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(54) REAL TIME VIRTUAL REALITY LEVERAGING WEB CAMS AND IP CAMS AND WEB CAM AND IP CAM NETWORKS

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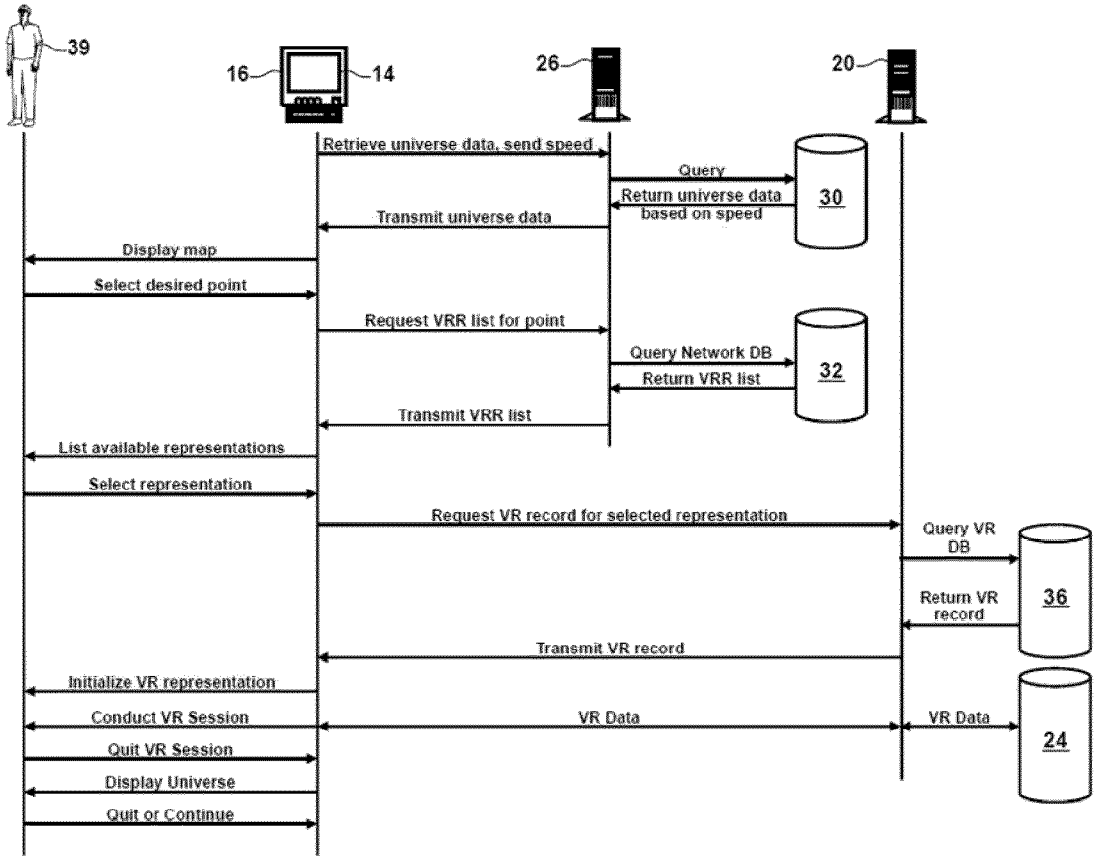
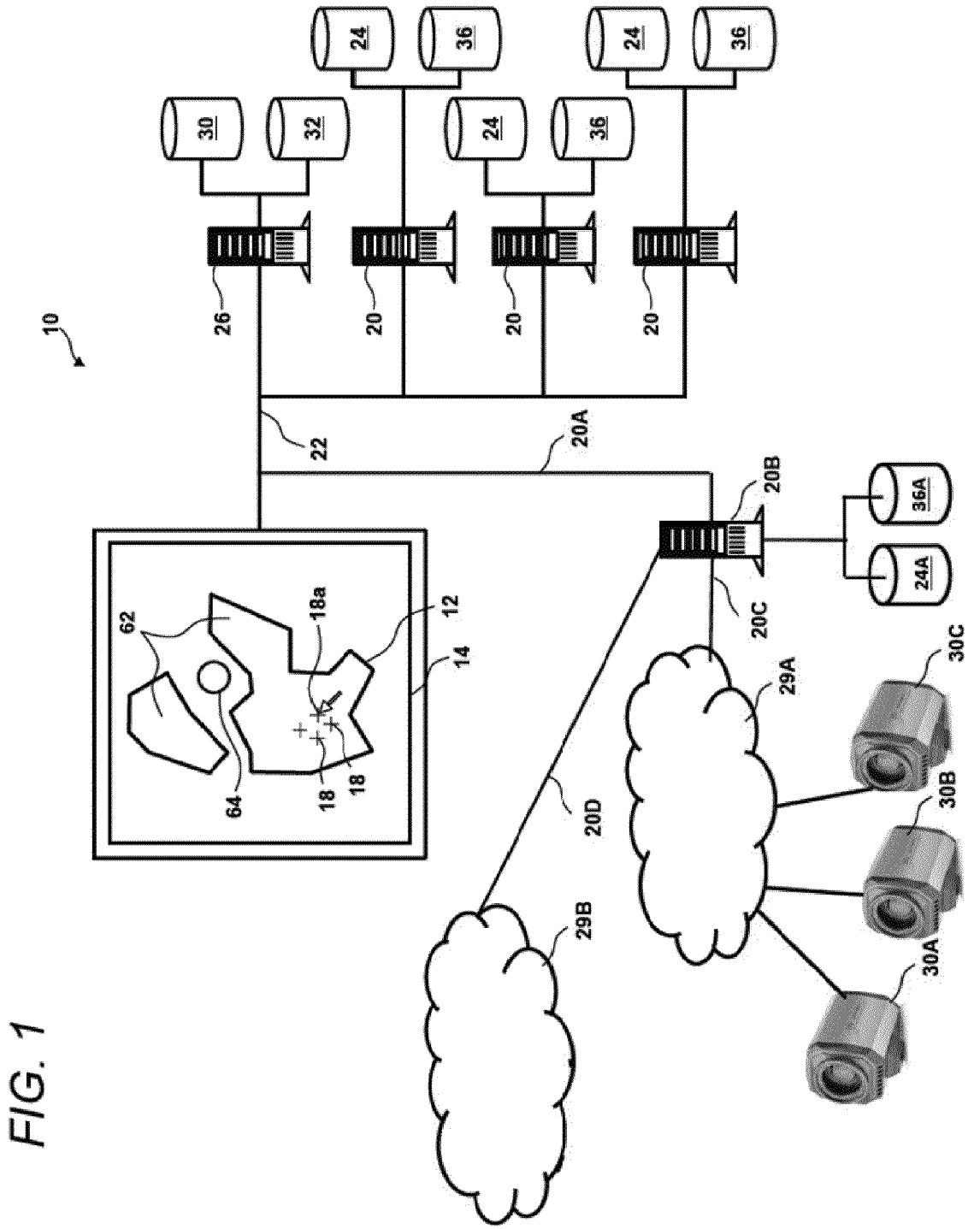
(57) **ABSTRACT**

Systems and methods for enabling a visitor to access VR representations authored by different authors of locations in a virtual universe via a computer network are provided. A plurality of VR data sets may be stored. Each VR data set comprise web or IP camera VR datasets and may be independently authored by a respective author different from the other authors. One or more VR data servers may be adapted to access and transmit the VR data sets, and each VR data set may be associated with a VR data server for access to the VR data set. A domain server may be adapted to access and transmit domain data comprising the location within the universe of each VR representation and the network address of the VR data server associated with the VR representation. Further, a client host may be adapted to communicate with the domain server to receive domain data representing the network address of the VR data server associated with a selected VR representation, the client host further adapted to communicate with that VR data server to access the VR data set defining the VR representation without leaving the virtual universe.




10
24
36
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32
24
36
26
20
20
20
22
20A
20B
36A
24A
20C
62
18a
12
14
64
18
18
29A
30C
20D
30B
29B
30A

FIG. 1

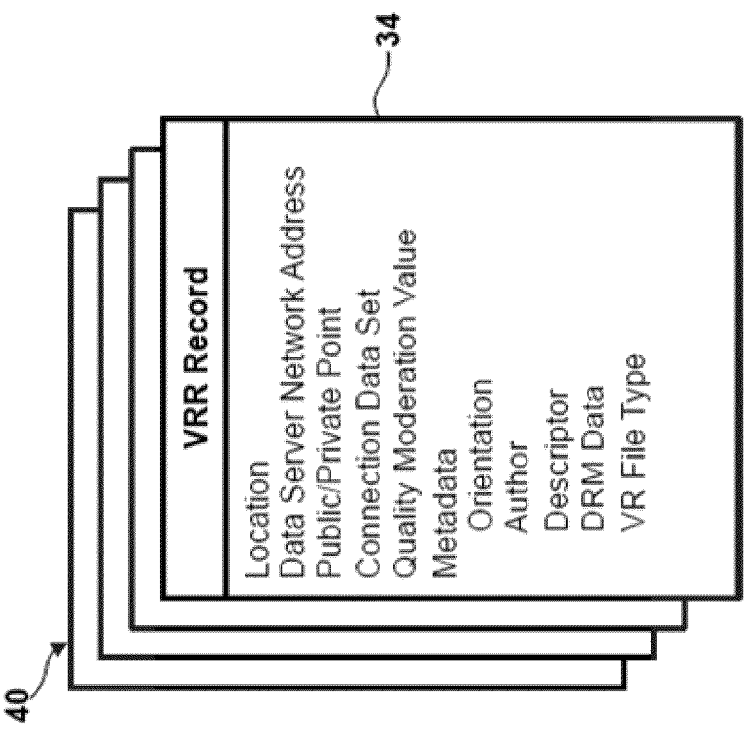
40
VRR Record
Location
Data Server Network Address
Public/Private Point
Connection Data Set
Quality Moderation Value
Metadata
Orientation
Author
Descriptor
DRM Data
VR File Type
34

FIG. 2

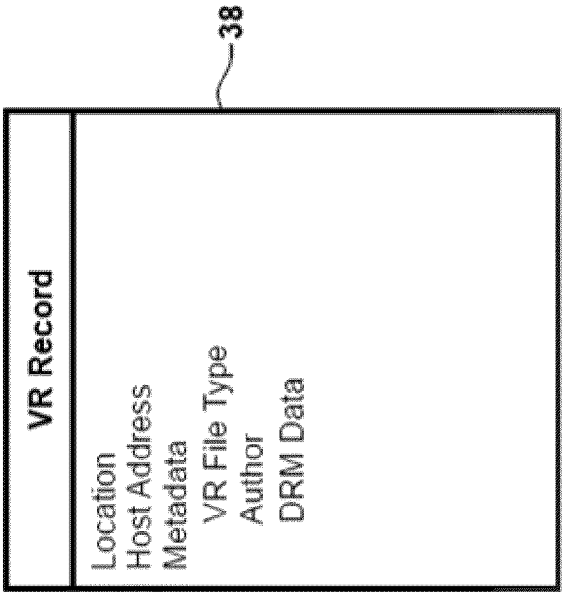
VR Record
Location
Host Address
Metadata
VR File Type
Author
DRM Data
38

