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Notice: The following is part of a provisional application for a patent relating to an interactive system for visualization and retrieval of video data. These patent related documents were submitted to the repository by Borko Furht, Department of Computer and Electrical Engineering and Computer Science (CEECS) Florida Atlantic University.

INTERACTIVE SYSTEM FOR
VISUALIZATION AND RETRIEVAL OF VIDEO DATA

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FIELD OF THE INVENTION

[0001] The present invention relates to a system and method for displaying and retrieving video data, especially an interactive system for visualization and retrieving of video data based on hypercube structures.

BACKGROUND OF THE INVENTION

[0002] Recent advances in Internet and video technology, including mobile and wireless systems, allow receiving a high-quality resolution video on the desktops as well as on the variety of mobile systems. High speed networks provide high bandwidth, which will soon allow people to receive multiple real-time videos. It is on the verge of the Web-based video revolution, in which people will begin receiving and processing video applications in a completely new way. Besides just watching videos, the users are also becoming content creators; they create their own videos, upload videos and own their own channels.

[0003] There are a number of companies, which are currently offering a variety of video-based applications, predominately in the area of entertainment. Basically, they all allow a similar functionality and similar user experience. Various video clips are stored on the company's servers and a set of videos are presented sequentially (or linearly) on the selected Webpage. The user can click on a selected video icon, a larger window will open, and the user can then watch the video. There is a VCR-type of functionality for controlling the video (Start, Stop, Forward, etc.). Examples of screen shuts from several companies are shown in Figs. 1 and 2.

[0004] There is a simple navigation through the system by clicking various categories, or by using search function to find and retrieve videos using key words. However, this sequential (or linear) structure does not provide exciting user experience, especially for young

generation, which grew up with video games. There is no specific links between various video, which connect topics in space and time.

[0005] US Patent Application No. 2003/0001904 A1 (Rosen et al.) describes a tool for generating a standardized multimedia presentation as well as a viewer for presenting such a presentation. The presentation is presented to the user through a graphical user interface in the form of a three-dimensional geometric object, such as a 3-by-3 cube. The end user can choose any topic from the cubes and then choose any subtopic.

[0006] US 7,146,576 (Chang et al.) describes an apparatus and method for browsing a plurality of data objects represented by images displayed within a three-dimensional graphical environment. The representative images of the data objects are arranged within the three-dimensional graphical environment dependent on a selected one of the schemes.

[0007] US 2002/0163546 A1 (Gallo) describes to a method of representing information on a three-dimensional user interface having multiple portals, in which data is associated with each of the portals. A symbolic marker is associated with each of the portals according to a pre-specified scheme, and displayed in the respective portals.

[0008] However, none of the above-mentioned documents discloses a cube-based, especially a hypercube-based interactive system for connecting video data in space and time as well as to combine video data from different sources.

[0009] This object of this invention is to provide a new interactive system for visualization and retrieval of video data, which is based on hypercube structures. The new interactive system for visualization and retrieval of video data allows content creators to connect video data in space and time as well as to combine video data from different sources. The interactive system provides a new experience both for content creators and for the users. Content creators can organize and visualize a complex video data structure in a well-structured way, and can combine video data in space and time. The users can easily navigate through a number of video clips in space and time.

SUMMARY OF THE INVENTION

[0010] According to one aspect, the present invention provides a cube-based three-dimensional interactive system for visualization and retrieval of data. The system includes at least one interactive cube having eight nodes, each node being linked to a data item, the data items on the nodes being organized in space or time. Textual information about a respective data item appears upon traversing the corresponding node and the data item opens up upon selection.

[0011] Although the system is particular suitable for video clips, the data items may also including numeric, textual, audio, or multimedia files.

[0012] The interactive cube is expendable to include more than eight nodes, such as 12, 18 or more nodes. The system may also includes a plurality of interactive cubes connected with one another to form a one-level, multi-level or multi-dimensional hypercube.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The present invention is illustrated by way of example and not limitation in the accompanying drawings in which like reference numbers indicate similar parts, and in which:

[0014] Fig. 1 shows two screen shots from www.youtube.com.

[0015] Fig. 2 shows screen shots from www.current.tv and www.lulu.tv.

[0016] Fig. 3 shows a cube-based interface with information about the video and enlarged playing video clip.

[0017] Fig. 4A shows a dual cube with 12 nodes.

[0018] Fig. 4B shows a quadratic cube with 18 nodes.

[0019] Fig. 5 shows an example of a hypercube extension consisting of space and time cubes.

[0020] Fig. 6 shows a multi-level hypercube.

