Connecting Information as Navigation Paths for Exploring Digital Video Collections

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Abstract

The way information is presented to users is of great importance in today's digital world. This is especially true for data collections that are rich in information that is not always easily understood. In this paper we present a solution for accessing digital video collections using specially created interfaces for data exploration. We developed a data navigation model that is used to establish links between data records and created different web-based tools for using these connections as paths that users can follow in their exploration of the content. We argue that by providing a set of interactive tools for data exploration we can increase the amount of information that is passed from data to users. We show how different interface solutions for accessing informative digital collections can be used to improve users experience of exploring the data and help them make effective use of acquired information.

Categories and Subject Descriptors (according to ACM CCS) H.3 Information storage and retrieval

1. Introduction

Recent advances in internet-based technologies resulted in the great amount of digital information being created at any moment and any place by various means. Having the right control over the information helps the acquisition of new knowledge that can further help the advance of the society in general. Creation of advanced tools for interacting with the content is one of the most important goals of modern digital libraries. There has been much progress on defining and using various metadata structures and knowledge representation for describing and organizing information in digital libraries [KM09]. However less progress has been made on developing new means of interacting with the content. By focusing the attention on content user interactions, learning capabilities of digital libraries can be improved resulting in better use of digital information in schools and educational institutions [MPH06] [Alr10]. A significant challenge for digital library design and use in the new era will be to help users understand information and provide the basis for the creation of new knowledge based on the existing information [HH00]. The field of human-computer interaction is a research area that tries to understand ways machines and humans are interacting [DFA04]. Creation of functional user interfaces should consider any rules in user behavior when searching, accessing and sharing information. It should make use of user's

behavior patterns in order to create tools that will attract users attention, and help them actually use the data. Good interfaces can challenge users to explore beyond their initial interest and stretch their understanding of the specific topic. Interfaces that exploit powerful human vision and spatial cognition can help humans mentally organize, electronically access, and manage large, complex information spaces. The design of usable user interfaces for digital libraries is a complex task that requires knowledge and guidelines on user-centered design. It requires knowledge about the users, their tasks, the context of use, and what is technically feasible [Bre10]. We developed a framework for understanding the purpose of new families of digital libraries. The assumption of our digital library model is that it should provide channels for passing the information from content to users, and for users to pass the knowledge back to the library. Together with the creation of tools for moving around information space, we developed tools for data presentation and visualization that are providing various different perspectives of the available information.

2. Data Navigation Model

Information seeking can be seen as a skill in which users search for information for the purpose of research, personal interests, and problem solving. We argue that a digital library should give user a chance to explore available

knowledge by exploring many different items, by exploring relations between items, and by getting the complete picture of the available data from various perspectives. Our model is created with the assumption that users can learn more information if they are actively moving around the information space, instead of formulating the queries and expecting the system to return all the necessary information. The way items are presented should help users memorize the information fast, and help them make the choice on which path to follow. We assume each data record stored in the database as a node in the information space that can be accessed by following various navigation paths. In the connection model every metadata field can be used to connect items with same or similar value. For example type of document can be used as a link that connects items of the same type. That means that all text objects are connected with the link being a metadata field type of object. This model favors data exploration and browsing to search since it is in our view efficient way to get the overview of data and access many different items.

The information flow is a term we use to describe transfer of information from data stored in the system to users and the other way around. This transfer can also occur between different users using the library. The transfer of information between content and users depends on the amount of relevant information stored in digital representation of an object, and the potential of the interface to pass this information to the user. The goal of a digital library should be to enable transfer of information between content and users by using various means for data presentation. In the view of our information model, the purpose of digital libraries interfaces should be to increase the information flow. Tools used for presenting information, should be developed in interaction with users, by having them evaluate tools at early stages of development process. Evaluation can give valuable information on how are different solutions accepted by users, and how can they be improved. Presenting data to users is an important task in order to improve the performance of a digital library. Instead of just presenting data in the grid as it is used in many digital libraries today, new means of displaying information should be defined. These new means should increase the "traffic" between users and system by taking into considerations users and what users want from the system, by stimulating cognitive process in users, and by presenting information in appealing way.

