MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority pursuant to 35 U.S.C. § 119(e) to U.S. provisional applications Serial No. 60/871,446, filed December 21, 2006, and Serial No. 60/877,930, filed October 3, 2006, which applications are specifically incorporated herein, in their entirety, by reference.

BACKGROUND

1. Field of the Inventions

The present invention relates to virtual computer-generated environments in which participants are represented by computer-generated avatars, and in particular for environments that simulate an actual 3-D environment and allow for simultaneous participation of multiple players.

2. Description of Related Art

Computer generated virtual environments are increasingly popular methods for people, both real and automated, to interact within a networked system. The creation of virtualized worlds, three dimensional or otherwise, is well known. Simple text based adventures such as "Zork", early "first person shooter" games such as "Doom", and ultimately numerous highly complex environments such as "Halo" are well known in the art. Various on-line environments are known in which a 3-D physical world (actual or fantasy) is simulated. Environments of this type are sometimes referred to as "virtual reality" or "virtual reality universe" (VRU) environments. In known VRU environments, an actual or fantasy universe is simulated within a computer memory. Multiple players may participate in the environment through a computer network, such as a local area network or a wide area network. Each player selects an "avatar," which may comprise a three-dimensional figure of a man, woman, or other being, to represent them in the VRU

environment. Players send inputs to a VRU engine to move their avatars around the VRU environment, and are able to cause interaction between their avatars and objects in the VRU. For example, a player's avatar may interact with an automated entity or person, simulated static objects, or avatars operated by other players.

With the ubiquity of computer networking, engineers and designers included the ability for players within these virtual environments to interact. One drawback of the VRU is that, as in the actual world, space is limited by environmental constraints. In addition, limitations on computer processing speed, network bandwidth, and other factors also limit the number of participants and the richness of environment. Accordingly, prior art VRU environments may limit the number of simultaneous players and their methods of interactions for various reasons, including to avoid exceeding the programming, networking, and hardware limitations of the servers and/or clients.

Such limitations may be present in "massively multiplayer" environments, such as "Everquest" or "Second Life", which are built specifically on the concept of mimicking real world environments, including the natural capacity of real world environments to hold numerous simultaneous inhabitants. Such limitations may be implemented in a less than desirable manner because they limit the ability of the VRU to accommodate the wishes of its clients. However, such limitations are provided for various reasons, including because (a) server capacity is incapable of simultaneously handling the number of users desired or (b) client capacity, for each user, is insufficient to process and display the data needed for such user's computer to appropriately and adequately render avatars or other representations of the other users, and otherwise construct a complete and accurate representation of the environment; or (c) independent of hardware or software capacity considerations, limitations imposed by geometric constraints of the simulated environment, or simply put, lack of simulated space.

Mechanisms to address server capacity and client capacity issues, while flawed, exist in the art. Such mechanisms may include automatically moving avatars from one portion of the environment to another (with or without the player's consent), barring

additional avatars from entering an environment once a defined capacity is reached, limiting the ability of inhabitants of the environment to interact with each other and the environment, and having servers operate completely (or partially) independently.

For example, one problem in implementing a VRU arises from its presentation of content in a virtual approximation of real, three-dimensional space. As a result, there is a limit on how much modeled space can be occupied at the same time. When using the HTTP application layer or other conventional internet modalities, the number of users able to participate on a web site simultaneously is limited only by the computing power and network bandwidth available to the site hosting the page. In contrast, a VRU mimics the three-dimensional space found within the physical world and therefore the space limitations found in the real world also are experienced within the VRU. These include such limitations as the inability to realistically depict multiple users in the same place, the inability of users to walk through the same doorway simultaneously, the inability to exceed occupancy limitations, and similar real world space limitations. Because VRU users are visible to other users, they occupy space, a portion of the visual field, or both.

The problem may be further demonstrated with the example of a nightclub within a VRU. The nightclub would be represented as a fixed area of space within the VRU. While the VRU could in theory have a nightclub of enormous dimensions, there would be areas within the nightclub, such as proximate to a stage or proximate to celebrities present therein, which would be very desirable areas to inhabit. As a result, whether the area at issue is described as the full nightclub or the more desirable areas therein, some or the entire nightclub may have less space available for occupancy than there are people who desire to have their avatars occupy it. While the same solutions exist in a VRU as exist in the real world for increasing occupancy capacity (i.e. making the facility bigger, packing more people in with less space available to reach, etc.), the very limitations found in those real world solutions would apply in a VRU.

A second problem common to VRU's is that they depend on their various users' computers to render the environments that are presented within the VRU. Thus, there

are limitations on how many avatars, objects, textures and other features can be rendered and animated for each user. Again utilizing the example of a nightclub, if the dimensions of the nightclub were drawn so that 10,000 avatars could simultaneously be accommodated, seen, and interacted with, each user computer would be tasked with tracking, rendering and animating each of 10,000 autonomously controlled avatars. Similarly, avatars within the same space, when permitted to communicate with each other, whether via chat, voice over IP, or otherwise, may generate too much content to permit effective communication.

It is desirable, therefore, to resolve these problems and to provide access for greater numbers of avatars within a VRU space while minimizing undesired experiences for VRU participants, and providing new, more varied and interesting opportunities and experiences for users within the VRU space.

SUMMARY

The instant inventions disclose a method, system and apparatus for dynamically establishing and managing multiple instances of a space within a VRU. Such multiple instances may be referred to herein as "dimensions." The inventions allow for the creation of an unlimited number of duplicate instances of a space in a VRU, which instances are created dynamically, and which instances users can interact across. Furthermore, the inventions permit such dimensions to be utilized in a manner that does little or nothing to impair the ability of the VRU to emulate those portions of the real world environment that may be crucial to a positive user experience within a VRU.

In an embodiment of the inventions, once the occupancy capacity of an area has been met, another attempt to access the area by an additional avatar may trigger creation of a new instance, or dimension, of the area. The new area may then be populated with avatars subsequently seeking to enter that area of the VRU environment. The term "new dimension" or "duplicate dimension" encompasses a virtual space such as may be provided by duplication of certain portions of the content within an area, such as, for example, walls and other simulated structural elements, a stage and all participants thereon, or other elements. This may be accomplished, in the

alternative by making the elements which are not desired to be duplicated (i.e. avatars) invisible and inaccessible to other, similarly non-duplicated elements (i.e. other avatars).

Further attempts to access the area may populate the new dimension until such time as the new dimension reaches its occupancy capacity, at which time an additional new dimension would be generated and the cycle repeated.

It is to be understood that in other embodiments, other algorithms for populating dimensions may be used. Such algorithms may include, for example, adding new avatars to the least populated dimension. Thus, if one or more avatars have left the first dimension after the creation and population of a second dimension, new users might be preferentially placed in the first dimension before the second dimension reaches its occupancy capacity. For further example, avatars may be added approximately evenly across several dimensions all of which are below their occupancy capacity, and/or avatars may be placed in one of duplicate dimensions based on the users' status, achievements or other classifications. Users may also create their own duplicate dimension with limited enrollment or purposes. These may include and/or permit, without limitation, (a) themselves; (b) a private party; (c) members of a group; (d) the public at large; (e) paid attendees; and/or (f) specified invitees.

In embodiments, avatars may be distributed to a new dimension from one or more crowded dimensions. Crowding may be determined by various measures. For example, an optimal or "full" level of population for a particular dimension may be determined. Avatars may be allowed to continue to populate such dimensions in excess of their optimal capacity. New dimensions may be formed by transporting avatars from one or more of the dimensions into a new dimension when a trigger event occurs. Trigger events may include, for example, one or more dimensions exceeding their optimal occupancy capacity by some amount or percentage; and/or when the overall number of users in all relevant dimensions would warrant the creation of a new dimension, when at least one of those dimensions exceeds its optimal occupancy capacity. Thus, for example, if Dimension A exceeds its optimal capacity by 30% and ~~Dimension B exceeds its optimal capacity by 30%, Dimension C is created and some~~

users from Dimension A and Dimension B are imported into Dimension C. In the alternative, a trigger event may occur at some level less than the optimal or full occupancy level, for example, to leave room for preferred users of a particular dimension.

Two or more dimensions may be combined to form a larger dimension containing all the participants of the former dimensions. Likewise one or more dimensions may be split up into a number of smaller dimensions, with avatars assigned to dimensions based on random selection, user preferences, user profiles, and/or other criteria. Various triggers may be used to determine when a dimension should be combined or split up, such as, for example, the population of the dimension falling above or below a defined threshold.

In other embodiments, avatars may populate dimensions based on user generated preferences. Thus, for example, a Spanish speaking user may prefer to populate a dimension shared by other Spanish speaking users, even if such a dimension has, for example, fewer avatars than other available dimensions which are populated predominantly of speakers of other languages. Similarly, users from language groups that are more easily translated in a mechanical manner into the other users' languages may be treated as a single group. Thus, for example, if Spanish and French are more easily translated between than are Spanish and Chinese, the Spanish and French users may be grouped together in a dimension having a translation function.

In other embodiments, avatars may populate dimensions based on preferences deduced from the user's supplied information or information otherwise obtained about the user. Thus, for example, a user may prefer to populate a dimension shared by users that appear on his list of friends, even if such a dimension has, for example, fewer avatars than other available dimensions which are populated predominantly by users who do not appear on their list of friends. Similarly, a user may wish to avoid dimensions which are populated by users on their list of ignored users. Algorithms that incorporate users' information including their friends, friends of friends, ignored users; as well as users who belong to groups or groups with similar interests to groups that the

user is involved with are all examples of preferences that could be used to deduce a preferential dimension for a user to join.

Users may be given the opportunity to travel between dimensions, optionally subject to defined limits or conditions. Thus if a user is directed to populate a certain dimension, yet they would prefer to populate a different dimension, the user may select to have their avatar change dimensions to the desired dimension. Users may transport themselves to the desired dimension unless restricted from doing so by factors including but not limited to: that the desired dimension is restricted; that the desired dimension is private; and/or that the desired dimension is at or above its relevant occupancy capacity. Transport to different dimensions may be accomplished, for example, by clicking on the name of or a link relating to a user, an avatar or an object, or by manipulating an avatar so that enters a portal which may lead, either directly or through one or more additional portals, to a corresponding space in a different dimension. The avatar may then be transported to the dimension where the user, avatar, or object resides. In the alternative, or in addition, a VRU space may include "locked dimensions," that do not permit travel to and/or from the dimension, or that impose other restrictions not generally imposed on other dimensions in the VRU space.

Different dimensions may be related to one another and to interact or influence one another in defined ways. For example, users may also be permitted to observe other dimensions without being visible and/or able to interact with those dimensions at all. This may be useful, for example, prior to travel to such dimension, or if a user is merely interested in observing interactions of others. Users may be permitted to obtain information about what dimensions other users are in, such as users who are marked on the user's friends list or ignored users list.

Users may be given the option to chat between dimensions; i.e., with users populating other dimensions. Such chat may include private chat; public chat; or group chat or any other channel of chat that the user may desire. Thus, public chat may, for example, aggregate chat from more than one dimension. In the alternative, or in addition, the public chat may not aggregate more than one dimension, but individual

users may wish to monitor or participate in public chat (or any other channel of chat) from dimensions other than the one in which their avatar presently populates.

In an embodiment of the inventions, a defined area or portion of multiple dimensions may be visible to, and/or interact with, other parts or members of the dimensions. For example, a stage area may be defined that is visible and audible in multiple dimensions surrounding the stage area. Access to such a stage or common area may be limited in any desired way. Actions on the stage may affect multiple dimensions. For example, if a robot avatar or normal avatar throws an object out of a stage area into a surrounding nightclub, as the object passes a boundary between the stage area and the multi-dimensional nightclub floor, the thrown object may be replicated and appear in each of the surrounding dimensions.

Likewise, the surrounding multi-dimensional areas may influence a common area. Continuing the nightclub example, a performer on a common stage may receive audience feedback from multiple surrounding dimensions. For further example, a storefront may comprise a common area in which an avatar for a sales clerk may reside. The clerk may service avatar customers from multiple dimensions, with priority of service determined in different ways. For example, customers in different dimensions may summon the clerk, which may be depicted as "busy" (for example, depicted as interacting with another avatar) at times when the clerk is occupied with servicing a customer in another dimension. The waiting customer may be given a message with an estimated wait time, or an offer to make an appointment with the clerk. If multiple customers are waiting, they may be queued and serviced in any order desired by the clerk. For example, repeat customers may be serviced first.

In both of the foregoing examples, the performer and the clerk provide examples of an object – e.g., an avatar – that has a multi-instance presence in more than one dimension. In an embodiment of the invention, the presence in multiple dimensions may be asynchronous. In other words, each instance of the object in multiple dimensions may be generated asynchronously, depending on input from each

dimension. In the alternative, the object may be generated synchronously, meaning as a single instance using the same input for each dimension.

A more complete understanding of the method and system for managing multiple dimensions in a VRU space will be afforded to those skilled in the art, as well as a realization of additional advantages and objects thereof, by a consideration of the following detailed description of the preferred embodiment. Reference will be made to the appended sheets of drawings, which will first be described briefly.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic diagram showing a system according to the inventions.

Fig. 2 is a schematic diagram showing a system according to the inventions.

Fig. 3 is a schematic diagram showing aspects of a system with multiple dimensions according to the inventions.

Fig. 4 is a block diagram showing aspects of a system for handling multiple dimensions according to the inventions.

Fig. 5 is a schematic diagram showing aspects of a method for managing multiple dimensions according to the inventions.

Fig. 6 is a block diagram showing aspects of managing an interface between multiple dimensions according to the inventions.

Figs. 7A – C are exemplary simplified screenshots of user displays according to the inventions.

Figs. 8 – 10 are flow diagrams showing exemplary steps of methods according to the inventions.

DETAILED DESCRIPTION OF VARIOUS EMBODIMENTS

Referring to Fig. 1, a system 100 for providing a VRU to multiple users may comprise a plurality of client sites, nodes or terminals, for example a personal computer 104, portable computers 106, 110, a compact player, cell phone or digital assistant 108, and/or router 112 communicating via a WAN 102 to one or more servers 114. Servers 114 store and serve VRU data and software to the client sites. Software or firmware

may also be located at each client site, configured to work cooperatively with software or firmware operating on servers 114. Generally, any number of users may be communicating with servers 114 for participation in the VRU at any given time.

Referring to Fig. 2, a system 200 for providing a VRU according to the invention may be considered to be comprised of server-side components (to the left of dashed line 222) and client-side components (to the right of dashed line 222). Server-side components may comprise a portal 220 for managing connections to multiple simultaneous players. Portal 220 may interact with a VRU engine 218, passing user input from multiple clients to a VRU engine, and passing data from the VRU engine to respective individual players. VRU engine 218 may be operatively associated with various memory spaces, including dimensional spaces 208 holding two or more parallel dimensions 212, 214, 215 and 216, and a personalized or common data space 210. As known in the art, objects in a VRU are modeled as three-dimensional objects, or two-dimensional objects, having a defined location, orientation, surface, surface texture, and other properties for graphic rendering or game behavior. Dimensional memory space 208 may hold active or inactive instances of defined spaces used in the VRU environment. For example, the environment of a popular simulated nightclub may be replicated in different spaces. Personalized space 210 may be comprised of various different personal areas each assigned to a different user, for example, avatar or avatar accessories data. The VRU engine may operate with other memory areas not shown in Fig. 2, for example various data libraries, archives, and records not inconsistent with the methods and systems disclosed herein.

In an embodiment of the invention, each user may customize an avatar to have an appearance and qualities specified by the user, by choosing avatar characters, features, clothing and/or accessories from an online catalog or store. The particular arrangement selected by a user may reside in a personalized space 210 associate with a particular user, specifying which avatar elements are to be drawn from a common space to construct an avatar. In an embodiment of the invention, a customized avatar instance may be stored in a personalized space for the user. In the alternative, or in

addition, a user may own customized elements of an avatar, including clothing, accessories, simulated physical powers, etc., that are stored solely in the personalized space and are not available to other users. Avatars may move and interact both with common elements and personalized elements.

A separate administration module 202 may operate at the server level to create, update, modify or otherwise control the content of the VRU as defined in the memory areas 204 and 210. Generally, changes in the personal space area 210 are driven by individual users, either through the VRU administrator 202 or another module. Control of common areas, i.e., the game environment and the objects in it, including any multi-dimensional areas, may be via the administrator module 202.

At the client level, a player interface module 224 may be installed to receive player inputs from one or more user input devices 228, such as a keyboard, mouse or other pointer, or microphone, and provide data to the VRU engine 218 via portal 222 in response to the input. The player interface module may also receive game data from portal 220 and process the data for display on display 226 and/or for audio output on speaker 230. Various systems and methods for providing a three-dimensional, multiplayer interactive animation to multiple players are known in the art, or may be adapted by one of ordinary skill for use with the invention. For example, rendering of a scene may be performed at the client or server level. Generally, it may be advantageous to perform calculations and graphics operations, to the extent possible, at the client level, thereby freeing up network bandwidth and minimizing loads on the server. The invention is not limited to a particular hardware or software architecture for carrying out the steps described herein.

Fig. 3 shows in schematic fashion a system 300 for providing a multi-user, multi-dimensional animation. System 300 comprises a portal or interface 308 connected to receive data, such as through a wide area network 306, from a plurality of users 302, 304 (two of many shown). Users 302, 304 may operate a client computer having a web browser or application configured to communicate animation commands to VRU engine 310 via interface 308. VRU engine 310 may model a virtual three-dimensional

environment 311 within a computer memory 312. A first user 302 may provide commands via portal 308 to VRU engine 310 used to control the operation of a first avatar 314. Likewise, a second user 304 may control a second avatar 316.

Environment 311 may include multiple scenes or regions modeled to simulate a region of space, for example, the surface of a planet or region thereof, the inside of a room or building, the surface of an island, and so forth. It should be appreciate that Fig. 3 presents a highly simplified schematic view of a modeled environment. An actual modeled environment may be highly complex, including thousands of different modeled spaces, some or all of which may exist in more than one dimension. Modeled scenes or spaces may be of different types, meaning they may be modeled according to different rules. They are connected in that transportation between spaces is allowed, at least for some avatars in the environment 311.

The environment 311 may allow for the passage of avatars between scenes via simulated portals or transportation elements, for example, simulated doorways, teleportation terminals, roads, cars, trains, etc. By entering a portal or transportation element, an avatar may leave a first scene and be delivered to a second scene being simulated in the memory 312. One of the tasks of the VRU engine may be to keep track of the various portals and transportation elements between scenes, operating these elements when requested by users, and adding or deleting portals as scenes are added or deleted. Generally, portals should act in a stable, predictable manner so that a user may navigate his or her avatar through the simulated environment 311 to accomplish the user's objectives. For example, a simulated doorway at the simulated 100 East Main Street address of the simulated public road system in Computerville should always lead to the registered tenant at that address, be that a private residence or business. For further example, some transportation elements, for example teleportation portals or subways, may lead to different destinations. However, in this case the transportation element should be configured to allow the user to control the destination of the user's avatar, if so desired.

VRU engine 310 may operate such that some scenes in environment 311 may be capable of being replicated to create another instance of the scene, for example multi-dimensional spaces 320, while other scenes cannot be replicated, for example a non-replicable or mono-dimensional space 318. Thus, environment 311 may contain both types of spaces, as well as portals or transportation elements allowing avatars to transport between multi-dimensional and mono-dimensional spaces. Avatars 314, 316 present in mono-dimensional space 318 may be transported via portal 317 to any one of the multi-dimensional spaces 320. Conversely, avatars in the multi-dimensional spaces 320 may pass into space 318 via portal 317, which may be replicated as an instance in each multi-dimensional space 321a-d. Multi-dimensional spaces 320 may originate as a single mono-dimensional, bounded modeled space. If the space becomes overly crowded, it may be replicated in any number of instances to provide room for growth in the population of avatars. However, the replicated space is not merely a copy, but rather exists as a connected part of the same environment 311. For example, space 321d may be a popular virtual nightclub originally existing in a single instance. As the popularity of the club grows, it may be desirable, for example, to replicate the nightclub experience for new customers. Hence, each dimension 321b, c and d may be created in response to population threshold of the existing club's instances being exceeded. Each additional dimension may allow for two-way travel through a portal 317 to a common area, or through any number of alternative portals.

The additional dimensions 321b-d may therefore provide the advantages of accommodating any number of users without requiring users to subscribe to a new game or environment 311. The most popular and successful destination in the environment 311 may therefore be enjoyed by more users, almost without limit. User's are therefore not required to exit a particular game or environment to enjoy these popular attractions. Likewise, users need not be cut off from communicating with or otherwise interacting with any other users participating in the multi-user environment 311 while still being able to freely access the most crowded destinations within the environment.

The existence of multiple dimensions 320 may be revealed or hidden from some of all users 302, 304. In an embodiment of the invention, some or all users may enter into one or a series of multi-dimensional spaces without being aware of the existence of other dimensions. In the alternative, users may be given an indication that their avatars have entered or are entering a space for which multiple instances exist. Both alternatives may co-exist within the same environment 311, depending on the identity of the user and desired characteristics of a multi-dimensional space.

Environment 311 may further comprise one or more common spaces 322 that provide for simultaneous interaction with multiple instances of parallel dimensions 320. For example, a common space may comprise a stage to a club or theater. The interior of the common space may be visible and/or audible in each of the dimensions 321a-d. An avatar or other object in the common space 322 may be able to pass into each of the parallel spaces, being replicated in the process. Certain objects or avatars may also be able to pass from the parallel dimensions 320 into the common area. For example, avatars may queue up inside of different parallel dimensions and be granted access to the common area 322 in sequence. For further example, some avatars may be granted special rights or powers that permit them to enter a common space 322 that permits simultaneous interaction with multiple dimensions. Various other exemplary interactions between common spaces and parallel dimensions will be described in the detailed description below.

Fig. 3 may also serve to illustrate an alternative embodiment in which users are segregated into independent, isolated groups that simultaneously share a simulated space or facility. In this embodiment, the dimensions 321a-d may represent isolated groups of avatars and interactive objects. Such groups may be contained within a non-interactive common environment, such as the walls, ceilings and floors of a simulated nightclub or other space. The non-interactive common environment may serve as common backdrop that is shared by the different groups 321a-d, which need not be aware of one another's existence. This embodiment serves to illustrate that the

experience of multiple parallel dimensions may be implemented in various ways, without departing from the spirit and scope of the inventions.

Fig. 4 is a block diagram showing exemplary aspects of a multi-dimensional system 400. System 400 may be implemented, for example, by a server or group of servers operating at a network-accessible site. Input data 402, including for example user commands or data used to direct the motion of avatars and other objects, may be provided to system 400 via a portal. Output data 404, including for example virtual-reality data configured to cause remote clients to output an animated display of a corresponding one of the parallel dimensions and avatars therein, may be output to a portal module for distribution to remote clients.

System 400 may comprise an avatar manager component 406 operably connected to a database 408 of avatar data. Like other components of system 400, the avatar manager component 406 may be implemented in any suitable software, hardware, or combination thereof. The avatar manager may process incoming user command and associate commands with corresponding avatar and other object data. For example, the avatar manager may ensure that each avatar is configured according to user commands with clothing, accessories, or gear available to its corresponding user. The avatar manager may communicate with a dimensional configurator 410 and population manager 418 to ensure that each avatar is placed correctly in one of parallel dimensions managed by the configurator and population manager. The avatar manager may further communicate with an animation component 414 to ensure that each avatar is positioned and moved in accordance with user commands. In addition, the avatar manager may cooperate with a communications component that operates to allow communication, for example text or audio chat, between different users.

A population manager 418 may monitor the population density of avatars in defined area of the environment, or more generally throughout the environment. If a population threshold is exceeded, the population manager may instruct the dimensional configurator 410 to generate or activate another instance of the overcrowded area. Likewise, the population manager may monitor parallel dimensions, and instruct the

dimensional configurator to collapse two or more parallel dimensions into one, if population density falls below a defined threshold.

A dimensional configurator 410 may generate or activate additional parallel dimensions as needed to accommodate population growth. Essentially, the configurator may generate another instance of a crowded space within a virtual-reality environment by copying an existing space or template. In the alternative, different avatar populations may share common elements defining the envelope of a modeled space. Elements of modeled spaces may be stored in a dimensional database 412 in operative association with the configurator 410. The configurator may also ensure, in cooperation with the avatar manager 406, that each dimension is correctly populated with avatars. The configurator 410 may also operate to collapse empty or sparsely populated ones of parallel dimensions. For example, the configurator may move remaining avatars to another dimension and inactivate or delete the emptied dimension.

A communications module 416 may operate more or less independently of other components to enable communication, such as chat, between different users. In an embodiment of the invention, chat operates independently of animation. In the alternative, a chat process may be coordinated with avatar animation. For example, an avatars lips may move in sync with audio chat. In either embodiments, the communications module may allow users to chat with other users corresponding to nearby avatars. In addition, the communications module may permit users to place a chat "telephone call" to any user logged into the system, regardless of the relative locations of the users' avatars.

An animation component 414 may operate to process user commands, dimensional data and other model data to produce simulations of all active parallel spaces and other active regions of the modeled environment. Generally, a space or region may be considered active if it is within sight of a user-selected viewpoint. Various methods are known for simulating avatars and objects within modeled spaces, and any suitable method may be used. In addition, it is anticipated that new method may be developed that may also be suitable. In general, any method that is suitable for

modeling non-parallel, regular region of modeled space should be readily adaptable to modeling parallel dimensions.

The animator 414 may produce raw model data that is not configured for efficient distribution to remote clients. Accordingly, the animator may cooperate with an output control module 420 to prepare the output data 404 for distribution to remote clients. This may include translation or transformation of the animated model data from the animator to a format that is suitable for distribution to system clients. The form of translation or transformation will depend on the application software used at the client level and other details that should be apparent to one of ordinary skill.

In another preferred embodiment, various ones of the dimensions may overlap, for example, to prevent users from experiencing an overly empty dimension. Such overlap may be geographical (i.e. areas within a virtual "club" or other environment), overlap between users grouped into dimensions, or otherwise. Referring to Fig. 5, an exemplary multi-dimensional system 500 is shown schematically, as it might be represented in a system memory. System 500 may comprise a first dimension 502 adjacent to a second dimension 504, representing, for example, areas of a virtual nightclub. The first dimension may be connected to a common space 506 via a transparent interface 507. The common space may represent, for example, a stage area. The first and second dimensions may be demarcated by a pair of interfaces 512, 514 that define an overlapping region 510 belonging to both dimensions 502, 504. Interfaces 512, 514 may also be transparent, so that all parts of the system 500 interior are potentially visible from viewpoint in any one of areas 502, 504 and 506. The parallel dimensions 502, 504 may also be enclosed by a common wall. In general, avatars within the parallel dimensions 502, 504 may not be able to pass through the interfaces 507, 512 and 514. In an embodiment of the invention, however, passing through one of the interfaces 512 and 514 may trigger a reassignment to another dimension designed maintain the user within an assigned group of avatars.

With reference still to Fig. 5, one implementation of this embodiment may be to create four instances of a nightclub, with four different audiences (A,B,C, and D), as shown in Table 1 below.

TABLE 1.

Instance Number	Audience Area 1	Audience Area 2
1	Group A	Group B
2	Group C	Group D
3	Group D	Group A
4	Group B	Group C

The nightclub appears to be fully contiguous to all avatars in every instance, but the population of Areas 1 and 2 (corresponding to spaces 502, 504, respectively) depends on which instance and audience area an avatar is located in. Thus, for example, in Instance Number 1, Audience Area 1, an avatar looking into Audience Area 2 may see Group B. However, when the avatar moves into Audience Area 2, it may be automatically transitioned to Instance 3. Therefore, from the viewpoint of this avatar when looking back toward the stage, Group D is seen within Audience Area 1, and the avatar remains in Group A, albeit on the other side of the group.

Boundaries between the two Audience Areas, and between Audience Area 1 and the stage, may be referred to as an "interface". The interfaces may be sharp, with no overlap, or there may be areas within the interface where multiple instances of the universe may exist simultaneously. Similarly, communication (visual, audio, chat, or otherwise), may be implemented across interfaces potentially limited by proximity of users to the interface. For example, an avatar 518 present in region 510 may be able to

chat with avatar 520 in Audience Area 1, even if the avatar 518 belongs to a different group than present in Area 1.

The common dimension 506, or the stage area in the diagram above, may be created in a manner in which the performer 516 will be visible to all users in all instance numbers. Some audience groups, or members, may be permitted to interact with the performers and may be selected by any of a number of criteria, including without limitation paid members, early arrivals, random selection, etc. The performers may optionally see only one or more groups of users, may see all users even if shown via different computers, screens or windows or by representative methods such as statistics, applause meters, etc. The audiences from multiple dimensions may also be rendered translucently and overlain on each other, so as to make additional members visible to the performers.

In embodiments of the inventions, multiple end users may be merged into the same avatar with or without the ability to share control of the avatar. For shared control, the control inputs of multiple users may be aggregated in order to generate activity, or may be granted in a round robin or other manner. One example of this would be to permit people in multiple dimensions at a nightclub to get into the "stage diving" line, and then inhabit a single avatar which is then permitted to enter the "performer" dimension, be seen by all users, and then jump off the stage, disaggregate, and land, each user into his own dimension. Further examples of multi-user animations of one or more avatars may be found in provisional Application No. 60/871,446, filed December 21, 2006, which application is incorporated herein by reference.

Objects moving from a common dimension may optionally automatically replicate when crossing an interface into a parallel dimension so as to replicate into multiple instances of themselves. Fig. 6 is a diagram showing an exemplary system 600 comprising a common dimension 604 linked to parallel dimensions 601, 602, and 603. In embodiments of the inventions, such replication may place a copy of the item into each dimension or instance of linked to the common dimension. The item may then be independently manipulated and utilized within each dimension or instance. Optionally,

the items may be marked, numbered, or tracked by the dimension into which they first were replicated. For example, a performer avatar 606 may throw a ball 607 towards interface 610. As the ball penetrates the interface, it may be subtracted from common space 604 and appear as separate independent instances 608a-c in parallel dimensions 601, 602 and 603 respectively. Essentially, any number of new objects may be generated in this manner. After penetrating fully past the respective interfaces 611a-c, the newly-generated balls may exist as new objects 612a-c, respectively.

Common areas linked to multiple dimensions may also be useful for commercial use, for example, the provisions of services or virtual products. Some such application may involve the personal attention of a merchant or service provider. Such a user may desire to be marketed in all linked parallel dimensions, but cannot simultaneously serve users in different dimensions. For such applications, it may be desirable to manage the interface between the common area and the parallel dimensions to permit both pan-dimensional presence for the merchant or service provider, and personal service for each customer. Figs. 7A-C are simplified screenshots exemplifying an implementation of an exemplary method for accomplishing this objective.

Fig. 7A shows a screenshot 710 representing system output data such as may be provided to a first user having an avatar 702 in a first parallel dimension visiting an avatar doctor 701 located in a common dimension. A client computer belonging to the first user may take the output data and render a display such as shown. The first user may see an animation of her own avatar 702 conversing with the doctor 701. A chat window 703 may comprise chat text of a conversation between the doctor and the first user. Other objects, for example virtual wares if the user of the common dimension is a merchant of such wares, may optionally be shown to the first user.

Fig. 7B shows a screenshot 720 similarly representing data provided to a second user operating an avatar 722 located in a second parallel dimension. This user may see an animation indicating that the doctor is busy with another patient. For example, a view of a closed door 721 may be presented. Alternative presentations may include, for example, a robot avatar receptionist for the doctor. Optionally, a message box 723 may

be provided explaining the status of the doctor, the second user's place in the doctor's queue, an estimated wait time, or any other desired information, including but not limited to advertising.

Fig. 7C shows an exemplary screenshot 730 similarly representing data that may be provided to a user of the common dimension. Such a user may be presented with views of all linked parallel dimensions. The illustrated example shows tiled views, but any other arrangement, for example overlays or successive views, may also be used. In this example, the doctor sees the active patient 702 and a view 731 of the first dimension where the active patient resides. A chat window 734 showing the active conversation may also be displayed. The doctor may also see a view 732 of the second dimension showing the patient 722 waiting there. In this example, a view 733 of a third dimension is provided showing no patients waiting in that dimension. In the alternative, views of dimensions with no waiting patients may be omitted. Any number of parallel dimensions may thus be made visible to a user operating in a common dimension.

According to the foregoing, therefore, parallel dimensions may be implemented in a computer platform using programming steps that should be apparent to one of ordinary skill in view of the present disclosure. Fig. 8 shows exemplary steps of a method 800 for managing multi-instance, multi-user animation platforms, such as may be implemented in a VRU environment.

Step 802 may comprise modeling a plurality of parallel dimensions in a computer memory. Computer modeling of three-dimensional spaces is known in the art. Such models may conform to rules that mimic the physical environment on earth, or may use modified rules to simulate other environments. Any suitable model and method of modeling may be used. As used herein, a "parallel dimension" means a duplicate or recognizable counterpart of a bounded, computer-modeled space that is accessible via a common environment. Parallel dimensions may be created, for example, by copying element of an existing space or template for a space in the computer memory. Each of the plurality of parallel dimensions may comprise an independent model of a physical, three-dimensional space having corresponding features such that the parallel

dimensions are recognizable as counterparts to each other. It is not necessary that each dimension be an exact duplicate of other dimensions. Because the dimensions operate independently, some divergence may occur after the dimensions become active. For example, a piece of furniture that is initially positioned identically in counterpart dimensions may be moved.

The parallel dimensions may have the characteristic of operating concurrently in a system memory. While certain activities inside each parallel dimension may be independent, for example, the activity of avatars, nonetheless the parallel dimensions may retain some relationships to one another. For example, the parallel dimensions may share common spaces or portals to common spaces. For further example, communication between avatars in different dimensions may be permitted. Avatars may also be permitted to travel between dimensions.

