Visualization of the Search Results of the Semantic Web Search Engines

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ABSTRACT
The Semantic Web calls for a new generation of search query visualizer that can rely on the document metadata. For this purpose, we present the design of WebViser a visualizer and browser of search results organized along three dimensions: a class based representation of documents on carousels, a stack structure of classes according to their ranking, and a meta carousel for the localization of class stacks associated with different queries. In addition links that connect documents through metadata comparison are displayed in such a way that link overlaps and visualization cluttering are minimized. A qualitative evaluation provides interesting insights on the users' appropriation of the interface and demonstrates that this system is an effective complementary to the traditional explorer for Semantic Web search engines.

Categories and Subject Descriptors
I.2.4 [**Knowledge Representation Formalisms and Methods**]: Semantic networks; I.2.10 [**Vision and Scene Understanding**]: 3D/stereo scene analysis

General Terms
Semantic Web Visualization

Keywords
Semantic Web search engine, search query visualization, carousel stack, metadata comparison

1. INTRODUCTION
Interactive search is important for accessing documents in the Semantic Web. Traditional explorer like Google is hard to show this search result which has ranked classes composed of non-ranked documents. Related documents are easily found by meta data inside this search result but traditional explorer is quite inconvenient to show them. This paper reports a visualizer called WebViser for exploring such search result. Our work integrates three modes of spatial document layout: a circular representation of linked documents [1], a carousel layout of document classes [3], and a stack based representation of pile of classes [2]. Links for metadata comparison are represented by parametric curves instead of line segments to minimize link crossings and overlaps. The qualitative evaluation result shows users appreciate the combined access to search results, but it also highlights some shortcomings that will be addressed in future versions of WebViser.

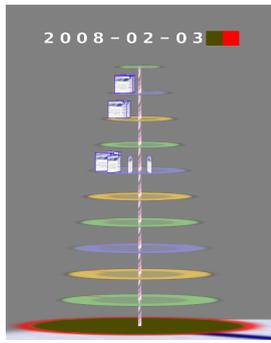## 2. VISUALIZATION TECHNIQUES AND ARCHITECTURE
The design is based on the three main dimensions of the search result from the Semantic Web search engine. First, documents are clustered into classes. Second, each document is tagged with the associated metadata such as date, location, etc. Last, classes are ranked according to their relevance for the current query. Because of the high dimensionality of the data, and the opportunity of using several views on the same data set, 3D environment is chosen for data representation. First, all documents of one class are displayed on the border of one rotating carousel. Second, carousels of each query are piled into a stack from the lowest relevant class (the bottom class) to the most relevant one at the top (Figure 1(a)). Last, carousel stacks are placed along a larger carousel (named as metacarousel). Finally, a flexible type of nonlinear graphical links (Figure 1(b)) showing the metadata comparison connects related documents to avoid cluttering the view with overlapping links. Different link colors for different metadata facilitate the visual perception of link categories.

The viewing interface (Figure 1(c)) is a multifocus visualization with one top view of the meta carousel (left view) and up to four local views on the right part to display individual stack and comparison result. Since 3D data browsing can be difficult and discouraging for the users, an inspector window (Figure 1(d) and a detail dialog in Java are used for iterative search query formulation and accessing the textual content of web documents respectively.
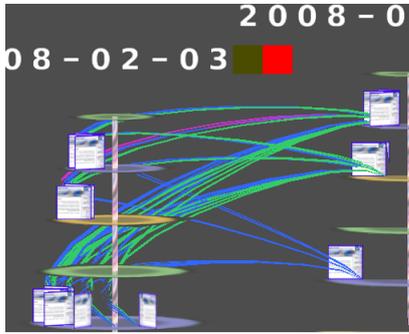
3. EVALUATION AND PERSPECTIVES
A qualitative evaluation has been undertaken and shown that our main purpose for semantic web search results exploration has been reached. All subjects believe the documents in each carousel are the same rank and there must be a rank between 2 carousels. They all like the link for metadata comparison and can easily find the similarities between linked documents through the detail dialog.
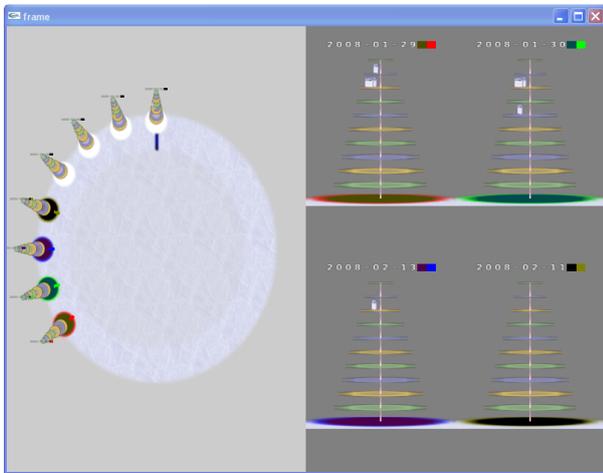
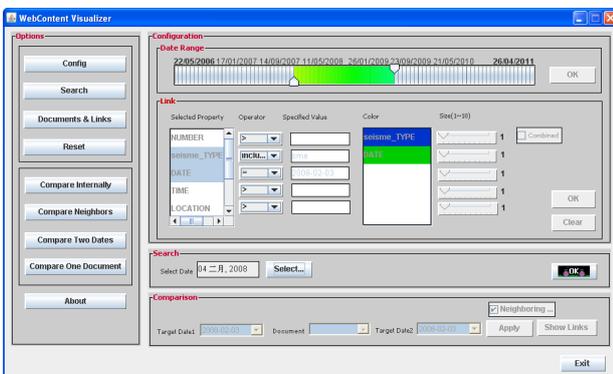From these preliminary results, we have defined the lines for

(a) Carousel stack

(b) Colored link

(c) The view interface

(d) Inspector window

Figure 1: Visualization techniques and architecture

future improvements of the interface: 1) filter support to show only links put on specified documents; 2) visualization of difference between 2 documents so that not just similarities but also differences can be displayed; 3) multi-tab style of inspector window to provide a more clarified interface with different tabs for different functions.

4. ACKNOWLEDGMENTS

5. REFERENCES

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