FIG. 3

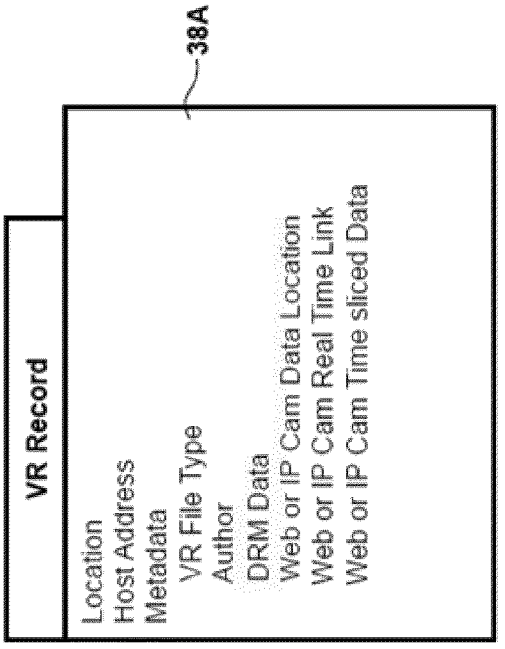

FIG. 3A

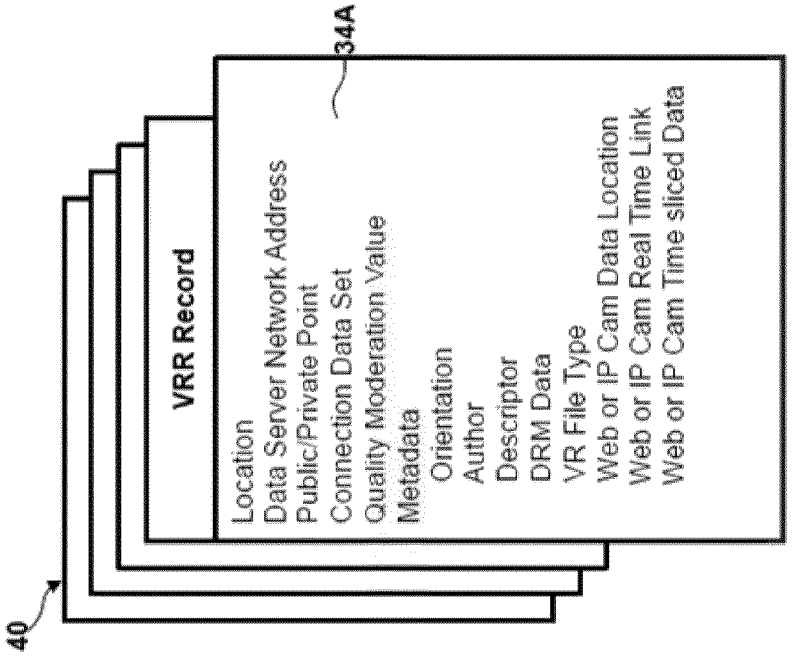

FIG. 2A

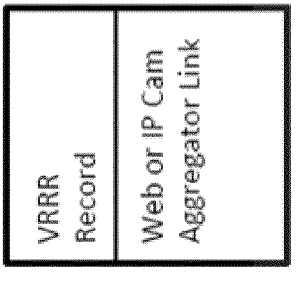

FIG. 2B

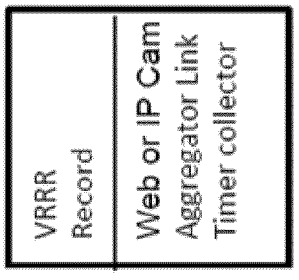

FIG. 2C

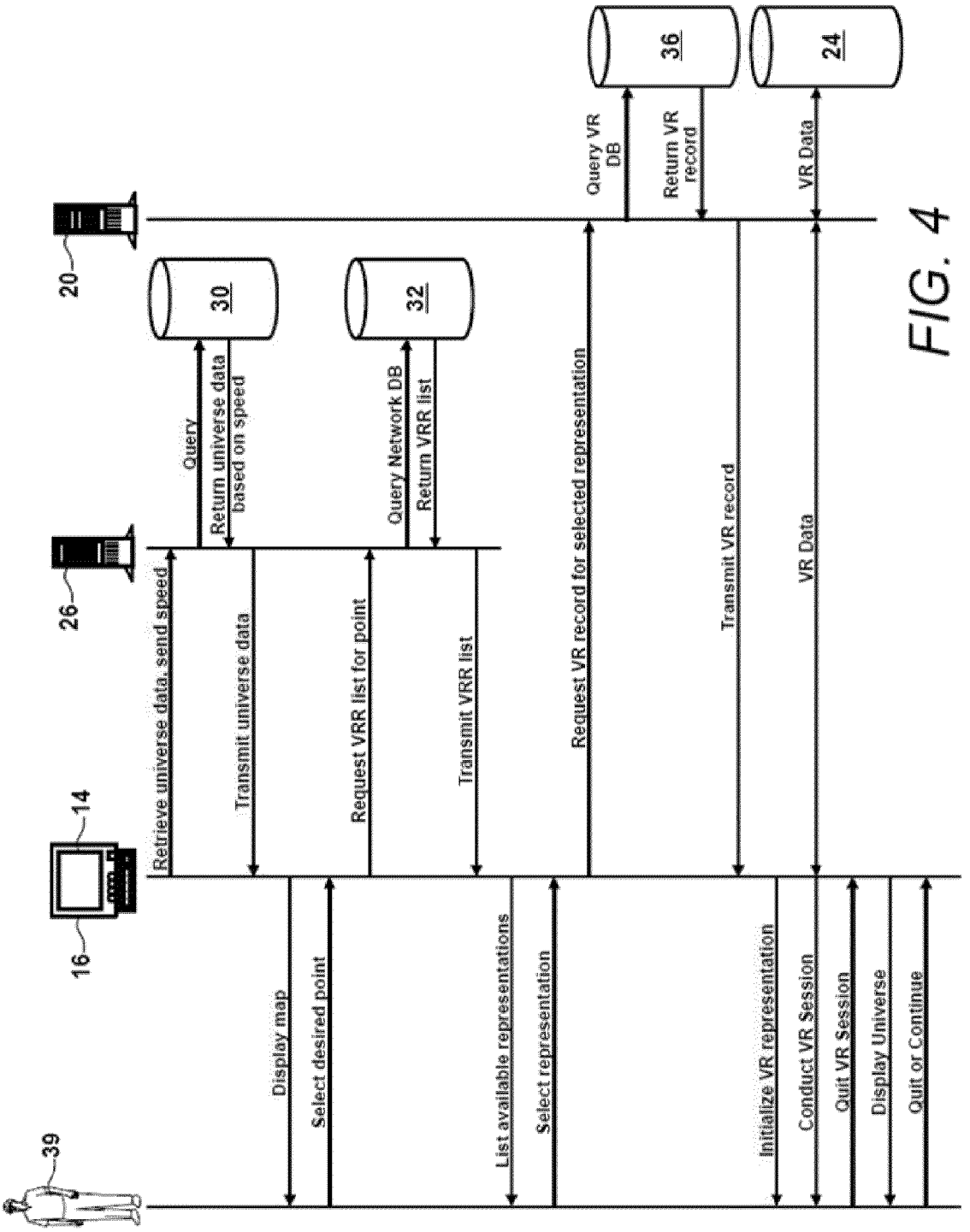
39
16
14
26
20
30
32
36
24
Retrieve universe data, send speed
Transmit universe data
Query
Return universe data based on speed
Request VRR list for point
Transmit VRR list
Query Network DB
Return VRR list
Request VR record for selected representation
Transmit VR record
VR Data
Query VR DB
Return VR record
VR Data
Display map
Select desired point
List available representations
Select representation
Initialize VR representation
Conduct VR Session
Quit VR Session
Display Universe
Quit or Continue

FIG. 4

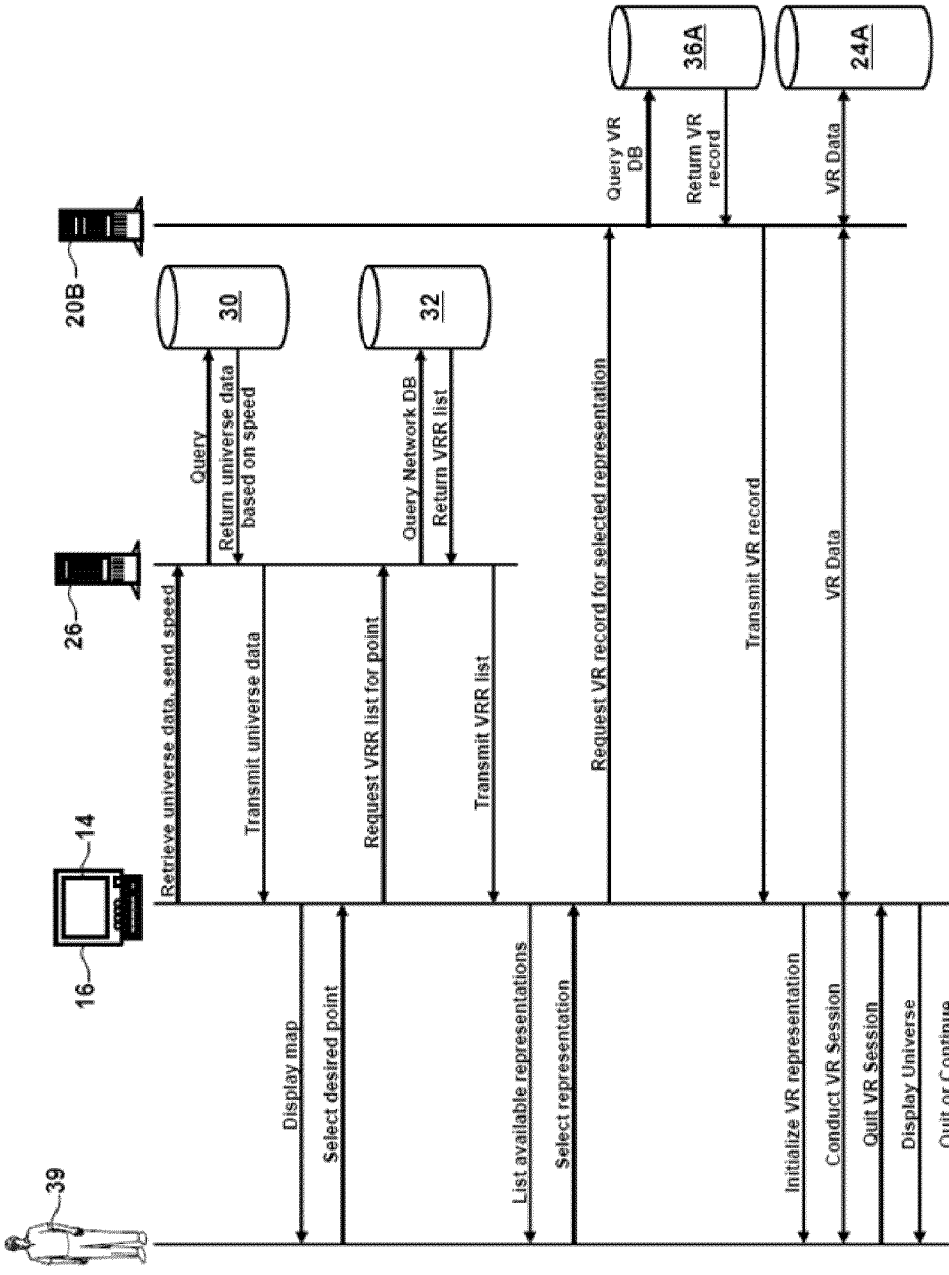
39
16
14
26
20B
30
32
36A
24A
Display map
Select desired point
Retrieve universe data, send speed
Transmit universe data
Query
Return universe data based on speed
Request VRR list for point
Transmit VRR list
Query Network DB
Return VRR list
List available representations
Select representation
Request VR record for selected representation
Query VR DB
Return VR record
Transmit VR record
VR Data
VR Data
Initialize VR representation
Conduct VR Session
Quit VR Session
Display Universe
Quit or Continue