One important inter-dimensional relationship may comprise inter-dimensional population control. The VRU system may comprise, for example, a VRU module that operates to monitor the population of certain spaces within the VRU to ensure that they do not become too crowded with avatars, as indicated at step 804. Besides ensuring that additional dimensions are generated or activated as needed to relieve overcrowding, the VRU system may operate to distribute avatars between parallel dimensions. For example, step 804 may comprise locating or assigning avatars within corresponding ones of parallel dimensions so as to prevent over-population of any one of the parallel dimensions by avatars. To perform this step, the VRU engine or module may compare a present avatar population, population density, and/or rate of change of the foregoing, to criteria established for the space in question. For example, an optimal avatar density for a nightclub floor may be in the range of 1 – 4 avatars per square meter of simulated space, while for a simulated park the optimal density may be 0.2 – 1 avatars per square meter.

As the population of a space approaches or exceeds a defined limitation, as indicated at steps 808 and 808, the VRU system may generate or activate a parallel dimension that replicates the overcrowded dimension. In an embodiment of the

invention, multiple parallel dimensions may operate simultaneously. If, for example, just one of these dimensions becomes overcrowded, the overcrowding may be resolved by transferring avatars to less crowded dimensions, as indicated at step 810. If no less crowded dimensions are available, a new dimension may be generated and/or activated. In an embodiment of the invention, a new parallel dimension may be generated by copying certain elements of an existing space, or by copying a template for an existing space that is reserved in memory for the purpose of generating parallel dimensions when needed.

Parallel dimensions may also be collapsed into fewer dimensions as avatar populations decline. For example, if an average population density across multiple dimensions falls below a defined threshold, any empty dimensions may be shut down. The process of shutting down a dimension may include erasing the dimension from the computer memory used to model the computer environment. In an embodiment of the invention, the closed dimension may be archived or reserved for future use, optionally for a limited period of time. If it is desired to shut down a dimension that is not empty of avatars, avatars present in the dimension may be transported to an adjacent parallel dimension. Before shutting down a dimension, the system may inform users corresponding to any avatars in the dimension. Such users may be given the option of transporting to a parallel dimension or elsewhere in the VRU environment. If a user does not select an alternative destination, the VRU system may choose for her. Advantageously, shutting down under-populated dimensions may conserve system resources and prevent users from encountering under-populated environments.

As indicated at step 810, avatars may be distributed between related parallel dimensions according to various schemes. Method 800 may further comprise relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions. Relocation may be accomplished by any desired method of transporting avatars within a VRU environment. For example, an avatar may walk through a door to another space or be "teleported" to another space in the environment. An avatar may be relocated from a first one of the parallel dimensions to a second one of the parallel

dimensions (or to any other location in the environment) in response to user input signifying a request to relocate the avatar. In the alternative, relocation may be performed without user input. For example, an avatar may be relocated between parallel dimensions or out of a parallel dimension when a population of avatars in one or more of the parallel dimensions reaches a predetermined limit. One or more avatars may be automatically relocated from crowded ones of the parallel dimensions into an additional parallel dimension that is generated or activated to accommodate avatar population growth.

Whatever the number of dimensions operable within an environment, a VRU system should operate to independently animate ones of the plurality of avatars within different ones of the parallel dimensions, using input from respective corresponding ones of users. "Animate," in this sense, essentially means to process user input data, rules of the modeled environment, modeled properties of objects in the environment, or other data to calculate the positions and/or shape of objects in the environment at successive instants of modeled time. Such an animation process may be encompassed in what is generally as "computer simulation." Fig. 9 shows exemplary steps of a method 900 for animating a VRU environment and objects therein. It should be appreciated that method 900 may be operated concurrently with method 800 to manage a multi-user, multi-dimensional animation process and provide a plurality of users with desired output data.

At step 902, the VRU engine may animate avatars and objects in each dimension. Avatars and objects may be modeled in any desired manner. In an embodiment of the invention, avatars may be modeled as jointed figures covered by a skin. Objects may interact with one another via "contact" that occurs when modeled objects attempt to occupy the same volume of modeled space. Various physical attributes, such as, for example, mass, momentum, muscle & skeletal limitations, and so forth, may be associated with the modeled objects to impart greater realism to the simulation. In embodiments of the inventions, physical rules may be modeled so as to permit activities that cannot occur in the real world, such as, for example, winged flight

by humans. In general, various computer modeling methods are known in the art to simulate motion of objects and figures in modeled space, and any suitable method may be used to simulate motion of avatars and other objects.

Animation of objects in parallel dimensions may generally proceed independently of each other. For example, a first avatar in a first dimension should not be able to contact or be visible to a second avatar in a second dimension. Avatars may be able to chat across dimensions, which may be conducted as a separate process apart from animation. Objects and avatars in a common dimension may be modeled together with each parallel dimension. For example, if "c" represents the model of the common space and "p" represents the model of the parallel space, the animation for each parallel space "p_i" may comprise "$p_i + c$."

At step 906, portal output data may be generated for a plurality of remote clients. A system module, e.g., a portal module, may separate and direct data from multiple animation streams so that the correct data is provided to each client in the correct format and sequence. Each client should receive sufficient data to generate a view of the environment as seen through the virtual eyes of his or her avatar, or as seen from another viewpoint near the avatar. The view should include at least nearby avatars and objects. More distant objects may also be visible, optionally at diminishing resolution with increasing distance from the viewpoint. In general, the identification of a viewpoint associated with each user may make it possible to reduce the amount of information sent to each user, as more distant information need not be provided.

As an output of the animation process, virtual-reality data may be provided to each of the plurality of users, as indicated at step 906. Various methods are known in the art for providing data to clients, and any suitable method may be used. A connection may be made to one or more communication ports of client computers running an application for receiving data and transforming it as necessary for a visual display. The virtual-reality data may be configured to cause remote clients of each of the users to output an animated display of a corresponding one of the parallel dimensions and avatars therein, as indicated at step 910. For example, a first user

corresponding to an avatar located in parallel dimension 'A' may receive virtual-reality data for viewing objects and other avatars inside of dimension 'A', while a second user controlling an avatar located in parallel dimension 'B' may receive data for displaying the interior of dimension 'B.' Both users may receive data for viewing a common dimension 'C' linked to dimensions 'A' and 'B,' if present.

As previously noted, a common space may be modeled in the computer memory, configured in relation to multiple parallel dimensions so that an interior of the common space is visible from viewpoints located inside each of the parallel dimensions. In an embodiment of the invention, the common space may be modeled so that information concerning each of the parallel dimensions is provided to a user operating an avatar in the common space, or otherwise assigned a viewpoint located in the common space. Such information may be provided, for example, as interior views of each of the plurality of dimensions.

In embodiments of the inventions, it may be desirable to model a common space in a computer memory, configured in relation to multiple parallel dimensions so that a modeled object originating from the common space is capable of passing into at least one of the parallel dimensions, or vice-versa. Fig. 10 shows exemplary steps of a method 1000 for managing an interface between a common space and a parallel space. At step 1002, an inter-dimensional interface may be defined between the common space and two or more parallel spaces, or between adjacent parallel spaces. For example, a surface may be defined as a boundary between the common space and each of the parallel spaces. Such surfaces may be contoured to fit one another. That is, an interface surface dividing the common space from multiple parallel dimensions may be contoured to fit each of the surfaces that divide each of the parallel dimensions from the common space. An interface may be modeled to include an overlapping region interactive with both adjacent ones of the plurality of dimensions, or without an overlapping region.

In an embodiment of the invention, an interface may be modeled as a transparent object. Therefore, the common space may be visible to each of multiple

parallel dimensions, for example as a stage, storefront, or entry area. Likewise, multiple parallel dimensions may be visible from the common space, either overlain on each other, tiled, presented in sequence, or in some other arrangement. If multiple parallel dimensions are arranged around a common space, providing a transparent interface around the common space may render adjacent ones of the paralle dimensions visible to each other. In the alternative, an interface may be modeled as a translucent or opaque object.

At step 1004, the interface may be monitored for approaching objects. When an object touches or approaches the interface, the system may determine the interface properties of the object, as shown at step 1006. For example, the system may consult a properties table associated with the object to determine whether or not the object has the capability of passing through the interface. The simulation may then proceed differently, depending on the properties of the object. If the object is allowed to "pass" through the interface, an object passing from the common space into multiple parallel dimensions may be replicated as it passes through the interface, as indicated at step 1008. The replicated objects may then be animated synchronously (as in the case of an avatar controlled by a single user), or asynchronously (as in the case of a passive object) in each of the parallel dimensions.

In an embodiment of the inventions, a common space in the computer memory may be configured in relation to multiple parallel dimensions so that an avatar originating from the common space is capable of passing into one of the parallel dimensions. This is a special case that may be used to populate multiple dimensions with avatars originating from a common space, for example a space modeled as a public road or hallway. In this embodiment, one of the parallel dimensions is selected as the destination for the object. Selection may be accomplished using various criteria. In an embodiment of the invention, selection may be based on avatar populations of each parallel space. For example, an avatar may be directed to a dimension having the lowest population, or any other desired population criteria. In the alternative, or in addition, selection may be based on a corresponding user preference. For example, a

user may indicate a preference for a dimension populated by other French-speaking avatars.

In addition, a common space in the computer memory may be configured in relation to the plurality of parallel dimensions so that an avatar originating from any one of multiple parallel dimensions is capable of passing into the common space. An object passing from a parallel space into a common space may be subtracted from the parallel space and added to the common space as it passes through the interface. This may be used as a way for avatars to leave a parallel dimension and to re-enter non-parallel portions of the modeled environment.

If the object is not allowed to pass through the interface, the object may be bounced from the interface, or stopped short of the interface, as indicated at step 1010. The object therefore cannot leave the dimension of origin through that particular interface. Of course, because the dimension is part of a larger modeled environment, it should contain at least one other doorway or other transportation element that allows objects to leave the dimension and enter other portions of the modeled environment.

According to the foregoing, therefore, implementations of parallel dimensions may require the creation and tracking of at least three different categories of items. The first category may include items such as walls that are non-manipulable and are identical in all dimensions. The walls may in fact exist only in a single dimension, which is shared via an interface with all other dimensions, in this manner minimizing the number of items that servers and clients must track. The second category may include items existing in a single dimension only, such as avatars. The third category may include items created identically in all dimensions but that become independent of each other once created. This third category may be exemplified by furniture and the like.

When a dimension is generated or activated, it may be populated with standardized furniture or other objects belonging to the third category. Such furniture, while potentially identical when created, and created simultaneously in multiple dimensions, may be manipulable, destructible, and otherwise alterable within each dimension independently. Movable replicated objects, for example, furniture and the

like, existing in parallel dimensions may tend to migrate to different locations over time, as each instance of the dimension may be modeled separately. This may lead to divergence between otherwise parallel dimensions that may make travel or other interactions between parallel dimensions disorienting for those who experience them. At the same time, it may not be desirable to make such objects unmovable or unchangeable.

Therefore, it may be desirable to return certain movable objects back to a home position when displaced. In an embodiment of the invention, therefore, analogous objects may be tracked in different ones of parallel dimensions. Any ones of the analogous objects that become displaced from a home position may be moved back towards the home position, so that positions of analogous objects within each of the parallel dimension tend to converge on the home position over time. For example, a chair may be moved by an avatar in one of the dimensions. However, in related parallel dimensions, the chair is unmoved. A system component may cause the moved chair to slowly, potentially over the course of hours, to move back to the position of the chair in the adjoining dimensions. Return movement may be executed relatively slowly so that it is not noticeable to nearby avatars. Speed of return movement may depend, therefore, on the relative proximity of nearest avatars. For further example, if a glass is dropped within a dimension, the server may cause it to fall and roll in the direction of the corresponding glass in a neighboring dimension. In this manner, the dimensions would continue to resemble each other over time, making travel between the dimensions less disorienting for the persons manipulating the avatars.

In general, a VRU environment may provide communication tools for users to communicate with one another in real time. For example, a typical environment may include a text chat or audio chat feature. In general, it may be desirable to not disable such communication features for users associated with avatars located in different parallel dimensions. In other words, although parallel dimensions may be animated separately, they are still part of the same environment and may still make use of the ~~same communication tools. In an embodiment of the invention, therefore, a~~

communication channel may be provided between avatars in different ones of the plurality of dimensions.

Having thus described embodiments of method and system for a multi-user, multi-dimensional animation, it should be apparent to those skilled in the art that certain advantages of the within system have been achieved. It should also be appreciated that various modifications, adaptations, and alternative embodiments thereof may be made within the scope and spirit of the present invention. For example, a method implemented over a public network such as the Internet has been illustrated, but the inventive concepts described above would be equally applicable to implementations over other networks. The invention is defined by the following claims.

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(74) Agent: JAECH, Jonathan, A.; Connolly Bove Lodge & Hutz LLP, P.O. Box 2207, Wilmington, DE 19899 (US).

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(71) Applicant *(for all designated States except US)*: **IDEAFLOOD, INC.** [US/US]; P.O. Box 11289, Zephyr Cove, NV 89448 (US).

(71) Applicants and
(72) Inventors *(for all designated States except US)*: **SHUSTER, Gary, Stephen** [US/US]; 486 E. Rusty Harbor Drive, Fresno, CA 93704 (US). **SHUSTER, Brian, Mark** [US/US]; P.O. Box 2183, Stateline, NV 89449 (US). **ANDREW, William, Hendrick** [US/US]; 339 Winnona Drive, Decatur, GA 30030 (US). **FLESCH, Robert, Steven** [US/US]; 1830 Windmere Drive, Atlanta, GA 30324 (US).

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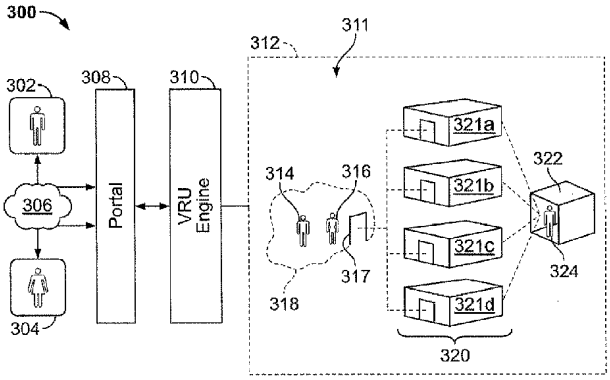

FIG. 3

(57) Abstract: A multi-instance, multi-user animation platform includes a plurality of modeled parallel dimensions in a computer memory. Each of the parallel dimensions may be an independent model of a physical, three-dimensional space having corresponding features such that the parallel dimensions are recognizable as counterparts to each other. Avatars are located within corresponding ones of the parallel dimensions so as to prevent over-population of any one of the parallel dimensions by avatars. Avatars are animated within different ones of the parallel dimensions using input from respective users to provide virtual-reality data. The virtual-reality data may be configured to cause remote clients to output an animated display of a corresponding one of the parallel dimensions and avatars therein.

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CLAIMS

What is Claimed is:

1. A method for managing a multi-instance, multi-user animation platform, comprising:

modeling a plurality of parallel dimensions in a computer memory, each of the plurality of parallel dimensions comprising an independent model of a physical, three-dimensional space having corresponding features such that the parallel dimensions are recognizable as counterparts to each other;

locating ones of a plurality of avatars within corresponding ones of the parallel dimensions so as to prevent over-population of any one of the parallel dimensions by avatars; and

animating ones of the plurality of avatars within different ones of the parallel dimensions using input from respective corresponding ones of a plurality of users to provide virtual-reality data, the virtual-reality data configured to cause remote clients of each of the plurality of users to output an animated display of a corresponding one of the parallel dimensions and avatars therein.

2. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions.

3. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions in response to user input signifying a request to relocate the avatar.

4. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions when a population of avatars in the first one of the parallel dimensions reaches a predetermined limit.

5. The method of claim 1, further comprising generating an additional parallel dimension to accommodate an increase in avatar population.

6. The method of claim 5, further comprising relocating avatars from the plurality of parallel dimensions into the additional parallel dimension.

7. The method of claim 1, further comprising generating the plurality of parallel dimensions as replicas of a template space.

8. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that an interior of the common space is visible from viewpoints located inside each of the plurality of parallel dimensions.

9. The method of claim 1, further comprising modeling the common space so that information concerning each of the plurality of parallel dimensions is provided to a user operating an avatar in the common space.

10. The method of claim 9, further comprising providing the information as interior views of each of the plurality of dimensions.

11. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that a modeled object originating from the common space is capable of passing into at least one of the plurality of parallel dimensions.

12. The method of claim 11, further comprising replicating the modeled object passing into the plurality of parallel dimensions so that a replica of the object is modeled in each of the plurality of parallel dimensions after the object passes from the common space.

13. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that an avatar originating from the common space is capable of passing into one of the plurality of parallel dimensions.

14. The method of claim 13, further comprising selecting which one of the plurality of parallel dimensions the avatar is capable of passing into based on avatar populations of each parallel space.

15. The method of claim 13, further comprising selecting which one of the plurality of parallel dimensions the avatar is capable of passing into based on a corresponding user preference.

16. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that an avatar originating from any one of the plurality of parallel dimensions is capable of passing into the common space.

17. The method of claim 1, further comprising tracking analogous objects in different ones of the parallel dimensions and moving any displaced ones of the analogous objects so that positions of analogous objects within each of the parallel dimension tend to converge over time.

18. The method of claim 1, further comprising collapsing first and second ones of the plurality of dimensions into a combined dimension populated by the avatars formerly in the first and second ones of the plurality of dimensions.

19. The method of claim 1, further comprising synchronously animating an avatar present in multiple ones of the plurality of dimensions.

20. The method of claim 1, further comprising asynchronously animating an avatar present in multiple ones of the plurality of dimensions.

21. The method of claim 1, further comprising modeling an interface between adjacent ones of the plurality of dimensions.

22. The method of claim 21, further comprising modeling the interface to include an overlapping region interactive with both adjacent ones of the plurality of dimensions.

23. The method of claim 21, further comprising modeling the interface as a transparent object rendering the adjacent ones of the plurality of dimensions visible to each other.

24. The method of claim 21, further comprising providing a communication channel between avatars in different ones of the plurality of dimensions.

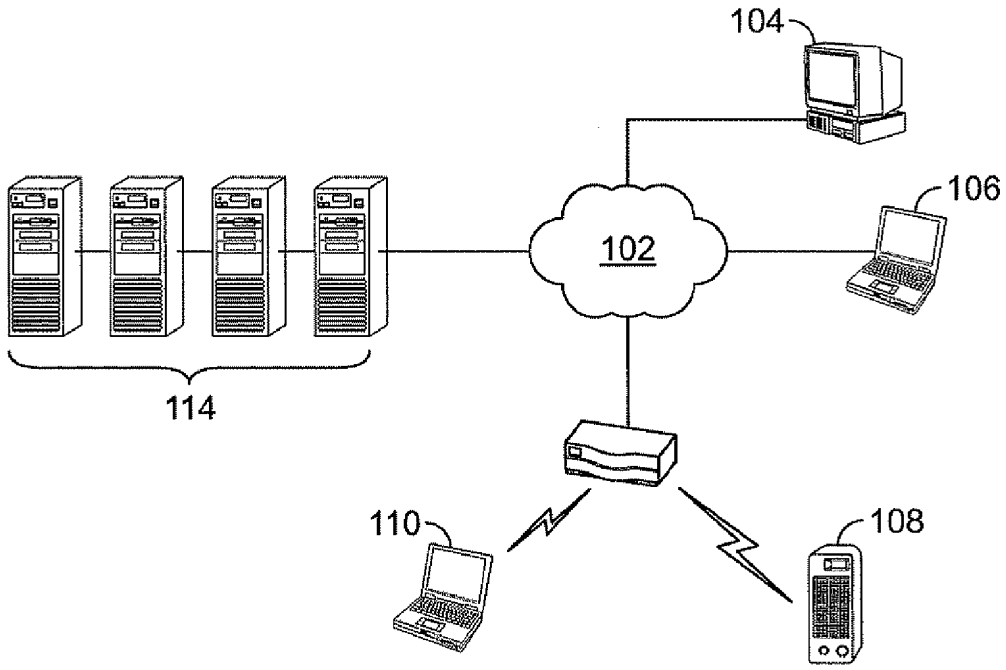


FIG. 1

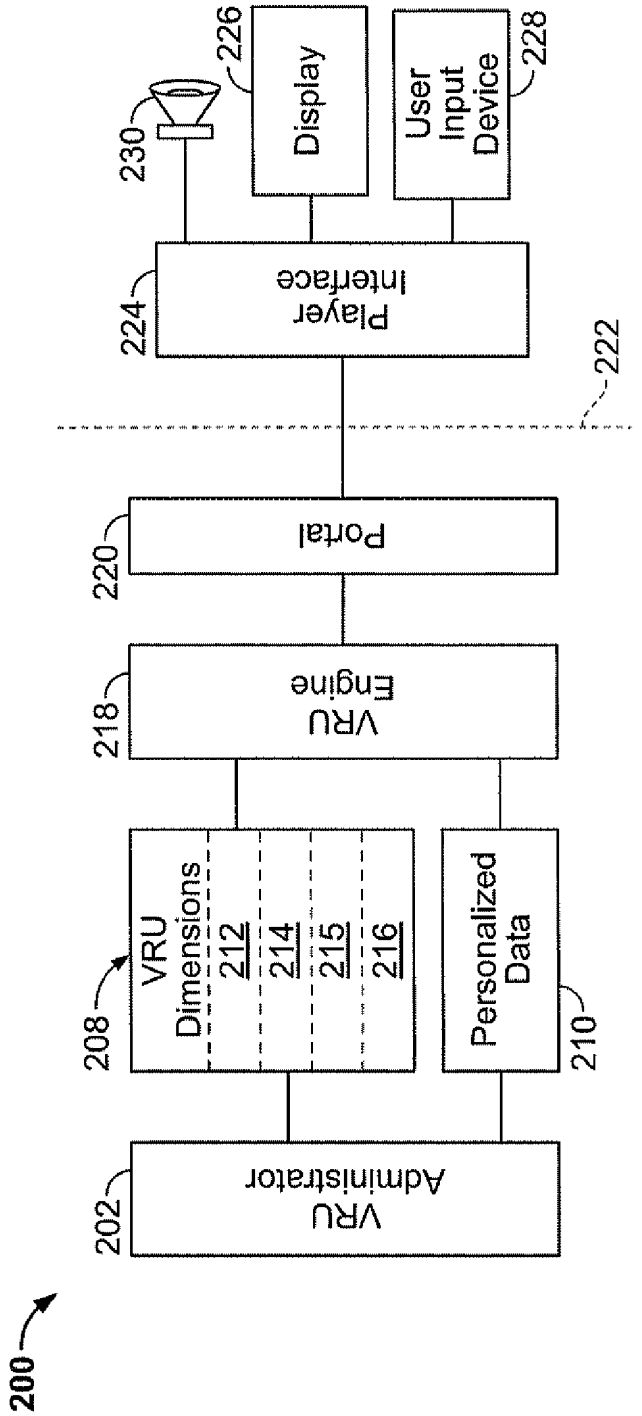

200
202
VRU Administrator
208
VRU Dimensions
212
214
215
216
210
Personalized Data
218
VRU Engine
220
Portal
222
224
Player Interface
226
Display
228
User Input Device
230

FIG. 2

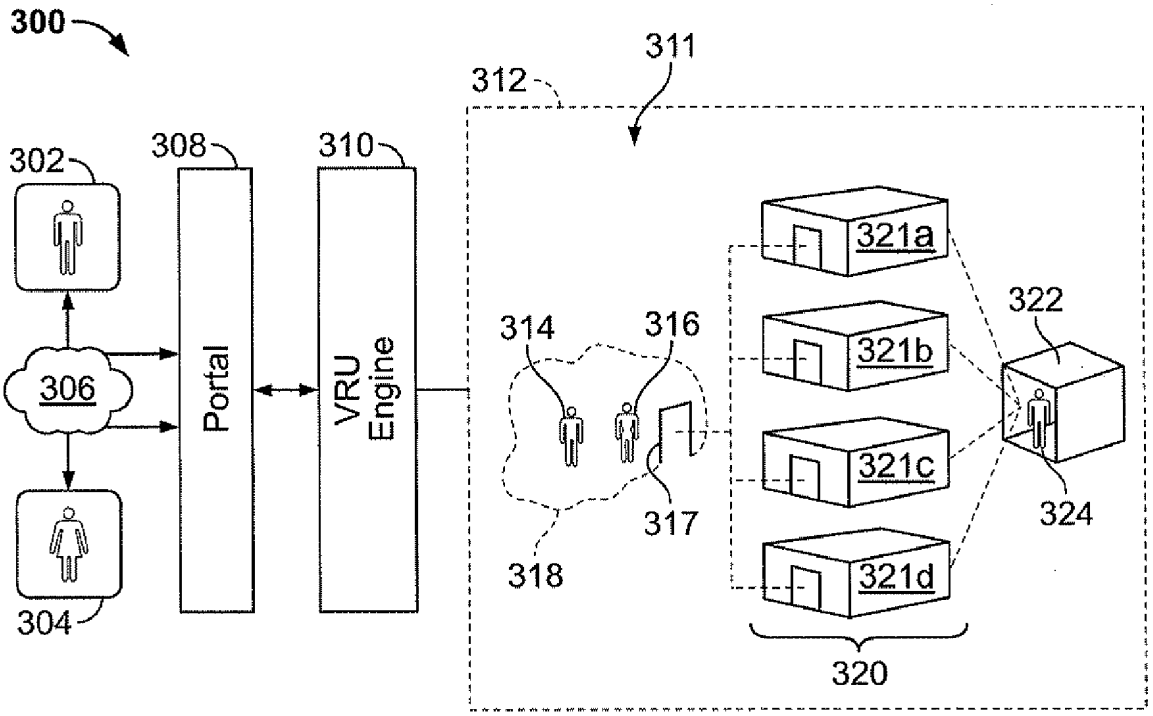

300
311
312
302
308
310
306
Portal
VRU Engine
304
314
316
317
318
321a
321b
321c
321d
322
324
320

FIG. 3

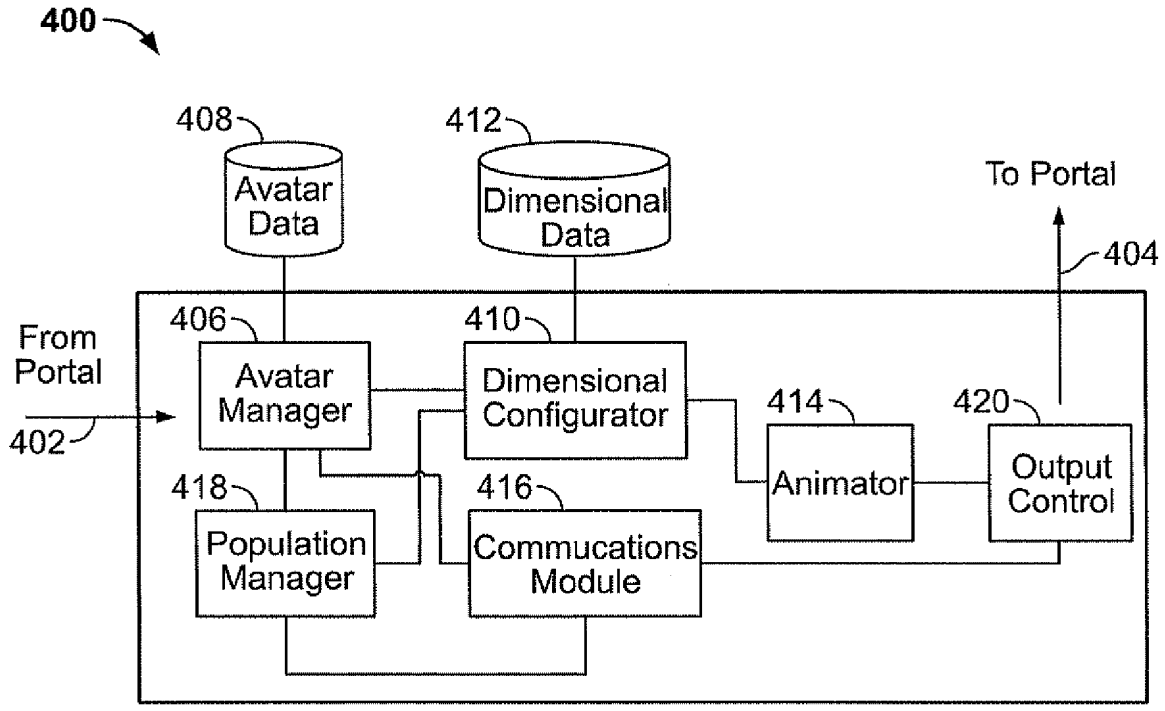

400
408
Avatar Data
412
Dimensional Data
To Portal
404
From Portal
402
406
Avatar Manager
410
Dimensional Configurator
414
Animator
420
Output Control
418
Population Manager
416
Commucations Module

FIG. 4

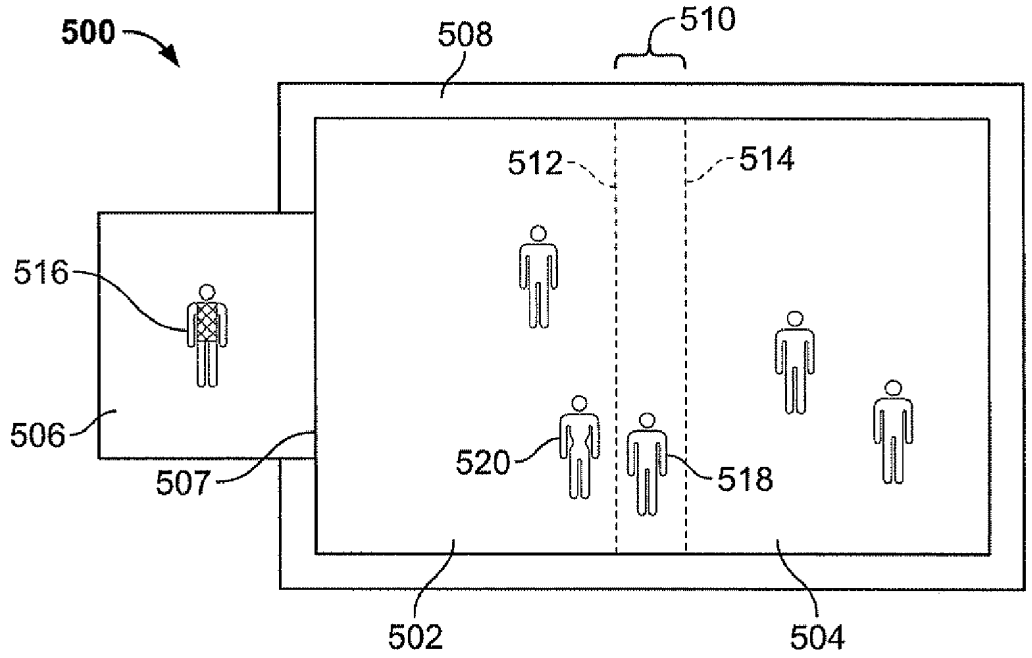

500
508
510
512
514
516
506
507
520
518
502
504

FIG. 5

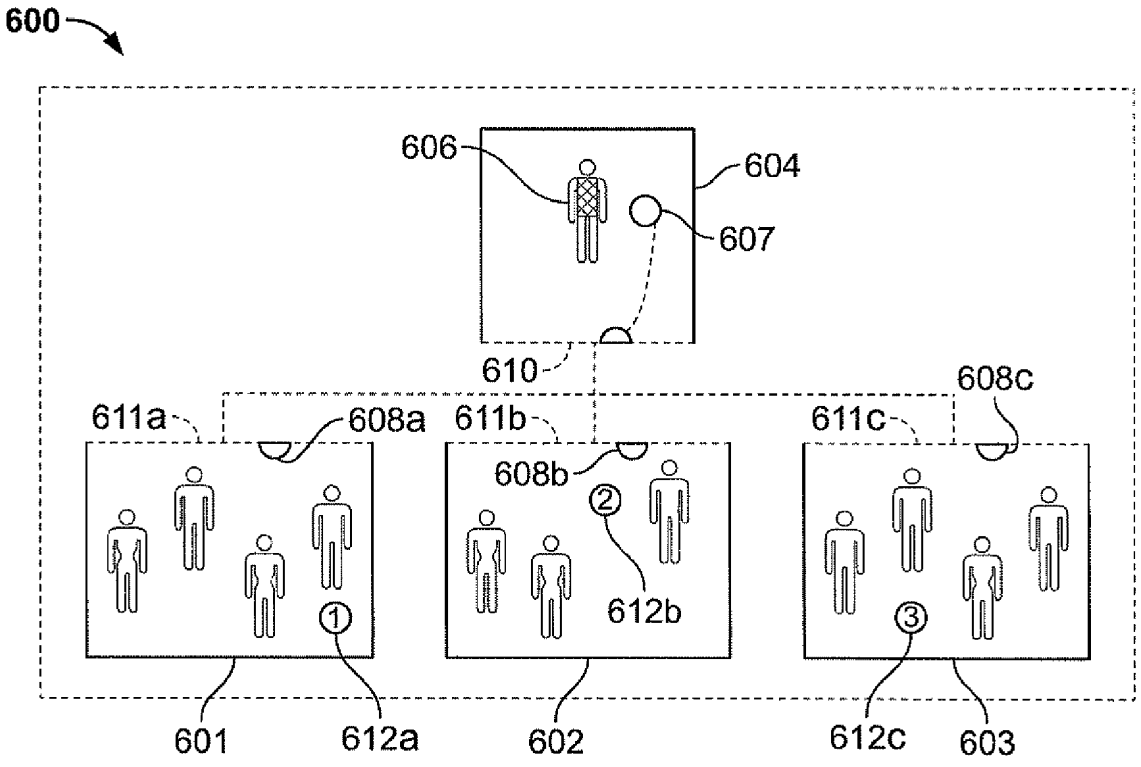

600
606
604
607
610
608c
611a
608a
611b
608b
611c
2
612b
1
3
601
612a
602
612c
603

