Sneak Preview?
Instantly Know What To Expect In Faceted Video Searching

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Abstract: This paper presents the Semantic Multimedia Explorer (SEMEX) a semantic search engine that supports exploratory video retrieval. SEMEX combines entities and content-based suggestions to support semantic search. The SEMEX interface provides facet filters, entity recommendations, a pagination and browsable search results; all of these elements are interconnected by instant "linking and brushing". Hence SEMEX enables instantaneous visual feedback on how a selected search facet will affect the displayed result set. This unique feature facilitates a quicker and clearer search process compared to other systems that need to perform new search queries to achieve a similar result. By making the subsequent results available *at fingertips*, the SEMEX interface allows users to pursue related exploratory search strategies that lead to a genuinely responsive and quick browsing experience.

1 Introduction

With the introduction of *Google Instant*[1], popular web information retrieval has become quick. Immediately after entering a keyword into the search field, suggestions are shown in a drop down box and the result set is constantly updated during text input. Thus, *Google* provides instantaneous feedback on keyword search and resolves what once have been successively received web pages into a continuous flow of user input and system feedback. As e.g., the video search of *Bing*[2] plays videos already in thumbnail preview. In this way it transfers the users' decision making process from the sites actually containing the video content to the page of the video result set itself.
While most keyword-based search systems are optimized to narrow down a huge data space to the most suitable results and present them in "ten blue links", exploratory search aims at finding results, which are not considered to be related at first glance. Similar to the concept of the flaneur, an urban wanderer of the late 19th century, who leisurely walks through the more and more modernized urban landscape and draws inspiration from it, exploratory search assists the user in navigating the growing information spaces and lets her choose between alternatives, move along paths, and move back to discover sidetracks

[1] http://www.google.com/instant/
[2] http://www.bing.com/videos/

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and to choose alternative ways [DCW11]. The growing amount of structured data on the web promises to enhance exploratory search by taking into account the actual meaning of the information and its semantics. Even though speed in terms of system feedback and an upfront but deep gaze into video result items have become available in popular web information retrieval, in the case of exploratory semantic search, instantness and an early preview into represented items on a semantic level, is highly required but only slowly taking shape.

Exploratory semantic search is based on facets and content-based recommendations, enabling the user to better refine and broaden search queries [WKS+10]. Extracting entities from vast data collections and to find meaningful representations on the interface is understood to be one of the most important challenges in search today [BYB+11]. In the field of semantic search, there is a fine line between usability and expressivity [WKW+10]. User interaction overall needs to become more intuitive and *lightweight*. The success of exploratory semantic search heavily depends on accessible and user-friendly interfaces.

Taking these aspects into consideration, this paper presents the semantic search engine SEMEX[3] that facilitates its users to perform state-of-the-art exploratory video retrieval. The objective of the interface design was to support its users with a quick feedback on selected facets that encourages exploratory search. This paper is structured as follows: In Sect. 2 we describe related work and introduce the relevant technologies and paradigms. Sect. 3 deals with the realization of the user interface including design aspects. Then, Sect. 4 presents and discusses different show cases. Finally, Sect. 5 concludes the paper with a short discussion of achieved results.

2 Design Aspects and Related Systems

The Semantic Multimedia Explorer research project was initiated to develop technologies that reply to the growing amount of multimedia content on the World Wide Web. For the current prototype videos from the *defa spectrum archive*[4] have been automatically analyzed and semantically annotated; those contain documentaries on alternating subjects originating from the former German Democratic Republic. To make this content available to its users, the SEMEX interface makes use of an entity- and facet-based navigation to comprise and refine its search results. In current interfaces, these elements often are represented by facet links with attached numbers. These numbers indicate how the result set will be refined when a link is selected. The academic video search engine "Yovisto" makes use of faceted browsing with a clear left-right-paradigm [WS11]. Users can expand their search queries by means of suggested DBpedia classes on the left. On the right, the current search can be filtered with facets derived from the results. With "SemaPlorer" it is possible to explore and visualize heterogeneous semantic data sets in real time. Therefore, the system also makes use of faceted search. The changes take affect after a facet link

[3] SEMEX was developed at the Hasso Plattner Institute for IT Systems Engineering in Potsdam, Germany in cooperation with Merz Akademie Stuttgart during the Mediaglobe project. Mediaglobe is part of the THESEUS research program, supported by the Federal Ministry of Economics and Technology on the basis of a decision by the German Bundestag.