FIG. 4A

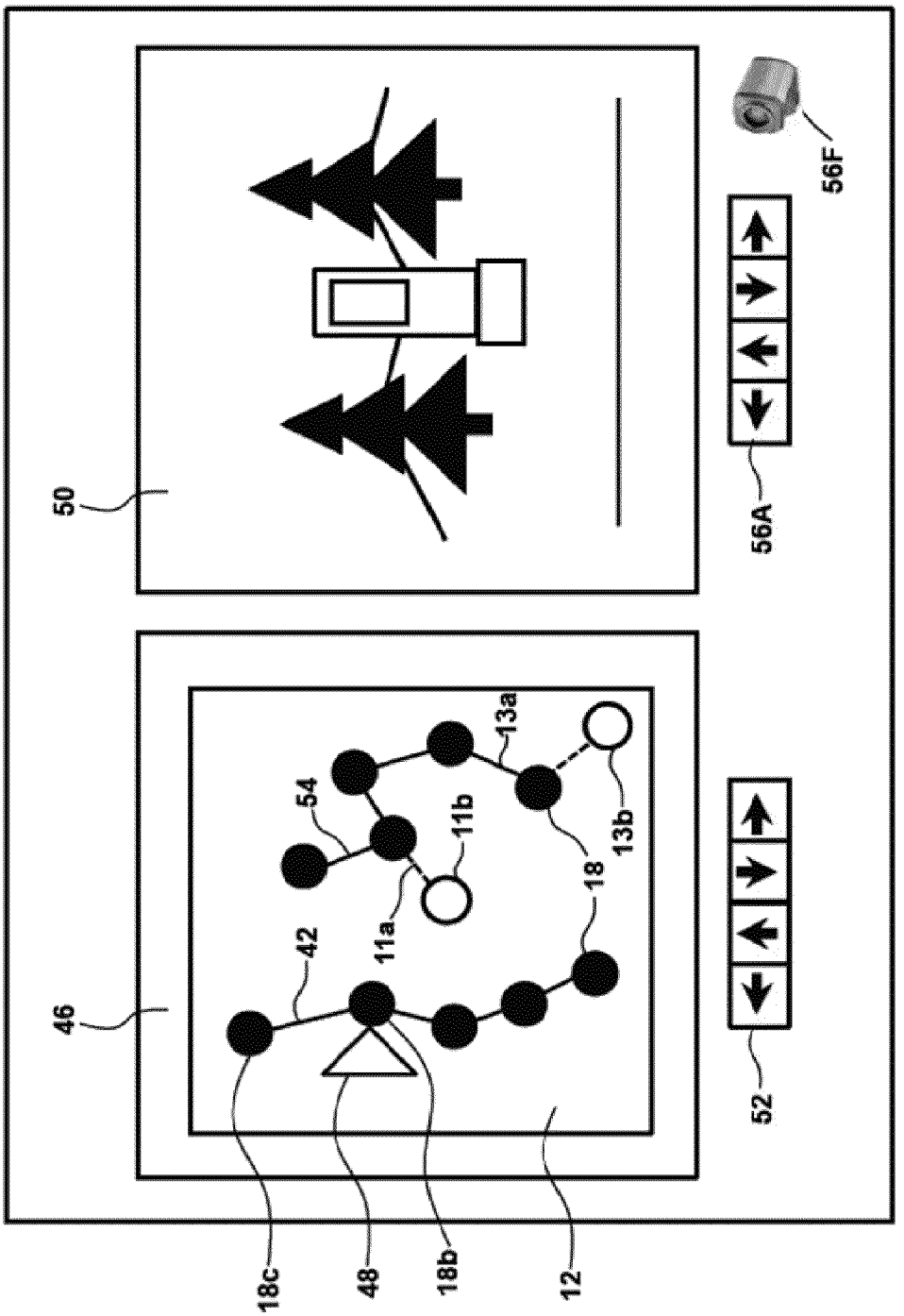

FIG. 5

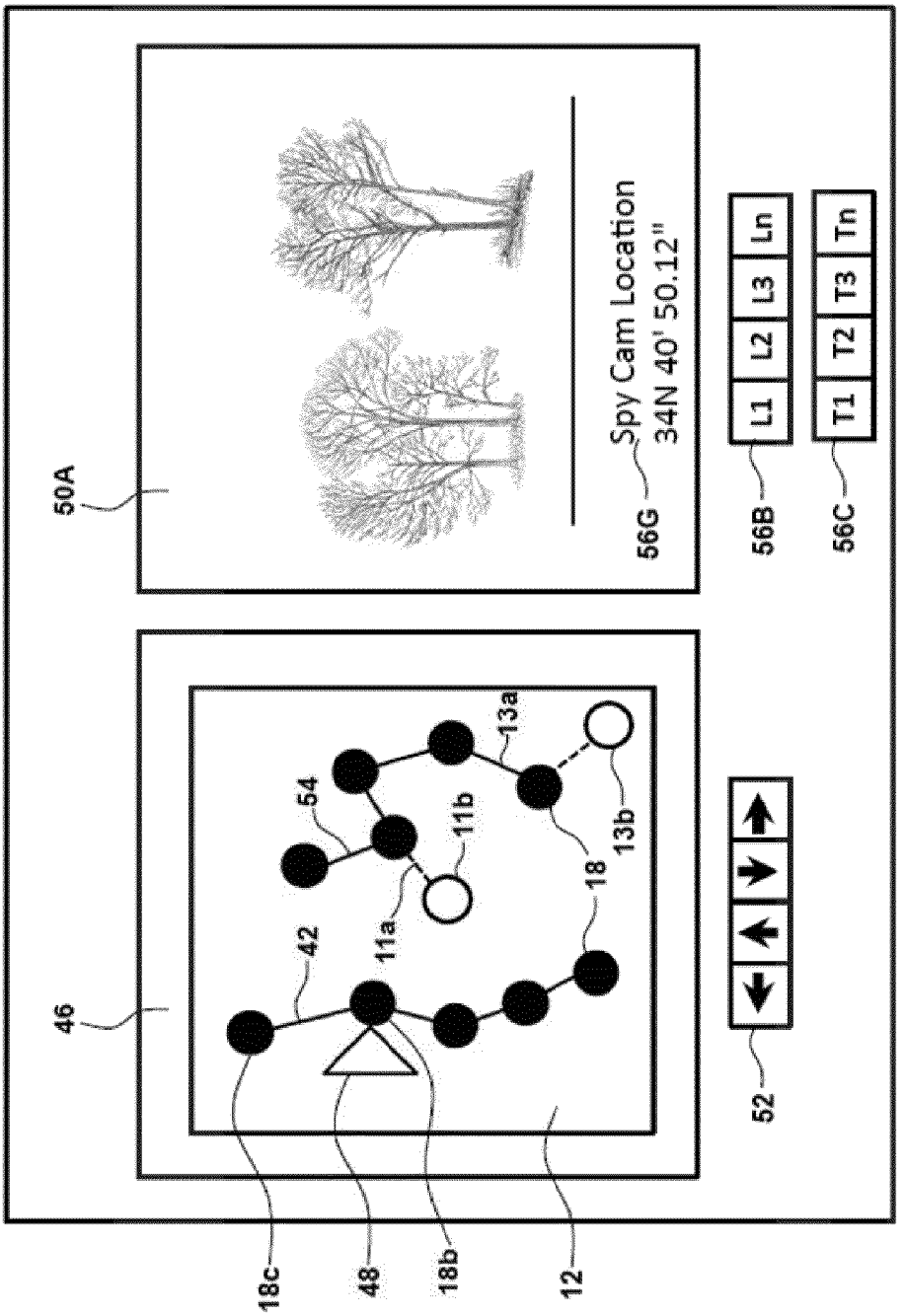
50A
Spy Cam Location
34N 40' 50.12"
56G
L1
L2
L3
Ln
56B
T1
T2
T3
Tn
56C
46
54
13a
11b
13b
18
42
11a
52
18c
48
18b
12

FIG. 5A

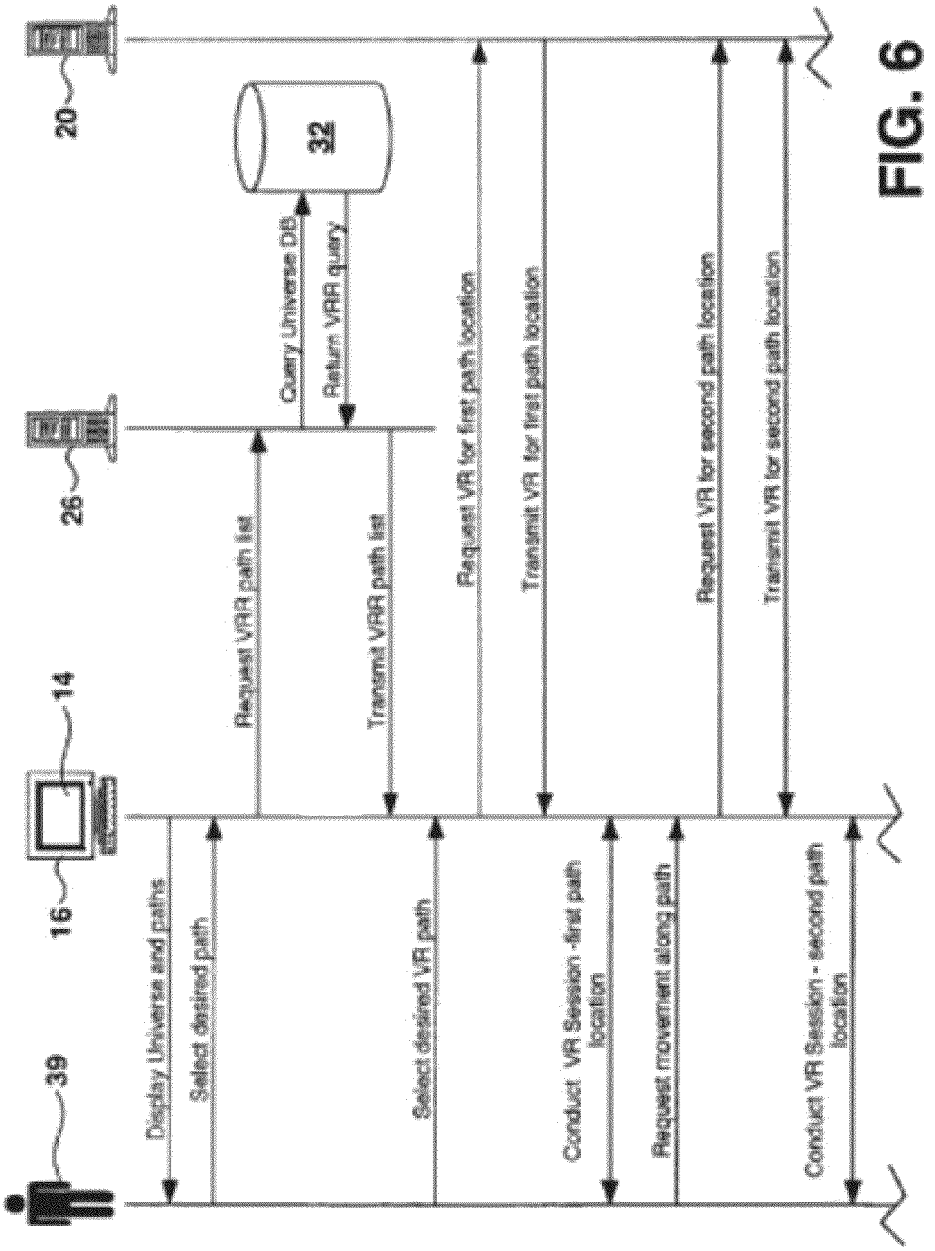
39
16
14
26
20
32
Display Universe and paths
Select desired path
Request VRR path list
Transmit VRR path list
Query Universe DB
Return VRR query
Select desired VR path
Request VR for first path location
Transmit VR for first path location
Conduct VR Session -first path location
Request movement along path
Request VR for second path location
Transmit VR for second path location
Conduct VR Session - second path location

