MedioVis – Visual Information Seeking in Digital Libraries

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ABSTRACT

MedioVis is a visual information seeking system that aims to support users' natural seeking behavior, particularly in complex information spaces. To achieve this goal we introduce multiple complementary visualization techniques together with an easy-to-use and consistent interaction concept. Over the last four years, MedioVis was developed in the context of digital libraries following a user-centered design process. The focus of this paper is the presentation of our interaction model and further to give an overview of the applied visualization techniques.

Categories and Subject Descriptors

H 5.2 [Information Interfaces and presentation]: User Interfaces - Graphical user interfaces, Interaction styles, User-centered design

General Terms

Design, Human Factors.

Keywords

Interaction Design, Semantic Zooming, Coordinated Views.

1. INTRODUCTION

Nowadays users of digital libraries are confronted with information that is rapidly growing in quantity, heterogeneity and dimensionality. Therefore, more effective tools are required to facilitate the exploration and search in this information space. We propose MedioVis as a flexible application for the visual exploration of such data that is especially designed for users without prior professional experience in search, retrieval or visualization [2]. The project was launched four years ago and still undergoes iterative development and evaluation cycles. To gain continuous end-user feedback and insights in real interaction behavior, we are running MedioVis for over three years in the media library of the University of Konstanz.

2. SYSTEM CHARACTERISTICS

Due to the increasing complexity of user-accessible information spaces in digital libraries a single visualization is not able to sufficiently cover the various information needs and seeking strategies.

Thus, MedioVis offers the possibility to flexibly collocate complementary visualizations to provide several views to different dimensions of the information space. This is realized by multiple coordinated views [1] connected through the technique of snap-together [5] and linking and brushing. Hence, the user is able to define mutual filters in different visualizations to narrow down the data space to a relevant subset. The synchronized visualizations provide the user with instant feedback and a powerful but straightforward filter mechanism. The user can directly manipulate the selection and arrangement of visualizations, by dragging and dropping them from the tool bar onto the desired area in the application window.

An information seeking process is often a combination of several searches. The user must be able to switch between different search paths without losing the afore gathered information. To support this non-linear search strategy, we integrated a tab concept, similar to multiple document interfaces.

Figure 1. MedioVis: Multiple Coordinated Views with HyperScatter (top) and HyperGrid (bottom).

To create a pleasurable and satisfying user experience we developed an attractive and deliberate visual design in cooperation with communication designers. Additionally, we integrated multimedia content (e.g. images, videos, web pages) as well as supportive and natural user interaction concepts (e.g. animated zooming, direct manipulation) to increase the joy of use.

3. VISUALIZATION TECHNIQUES

In consequence of our gathered experiences and evaluation results [2], MedioVis applies multiple visualizations that complement the

features of each other. We intentionally decided to use and combine visualizations that base on well-known and straightforward concepts (e.g. tables, scatter plots). Crucial for the design was the applicability for analytical and browsing oriented ways of data exploration (e.g. dynamic queries or details on demand).

To get an overview over the entire data space at a glance, we introduce the HyperScatter (see figure 1) as a zoomable, two-dimensional scatter plot. It enables the user to explore relations between the data objects along different user-adjustable dimensions and to recognize patterns. Furthermore, the interactive visualization can be used for visual filtering, through animated zooming into a user-defined area of the plot and thereby offers a natural way of query formulation and refinement. Depending on the user's information demand, the HyperScatter also allows progressive access to detail information through continuous semantic zooming [6] into specific data objects. This detail on demand technique, realized by semantic zooming is a general interaction concept of MedioVis. With this technique, we intent to avoid information overload. The user decides through zooming into a region of interest, which information is important in a certain context.

The HyperGrid (see figure 1) applies the zoomable user interface concept on a well-known table visualization. It allows filtering, sorting and selecting of individual data objects, which are presented in columns [4]. Furthermore the HyperGrid enables the user to explore meta data and related external multimedia content (Web 2.0 content like Google Maps, Wikipedia entries etc.) through semantic zooming into table cells. There, it is even possible to access the real data object (e.g. full text in a PDF document, streamed video). Thus, typical problems like "change blindness" or "loss of orientation" are avoided. As a result, the system allows a browsing-oriented discovering of the data space without leaving the context of the table. In addition, the HyperGrid is very appropriate to compare two or more data sets through the structured nature of a table.
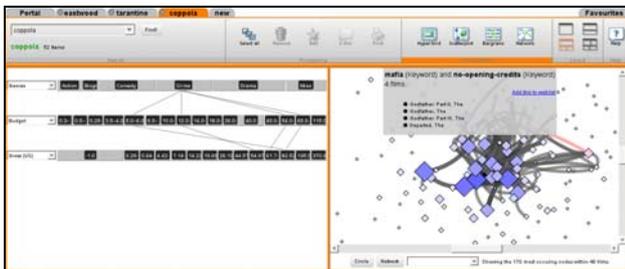

Figure 2. MedioVis: Multiple Coordinated Views with Parallel Bargrams (left) and Network Visualization (right).

With the parallel bargrams (see figure 2), inspired by [7], we provide a different entry point to the data by giving an overview of the attribute space rather than looking at the objects themselves. The amount of data objects with a certain attribute value is mapped onto the length of a section of a bar. By showing several bars beneath each other, the system allows to examine multiple attributes at once. The connecting lines between the bars evolve in a parallel coordinate visualization [3], exposing relationships and characteristic distributions between diverse attributes.

The network visualization (see figure 2) enables the user to analyze relationships between data objects through connecting attribute values (e.g. tags, authors). The network illustrates these values as nodes, where the number of occurrences is mapped to their size and color. The data objects with similar attribute characteristics are represented by connecting edges.

Since a single visualization cannot completely cover all kinds of information needs, MedioVis combines the introduced visualizations to overcome their limitations. The users for example may use sequentially or parallel the HyperScatter, with its good possibility to gain an overview and narrow down the data set and the HyperGrid to explore and compare the remaining data sets. Furthermore, by the applied interaction techniques like linking and brushing the user may gain an enhanced knowledge and deeper understanding of the information space.

4. CONCLUSION

With MedioVis, we offer an innovative visual information seeking system for end-users. To give a satisfying search experience, we faced the challenges of providing different views on the data space and of supporting analytical and browsing oriented exploration strategies through the usage of multiple coordinated visualizations and a consistent and supportive interaction design. The concepts we developed in the context of digital libraries can also be transferred onto other information seeking domains. For example, we successfully applied them on personal information management, virtual museums and image retrieval. MedioVis runs in the library of the University of Konstanz and is available as an open source project[2].

5. REFERENCES

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