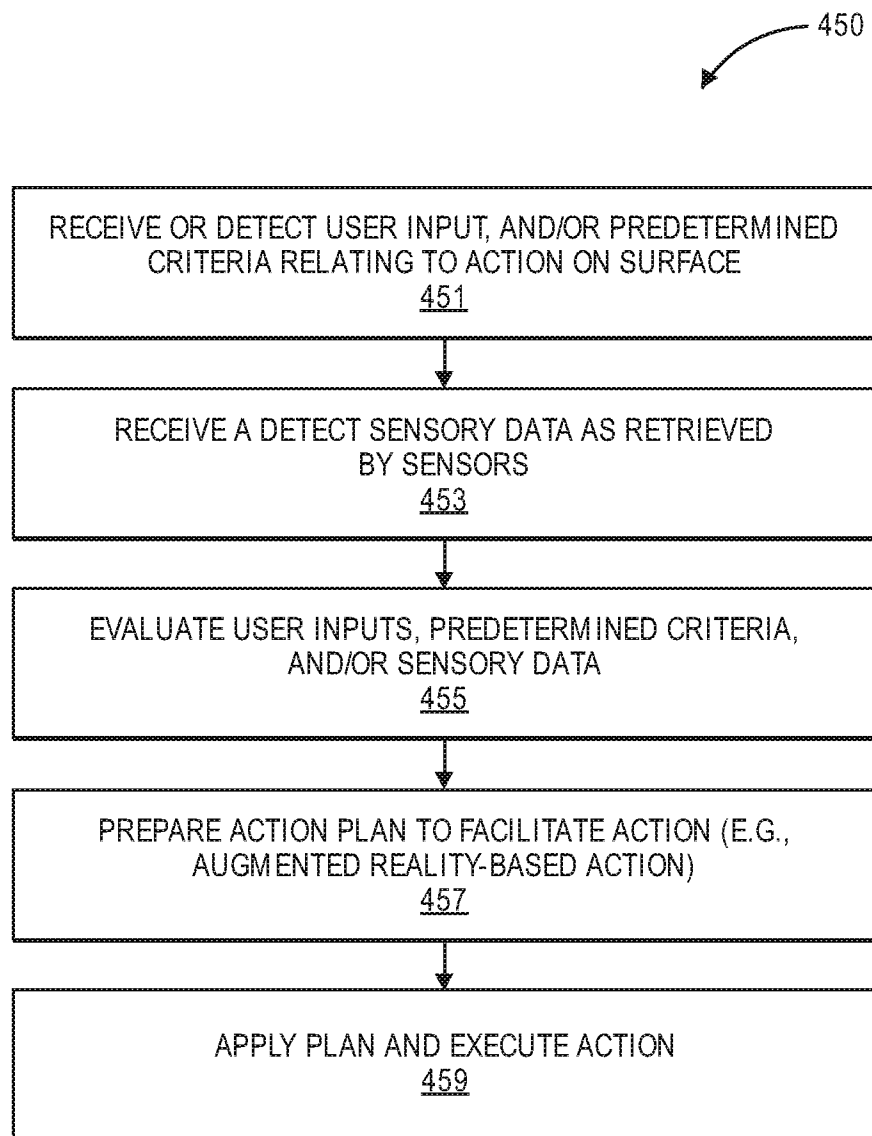


FIG. 3

**FIG. 4A****FIG. 4B**

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**FIG. 4C**

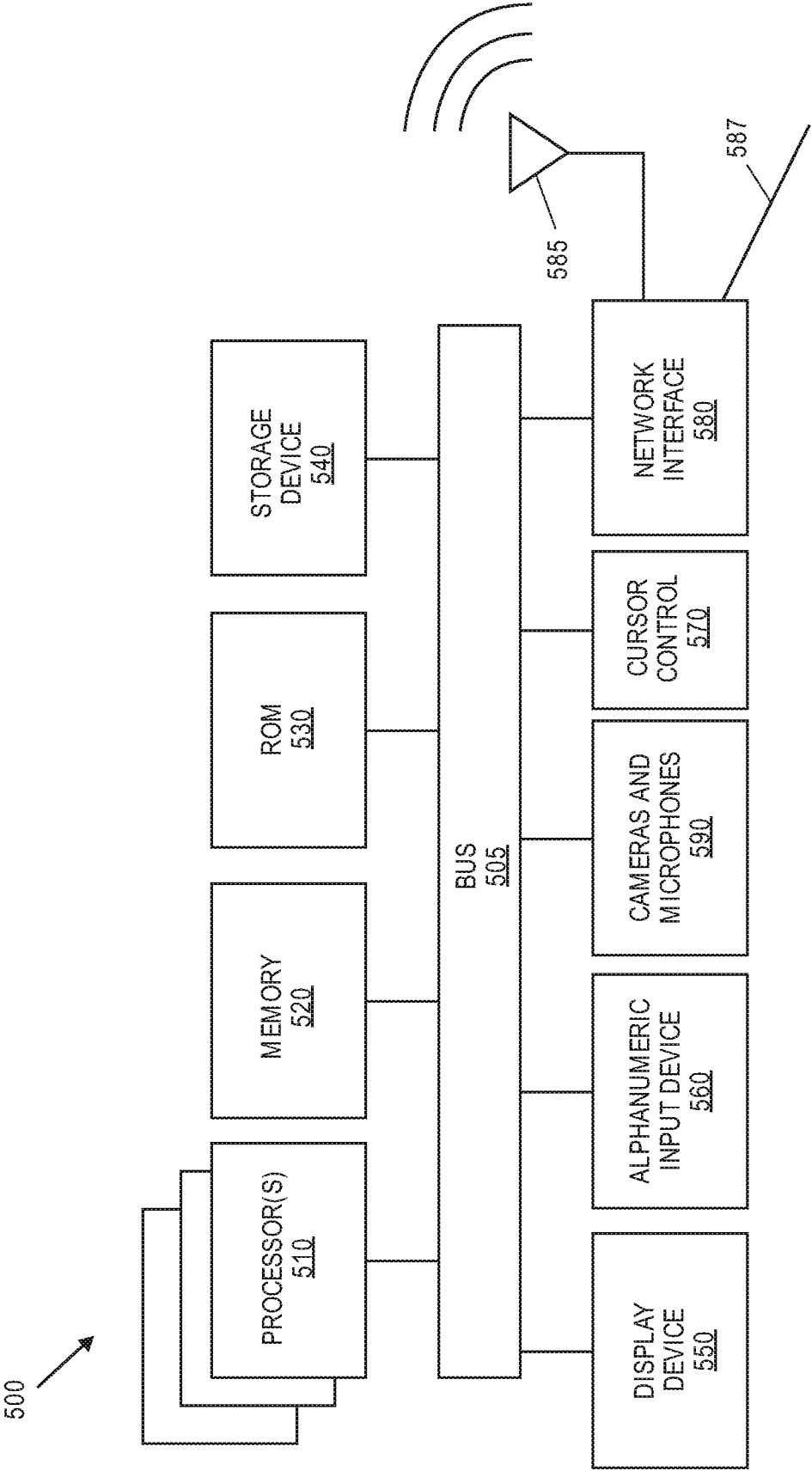


FIG. 5

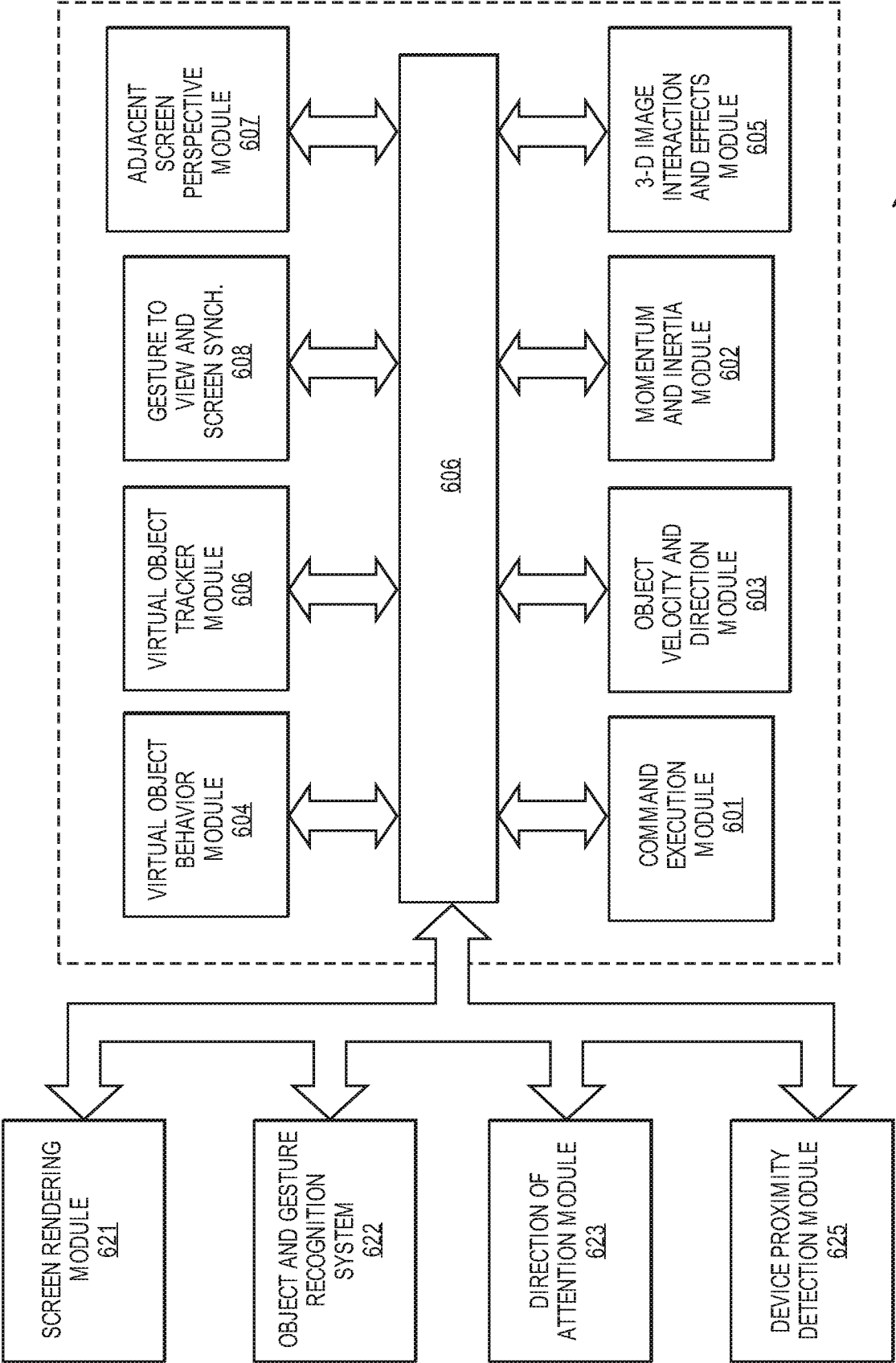


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/030919**A. CLASSIFICATION OF SUBJECT MATTER****A63H 1/00(2006.01)i, A63H 30/04(2006.01)i, A63F 9/16(2006.01)i**

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A63H 1/00; A63F 9/16; A63H 1/20; A63H 30/04

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: play surface, moveable object, action plan, adjust, sensor, and game

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2009-247707 A (TOMY CO., LTD.) 29 October 2009 See paragraphs [0017], [0026], [0028]-[0029], [0032], [0034] and figures 1-3.	1, 10, 19-23
Y		2-9, 11-18
Y	US 2013-0324004 A1 (SCHWARTZ, ROBERT) 05 December 2013 See paragraphs [0024]-[0025] and figure 1.	2-9, 11-18
A	JP 2012-000322 A (TOMY CO., LTD. et al.) 05 January 2012 See paragraphs [0040]-[0041] and figures 3-4.	1-23
A	JP 2013-000284 A (TOMY CO., LTD. et al.) 07 January 2013 See paragraphs [0019], [0023] and figures 2, 4.	1-23
A	JP 2006-247119 A (KANEDA et al.) 21 September 2006 See paragraph [0013] and figure 1.	1-23



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

03 August 2016 (03.08.2016)

Date of mailing of the international search report

04 August 2016 (04.08.2016)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2016/030919

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JP 2006-247119 A	21/09/2006	None	