FIG. 6

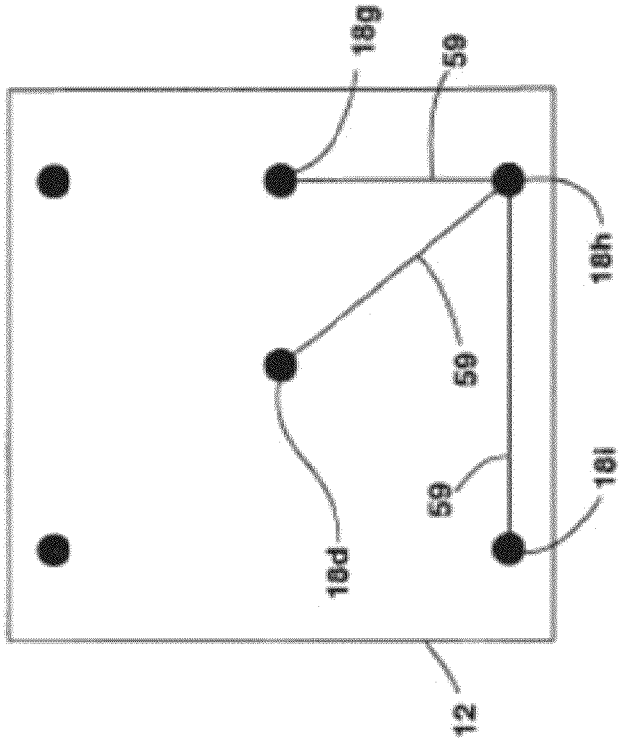
18g
59
18h
59
59
18i
18d
12

FIG. 7b

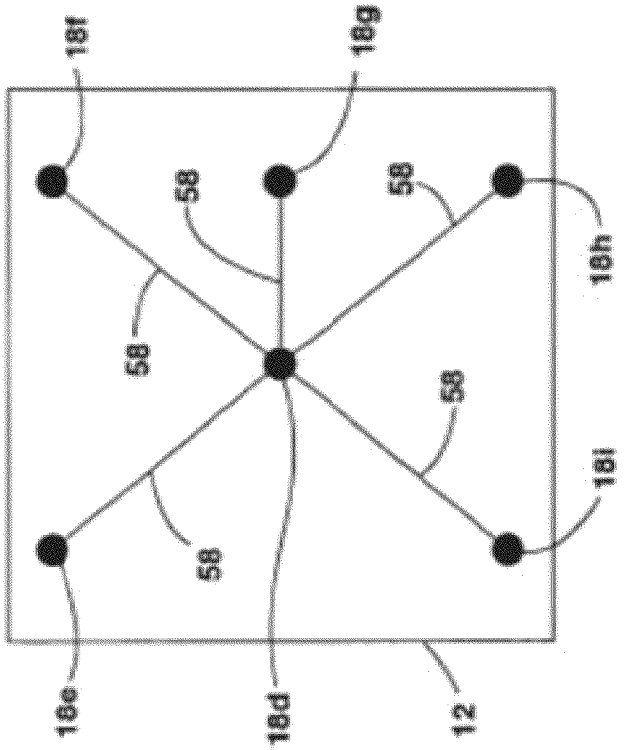
18f
18g
58
58
18h
58
58
58
18i
18e
18d
12

FIG. 7a

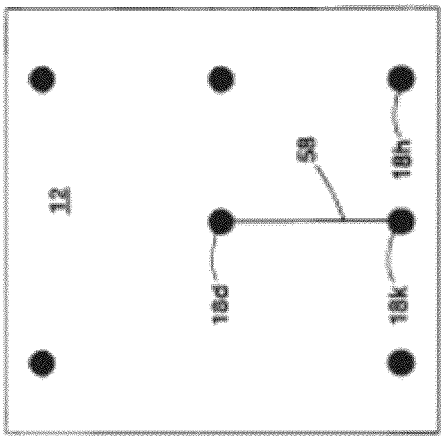

FIG. 9

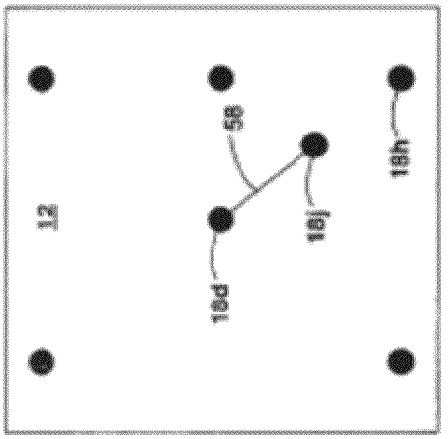

FIG. 8

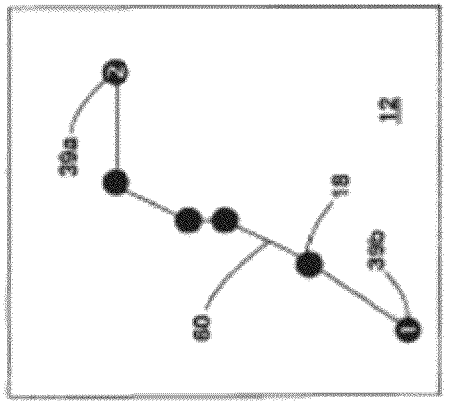

FIG. 10

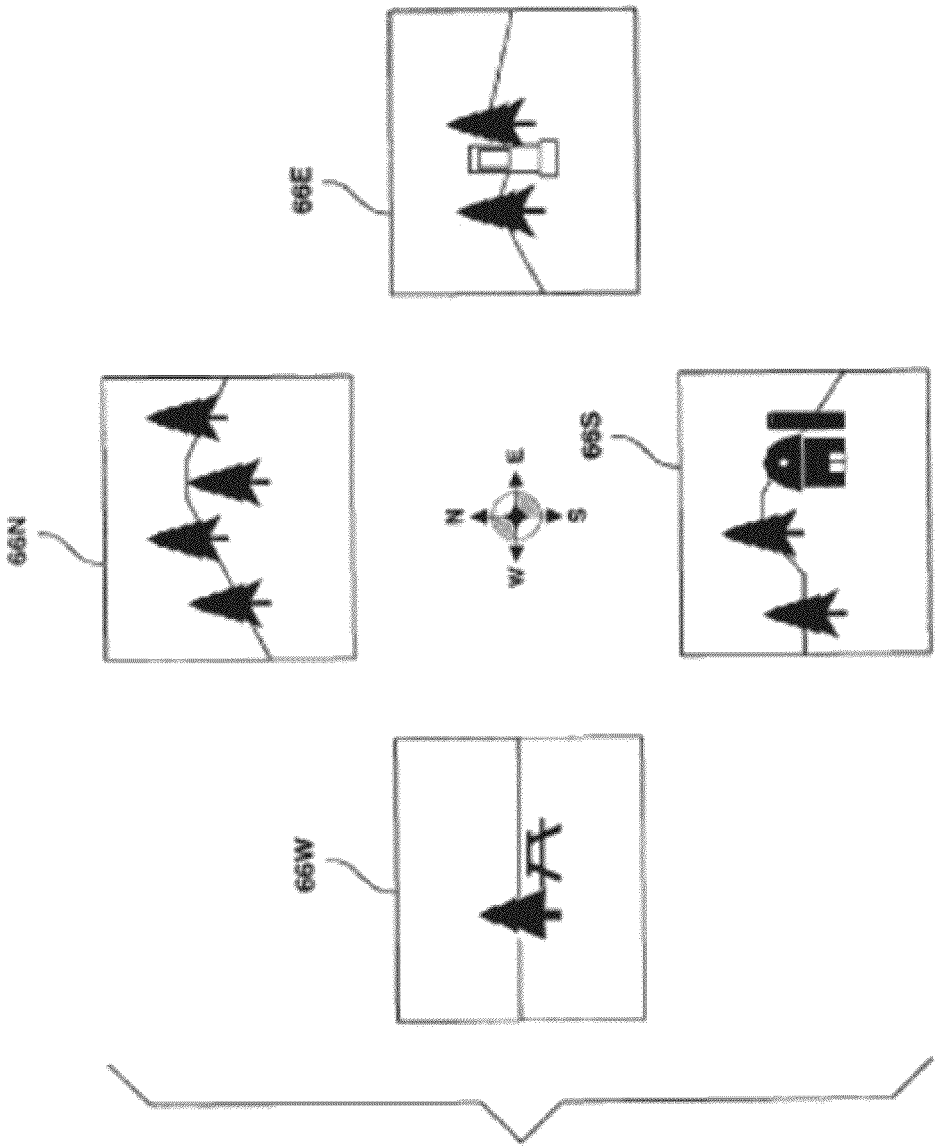

FIG. 11

REAL TIME VIRTUAL REALITY LEVERAGING WEB CAMS AND IP CAMS AND WEB CAM AND IP CAM NETWORKS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims the priority benefit of U.S. Provisional Patent Application Ser. No. 61/786,572 filed Mar. 15, 2013 entitled, "Personal Digital Assistance and Virtual Reality," the disclosures of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to computer-generated virtual reality representations of locations. Specifically, the present invention relates to storing, organizing, and providing access to a number of virtual reality representations whose data comes from spy cams and spy cam networks of web cams all through a computer network.

[0004] 2. Description of the Related Art

[0005] Virtual reality (VR) models and simulates views from a location in virtual space. The visitor perceives the view from virtual space on a computer monitor or specialized display, and experiences "movement" by changing position or orientation within the virtual space. The visitor may even be "teleported" to different points in the virtual space.

[0006] Although recognized as having substantial potential, virtual reality has remained limited because it has yet to connect to the many cloud databases as well as many remote data gathering devices. As explained below, virtual reality representations model a single virtual space, and authoring virtual reality representations requires specialized computer programming or graphics skills. These factors have hindered broader adoption of virtual reality.

[0007] A virtual reality representation models a single volume, area, or point within virtual space. The representation may model physical space, such as a location or region on the Earth, or may model imaginary space in a video game. The visitor can move around in the virtual space, but is limited to remaining in that virtual space.

[0008] Authors are usually involved in creating virtual reality representations of the locations, or of related locations. These representations may exist on different websites, servers, or computers. There is a need to expand the data of virtual reality away from authors who happen to take pictures or video of a geo-location.

[0009] A webcam is a video camera that feeds its images in real time to a computer or computer network. An IP camera uses a direct connection using ethernet or Wi-Fi whereas a webcam is generally connected by a USB cable, FireWire cable, or similar cable.

