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(54) Title: GUI HAS LIBRARY METAPHOR BASED ON NON-EUCLIDEAN GEOMETRY.

(57) Abstract: A data processing system has a GUI that enables the user to interact with a virtual environment. The environment has a graphical representation of a storage based on a library metaphor. The storage is being used to graphically archive information items. The virtual environment has a path-dependent geometry. This allows modification of the storage to add additional items without visually disrupting the organization of the items stored previously.

GUI has library metaphor based on non-euclidean geometry

FIELD OF THE INVENTION

The invention relates to a graphical user-interface (GUI), especially for a virtual library or a visually organized collection of items in a virtual environment.

BACKGROUND ART

U.S. patent 5,907,845 discloses the storing of on-line electronic books in remote storage devices. The books are accessible through a server or other type of interface device. A bookcase is created and stored in a local storage device. Appropriate electronic links are supplied in order to access an electronic book from the bookcase. The bookcase provides a library metaphor that allows a user to organize the online books in a manner that has meaning and utility to the user.

A library metaphor in a GUI typically portrays a file system showing icons such as cabinets, shelves, and documents organized in the cabinets and on the shelves. The icons can be arranged and rearranged by the user.

SUMMARY OF THE INVENTION

The bookcase is a well-known user-interface (UI) metaphor for data stores. The known metaphors use 2-D or 3-D Euclidean geometric concepts, i.e., they could be recreated as actual physical models while conserving the perceived geometry of the virtual model rendered on the display monitor. The basic visual appearance of such a UI is completely determined by the user's position and orientation with regard to the model as if it were real.

The problem with the conventional metaphors is that when new items get added, the items already present must often be reorganized. This means that the items are to be shifted or otherwise relocated, so that they are no longer in the same location afterwards. This hampers the visually oriented retrieval of information ("spatial memory"), which a GUI is exactly supposed to facilitate.

The inventor proposes to apply non-Euclidean geometrical concepts to a data storage in a virtual environment represented by, e.g., a book case metaphor, in a virtual

environment. The invention is to allow to add space to any location in a virtual environment without having to re-organize the existing content. This is achieved, e.g., by making the geometry of at least part of the environment path-dependent.

To clarify the concept of a non-Euclidean space, consider the fictional TARDIS device in the British science fiction television series "Dr. Who". The device appears on the outside as a telephone box which occupies an area of roughly 1 meter by 1 meter, but it is as spacious as a mansion on the inside. This fictional device requires an additional element to specify its basic appearance from a given vantage point: in addition to the user's position and orientation, the appearance depends on the particular path taken to the vantage point. To clarify path-dependence consider the following example. A person is standing at a certain position and from there walks ten steps straight ahead, makes a right turn and walks ten steps, makes again a right turn and walks again ten steps, and makes a final right turn and walks the last ten steps. In a Euclidean space, the person finds him/herself back at the location that he/she started out from. There are non-Euclidean geometries that let the person end up in a different position.

BRIEF DESCRIPTION OF THE DRAWING

The invention is explained in further detail, by way of example and with reference to the accompanying drawing, wherein:

Figs.1 and 2 illustrate a graphical representation of a virtual environment using a library metaphor.

Throughout the drawing same reference numerals indicate similar or corresponding features.

DETAILED EMBODIMENTS

Fig.1 is a diagram illustrating a library metaphor as used in a GUI. The GUI gives the user access to a virtual environment 100, in this case a data storage that is visually represented by multiple bookcases with shelf configurations 102, 104, 106, 108 and 110. Configurations 102, 106 and 108 are parallel to one another, separated by spaces 112 and 114, respectively. The bookcases form a Euclidean space in this diagram. That is, this data storage could be recreated as a 3D physical model in real life. In virtual environment 100 the user can navigate among the bookcases in a way similar to the one in the true three-dimensional world that people are familiar with.

The data storage is used to visually represent an inventory of, e.g., sound tracks of the user's CD collection, movies of his/her DVD collection, copies of web pages stored locally by this user and categorized according to topic or date, etc. Each specific one of the graphical objects (not shown) on the shelves corresponds to a specific content information item. Clicking or otherwise selecting the object via the GUI activates a retrieval mechanism. For example, the metaphor can be used on the user's home network connecting the user's CD jukebox, the user's DVD jukebox, the HDD of the user's PC. Retrieval of a specific CD, DVD or electronic file is governed by a script that gets initiated by the user clicking the graphical object. In another example, the user can lease storage space on a remote server and organize his/her data via his/her client using the GUI. The storage service can provide an editing tool to enable the user to create the graphical representation of the objects (e.g., to label them and to add the proper hyperlink or script for retrieval of the information item represented, etc.).