[4] http://www.defa-spektrum.de/

is selected and no number or preview is given [SSS+09]. "Exhibit"[5] is a toolkit to create faceted browsing interfaces [HKM07]. For example, it comes with a time-line and a map view, which position the results in a temporal and geographical context. Numbers associated to a facet link provide a hint, how the result set will be changed after selection. It is due to the nature of this toolkit, that the result set can only be changed after explicit selection. The "Flamenco" search interface has the primary goal of allowing users to move through large information spaces like the painting collection of the San Francisco Fine Arts Museum or Nobel Price winners. "Flamenco" also uses numbers besides facet links and a tooltip to give a preview on consecutive facets [HEE+02]. "Yelp" uses a blending of checkboxes of facet links and thus modifies the labels shown beneath the facets to match similar but expanded concepts related to the query [Hea08]. Stefaner et al. published the faceted search interface "Elastic Lists" [SUS08]. It supports searching from general to special terms, navigation by selection, and trial and error by search path backtracking. In most of their applications the "Elastic Lists" also provide a number behind their facet links to indicate how many results will remain after selection. Even though all given examples provide a better way to refine searches than popular search engines do today, still they lack the immediacy of systems like *Google Instant* or the *Bing* video preview.
SEMEX makes use of "linking and brushing", a principle commonly used in information visualization to describe a connection between two or more views of the same data [Kei02]. "Linking and Brushing" was introduced by Becker and Cleveland [BC87] to brush scatterplot matrices. In that early case, brushing over a node on one graph highlighted related points on the other graphs. To enable the video results for "linking and brushing", SEMEX uses a visual pagination that resembles the "TileBars" introduced by Hearst et al that also aligned result items in a visual grid [Hea95]. For faceted refinements in a search process, this principle, also was used by Marian Dörk et al with "VisGets" interconnecting various resources [DCC+08]. When brushing over elements such as tags, locations, time filters and thumbnails, the relation between these elements is highlighted. This example connects different elements in a meaningful way, yet the pagination of the result set has not been enabled for brushing and "VisGets" does not allow the formulation of complex entity-based search queries.

3 The SEMEX User Interface

Considering Fig. 1, the layout of the SEMEX user interface comprises the search query input field (1), the context explorer (2), the facet filters (3), and the area for search results with pagination (4). The *Context Explorer* consists of four colored squares, in which the SEMEX system suggests related entities divided into the four basic categories Persons, Places, Events and other Things. These suggestions are based on *semantically* related resources matching to the current search result. The related resources are generated with the help of DBpedia[6] [WS11]. Aligned in three columns below the context explorer, the *Facet Filters* can be found; they are also grouped into the four categories and are derived

[5] http://www.simile-widgets.org/exhibit/
[6] http://www.dbpedia.org/

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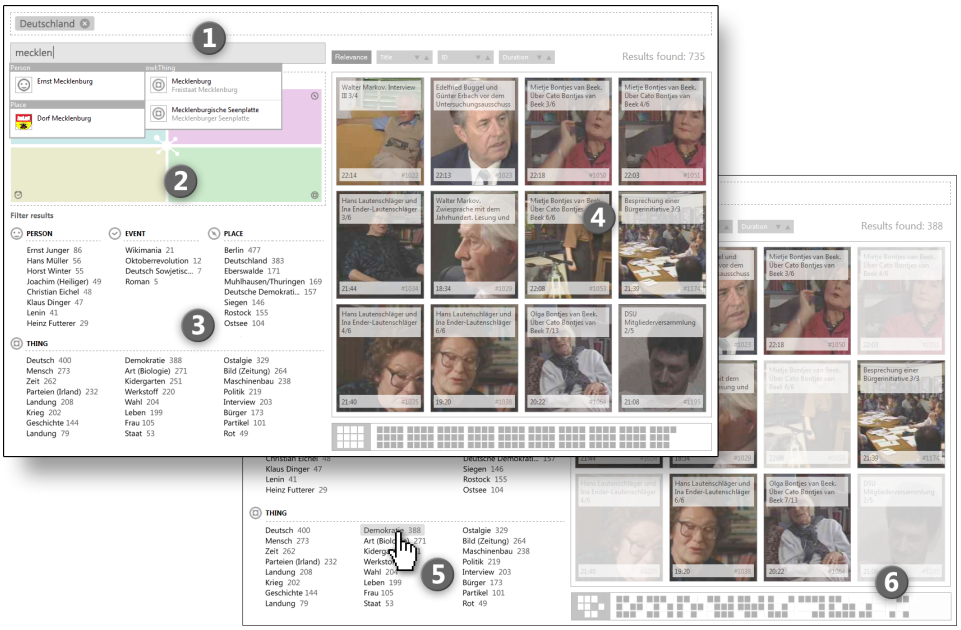