FIG. 6

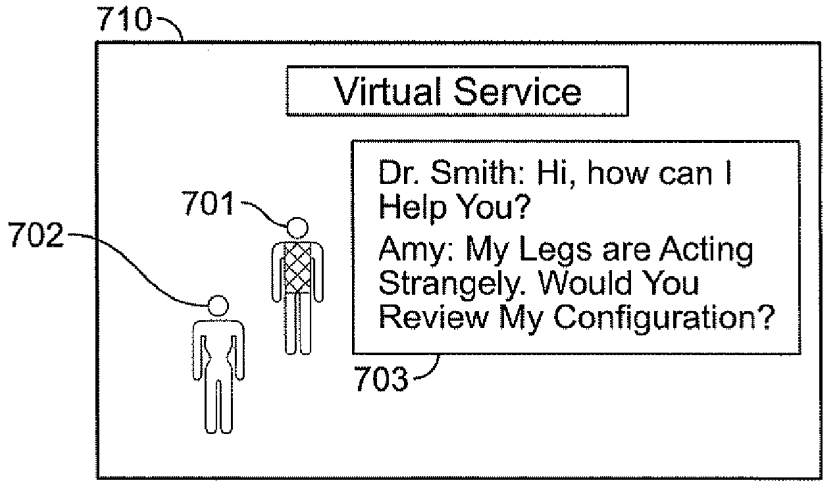


FIG. 7A

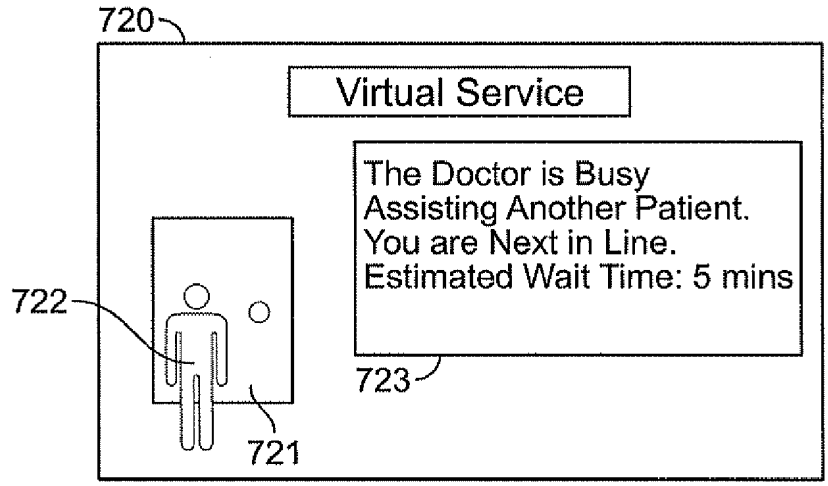


FIG. 7B

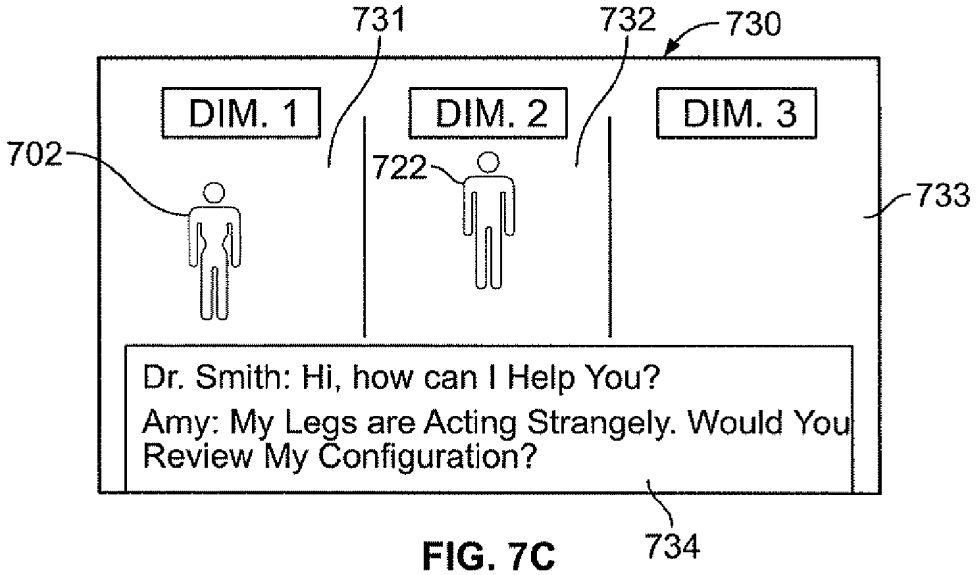


FIG. 7C

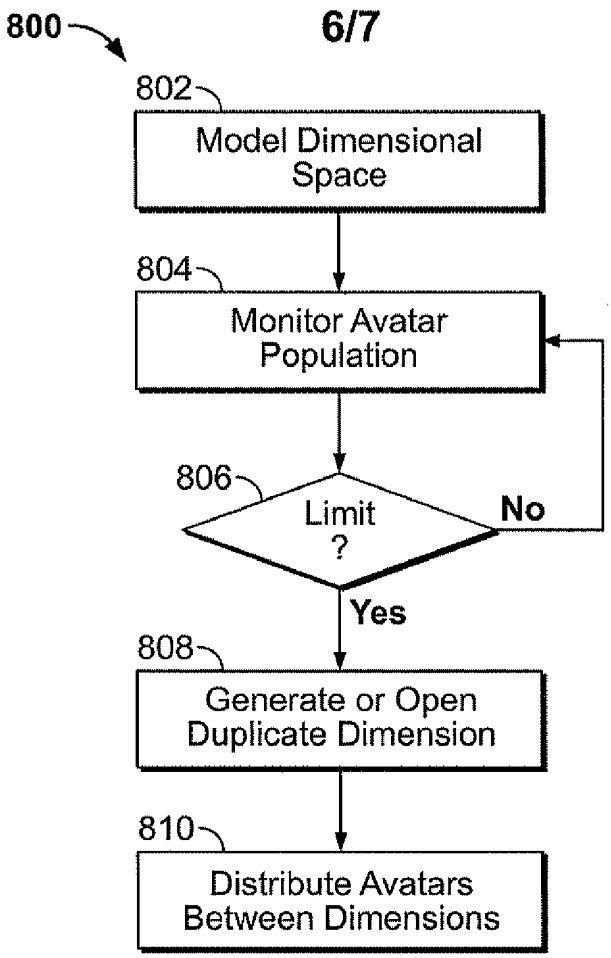

800
802
Model Dimensional Space
804
Monitor Avatar Population
806
Limit ?
No
Yes
808
Generate or Open Duplicate Dimension
810
Distribute Avatars Between Dimensions

FIG. 8

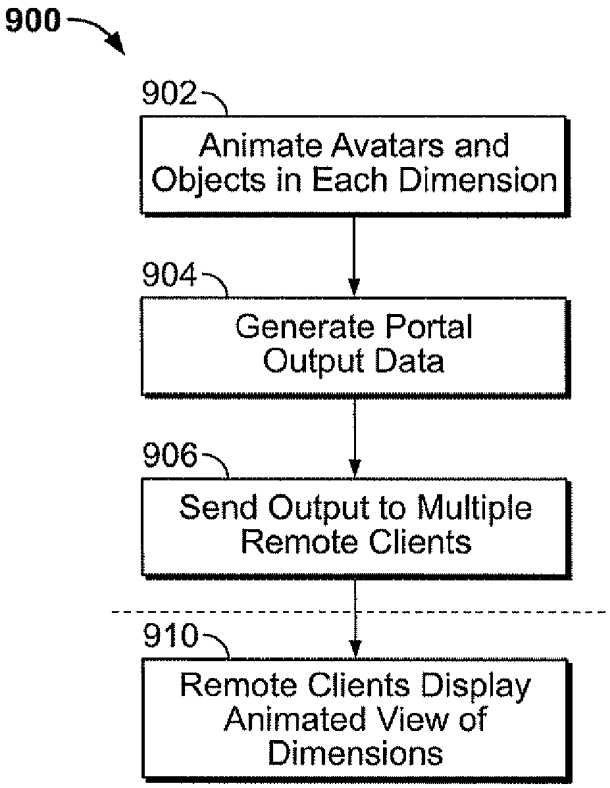

900
902
Animate Avatars and Objects in Each Dimension
904
Generate Portal Output Data
906
Send Output to Multiple Remote Clients
910
Remote Clients Display Animated View of Dimensions

FIG. 9

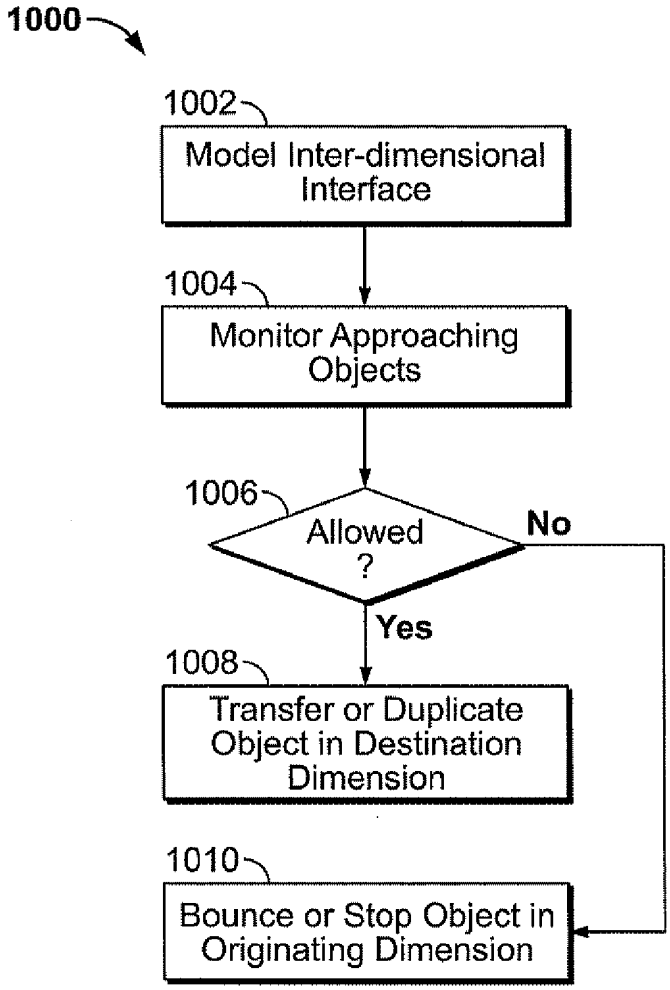
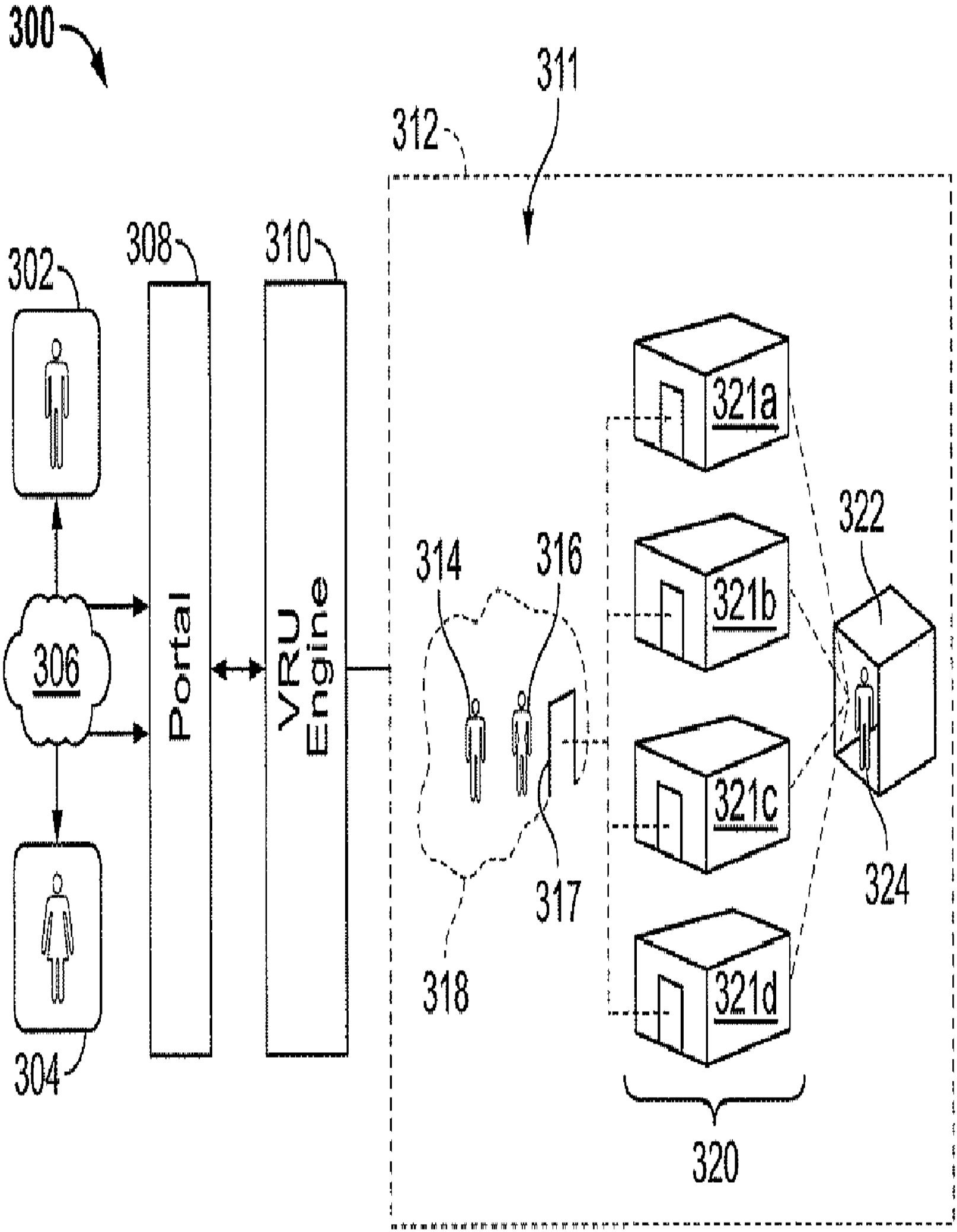

1000
1002
Model Inter-dimensional Interface
1004
Monitor Approaching Objects
1006
Allowed ?
No
Yes
1008
Transfer or Duplicate Object in Destination Dimension
1010
Bounce or Stop Object in Originating Dimension

FIG. 10


300
311
312
308
310
302
Portal
VRU Engine
306
314
316
321a
321b
321c
321d
322
324
317
318
304
320

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(71) Demandeur/Applicant:
IDEAFLOOD, INC., US

(72) Inventeurs/Inventors:
SHUSTER, GARY STEPHEN, US;
SHUSTER, BRIAN MARK, US;
ANDREW, WILLIAM HENDRICK, US;
FLESCH, ROBERT STEVEN, US

(74) Agent: GOWLING LAFLEUR HENDERSON LLP

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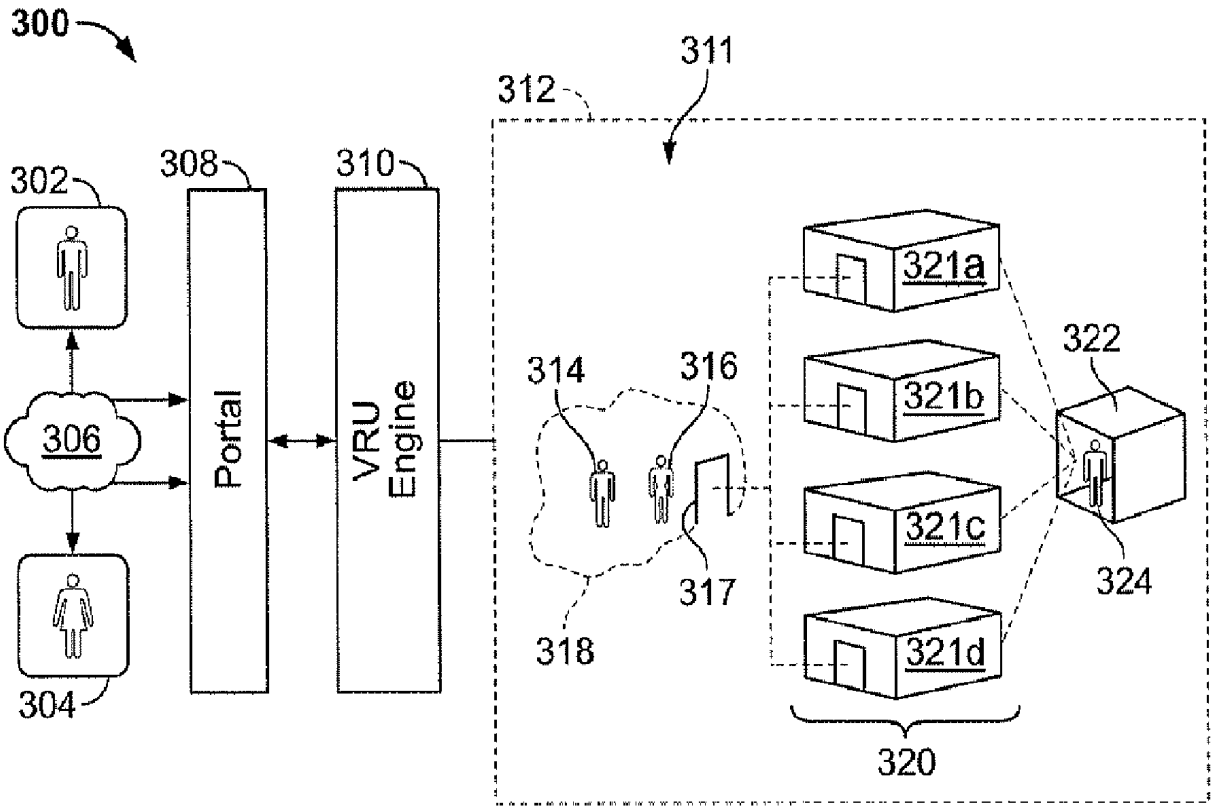
(54) Title: MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS



(57) Abrégé/Abstract:
A multi-instance, multi-user animation platform includes a plurality of modeled parallel dimensions in a computer memory. Each of the parallel dimensions may be an independent model of a physical, three-dimensional space having corresponding features such that the parallel dimensions are recognizable as counterparts to each other. Avatars are located within corresponding ones of the parallel dimensions so as to prevent over-population of any one of the parallel dimensions by avatars. Avatars are animated within different ones of the parallel dimensions using input from respective users to provide virtual-reality data. The virtual-reality data may be configured to cause remote clients to output an animated display of a corresponding one of the parallel dimensions and avatars therein.

CLAIMS

1. A method for managing a multi-instance, multi-user animation process, comprising:

modeling, using a computer, a plurality of parallel dimensions in a computer memory, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits that are defined by at least one model of a three dimensional object;

assigning ones of a plurality of avatars within the computer memory so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, so as to prevent over-population of any one of the parallel dimensions by avatars; and

animating ones of the plurality of avatars populating different ones of the parallel dimensions in response to input from respective corresponding ones of a plurality of clients to provide virtual-reality data, using the computer, the virtual-reality data configured to enable the clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

2. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions.

3. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions in response to user input signifying a request to relocate the avatar.

4. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions in response to determining that a population of avatars in the first one of the parallel dimensions has reached a predetermined limit.

5. The method of claim 1, further comprising generating an additional parallel dimension to accommodate an increase in avatar population.

6. The method of claim 5, further comprising relocating avatars from the plurality of parallel dimensions into the additional parallel dimension.

7. The method of claim 1, further comprising generating the plurality of parallel dimensions as replicas of a template space.

8. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that at least one object located inside the common space is visible from viewpoints located inside each of the plurality of parallel dimensions.

9. The method of claim 8, further comprising animating at least one avatar populating the common space in response to input from a corresponding client, to provide the virtual-reality data further enabling the corresponding client to output an animated display including at least a portion of each of the plurality of parallel dimensions and avatars populated therein.

10. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that a modeled object originating from the common space is capable of passing into at least one of the plurality of parallel dimensions.

11. The method of claim 10, further comprising replicating the modeled object passing into the plurality of parallel dimensions so that a replica of the object is modeled in each of the plurality of parallel dimensions after the object passes from the common space.

12. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that an avatar originating from the common space is capable of passing into one of the plurality of parallel dimensions.

13. The method of claim 12, further comprising selecting which one of the plurality of parallel dimensions the avatar is capable of passing into based on avatar populations of each parallel space.

14. The method of claim 12, further comprising selecting which one of the plurality of parallel dimensions the avatar is capable of passing into based on a corresponding user preference.

15. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that an avatar originating from any one of the plurality of parallel dimensions is capable of passing into the common space.

16. The method of claim 1, further comprising tracking analogous objects in different ones of the parallel dimensions and moving any displaced ones of the analogous objects so that positions of analogous objects within each of the parallel dimension tend to converge over time.

17. The method of claim 1, further comprising collapsing first and second ones of the plurality of dimensions into a combined dimension populated by the avatars formerly in the first and second ones of the plurality of dimensions.

18. The method of claim 1, further comprising synchronously animating an avatar present in multiple ones of the plurality of dimensions.

19. The method of claim 1, further comprising asynchronously animating an avatar present in multiple ones of the plurality of dimensions.

20. The method of claim 1, further comprising modeling an interface between adjacent ones of the plurality of dimensions.

21. The method of claim 20, further comprising modeling the interface to include an overlapping region interactive with both adjacent ones of the plurality of dimensions.

22. The method of claim 20, further comprising modeling the interface as a transparent object rendering the adjacent ones of the plurality of dimensions visible to each other.

23. The method of claim 20, further comprising providing a communication channel between avatars populating different ones of the plurality of dimensions.

24. A computer-readable medium encoded with instructions, that when executed by a computer, cause the computer to:

model a plurality of parallel dimensions, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits defined for the three-dimensional space;

assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and

animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

25. A computer comprising a memory holding instructions, that when executed by the computer, cause the computer to:

generate a plurality of parallel dimensions in a computer memory, each being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within defined spatial limits;

assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and

animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the clients to output an animated display of an assigned one of the parallel dimensions and avatars populated therein.

MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS

BACKGROUND

1. Field of the Inventions

The present invention relates to virtual computer-generated environments in which participants are represented by computer-generated avatars, and in particular for environments that simulate an actual 3-D environment and allow for simultaneous participation of multiple players.

2. Description of Related Art

Computer generated virtual environments are increasingly popular methods for people, both real and automated, to interact within a networked system. The creation of virtualized worlds, three dimensional or otherwise, is well known. Simple text based adventures such as "Zork", early "first person shooter" games such as "Doom", and ultimately numerous highly complex environments such as "Halo" are well known in the art. Various on-line environments are known in which a 3-D physical world (actual or fantasy) is simulated. Environments of this type are sometimes referred to as "virtual reality" or "virtual reality universe" (VRU) environments. In known VRU environments, an actual or fantasy universe is simulated within a computer memory. Multiple players may participate in the environment through a computer network, such as a local area network or a wide area network. Each player selects an "avatar," which may comprise a three-dimensional figure of a man, woman, or other being, to represent them in the VRU environment. Players send inputs to a VRU engine to move their avatars around the VRU environment, and are able to cause interaction between their avatars and objects in the VRU. For example, a player's avatar may interact with an automated entity or person, simulated static objects, or avatars operated by other players.

With the ubiquity of computer networking, engineers and designers included the ability for players within these virtual environments to interact. One drawback of the

VRU is that, as in the actual world, space is limited by environmental constraints. In addition, limitations on computer processing speed, network bandwidth, and other factors also limit the number of participants and the richness of environment. Accordingly, prior art VRU environments may limit the number of simultaneous players and their methods of interactions for various reasons, including to avoid exceeding the programming, networking, and hardware limitations of the servers and/or clients.

Such limitations may be present in "massively multiplayer" environments, such as "Everquest" or "Second Life", which are built specifically on the concept of mimicking real world environments, including the natural capacity of real world environments to hold numerous simultaneous inhabitants. Such limitations may be implemented in a less than desirable manner because they limit the ability of the VRU to accommodate the wishes of its clients. However, such limitations are provided for various reasons, including because (a) server capacity is incapable of simultaneously handling the number of users desired or (b) client capacity, for each user, is insufficient to process and display the data needed for such user's computer to appropriately and adequately render avatars or other representations of the other users, and otherwise construct a complete and accurate representation of the environment; or (c) independent of hardware or software capacity considerations, limitations imposed by geometric constraints of the simulated environment, or simply put, lack of simulated space.

Mechanisms to address server capacity and client capacity issues, while flawed, exist in the art. Such mechanisms may include automatically moving avatars from one portion of the environment to another (with or without the player's consent), barring additional avatars from entering an environment once a defined capacity is reached, limiting the ability of inhabitants of the environment to interact with each other and the environment, and having servers operate completely (or partially) independently.

For example, one problem in implementing a VRU arises from its presentation of content in a virtual approximation of real, three-dimensional space. As a result, there is a limit on how much modeled space can be occupied at the same time. When using the

HTTP application layer or other conventional internet modalities, the number of users able to participate on a web site simultaneously is limited only by the computing power and network bandwidth available to the site hosting the page. In contrast, a VRU mimics the three-dimensional space found within the physical world and therefore the space limitations found in the real world also are experienced within the VRU. These include such limitations as the inability to realistically depict multiple users in the same place, the inability of users to walk through the same doorway simultaneously, the inability to exceed occupancy limitations, and similar real world space limitations. Because VRU users are visible to other users, they occupy space, a portion of the visual field, or both.

The problem may be further demonstrated with the example of a nightclub within a VRU. The nightclub would be represented as a fixed area of space within the VRU. While the VRU could in theory have a nightclub of enormous dimensions, there would be areas within the nightclub, such as proximate to a stage or proximate to celebrities present therein, which would be very desirable areas to inhabit. As a result, whether the area at issue is described as the full nightclub or the more desirable areas therein, some or the entire nightclub may have less space available for occupancy than there are people who desire to have their avatars occupy it. While the same solutions exist in a VRU as exist in the real world for increasing occupancy capacity (i.e. making the facility bigger, packing more people in with less space available to reach, etc.), the very limitations found in those real world solutions would apply in a VRU.

A second problem common to VRU's is that they depend on their various users' computers to render the environments that are presented within the VRU. Thus, there are limitations on how many avatars, objects, textures and other features can be rendered and animated for each user. Again utilizing the example of a nightclub, if the dimensions of the nightclub were drawn so that 10,000 avatars could simultaneously be accommodated, seen, and interacted with, each user computer would be tasked with tracking, rendering and animating each of 10,000 autonomously controlled avatars. Similarly, avatars within the same space, when permitted to communicate with each other, whether via chat, voice over IP, or otherwise, may generate too much content to

permit effective communication.

It is desirable, therefore, to resolve these problems and to provide access for greater numbers of avatars within a VRU space while minimizing undesired experiences for VRU participants, and providing new, more varied and interesting opportunities and experiences for users within the VRU space.

SUMMARY

The instant inventions disclose a method, system and apparatus for dynamically establishing and managing multiple instances of a space within a VRU. Such multiple instances may be referred to herein as "dimensions." The inventions allow for the creation of an unlimited number of duplicate instances of a space in a VRU, which instances are created dynamically, and which instances users can interact across. Furthermore, the inventions permit such dimensions to be utilized in a manner that does little or nothing to impair the ability of the VRU to emulate those portions of the real world environment that may be crucial to a positive user experience within a VRU.

In an embodiment of the inventions, once the occupancy capacity of an area has been met, another attempt to access the area by an additional avatar may trigger creation of a new instance, or dimension, of the area. The new area may then be populated with avatars subsequently seeking to enter that area of the VRU environment. The term "new dimension" or "duplicate dimension" encompasses a virtual space such as may be provided by duplication of certain portions of the content within an area, such as, for example, walls and other simulated structural elements, a stage and all participants thereon, or other elements. This may be accomplished, in the alternative by making the elements which are not desired to be duplicated (i.e. avatars) invisible and inaccessible to other, similarly non-duplicated elements (i.e. other avatars).

Further attempts to access the area may populate the new dimension until such time as the new dimension reaches its occupancy capacity, at which time an additional new dimension would be generated and the cycle repeated.

It is to be understood that in other embodiments, other algorithms for populating

dimensions may be used. Such algorithms may include, for example, adding new avatars to the least populated dimension. Thus, if one or more avatars have left the first dimension after the creation and population of a second dimension, new users might be preferentially placed in the first dimension before the second dimension reaches its occupancy capacity. For further example, avatars may be added approximately evenly across several dimensions all of which are below their occupancy capacity, and/or avatars may be placed in one of duplicate dimensions based on the users' status, achievements or other classifications. Users may also create their own duplicate dimension with limited enrollment or purposes. These may include and/or permit, without limitation, (a) themselves; (b) a private ,party; (c) members of a group; (d) the public at large; (e) paid attendees; and/or (f) specified invitees.

In embodiments, avatars may be distributed to a new dimension from one or more crowded dimensions. Crowding may be determined by various measures. For example, an optimal or "full" level of population for a particular dimension may be determined. Avatars may be allowed to continue to populate such dimensions in excess of their optimal capacity. New dimensions may be formed by transporting avatars from one or more of the dimensions into a new dimension when a trigger event occurs. Trigger events may include, for example, one or more dimensions exceeding their optimal occupancy capacity by some amount or percentage; and/or when the overall number of users in all relevant dimensions would warrant the creation of a new dimension, when at least one of those dimensions exceeds its optimal occupancy capacity. Thus, for example, if Dimension A exceeds its optimal capacity by 30% and Dimension B exceeds its optimal capacity by 30%, Dimension C is created and some users from Dimension A and Dimension B are imported into Dimension C. In the alternative, a trigger event may occur at some level less than the optimal or full occupancy level, for example, to leave room for preferred users of a particular dimension.

Two or more dimensions may be combined to form a larger dimension containing all the participants of the former dimensions. Likewise one or more dimensions may be split up into a number of smaller dimensions, with avatars assigned to dimensions

based on random selection, user preferences, user profiles, and/or other criteria. Various triggers may be used to determine when a dimension should be combined or split up, such as, for example, the population of the dimension falling above or below a defined threshold.

In other embodiments, avatars may populate dimensions based on user generated preferences. Thus, for example, a Spanish speaking user may prefer to populate a dimension shared by other Spanish speaking users, even if such a dimension has, for example, fewer avatars than other available dimensions which are populated predominantly of speakers of other languages. Similarly, users from language groups that are more easily translated in a mechanical manner into the other users' languages may be treated as a single group. Thus, for example, if Spanish and French are more easily translated between than are Spanish and Chinese, the Spanish and French users may be grouped together in a dimension having a translation function.

In other embodiments, avatars may populate dimensions based on preferences deduced from the user's supplied information or information otherwise obtained about the user. Thus, for example, a user may prefer to populate a dimension shared by users that appear on his list of friends, even if such a dimension has, for example, fewer avatars than other available dimensions which are populated predominantly by users who do not appear on their list of friends. Similarly, a user may wish to avoid dimensions which are populated by users on their list of ignored users. Algorithms that incorporate users' information including their friends, friends of friends, ignored users; as well as users who belong to groups or groups with similar interests to groups that the user is involved with are all examples of preferences that could be used to deduce a preferential dimension for a user to join.

Users may be given the opportunity to travel between dimensions, optionally subject to defined limits or conditions. Thus if a user is directed to populate a certain dimension, yet they would prefer to populate a different dimension, the user may select to have their avatar change dimensions to the desired dimension. Users may transport themselves to the desired dimension unless restricted from doing so by factors including

but not limited to: that the desired dimension is restricted; that the desired dimension is private; and/or that the desired dimension is at or above its relevant occupancy capacity. Transport to different dimensions may be accomplished, for example, by clicking on the name of or a link relating to a user, an avatar or an object, or by manipulating an avatar so that enters a portal which may lead, either directly or through one or more additional portals, to a corresponding space in a different dimension. The avatar may then be transported to the dimension where the user, avatar, or object resides. In the alternative, or in addition, a VRU space may include "locked dimensions," that do not permit travel to and/or from the dimension, or that impose other restrictions not generally imposed on other dimensions in the VRU space.

Different dimensions may be related to one another and to interact or influence one another in defined ways. For example, users may also be permitted to observe other dimensions without being visible and/or able to interact with those dimensions at all. This may be useful, for example, prior to travel to such dimension, or if a user is merely interested in observing interactions of others. Users may be permitted to obtain information about what dimensions other users are in, such as users who are marked on the user's friends list or ignored users list.

Users may be given the option to chat between dimensions; i.e., with users populating other dimensions. Such chat may include private chat; public chat; or group chat or any other channel of chat that the user may desire. Thus, public chat may, for example, aggregate chat from more than one dimension. In the alternative, or in addition, the public chat may not aggregate more than one dimension, but individual users may wish to monitor or participate in public chat (or any other channel of chat) from dimensions other than the one in which their avatar presently populates.

In an embodiment of the inventions, a defined area or portion of multiple dimensions may be visible to, and/or interact with, other parts or members of the dimensions. For example, a stage area may be defined that is visible and audible in multiple dimensions surrounding the stage area. Access to such a stage or common area may be limited in any desired way. Actions on the stage may affect multiple

dimensions. For example, if a robot avatar or normal avatar throws an object out of a stage area into a surrounding nightclub, as the object passes a boundary between the stage area and the multi-dimensional nightclub floor, the thrown object may be replicated and appear in each of the surrounding dimensions.

Likewise, the surrounding multi-dimensional areas may influence a common area. Continuing the nightclub example, a performer on a common stage may receive audience feedback from multiple surrounding dimensions. For further example, a storefront may comprise a common area in which an avatar for a sales clerk may reside. The clerk may service avatar customers from multiple dimensions, with priority of service determined in different ways. For example, customers in different dimensions may summon the clerk, which may be depicted as "busy" (for example, depicted as interacting with another avatar) at times when the clerk is occupied with servicing a customer in another dimension. The waiting customer may be given a message with an estimated wait time, or an offer to make an appointment with the clerk. If multiple customers are waiting, they may be queued and serviced in any order desired by the clerk. For example, repeat customers may be serviced first.

In both of the foregoing examples, the performer and the clerk provide examples of an object - e.g., an avatar - that has a multi-instance presence in more than one dimension. In an embodiment of the invention, the presence in multiple dimensions may be asynchronous. In other words, each instance of the object in multiple dimensions may be generated asynchronously, depending on input from each dimension. In the alternative, the object may be generated synchronously, meaning as a single instance using the same input for each dimension.