The data storage can also be shared by two or more users, e.g., a family or another social community to provide shared services, etc. Privileges can be imposed on access of particular ones or all of the information items or of the objects representing them, etc.

Fig.2 is a diagram of virtual environment 100 that has undergone a transformation. In this example, shelf configuration 106 has been transformed to include shelf configurations 204, 206 and 208 that are accessible via space 202. The user has transformed the shelf configurations by, for example, pushing a portion of configuration 106 inwards (in virtual environment 100 through proper tools in the GUI) as if it were an elastically deformable physical object. Owing to the non-Euclidean geometry of this part of virtual environment 100, additional space 202 does not protrude into space 114. That is, when the user goes from space 112 to space 114 in virtual environment 100 after creating space 204, space 114 in Fig. 2 is the same as before, i.e., as in Fig.1.

This concept of creating additional spaces in virtual environment can be applied to further levels of organizing the information items, e.g., per shelf or per shelf compartment. For example, a shelf 210 has compartments 212, 214 and 216. Compartment 212 can be expanded in the direction perpendicular to configuration 102 to create a space 218. Note that the shelves and compartments that have not been transformed maintain their information visually organized across shelves and compartments as before. It is clear that the appearance of the spaces in the virtual environment need not be restricted to box-like

compartments and segments, but that curved or irregularly shaped representations are acceptable as well as the designer sees fit.

Further, environment 100 can be organized as a collection of spatial entities: multiple rooms or multiple floors with rooms or multi-story buildings with rooms of cabinets, etc. The library metaphor allows the user to create or define additional cabinets, rooms, floors, buildings, etc. Links between these spatial entities represent associations between the sets of information items stored or storable in these entities. The links can be user-programmable and be represented as pathways or corridors linking two cabinets, rooms or buildings. An, at least locally, non-Euclidean geometry, enables the user to visualize the links between the sets based on, e.g., topical, historical, functional or any other taxonomic criterion. In a virtual environment with a globally Euclidean geometry, such visual links would intersect or at least visually interfere with one another. Using the non-Euclidean geometry, the links represent themselves as simple pathways.

As an aspect of the invention, consider the concept "motorcycle" in all its parts. Clusters of parts form functional blocks, such as an oil pump, an engine, a frame, a transmission, drive train, etc. Various engines can be mated to any of multiple frames and vice versa, several transmissions can be used with any of multiple engines and vice versa. To design a specimen, those parts and clusters of parts are combined for which a certain optimum can be achieved, e.g., acceleration, reliability, cost, or road-handling, under the condition that the parts to be combined are compatible. The design of the specimen is therefore a solution to an optimization problem. In order to manage this, version management systems are being used. A version management system is a known software tool that lets the designer keep an overview of the details, upgrades, alternatives, etc., at the various levels in the design process. Each choice of a class of parts or of a specimen in a class of parts restricts the next choice to those options that allow to solve the optimization problem. The GUI in the invention allows the designer to graphically interact with the logistics of the design process in a version management system. In addition to creating additional space as described above in the library of parts, e.g., to accommodate updates or new parts, selecting a class or a specimen in a class modifies the virtual environment by restricting access to those cabinets or bookcases (or rooms or floors) that contain the remainder of compatible classes or parts given the history of the design process. In this manner, a dynamic design process is mapped onto a graphically represented virtual environment with areas, whose appearance or accessibility depends on the path taken to get there.

The data base access application and the graphical version management system are examples of aspects of the invention. The non-Euclidean concept for a virtual environment can as well be applied to, e.g., file manager applications, or 2D or 3D graphical window manager applications, etc. For example, a virtual desktop manager is a software tool that enables a user to keep track of his/her applications currently running on his/her PC or workstation, i.e., the applications that have their windows open. The user can position the application's window outside the field being visible on the screen of the display monitor. The conventional virtual desktop manager supplies a 2 D Euclidean map of the open windows and enables the user to see what is open and to retrieve the window. In the invention, the virtual desktop manager uses an at least partly non-Euclidean representation to enable path-dependencies among the windows. As a result, the screen is not cluttered up all the time. The library metaphor as discussed with reference to the drawing can be used as the virtual desktop's map to position and retrieve a specific one among the open applications.

CLAIMS:

1. An information processing system with a graphical user-interface (GUI) based on a library metaphor for enabling a user to retrieve an information item, wherein the GUI represents a virtual environment (100) with a non-Euclidean geometry.

2. The system of claim 1, wherein the environment is user-modifiable (202)

3. The system of claim 1, wherein the geometry is path-dependent (202 / 104) in at least part of the environment.

4. The system of claim 1, wherein the environment allows adding virtual space (204/208; 218) for accommodating a new information item.