[0021] Fig. 7 shows a two-dimensional hypercube.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The basic element of the method for creating an interactive user interface according to the invention is an interactive cube with eight nodes, as presented in an example in Fig. 3. Each node is linked to a specific video (or eventually to another level of a cube interface). In this specific example, the interactive cube presents a set of current news video clips on Iraq war, combined from different parts of the world. Each node contains a small video icon. The content creator can combine video clips from different sources and create a three-dimensional view of videos. The user can navigate through the cube space and the cube will rotate accordingly. As the user traverses a node (video icon) with the mouse, textual information about the related video will appear on the screen, as indicated in Fig. 3. The user can select and play the video by clicking on a node. The selected video will begin playing on the screen, as illustrated in Fig. 3.

[0023] Similarly, a time cube can be created, where video clips on the same topic are linked in time. The user can travel through the cube in time and select and watch the video.

[0024] The basic cube as shown in Fig. 3 and described above can be extended to provide more information (additional videos and additional multi-dimensional links). This allows an effective visualization of a large number of video data, including large video archives. The user gets more exciting experience in traveling through the space or time and searching for videos.

[0025] Fig. 4A shows a dual cube with 12 nodes and Fig. 4B shows a quadratic cube with 18 nodes. These structures allow more than 8 videos to be linked together in space and time.

[0026] Another possible extension is connecting two or several cubes and building hypercubes. An example in Fig. 5 illustrates connecting two cubes. A possible scenario is that from the video clip, which connects these two cubes, one cube to the left is a space-connected cube and another on the right is a time-connected cube. This method allows content creators to efficiently create, combine and link video clips in space and time. The user can then travel through the space and time and look for and select related video clips.

[0027] This model can be further extended to a multi-level hypercube, as illustrated in Fig. 6. Finally, multi-dimensional hypercubes can be created, as illustrated in Fig. 7. The two-dimensional hypercube in Fig. 7 provides an interesting link of an inner and outer cube, where related nodes (video clips) are interconnected.

[0028] The basic principles of navigation through the proposed hypercube structures have already been described above. The user travels through the hypercubes in space and time, gets basic descriptions of the videos in the hypercube, and selects the video for viewing. The hypercube model allows the user to get a comprehensive view of available videos on specific topics, and their space and time relationship.

[0029] In the emerging field of Internet applications relating to entertainment and news, there is a great number of applications which can take advantage of the proposed hypercube based user interface of the present invention. Practically, all the companies, which offer video applications (entertainment, news, etc) currently use tremendous number of videos. The proposed hypercube structure will help them to better organize and link these videos by their theme, and in space and time, and present to the user. The user will have a completely new experience in traveling through time and space hypercubes, and in selecting and watching videos.

[0030] The hypercube-based system according to the present invention can also be used for visualization and retrieval of other types of computer data including data, numeric, textual, audio, or multimedia files. In these cases, the nodes in the cube will present a general file rather than a video clip.

[0031] Finally, with emerging 3D displays, which are becoming affordable for mass usage, the hypercube-based interactive system of the invention presents a right tool for human-machine interaction..

[0032] While the invention has been described by reference to specific embodiments chosen for purposes of illustration, it should be apparent that numerous modifications could be made thereto by those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. A cube-based three-dimensional interactive system for visualization and retrieval of data, comprising:

at least one interactive cube having eight nodes, each node being linked to a data item, the data items on the nodes being organized in space or time;

wherein textual information about a respective data item appears upon traversing the corresponding node and the data item opens up upon selection.

2. The cube-based three-dimensional interactive system according to claim 1, wherein the data items including numeric, textual, audio, video or multimedia files.

3. The cube-based three-dimensional interactive system according to claim 1, wherein the interactive cube is expendable to include more than eight nodes.

4. The cube-based three-dimensional interactive system according to claim 1, wherein the system includes a plurality of interactive cubes connected with one another to form a hypercube.

5. The cube-based three-dimensional interactive system according to claim 1, wherein the hypercube is a multi-level hypercube or a multi-dimensional hypercube.

ABSTRACT OF DISCLOSURE

[0033] A cube-based three-dimensional interactive system is provided for visualization and retrieval of video data. The system includes at least one interactive cube having eight nodes, each node being linked to a specific video. The video clips on the nodes are organized in space or time. Textual information about a respective video appears upon traversing the corresponding node and the video begins to play upon selection. The interactive cube can be extended to including more than eight nodes, such as 12 or 18 nodes. The system can also have multiple cubes that are connected to form a one-level, multi-level or multi-dimensional hypercube