A more complete understanding of the method and system for managing multiple dimensions in a VRU space will be afforded to those skilled in the art, as well as a realization of additional advantages and objects thereof, by a consideration of the following detailed description of the preferred embodiment. Reference will be made to the appended sheets of drawings, which will first be described briefly.

In accordance with an aspect of the present invention, there is provided a method for managing a multi-instance, multi-user animation process, comprising: modeling, using a computer, a plurality of parallel dimensions in a computer memory, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits that are defined by at least one model of a three dimensional object; assigning ones of a plurality of avatars within the computer memory so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, so as to prevent over-population of any one of the parallel dimensions by avatars; and animating ones of the plurality of avatars populating different ones of the parallel dimensions in response to input from respective corresponding ones of a plurality of clients to provide virtual-reality data, using the computer, the virtual-reality data configured to enable the clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

In accordance with another aspect of the present invention, there is provided a computer-readable medium storing instructions, that when executed by a computer, cause the computer to: model a plurality of parallel dimensions, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits defined for the three-dimensional space; assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

In accordance with another aspect of the present invention, there is provided a computer comprising a memory holding instructions, that when executed by the computer, cause the computer to: generate a plurality of parallel dimensions in a computer memory, each being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within defined spatial limits; assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the clients to output an animated display of an assigned one of the parallel dimensions and avatars populated therein.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic diagram showing a system according to the inventions.

Fig. 2 is a schematic diagram showing a system according to the inventions.

Fig. 3 is a schematic diagram showing aspects of a system with multiple dimensions according to the inventions.

Fig. 4 is a block diagram showing aspects of a system for handling multiple dimensions according to the inventions.

Fig. 5 is a schematic diagram showing aspects of a method for managing multiple dimensions according to the inventions.

Fig. 6 is a block diagram showing aspects of managing an interface between multiple dimensions according to the inventions.

Figs. 7 A - C are exemplary simplified screenshots of user displays according to the inventions.

Figs. 8 - 10 are flow diagrams showing exemplary steps of methods according to the inventions.

DETAILED DESCRIPTION OF VARIOUS EMBODIMENTS

Referring to Fig. 1, a system 100 for providing a VRU to multiple users may comprise plurality of client sites, nodes or terminals, for example a personal computer 104, portable computers 106, 110, a compact player, cell phone or digital assistant 108, and/or router 112 communicating via a WAN 102 to one or more servers 114. Servers 114 store and serve VRU data and software to the client sites. Software or firmware may also be located at each client site, configured to work cooperatively with software or firmware operating on servers 114. Generally, any number of users may be communicating with servers 114 for participation in the VRU at any given time.

Referring to Fig. 2, a system 200 for providing a VRU according to the invention may be considered to be comprised of server-side components (to the left of dashed line 222) and client-side components (to the right of dashed line 222). Server-side components may comprise a portal 220 for managing connections to multiple simultaneous players. Portal 220 may interact with a VRU engine 218, passing user input from multiple clients to a VRU engine, and passing data from the VRU engine to respective individual players. VRU engine 218 may be operatively associated with various memory spaces, including dimensional spaces 208 holding two or more parallel dimensions 212, 214, 215 and 216, and a personalized or common data space 210. As known in the art, objects in a VRU are modeled as three-dimensional objects, or two-dimensional objects, having a defined location, orientation, surface, surface texture, and other properties for graphic rendering or game behavior. Dimensional memory space 208 may hold active or inactive instances of defined spaces used in the VRU environment. For example, the environment of a popular simulated nightclub may be replicated indifferent spaces. Personalized space 210 may be comprised of various different personal areas each assigned to a different user, for example, avatar or avatar accessories data. The VRU engine may operate with other memory areas not shown in Fig. 2, for example various data libraries, archives, and records not inconsistent with the

methods and systems disclosed herein.

In an embodiment of the invention, each user may customize an avatar to have an appearance and qualities specified by the user, by choosing avatar characters, features, clothing and/or accessories from an online catalog or store. The particular arrangement selected by a user may reside in a personalized space 210 associate with a particular user, specifying which avatar elements are to be drawn from a common space to construct an avatar. In an embodiment of the invention, a customized avatar instance may be stored in a personalized space for the user. In the alternative, or in addition, a user may own customized elements of an avatar, including clothing, accessories, simulated physical powers, etc., that are stored solely in the personalized space and are not available to other users. Avatars may move and interact both with common elements and personalized elements.

A separate administration module 202 may operate at the server level to create, update, modify or otherwise control the content of the VRU as defined in the memory areas 204 and 210. Generally, changes in the personal space area 210 are driven by individual users, either through the VRU administrator 202 or another module. Control of common areas, i.e., the game environment and the objects in it, including any multi-dimensional areas, may be via the administrator module 202.

At the client level, a player interface module 224 may be installed to receive player inputs from one or more user input devices 228, such as a keyboard, mouse or other pointer, or microphone, and provide data to the VRU engine 218 via portal 222 in response to the input. The player interface module may also receive game data from portal 220 and process the data for display on display 226 and/or for audio output on speaker 230. Various systems and methods for providing a three-dimensional, multiplayer interactive animation to multiple players are known in the art, or may be adapted by one of ordinary skill for use with the invention. For example, rendering of a scene may be performed at the client or server level. Generally, it may be advantageous to perform calculations and graphics operations, to the extent possible, at the client level, thereby freeing up network bandwidth and minimizing loads on the

server. The invention is not limited to a particular hardware or software architecture for carrying out the steps described herein.

Fig. 3 shows in schematic fashion a system 300 for providing a multi-user, multi-dimensional animation. System 300 comprises a portal or interface 308 connected to receive data, such as through a wide area network 306, from a plurality of users 302, 304 (two of many shown). Users 302, 304 may operate a client computer having a web browser or application configured to communicate animation commands to VRU engine 310 via interface 308. VRU engine 310 may model a virtual three-dimensional environment 311 within a computer memory 312. A first user 302 may provide commands via portal 308 to VRU engine 310 used to control the operation of a first avatar 314. Likewise, a second user 304 may control a second avatar 316.

Environment 311 may include multiple scenes or regions modeled to simulate a region of space, for example, the surface of a planet or region thereof, the inside of a room or building, the surface of an island, and so forth. It should be appreciate that Fig. 3 presents a highly simplified schematic view of a modeled environment. An actual modeled environment may be highly complex, including thousands of different modeled spaces, some or all of which may exist in more than one dimension. Modeled scenes or spaces may be of different types, meaning they may be modeled according to different rules. They are connected in that transportation between spaces is allowed, at least for some avatars in the environment 311.

The environment 311 may allow for the passage of avatars between scenes via simulated portals or transportation elements, for example, simulated doorways, teleportation terminals, roads, cars, trains, etc. By entering a portal or transportation element, an avatar may leave a first scene and be delivered to a second scene being simulated in the memory 312. One of the tasks of the VRU engine may be to keep track of the various portals and transportation elements between scenes, operating these elements when requested by users, and adding or deleting portals as scenes are added or deleted. Generally, portals should act in a stable, predictable manner so that a user may navigate his or her avatar through the simulated environment 311 to accomplish

the user's objectives. For example, a simulated doorway at the simulated 100 East Main Street address of the simulated public road system in Computerville should always lead to the registered tenant at that address, be that a private residence or business. For further example, some transportation elements, for example teleportation portals or subways, may lead to different destinations. However, in this case the transportation element should be configured to allow the user to control the destination of the user's avatar, if so desired.

VRU engine 310 may operate such that some scenes in environment 311 may be capable of being replicated to create another instance of the scene, for example multi-dimensional spaces 320, while other scenes cannot be replicated, for example a non-replicable or mono-dimensional space 318. Thus, environment 311 may contain both types of spaces, as well as portals or transportation elements allowing avatars to transport between multi-dimensional and mono-dimensional spaces. Avatars 314, 316 present in mono-dimensional space 318 may be transported via portal 317 to anyone of the multi-dimensional spaces 320. Conversely, avatars in the multi-dimensional spaces 320 may pass into space 318 via portal 317, which may be replicated as an instance in each multi-dimensional space 321a-d. Multi-dimensional spaces 320 may originate as a single mono-dimensional, bounded modeled space. If the space becomes overly crowded, it may be replicated in any number of instances to provide room for growth in the population of avatars. However, the replicated space is not merely a copy, but rather exists as a connected part of the same environment 311. For example, space 321d may be a popular virtual nightclub originally existing in a single instance. As the popularity of the club grows, it may be desirable, for example, to replicate the nightclub experience for new customers. Hence, each dimension 321b, c and d may be created in response to population threshold of the existing club's instances being exceeded. Each additional dimension may allow for two-way travel through a portal 317 to a common area, or through any number of alternative portals.

The additional dimensions 321b-d may therefore provide the advantages of accommodating any number of users without requiring users to subscribe to a new game or environment 311. The most popular and successful destination in the

environment 311 may therefore be enjoyed by more users, almost without limit. User's are therefore not required to exit a particular game or environment to enjoy these popular attractions. Likewise, users need not be cut off from communicating with or otherwise interacting with any other users participating in the multi-user environment 311 while still being able to freely access the most crowded destinations within the environment.

The existence of multiple dimensions 320 may be revealed or hidden from some of all users 302, 304. In an embodiment of the invention, some or all users may enter into one or a series of multi-dimensional spaces without being aware of the existence of other dimensions. In the alternative, users may be given an indication that their avatars have entered or are entering a space for which multiple instances exist. Both alternatives may co-exist within the same environment 311, depending on the identity of the user and desired characteristics of a multi-dimensional space.

Environment 311 may further comprise one or more common spaces 322 that provide for simultaneous interaction with multiple instances of parallel dimensions 320. For example, a common space may comprise a stage to a club or theater. The interior of the common space may be visible and/or audible in each of the dimensions 321a-d. An avatar or other object in the common space 322 may be able to pass into each of the parallel spaces, being replicated in the process. Certain objects or avatars may also be able to pass from the parallel dimensions 320 into the common area. For example, avatars may queue up inside of different parallel dimensions and be granted access to the common area 322 in sequence. For further example, some avatars may be granted special rights or powers that permit them to enter a common space 322 that permits simultaneous interaction with multiple dimensions. Various other exemplary interactions between common spaces and parallel dimensions will be described in the detailed description below.

Fig. 3 may also serve to illustrate an alternative embodiment in which users are segregated into independent, isolated groups that simultaneously share a simulated space or facility. In this embodiment, the dimensions 321a-d may represent isolated

groups of avatars and interactive objects. Such groups may be contained within a non-interactive common environment, such as the walls, ceilings and floors of a simulated nightclub or other space. The non-interactive common environment may serve as common backdrop that is shared by the different groups 321a-d, which need not be aware of one another's existence. This embodiment serves to illustrate that the experience of multiple parallel dimensions may be implemented in various ways.

Fig. 4 is a block diagram showing exemplary aspects of a multi-dimensional system 400. System 400 may be implemented, for example, by a server or group of servers operating at a network-accessible site. Input data 402, including for example user commands or data used to direct the motion of avatars and other objects, may be provided to system 400 via a portal. Output data 404, including for example virtual-reality data configured to cause remote clients to output an animated display of a corresponding one of the parallel dimensions and avatars therein, may be output to a portal module for distribution to remote clients.

System 400 may comprise an avatar manager component 406 operably connected to a database 408 of avatar data. Like other components of system 400, the avatar manager component 406 may be implemented in any suitable software, hardware, or combination thereof. The avatar manager may process incoming user command and associate commands with corresponding avatar and other object data. For example, the avatar manager may ensure that each avatar is configured according to user commands with clothing, accessories, or gear available to its corresponding user. The avatar manager may communicate with a dimensional configurator 410 and population manager 418 to ensure that each avatar is placed correctly in one of parallel dimensions managed by the configurator and population manager. The avatar manager may further communicate with an animation component 414 to ensure that each avatar is positioned and moved in accordance with user commands. In addition, the avatar manager may cooperate with a communications component that operates to allow communication, for example text or audio chat, between different users.

A population manager 418 may monitor the population density of avatars in

defined area of the environment, or more generally throughout the environment. If a population threshold is exceeded, the population manager may instruct the dimensional configurator 410 to generate or activate another instance of the overcrowded area. Likewise, the population manager may monitor parallel dimensions, and instruct the dimensional configurator to collapse two or more parallel dimensions into one, if population density falls below a defined threshold.

A dimensional configurator 410 may generate or activate additional parallel dimensions as needed to accommodate population growth. Essentially, the configurator may generate another instance of a crowded space within a virtual-reality environment by copying an existing space or template. In the alternative, different avatar populations may share common elements defining the envelope of a modeled space. Elements of modeled spaces may be stored in a dimensional database 412 in operative association with the configurator 410. The configurator may also ensure, in cooperation with the avatar manager 406, that each dimension is correctly populated with avatars. The configurator 410 may also operate to collapse empty or sparsely populated ones of parallel dimensions. For example, the configurator may move remaining avatars to another dimension and inactivate or delete the emptied dimension.

A communications module 416 may operate more or less independently of other components to enable communication, such as chat, between different users. In an embodiment of the invention, chat operates independently of animation. In the alternative, a chat process may be coordinated with avatar animation. For example, an avatars lips may move in sync with audio chat. In either embodiments, the communications module may allow users to chat with other users corresponding to nearby avatars. In addition, the communications module may permit users to place a chat "telephone call" to any user logged into the system, regardless of the relative locations of the users' avatars.

An animation component 414 may operate to process user commands, dimensional data and other model data to produce simulations of all active parallel spaces and other active regions of the modeled environment. Generally, a space or

region may be considered active if it is within sight of a user-selected viewpoint. Various methods are known for simulating avatars and objects within modeled spaces, and any suitable method may be used. In addition, it is anticipated that new method may be developed that may also be suitable. In general, any method that is suitable for modeling non-parallel, regular region of modeled space should be readily adaptable to modeling parallel dimensions.

The animator 414 may produce raw model data that is not configured for efficient distribution to remote clients. Accordingly, the animator may cooperate with an output control module 420 to prepare the output data 404 for distribution to remote clients. This may include translation or transformation of the animated model data from the animator to a format that is suitable for distribution to system clients. The form of translation or transformation will depend on the application software used at the client level and other details that should be apparent to one of ordinary skill.

In another preferred embodiment, various ones of the dimensions may overlap, for example, to prevent users from experiencing an overly empty dimension. Such overlap may be geographical (i.e. areas within a virtual "club" or other environment), overlap between users grouped into dimensions, or otherwise. Referring to Fig. 5, an exemplary multi-dimensional system 500 is shown schematically, as it might be represented in a system memory. System 500 may comprise a first dimension 502 adjacent to a second dimension 504, representing, for example, areas of a virtual nightclub. The first dimension may be connected to a common space 506 via a transparent interface 507. The common space may represent, for example, a stage area. The first and second dimensions may be demarcated by a pair of interfaces 512, 514 that define an overlapping region 510 belonging to both dimensions 502, 504. Interfaces 512, 514 may also be transparent, so that all parts of the system 500 interior are potentially visible from viewpoint in anyone of areas 502, 504 and 506. The parallel dimensions 502, 504 may also be enclosed by a common wall. In general, avatars within the parallel dimensions 502, 504 may not be able to pass through the interfaces 507, 512 and 514. In an embodiment of the invention, however, passing through one of the interfaces 512 and 514 may trigger a reassignment to another dimension designed

maintain the user within an assigned group of avatars.

With reference still to Fig. 5, one implementation of this embodiment may be to create four instances of a nightclub, with four different audiences (A, B, C, and D), as shown in Table 1 below.

TABLE 1.

Instance Number	Audience Area 1	Audience Area 2
1	Group A	Group B
2	Group C	Group D
3	Group D	Group A
4	Group B	Group C

The nightclub appears to be fully contiguous to all avatars in every instance, but the population of Areas 1 and 2 (corresponding to spaces 502, 504, respectively) depends on which instance and audience area an avatar is located in. Thus, for example, in Instance Number 1, Audience Area 1, an avatar looking into Audience Area 2 may see Group B. However, when the avatar moves into Audience Area 2, it may be automatically transitioned to Instance 3. Therefore, from the viewpoint of this avatar when looking back toward the stage, Group D is seen within Audience Area 1, and the avatar remains in Group A, albeit on the other side of the group.

Boundaries between the two Audience Areas, and between Audience Area 1 and the stage, may be referred to as an "interface". The interfaces may be sharp, with no overlap, or there may be areas within the interface where multiple instances of the universe may exist simultaneously. Similarly, communication (visual, audio, chat, or otherwise), may be implemented across interfaces potentially limited by proximity of users to the interface. For example, an avatar 518 present in region 510 may be able to

chat with avatar 520 in Audience Area 1, even if the avatar 518 belongs to a different group than present in Area 1.

The common dimension 506, or the stage area in the diagram above, may be created in a manner in which the performer 516 will be visible to all users in all instance numbers. Some audience groups, or members, may be permitted to interact with the performers and may be selected by any of a number of criteria, including without limitation paid members, early arrivals, random selection, etc. The performers may optionally see only one or more groups of users, may see all users even if shown via different computers, screens or windows or by representative methods such as statistics, applause meters, etc. The audiences from multiple dimensions may also be rendered translucently and overlain on each other, so as to make additional members visible to the performers.

In embodiments of the inventions, multiple end users may be merged into the same avatar with or without the ability to share control of the avatar. For shared control, the control inputs of multiple users may be aggregated in order to generate activity, or may be granted in a round robin or other manner. One example of this would be to permit people in multiple dimensions at a nightclub to get into the "stage diving" line, and then inhabit a single avatar which is then permitted to enter the "performer" dimension, be seen by all users, and then jump off the stage, disaggregate, and land, each user into his own dimension.

Objects moving from a common dimension may optionally automatically replicate when crossing an interface into a parallel dimension so as to replicate into multiple instances of themselves. Fig. 6 is a diagram showing an exemplary system 600 comprising a common dimension 604 linked to parallel dimensions 601, 602, and 603. In embodiments of the inventions, such replication may place a copy of the item into each dimension or instance of linked to the common dimension. The item may then be independently manipulated and utilized within each dimension or instance. Optionally, the items may be marked, numbered, or tracked by the dimension into which they first were replicated. For example, a performer avatar 606 may throw a ball 607 towards

interface 610. As the ball penetrates the interface, it may be subtracted from common space 604 and appear as separate independent instances 608a-c in parallel dimensions 601, 602 and 603 respectively. Essentially, any number of new objects may be generated in this manner. After penetrating fully past the respective interfaces 611a-c, the newly-generated balls may exist as new objects 612a-c, respectively.

Common areas linked to multiple dimensions may also be useful for commercial use, for example, the provisions of services or virtual products. Some such application may involve the personal attention of a merchant or service provider. Such a user may desire to be marketed in all linked parallel dimensions, but cannot simultaneously serve users in different dimensions. For such applications, it may be desirable to manage the interface between the common area and the parallel dimensions to permit both pan-dimensional presence for the merchant or service provider, and personal service for each customer. Figs. 7A-C are simplified screenshots exemplifying an implementation of an exemplary method for accomplishing this objective.

Fig. 7A shows a screenshot 710 representing system output data such as may be provided to a first user having an avatar 702 in a first parallel dimension visiting an avatar doctor 701 located in a common dimension. A client computer belonging to the first user may take the output data and render a display such as shown. The first user may see an animation of her own avatar 702 conversing with the doctor 701. A chat window 703 may comprise chat text of a conversation between the doctor and the first user. Other objects, for example virtual wares if the user of the common dimension is a merchant of such wares, may optionally be shown to the first user.

Fig. 7B shows a screenshot 720 similarly representing data provided to a second user operating an avatar 722 located in a second parallel dimension. This user may see an animation indicating that the doctor is busy with another patient. For example, a view of a closed door 721 may be presented. Alternative presentations may include, for example, a robot avatar receptionist for the doctor. Optionally, a message box 723 may be provided explaining the status of the doctor, the second user's place in the doctor's queue, an estimated wait time, or any other desired information, including but not limited

to advertising.

Fig. 7C shows an exemplary screenshot 730 similarly representing data that may be provided to a user of the common dimension. Such a user may be presented with views of all linked parallel dimensions. The illustrated example shows tiled views, but any other arrangement, for example overlays or successive views, may also be used. In this example, the doctor sees the active patient 702 and a view 731 of the first dimension where the active patient resides. A chat window 734 showing the active conversation may also be displayed. The doctor may also see a view 732 of the second dimension showing the patient 722 waiting there. In this example, a view 733 of a third dimension is provided showing no patients waiting in that dimension. In the alternative, views of dimensions with no waiting patients may be omitted. Any number of parallel dimensions may thus be made visible to a user operating in a common dimension.

According to the foregoing, therefore, parallel dimensions may be implemented in a computer platform using programming steps that should be apparent to one of ordinary skill in view of the present disclosure. Fig. 8 shows exemplary steps of a method 800 for managing multi-instance, multi-user animation platforms, such as may be implemented in a VRU environment.

Step 802 may comprise modeling a plurality of parallel dimensions in a computer memory. Computer modeling of three-dimensional spaces is known in the art. Such models may conform to rules that mimic the physical environment on earth, or may use modified rules to simulate other environments. Any suitable model and method of modeling may be used. As used herein, a "parallel dimension" means a duplicate or recognizable counterpart of a bounded, computer-modeled space that is accessible via a common environment. Parallel dimensions may be created, for example, by copying element of an existing space or template for a space in the computer memory. Each of the plurality of parallel dimensions may comprise an independent model of a physical, three-dimensional space having corresponding features such that the parallel dimensions are recognizable as counterparts to each other. It is not necessary that each dimension be an exact duplicate of other dimensions. Because the dimensions

operate independently, some divergence may occur after the dimensions become active. For example, a piece of furniture that is initially positioned identically in counterpart dimensions may be moved.

The parallel dimensions may have the characteristic of operating concurrently in a system memory. While certain activities inside each parallel dimension may be independent, for example, the activity of avatars, nonetheless the parallel dimensions may retain some relationships to one another. For example, the parallel dimensions may share common spaces or portals to common spaces. For further example, communication between avatars in different dimensions may be permitted. Avatars may also be permitted to travel between dimensions.

One important inter-dimensional relationship may comprise inter-dimensional population control. The VRU system may comprise, for example, a VRU module that operates to monitor the population of certain spaces within the VRU to ensure that they do not become too crowded with avatars, as indicated at step 804. Besides ensuring that additional dimensions are generated or activated as needed to relieve overcrowding, the VRU system may operate to distribute avatars between parallel dimensions. For example, step 804 may comprise locating or assigning avatars within corresponding ones of parallel dimensions so as to prevent over-population of anyone of the parallel dimensions by avatars. To perform this step, the VRU engine or module may compare a present avatar population, population density, and/or rate of change of the foregoing, to criteria established for the space in question. For example, an optimal avatar density for a nightclub floor may be in the range of 1 - 4 avatars per square meter of simulated space, while for a simulated park the optimal density may be 0.2 – 1 avatars per square meter.

As the population of a space approaches or exceeds a defined limitation, as indicated at steps 808 and 808, the VRU system may generate or activate a parallel dimension that replicates the overcrowded dimension. In an embodiment of the invention, multiple parallel dimensions may operate simultaneously. If, for example, just one of these dimensions becomes overcrowded, the overcrowding may be resolved by

transferring avatars to less crowded dimensions, as indicated at step 810. If no less crowded dimensions are available, a new dimension may be generated and/or activated. In an embodiment of the invention, a new parallel dimension may be generated by copying certain elements of an existing space, or by copying a template for an existing space that is reserved in memory for the purpose of generating parallel dimensions when needed.

Parallel dimensions may also be collapsed into fewer dimensions as avatar populations decline. For example, if an average population density across multiple dimensions falls below a defined threshold, any empty dimensions may be shut down. The process of shutting down a dimension may include erasing the dimension from the computer memory used to model the computer environment. In an embodiment of the invention, the closed dimension may be archived or reserved for future use, optionally for a limited period of time. If it is desired to shut down a dimension that is not empty of avatars, avatars present in the dimension may be transported to an adjacent parallel dimension. Before shutting down a dimension, the system may inform users corresponding to any avatars in the dimension. Such users may be given the option of transporting to a parallel dimension or elsewhere in the VRU environment. If a user does not select an alternative destination, the VRU system may choose for her. Advantageously, shutting down under-populated dimensions may conserve system resources and prevent users from encountering under-populated environments.

As indicated at step 810, avatars may be distributed between related parallel dimensions according to various schemes. Method 800 may further comprise relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions. Relocation may be accomplished by any desired method of transporting avatars within a VRU environment. For example, an avatar may walk through a door to another space or be "teleported" to another space in the environment. An avatar may be relocated from a first one of the parallel dimensions to a second one of the parallel dimensions (or to any other location in the environment) in response to user input signifying a request to relocate the avatar. In the alternative, relocation may be performed without user input. For example, an avatar may be relocated between

parallel dimensions or out of a parallel dimension when a population of avatars in one or more of the parallel dimensions reaches a predetermined limit. One or more avatars may be automatically relocated from crowded ones of the parallel dimensions into an additional parallel dimension that is generated or activated to accommodate avatar population growth.

Whatever the number of dimensions operable within an environment, a VRU system should operate to independently animate ones of the plurality of avatars within different ones of the parallel dimensions, using input from respective corresponding ones of users. "Animate," in this sense, essentially means to process user input data, rules of the modeled environment, modeled properties of objects in the environment, or other data to calculate the positions and/or shape of objects in the environment at successive instants of modeled time. Such an animation process may be encompassed in what is generally as "computer simulation." Fig. 9 shows exemplary steps of a method 900 for animating a VRU environment and objects therein. It should be appreciated that method 900 may be operated concurrently with method 800 to manage a multi-user, multi-dimensional animation process and provide a plurality of users with desired output data.

At step 902, the VRU engine may animate avatars and objects in each dimension. Avatars and objects may be modeled in any desired manner. In an embodiment of the invention, avatars may be modeled as jointed figures covered by a skin. Objects may interact with one another via "contact" that occurs when modeled objects attempt to occupy the same volume of modeled space. Various physical attributes, such as, for example, mass, momentum, muscle & skeletal limitations, and so forth, may be associated with the modeled objects to impart greater realism to the simulation. In embodiments of the inventions, physical rules may be modeled so as to permit activities that cannot occur in the real world, such as, for example, winged flight by humans. In general, various computer modeling methods are known in the art to simulate motion of objects and figures in modeled space, and any suitable method may be used to simulate motion of avatars and other objects.

Animation of objects in parallel dimensions may generally proceed independently of each other. For example, a first avatar in a first dimension should not be able to contact or be visible to a second avatar in a second dimension. Avatars may be able to chat across dimensions, which may be conducted as a separate process apart from animation. Objects and avatars in a common dimension may be modeled together with each parallel dimension. For example, if "c" represents the model of the common space and "p" represents the model of the parallel space, the animation for each parallel space "p_i" may comprise "$p_i + c$."

At step 906, portal output data may be generated for a plurality of remote clients. A system module, e.g., a portal module, may separate and direct data from multiple animation streams so that the correct data is provided to each client in the correct format and sequence. Each client should receive sufficient data to generate a view of the environment as seen through the virtual eyes of his or her avatar, or as seen from another viewpoint near the avatar. The view should include at least nearby avatars and objects. More distant objects may also be visible, optionally at diminishing resolution with increasing distance from the viewpoint. In general, the identification of a viewpoint associated with each user may make it possible to reduce the amount of information sent to each user, as more distant information need not be provided.

As an output of the animation process, virtual-reality data may be provided to each of the plurality of users, as indicated at step 906. Various methods are known in the art for providing data to clients, and any suitable method may be used. A connection may be made to one or more communication ports of client computers running an application for receiving data and transforming it as necessary for a visual display. The virtual-reality data may be configured to cause remote clients of each of the users to output an animated display of a corresponding one of the parallel dimensions and avatars therein, as indicated at step 910. For example, a first user corresponding to an avatar located in parallel dimension 'A' may receive virtual-reality data for viewing objects and other avatars inside of dimension 'A', while a second user controlling an avatar located in parallel dimension 'B' may receive data for displaying the interior of dimension 'B.' Both users may receive data for viewing a common dimension

'C' linked to dimensions 'A' and 'B,' if present.

As previously noted, a common space may be modeled in the computer memory, configured in relation to multiple parallel dimensions so that an interior of the common space is visible from viewpoints located inside each of the parallel dimensions. In an embodiment of the invention, the common space may be modeled so that information concerning each of the parallel dimensions is provided to a user operating an avatar in the common space, or otherwise assigned a viewpoint located in the common space. Such information may be provided, for example, as interior views of each of the plurality of dimensions.

In embodiments of the inventions, it may be desirable to model a common space in a computer memory, configured in relation to multiple parallel dimensions so that a modeled object originating from the common space is capable of passing into at least one of the parallel dimensions, or vice-versa. Fig. 10 shows exemplary steps of a method 1000 for managing an interface between a common space and a parallel space. At step 1002, an inter-dimensional interface may be defined between the common space and two or more parallel spaces, or between adjacent parallel spaces. For example, a surface may be defined as a boundary between the common space and each of the parallel spaces. Such surfaces may be contoured to fit one another. That is, an interface surface dividing the common space from multiple parallel dimensions may be contoured to fit each of the surfaces that divide each of the parallel dimensions from the common space. An interface may be modeled to include an overlapping region interactive with both adjacent ones of the plurality of dimensions, or without an overlapping region.

In an embodiment of the invention, an interface may be modeled as a transparent object. Therefore, the common space may be visible to each of multiple parallel dimensions, for example as a stage, storefront, or entry area. Likewise, multiple parallel dimensions may be visible from the common space, either overlain on each other, tiled, presented in sequence, or in some other arrangement. If multiple parallel dimensions are arranged around a common space, providing a transparent interface

around the common space may render adjacent ones of the parallel dimensions visible to each other. In the alternative, an interface may be modeled as a translucent or opaque object.

At step 1004, the interface may be monitored for approaching objects. When an object touches or approaches the interface, the system may determine the interface properties of the object, as shown at step 1006. For example, the system may consult a properties table associated with the object to determine whether or not the object has the capability of passing through the interface. The simulation may then proceed differently, depending on the properties of the object. If the object is allowed to "pass" through the interface, an object passing from the common space into multiple parallel dimensions may be replicated as it passes through the interface, as indicated at step 1008. The replicated objects may then be animated synchronously (as in the case of an avatar controlled by a single user), or asynchronously (as in the case of a passive object) in each of the parallel dimensions.

In an embodiment of the inventions, a common space in the computer memory may be configured in relation to multiple parallel dimensions so that an avatar originating from the common space is capable of passing into one of the parallel dimensions. This is a special case that may be used to populate multiple dimensions with avatars originating from a common space, for example a space modeled as a public road or hallway. In this embodiment, one of the parallel dimensions is selected as the destination for the object. Selection may be accomplished using various criteria. In an embodiment of the invention, selection may be based on avatar populations of each parallel space. For example, an avatar may be directed to a dimension having the lowest population, or any other desired population criteria. In the alternative, or in addition, selection may be based on a corresponding user preference. For example, a user may indicate a preference for a dimension populated by other French-speaking avatars.

In addition, a common space in the computer memory may be configured in relation to the plurality of parallel dimensions so that an avatar originating from any one

of multiple parallel dimensions is capable of passing into the common space. An object passing from a parallel space into a common space may be subtracted from the parallel space and added to the common space as it passes through the interface. This may be used as a way for avatars to leave a parallel dimension and to re-enter non-parallel portions of the modeled environment.

If the object is not allowed to pass through the interface, the object may be bounced from the interface, or stopped short of the interface, as indicated at step 1010. The object therefore cannot leave the dimension of origin through that particular interface. Of course, because the dimension is part of a larger modeled environment, it should contain at least one other doorway or other transportation element that allows objects to leave the dimension and enter other portions of the modeled environment.

According to the foregoing, therefore, implementations of parallel dimensions may require the creation and tracking of at least three different categories of items. The first category may include items such as walls that are non-manipulable and are identical in all dimensions. The walls may in fact exist only in a single dimension, which is shared via an interface with all other dimensions, in this manner minimizing the number of items that servers and clients must track. The second category may include items existing in a single dimension only, such as avatars. The third category may include items created identically in all dimensions but that become independent of each other once created. This third category may be exemplified by furniture and the like.

When a dimension is generated or activated, it may be populated with standardized furniture or other objects belonging to the third category. Such furniture, while potentially identical when created, and created simultaneously in multiple dimensions, may be manipulable, destructible, and otherwise alterable within each dimension independently. Movable replicated objects, for example, furniture and the like, existing in parallel dimensions may tend to migrate to different locations over time, as each instance of the dimension may be modeled separately. This may lead to divergence between otherwise parallel dimensions that may make travel or other interactions between parallel dimensions disorienting for those who experience them.

At the same time, it may not be desirable to make such objects unmovable or unchangeable.

Therefore, it may be desirable to return certain movable objects back to a home position when displaced. In an embodiment of the invention, therefore, analogous objects may be tracked in different ones of parallel dimensions. Any ones of the analogous objects that become displaced from a home position may be moved back towards the home position, so that positions of analogous objects within each of the parallel dimension tend to converge on the home position over time. For example, a chair may be moved by an avatar in one of the dimensions. However, in related parallel dimensions, the chair is unmoved. A system component may cause the moved chair to slowly, potentially over the course of hours, to move back to the position of the chair in the adjoining dimensions. Return movement may be executed relatively slowly so that it is not noticeable to nearby avatars. Speed of return movement may depend, therefore, on the relative proximity of nearest avatars. For further example, if a glass is dropped within a dimension, the server may cause it to fall and roll in the direction of the corresponding glass in a neighboring dimension. In this manner, the dimensions would continue to resemble each other over time, making travel between the dimensions less disorienting for the persons manipulating the avatars.

In general, a VRU environment may provide communication tools for users to communicate with one another in real time. For example, a typical environment may include a text chat or audio chat feature. In general, it may be desirable to not disable such communication features for users associated with avatars located in different parallel dimensions. In other words, although parallel dimensions may be animated separately, they are still part of the same environment and may still make use of the same communication tools. In an embodiment of the invention, therefore, a communication channel may be provided between avatars in different ones of the plurality of dimensions.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and

modifications can be made. The scope of the claims should not be limited by the preferred embodiments set forth in the examples, but should be given the broadest interpretation consistent with the description as a whole.