[0010] The most popular use of these cameras is the establishment of video links, permitting computers to act as videophones or videoconference stations. The common use as a video camera for the World Wide Web gave the webcam its name. Other popular uses include security surveillance, computer vision, video broadcasting, and for recording social videos.

[0011] Webcams are known for their low manufacturing cost and flexibility making them the lowest cost form of video telephony. They have also become a source of security and privacy issues, as some built-in webcams can be remotely activated via spyware.

[0012] It is desirable to find a way to connect these web and IP cams to the virtual reality networks to take advantage of growing the virtual data base independent of authors.

[0013] In particular, it would be desirable that the web and IP camera representations be connected together in a way that enables the visitor to experience these representations. For example, if the locations modeled by a web or IP camera are of a physical location virtual reality visitors select, the visitor could choose that representation to experience. This creates a "virtual universe" made of separate virtual reality web or IP camera representations that can be toured by visitors.

[0014] There are also many websites that aggregate the collection of web cams or IP cameras for visitors to explore various geo-locations. However, these websites are not organized by virtual travel and further they are not linked to other forms of data. It would be advantageous to link these web cameras and IP cameras for improvement of visitor's experiences through virtual reality representations.

[0015] Prior art U.S. Pat. No. 7,298,378, Issues Nov. 20, 2007, "Virtual reality universe realized as a distributed location network" describes a virtual reality network which provides access to a number of virtual reality representations, each virtual reality representation representing a location in a virtual universe and defined by VR data stored on the network. The VR data can be in a simplified data format. A database stores the network address and the location in the universe of each virtual reality representation. A database server provides access to the database. The database server generates a list of locations in response to a location query from a visitor, and provides the network address of the virtual reality representation of a selected location. A visitor connects to the database server with a client host to visit the locations in the virtual universe. This patent does not describe connections to other data sources other than that created by hum authors.

SUMMARY OF THE CLAIMED INVENTION

[0016] The invention is a network capable of connecting web cameras and IP cameras to virtual reality representations together with other virtual reality data to form a virtual universe. The virtual reality representations can be in a simplified virtual reality format that requires no special computer programming or graphics skills to create.

[0017] A network in accordance with the present invention includes a number of virtual reality representations, each virtual reality representation representing a location in a virtual universe and defined by VR data stored on the network at a network address. For some locations in a virtual reality universe, real time data or time-sliced data (that is video or image data taken at various times) is available to add to the static virtual reality data.

[0018] A database stores the network address and the location in the universe of each virtual reality representation as well as stores the web camera or IP camera data as well as actual links to the web or IP cameras. A database server provides access to the database. The database server generates a list of locations in response to a location query from a visitor, and provides the network address of the virtual reality representation of a selected location.

[0019] The visitor connects to the network using a client host adapted to communicate with the domain server. The

host receives data representing the network address of the VR data server associated with a selected VR representation. The host is also adapted to communicate with the VR data server to access the VR data set defining the VR representation.

[0020] In using the network, the visitor is preferably presented with a map displaying locations in the virtual universe. Each location is associated with a virtual reality representation accessible through the network. The visitor selects a location on the map he or she desires to visit. The domain server receives the selected location and retrieves from the database the network location of the data server providing access to the selected virtual reality representation. The domain server transmits the network address of the data server to the host, and the host communicates with the data server to receive the VR data defining the virtual reality representation. For web camera or IP camera connections, the domain server transmits the network address of the data server to the host, and the host communicates with the data server to receive the VR data from the web camera or IP camera stored or real time data defining the virtual reality representation.

[0021] In one possible embodiment, the client host includes a monitor that displays both the map and the virtual reality presentation generated from the static VR data along with data from web or IP cameras. In other possible embodiments the virtual reality presentation can utilize specialized hardware separate from the map display.

[0022] In preferred embodiments of the present invention, the network stores data representing paths in the virtual universe. A path is defined by at least two different locations in the universe. When the domain server receives a message from the host requesting virtual movement from a first location to a second location, the domain server communicates the network address of the data server associated with the second location to the host. The host then communicates with that data server and transitions from the first VR presentation to the VR presentation of the second location. The visitor perceives a substantially continuous movement along the path from the first location to the second location without leaving the virtual universe.

[0023] Paths can be defined in different ways in alternative embodiments of the network. The domain server can store predefined path definitions by storing a list of the locations defining the path. Alternatively, the domain server stores a data record for each location in the universe. The data set records the adjacent locations in the universe to define a path from each location to adjacent locations. In other alternative embodiments the path is defined in response to system events and then made available to the user.

[0024] The network preferably includes administrative software that enables new virtual reality representations of static VR data along with data from web or IP cameras to be added to the network. The virtual reality representations can be stored on existing data servers on the network, or stored on data servers that are themselves added to the network. The database is updated to reflect the new locations in the virtual universe and the network addresses of the data servers accessing the representations.

[0025] In one advantageous embodiment of the present invention, the virtual universe is divided into public and private regions. Any author can add to the network a virtual reality static VR data along with data from web or IP cameras representation of a location in the public region of the universe. Only authorized authors can add representations in private regions of the universe.

[0026] In another advantageous embodiment of the present invention, the network is operated as a self-regulating virtual reality universe. The network preferably provides visitor access to a number of virtual reality representations, each authored by a different author or data from web or IP cameras. The domain server receives ratings from visitors to the quality of the virtual reality representations they visited, and assesses the quality of each virtual reality representation based on the ratings provided by the visitors.

[0027] Action is then taken regarding a virtual reality based on the assessed quality of the virtual reality representation. The quality can be rated as a running average of visitor ratings. If the rating falls below a predetermined score, visitor access to the representation can be removed or the representation can be removed from the network. Preferably the action is taken automatically and without human intervention so that the network is self-regulating.

[0028] To simplify creation of virtual reality representations, the VR data can be stored in a simplified file format that stores digital photographs taken from a specific geographic location. An author either provides the links to the web or IP cameras, as well as can determining timing of collecting snapshots of the web or IP cameras. Also an author provides a link to a website of web or IP cameras with software able to identify a particular web or IP camera based upon the geo location requested. Also an author takes a number of photographs from the location with a digital camera. The photographs are preferably in JPG format but other "digital film" formats can be used. Each photograph preferably is taken in a different viewing direction, preferably viewing north, south, east, and west. The images are uploaded to the network along with geographical data (for example, latitude and longitude) that identifies where the photographs were taken. The domain server stores the images, the viewing direction associated with each image, and geographical data in a single data file on a data server. The domain server updates its database of either the static VR data or real time or time sliced data from web or IP cameras. associating the geographical location with a virtual location in the virtual universe. The virtual representation is now accessible to visitors, and the photographs are displayed when generating the virtual reality presentation of the virtual location.

[0029] A virtual reality network in accordance with the present invention offers many advantages. A number of different virtual reality representations are made available to visitors through a single, centrally accessible domain server. The domain server enables visitors to experience virtual reality representations created by different authors, and to tour a virtual universe created by logically organizing and connecting the separate representations.

[0030] Authors can easily add new virtual reality representations of either the static VR data or real time or time sliced data from web or IP cameras to the network, enabling visitors to experience a virtual reality universe that grows richer and richer with time. With the simplified VR file format, persons may share with others their travels to places around the world, or may easily create their own virtual universe for business or private use.

[0031] Other objects and features of the present invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying eight drawing sheets illustrating an embodiment of the invention.

[0032] It is also understood; that there are many ways that the databases can be connected to, as in this case servers are defined by holding data by geo-locations, but it can be connected in any other cloud based structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] FIG. **1** is a schematic view of a virtual reality universe realized as a distributed location network in accordance with the present invention;

[0034] FIG. **2** is a schematic view of a virtual reality representation record used in the network shown in FIG. **1**;

[0035] FIG. **2**A is a schematic view of a web cam or IP camera virtual reality representation record used in the network shown in FIG. **1**;

[0036] FIG. **2**B is a schematic view of a web cam or IP camera links virtual reality representation record used in the network shown in FIG. **1**;

[0037] FIG. **2**C is a schematic view of a web cam or IP camera links and timer of the link of virtual reality representation record used in the network shown in FIG. **1**;

[0038] FIG. **3** is a schematic view of a virtual reality record used in the network shown in FIGURE.

[0039] FIG. **3**A is a schematic view of a virtual reality web cam or IP camera record used in the network shown in FIG. **1**;

[0040] FIG. **4** is a sequence diagram illustrating a visitor utilizing a client host communicating with the network shown in FIG. **1** to view a location in the virtual universe;

[0041] FIG. **4**A is a sequence diagram illustrating a visitor utilizing a client host communicating with the web or IP cameras data network shown in FIG. **1** to view a location in the virtual universe;

[0042] FIG. **5** is a view of the client host display displaying a map of the universe and a virtual reality presentation of a location in the virtual universe;

[0043] FIG. **5**A is a view of the client host display displaying a map of the universe and a virtual reality presentation of web camera or IP camera data of a location in the virtual universe;

[0044] FIG. **6** is a sequence diagram similar to FIG. **4** illustrating a visitor moving along a path in the virtual universe;

[0045] FIGS. **7***a* and **7***b* represent paths in the virtual universe extending between adjacent locations in the universe;

[0046] FIGS. **8-10** illustrate other paths in the virtual universe; and

[0047] FIG. **11** represents photographs that define a simplified virtual reality representation of a physical location modeled in the virtual universe.

DETAILED DESCRIPTION

[0048] Systems and methods for enabling a visitor to access VR representations authored by different authors of locations in a virtual universe via a computer network are provided. A plurality of VR data sets may be stored. Each VR data set comprise web or IP camera VR datasets and may be independently authored by a respective author different from the other authors. One or more VR data servers may be adapted to access and transmit the VR data sets, and each VR data set may be associated with a VR data server for access to the VR data set. A domain server may be adapted to access and transmit domain data comprising the location within the universe of each VR representation and the network address of the VR data server associated with the VR representation. Further, a client host may be adapted to communicate with the domain server to receive domain data representing the network address of the VR data server associated with a selected VR representation, the client host further adapted to communicate with that VR data server to access the VR data set defining the VR representation without leaving the virtual universe.

[0049] Users or visitors may use any number of different electronic computing client devices, which can include, but is not limited to, general purpose computers, mobile phones, smartphones, personal digital assistants (PDAs), portable computing devices (e.g., laptop, netbook, tablets), desktop computing devices, handheld computing device, or any other type of computing device capable of communicating over a communication network. Such devices are preferably configured to access data from other storage media, such as, but not limited to memory cards or disk drives as may be appropriate in the case of downloaded services. Such devices preferably include standard hardware computing components such as, but not limited to network and media interfaces, non-transitory computer-readable storage (memory), and processors for executing instructions that may be stored in memory.

[0050] FIG. **1** illustrates a distributed location network **10** in accordance with the present invention.

[0051] The network **10** enables a visitor to visit and explore a virtual universe. FIG. **1** illustrates a map **12** of the virtual universe displayed on a visitor's computer monitor by a software program or virtual reality browser (VR browser) **14** running on a visitor's computer **16** connected as a network client. The universe can model a real or tangible space, such as the surface of the Earth, with the universe representing real or tangible locations in physical space. Alternatively, the universe can model an imaginary space, such as L. Frank Baum's Oz or a stick model of a protein molecule, with the universe representing imaginary locations in nonphysical space.