3. Conversations with Jacques Lipchitz

Jacques Lipchitz was a famous Israeli sculptor and the goal of the project was to create an interactive tool that will enable museum visitors to communicate with the artist, using a touch screen kiosk situated in the room dedicated to the artist's life. While exploring items from artist's life, visitors can stop at the kiosk and start a conversation. The information basis for the project was 6 hours of interview videos with the artist, recorded over three days during which the artist discussed many different topics such as his

childhood memories, his art, religion, history and many others. The project can be seen as an example of how the combination of traditional museum with modern technologies, can enrich the exhibition by engaging users with the content.
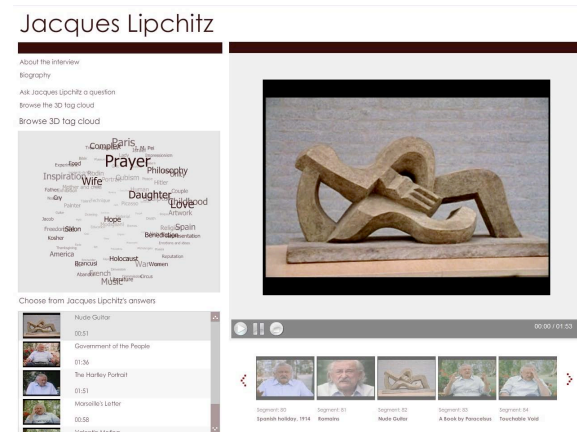

Figure 1. *Conversations with Jacques Lipchitz. The look of the interface for exploring the collection using key word tags. 3D tag cloud is used to show the set of available tags. The size of the tag in the tag cloud depends of the term frequency in the set of metadata descriptions.*

After accessing the library user have options to search answers using the tag cloud or to browse questions by selecting covered topics. After selecting a query, system returns a set of results, as shown in the Figure 1 and Figure 2. The user can select answer and the video showing the answer is played at the central part of the page. Together with the answer set of connected answers is shown to the user. We used three different connection factors: key word tags, position in the original movie and questions answered. While watching the selected video user can at any moment at the same screen refine his search and follow another navigation path, by selecting any of the connected answers. In order to explore the content users are presented with navigational interface that make it easy for users to move over the information space. By providing a set of connected answers together with the specific answer of interest gives users a chance to easily select next step on his exploration, based on different connecting criteria.

4. Human sanctuary

Another project that was done in collaboration with the Israeli Museum is an online library for exploring the world of the ancient community of Qumran, that was behind the creation of Dead Sea Scrolls, the oldest known surviving copies of Biblical and extra-biblical documents. The scrolls are very important source of information for understanding the development or religions and societies. Dead Sea Scrolls are exhibited at the Jerusalem Museum together with many objects found on the place where it is believed the scrolls have been written. In order to make the exhibi-

tions more appealing to the public, the museum created 20-minute feature movie that shows the main aspects of the Qumran community. In the 20-minute movie many different aspects of the community are described. Also objects that are now part of the museum exhibitions are shown in the movie in their original context. The movie itself although short is full of symbolism and detailed description is needed in order to express its messages properly. In order to understand the information presented in the movie, it was necessary to enrich the movie with external information such as links to web pages, links to real world objects exhibited in the museum, and textual descriptions of various concepts.
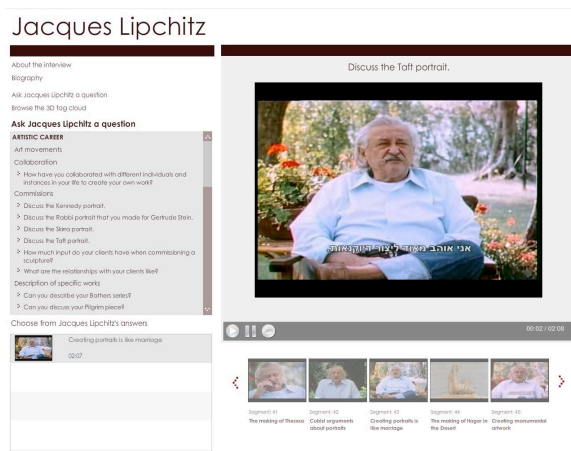