CLAIMS

1. A method for managing a multi-instance, multi-user animation process, comprising:

modeling, using a computer, a plurality of parallel dimensions in a computer memory, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits that are defined by at least one model of a three dimensional object;

assigning ones of a plurality of avatars within the computer memory so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, so as to prevent over-population of any one of the parallel dimensions by avatars; and

animating ones of the plurality of avatars populating different ones of the parallel dimensions in response to input from respective corresponding ones of a plurality of clients to provide virtual-reality data, using the computer, the virtual-reality data configured to enable the clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

2. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions.

3. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions in response to user input signifying a request to relocate the avatar.

4. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions in response to determining that a population of avatars in the first one of the parallel dimensions has reached a predetermined limit.

5. The method of claim 1, further comprising generating an additional parallel dimension to accommodate an increase in avatar population.

6. The method of claim 5, further comprising relocating avatars from the plurality of parallel dimensions into the additional parallel dimension.

7. The method of claim 1, further comprising generating the plurality of parallel dimensions as replicas of a template space.

8. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that at least one object located inside the common space is visible from viewpoints located inside each of the plurality of parallel dimensions.

9. The method of claim 8, further comprising animating at least one avatar populating the common space in response to input from a corresponding client, to provide the virtual-reality data further enabling the corresponding client to output an animated display including at least a portion of each of the plurality of parallel dimensions and avatars populated therein.

10. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that a modeled object originating from the common space is capable of passing into at least one of the plurality of parallel dimensions.

11. The method of claim 10, further comprising replicating the modeled object passing into the plurality of parallel dimensions so that a replica of the object is modeled in each of the plurality of parallel dimensions after the object passes from the common space.

12. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that an avatar originating from the common space is capable of passing into one of the plurality of parallel dimensions.

13. The method of claim 12, further comprising selecting which one of the plurality of parallel dimensions the avatar is capable of passing into based on avatar populations of each parallel space.

14. The method of claim 12, further comprising selecting which one of the plurality of parallel dimensions the avatar is capable of passing into based on a corresponding user preference.

15. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that an avatar originating from any one of the plurality of parallel dimensions is capable of passing into the common space.

16. The method of claim 1, further comprising tracking analogous objects in different ones of the parallel dimensions and moving any displaced ones of the analogous objects so that positions of analogous objects within each of the parallel dimension tend to converge over time.

17. The method of claim 1, further comprising collapsing first and second ones of the plurality of dimensions into a combined dimension populated by the avatars formerly in the first and second ones of the plurality of dimensions.

18. The method of claim 1, further comprising synchronously animating an avatar present in multiple ones of the plurality of dimensions.

19. The method of claim 1, further comprising asynchronously animating an avatar present in multiple ones of the plurality of dimensions.

20. The method of claim 1, further comprising modeling an interface between adjacent ones of the plurality of dimensions.

21. The method of claim 20, further comprising modeling the interface to include an overlapping region interactive with both adjacent ones of the plurality of dimensions.

22. The method of claim 20, further comprising modeling the interface as a transparent object rendering the adjacent ones of the plurality of dimensions visible to each other.

23. The method of claim 20, further comprising providing a communication channel between avatars populating different ones of the plurality of dimensions.

24. A computer-readable medium storing instructions, that when executed by a computer, cause the computer to:

model a plurality of parallel dimensions, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits defined for the three-dimensional space;

assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and

animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the

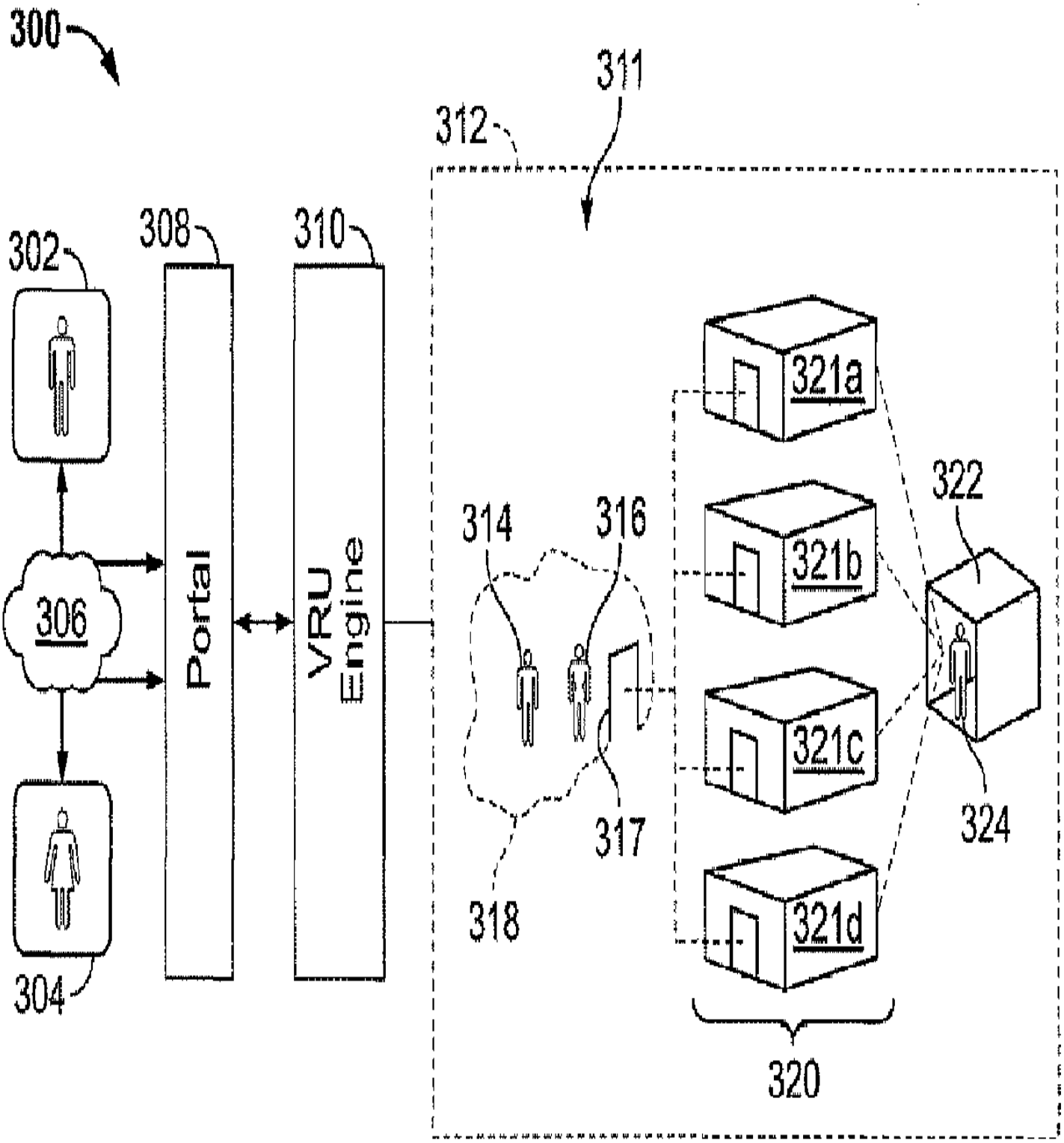
clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

25. A computer comprising a memory holding instructions, that when executed by the computer, cause the computer to:

generate a plurality of parallel dimensions in a computer memory, each being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within defined spatial limits;

assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and

animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the clients to output an animated display of an assigned one of the parallel dimensions and avatars populated therein.


300
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VRU Engine
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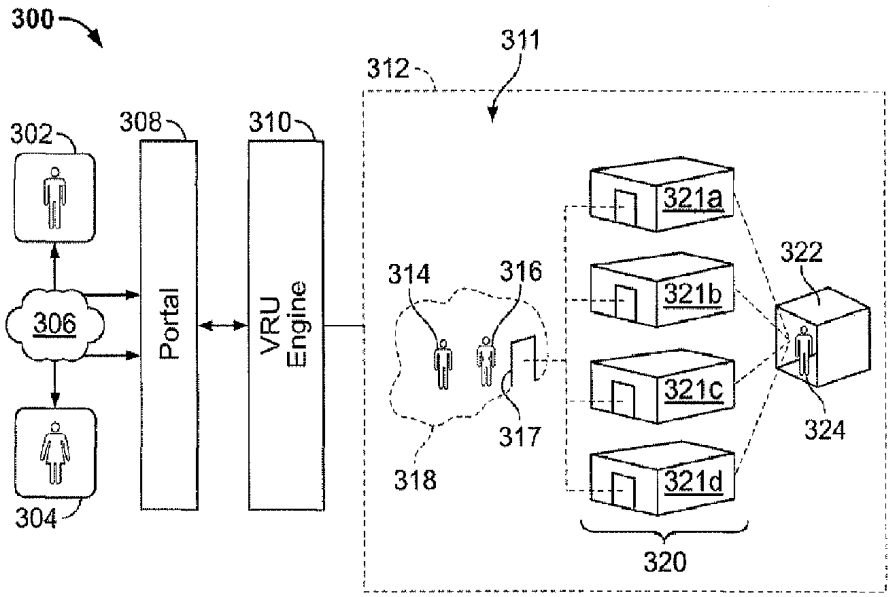
G06F 19/00 (2011.01)

(72) **Inventeurs/Inventors:**
SHUSTER, GARY STEPHEN, US;
SHUSTER, BRIAN MARK, US

(73) **Propriétaire/Owner:**
IDEAFLOOD, INC., US

(74) **Agent:** GOWLING WLG (CANADA) LLP

(54) **Titre : PLATES-FORMES D'ANIMATION MULTI-UTILISATEUR ET MULTI-INSTANCE**
(54) **Title: MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS**



(57) **Abrégé/Abstract:**
A multi-instance, multi-user animation platform includes a plurality of modeled parallel dimensions in a computer memory. Each of the parallel dimensions may be an independent model of a physical, three-dimensional space having corresponding features such that the parallel dimensions are recognizable as counterparts to each other. Avatars are located within corresponding ones of the parallel dimensions so as to prevent over-population of any one of the parallel dimensions by avatars. Avatars are animated within different ones of the parallel dimensions using input from respective users to provide virtual-reality data. The virtual-reality data may be configured to cause remote clients to output an animated display of a corresponding one of the parallel dimensions and avatars therein.

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Auteur de la requête / Requester

CPA GLOBAL

Adresse / Address

Liberation House, Castle Street, St Helier, JE1 1BL, GB - United Kingdom

Payeur / Payor

COMPUTER PATENT ANNUITIES LTD.

Numéro de demande ou de brevet / Application or patent number	Numéro de reference / Reference number	Titre / Title
2922836	08932920CA	CONTROL DEVICE OF ELECTRICAL APPARATUS AND ENERGY MANAGEMENT SYSTEM
3174677	55000801-4775CA	SMALL BONE FIXATION SYSTEMS AND METHODS
2865594	55000801-2827CA	HUMAN BINDING MOLECULES CAPABLE OF BINDING TO AND NEUTRALIZING INFLUENZA B VIRUSES AND USES THEREOF
2872180	55000801-4349CA	ELECTRIC MOTOR DRIVEN TOOL FOR ORTHOPEDIC IMPACTING
3212669	55000801-4943CA	TREATMENT OF CANCERS LACKING EGFR-ACTIVATING MUTATIONS
2873856	55000801-2166CA	METHOD OF SURGICAL PLANNING
2872182	55000801-4350CA	ELECTRIC MOTOR DRIVEN TOOL FOR ORTHOPEDIC IMPACTING
3212960	55000801-4953CA	REFRACTIVE EXTENDED DEPTH OF FOCUS INTRAOCULAR LENS, AND

		METHODS OF USE AND MANUFACTURE
3091338	P1899CA00	PROCESS FOR THE PREPARATION OF ELOBIXIBAT
3210215	PAT 116252W-1	SYSTEMS, APPARATUS, AND METHODS FOR FLUID INFUSION
2645085	15542-10 KAM	METHOD AND APPARATUS FOR CONDUCTING MICROWAVE ASSISTED ORGANIC REACTIONS WITH GAS-PHASE REACTANTS
2902296	0081183-30/91379963	SYSTEMS, METHODS AND APPARATUSES FOR DEVICE ATTESTATION BASED ON SPEED OF COMPUTATION
2902283	0081183-29/90886482	ENSURING THE PROXIMITY OF A COMMUNICATION DEVICE TO ITS PARTNER DEVICE
3175042	P40022	GROUND STATION FOR UNMANNED AERIAL VEHICLES
3010254	P2862CA01	SIZE-BASED ANALYSIS OF FETAL DNA FRACTION IN MATERNAL PLASMA
2865523	P2862CA00	SIZE-BASED ANALYSIS OF FETAL DNA FRACTION IN MATERNAL PLASMA
2685353	08914862CA	MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS
2829092	81773562/63293-4430	INTEGRATED FIBER OPTIC MONITORING SYSTEM FOR A WELLSITE AND METHOD OF USING SAME
3214419	90698637	CONCENTRATED COMPOSITION AND USES OF SAME
3245528	511627-CA	ANTI-GD2 ANTIBODIES, IMMUNOCONJUGATES AND THERAPEUTIC USES THEREOF
3055666	85459457	INFECTED CELL CULTURES
2581149	15690-08CA	RECEIVER COLLAR
		ACOUSTIC TELEMETRY TOOL

3249394	92760696	FOR HIGH MECHANICAL LOADING
2904885	000210-0424	ANCHORING SYSTEM FOR SEAT BACK
2626455	77261-19	DYNAMIC CALL CHARACTERISTIC CONTROL ON A PER CALL BASIS
2858055	05004321-447CA	ENERGY STORAGE DEVICES COMPRISING CARBON-BASED ADDITIVES AND METHODS OF MAKING THEREOF
2977550	84060884	SYSTEMS AND METHODS FOR OBTAINING AND EXECUTING COMPUTER CODE SPECIFIED BY CODE ORDERS IN AN ELECTRONIC TRADING VENUE
2753218	75948-2/HGA	ROTATIONAL DRILL BITS AND DRILLING APPARATUSES INCLUDING THE SAME
2901410	7972-P49158CA00	USE OF LEVOCETIRIZINE AND MONTELUKAST IN THE TREATMENT OF TRAUMATIC INJURY
2582003	P1481CA00	QUEUEING METHOD TO COORDINATE CONNECTION ATTEMPTS TO A SERVER
2581317	P1469CA00	METHOD FOR DISTRIBUTING CONNECTION ATTEMPTS TO A SERVER
3131652	V821556CA	A LIQUID DISPENSING APPARATUS
2797569	79744-23	METHOD AND DEVICE FOR VIDEO PREDICTIVE ENCODING
3015373	56133000-7CA	VALVE IMPLANT WITH INTEGRATED SENSOR AND TRANSMITTER
3059201	113326-1698	LOW-PROFILE HEART VALVE AND DELIVERY SYSTEM
2900290	113326-1470	SYSTEMS AND METHODS FOR ENSURING SAFE AND RAPID DEPLOYMENT OF PROSTHETIC HEART VALVES
		RETAINING MECHANISMS FOR

2791390	113326-1285	PROSTHETIC VALVES
2790207	113326-1282	LOW-PROFILE HEART VALVE AND DELIVERY SYSTEM
3049862	014997-0005	POWER TONG
3018539	P48518	MECHANICAL CLINCH JOINING COMPONENT AND METHOD FOR MANUFACTURING SAME
2645048	PAT 67762W-1	MECHANICAL SEAL WITH ENHANCED FACE STABILITY
3092874	23657-P62532CA00	NETWORK AGNOSTIC DYNAMIC SATCOM SYSTEM AND ASSOCIATED NETWORK FEATURES
2808565	68810005	LINEAR ELECTRIC MOTOR FOR ARTIFICIAL LIFT SYSTEM
2829100	GAL496-1CA	A METHOD, SYSTEM AND PROGRAM FOR IMPROVED HEALTH CARE
2960098	T8480999CA	STEERING MECHANISM FOR A BOAT HAVING A PLANING HULL
2903436	021442-1173	RATCHETING TORQUE WRENCH
3017127	5652-P57033CA00	METHOD AND SYSTEM FOR ELECTRONIC DISTRIBUTION OF CONTROLLED TOKENS
2978461	5652-P53687CA00	SECURE MOBILE REMOTE PAYMENTS
2866634	9173-P46975CA00	COMPOSITIONS COMPRISING SECRETORY-LIKE IMMUNOGLOBULINS
2865810	9173-P46977CA00	TREATMENT OF MUCOSITIS WITH IMMUNOGLOBULIN
2901225	9173-P49179CA00	TREATMENT AND PREVENTION OF REMOTE ISCHEMIA-REPERFUSION INJURY
2792409	43409-0001	STRUCTURED CATALYTIC NANOPARTICLES AND METHOD OF PREPARATION
3050360	PAT 106226W-1	PROTECTION DEVICE FOR A SHELL-AND-TUBE EQUIPMENT
		PALLET DISPENSER AND

3077946	QTE-P1001D-CA	METHOD THEREOF
2918269	QTE-P1001-CA	PALLET DISPENSER AND METHOD THEREOF
2680108	9061-24 (128900) WKS	BENEFICIAL EFFECTS OF BACTERIOPHAGE TREATMENTS
2677714	23791-4-NP	DOCUMENT IMAGING AND PROCESSING SYSTEM
3016958	05202487-284CA	PRODUCTION OF IRON OXIDE RED PIGMENT
3016947	05202487-283CA	PRODUCTION OF IRON OXIDE RED PIGMENT
3212197	P33823	SYSTEMS AND METHODS FOR REAL-TIME MEASUREMENT OF SOIL CARBON SEQUESTRATION USING NON-INVASIVE MULTIMODAL SENSORS
2903761	505107-CA	VECTOR MAXIMIZING SCREEN
3213106	90675556	METHODS AND SYSTEMS FOR OPERATIONAL SURVEILLANCE OF A PHYSICAL ASSET USING SMART EVENT DETECTION
3178125	90133452	MARINE SEISMIC IMAGING
2978910	84070272	APPARATUS AND METHOD FOR CONTROLLING VALVE OPERATION BASED ON VALVE HEALTH
2978908	84070261	DYNAMIC SCADA
2866251	81782262	SYSTEM AND METHOD FOR DELIVERING TREATMENT FLUID
2828979	81773710	AN ELECTRIC CONNECTOR ACCESSORY AND ITS METHOD OF ASSEMBLY
2863790		CROSS FLOW TRAY AND SUPPORT SYSTEM FOR USE IN A MASS TRANSFER COLUMN
2905735	14818/00071	NONWOVEN FABRICS OF SHORT INDIVIDUALIZED BAST FIBERS AND PRODUCTS MADE THEREFROM

2905734	14818/00070	WATER DISPERSIBLE WIPE SUBSTRATE
2624752		ROBOTIC MULTI-PRODUCT CASE-PACKING SYSTEM
3016070	36501-3012	UTILIZING WET FRACTURING SAND FOR HYDRAULIC FRACTURING OPERATIONS
2922859	7455-5008 (131673) WKS	STABILIZATION OF NUCLEIC ACIDS IN URINE
2850636	87043-2CA/ADB	HEAD PROTECTION FOR REDUCING LINEAR ACCELERATION
2902738	81790938 (0084599-107)	ELECTRICITY METER HAVING MULTIPLE HALL DEVICES
3092585	89730179	PARENTERALLY ADMINISTERED IMMUNE ENHANCING DRUGS
3017172	84508927	NEUROACTIVE STEROIDS, COMPOSITIONS, AND USES THEREOF
3055568	85578703 [9000571-1PPH]	FILTER BACKWASH CONTROL SYSTEM FOR A WATER OR WASTEWATER TREATMENT SYSTEM TO CONSERVE WATER DURING THE FILTER BACKWASH PROCESS
2984731	81770205	WASTEWATER TREATMENT SYSTEM AND METHOD
2645066	81629285	WASTEWATER TREATMENT SYSTEM AND METHOD
3056827	PAT 106555W-1	PARTITION WALL SYSTEM HAVING AIR PURIFICATION FUNCTION AND METHOD FOR PURIFYING AIR
2829597	08925637CA	SYSTEMS AND METHODS FOR ANALYTIC DATA GATHERING FROM IMAGE PROVIDERS AT AN EVENT OR GEOGRAPHIC LOCATION
3211106	25357-P72893CA00	FOOD SUPPLEMENT TO PROMOTE BODY WEIGHT LOSS
		BROADBAND DECOUPLED

3211410	2229-139	MIDBAND DIPOLE FOR A DENSE MULTIBAND ANTENNA
2867410	003934-0245	UNIVERSAL CANCER PEPTIDES DERIVED FROM TELOMERASE
2980698	84101728	INTEGRATED C3-C4 HYDROCARBON DEHYDROGENATION PROCESS
2960249	08937027CA	AQUEOUS COMPOSITIONS HAVING POLYALKOXYLATES FOR IMPROVED OPEN TIME
2960100	08937028CA	AQUEOUS COMPOSITIONS HAVING POLYALKOXYLATE SALTS FOR IMPROVED OPEN TIME
2680026		BUILDING SYSTEM
2866700	PAT 81391W-1	DEVICE, SYSTEM AND METHOD FOR IMAGE-BASED CONTENT DELIVERY

Confirmation du demandeur / breveté - Applicant / Patentee confirmation

En vertu de l'article 9 des Règles sur les Brevets, pour chaque demande ou brevet identifié, le demandeur / breveté est confirmé comme un des demandeurs ou brevetés au dossier.

In compliance with section 9 of the Patent Rules, for each of the identified applications or patents, the applicant / patentee is confirmed as one of the applicants or patentees on file.

Numéro de demande ou de brevet / Application or patent number	**Demandeur / Breveté / Applicant / Patentee**
2581149	INNOTEK, INC.
2581317	MITEL NETWORKS CORPORATION
2582003	MITEL NETWORKS CORPORATION
2624752	GPCP IP HOLDINGS LLC
2626455	ORACLE INTERNATIONAL CORPORATION
2645048	JOHN CRANE INC.
2645066	LUMMUS TECHNOLOGY LLC
2645085	CEM CORPORATION
2677714	CUMMINS-ALLISON CORP.
2680026	JAMES HARDIE TECHNOLOGY LIMITED
2680108	BIOCONTROL LIMITED
2685353	UTHERVERSE GAMING, LLC
2753218	APERGY BMCS ACQUISITION CORPORATION
2790207	EDWARDS LIFESCIENCES CORPORATION

2791390	EDWARDS LIFESCIENCES CORPORATION
2792409	CERION LLC
2797569	TENCENT TECHNOLOGY (SHENZHEN) COMPANY LIMITED
2808565	OILFIELD EQUIPMENT DEVELOPMENT CENTER LIMITED
2828979	CONNECTEURS ELECTRIQUES DEUTSCH
2829092	SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.
2829100	SEEGNAL EHEALTH LTD
2829597	KBA2, INC.
2850636	MIPS AB
2858055	STRYTEN ENERGY LLC
2863790	KOCH-GLITSCH, LP
2865523	THE CHINESE UNIVERSITY OF HONG KONG
2865594	JANSSEN VACCINES & PREVENTION B.V.
2865810	UNIVERSITAET BERN
2866251	SCHLUMBERGER CANADA LIMITED
2866634	CSL BEHRING AG
2866700	APPLE INC.
2867410	CENTRE HOSPITALIER REGIONAL UNIVERSITAIRE DE BESANCON
2872180	DEPUY SYNTHES PRODUCTS, INC.
2872182	DEPUY SYNTHES PRODUCTS, INC.
2873856	DEPUY SYNTHES PRODUCTS, INC.
2900290	EDWARDS LIFESCIENCES CORPORATION
2901225	UNIVERSITAT BERN
2901410	IRR, INC., (D/B/A INFLAMMATORY RESPONSE RESEARCH, INC.)
2902283	OLOGN TECHNOLOGIES AG
2902296	OLOGN TECHNOLOGIES AG
2902738	ITRON, INC.
2903436	ECA MEDICAL INSTRUMENTS
2903761	NATIONAL OILWELL VARCO, L.P.
2904885	SERIES INTERNATIONAL, LLC
2905734	GPCP IP HOLDINGS LLC
2905735	GPCP IP HOLDINGS LLC
2918269	QTEK TECHNOLOGY LTD.
2922836	TOYOTA JIDOSHA KABUSHIKI KAISHA

2922859	STRECK, INC.
2960098	MASTERCRAFT BOAT COMPANY, LLC
2960100	DOW GLOBAL TECHNOLOGIES LLC
2960249	DOW GLOBAL TECHNOLOGIES LLC
2977550	REFINITIV US ORGANIZATION LLC
2978461	MASTERCARD INTERNATIONAL INCORPORATED
2978908	SCHLUMBERGER CANADA LIMITED
2978910	SCHLUMBERGER CANADA LIMITED
2980698	DOW GLOBAL TECHNOLOGIES LLC
2984731	LUMMUS TECHNOLOGY LLC
3010254	THE CHINESE UNIVERSITY OF HONG KONG
3015373	EDWARDS LIFESCIENCES CORPORATION
3016070	TYPHON TECHNOLOGY SOLUTIONS, LLC
3016947	LANXESS DEUTSCHLAND GMBH
3016958	LANXESS DEUTSCHLAND GMBH
3017127	MASTERCARD INTERNATIONAL INCORPORATED
3017172	SAGE THERAPEUTICS, INC.
3018539	KABUSHIKI KAISHA KOBE SEIKO SHO (KOBE STEEL, LTD.)
3049862	FRANK'S INTERNATIONAL, LLC
3050360	ALFA LAVAL OLMI S.P.A.
3055568	ROMERS, MARK W.
3055666	MERCK PATENT GMBH
3056827	BEIJING NEW BUILDING MATERIALS PUBLIC LIMITED COMPANY
3059201	EDWARDS LIFESCIENCES CORPORATION
3077946	QTEK TECHNOLOGY LTD.
3091338	ELOBIX AB
3092585	ARCUS BIOSCIENCES, INC.
3092874	SMITHS INTERCONNECT, INC.
3131652	ZURU (SINGAPORE) PTE. LTD.
3174677	CROSSROADS EXTREMITY SYSTEMS, LLC
3175042	MATTERNET, INC.
3178125	SCHLUMBERGER CANADA LIMITED
3210215	410 MEDICAL, INC.
3211106	NGN HEALTHCARE - NEW GENERATION NUTRACEUTICALS S.R.L.
3211410	JOHN MEZZALINGUA ASSOCIATES, LLC
3212197	EARTHOPTICS, INC.

3212669	JANSSEN BIOTECH, INC.
3212960	AMO GRONINGEN B.V.
3213106	SCHLUMBERGER CANADA LIMITED
3214419	JOHNSON & JOHNSON CONSUMER INC.
3245528	MERCK PATENT GMBH
3249394	WEATHERFORD TECHNOLOGY HOLDINGS, LLC

Taxes payées – Fees paid

Numéro de demande ou brevet / Application or patent number	Numéro de référence / Reference number	Type de taxe / Fee type	Montant / Amount
3245528	511627-CA	MF (application, 2nd anniv.) - standard	125.00
3249394	92760696	MF (application, 2nd anniv.) - standard	125.00
3212669	55000801-4943CA	MF (application, 3rd anniv.) - standard	125.00
3210215	PAT 116252W-1	MF (application, 3rd anniv.) - standard	125.00
3211106	25357-P72893CA00	MF (application, 3rd anniv.) - standard	125.00
3212197	P33823	MF (application, 3rd anniv.) - standard	125.00
3211410	2229-139	MF (application, 3rd anniv.) - standard	125.00
3214419	90698637	MF (application, 3rd anniv.) - standard	125.00
3212960	55000801-4953CA	MF (application, 3rd anniv.) - standard	125.00
3213106	90675556	MF (application, 3rd anniv.) - standard	125.00
3178125	90133452	MF (application, 4th anniv.) - standard	125.00
3175042	P40022	MF (application, 4th anniv.) - standard	125.00
3174677	55000801-4775CA	MF (application, 4th anniv.) - standard	125.00
3092874	23657-P62532CA00	MF (application, 6th anniv.) - standard	277.00
3092585	89730179	MF (application, 6th anniv.) - standard	277.00
3091338	P1899CA00	MF (application, 6th anniv.) - standard	277.00
3131652	V821556CA	MF (application, 6th anniv.) - standard	277.00
3055666	85459457	MF (application, 7th anniv.) - standard	277.00
2960249	08937027CA	MF (application, 8th anniv.) - standard	277.00
3016947	05202487-283CA	MF (application, 8th anniv.) - standard	277.00
2960100	08937028CA	MF (application, 8th anniv.) - standard	277.00
3056827	PAT 106555W-1	MF (patent, 7th anniv.) - standard	277.00
3055568	85578703 [9000571-1PPH]	MF (patent, 7th anniv.) - standard	277.00
3050360	PAT 106226W-1	MF (patent, 7th anniv.) - standard	277.00
3015373	56133000-7CA	MF (patent, 8th anniv.) - standard	277.00
3018539	P48518	MF (patent, 8th anniv.) - standard	277.00
3017172	84508927	MF (patent, 8th anniv.) - standard	277.00
3017127	5652-P57033CA00	MF (patent, 8th anniv.) - standard	277.00
3016070	36501-3012	MF (patent, 8th anniv.) - standard	277.00
3016958	05202487-284CA	MF (patent, 8th anniv.) - standard	277.00
2960098	T8480999CA	MF (patent, 8th anniv.) - standard	277.00
3049862	014997-0005	MF (patent, 8th anniv.) - standard	277.00
2980698	84101728	MF (patent, 9th anniv.) - standard	277.00

Version: 2024-03

2922836	08932920CA	MF (patent, 9th anniv.) - standard	277.00
2978910	84070272	MF (patent, 9th anniv.) - standard	277.00
2977550	84060884	MF (patent, 9th anniv.) - standard	277.00
2978461	5652-P53687CA00	MF (patent, 9th anniv.) - standard	277.00
2922859	7455-5008 (131673) WKS	MF (patent, 9th anniv.) - standard	277.00
2978908	84070261	MF (patent, 9th anniv.) - standard	277.00
2903761	505107-CA	MF (patent, 11th anniv.) - standard	347.00
2905735	14818/00071	MF (patent, 11th anniv.) - standard	347.00
2902296	0081183-30/91379963	MF (patent, 11th anniv.) - standard	347.00
2905734	14818/00070	MF (patent, 11th anniv.) - standard	347.00
2901225	9173-P49179CA00	MF (patent, 11th anniv.) - standard	347.00
2900290	113326-1470	MF (patent, 11th anniv.) - standard	347.00
2902738	81790938 (0084599-107)	MF (patent, 11th anniv.) - standard	347.00
2918269	QTE-P1001-CA	MF (patent, 11th anniv.) - standard	347.00
3077946	QTE-P1001D-CA	MF (patent, 11th anniv.) - standard	347.00
2902283	0081183-29/90886482	MF (patent, 11th anniv.) - standard	347.00
2903436	021442-1173	MF (patent, 11th anniv.) - standard	347.00
2904885	000210-0424	MF (patent, 11th anniv.) - standard	347.00
2901410	7972-P49158CA00	MF (patent, 11th anniv.) - standard	347.00
2873856	55000801-2166CA	MF (patent, 12th anniv.) - standard	347.00
2865810	9173-P46977CA00	MF (patent, 12th anniv.) - standard	347.00
2866700	PAT 81391W-1	MF (patent, 12th anniv.) - standard	347.00
3010254	P2862CA01	MF (patent, 12th anniv.) - standard	347.00
2872182	55000801-4350CA	MF (patent, 12th anniv.) - standard	347.00
2865523	P2862CA00	MF (patent, 12th anniv.) - standard	347.00
2865594	55000801-2827CA	MF (patent, 12th anniv.) - standard	347.00
2850636	87043-2CA/ADB	MF (patent, 12th anniv.) - standard	347.00
2866634	9173-P46975CA00	MF (patent, 12th anniv.) - standard	347.00
2866251	81782262	MF (patent, 12th anniv.) - standard	347.00
2872180	55000801-4349CA	MF (patent, 12th anniv.) - standard	347.00
2808565	68810005	MF (patent, 12th anniv.) - standard	347.00
2867410	003934-0245	MF (patent, 12th anniv.) - standard	347.00
2863790		MF (patent, 12th anniv.) - standard	347.00
2829597	08925637CA	MF (patent, 13th anniv.) - standard	347.00
2829100	GAL496-1CA	MF (patent, 13th anniv.) - standard	347.00
2858055	05004321-447CA	MF (patent, 13th anniv.) - standard	347.00
2829092	81773562/63293-4430	MF (patent, 13th anniv.) - standard	347.00
2828979	81773710	MF (patent, 13th anniv.) - standard	347.00
2790207	113326-1282	MF (patent, 14th anniv.) - standard	347.00
2791390	113326-1285	MF (patent, 14th anniv.) - standard	347.00
2792409	43409-0001	MF (patent, 14th anniv.) - standard	347.00
2797569	79744-23	MF (patent, 14th anniv.) - standard	347.00
3059201	113326-1698	MF (patent, 14th anniv.) - standard	347.00
2753218	75948-2/HGA	MF (patent, 15th anniv.) - standard	624.00
2680026		MF (patent, 17th anniv.) - standard	624.00
2624752		MF (patent, 17th anniv.) - standard	624.00
2677714	23791-4-NP	MF (patent, 17th anniv.) - standard	624.00

Version: 2024-03

2685353	08914862CA	MF (patent, 17th anniv.) - standard	624.00
2680108	9061-24 (128900) WKS	MF (patent, 17th anniv.) - standard	624.00
2984731	81770205	MF (patent, 18th anniv.) - standard	624.00
2582003	P1481CA00	MF (patent, 18th anniv.) - standard	624.00
2645048	PAT 67762W-1	MF (patent, 18th anniv.) - standard	624.00
2581149	15690-08CA	MF (patent, 18th anniv.) - standard	624.00
2645066	81629285	MF (patent, 18th anniv.) - standard	624.00
2581317	P1469CA00	MF (patent, 18th anniv.) - standard	624.00
2645085	15542-10 KAM	MF (patent, 18th anniv.) - standard	624.00
2626455	77261-19	MF (patent, 19th anniv.) - standard	624.00
		Total	30402.00

Innovation, Sciences et Développement économique Canada
Office de la propriété intellectuelle du Canada

Innovation, Science and Economic Development Canada
Canadian Intellectual Property Office

GOWLING LAFLEUR HENDERSON LLP
2600 - 160 Elgin Street
OTTAWA Ontario
K1P 1C3

Date : 2009/12/22

AVIS D'ENTREE DANS LA PHASE NATIONALE
NOTICE OF NATIONAL ENTRY

N° de demande/Application No. : 2,685,353 **Date de dépôt/Filing Date :** 2008/03/07
N° de demande PCT/PCT Application No. : US 2008/056150

Votre référence/ Your Reference : 08914862CA

Date de priorité/ Priority Date : United States of America (60/893,531) 2007/03/07

Titre de l'invention/ Title of Invention : MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS

Demandeur(s)/Applicant(s) : IDEAFLOOD, INC.