[0052] The network **10** is preferably a local, proprietary network (e.g., an intranet) and/or is alternatively a part of a larger wide-area network (e.g., the cloud). The network **10** can be a local area network (LAN), which is communicatively coupled to a wide area network (WAN) such as the Internet. The Internet is a broad network of interconnected computers and servers allowing for the transmission and exchange of Internet Protocol (IP) data between users connected through a network service provider. Examples of network service providers are the public switched telephone network, a cable service provider, a provider of digital subscriber line (DSL) services, or a satellite service provide.

[0053] The visitor explores the universe by selecting and viewing virtual reality presentations of virtual locations or points **18** on the map **12**. Each point **18** represents a location in the universe that has at least one virtual reality representation available for a visitor to access and experience. A point **18** can model a point, area or volume in the virtual universe and a visitor may be capable of moving about the area or volume if the virtual reality presentation enables it.

[0054] The VR browser **14** retrieves the data for the virtual reality representations from virtual reality data servers (VR data servers) **20**. VR data servers **20** are connected to the browser **14** by network connections **22**. The network connections **22** may be through a Local Area Network (LAN) or a global network such as the Internet. VR data servers **20** may include any type of server or other computing device as is known in the art, including standard hardware computing components such as network and media interfaces, non-tran-

sitory computer-readable storage (memory), and processors for executing instructions or accessing information that may be stored in memory. The functionalities of multiple servers may be integrated into a single server. Any of the aforementioned servers (or an integrated server) may take on certain client-side, cache, or proxy server characteristics. These characteristics may depend on the particular network placement of the server or certain configurations of the server.

[0055] Each VR data server **20** provides access to VR data **24** for a virtual reality representation of the selected point **18**. Data can be stored in conventional virtual reality file formats such as QUICKTIME, X3D, VRML, and the like, or can be stored as separate digital image files. VR data **24** can be stored on the VR data server **20** or stored on additional network data servers (not shown) distributed through the network **10**.

[0056] The entire network **10**, including the network client **16** and the servers **20** and **26**, may also be hosted on a single computer if a distributed network is not required.

[0057] A point **18** may have a number of different virtual reality representations served by a number of different VR data servers **20**. These representations may be stored in different file formats, may represent the point in different seasons of the year or in different historical eras, or may provide an alternative or augmented user interface or sensory experience. Of course, a particular data server **20** could serve a number of virtual reality representations of a point **18** or different points **18**.

[0058] A domain server **26** hosts a universe database **30** for displaying the map **12** and the points **18** on the map **12**. The database **30** preferably includes graphic files, image files, and other data for generating and displaying the map **12**. The universe database **30** may also include the network addresses or network paths to the VR files associated with the virtual reality representations.

[0059] The domain server **26** also maintains a network database **32** that stores information about each point **18** and the network addresses of the one or more VR data servers **20** that provide access to VR representations of the point **18**.

[0060] The network database **32** holds a number of virtual reality representation records (VRR records) **34**.

[0061] FIG. **1**. also shows connection **20**A to web or IP camera server **20**B. Web or IP camera server **20**B is connected to network database **24**A and **32**A of virtual representation records **34**A (see FIG. **2**A) and **38**A (see FIG. **3**A). Web or IP camera server **20**B is also connected (thru connection **20**C) to internet cloud **29**A which in turn connects to numerous web or IP cameras examples **30**A, **30**B and **30**C. Web or IP camera server **20**B is also connected (thru connection **20**D) to internet cloud **29**B which connects to numerous web or IP cameras website.

[0062] FIG. **2** illustrates a typical VRR record **34**. The VRR record **34** is a data structure that provides information enabling the VR browser **14** to locate the VR data server **20** providing access to a specific VR representation. A VRR record **34** includes the location of the point **18** and the network address of the VR data server **20** associated with the VR representation of the point **18**.

[0063] The VRR record **34** preferably also includes metadata providing additional information about the point **18**, the associated VR data server **20**, and the virtual reality representation of the point **18**. Metadata can include the author, VR file format, or a description of the VR representation. Other metadata can include digital rights management (DRM) information, initial orientation or direction of the default opening view of the virtual reality representation, or the like.

[0064] Each VR data server **20** maintains a local database **36** that records the location or locations of the VR data **24** accessed through the VR data server **20** (see FIG. **1**). The local database **36** holds a virtual reality record (VR record) **38** for each representation accessed through the VR data server **20**.

[0065] FIG. **2**A illustrates a typical VRR record **34**A. The VRR record **34**A is a data structure that provides information enabling the VR browser **14** to locate the VR data server **20**B providing access to a specific VR representation. A VRR record **34**A includes the location of the point **18** and the network address of the VR data server **20**B associated with the VR web or IP camera representation of the point **18**.

[0066] The VRR record **34**A preferably also includes metadata providing additional information about the point **18**, the associated VR data server **20**B, and the virtual reality wen or IP camera representation of the point **18**. Metadata can include the author, VR file format, or a description of the VR representation. Other metadata can include digital rights management (DRM) information, initial orientation or direction of the default opening view of the virtual reality representation, or the like. Other metadata includes Web or IP Cam Data Location, Web or IP Cam Real Time Link (the link to the real time web or IP camera) and Web or IP Cam Time sliced Data (that is data that is collected at various times from web or IP cameras).

[0067] Each VR data server **20**B maintains a local database **36**A that records the location or locations of the VR data **24**A accessed through the VR data server **20**B (see FIG. **1**). The local database **36**A holds a virtual reality record (VR record) **38**A for each representation accessed through the VR data server **20**B.

[0068] FIG. **2**B shows example VRRR record for Web or IP Cameras storing the Web or IP Cam Aggregator Link (hyper link to the web or IP cameras).

[0069] FIG. **2**C. shows example VRRR record for Web or IP Cameras storing the Web or IP Cam Aggregator Link timer collector that is the time data that tells the network when to take a snapshot data of any connected Web or IP camera. In this way, the web or IP camera data stored can be stored over time.

[0070] FIG. **3** illustrates a typical VR record **38**. The VR record **38** is a data structure that includes the location of the point **18**, the location of the VR data **24** for the representation of the point, and metadata containing further information about the VR data **24**. For example, such metadata may include the author and digital rights management (DRM) information, VR data format, or descriptive information about the VR representation.

[0071] The universe database **30**, the network database **32**, or a local database **36** can be realized as a single-file relational database, object database, or hierarchal XML database. Alternatively, a database **30**, **32**, **36** can be realized as a number of separate data files, wherein each data record is stored in a respective data file. The data file can be in structured text file format, XML format, or other conventional data format. The selection of database schema and format is based on conventional software engineering considerations, including the network architecture, the network load, and available software.

[0072] FIG. **3**A illustrates a typical VR record **38**A. The VR record **38**A is a data structure that includes the location of the point **18**, the location of the web or IP camera VR data **24**A for the representation of the point, and metadata containing fur-

ther information about the VR data **24**A. For example, such metadata may include the author and digital rights management (DRM) information, VR data format, or descriptive information about the VR representation. Other metadata includes Web or IP Cam Data Location, Web or IP Cam Real Time Link (the link to the real time web or IP camera) and Web or IP Cam Time sliced Data (that is data that is collected at various times from web or IP cameras).

[0073] The universe database **24**, the network database **24**A, or a local database **36**A can be realized as a single-file relational database, object database, or hierarchal XML database. Alternatively, a database **30**, **24**A, **36**A can be realized as a number of separate data files, wherein each data record is stored in a respective data file. The data file can be in structured text file format, XML format, or other conventional data format. The selection of database schema and format is based on conventional software engineering considerations, including the network architecture, the network load, and available software.

[0074] FIG. **4** illustrates a first user session wherein a visitor **39** explores the virtual universe point-by-point. For clarity only one visitor is shown connected to the network **10**, but it should be understood that a number of visitors can simultaneously explore the universe.

[0075] The VR browser **14** retrieves the map data **30** from the domain server **26** and begins the user session by displaying the map **12** shown in FIG. **1**. The map **12** displays the points **18**, and the user interface of the VR browser **14** enables the visitor **39** to select which point **18** and the representation of the selected point **18** he or she would like to experience.

[0076] It should be understood that the universe database **30** may include or enable generation of a number of different maps representing different regions or sub-regions of the universe. The VR browser **14** may simultaneously or sequentially display different maps during a user session. For example, the visitor is initially presented with a "master map" or model of the entire universe. If the virtual universe is sufficiently extensive, the user interface of the VR browser **14** enables users to "drill down" and select more detailed maps or models of sub-regions (for example, maps representing a continent, a country, a city, and then a city block) to select a desired point **18**.

[0077] Map **12** should therefore be understood to represent all possible maps the VR browser **14** may display as part of its user interface. Maps may be representations of one-dimensional, two-dimensional, three-dimensional, or n-dimensional space as is appropriate for the virtual universe such maps represent.

[0078] The map **12** may also display additional information that assists the visitor in selecting a point or a VR representation of the point. For example, the map might indicate points of historical interest or the number and types of virtual reality representations available for each point.

[0079] In the illustrated embodiment, the visitor selects a desired point **18***a* from the map **12** by clicking the mouse (see FIG. **1**). The browser **14** determines the location of the selected point **18***a* on the map and requests a list **40** of VRR records **34** associated with that point from the domain server **26** (see FIG. **2**).

[0080] The domain server **26** queries the network database **32** for the list of VRR records of points at or proximate to the selected point **18***a*. The domain server **26** returns the VRR list **40** to the VR browser **14**. The VR browser **14** generates a list of available VR representations from the VRR list **40**, and displays the list for the selected point **18***a*.

[0081] The display list can include information from the metadata to assist the visitor in selecting a VR representation to experience. For example, the VR browser **14** might display an icon for each representation indicating some characteristic of the representation (such as season of the year, its VR file format, or quality moderation value (discussed in further detail below)).

[0082] The visitor selects from the display list the desired virtual reality representation to experience. If there is only one representation associated with the selected point, the steps of displaying and selecting from the list can be eliminated.

[0083] The VR browser **14** uses the VRR record **34** associated with the selected representation to look up the network address of the VR data server **20** providing access to the virtual representation. The VR browser **14** requests the VR record **38** for the selected representation from the VR data server **20**. The VR browser **14** uses the returned VR record **38** to fetch the VR data file **24** and initialize a virtual reality presentation that will be perceived and experienced by the visitor **39**. For example, the VR browser **14** could start one helper application to display a QUICKTIME presentation and another helper application to display a VRML presentation.

[0084] In the illustrated embodiment, the VR browser **14** displays the map **12** in a first window and the virtual reality presentation in a second window (discussed in greater detail later). In other embodiments, virtual reality presentations could be displayed independently of the VR browser **14** through more specialized or augmented VR hardware, such as a headset.

[0085] During the VR presentation, the VR browser **14** receives input from the visitor and communicates with the VR data server **20** to fetch the VR data **36**. The visitor can change the point of view and move about the presentation as permitted by the virtual reality representation being experienced. When the visitor ends the VR presentation, the window displaying the VR presentation closes or goes blank. The visitor **39** can then select a new point **18** or quit the application.

[0086] In addition to exploring selected points **18**, the network **10** enables the visitor **39** to explore paths through the universe. See, for example, path **42** shown in FIG. **5**. A path is defined as extending along a set of points or extending between start and end points in the universe. The network **10** supports multiple types of paths as will be described in further detail below.

[0087] A visitor sequentially experiences virtual reality presentations of the points **18** on the path. The VR browser **14** automatically moves from displaying one VR presentation to the next in response to visitor input indicating movement along the path. This provides the visitor with the perception of walking through or being "immersed" in the universe. If the points **18** are sufficiently close together, the visitor will essentially perceive continuous or seamless movement through the virtual universe.