Figure 1: Brushing over a facet (5), modifies search results and pagination (6).

from the current search result. On the right hand's side the *Search Results* are arranged in a tiled layout. Each result tile represents a video and shows its title and duration, as well as a representative thumbnail. Since selecting and de-selecting facets and suggestions is essential for the quick exploratory search of SEMEX, we wanted to provide an instant feedback on how selected suggestions or facets will affect the currently shown result set. When the user brushes over a facet link, as indicated in Fig. 1 (5), linked thumbnails and tiles of the pagination that do not fit the criteria are grayed out (6).

4 Search Scenarios and Demonstration

The first example considers *Queries and Disambiguation*. It starts with typing the query string "Mecklenburg"[7] into the search mask of SEMEX. While typing, a disambiguation matrix is displayed, that suggests what the term entered stands for. In our case Mecklenburg might refer to a person called "Ernst Mecklenburg", a place such as the village Mecklenburg, or other entities, as e.g. the German federal state. The suggested entities are grouped in different blocks and can be recognized by distinct icons. When selecting "Freistaat Mecklenburg" (the German federal state), the search term is confirmed and from now on is listed as an entity in the facet area on top of the page. The items listed in this

[7]The examples given are due to the limited specialized content of the *defa spektrum archive*.

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area comprise active entities and search terms that determine the shown search results.
The second example demonstrates the *Context Explorer and Facet Filters*. On the left hand's side the context explorer and the facet filters can be found. For our example, SEMEX suggests "Schwerin" and "Rostock". Schwerin is the capital of Mecklenburg and Rostock is its largest city. When brushing over Rostock, about half the results remain visible; when brushing over Schwerin, less results remain.
Aligned below the context explorer the facet filters are also grouped into the four categories. These facets are derived from the current search result. In the Person category for example, "Erich Honecker" can be found, the political leader of the German Democratic Republic. He is accompanied by "Egon Krenz", Honecker's successor. In the category for Things "Ostalgie" can be found, a German term referring to nostalgia for aspects of life in East Germany. When brushing over the two politicians, a handful of results remain visible, some more when brushing over "Ostalgie". By making the facets available for brushing and linking them to the representative thumbnails, SEMEX provides valuable feedback on how the result set will be changed according to the next input provided by the user. Eventually, a click on a facet, places it in the facet area on top of the page and the results are changed accordingly.
By selecting an item within the search results, the left column is overlaid with information about the selected video and the video player. In a tabbed layout below the player, entities detected by Automated Speech Recognition and Video OCR are listed. When an entity is selected, the video fast-forwards or rewinds to the occurrence of the entity in the current video.

5 Conclusion and Future Work

The search with SEMEX cannot be achieved with current search engines: Semantic entities enable video search beyond the capabilities of keywords and the quick refinement of the search query and the preview made possible by "linking and brushing" facilitates the user to perform searches that are not only exploratory but also *lightweight*. The linking of facets and elements like thumbnails and pagination is a real benefit for exploratory search – leaving behind the paradigm of consecutively loaded pages making way for quick preview and deep gaze into the content of videos.
In future work we plan to investigate, how further elements of the interface can be put into meaningful interconnections to each other. For example, brushing could also be applied to segments of the videos, the entities of the detail view could be connected back to the search results and the pagination could make use of different display methods.
Because of copyright protection on its media content, a public live demo[8] of SEMEX can only be provided at the workshop. Nevertheless, a screencast demonstrates the user interface in all details (c.f. http://www.bit.ly/semexdemo).

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[8] http://mediaglobe.yovisto.com:8080/mggui/

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