Inventeur(s)/Inventor(s) : SHUSTER, GARY STEPHEN; SHUSTER, BRIAN MARK; ANDREW, WILLIAM HENDRICK; FLESCH, ROBERT STEVEN

Avis spécial

Veuillez noter que la taxe annuelle qui permet de maintenir votre demande en état est applicable tous les ans à compter du 2e anniversaire jusqu'au 20e et vous devez la payer au plus tard à la date d'anniversaire. L'omission de payer cette taxe avant l'expiration du délai fixé résultera en l'abandon de votre demande.

Special Notice

You are reminded that annual fees to maintain your application are needed for each one-year period between the 2nd and 20th anniversaries, and must be paid on or before each anniversary. Failure to pay within the prescribed time limit will lead to abandonment of your application.

Commissaire aux brevets/Commissioner of Patents

Innovation, Sciences et Développement économique Canada
Office de la propriété intellectuelle du Canada

Innovation, Science and Economic Development Canada
Canadian Intellectual Property Office

GOWLING LAFLEUR HENDERSON LLP
2600 - 160 Elgin Street
OTTAWA Ontario
K1P 1C3

Date : 2009/12/22

Date de dépôt/Filing Date : 2008/03/07
Votre référence/ Your Reference : 08914862CA

Titre de l'invention/ Title of Invention : MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS

Montant dû/Amount Due : $100.00

Date limite de paiement/ Payment Due Date : 2010/03/07

N° de demande/Application No. : 2,685,353

OBJET: TAXE DE MAINTIEN

La présente a pour but de vous rappeler que pour maintenir votre demande en vigueur, vous devez payer la taxe annuelle au plus tard à la date d'anniversaire du dépôt, à compter du 2e anniversaire.

Vous pouvez payer annuellement ou à l'avance les taxes de maintien pour un nombre d'années donné. Vous pouvez économiser du temps en payant en ligne; vos paiements seront enregistrés et confirmés le jour même. Pour plus de renseignements sur la méthode de paiement en ligne, rendez-vous au : www.opic.ic.gc.ca/taxesdemaintien.

L'omission de payer cette taxe dans les délais fixés résultera en l'abandon de la demande de brevet.

Veuillez prendre note que vous ne recevrez pas d'autre rappel concernant la demande de brevet susmentionnée.

Pour de plus amples renseignements, veuillez communiquer avec le Bureau canadien des brevets au 819-956-7049.

SUBJECT: MAINTENANCE FEE

You are reminded that, in order to maintain the patent application in force, an annual fee must be paid on or before the anniversary of the filing date, starting with the second anniversary.

The maintenance fees can be paid yearly or for any number of years in advance. You can save time by paying online; your payment will be recorded and acknowledged the same day. For online payment information, visit www.cipo.ic.gc.ca/maintenancefees

Failure to pay within the prescribed time limit will lead to the abandonment of the patent application. Please note that this is the only reminder notice that will be issued for this particular application.

Should you require more information, please do not hesitate to contact the Canadian Patent Office at 819-956-7049.

Commissaire aux brevets/Commissioner of Patents

GOWLING LAFLEUR HENDERSON LLP
2600 - 160 Elgin Street
OTTAWA Ontario
K1P 1C3

Date : 2012/11/08

RAPPEL - REQUETE D'EXAMEN
REMINDER - REQUEST FOR EXAMINATION

N° de demande/Application No.: **2,685,353**
Date de dépôt/Filing Date : 2008/03/07
Votre référence/
Your Reference : 08914862CA

Propriétaire(s)/Owner(s) : IDEAFLOOD, INC.

Date limite/Due Date : 2013/03/07

Montant dû/Amount Due : $800.00

En vertu de l'article 35 de la Loi sur les brevets et de l'article 96 de ses règles et afin d'éviter l'abandon de cette demande de brevet, une requête d'examen doit être déposée et accompagnée de la taxe prescrite, avant la date d'échéance susmentionnée.

Under Section 35 of the Patent Act and Section 96 of the Patent Rules, a request for examination must be filed and the prescribed fee paid, on or before the above due date in order to prevent abandonment of this patent application.

Commissaire aux brevets/Commissioner of Patents

Innovation, Sciences et Développement économique Canada
Office de la propriété intellectuelle du Canada

Innovation, Science and Economic Development Canada
Canadian Intellectual Property Office

GOWLING LAFLEUR HENDERSON LLP
2600 - 160 Elgin Street
OTTAWA Ontario
K1P 1C3

Date : 2013/01/15

ACCUSE DE RECEPTION DE LA REQUETE D'EXAMEN
ACKNOWLEDGEMENT OF REQUEST FOR EXAMINATION

N° de demande/Application No. : 2,685,353 **Classification :** G06T 13/20

Votre référence/Your Reference : 08914862CA

Titre de l'invention/ Title of Invention : MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS

Propriétaire(s)/Owner(s) : IDEAFLOOD, INC.

Nous accusons réception de la requête et de la taxe prescrite.

L'examen de la demande suivra son cours.

Au cours de l'examen, le demandeur devrait considérer signaler toute antériorité dont il prend connaissance et qui pourrait être digne d'intérêt par rapport à la brevetabilité de l'invention revendiquée. La communication volontaire de ces informations réduira les chances qu'une demande soit exigée en vertu de l'article 29 des *Règles sur les brevets*, et pourrait contribuer à accélérer le traitement de la demande.

Le demandeur ne devrait pas fournir de renseignements auxquels l'examinateur peut avoir facilement accès. En général, il n'est pas nécessaire de fournir des copies de documents de brevet identifiés, mais des copies de documents « non-brevet » ou de traductions peuvent être soumises, en particulier s'il y a des raisons de croire que le bureau ne pourra pas obtenir facilement une copie. Veuillez vous référer à la section 13.04 du RPBB pour de plus amples renseignements.

The Request for Examination and prescribed fee have been received.

Examination of the application will take place in due course.

Throughout the course of examination, the applicant should consider identifying any prior art which comes to their attention and that may be relevant to the patentability of their claimed invention. Voluntarily providing this information will reduce the likelihood of a formal requisition being made under section 29 of the *Patent Rules*, and may serve to expedite prosecution.

The applicant should not provide information that is readily available to the examiner. It is generally not necessary to provide copies of any patent documents identified, but copies of non-patent documents or translations may be submitted, especially if there is reason to believe the Office will not be able to readily obtain a copy. Please see section 13.04 of the MOPOP for further details.

J. CHARETTE

Innovation, Sciences et Développement économique Canada
Office de la propriété intellectuelle du Canada

Innovation, Science and Economic Development Canada
Canadian Intellectual Property Office

GOWLING LAFLEUR HENDERSON LLP
2600 - 160 Elgin Street
OTTAWA Ontario
K1P 1C3

Date : 2015/08/17

Classification :
G06T 13/20

AVIS D'ACCEPTATION/NOTICE OF ALLOWANCE

N° de demande/Application No. : 2,685,353 **Date de dépôt/Filing date :** 2008/03/07

Votre référence/ Your Reference : 08914862CA

Titre de l'invention/ Title of Invention : MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS

Propriétaire(s)/Owner(s) : IDEAFLOOD, INC.

Revendications/Claims : 025

Examiné tel que modifié/ Examined as amended : 2015/05/14

La demande de brevet susmentionnée a été jugée acceptable.

Il faut acquitter la taxe finale de **TROIS CENTS DOLLARS (300$),** ou CENT CINQUANTE DOLLARS (150$) si le requérant a le droit de revendiquer le statut de petite entité et a soumis une déclaration de petite entité, dans les six mois suivant la date du présent avis. Faute de quoi la demande sera réputée abandonnée conformément à l'alinéa 73(1)f) de la Loi sur les brevets.

Une taxe additionnelle de six dollars (6$) par page excédant 100 pages du mémoire descriptif et dessins devra aussi être payée.

Le brevet sera délivré au nom du dernier propriétaire inscrit à nos dossiers à qui a fourni une documentation acceptable, au plus tard la date du paiement de la taxe finale, conformément à l'article 41 des Règles sur les brevets.

La réponse au présent avis doit comprendre l'identification complète de la demande et la date de l'avis.

La publication des brevets canadiens délivrés dans la Gazette du Bureau des brevets peut comprendre aussi une note concernant la mise en vente d'un brevet ou de sa licence. Si vous désirez profiter de ce service gratuit, veuillez l'indiquer au moment de payer la taxe finale.

The above application for patent has been found allowable.

The final fee of **THREE HUNDRED DOLLARS ($300), or ONE HUNDRED AND FIFTY DOLLARS ($150)** where the applicant is entitled to claim small entity status and has submitted a small entity declaration, must be paid within six months following the date of this notice. Otherwise, the application will be deemed to be abandoned pursuant to paragraph 73(1)(f) of the Patent Act.

An additional fee of six dollars ($6.00) per page over 100 pages of specification and drawings must also be paid.

The patent shall issue to the last registered owner who has submitted acceptable documentation on or before the date that the final fee is paid (as pursuant to Section 41 of the Patent Rules).

A reply to this notice must include full identification of the application including the date of the notice.

The publication of issued Canadian patents in the Patent Office Record can also include an indication that the patent is available for licence or sale. If you wish to take advantage of this free service, please indicate this when paying the final fee.

Commissaire aux brevets/Commissioner of Patents

Innovation, Sciences et Développement économique Canada
Office de la propriété intellectuelle du Canada

Innovation, Science and Economic Development Canada
Canadian Intellectual Property Office

Courtoisie - Certificat d'inscription (transfert)
Courtesy - Certificate of Recordal (Transfer)

GOWLING WLG (CANADA) LLP
CIPO@gowlingwlg.com

Détails du certificat
Certificate Details

Date du certificat: Certificate Date:	2023/01/17
N° d'inscription: Recordal N°:	**05859349**
Votre n° de référence: Your Reference N°:	08914862CA

De/From:	IDEAFLOOD, INC.
À/To:	UTHERVERSE DIGITAL, INC.
Transfert:	TRANSFERT DROIT EXCLUSIF
Transfer:	TRANSFER FULL INTEREST

Les dossiers du Bureau des brevets indiquent qu'un transfert a été inscrit relativement à la (aux) demande(s) et/ou au(x) brevet(s) suivants:

Patent Office records indicate that a transfer has been recorded for the following application(s) and/or patent(s):

Brevets/Patents:

2,685,353

Courtoisie - Certificat d'inscription (transfert)
Courtesy - Certificate of Recordal (Transfer)

GOWLING WLG (CANADA) LLP
CIPO@gowlingwlg.com

Détails du certificat
Certificate Details

Date du certificat: Certificate Date:	2023/01/17
N° d'inscription: Recordal N°:	**05859350**
Votre n° de référence: Your Reference N°:	08914862CA

De/From:	UTHERVERSE DIGITAL, INC.
À/To:	UTHERVERSE GAMING, LLC
Transfert:	TRANSFERT DROIT EXCLUSIF
Transfer:	TRANSFER FULL INTEREST

Les dossiers du Bureau des brevets indiquent qu'un transfert a été inscrit relativement à la (aux) demande(s) et/ou au(x) brevet(s) suivants:

Patent Office records indicate that a transfer has been recorded for the following application(s) and/or patent(s):

Brevets/Patents:

2,685,353

Office de la propriété intellectuelle du Canada
Canadian Intellectual Property Office

Place du Portage, Phase I
50, rue Victoria
Gatineau (Québec)
K1A 0C9

Place du Portage, Phase I
50 Victoria Street
Gatineau, QC
K1A 0C9

Reçu du paiement électronique / Electronic Payment Receipt

DATE: 2013-03-05
HEURE / TIME: 14:44:08

NUMÉRO DE CONFIRMATION / CONFIRMATION NUMBER
3854559
Merci / Thank You

NOM ET ADRESSE / NAME AND ADDRESS:

GOWLING LAFLEUR HENDERSON LLP
ERRATT, J.A.
c/o Gowling Lafleur Henderson LLP
OTTAWA, Ontario
K1P 1C3
Canada

No de document / Document No.	Description / Description	Taxes / Fees
2685353	MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS Taxes de maintien - Demande / Maintenance Fee - Application année(s)/year(s): 5 Numéro PCT / PCT Number: US2008056150 Numéro de référence / Reference Number: 08914862CA	$ 200.00

Total des taxes payées / Total Fees Paid :	$ 200.00

INFORMATION SUR LE PAIEMENT / PAYMENT INFORMATION

(819) 994-2269

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 08/56150

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06F 3/048 (2008.04)
USPC - 715/706
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)
IPC(8): G06F 3/048 (2008.04)
USPC: 715/706

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
382/117,173-174; 711/100

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
USPTO WEST (PGPB, USPT, EPAB, JPAB); Google
Search Terms Used: parallel$, dimension, environment, space, place, expand, increase, threshold, limit, update, additional, everquest, secondlife, massive, multiplayer, avatar, virtual, population

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,767,287 B1 (MCQUAID et al.) 27 July 2004 (27.07.2004), entire document, especially col 5, 9, 14, 24	1-24
Y	US 2004/0235564 A1 (BOOTH) 25 November 2004 (25.11.2004), entire document, especially para [0020]-[0024]	1-24
Y	US 2007/0011273 A1 (GREENSTEIN et al.) 11 January 2007 (11.01.2007), entire document, especially para [0047]-[0050]	7
A	US 2006/0119598 A1 (LITTLEFIELD) 08 June 2006 (08.06.2006)	1-24
A	US 2005/0026692 A1 (DYL) 03 February 2005 (03.02.2005)	1-24
A	US 2003/0151605 A1 (DOMINICI) 14 August 2003 (14.08.2003)	1-24

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 July 2008 (24.07.2008)	01 AUG 2008
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2007)

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

Category	:	**PCT National Phase**
Current Owner	:	**Ideaflood, Inc.**
Original Applicant	:	**Ideaflood, Inc.**
Serial No.	:	**PCT/US2008/056150**
Filing Date	:	**March 07, 2008**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**
Date	:	**September 8, 2009**

The Commissioner of Patents
50 Victoria Street, Phase I, Place du Portage
Gatineau, Quebec K1A 0C9

Voluntary Amendment

Dear Commissioner of Patents:

In order to more particularly define the invention for the purposes of examination, applicant encloses an amended set of 25 claims. Kindly enter the new claims for examination when requested.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Agents for Applicant

Bruce E. Morgan
Direct Dial (613) 786-0127
160 Elgin Street, Suite 2600
Ottawa, Ontario
Canada K1P 1C3
BEM:mr
Encls.

[OTT_LAW\2248038\1]

CLAIMS

1. A method for managing a multi-instance, multi-user animation process, comprising:

modeling, using a computer, a plurality of parallel dimensions in a computer memory, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits that are defined by at least one model of a three dimensional object;

assigning ones of a plurality of avatars within the computer memory so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, so as to prevent over-population of any one of the parallel dimensions by avatars; and

animating ones of the plurality of avatars populating different ones of the parallel dimensions in response to input from respective corresponding ones of a plurality of clients to provide virtual-reality data, using the computer, the virtual-reality data configured to enable the clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

2. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions.

3. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions in response to user input signifying a request to relocate the avatar.

4. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions in response to determining that a population of avatars in the first one of the parallel dimensions has reached a predetermined limit.

5. The method of claim 1, further comprising generating an additional parallel dimension to accommodate an increase in avatar population.

6. The method of claim 5, further comprising relocating avatars from the plurality of parallel dimensions into the additional parallel dimension.

7. The method of claim 1, further comprising generating the plurality of parallel dimensions as replicas of a template space.

8. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that at least one object located inside the common space is visible from viewpoints located inside each of the plurality of parallel dimensions.

9. The method of claim 8, further comprising animating at least one avatar populating the common space in response to input from a corresponding client, to provide the virtual-reality data further enabling the corresponding client to output an animated display including at least a portion of each of the plurality of parallel dimensions and avatars populated therein.

10. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that a modeled object originating from the common space is capable of passing into at least one of the plurality of parallel dimensions.

11. The method of claim 10, further comprising replicating the modeled object passing into the plurality of parallel dimensions so that a replica of the object is modeled in each of the plurality of parallel dimensions after the object passes from the common space.

12. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that an avatar originating from the common space is capable of passing into one of the plurality of parallel dimensions.

13. The method of claim 12, further comprising selecting which one of the plurality of parallel dimensions the avatar is capable of passing into based on avatar populations of each parallel space.

14. The method of claim 12, further comprising selecting which one of the plurality of parallel dimensions the avatar is capable of passing into based on a corresponding user preference.

15. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that an avatar originating from any one of the plurality of parallel dimensions is capable of passing into the common space.

16. The method of claim 1, further comprising tracking analogous objects in different ones of the parallel dimensions and moving any displaced ones of the analogous objects so that positions of analogous objects within each of the parallel dimension tend to converge over time.

17. The method of claim 1, further comprising collapsing first and second ones of the plurality of dimensions into a combined dimension populated by the avatars formerly in the first and second ones of the plurality of dimensions.

18. The method of claim 1, further comprising synchronously animating an avatar present in multiple ones of the plurality of dimensions.

19. The method of claim 1, further comprising asynchronously animating an avatar present in multiple ones of the plurality of dimensions.

20. The method of claim 1, further comprising modeling an interface between adjacent ones of the plurality of dimensions.

21. The method of claim 20, further comprising modeling the interface to include an overlapping region interactive with both adjacent ones of the plurality of dimensions.

22. The method of claim 20, further comprising modeling the interface as a transparent object rendering the adjacent ones of the plurality of dimensions visible to each other.

23. The method of claim 20, further comprising providing a communication channel between avatars populating different ones of the plurality of dimensions.

24. A computer-readable medium encoded with instructions, that when executed by a computer, cause the computer to:

model a plurality of parallel dimensions, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits defined for the three-dimensional space;

assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and

animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

25. A computer comprising a memory holding instructions, that when executed by the computer, cause the computer to:

generate a plurality of parallel dimensions in a computer memory, each being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within defined spatial limits;

assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and

animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the clients to output an animated display of an assigned one of the parallel dimensions and avatars populated therein.

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

Category	:	**PCT National Phase**
Current Owner	:	**Ideaflood, Inc.**
Original Applicant	:	**Ideaflood, Inc.**
Serial No.	:	**PCT/US2008/056150**
Filing Date	:	**March 7, 2008**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**
Date	:	**December 7, 2009**

062

2685353

The Commissioner of Patents
Place du Portage I
50 Victoria Street, Room C-114
Gatineau, Quebec K1A 0C9

Submission of Entitlement Declaration

Dear Commissioner of Patents:

Applicant encloses the required Entitlement Declaration.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Agents for Applicant

Bruce E. Morgan
Direct Dial (613) 786-0127
160 Elgin Street, Suite 2600
Ottawa, Ontario
Canada K1P 1C3
BEM:mr
Encl.

[OTT_LAW\2325631\1]

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

Category		**PCT National Phase**
Applicant at National Entry	:	**Ideaflood, Inc.**
Current Owner	:	**Ideaflood, Inc.**
PCT Serial No.	:	**PCT/US2008/056150**
Filing Date	:	**March 7, 2008**
Entity Status	:	**Regular Entity**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**

The Commissioner of Patents
50 Victoria Street, Phase I, Place du Portage
Gatineau, Quebec K1A 0C9

Entitlement Declaration

Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate:

in relation to international application No. PCT/US2008/056150,

Ideaflood, Inc.

is entitled to apply for and be granted a patent by virtue of the following:

(i) Gary Stephen SHUSTER of 486 E. Rusty Harbor Drive, Fresno, CA 93704, U.S.A.; and

Brian Mark SHUSTER of P.O. Box 2183, Stateline, NV 89449, U.S.A. are the inventor of the subject matter for which protection is sought by way of the international application.

(ii) Ideaflood, Inc. was entitled by assignment from the inventors Gary Stephen SHUSTER and Brian Mark SHUSTER prior to the filing date.

SIGNED at Ottawa, Ontario this 7th day of December, 2009.

Ideaflood, Inc.

By: _____
Gowling Lafleur Henderson LLP

[OTT_LAW\2254466\1]

December 22, 2009

GOWLING LAFLEUR HENDERSON LLP
2600 - 160 Elgin Street
OTTAWA Ontario
K1P 1C3

Application No.	:	**2,685,353**
Owner	:	IDEAFLOOD, INC.
Title	:	**MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS**
Classification	:	G06F 3/048 (2006.01)
Your File No.	:	**08914862CA**

COMPLETION REQUIREMENT LETTER

Your national entry application PCT/ US 2008 / 056150 has been assigned the above mentioned serial number.

However, the application remains incomplete with regard to the following item(s):

- a declaration as to the applicant's entitlement, as at the filing date , to apply for and be granted a patent, in accordance with Rule 4.17 of the *Regulations under the PCT*

A declaration from inventors **WILLIAM HENDRICK ANDREWS** and **ROBERT STEVEN FLESCH** to the applicant **IDEAFLOOD, INC.** is required to complete the chain of title.

However, in order to proceed with your request and since the rights of the inventors are affected, further evidence is required. An affidavit from the inventors in question stating that they are aware of their withdrawal as inventors or an affidavit from the agent of record would be sufficient. As an alternative a form 306 from the International Bureau showing that the inventors have been removed can be provided. No other proof would be required.

To prevent abandonment, the outstanding completion requirement along with the **$200.00** completion fee prescribed in Schedule II of the *Patent Rules* must be received on or before **March 22, 2010.**

Please disregard this letter if a reply has already been submitted.

Should you require further information, please contact the undersigned.

Shirley Lavergne
PCT National Analyst
(819) 953-8423

058

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

Industry Canada Industrie Canada

A/M/J Y/M/D
2010/02/24

056 - 10

CIPO OPIC

A001468095

Category	:	**PCT National Phase**
Current Owner	:	**Ideaflood, Inc.**
Original Applicant	:	**Ideaflood, Inc.**
Serial No.	:	**2,685,353**
Filing Date	:	**March 7, 2008**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**
Date	:	**February 24, 2010**

The Commissioner of Patents
Place du Portage I
50 Victoria Street, Room C-114
Gatineau, Quebec K1A 0C9

Attention: Shirley Lavergne, PCT National Analyst

Dear Commissioner of Patents:

Further to the Office letter of December 22, 2009, (copy attached), Applicant has today filed a Section 31 Application (copy attached) removing the two inventors which are requested by the completion letter.

From the above a further Declaration is not required and withdrawal of the request is respectfully requested.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Agents for Applicant

Bruce E. Morgan
Direct Dial (613) 786-0127
160 Elgin Street, Suite 2600
Ottawa, Ontario
Canada K1P 1C3
BEM:mr
Encl.

Office de la propriété intellectuelle du Canada
Un organisme d'Industrie Canada
www.opic.gc.ca

Canadian Intellectual Property Office
An Agency of Industry Canada
www.cipo.gc.ca

December 22, 2009

GOWLING LAFLEUR HENDERSON LLP
2600 - 160 Elgin Street
OTTAWA Ontario
K1P 1C3

Application No.	:	**2,685,353**
Owner	:	IDEAFLOOD, INC.
Title	:	**MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS**
Classification	:	G06F 3/048 (2006.01)
Your File No.	:	**08914862CA**

Due Receipt: Jan 6/10
Our Reference:
Due Date: Mar. 22/10
Initials: JR

COMPLETION REQUIREMENT LETTER

Your national entry application PCT/ US 2008 / 056150 has been assigned the above mentioned serial number.

However, the application remains incomplete with regard to the following item(s):

- a declaration as to the applicant's entitlement, as at the filing date , to apply for and be granted a patent, in accordance with Rule 4.17 of the *Regulations under the PCT*

A declaration from inventors **WILLIAM HENDRICK ANDREWS** and **ROBERT STEVEN FLESCH** to the applicant **IDEAFLOOD, INC.** is required to complete the chain of title.

However, in order to proceed with your request and since the rights of the inventors are affected, further evidence is required. An affidavit from the inventors in question stating that they are aware of their withdrawal as inventors or an affidavit from the agent of record would be sufficient. As an alternative a form 306 from the International Bureau showing that the inventors have been removed can be provided. No other proof would be required.

To prevent abandonment, the outstanding completion requirement along with the **$200.00** completion fee prescribed in Schedule II of the *Patent Rules* must be received on or before **March 22, 2010.**

Please disregard this letter if a reply has already been submitted.

Should you require further information, please contact the undersigned.

Shirley Lavergne
PCT National Analyst
(819) 953-8423

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

Industry Canada Industrie Canada

A/M/J Y/M/D

2010/02/24

056 - 10

CIPO OPIC

A001468391

Category	:	**PCT National Phase**
Current Owner	:	**Ideaflood, Inc.**
Original Applicant	:	**Ideaflood, Inc.**
Serial No.	:	**2,685,353**
Filing Date	:	**March 7, 2008**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**
Date	:	**February 24, 2010**

The Commissioner of Patents
Place du Portage I
50 Victoria Street, Room C-114
Gatineau, Quebec K1A 0C9

Section 31 Application

Dear Commissioner of Patents:

Pursuant to the provisions of Section 31 of the Patent Act, applicant requests amendment of the inventorship in the above referenced application to identify the inventors as Brian Shuster and Gary Shuster only, and thereby remove William Hendrick and Robert Flesch as incorrectly named inventors.

Attached with this Application are Written Submissions and a supporting Affidavit of Jonathan Jaech.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Agents for Applicant
Bruce E. Morgan
Direct Dial (613) 786-0127
BEM:mr
Encls.

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

Category	:	**PCT National Phase**
Current Owner	:	**Ideaflood, Inc.**
Original Applicant	:	**Ideaflood, Inc.**
Serial No.	:	**2,685,353**
Filing Date	:	**March 7, 2008**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**
Date	:	**February 24, 2010**

The Commissioner of Patents
Place du Portage I
50 Victoria Street, Room C-114
Gatineau, Quebec K1A 0C9

Written Submissions

Dear Commissioner of Patents:

1. Canadian Application 2,685,353 is a National Entry of PCT/US2008/056150. In the PCT Application, inventors were identified as Brian Shuster, Gary Shuster, William Hendrick and Robert Flesch. As appears from the Affidavit of Jonathan Jaech filed herewith, Brian Shuster and Gary Shuster are properly based and properly named inventors (see Paragraph 2, Jaech Affidavit).

2. Subsequent to the PCT Application and the National Entry in Canada, it was determined from a further, careful review that William Hendrick and Robert Flesch were inadvertently named based upon inadequate information (see Jaech Affidavit, Paragraph 3).

3. The identification of William Hendrick and Robert Flesch was based upon misunderstanding of the subject matter of the patent, and upon full consultation and review, Mr. Jaech, the U.S. patent attorney responsible for this case, determined that only Brian Shuster and Gary Shuster were properly named inventors.

4. The misidentification of Mr. Hendrick and Mr. Flesch was without intent to mislead or delay the application, and applicant now requests that the improperly identified inventors be deleted pursuant to the provisions of Section 31.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Agents for Applicant
Bruce E. Morgan
Direct Dial (613) 786-0127
BEM:mr
Encls.

APPLICATION NO.	:	2,685,535 (CANADA)
OWNER	:	IDEAFLOOD, INC.
TITLE	:	MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS
CLASSIFICATION	:	G06F 3/048 (2006.1)
ATTORNEY DKT.	:	08914862CA

AFFIDAVIT

1. I, Jonathan Jaech, am a United States registered patent attorney representing the owner of the above-referenced Canadian application, Ideaflood, Inc. in the related U.S. and International (PCT) applications. Specifically, I represented and continue to represent Ideaflood in PCT Application PCT/US2008/056150 (hereinafter, the "PCT Application") and its priority date application, U.S. Provisional Application Serial No. 60/893,531 (hereinafter, "U.S. Provisional Application.")

2. The PCT Application and U.S. Provisional Application both name four inventors: Brian Shuster, Gary Shuster, William Hendrick and Robert Flesch. Prior to filing the U.S. Provisional Application. I identified the inventors Brian Shuster and Gary Shuster from disclosure materials I received from these persons, and William Hendrick and Robert Flesch were identified as inventors by Brian Shuster.

3. Prior to national entry into Canada, I consulted with inventors Brian Shuster and Gary Shuster regarding inventorship of the amended claims to be filed in the Canadian case, and reviewed certain disclosures predating the U.S. Provisional Application provided to me by Brian Shuster. Based on that consultation and review, I have determined that the subject matter encompassed by the claims of the U.S. Provisional Application, the PCT Application, and Canadian Application 2,685,535 was invented by Brian Shuster and Gary Shuster only, and that the identification of William Hendrick

and Robert Flesch as inventors in the U.S. Provisional Application and the PCT Application was inadvertent with no intention to mislead.

4. I swear under penalty of perjury that that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements so made are punishable by fine or imprisonment, or both, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Jonathan Jaech — Date: 2-12-2010

JURAT

STATE OF CALIFORNIA

COUNTY OF LOS ANGELES

Subscribed and sworn to (or affirmed) before me on this 12th of February, 2010, by Jonathan Jaech

Personally known to me or proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

Signature: Dorian Dellisanti

Dorian Dellisanti
Comm. #1771607

DORIAN DELLISANTI
COMM. #1771607
NOTARY PUBLIC - CALIFORNIA
LOS ANGELES COUNTY
COMM. EXPIRES OCT. 4, 2011

(Seal)

0600 48

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

Industry Canada Industrie Canada

A/M/J Y/M/D

2010/02/24

056 - 10

CIPO OPIC A001468093

Category	:	**PCT National Phase**
Current Owner	:	**Ideaflood, Inc.**
Original Applicant	:	**Ideaflood, Inc.**
Serial No.	:	**2,685,353**
Filing Date	:	**March 7, 2008**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**
Date	:	**February 24, 2010**

The Commissioner of Patents
Place du Portage I
50 Victoria Street, Room C-114
Gatineau, Quebec K1A 0C9

Section 31 Application

Dear Commissioner of Patents:

Pursuant to the provisions of Section 31 of the Patent Act, applicant requests amendment of the inventorship in the above referenced application to identify the inventors as Brian Shuster and Gary Shuster only, and thereby remove William Hendrick and Robert Flesch as incorrectly named inventors.

Attached with this Application are Written Submissions and a supporting Affidavit of Jonathan Jaech.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Agents for Applicant
Bruce E. Morgan
Direct Dial (613) 786-0127
BEM:mr
Encls.

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

Category	:	**PCT National Phase**
Current Owner	:	**Ideaflood, Inc.**
Original Applicant	:	**Ideaflood, Inc.**
Serial No.	:	**2,685,353**
Filing Date	:	**March 7, 2008**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**
Date	:	**February 24, 2010**

The Commissioner of Patents
Place du Portage I
50 Victoria Street, Room C-114
Gatineau, Quebec K1A 0C9

Written Submissions

Dear Commissioner of Patents:

1. Canadian Application 2,685,353 is a National Entry of PCT/US2008/056150. In the PCT Application, inventors were identified as Brian Shuster, Gary Shuster, William Hendrick and Robert Flesch. As appears from the Affidavit of Jonathan Jaech filed herewith, Brian Shuster and Gary Shuster are properly based and properly named inventors (see Paragraph 2, Jaech Affidavit).

2. Subsequent to the PCT Application and the National Entry in Canada, it was determined from a further, careful review that William Hendrick and Robert Flesch were inadvertently named based upon inadequate information (see Jaech Affidavit, Paragraph 3).

3. The identification of William Hendrick and Robert Flesch was based upon misunderstanding of the subject matter of the patent, and upon full consultation and review, Mr. Jaech, the U.S. patent attorney responsible for this case, determined that only Brian Shuster and Gary Shuster were properly named inventors.

4. The misidentification of Mr. Hendrick and Mr. Flesch was without intent to mislead or delay the application, and applicant now requests that the improperly identified inventors be deleted pursuant to the provisions of Section 31.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Agents for Applicant
Bruce E. Morgan
Direct Dial (613) 786-0127
BEM:mr
Encls.

APPLICATION NO.	:	2,685,535 (CANADA)
OWNER	:	IDEAFLOOD, INC.
TITLE	:	MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS
CLASSIFICATION	:	G06F 3/048 (2006.1)
ATTORNEY DKT.	:	08914862CA

AFFIDAVIT

1. I, Jonathan Jaech, am a United States registered patent attorney representing the owner of the above-referenced Canadian application, Ideaflood, Inc. in the related U.S. and International (PCT) applications. Specifically, I represented and continue to represent Ideaflood in PCT Application PCT/US2008/056150 (hereinafter, the "PCT Application") and its priority date application, U.S. Provisional Application Serial No. 60/893,531 (hereinafter, "U.S. Provisional Application.")

2. The PCT Application and U.S. Provisional Application both name four inventors: Brian Shuster, Gary Shuster, William Hendrick and Robert Flesch. Prior to filing the U.S. Provisional Application. I identified the inventors Brian Shuster and Gary Shuster from disclosure materials I received from these persons, and William Hendrick and Robert Flesch were identified as inventors by Brian Shuster.

3. Prior to national entry into Canada, I consulted with inventors Brian Shuster and Gary Shuster regarding inventorship of the amended claims to be filed in the Canadian case, and reviewed certain disclosures predating the U.S. Provisional Application provided to me by Brian Shuster. Based on that consultation and review, I have determined that the subject matter encompassed by the claims of the U.S. Provisional Application, the PCT Application, and Canadian Application 2,685,535 was invented by Brian Shuster and Gary Shuster only, and that the identification of William Hendrick

and Robert Flesch as inventors in the U.S. Provisional Application and the PCT Application was inadvertent with no intention to mislead.