[0088] Path **42** represents a pre-defined path. A pre-defined path is defined prior to the user session and may, for example, represent a virtual river, highway, or historical trail through the universe. Pre-defined paths are preferably defined in the universe database **30** and represented on the map **12** for selection by the visitor **39**.

[0089] FIG. **4**A illustrates a first user session wherein a visitor **39** explores the virtual universe point-by-point. For clarity only one visitor is shown connected to the network **10**, but it should be understood that a number of visitors can simultaneously explore the universe.

[0090] The VR browser **14** retrieves the map data **30** from the domain server **26** and begins the user session by displaying the map **12** shown in FIG. **1**. The map **12** displays the points **18**, and the user interface of the VR browser **14** enables the visitor **39** to select which point **18** and the representation of the selected point **18** he or she would like to experience.

[0091] It should be understood that the universe database **30** may include or enable generation of a number of different maps representing different regions or sub-regions of the universe. The VR browser **14** may simultaneously or sequentially display different maps during a user session. For example, the visitor is initially presented with a "master map" or model of the entire universe. If the virtual universe is sufficiently extensive, the user interface of the VR browser **14** enables users to "drill down" and select more detailed maps or models of sub-regions (for example, maps representing a continent, a country, a city, and then a city block) to select a desired point **18**.

[0092] Map **12** should therefore be understood to represent all possible maps the VR browser **14** may display as part of its user interface. Maps may be representations of one-dimensional, two-dimensional, three-dimensional, or n-dimensional space as is appropriate for the virtual universe such maps represent.

[0093] The map **12** may also display additional information that assists the visitor in selecting a point or a VR representation of the point. For example, the map might indicate points of historical interest or the number and types of virtual reality representations available for each point.

[0094] In the illustrated embodiment, the visitor selects a desired point **18***a* from the map **12** by clicking the mouse (see FIG. **1**). The browser **14** determines the location of the selected point **18***a* on the map and requests a list **40** of web or IP camera VRR records **34**A associated with that point from the domain server **26** (see FIG. **2**).

[0095] The domain server **26** queries the network database **32** for the list of VRR records of points at or proximate to the selected point **18***a*. The domain server **26** returns the VRR list **40** to the VR browser **14**. The VR browser **14** generates a list of available VR representations from the VRR list **40**, and displays the list for the selected point **18***a*.

[0096] The display list can include information from the metadata to assist the visitor in selecting a VR representation to experience. For example, the VR browser **14** might display an icon for each representation indicating some characteristic of the representation (such as season of the year, its VR file format, or quality moderation value (discussed in further detail below)).

[0097] The visitor selects from the display list the desired virtual reality representation to experience. If there is only one representation associated with the selected point, the steps of displaying and selecting from the list can be eliminated.

[0098] The VR browser **14** uses the web or IP camera VRR record **34**A associated with the selected representation to look up the network address of the VR web or IP camera data server **20**B providing access to the virtual representation. The VR browser **14** requests the VR record **38** for the selected representation from the VR data server **20**B. The VR browser **14** uses the returned web or IP camera VR record **38**A to fetch the web or IP camera VR data file **24**A and initialize a virtual reality presentation that will be perceived and experienced by the visitor **39**. For example, the VR browser **14** could start one helper application to display a QUICKTIME presentation and another helper application to display a VRML presentation.

[0099] In the illustrated embodiment, the VR browser **14** displays the map **12** in a first window and the virtual reality presentation in a second window (discussed in greater detail later). In other embodiments, virtual reality presentations could be displayed independently of the VR browser **14** through more specialized or augmented VR hardware, such as a headset.

[0100] During the VR presentation, the VR browser **14** receives input from the visitor and communicates with the VR data server web or IP camera **20**B to fetch the web or IP camera VR data **36**A. The visitor can change the point of view and move about the presentation as permitted by the virtual reality representation being experienced. When the visitor ends the VR presentation, the window displaying the VR presentation closes or goes blank. The visitor **39** can then select a new point **18** or quit the application.

[0101] In addition to exploring selected points **18**, the network **10** enables the visitor **39** to explore paths through the universe. See, for example, path **42** shown in FIG. **5**. A path is defined as extending along a set of points or extending between start and end points in the universe. The network **10** supports multiple types of paths as will be described in further detail below.

[0102] A visitor sequentially experiences virtual reality presentations of the points **18** on the path. The VR browser **14** automatically moves from displaying one VR presentation to the next in response to visitor input indicating movement along the path. This provides the visitor with the perception of walking through or being "immersed" in the universe. If the points **18** are sufficiently close together, the visitor will essentially perceive continuous or seamless movement through the virtual universe.

[0103] Path **42** represents a pre-defined path. A pre-defined path is defined prior to the user session and may, for example, represent a virtual river, highway, or historical trail through the universe. Pre-defined paths are preferably defined in the universe database **30** and represented on the map **12** for selection by the visitor **39**.

[0104] FIG. **5** illustrates the VR browser **14** with a first display window **46** and a second display window **50**. Display window **46** displays the map **12**, the path **42**, and the points **18** along the path **42** as shown. The second window **50** displays the virtual reality presentation of the active, or currently visited, point **18***b*.

[0105] When displaying a virtual reality presentation of a point **18**, the VR browser **14** preferably displays an icon **48** indicating the active point **18**. The illustrated icon **48** is an arrow that also indicates the approximate direction of the current line of view of the virtual reality presentation shown in the second window **50**. Icon **48** is shown indicating that point **18***b* is the active point and that the direction of the current line of view is west.

[0106] Navigation widgets **52** associated with the first window **46** enable the visitor to move along the path **42** or to move to a different path (such as a second path **54**). Navigation widgets **56** associated with the second window **50** enable the visitor to change the line of view of the VR presentation in the

second window **50**. Widgets **52** and **56** can be combined into a single control if desired, and alternative known interface controls (including the mouse) or other interface widgets may replace or be used with the widgets **52**, **56**.

[0107] **56**F is a widget that when activated, will manifest web or IP camera data of the point be viewed as shown in FIG. **5**A.

[0108] FIG. **5**A illustrates the VR browser **14** with a first display window **46** and a second display window **50**A. Display window **46** displays the map **12**, the path **42**, and the points **18** along the path **42** as shown. The second window **50**A displays the web or IP camera virtual reality presentation of the active, or currently visited, point **18***b*.

[0109] When displaying a virtual reality presentation of a point **18**, the VR browser **14** preferably displays an icon **48** indicating the active point **18**. The illustrated icon **48** is an arrow that also indicates the approximate direction of the current line of view of the virtual reality presentation shown in the second window **50**A. Icon **48** is shown indicating that point **18***b* is the active point and that the direction of the current line of view is west.

[0110] Navigation widgets **52** associated with the first window **46** enable the visitor to move along the path **42** or to move to a different path (such as a second path **54**).

[0111] IP or web camera navigation data **56**G shows the actual longitude and latitude or the location of the image shown in **50**A.

[0112] IP or web camera navigation widgets **56**B associated with the second window **50**A enable the visitor to change the location of the web or IP camera, that is, some remote cameras are capable of being remotely changed. This allows the visitor to travel around the location point in real time.

[0113] IP or web camera navigation widgets **56**C associated with the second window **50**A enable the visitor to change the time that the image for the web or IP camera picture was taken. This allows the visitor to go from real time, to time sliced data, so the visitor can see the past.

[0114] FIG. **6** illustrates a second user session in which the visitor moves along and explores the path **42** (the database **36** and VR data **24** are omitted from the drawing). The VR browser **14** retrieves the map and path data from the universe database **30** and displays the map **12** as shown in FIG. **5**.

[0115] The visitor selects the desired path **42**, and the VR browser **14** obtains the VRR record list **40** for the points **18** on the path **42** from the domain server **26**. For simplicity, it is assumed that each point **18** on the path **42** has only one virtual reality representation; so each VRR record **34** is associated with a single point **18** on the path **42**.

[0116] The VR browser **14** uses the VRR record **34** associated with the path's starting point **18***c* to look up the network address of the appropriate VR data server **20** and retrieves the VR record **38** from that server **20**. The VR record data is used to initialize and display the virtual reality presentation of the first, or starting point **18***c* (see FIG. **5**). Widgets **56** control the line of view of the virtual reality presentation as described.

[0117] Widgets **52** move the visitor to the next, or second point on the path **42**. The VR browser **14** uses the VRR record **34** associated with the next point to retrieve VR data for the next point. If the points **18** along the path **42** are sufficiently close, the transition from point to point appears to the visitor as a continuous movement along the path.

[0118] In moving from the virtual reality representation of one point to another, the VR browser **14** may also maintain (as closely as possible) the same line of view to maintain the appearance of continuous movement. For example, if the visitor is looking south and moves to the next point, the initial line of view for the next point is also viewing south. In alternative embodiments, however, the VR browser **14** can initialize each virtual reality presentation with a pre-determined or default line of view.

[0119] A second type of path preferably supported by the network **10** is a connection path. A connection path is a dynamic path generated from an active point **18** to adjacent points **18** during the user session. FIG. **7***a* illustrates the map **12** displaying connection paths **58** extending between an active point **18***d* and adjacent points **18***e*-**18***i*. Connection paths **58** connect two adjacent or neighboring points **18**, enabling the visitor to pick and choose his or her own route through the universe.

[0120] The connection paths **58** typically provide multiple routes between points. For example, the visitor can move from point **18***d* to point **18***h* directly, or can move first to point **18***g* and then to point **18***h*. FIG. **7***b* illustrates the connection paths **59** when the visitor reaches point **18***h*. The paths **59** start from point **18***h* and end at points **18***d*, **18***g*, and **18***i*.

[0121] The VRR record(s) **34** for each point **18** preferably includes a connection data set (see FIG. **2**) that lists adjacent points **18**. For example, the connection data set for point **18***d* (shown in FIG. **7***a*) includes point's **18***e*-**18***i* and the direction to each point. This enables the VR browser **14** to display the connection paths **58** available to the visitor; the VR browser **14** can also iteratively retrieve the VRR records of adjacent points to display a network of available paths on the map **12**. The connection data set also allows the VR browser **14** to efficiently respond and display the next virtual reality presentation after receiving a visitor request to move in a given direction from active point **18***d*.

[0122] The domain server **26** generates the connection data set when a new point **18** is added to the network. The adjacent points **18** are retrieved from the universe database **30** to generate the connection data set for the new point **18**.

[0123] The domain server **26** also modifies the connection data set of adjacent points **18** as illustrated in FIGS. **8** and **9**. The maps **12** in FIGS. **8** and **9** are otherwise identical to the map **12** in FIG. **7***a*, but include a later-added point **18***j* or **18***k*, respectively. In FIG. **8**, point **18***j* is inserted between points **18***d* and **18***h*. Point **18***j* is now adjacent to point **18***d* instead of point **18***h*. The connection data set associated with point **18***d* is modified to remove point **18***h* and to insert point **18***j* for the connection path **58** extending between points **18***d* and **18***j*. In FIG. **9**, point **18***k* is an additional point adjacent to point **18***d*. Point **18***k* is added to the data connection set associated with point **18***d* for the connection path **58** extending between points **18***d* and **18***k*.

[0124] A visitor can also preferably edit the connection data set for a point **18** to add or subtract connection paths extending from the point. The visitor can add a remote point **18** to the data set, creating a connection path to that remote point. A point can be removed from the data set, eliminating a connection path. The modified data set can be stored on the visitor's machine **16** for use only by the visitor's browser **14**, or the modifications can be saved in the network database **32** to be made available to all visitors.