Figure 2. *Conversations with Jacques Lipchitz . The look of the interface for exploring questions. After users selects a question relevant videos are presented on the left side of the screen. Video showing the answer is shown at the center of the screen with the set or connected segments.*

Users can browse available images using specially created image browsing tools, instead of displaying images in a 2D grid. We wanted to come up with advanced ways of displaying data that will help users get better overview oft he available images. We used special image cloud that enables users to look number of images at the time see Figure 3. Another possibility for users to explore the content is by browsing topics, and by using them to search other objects such as texts and images as shown in Figure 4. Topics can be browsed using a tool that is based on interactive data visualization. Users are presented with hierarchical structure of the movie's topics, and can directly select specific topic. Also user can explore temporal distribution of topics by moving the horizontal slider that is used to select specific part of the movie, and show corresponding topics. Another way of exploring temporal distribution of items is the use of interactive timeline. The timeline is combined with hierarchical tree structure that is used to select topics that will be shown on timeline.
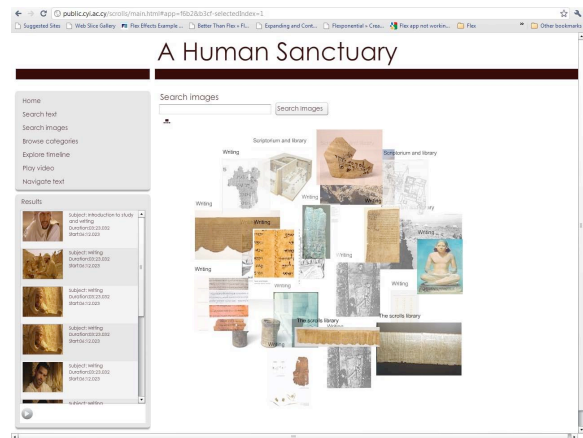
Figure 3. *A Human Sanctuary. The look of the interface for browsing images on the 3D image cloud. Animation and use of three dimensions gives users new perspective on the set of available images. 3D tag cloud is used to help users find and explore images, and as an entry point into information space. By selecting one of the images users enters data and starts his exploration of a video collection.*

After topic is selected users can explore distribution of topic segments over the duration of the video, and together with temporal distribution of image and textual descriptions as shown in Figure 5. Users can then select any time segments on the timeline and explore in details available descriptions. Another way of exploring the movie is to watch the complete movie and let the system notify you of any information available that is used to describe the specific time interval. As video plays system presents users with links to additional information when certain parts of videos are played. In this way just by looking at the video users get the chance to browse all the available information. By clicking on the link to descriptions, user can explore in more details selected descriptions, and then go back to watching the movie.

5. Conclusions

We presented a new way of exploring digital video collections by connecting information and by using these as navigation paths for data exploration. We used metadata descriptions to find items that are similar based on available metadata description field, and created connections between data based on specific criteria. Interactive tools for presenting information make use of these connections by letting users easily move from one item to another while exploring the information space. In this way users are stimulated to explore many different items, memorize them and share them with other users. Several topics arose during the implementation of the above-mentioned projects: interaction with content should take into consideration the target audience, the environment of interaction with the content (both hardware and the physical space where the hardware is located), the media of interaction (web-based

or other digital installations, remote or not, etc.) as well as the content itself and the reason for interaction with the content. All these factors make the interaction with content a completely different task than the one in traditional libraries and require a different approach (aspects of which were detailed in this paper). Thus, in no way a digital archive should imitate the traditional one, but complement it and offer new paths of interaction with content, reachable in the digital environment but not in the physical one.

Figure 4. *A Human Sanctuary. The look of the interface for exploring available topics. Users can explore movie by selecting topics of interest. Interactive presentation of topic's hierarchical structure, combined with the time slider is used to explore move by selecting topics of interest. By moving the time slider topics covered in the specified interval of the movie are highlighted. User can then select the topic, and the set of connected videos are shown on the result menu on the left side of the screen.*

6. Acknowledgements

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Figure 5. *A Human Sanctuary. Use of the movie timeline to explore distribution of topics. By moving along the timeline users can explore topics and available descriptions as they appear in the movie. Topics and descriptions can then be selected directly from the timeline.*

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