5. A software application for creating a GUI based a library on metaphor for enabling a user to retrieve an information item, wherein the GUI represents a virtual environment (100) with a non-Euclidean geometry.

6. The application of claim 5, enabling the user to modify (202) the environment.

7. The application of claim 5, wherein the geometry is path-dependent (202/104) in at least part of the environment.

8. The application of claim 5, enabling the user to add virtual space (204/208; 218) for accommodating a new information item.

9. The application of claim 5, comprising version management software and/or a database access application and/or a file manager application and/or a graphical window manager application and/or a virtual desktop manager.

10. A method of enabling a user to interact with a virtual environment (100) using a GUI based on a library metaphor, the method comprising representing the virtual environment via the GUI as having at least a portion with a non-Euclidean geometry.

11. The method of claim 10, comprising enabling the user to modify (202) the environment.

12. The method of claim 10, comprising representing at least part of the environment with a path-dependent geometry (202 / 104).

13. The method of claim 10, comprising enabling the user to add virtual space (204, 208; 218) for accommodating a new information item.

14. The method of claim 10, wherein the virtual environment comprises a representation of a version management system and/or a representation of a data base access application and/or a representation of a file manager application and/or a representation of a virtual desktop manager.

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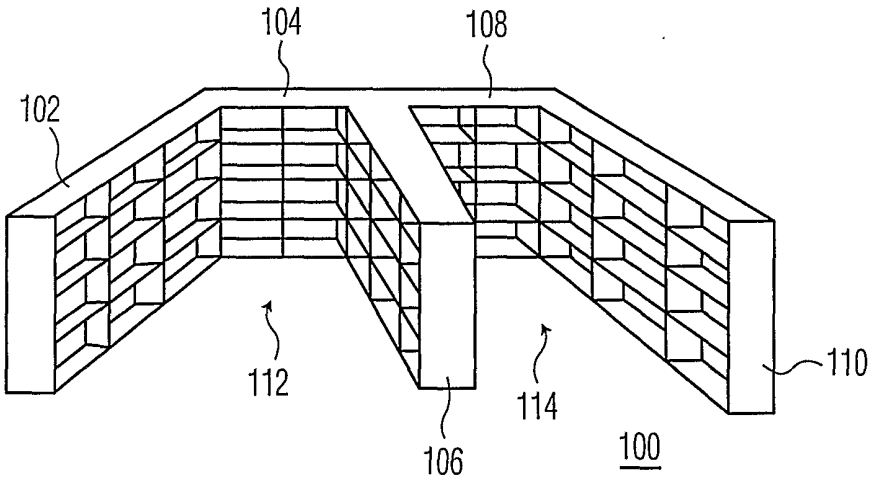
104
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FIG. 1

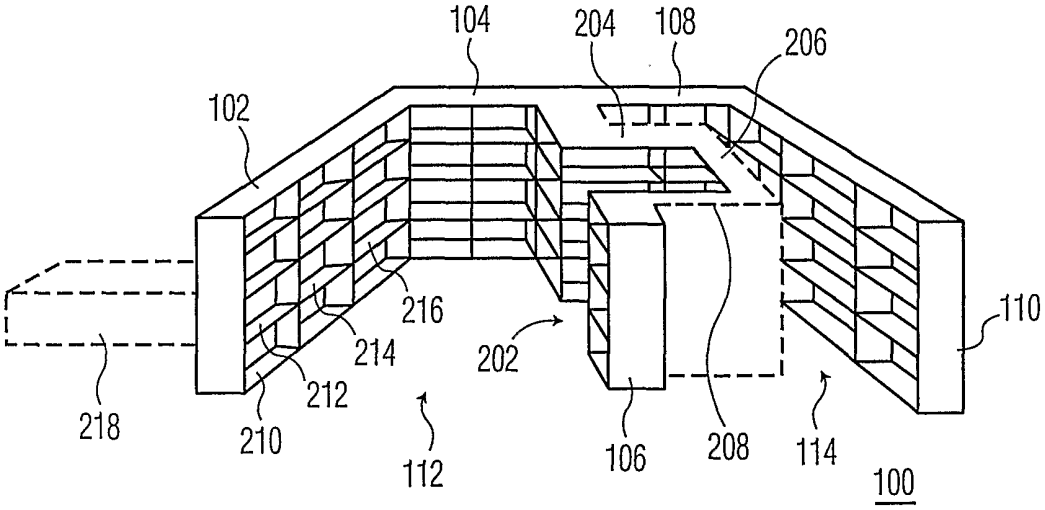
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FIG. 2