4. I swear under penalty of perjury that that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements so made are punishable by fine or imprisonment, or both, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Jonathan Jaech

2-12-2010

Jonathan Jaech

Date

JURAT

STATE OF CALIFORNIA

COUNTY OF LOS ANGELES

Subscribed and sworn to (or affirmed) before me on this 12th of February, 2010, by Jonathan Jaech

Personally known to me or proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

Signature: Dorian Dellisanti

Dorian Dellisanti
Comm. #1771607

DORIAN DELLISANTI
COMM. #1771607
NOTARY PUBLIC - CALIFORNIA
LOS ANGELES COUNTY
COMM. EXPIRES OCT. 4, 2011

(Seal)

007
DE

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

A/M/J Y/M/D
2013/01/07
008- 13
A002123002

Category	:	**PCT National Phase**
Current Owner	:	**Ideaflood, Inc.**
Original Applicant	:	**Ideaflood, Inc.**
Serial No.	:	**2,685,353**
Filing Date	:	**March 7, 2008**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**
Date	:	**January 7, 2013**

The Commissioner of Patents
Place du Portage I
50 Victoria Street, Room C-114
Gatineau, Quebec K1A 0C9

#1876101

Request for Examination

Dear Commissioner of Patents:

The Applicant requests examination of this application.

The prescribed fee of $800.00 is included in today's payment. The applicant has elected to pay this fee at a regular entity rate.

In the event that this application is currently deemed to be abandoned for failure to pay any prescribed fee, or for any other reason, the applicant requests reinstatement of this application. Accordingly, CIPO is requested and authorized to deduct the prescribed reinstatement fee of $200.00 for each cause of abandonment and any other fees currently due, directly from our account number 600000107.

Should the fees submitted with this letter be insufficient to cover all of the fees for which payment is explicitly or implicitly requested by this letter, CIPO is authorized to charge the amount of the insufficiency to account number 600000107.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Gowling Lafleur Henderson LLP

Agents for Applicant

Bruce E. Morgan
Direct Dial (613) 786-0127
160 Elgin Street, Suite 2600
Ottawa, Ontario
Canada K1P 1C3
BEM:hw
Examination Fee: $800.00

028

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

Category	:	**PCT National Phase**
Current Owner	:	**Ideaflood, Inc.**
Original Applicant	:	**Ideaflood, Inc.**
Serial No.	:	**2,685,353**
Filing Date	:	**March 7, 2008**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**
Date	:	**February 26, 2013**

The Commissioner of Patents
Place du Portage I
50 Victoria Street, Room C-114
Gatineau, Quebec K1A 0C9

Submission of References

Dear Commissioner of Patents:

In order to assist in the examination of the present application, Applicant submits the Information Disclosure Statements filed in the related to the corresponding United States Patent matters together with the non-patent and references cited.

The enclosed documents are submitted voluntarily to facilitate the examination process without prejudice and without admission that the listed or enclosed references or their contents are relevant to the requirements of the Patent Act and Patent Rules. Applicant reserves all rights to argue against the citability and/or relevance of the listed or the enclosed references or that of any other reference listed thereon.

Early and favourable consideration of the application on its merits is respectfully requested.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Agents for Applicant

Bruce E. Morgan
Direct Dial (613) 786-0127
160 Elgin Street, Suite 2600
Ottawa, Ontario
Canada K1P 1C3
BEM:cr

Office de la propriété intellectuelle du Canada
Canadian Intellectual Property Office

Place du Portage, Phase I
50, rue Victoria
Gatineau (Québec)
K1A 0C9

Place du Portage, Phase I
50 Victoria Street
Gatineau, QC
K1A 0C9

Reçu du paiement électronique / Electronic Payment Receipt

DATE: 2014-03-04
HEURE / TIME: 11:16:33

NOM ET ADRESSE / NAME AND ADDRESS:

GOWLING LAFLEUR HENDERSON LLP
ERRATT, J.A.
c/o Gowling Lafleur Henderson LLP
OTTAWA, Ontario
K1P 1C3
Canada

NUMÉRO DE CONFIRMATION / CONFIRMATION NUMBER
4398972
Merci / Thank You

Table composée de 2 rangée(s) et de 3 colonne(s). / Table with 2 row(s) and 3 column(s).

No de Document No.	Description / Description	Taxes / Fees
2685353	MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS Taxes de maintien - Demande / Maintenance Fee - Application année(s)/year(s): 6 Numéro PCT / PCT Number: US2008056150 Numéro de référence / Reference Number: 08914862CA	$ 200.00

Total des taxes payées / Total Fees Paid :	$ 200.00

INFORMATION SUR LE PAIEMENT / PAYMENT INFORMATION

Numéro de téléphone / Phone number (819) 994-2269

Canada

OPIC CIPO

14 November 2014 (14-11-2014)

GOWLING LAFLEUR HENDERSON LLP
2600 - 160 Elgin Street
OTTAWA Ontario
K1P 1C3

Application No.	:	**2,685,353**
PCT No.	:	**US2008056150**
Owner	:	IDEAFLOOD, INC.
Title	:	**MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS**
Classification	:	G06T 13/20 (2011.01)
Your File No.	:	**08914862CA**
Examiner	:	Tatjana Kremer

YOU ARE HEREBY NOTIFIED OF:

- A REQUISITION BY THE EXAMINER IN ACCORDANCE WITH SUBSECTION 30(2) OF THE *PATENT RULES*; AND
- A REQUISITION BY THE EXAMINER IN ACCORDANCE WITH SECTION 29 OF THE *PATENT RULES*.

IN ORDER TO AVOID **MULTIPLE ABANDONMENTS** UNDER PARAGRAPH 73(1)(*a*) OF THE *PATENT ACT*, A WRITTEN REPLY **TO EACH REQUISITION** MUST BE RECEIVED WITHIN THE **6** MONTH PERIOD AFTER THE ABOVE DATE.

This application has been examined taking into account the:

Description,	pages 1-30, as originally filed;
Claims,	1-25, as received on 8 September 2009 (08-09-2009) during the national phase; and
Drawings,	pages 1/7-7/7, as originally filed.

This application has been examined taking into account applicant's correspondence on prior art received in this office on 26 February 2013 (26-02-2013).

The number of claims in this application is 25.

A search of the prior art has thus far failed to reveal any pertinent references.

The examiner has identified the following defects in the application:

Indefiniteness

Claim 24 is indefinite and does not comply with subsection 27(4) of the *Patent Act*. Claim 24 is directed to a (emphasis added) "computer-readable medium encoded with instructions, that when executed by a computer, cause the computer to:...". To avoid ambiguity, it has to be clear that the claimed computer readable medium is recordable-type storage medium, and not a transmission

type medium such as, for example, a not patentable wireless signal [see Canadian Intellectual Property Office (CIPO), Manual of Patent Office Practice (MOPOP), 1998 ed. (Ottawa-Gatineau: CIPO, May 2014), section 12.05.04]. The claim should be amended to appear in proper form, i.e. to include a word with a more specific meaning, such as "storing", for example: "a computer-readable medium storing instructions..." [see MOPOP, section 16.08.04].

References in the Description and Other Description Defects

The description contains statements that incorporate by reference other documents and does not comply with subsection 81(1) of the *Patent Rules*. Such statements are found on page 1, lines 6-7, page and page 19, lines 21-22, and should be removed.

Subsection 81(2) of the *Patent Rules* requires that the description does not refer to a document which is not part of the application unless the document is available to the public. If the document referred to on page 19, lines 21-22, is not publicly available, its reference should be deleted or replaced by its corresponding patent or publication numbers.

The description includes inaccurate statements and does not comply with subsection 27(3) of the *Patent Act*. Statements referring to a provisional application on page 19, lines 21-22, are inaccurate and should be removed. There is no provision in the Canadian *Patent Act* and *Patent Rules* for continuation-in-part, provisional applications and Attorney Docket numbers.

The description does not correctly and fully describe the invention and does not comply with subsection 27(3) of the *Patent Act*. Statements such as those found at page 15, lines 1-2, and page 30, lines 5-7, indicating that the claims encompass or must be interpreted having regard to the "spirit of the invention", i.e. that claims are to be viewed as broader than the teachings of the description, do not correctly describe the invention and should be removed [See Canadian Intellectual Property Office (CIPO), Manual of Patent Office Practice (MOPOP), 1998 ed. (Ottawa-Gatineau: CIPO, May 2014), subsection 9.05.06.].

The description does not comply with subsection 68(1) of the *Patent Rules*. Pages 1, 3-7, 9-13, 15-29 comprise horizontal lines in the lower portion of the pages. A portion of the text of the last paragraph on each of these pages appears to be either underlined or stricken through. These pages should be replaced.

Requisitions

In view of the foregoing defects, the applicant is requisitioned, under subsection 30(2) of the *Patent Rules*, to amend the application in order to comply with the *Patent Act* and the *Patent Rules* or to provide arguments as to why the application does comply.

Under section 34 of the *Patent Rules*, any amendment made in response to this requisition must be accompanied by a statement explaining the nature thereof, and how it corrects each of the above identified defects.

Requisition under Section 29 of the *Patent Rules*

The applicant is requisitioned under paragraph 29(1)(*b*) of the *Patent Rules* to provide the application numbers, filing dates and, if granted, the patent numbers, in respect of any applications describing the same invention that have been filed in European Patent Office on behalf of the applicant or any other person claiming under an inventor named in the application.

If any of the requisitioned information is not available or known to the applicant, in accordance with subsection 29(3) of the *Patent Rules*, the applicant must state in the response to this requisition the reasons why the information is not available or known.

Tatjana Kremer
Patent Examiner, Section E9
819-934-0312

As per CIPO Client Service Standards, a response to a telephone enquiry or voice mail should be provided by the end of the next business day. In the event that attempts to reach the examiner are unsuccessful, the examiner's Section Head, Chaza Nasrallah, can be reached at 819-994-1989.

Examination Search Report

Box I: General Information

Application No.	2,685,353	Search Report Date	05-11-2014
Title	MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS		
Examiner	Tatjana Kremer	Search Conducted?	Yes

Box II: Foreign Prosecution

Family Member	File Wrapper Reviewed	Status of Prosecution
WO2008109798	05-11-2014	Completed
US8276071	05-11-2014	Completed
US8589792	05-11-2014	Completed
US8812954	05-11-2014	Completed

Box III: Prior Art Submissions

Type of submissions	Reviewed?
Applicant's submissions(s) of prior art received on 26-02-2013	Yes

Box IV: Search History

Claims Searched	1-25	Date of Search	05-11-2014

Type of Search Conducted (select all that apply):

Canadian first to file search	■	Supplemental/top up search	□
Inventor/applicant search	■	Non laid open search	□
Comprehensive search	□	In-house searcher	□
Relied on previous search result(CIPO and/or by Foreign Office)			■

Search History from Databases Consulted:

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##### CANADIAN PATENT DATABASE ##########