[0125] A third type of path supported by the network **10** is the event path. An event path is a dynamic path generated by the network in response to an event or visitor query. For example, the visitor **39** may request the path from his or her current location to another location in the universe. The VR

browser **14** queries the universe database **30** and displays the points **18** along the path on the map **12**.

[0126] FIG. **10** illustrates an event path **60** generated by an event. The domain server **26** maintains a list of active visitors on the network **10** and the current location of each visitor in the universe. The map **12** displays the positions of all the users **39** and the path to each user. For clarity only two active visitors **39***a*, **39***b* and one path **60** between them are shown in FIG. **10**. Paths **60** are automatically updated as visitors move about in the universe and as visitors join and leave the network.

[0127] A fourth type of path supported by the network is the visitor-defined path. Path **54** (see FIG. **5**) represents a visitor-defined path. The visitor defines the end points and the points **18** of the path **54**. The path can be created, for example, by inputting a list of the points **18** defining the path or by having the VR browser **14** maintain and store a history of the points **18** visited by the visitor in prior visits.

[0128] The definition of the visitor-defined path **54** may be stored on the visitor's machine **16** for use only by the visitor **39**. Alternatively, the path definition is stored in the universe database **30** and made available to all network visitors.

[0129] As described above, the domain server **26** provides a single point of access for the VR browser **14** to initiate a user session and display a map of available points **18** in the universe. This enables new points **18** to be added to the universe and new virtual reality representations of new or existing points **18** to be made available to all VR browsers **14** on the network **10** by updating the domain server databases **30** and **32**.

[0130] An author creating a virtual reality representation for a new or existing point **18** stores the data on his or her own VR data server **20** and then connects the VR data server to the network **10**. The author remotely invokes an administrative program on the domain server **26** that adds the location to the universe database **30** and adds a new VRR record **34** to the network database **32**. The new VRR record **34** includes the location of the new point **18** and the network address of the associated VR data server **20**. The VR browser **14** automatically generates an up-to-date map **12** when it retrieves the map data from the universe database **30**.

[0131] If desired, the client machine **16** can cache VR data **34** as well as records from the databases **30**, **32**, and **36** for improved performance. The VR browser **14** uses the local data cache to display the map and to retrieve VR data from the network **10**. However, the data cache should be refreshed regularly or at the visitor's command to prevent stale data. Alternatively, the database records can include a "Time to Live" field for automatic updating of the data caches.

[0132] To facilitate creation of VR representations of points **18**, the universe is preferably divided into a public region and a private region. Authors are free to add virtual reality representations of any point in the public region. Only authorized authors can add virtual representations of private regions.

[0133] To illustrate the concept of public and private regions in more concrete terms, the map **12** is a virtual representation of the Gettysburg National Military Park **62** and the adjacent borough of Gettysburg, Pa. **64**. See FIG. **1**; the borough of Gettysburg is represented schematically as a circular area. The Military Park **62** is a public region of the universe and the borough of Gettysburg **64** is a private region of the universe.

[0134] Tourists or Civil War buffs can author a virtual reality representation for a new point **18** in the Military Park **62** or author an additional virtual reality representation for an existing point **18**. The author can provide visitor access to the representation through a publicly or privately available VR data server **20**. The author updates the domain server databases **30**, **32** through the administrative software as previously described and updates the local database **36** and stores the VR data **24** on the data server **20**. The new point and its representation are now available to all visitors.

[0135] Over time, the number of points in the universe having virtual reality representations increases and the number of representations for a given point increases. This enables users to select points and view presentations that provide them with a rich and varied virtual visit to the virtual Military Park **62**.

[0136] To further encourage the creation and selection of high-quality virtual presentations, each representation of a public point **18** is preferably assigned a quality moderation value. A quality moderation value represents the quality of the representation and assists visitors in selecting which representations to view. The quality moderation value is preferably stored in the representation's VRR record **34** (see FIG. **2**) and is displayed on the map **12**.

[0137] For example, a representation can be assigned a quality moderation value between 0 and 10, where 0 represents a low quality representation and 10 represent a high quality representation. A visitor can rate the quality of the representation after experiencing the virtual reality presentation. A running average of visitors' ratings is stored as the representation's quality moderation value. This mechanism enables the network **10** to be self-moderating in that representations whose quality falls below a minimum value can be automatically removed from the network or not listed for selection.

[0138] Virtual reality representations of points within Gettysburg borough **64**, however, are limited to authorized authors. Examples of such authors may include owners of commercial establishments who wish to control the content of the virtual reality representation of their store or business. A private representation may be hosted on a VR data server **20** whose access is controlled by the author and may or may not be assigned a quality moderation value.

[0139] Virtual reality representations of public points are preferably created in a simple, standardized format to encourage those without technical or computer expertise to contribute virtual reality representations to the network **10**.

[0140] FIG. **11** illustrates a preferred, simplified virtual reality format. Four images **66** are taken with a digital camera from a point, each photograph having a line of view facing north, south, east, and west, respectively. The administrative program uploads the four image files and presents an on-line form requesting the location of the point and associated metadata. The administrative program stores the image files as VR data **24** on a VR data server **20**, updates the universe database **30**, adds the appropriate VRR record to the network database **32**, and adds the appropriate VR record to the local database **36**.

[0141] Because the illustrated public region **62** represents an area of the Earth, the latitude and longitude of the corresponding physical location of an actual point on the Earth's surface provides a convenient way of identifying the location of a point **18** on the map **12**. The administrative program requests the latitude and longitude of the point, which can be obtained, for example, by a GPS reading when the digital photographs are taken.

[0142] It is understood that other kinds of metadata, data fields, data keys, or data formats can be used for or stored in the databases **30**, **32**, and **36** and that other VR data **24** can be stored in other file formats. The data can be distributed on other servers on the network **10**. But the VR browser **14** preferably accesses the network **10** initially through the single domain server **26** regardless of how the data itself is distributed throughout the network **10**.

[0143] It is contemplated that embodiments of the virtual reality network **10** will be customized for particular industries or visitors. For example, a real estate network would host virtual reality representations of houses available for sale. The seller's real estate agent takes photographs of each room in a house and uploads them to the real estate network, along with the floor plan and other metadata. A buyer's real estate agent selects the house to visit, and the VR browser displays the floor plan and the paths through the house. The visitor moves along the paths in the house, in effect taking a virtual reality tour through each room in the house.

[0144] The present invention may be implemented in an application that may be operable using a variety of devices. Non-transitory computer-readable storage media refer to any medium or media that participate in providing instructions to a central processing unit (CPU) for execution. Such media can take many forms, including, but not limited to, non-volatile and volatile media such as optical or magnetic disks and dynamic memory, respectively. Common forms of non-transitory computer-readable media include, for example, a floppy disk, a flexible disk, a hard disk, magnetic tape, any other magnetic medium, a CD-ROM disk, digital video disk (DVD), any other optical medium, RAM, PROM, EPROM, a FLASHEPROM, and any other memory chip or cartridge.

[0145] Various forms of transmission media may be involved in carrying one or more sequences of one or more instructions to a CPU for execution. A bus carries the data to system RAM, from which a CPU retrieves and executes the instructions. The instructions received by system RAM can optionally be stored on a fixed disk either before or after execution by a CPU. Various forms of storage may likewise be implemented as well as the necessary network interfaces and network topologies to implement the same.

[0146] While we have illustrated and described preferred embodiments of our invention, it is understood that this is capable of modification, and we therefore do not wish to be limited to the precise details set forth, but desire to avail ourselves of such changes and alterations as fall within the purview of the following claims.

What is claimed is:

1. A system for enabling a visitor to access VR representations authored by different authors as well as any of a plurality of web or IP cameras of locations in a virtual universe via a computer network, the system comprising:

memory for storing a plurality of VR data sets comprising web or IP camera VR datasets, wherein each VR data set defines a VR representation of a location, each data set independently authored or defined by a respective author different from the other authors;

one or more VR data servers adapted to access and transmit the VR data sets, each VR data set associated with a VR data server for access to the VR data set;

a domain server adapted to access and transmit domain data comprising the location within the universe of each VR representation and the network address of the VR data server associated with the VR representation; and

a client host adapted to communicate with the domain server to receive the domain data representing the network address of the VR data server associated with a selected VR representation, the client host further adapted to communicate with that VR data server to access the VR data set defining the VR representation without leaving the virtual universe.

2. The system of claim **1**, wherein the web or IP camera data is obtained in real-time.

3. The system of claim **1**, wherein the web or IP camera data is time-sliced data.

4. The system of claim **1**, where the web or IP camera data is changeable by remotely changing the camera location.

5. The system of claim **1**, where the web or IP camera data is extracted from a web site that aggregates the web or IP camera data.

6. The system of claim **1**, wherein each of the one or more data servers stores a database of the locations of the both static and web or IP camera virtual reality representations accessible through the data server and the network addresses of the VR data sets defining such virtual reality representations, whereby VR data sets can be stored remotely from the data server.

8. The system of claim **1**, wherein at least one of the VR data sets comprise first data representing a plurality of photographs or data from a web or IP camera taken from a geographical location, each photograph or data from a web or IP camera taken in a respective viewing direction, and second data representing the viewing direction of each photograph.

9. The system of claim **1**, wherein the client host comprises means for generating both static and web or IP camera virtual reality presentation utilizing the accessed VR data set.

10. The system of claim **1**, wherein the domain data in the domain server is updated based on author submission of information regarding the network address of the data server and the location in the virtual reality universe associated with the VR data set as well as determining the time when an IP or web camera data is to take automatic pictures.

11. The system of claim **1**, wherein at least one of the VR data sets comprise data representing a photograph or data from a web or IP camera taken from a geographical location.

12. A method for enabling a visitor to access VR representations authored by different authors as well as any of a plurality of web or IP cameras of locations in a virtual universe via a computer network, the method comprising:

providing a plurality of data servers and a domain server interconnected with the data servers, the data servers providing access to sets of VR data of virtual representations of locations within the universe, each set of VR data authored by a respective different author independently of the other authors, the VR data comprising comprising web or IP camera VR datasets, the domain server providing access to domain data for selecting the location to visit and the network address of the data server providing access to the VR data for the selected location;

receiving data from the visitor representing a selected location in the universe;

accessing the domain data in response to the received data and obtaining therefrom the network address of the data server that provides access to the VR data for the selected location; and

transferring the VR data for the selected location from the data server to the visitor's computer for generation of a VR presentation of the selected location without leaving the virtual universe.

13. A non-transitory computer-readable storage medium, having embodied thereon a program executable by a processor to perform a method for enabling a visitor to access VR representations authored by different authors as well as any of a plurality of web or IP cameras of locations in a virtual universe via a computer network, the method comprising:

providing a plurality of data servers and a domain server interconnected with the data servers, the data servers providing access to sets of VR data of virtual representations of locations within the universe, each set of VR data authored by a respective different author independently of the other authors, the VR data comprising comprising web or IP camera VR datasets, the domain server providing access to domain data for selecting the location to visit and the network address of the data server providing access to the VR data for the selected location;

receiving data from the visitor representing a selected location in the universe;

accessing the domain data in response to the received data and obtaining therefrom the network address of the data server that provides access to the VR data for the selected location; and

transferring the VR data for the selected location from the data server to the visitor's computer for generation of a VR presentation of the selected location without leaving the virtual universe.

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