Query Number of Hits
1      (filing-date <= 2008-03-07 and 'avatar' and (( (multi* <NEAR/5> ('instance' or
'dimension')) <NEAR/5> 'space') <NEAR/5> virtual))    0
2      filing-date <= 2008-03-07 and 'avatar' and ( multi* <NEAR/5> ('instance' or
'dimension')) and ('space'<NEAR/5> virtual)    3
```

ESPACENET

MULTI-INSTANCE and MULTI-USER
Shuster, Gary Stephen
Shuster, Brian Mark

GOOGLE

MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS
Shuster, Gary Stephen
Shuster, Brian Mark

Office de la propriété intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
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50, rue Victoria
Place du Portage, Phase I
Gatineau (Québec) Canada
K1A 0C9

50 Victoria Street
Place du Portage, Phase I
Gatineau, QC, Canada
K1A 0C9

Reçu du paiement électronique / Electronic Payment Receipt

DATE: 2015-03-09
HEURE / TIME: 13:12:11

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GOWLING LAFLEUR HENDERSON LLP
ROY, MATTHEW M.
c/o Gowling Lafleur Hendercon LLP
OTTAWA, Ontario
K1P 1C3
Canada

NUMÉRO DE CONFIRMATION / CONFIRMATION NUMBER
4948800
Merci / Thank You

Table composée de 2 rangée(s) et de 3 colonne(s). / Table with 2 row(s) and 3 column(s).

No de document / Document No.	Description / Description	Taxes / Fees
2685353	MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS Taxes de maintien - Demande / Maintenance Fee - Application année(s)/year(s): 7 Numéro PCT / PCT Number: US2008056150 Numéro de référence / Reference Number: 08914862CA	$ 200.00

Total des taxes payées / Total Fees Paid : $ 200.00

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Numéro de téléphone (819) 994-2269

PAYMENT INFORMATION
Phone number (819) 994-2269

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

Category	:	**PCT National Phase**
Current Owner	:	**Ideaflood, Inc.**
Original Applicant	:	**Ideaflood, Inc.**
Serial No.	:	**2,685,353**
Filing Date	:	**March 7, 2008**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**
Date	:	**May 14, 2015**

Industry Canada Industrie Canada

A/M/J Y/M/D

2015/05/14

135 - 15

CIPO OPIC

E001893599

The Commissioner of Patents
Place du Portage I
50 Victoria Street, Room C-114
Gatineau, Quebec K1A 0C9

Response to Official Action

Dear Commissioner of Patents:

In response to the Official Action dated November 14, 2014, kindly amend this application as follows:

IN THE DESCRIPTION:

Please replace pages 1 to 30 of the description currently on file with the new pages 1 to 31, enclosed herewith.

IN THE CLAIMS:

Please replace claim pages 31 to 35 currently on file with the new claim pages 32 to 36 containing claims 1 to 25, enclosed herewith.

REMARKS

Response to Requisition under Subsection 30(2) of the *Patent Rules*

Claim 24 has been amended.

Claim 24 has been rejected as allegedly being indefinite. Applicant has amended Claim 24 to recite "A computer-readable medium storing instructions..." as suggested by the Examiner. Applicant believes Claim 24 as amended now complies with subsection 27(4) of the Patent Act and respectfully requests that the objection be withdrawn.

Description pages 1 and 19 have been rejected as allegedly not complying with subsection 81(1) of the Patent Rules. Applicant has removed statements that incorporate by reference other documents.

Applicant has amended page 19 of the description to remove the statement referring to a non-published, provisional patent application. Applicant believes page 19 as amended now complies with Subsection 81(2) of the Patent Rules and subsection 27(3) of the Patent Act and respectfully requests that the objections be withdrawn.

Applicant has amended description pages 15 and 30 to comply with subsection 27(3) of the Patent Act and requests that the objection be withdrawn.

Applicant has replaced description pages 1 to 29 to remove horizontal lines in the lower portion of the pages. Applicant believes the description pages as amended now comply with subsection 68(1) of the Patent Rules and respectfully requests that the objection be withdrawn.

Summary has been amended to include statements consistent with the independent claims.

Pursuant to the Examiner's requisition under Subsection 30(2) of the *Patent Rules*, Applicant has provided the above amendments and/or arguments to address the defects alleged by the Examiner. It is respectfully submitted that the application complies with the *Patent Act* and *Rules*.

Response to Requisition under Section 29 of the *Patent Rules*

In response to the Examiner's requisition under Section 29 of the *Patent Rules,* Applicant asserts that no applications describing the same invention have been filed in the European Patent Office.

Early and favourable consideration of this application is respectfully requested.

In the event that this application is currently deemed to be abandoned for failure to pay a maintenance fee, the applicant requests reinstatement of this application. Accordingly, the Commissioner is requested and authorized to deduct $650.00 to cover the reinstatement fee and the maintenance fee directly from our account number 600000107.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Agents for Applicant

Mark Sprigings
Direct Dial (613) 783-8838
160 Elgin Street, Suite 2600
Ottawa, Ontario
Canada K1P 1C3
MS:lj
Encls.

MULTI-INSTANCE, MULTI-USER ANIMATION PLATFORMS

BACKGROUND

1. Field of the Inventions

The present invention relates to virtual computer-generated environments in which participants are represented by computer-generated avatars, and in particular for environments that simulate an actual 3-D environment and allow for simultaneous participation of multiple players.

2. Description of Related Art

Computer generated virtual environments are increasingly popular methods for people, both real and automated, to interact within a networked system. The creation of virtualized worlds, three dimensional or otherwise, is well known. Simple text based adventures such as "Zork", early "first person shooter" games such as "Doom", and ultimately numerous highly complex environments such as "Halo" are well known in the art. Various on-line environments are known in which a 3-D physical world (actual or fantasy) is simulated. Environments of this type are sometimes referred to as "virtual reality" or "virtual reality universe" (VRU) environments. In known VRU environments, an actual or fantasy universe is simulated within a computer memory. Multiple players may participate in the environment through a computer network, such as a local area network or a wide area network. Each player selects an "avatar," which may comprise a three-dimensional figure of a man, woman, or other being, to represent them in the VRU environment. Players send inputs to a VRU engine to move their avatars around the VRU environment, and are able to cause interaction between their avatars and objects in the VRU. For example, a player's avatar may interact with an automated entity or person, simulated static objects, or avatars operated by other players.

With the ubiquity of computer networking, engineers and designers included the ability for players within these virtual environments to interact. One drawback of the

VRU is that, as in the actual world, space is limited by environmental constraints. In addition, limitations on computer processing speed, network bandwidth, and other factors also limit the number of participants and the richness of environment. Accordingly, prior art VRU environments may limit the number of simultaneous players and their methods of interactions for various reasons, including to avoid exceeding the programming, networking, and hardware limitations of the servers and/or clients.

Such limitations may be present in "massively multiplayer" environments, such as "Everquest" or "Second Life", which are built specifically on the concept of mimicking real world environments, including the natural capacity of real world environments to hold numerous simultaneous inhabitants. Such limitations may be implemented in a less than desirable manner because they limit the ability of the VRU to accommodate the wishes of its clients. However, such limitations are provided for various reasons, including because (a) server capacity is incapable of simultaneously handling the number of users desired or (b) client capacity, for each user, is insufficient to process and display the data needed for such user's computer to appropriately and adequately render avatars or other representations of the other users, and otherwise construct a complete and accurate representation of the environment; or (c) independent of hardware or software capacity considerations, limitations imposed by geometric constraints of the simulated environment, or simply put, lack of simulated space.

Mechanisms to address server capacity and client capacity issues, while flawed, exist in the art. Such mechanisms may include automatically moving avatars from one portion of the environment to another (with or without the player's consent), barring additional avatars from entering an environment once a defined capacity is reached, limiting the ability of inhabitants of the environment to interact with each other and the environment, and having servers operate completely (or partially) independently.

For example, one problem in implementing a VRU arises from its presentation of content in a virtual approximation of real, three-dimensional space. As a result, there is a limit on how much modeled space can be occupied at the same time. When using the

HTTP application layer or other conventional internet modalities, the number of users able to participate on a web site simultaneously is limited only by the computing power and network bandwidth available to the site hosting the page. In contrast, a VRU mimics the three-dimensional space found within the physical world and therefore the space limitations found in the real world also are experienced within the VRU. These include such limitations as the inability to realistically depict multiple users in the same place, the inability of users to walk through the same doorway simultaneously, the inability to exceed occupancy limitations, and similar real world space limitations. Because VRU users are visible to other users, they occupy space, a portion of the visual field, or both.

The problem may be further demonstrated with the example of a nightclub within a VRU. The nightclub would be represented as a fixed area of space within the VRU. While the VRU could in theory have a nightclub of enormous dimensions, there would be areas within the nightclub, such as proximate to a stage or proximate to celebrities present therein, which would be very desirable areas to inhabit. As a result, whether the area at issue is described as the full nightclub or the more desirable areas therein, some or the entire nightclub may have less space available for occupancy than there are people who desire to have their avatars occupy it. While the same solutions exist in a VRU as exist in the real world for increasing occupancy capacity (i.e. making the facility bigger, packing more people in with less space available to reach, etc.), the very limitations found in those real world solutions would apply in a VRU.

A second problem common to VRU's is that they depend on their various users' computers to render the environments that are presented within the VRU. Thus, there are limitations on how many avatars, objects, textures and other features can be rendered and animated for each user. Again utilizing the example of a nightclub, if the dimensions of the nightclub were drawn so that 10,000 avatars could simultaneously be accommodated, seen, and interacted with, each user computer would be tasked with tracking, rendering and animating each of 10,000 autonomously controlled avatars. Similarly, avatars within the same space, when permitted to communicate with each other, whether via chat, voice over IP, or otherwise, may generate too much content to

permit effective communication.

It is desirable, therefore, to resolve these problems and to provide access for greater numbers of avatars within a VRU space while minimizing undesired experiences for VRU participants, and providing new, more varied and interesting opportunities and experiences for users within the VRU space.

SUMMARY

The instant inventions disclose a method, system and apparatus for dynamically establishing and managing multiple instances of a space within a VRU. Such multiple instances may be referred to herein as "dimensions." The inventions allow for the creation of an unlimited number of duplicate instances of a space in a VRU, which instances are created dynamically, and which instances users can interact across. Furthermore, the inventions permit such dimensions to be utilized in a manner that does little or nothing to impair the ability of the VRU to emulate those portions of the real world environment that may be crucial to a positive user experience within a VRU.

In an embodiment of the inventions, once the occupancy capacity of an area has been met, another attempt to access the area by an additional avatar may trigger creation of a new instance, or dimension, of the area. The new area may then be populated with avatars subsequently seeking to enter that area of the VRU environment. The term "new dimension" or "duplicate dimension" encompasses a virtual space such as may be provided by duplication of certain portions of the content within an area, such as, for example, walls and other simulated structural elements, a stage and all participants thereon, or other elements. This may be accomplished, in the alternative by making the elements which are not desired to be duplicated (i.e. avatars) invisible and inaccessible to other, similarly non-duplicated elements (i.e. other avatars).

Further attempts to access the area may populate the new dimension until such time as the new dimension reaches its occupancy capacity, at which time an additional new dimension would be generated and the cycle repeated.

It is to be understood that in other embodiments, other algorithms for populating

dimensions may be used. Such algorithms may include, for example, adding new avatars to the least populated dimension. Thus, if one or more avatars have left the first dimension after the creation and population of a second dimension, new users might be preferentially placed in the first dimension before the second dimension reaches its occupancy capacity. For further example, avatars may be added approximately evenly across several dimensions all of which are below their occupancy capacity, and/or avatars may be placed in one of duplicate dimensions based on the users' status, achievements or other classifications. Users may also create their own duplicate dimension with limited enrollment or purposes. These may include and/or permit, without limitation, (a) themselves; (b) a private ,party; (c) members of a group; (d) the public at large; (e) paid attendees; and/or (f) specified invitees.

In embodiments, avatars may be distributed to a new dimension from one or more crowded dimensions. Crowding may be determined by various measures. For example, an optimal or "full" level of population for a particular dimension may be determined. Avatars may be allowed to continue to populate such dimensions in excess of their optimal capacity. New dimensions may be formed by transporting avatars from one or more of the dimensions into a new dimension when a trigger event occurs. Trigger events may include, for example, one or more dimensions exceeding their optimal occupancy capacity by some amount or percentage; and/or when the overall number of users in all relevant dimensions would warrant the creation of a new dimension, when at least one of those dimensions exceeds its optimal occupancy capacity. Thus, for example, if Dimension A exceeds its optimal capacity by 30% and Dimension B exceeds its optimal capacity by 30%, Dimension C is created and some users from Dimension A and Dimension B are imported into Dimension C. In the alternative, a trigger event may occur at some level less than the optimal or full occupancy level, for example, to leave room for preferred users of a particular dimension.

Two or more dimensions may be combined to form a larger dimension containing all the participants of the former dimensions. Likewise one or more dimensions may be split up into a number of smaller dimensions, with avatars assigned to dimensions

based on random selection, user preferences, user profiles, and/or other criteria. Various triggers may be used to determine when a dimension should be combined or split up, such as, for example, the population of the dimension falling above or below a defined threshold.

In other embodiments, avatars may populate dimensions based on user generated preferences. Thus, for example, a Spanish speaking user may prefer to populate a dimension shared by other Spanish speaking users, even if such a dimension has, for example, fewer avatars than other available dimensions which are populated predominantly of speakers of other languages. Similarly, users from language groups that are more easily translated in a mechanical manner into the other users' languages may be treated as a single group. Thus, for example, if Spanish and French are more easily translated between than are Spanish and Chinese, the Spanish and French users may be grouped together in a dimension having a translation function.

In other embodiments, avatars may populate dimensions based on preferences deduced from the user's supplied information or information otherwise obtained about the user. Thus, for example, a user may prefer to populate a dimension shared by users that appear on his list of friends, even if such a dimension has, for example, fewer avatars than other available dimensions which are populated predominantly by users who do not appear on their list of friends. Similarly, a user may wish to avoid dimensions which are populated by users on their list of ignored users. Algorithms that incorporate users' information including their friends, friends of friends, ignored users; as well as users who belong to groups or groups with similar interests to groups that the user is involved with are all examples of preferences that could be used to deduce a preferential dimension for a user to join.

Users may be given the opportunity to travel between dimensions, optionally subject to defined limits or conditions. Thus if a user is directed to populate a certain dimension, yet they would prefer to populate a different dimension, the user may select to have their avatar change dimensions to the desired dimension. Users may transport themselves to the desired dimension unless restricted from doing so by factors including

but not limited to: that the desired dimension is restricted; that the desired dimension is private; and/or that the desired dimension is at or above its relevant occupancy capacity. Transport to different dimensions may be accomplished, for example, by clicking on the name of or a link relating to a user, an avatar or an object, or by manipulating an avatar so that enters a portal which may lead, either directly or through one or more additional portals, to a corresponding space in a different dimension. The avatar may then be transported to the dimension where the user, avatar, or object resides. In the alternative, or in addition, a VRU space may include "locked dimensions," that do not permit travel to and/or from the dimension, or that impose other restrictions not generally imposed on other dimensions in the VRU space.

Different dimensions may be related to one another and to interact or influence one another in defined ways. For example, users may also be permitted to observe other dimensions without being visible and/or able to interact with those dimensions at all. This may be useful, for example, prior to travel to such dimension, or if a user is merely interested in observing interactions of others. Users may be permitted to obtain information about what dimensions other users are in, such as users who are marked on the user's friends list or ignored users list.

Users may be given the option to chat between dimensions; i.e., with users populating other dimensions. Such chat may include private chat; public chat; or group chat or any other channel of chat that the user may desire. Thus, public chat may, for example, aggregate chat from more than one dimension. In the alternative, or in addition, the public chat may not aggregate more than one dimension, but individual users may wish to monitor or participate in public chat (or any other channel of chat) from dimensions other than the one in which their avatar presently populates.

In an embodiment of the inventions, a defined area or portion of multiple dimensions may be visible to, and/or interact with, other parts or members of the dimensions. For example, a stage area may be defined that is visible and audible in multiple dimensions surrounding the stage area. Access to such a stage or common area may be limited in any desired way. Actions on the stage may affect multiple

dimensions. For example, if a robot avatar or normal avatar throws an object out of a stage area into a surrounding nightclub, as the object passes a boundary between the stage area and the multi-dimensional nightclub floor, the thrown object may be replicated and appear in each of the surrounding dimensions.

Likewise, the surrounding multi-dimensional areas may influence a common area. Continuing the nightclub example, a performer on a common stage may receive audience feedback from multiple surrounding dimensions. For further example, a storefront may comprise a common area in which an avatar for a sales clerk may reside. The clerk may service avatar customers from multiple dimensions, with priority of service determined in different ways. For example, customers in different dimensions may summon the clerk, which may be depicted as "busy" (for example, depicted as interacting with another avatar) at times when the clerk is occupied with servicing a customer in another dimension. The waiting customer may be given a message with an estimated wait time, or an offer to make an appointment with the clerk. If multiple customers are waiting, they may be queued and serviced in any order desired by the clerk. For example, repeat customers may be serviced first.

In both of the foregoing examples, the performer and the clerk provide examples of an object - e.g., an avatar - that has a multi-instance presence in more than one dimension. In an embodiment of the invention, the presence in multiple dimensions may be asynchronous. In other words, each instance of the object in multiple dimensions may be generated asynchronously, depending on input from each dimension. In the alternative, the object may be generated synchronously, meaning as a single instance using the same input for each dimension.

A more complete understanding of the method and system for managing multiple dimensions in a VRU space will be afforded to those skilled in the art, as well as a realization of additional advantages and objects thereof, by a consideration of the following detailed description of the preferred embodiment. Reference will be made to the appended sheets of drawings, which will first be described briefly.

In accordance with an aspect of the present invention, there is provided a method for managing a multi-instance, multi-user animation process, comprising: modeling, using a computer, a plurality of parallel dimensions in a computer memory, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits that are defined by at least one model of a three dimensional object; assigning ones of a plurality of avatars within the computer memory so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, so as to prevent over-population of any one of the parallel dimensions by avatars; and animating ones of the plurality of avatars populating different ones of the parallel dimensions in response to input from respective corresponding ones of a plurality of clients to provide virtual-reality data, using the computer, the virtual-reality data configured to enable the clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

In accordance with another aspect of the present invention, there is provided a computer-readable medium storing instructions, that when executed by a computer, cause the computer to: model a plurality of parallel dimensions, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits defined for the three-dimensional space; assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

In accordance with another aspect of the present invention, there is provided a computer comprising a memory holding instructions, that when executed by the computer, cause the computer to: generate a plurality of parallel dimensions in a computer memory, each being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within defined spatial limits; assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the clients to output an animated display of an assigned one of the parallel dimensions and avatars populated therein.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic diagram showing a system according to the inventions.

Fig. 2 is a schematic diagram showing a system according to the inventions.

Fig. 3 is a schematic diagram showing aspects of a system with multiple dimensions according to the inventions.

Fig. 4 is a block diagram showing aspects of a system for handling multiple dimensions according to the inventions.

Fig. 5 is a schematic diagram showing aspects of a method for managing multiple dimensions according to the inventions.

Fig. 6 is a block diagram showing aspects of managing an interface between multiple dimensions according to the inventions.

Figs. 7 A - C are exemplary simplified screenshots of user displays according to the inventions.

Figs. 8 - 10 are flow diagrams showing exemplary steps of methods according to the inventions.

DETAILED DESCRIPTION OF VARIOUS EMBODIMENTS

Referring to Fig. 1, a system 100 for providing a VRU to multiple users may comprise plurality of client sites, nodes or terminals, for example a personal computer 104, portable computers 106, 110, a compact player, cell phone or digital assistant 108, and/or router 112 communicating via a WAN 102 to one or more servers 114. Servers 114 store and serve VRU data and software to the client sites. Software or firmware may also be located at each client site, configured to work cooperatively with software or firmware operating on servers 114. Generally, any number of users may be communicating with servers 114 for participation in the VRU at any given time.

Referring to Fig. 2, a system 200 for providing a VRU according to the invention may be considered to be comprised of server-side components (to the left of dashed line 222) and client-side components (to the right of dashed line 222). Server-side components may comprise a portal 220 for managing connections to multiple simultaneous players. Portal 220 may interact with a VRU engine 218, passing user input from multiple clients to a VRU engine, and passing data from the VRU engine to respective individual players. VRU engine 218 may be operatively associated with various memory spaces, including dimensional spaces 208 holding two or more parallel dimensions 212, 214, 215 and 216, and a personalized or common data space 210. As known in the art, objects in a VRU are modeled as three-dimensional objects, or two-dimensional objects, having a defined location, orientation, surface, surface texture, and other properties for graphic rendering or game behavior. Dimensional memory space 208 may hold active or inactive instances of defined spaces used in the VRU environment. For example, the environment of a popular simulated nightclub may be replicated indifferent spaces. Personalized space 210 may be comprised of various different personal areas each assigned to a different user, for example, avatar or avatar accessories data. The VRU engine may operate with other memory areas not shown in Fig. 2, for example various data libraries, archives, and records not inconsistent with the

methods and systems disclosed herein.

In an embodiment of the invention, each user may customize an avatar to have an appearance and qualities specified by the user, by choosing avatar characters, features, clothing and/or accessories from an online catalog or store. The particular arrangement selected by a user may reside in a personalized space 210 associate with a particular user, specifying which avatar elements are to be drawn from a common space to construct an avatar. In an embodiment of the invention, a customized avatar instance may be stored in a personalized space for the user. In the alternative, or in addition, a user may own customized elements of an avatar, including clothing, accessories, simulated physical powers, etc., that are stored solely in the personalized space and are not available to other users. Avatars may move and interact both with common elements and personalized elements.

A separate administration module 202 may operate at the server level to create, update, modify or otherwise control the content of the VRU as defined in the memory areas 204 and 210. Generally, changes in the personal space area 210 are driven by individual users, either through the VRU administrator 202 or another module. Control of common areas, i.e., the game environment and the objects in it, including any multi-dimensional areas, may be via the administrator module 202.

At the client level, a player interface module 224 may be installed to receive player inputs from one or more user input devices 228, such as a keyboard, mouse or other pointer, or microphone, and provide data to the VRU engine 218 via portal 222 in response to the input. The player interface module may also receive game data from portal 220 and process the data for display on display 226 and/or for audio output on speaker 230. Various systems and methods for providing a three-dimensional, multiplayer interactive animation to multiple players are known in the art, or may be adapted by one of ordinary skill for use with the invention. For example, rendering of a scene may be performed at the client or server level. Generally, it may be advantageous to perform calculations and graphics operations, to the extent possible, at the client level, thereby freeing up network bandwidth and minimizing loads on the

server. The invention is not limited to a particular hardware or software architecture for carrying out the steps described herein.

Fig. 3 shows in schematic fashion a system 300 for providing a multi-user, multi-dimensional animation. System 300 comprises a portal or interface 308 connected to receive data, such as through a wide area network 306, from a plurality of users 302, 304 (two of many shown). Users 302, 304 may operate a client computer having a web browser or application configured to communicate animation commands to VRU engine 310 via interface 308. VRU engine 310 may model a virtual three-dimensional environment 311 within a computer memory 312. A first user 302 may provide commands via portal 308 to VRU engine 310 used to control the operation of a first avatar 314. Likewise, a second user 304 may control a second avatar 316.

Environment 311 may include multiple scenes or regions modeled to simulate a region of space, for example, the surface of a planet or region thereof, the inside of a room or building, the surface of an island, and so forth. It should be appreciate that Fig. 3 presents a highly simplified schematic view of a modeled environment. An actual modeled environment may be highly complex, including thousands of different modeled spaces, some or all of which may exist in more than one dimension. Modeled scenes or spaces may be of different types, meaning they may be modeled according to different rules. They are connected in that transportation between spaces is allowed, at least for some avatars in the environment 311.

The environment 311 may allow for the passage of avatars between scenes via simulated portals or transportation elements, for example, simulated doorways, teleportation terminals, roads, cars, trains, etc. By entering a portal or transportation element, an avatar may leave a first scene and be delivered to a second scene being simulated in the memory 312. One of the tasks of the VRU engine may be to keep track of the various portals and transportation elements between scenes, operating these elements when requested by users, and adding or deleting portals as scenes are added or deleted. Generally, portals should act in a stable, predictable manner so that a user may navigate his or her avatar through the simulated environment 311 to accomplish

the user's objectives. For example, a simulated doorway at the simulated 100 East Main Street address of the simulated public road system in Computerville should always lead to the registered tenant at that address, be that a private residence or business. For further example, some transportation elements, for example teleportation portals or subways, may lead to different destinations. However, in this case the transportation element should be configured to allow the user to control the destination of the user's avatar, if so desired.

VRU engine 310 may operate such that some scenes in environment 311 may be capable of being replicated to create another instance of the scene, for example multi-dimensional spaces 320, while other scenes cannot be replicated, for example a non-replicable or mono-dimensional space 318. Thus, environment 311 may contain both types of spaces, as well as portals or transportation elements allowing avatars to transport between multi-dimensional and mono-dimensional spaces. Avatars 314, 316 present in mono-dimensional space 318 may be transported via portal 317 to anyone of the multi-dimensional spaces 320. Conversely, avatars in the multi-dimensional spaces 320 may pass into space 318 via portal 317, which may be replicated as an instance in each multi-dimensional space 321a-d. Multi-dimensional spaces 320 may originate as a single mono-dimensional, bounded modeled space. If the space becomes overly crowded, it may be replicated in any number of instances to provide room for growth in the population of avatars. However, the replicated space is not merely a copy, but rather exists as a connected part of the same environment 311. For example, space 321d may be a popular virtual nightclub originally existing in a single instance. As the popularity of the club grows, it may be desirable, for example, to replicate the nightclub experience for new customers. Hence, each dimension 321b, c and d may be created in response to population threshold of the existing club's instances being exceeded. Each additional dimension may allow for two-way travel through a portal 317 to a common area, or through any number of alternative portals.

The additional dimensions 321b-d may therefore provide the advantages of accommodating any number of users without requiring users to subscribe to a new game or environment 311. The most popular and successful destination in the

environment 311 may therefore be enjoyed by more users, almost without limit. User's are therefore not required to exit a particular game or environment to enjoy these popular attractions. Likewise, users need not be cut off from communicating with or otherwise interacting with any other users participating in the multi-user environment 311 while still being able to freely access the most crowded destinations within the environment.

The existence of multiple dimensions 320 may be revealed or hidden from some of all users 302, 304. In an embodiment of the invention, some or all users may enter into one or a series of multi-dimensional spaces without being aware of the existence of other dimensions. In the alternative, users may be given an indication that their avatars have entered or are entering a space for which multiple instances exist. Both alternatives may co-exist within the same environment 311, depending on the identity of the user and desired characteristics of a multi-dimensional space.

Environment 311 may further comprise one or more common spaces 322 that provide for simultaneous interaction with multiple instances of parallel dimensions 320. For example, a common space may comprise a stage to a club or theater. The interior of the common space may be visible and/or audible in each of the dimensions 321a-d. An avatar or other object in the common space 322 may be able to pass into each of the parallel spaces, being replicated in the process. Certain objects or avatars may also be able to pass from the parallel dimensions 320 into the common area. For example, avatars may queue up inside of different parallel dimensions and be granted access to the common area 322 in sequence. For further example, some avatars may be granted special rights or powers that permit them to enter a common space 322 that permits simultaneous interaction with multiple dimensions. Various other exemplary interactions between common spaces and parallel dimensions will be described in the detailed description below.

Fig. 3 may also serve to illustrate an alternative embodiment in which users are segregated into independent, isolated groups that simultaneously share a simulated space or facility. In this embodiment, the dimensions 321a-d may represent isolated

groups of avatars and interactive objects. Such groups may be contained within a non-interactive common environment, such as the walls, ceilings and floors of a simulated nightclub or other space. The non-interactive common environment may serve as common backdrop that is shared by the different groups 321a-d, which need not be aware of one another's existence. This embodiment serves to illustrate that the experience of multiple parallel dimensions may be implemented in various ways.

Fig. 4 is a block diagram showing exemplary aspects of a multi-dimensional system 400. System 400 may be implemented, for example, by a server or group of servers operating at a network-accessible site. Input data 402, including for example user commands or data used to direct the motion of avatars and other objects, may be provided to system 400 via a portal. Output data 404, including for example virtual-reality data configured to cause remote clients to output an animated display of a corresponding one of the parallel dimensions and avatars therein, may be output to a portal module for distribution to remote clients.

System 400 may comprise an avatar manager component 406 operably connected to a database 408 of avatar data. Like other components of system 400, the avatar manager component 406 may be implemented in any suitable software, hardware, or combination thereof. The avatar manager may process incoming user command and associate commands with corresponding avatar and other object data. For example, the avatar manager may ensure that each avatar is configured according to user commands with clothing, accessories, or gear available to its corresponding user. The avatar manager may communicate with a dimensional configurator 410 and population manager 418 to ensure that each avatar is placed correctly in one of parallel dimensions managed by the configurator and population manager. The avatar manager may further communicate with an animation component 414 to ensure that each avatar is positioned and moved in accordance with user commands. In addition, the avatar manager may cooperate with a communications component that operates to allow communication, for example text or audio chat, between different users.

A population manager 418 may monitor the population density of avatars in

defined area of the environment, or more generally throughout the environment. If a population threshold is exceeded, the population manager may instruct the dimensional configurator 410 to generate or activate another instance of the overcrowded area. Likewise, the population manager may monitor parallel dimensions, and instruct the dimensional configurator to collapse two or more parallel dimensions into one, if population density falls below a defined threshold.

A dimensional configurator 410 may generate or activate additional parallel dimensions as needed to accommodate population growth. Essentially, the configurator may generate another instance of a crowded space within a virtual-reality environment by copying an existing space or template. In the alternative, different avatar populations may share common elements defining the envelope of a modeled space. Elements of modeled spaces may be stored in a dimensional database 412 in operative association with the configurator 410. The configurator may also ensure, in cooperation with the avatar manager 406, that each dimension is correctly populated with avatars. The configurator 410 may also operate to collapse empty or sparsely populated ones of parallel dimensions. For example, the configurator may move remaining avatars to another dimension and inactivate or delete the emptied dimension.

A communications module 416 may operate more or less independently of other components to enable communication, such as chat, between different users. In an embodiment of the invention, chat operates independently of animation. In the alternative, a chat process may be coordinated with avatar animation. For example, an avatars lips may move in sync with audio chat. In either embodiments, the communications module may allow users to chat with other users corresponding to nearby avatars. In addition, the communications module may permit users to place a chat "telephone call" to any user logged into the system, regardless of the relative locations of the users' avatars.

An animation component 414 may operate to process user commands, dimensional data and other model data to produce simulations of all active parallel spaces and other active regions of the modeled environment. Generally, a space or

region may be considered active if it is within sight of a user-selected viewpoint. Various methods are known for simulating avatars and objects within modeled spaces, and any suitable method may be used. In addition, it is anticipated that new method may be developed that may also be suitable. In general, any method that is suitable for modeling non-parallel, regular region of modeled space should be readily adaptable to modeling parallel dimensions.

The animator 414 may produce raw model data that is not configured for efficient distribution to remote clients. Accordingly, the animator may cooperate with an output control module 420 to prepare the output data 404 for distribution to remote clients. This may include translation or transformation of the animated model data from the animator to a format that is suitable for distribution to system clients. The form of translation or transformation will depend on the application software used at the client level and other details that should be apparent to one of ordinary skill.

In another preferred embodiment, various ones of the dimensions may overlap, for example, to prevent users from experiencing an overly empty dimension. Such overlap may be geographical (i.e. areas within a virtual "club" or other environment), overlap between users grouped into dimensions, or otherwise. Referring to Fig. 5, an exemplary multi-dimensional system 500 is shown schematically, as it might be represented in a system memory. System 500 may comprise a first dimension 502 adjacent to a second dimension 504, representing, for example, areas of a virtual nightclub. The first dimension may be connected to a common space 506 via a transparent interface 507. The common space may represent, for example, a stage area. The first and second dimensions may be demarcated by a pair of interfaces 512, 514 that define an overlapping region 510 belonging to both dimensions 502, 504. Interfaces 512, 514 may also be transparent, so that all parts of the system 500 interior are potentially visible from viewpoint in anyone of areas 502, 504 and 506. The parallel dimensions 502, 504 may also be enclosed by a common wall. In general, avatars within the parallel dimensions 502, 504 may not be able to pass through the interfaces 507, 512 and 514. In an embodiment of the invention, however, passing through one of the interfaces 512 and 514 may trigger a reassignment to another dimension designed

maintain the user within an assigned group of avatars.

With reference still to Fig. 5, one implementation of this embodiment may be to create four instances of a nightclub, with four different audiences (A, B, C, and D), as shown in Table 1 below.

TABLE 1.

Instance Number	Audience Area 1	Audience Area 2
1	Group A	Group B
2	Group C	Group D
3	Group D	Group A
4	Group B	Group C

The nightclub appears to be fully contiguous to all avatars in every instance, but the population of Areas 1 and 2 (corresponding to spaces 502, 504, respectively) depends on which instance and audience area an avatar is located in. Thus, for example, in Instance Number 1, Audience Area 1, an avatar looking into Audience Area 2 may see Group B. However, when the avatar moves into Audience Area 2, it may be automatically transitioned to Instance 3. Therefore, from the viewpoint of this avatar when looking back toward the stage, Group D is seen within Audience Area 1, and the avatar remains in Group A, albeit on the other side of the group.

Boundaries between the two Audience Areas, and between Audience Area 1 and the stage, may be referred to as an "interface". The interfaces may be sharp, with no overlap, or there may be areas within the interface where multiple instances of the universe may exist simultaneously. Similarly, communication (visual, audio, chat, or otherwise), may be implemented across interfaces potentially limited by proximity of users to the interface. For example, an avatar 518 present in region 510 may be able to

chat with avatar 520 in Audience Area 1, even if the avatar 518 belongs to a different group than present in Area 1.

The common dimension 506, or the stage area in the diagram above, may be created in a manner in which the performer 516 will be visible to all users in all instance numbers. Some audience groups, or members, may be permitted to interact with the performers and may be selected by any of a number of criteria, including without limitation paid members, early arrivals, random selection, etc. The performers may optionally see only one or more groups of users, may see all users even if shown via different computers, screens or windows or by representative methods such as statistics, applause meters, etc. The audiences from multiple dimensions may also be rendered translucently and overlain on each other, so as to make additional members visible to the performers.

In embodiments of the inventions, multiple end users may be merged into the same avatar with or without the ability to share control of the avatar. For shared control, the control inputs of multiple users may be aggregated in order to generate activity, or may be granted in a round robin or other manner. One example of this would be to permit people in multiple dimensions at a nightclub to get into the "stage diving" line, and then inhabit a single avatar which is then permitted to enter the "performer" dimension, be seen by all users, and then jump off the stage, disaggregate, and land, each user into his own dimension.

Objects moving from a common dimension may optionally automatically replicate when crossing an interface into a parallel dimension so as to replicate into multiple instances of themselves. Fig. 6 is a diagram showing an exemplary system 600 comprising a common dimension 604 linked to parallel dimensions 601, 602, and 603. In embodiments of the inventions, such replication may place a copy of the item into each dimension or instance of linked to the common dimension. The item may then be independently manipulated and utilized within each dimension or instance. Optionally, the items may be marked, numbered, or tracked by the dimension into which they first were replicated. For example, a performer avatar 606 may throw a ball 607 towards

interface 610. As the ball penetrates the interface, it may be subtracted from common space 604 and appear as separate independent instances 608a-c in parallel dimensions 601, 602 and 603 respectively. Essentially, any number of new objects may be generated in this manner. After penetrating fully past the respective interfaces 611a-c, the newly-generated balls may exist as new objects 612a-c, respectively.

Common areas linked to multiple dimensions may also be useful for commercial use, for example, the provisions of services or virtual products. Some such application may involve the personal attention of a merchant or service provider. Such a user may desire to be marketed in all linked parallel dimensions, but cannot simultaneously serve users in different dimensions. For such applications, it may be desirable to manage the interface between the common area and the parallel dimensions to permit both pan-dimensional presence for the merchant or service provider, and personal service for each customer. Figs. 7A-C are simplified screenshots exemplifying an implementation of an exemplary method for accomplishing this objective.

Fig. 7A shows a screenshot 710 representing system output data such as may be provided to a first user having an avatar 702 in a first parallel dimension visiting an avatar doctor 701 located in a common dimension. A client computer belonging to the first user may take the output data and render a display such as shown. The first user may see an animation of her own avatar 702 conversing with the doctor 701. A chat window 703 may comprise chat text of a conversation between the doctor and the first user. Other objects, for example virtual wares if the user of the common dimension is a merchant of such wares, may optionally be shown to the first user.

Fig. 7B shows a screenshot 720 similarly representing data provided to a second user operating an avatar 722 located in a second parallel dimension. This user may see an animation indicating that the doctor is busy with another patient. For example, a view of a closed door 721 may be presented. Alternative presentations may include, for example, a robot avatar receptionist for the doctor. Optionally, a message box 723 may be provided explaining the status of the doctor, the second user's place in the doctor's queue, an estimated wait time, or any other desired information, including but not limited

to advertising.

Fig. 7C shows an exemplary screenshot 730 similarly representing data that may be provided to a user of the common dimension. Such a user may be presented with views of all linked parallel dimensions. The illustrated example shows tiled views, but any other arrangement, for example overlays or successive views, may also be used. In this example, the doctor sees the active patient 702 and a view 731 of the first dimension where the active patient resides. A chat window 734 showing the active conversation may also be displayed. The doctor may also see a view 732 of the second dimension showing the patient 722 waiting there. In this example, a view 733 of a third dimension is provided showing no patients waiting in that dimension. In the alternative, views of dimensions with no waiting patients may be omitted. Any number of parallel dimensions may thus be made visible to a user operating in a common dimension.

According to the foregoing, therefore, parallel dimensions may be implemented in a computer platform using programming steps that should be apparent to one of ordinary skill in view of the present disclosure. Fig. 8 shows exemplary steps of a method 800 for managing multi-instance, multi-user animation platforms, such as may be implemented in a VRU environment.

Step 802 may comprise modeling a plurality of parallel dimensions in a computer memory. Computer modeling of three-dimensional spaces is known in the art. Such models may conform to rules that mimic the physical environment on earth, or may use modified rules to simulate other environments. Any suitable model and method of modeling may be used. As used herein, a "parallel dimension" means a duplicate or recognizable counterpart of a bounded, computer-modeled space that is accessible via a common environment. Parallel dimensions may be created, for example, by copying element of an existing space or template for a space in the computer memory. Each of the plurality of parallel dimensions may comprise an independent model of a physical, three-dimensional space having corresponding features such that the parallel dimensions are recognizable as counterparts to each other. It is not necessary that each dimension be an exact duplicate of other dimensions. Because the dimensions

operate independently, some divergence may occur after the dimensions become active. For example, a piece of furniture that is initially positioned identically in counterpart dimensions may be moved.

The parallel dimensions may have the characteristic of operating concurrently in a system memory. While certain activities inside each parallel dimension may be independent, for example, the activity of avatars, nonetheless the parallel dimensions may retain some relationships to one another. For example, the parallel dimensions may share common spaces or portals to common spaces. For further example, communication between avatars in different dimensions may be permitted. Avatars may also be permitted to travel between dimensions.

One important inter-dimensional relationship may comprise inter-dimensional population control. The VRU system may comprise, for example, a VRU module that operates to monitor the population of certain spaces within the VRU to ensure that they do not become too crowded with avatars, as indicated at step 804. Besides ensuring that additional dimensions are generated or activated as needed to relieve overcrowding, the VRU system may operate to distribute avatars between parallel dimensions. For example, step 804 may comprise locating or assigning avatars within corresponding ones of parallel dimensions so as to prevent over-population of anyone of the parallel dimensions by avatars. To perform this step, the VRU engine or module may compare a present avatar population, population density, and/or rate of change of the foregoing, to criteria established for the space in question. For example, an optimal avatar density for a nightclub floor may be in the range of 1 - 4 avatars per square meter of simulated space, while for a simulated park the optimal density may be 0.2 – 1 avatars per square meter.

As the population of a space approaches or exceeds a defined limitation, as indicated at steps 808 and 808, the VRU system may generate or activate a parallel dimension that replicates the overcrowded dimension. In an embodiment of the invention, multiple parallel dimensions may operate simultaneously. If, for example, just one of these dimensions becomes overcrowded, the overcrowding may be resolved by

transferring avatars to less crowded dimensions, as indicated at step 810. If no less crowded dimensions are available, a new dimension may be generated and/or activated. In an embodiment of the invention, a new parallel dimension may be generated by copying certain elements of an existing space, or by copying a template for an existing space that is reserved in memory for the purpose of generating parallel dimensions when needed.

Parallel dimensions may also be collapsed into fewer dimensions as avatar populations decline. For example, if an average population density across multiple dimensions falls below a defined threshold, any empty dimensions may be shut down. The process of shutting down a dimension may include erasing the dimension from the computer memory used to model the computer environment. In an embodiment of the invention, the closed dimension may be archived or reserved for future use, optionally for a limited period of time. If it is desired to shut down a dimension that is not empty of avatars, avatars present in the dimension may be transported to an adjacent parallel dimension. Before shutting down a dimension, the system may inform users corresponding to any avatars in the dimension. Such users may be given the option of transporting to a parallel dimension or elsewhere in the VRU environment. If a user does not select an alternative destination, the VRU system may choose for her. Advantageously, shutting down under-populated dimensions may conserve system resources and prevent users from encountering under-populated environments.

As indicated at step 810, avatars may be distributed between related parallel dimensions according to various schemes. Method 800 may further comprise relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions. Relocation may be accomplished by any desired method of transporting avatars within a VRU environment. For example, an avatar may walk through a door to another space or be "teleported" to another space in the environment. An avatar may be relocated from a first one of the parallel dimensions to a second one of the parallel dimensions (or to any other location in the environment) in response to user input signifying a request to relocate the avatar. In the alternative, relocation may be performed without user input. For example, an avatar may be relocated between

parallel dimensions or out of a parallel dimension when a population of avatars in one or more of the parallel dimensions reaches a predetermined limit. One or more avatars may be automatically relocated from crowded ones of the parallel dimensions into an additional parallel dimension that is generated or activated to accommodate avatar population growth.

Whatever the number of dimensions operable within an environment, a VRU system should operate to independently animate ones of the plurality of avatars within different ones of the parallel dimensions, using input from respective corresponding ones of users. "Animate," in this sense, essentially means to process user input data, rules of the modeled environment, modeled properties of objects in the environment, or other data to calculate the positions and/or shape of objects in the environment at successive instants of modeled time. Such an animation process may be encompassed in what is generally as "computer simulation." Fig. 9 shows exemplary steps of a method 900 for animating a VRU environment and objects therein. It should be appreciated that method 900 may be operated concurrently with method 800 to manage a multi-user, multi-dimensional animation process and provide a plurality of users with desired output data.

At step 902, the VRU engine may animate avatars and objects in each dimension. Avatars and objects may be modeled in any desired manner. In an embodiment of the invention, avatars may be modeled as jointed figures covered by a skin. Objects may interact with one another via "contact" that occurs when modeled objects attempt to occupy the same volume of modeled space. Various physical attributes, such as, for example, mass, momentum, muscle & skeletal limitations, and so forth, may be associated with the modeled objects to impart greater realism to the simulation. In embodiments of the inventions, physical rules may be modeled so as to permit activities that cannot occur in the real world, such as, for example, winged flight by humans. In general, various computer modeling methods are known in the art to simulate motion of objects and figures in modeled space, and any suitable method may be used to simulate motion of avatars and other objects.

Animation of objects in parallel dimensions may generally proceed independently of each other. For example, a first avatar in a first dimension should not be able to contact or be visible to a second avatar in a second dimension. Avatars may be able to chat across dimensions, which may be conducted as a separate process apart from animation. Objects and avatars in a common dimension may be modeled together with each parallel dimension. For example, if "c" represents the model of the common space and "p" represents the model of the parallel space, the animation for each parallel space "p_i" may comprise "$p_i + c$."

At step 906, portal output data may be generated for a plurality of remote clients. A system module, e.g., a portal module, may separate and direct data from multiple animation streams so that the correct data is provided to each client in the correct format and sequence. Each client should receive sufficient data to generate a view of the environment as seen through the virtual eyes of his or her avatar, or as seen from another viewpoint near the avatar. The view should include at least nearby avatars and objects. More distant objects may also be visible, optionally at diminishing resolution with increasing distance from the viewpoint. In general, the identification of a viewpoint associated with each user may make it possible to reduce the amount of information sent to each user, as more distant information need not be provided.

As an output of the animation process, virtual-reality data may be provided to each of the plurality of users, as indicated at step 906. Various methods are known in the art for providing data to clients, and any suitable method may be used. A connection may be made to one or more communication ports of client computers running an application for receiving data and transforming it as necessary for a visual display. The virtual-reality data may be configured to cause remote clients of each of the users to output an animated display of a corresponding one of the parallel dimensions and avatars therein, as indicated at step 910. For example, a first user corresponding to an avatar located in parallel dimension 'A' may receive virtual-reality data for viewing objects and other avatars inside of dimension 'A', while a second user controlling an avatar located in parallel dimension 'B' may receive data for displaying the interior of dimension 'B.' Both users may receive data for viewing a common dimension

'C' linked to dimensions 'A' and 'B,' if present.

As previously noted, a common space may be modeled in the computer memory, configured in relation to multiple parallel dimensions so that an interior of the common space is visible from viewpoints located inside each of the parallel dimensions. In an embodiment of the invention, the common space may be modeled so that information concerning each of the parallel dimensions is provided to a user operating an avatar in the common space, or otherwise assigned a viewpoint located in the common space. Such information may be provided, for example, as interior views of each of the plurality of dimensions.

In embodiments of the inventions, it may be desirable to model a common space in a computer memory, configured in relation to multiple parallel dimensions so that a modeled object originating from the common space is capable of passing into at least one of the parallel dimensions, or vice-versa. Fig. 10 shows exemplary steps of a method 1000 for managing an interface between a common space and a parallel space. At step 1002, an inter-dimensional interface may be defined between the common space and two or more parallel spaces, or between adjacent parallel spaces. For example, a surface may be defined as a boundary between the common space and each of the parallel spaces. Such surfaces may be contoured to fit one another. That is, an interface surface dividing the common space from multiple parallel dimensions may be contoured to fit each of the surfaces that divide each of the parallel dimensions from the common space. An interface may be modeled to include an overlapping region interactive with both adjacent ones of the plurality of dimensions, or without an overlapping region.

In an embodiment of the invention, an interface may be modeled as a transparent object. Therefore, the common space may be visible to each of multiple parallel dimensions, for example as a stage, storefront, or entry area. Likewise, multiple parallel dimensions may be visible from the common space, either overlain on each other, tiled, presented in sequence, or in some other arrangement. If multiple parallel dimensions are arranged around a common space, providing a transparent interface

around the common space may render adjacent ones of the parallel dimensions visible to each other. In the alternative, an interface may be modeled as a translucent or opaque object.

At step 1004, the interface may be monitored for approaching objects. When an object touches or approaches the interface, the system may determine the interface properties of the object, as shown at step 1006. For example, the system may consult a properties table associated with the object to determine whether or not the object has the capability of passing through the interface. The simulation may then proceed differently, depending on the properties of the object. If the object is allowed to "pass" through the interface, an object passing from the common space into multiple parallel dimensions may be replicated as it passes through the interface, as indicated at step 1008. The replicated objects may then be animated synchronously (as in the case of an avatar controlled by a single user), or asynchronously (as in the case of a passive object) in each of the parallel dimensions.

In an embodiment of the inventions, a common space in the computer memory may be configured in relation to multiple parallel dimensions so that an avatar originating from the common space is capable of passing into one of the parallel dimensions. This is a special case that may be used to populate multiple dimensions with avatars originating from a common space, for example a space modeled as a public road or hallway. In this embodiment, one of the parallel dimensions is selected as the destination for the object. Selection may be accomplished using various criteria. In an embodiment of the invention, selection may be based on avatar populations of each parallel space. For example, an avatar may be directed to a dimension having the lowest population, or any other desired population criteria. In the alternative, or in addition, selection may be based on a corresponding user preference. For example, a user may indicate a preference for a dimension populated by other French-speaking avatars.

In addition, a common space in the computer memory may be configured in relation to the plurality of parallel dimensions so that an avatar originating from any one

of multiple parallel dimensions is capable of passing into the common space. An object passing from a parallel space into a common space may be subtracted from the parallel space and added to the common space as it passes through the interface. This may be used as a way for avatars to leave a parallel dimension and to re-enter non-parallel portions of the modeled environment.

If the object is not allowed to pass through the interface, the object may be bounced from the interface, or stopped short of the interface, as indicated at step 1010. The object therefore cannot leave the dimension of origin through that particular interface. Of course, because the dimension is part of a larger modeled environment, it should contain at least one other doorway or other transportation element that allows objects to leave the dimension and enter other portions of the modeled environment.

According to the foregoing, therefore, implementations of parallel dimensions may require the creation and tracking of at least three different categories of items. The first category may include items such as walls that are non-manipulable and are identical in all dimensions. The walls may in fact exist only in a single dimension, which is shared via an interface with all other dimensions, in this manner minimizing the number of items that servers and clients must track. The second category may include items existing in a single dimension only, such as avatars. The third category may include items created identically in all dimensions but that become independent of each other once created. This third category may be exemplified by furniture and the like.

When a dimension is generated or activated, it may be populated with standardized furniture or other objects belonging to the third category. Such furniture, while potentially identical when created, and created simultaneously in multiple dimensions, may be manipulable, destructible, and otherwise alterable within each dimension independently. Movable replicated objects, for example, furniture and the like, existing in parallel dimensions may tend to migrate to different locations over time, as each instance of the dimension may be modeled separately. This may lead to divergence between otherwise parallel dimensions that may make travel or other interactions between parallel dimensions disorienting for those who experience them.

At the same time, it may not be desirable to make such objects unmovable or unchangeable.

Therefore, it may be desirable to return certain movable objects back to a home position when displaced. In an embodiment of the invention, therefore, analogous objects may be tracked in different ones of parallel dimensions. Any ones of the analogous objects that become displaced from a home position may be moved back towards the home position, so that positions of analogous objects within each of the parallel dimension tend to converge on the home position over time. For example, a chair may be moved by an avatar in one of the dimensions. However, in related parallel dimensions, the chair is unmoved. A system component may cause the moved chair to slowly, potentially over the course of hours, to move back to the position of the chair in the adjoining dimensions. Return movement may be executed relatively slowly so that it is not noticeable to nearby avatars. Speed of return movement may depend, therefore, on the relative proximity of nearest avatars. For further example, if a glass is dropped within a dimension, the server may cause it to fall and roll in the direction of the corresponding glass in a neighboring dimension. In this manner, the dimensions would continue to resemble each other over time, making travel between the dimensions less disorienting for the persons manipulating the avatars.

In general, a VRU environment may provide communication tools for users to communicate with one another in real time. For example, a typical environment may include a text chat or audio chat feature. In general, it may be desirable to not disable such communication features for users associated with avatars located in different parallel dimensions. In other words, although parallel dimensions may be animated separately, they are still part of the same environment and may still make use of the same communication tools. In an embodiment of the invention, therefore, a communication channel may be provided between avatars in different ones of the plurality of dimensions.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and

modifications can be made. The scope of the claims should not be limited by the preferred embodiments set forth in the examples, but should be given the broadest interpretation consistent with the description as a whole.

CLAIMS

1. A method for managing a multi-instance, multi-user animation process, comprising:

modeling, using a computer, a plurality of parallel dimensions in a computer memory, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits that are defined by at least one model of a three dimensional object;

assigning ones of a plurality of avatars within the computer memory so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, so as to prevent over-population of any one of the parallel dimensions by avatars; and

animating ones of the plurality of avatars populating different ones of the parallel dimensions in response to input from respective corresponding ones of a plurality of clients to provide virtual-reality data, using the computer, the virtual-reality data configured to enable the clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

2. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions.

3. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions in response to user input signifying a request to relocate the avatar.

4. The method of claim 1, further comprising relocating an avatar from a first one of the parallel dimensions to a second one of the parallel dimensions in response to determining that a population of avatars in the first one of the parallel dimensions has reached a predetermined limit.

5. The method of claim 1, further comprising generating an additional parallel dimension to accommodate an increase in avatar population.

6. The method of claim 5, further comprising relocating avatars from the plurality of parallel dimensions into the additional parallel dimension.

7. The method of claim 1, further comprising generating the plurality of parallel dimensions as replicas of a template space.

8. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that at least one object located inside the common space is visible from viewpoints located inside each of the plurality of parallel dimensions.

9. The method of claim 8, further comprising animating at least one avatar populating the common space in response to input from a corresponding client, to provide the virtual-reality data further enabling the corresponding client to output an animated display including at least a portion of each of the plurality of parallel dimensions and avatars populated therein.

10. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that a modeled object originating from the common space is capable of passing into at least one of the plurality of parallel dimensions.

11. The method of claim 10, further comprising replicating the modeled object passing into the plurality of parallel dimensions so that a replica of the object is modeled in each of the plurality of parallel dimensions after the object passes from the common space.

12. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that an avatar originating from the common space is capable of passing into one of the plurality of parallel dimensions.

13. The method of claim 12, further comprising selecting which one of the plurality of parallel dimensions the avatar is capable of passing into based on avatar populations of each parallel space.

14. The method of claim 12, further comprising selecting which one of the plurality of parallel dimensions the avatar is capable of passing into based on a corresponding user preference.

15. The method of claim 1, further comprising modeling a common space in the computer memory configured in relation to the plurality of parallel dimensions so that an avatar originating from any one of the plurality of parallel dimensions is capable of passing into the common space.

16. The method of claim 1, further comprising tracking analogous objects in different ones of the parallel dimensions and moving any displaced ones of the analogous objects so that positions of analogous objects within each of the parallel dimension tend to converge over time.

17. The method of claim 1, further comprising collapsing first and second ones of the plurality of dimensions into a combined dimension populated by the avatars formerly in the first and second ones of the plurality of dimensions.

18. The method of claim 1, further comprising synchronously animating an avatar present in multiple ones of the plurality of dimensions.

19. The method of claim 1, further comprising asynchronously animating an avatar present in multiple ones of the plurality of dimensions.

20. The method of claim 1, further comprising modeling an interface between adjacent ones of the plurality of dimensions.

21. The method of claim 20, further comprising modeling the interface to include an overlapping region interactive with both adjacent ones of the plurality of dimensions.

22. The method of claim 20, further comprising modeling the interface as a transparent object rendering the adjacent ones of the plurality of dimensions visible to each other.

23. The method of claim 20, further comprising providing a communication channel between avatars populating different ones of the plurality of dimensions.

24. A computer-readable medium storing instructions, that when executed by a computer, cause the computer to:

model a plurality of parallel dimensions, each of the plurality of parallel dimensions being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within limits defined for the three-dimensional space;

assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and

animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the

clients to output an animated display of a corresponding one of the parallel dimensions and avatars populated therein.

25. A computer comprising a memory holding instructions, that when executed by the computer, cause the computer to:

generate a plurality of parallel dimensions in a computer memory, each being a replica of a modeled three dimensional space configured for modeling occupancy and movement of multiple avatars within defined spatial limits;

assign ones of a plurality of avatars between respective ones of the plurality of parallel dimensions so that each of the plurality of avatars populates a respective one of the parallel dimensions and each of the plurality of parallel dimensions is populated by a unique subset of the plurality of avatars, to control avatar population counts in each of the plurality of parallel dimensions; and

animate ones of the plurality of avatars populating different ones of the parallel dimensions in response to input identified as belonging to respective ones of multiple clients, to generate virtual-reality data configured to enable the respective ones of the clients to output an animated display of an assigned one of the parallel dimensions and avatars populated therein.

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE

In The Matter of Canadian Patent Application:

Category	:	**PCT National Phase**
Current Owner	:	**Ideaflood, Inc.**
Original Applicant	:	**Ideaflood, Inc.**
Serial No.	:	**2,685,353**
Filing Date	:	**March 7, 2008**
Title	:	**Multi-Instance, Multi-User Animation Platforms**
Our File	:	**08914862CA**
Date	:	**February 12, 2016**

#3324690

The Commissioner of Patents
Place du Portage I
50 Victoria Street, Room C-114
Gatineau, Quebec K1A 0C9

Payment of Final Fee

Dear Commissioner of Patents:

In reply to the Notice of Allowance dated August 17, 2015, our payment of today's date includes the prescribed Final Fee of $300.00 respecting the subject application. The applicant has elected to pay this fee at a regular entity rate.

In the event that this application is currently deemed to be abandoned for failure to pay any prescribed fee, or for any other reason, the applicant requests reinstatement of this application. Accordingly, CIPO is requested and authorized to deduct the prescribed reinstatement fee of $200.00 for each cause of abandonment and any other fees currently due, directly from our account number 600000107.

Should the fees submitted with this letter be insufficient to cover all of the fees for which payment is explicitly or implicitly requested by this letter, CIPO is authorized to charge the amount of the insufficiency to account number 600000107.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Agents for Applicant

Mark Sprigings
Direct Dial (613) 783-8838
160 Elgin Street, Suite 2600
Ottawa, Ontario
Canada K1P 1C3
MS:zi
Final Fee: $300.00