

Using Navigation Leads for Exploratory Search in Digital Libraries

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Researching a new domain in a digital library can be a challenging task even for a seasoned researcher and more so for novice ones, such as starting master or doctoral students. They can have a hard time formulating keyword queries, because they lack the needed domain overview and knowledge. The most natural way of navigation seems browsing, which does not force users to split their attention between the navigation interface and the search results. In addition, it supports the idea of navigation-aided retrieval as defined in [4] by understanding the search results as mere starting points for further exploration.

In order to emulate this behaviour and support exploration of the domain by the users, we provide them with navigation leads, i.e. links to relevant documents, with which we enrich the documents' summaries (or abstracts). In our work, we examine the influence of the navigation leads' different visualizations on the users' performance of exploratory search tasks in a digital libraries domain.

The eye-tracking technology has been increasingly utilized for evaluation of search systems. In [3] it was used to determine, at which elements of faceted search interface the users look the longest, finding out, that on the first results page they spend the most time looking at the search interface and facets and then on the consecutive pages they do not pay it much attention and examine the filtered results.

Other important metrics when evaluating exploratory search are learning and cognition which are closely linked to the concept of cognitive load. Measuring cognitive load can be a challenging task. The procedure usually consists of secondary task performance and subjective ratings [1], however other techniques can be used, such as concurrent and retrospective reporting, eye-tracking or concept-mapping [3].

In order to evaluate how the different visualizations of navigation leads affect the users' performance of exploratory search tasks, we have proposed three types of visualization, namely *visualization in text* of an abstract (or summary), *under the text* and *in a cloud of terms* next to the list of search results. Advantage of the first

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approach is that the leads can be viewed in their context; on the other hand, only words or phrases already present in abstracts can be used as navigation leads. When visualizing the leads under the text, they lose their immediate context, but do not get in the way of reading. Lastly, visualization in a cloud tries to mimic the tag cloud with one exception – only leads for the currently retrieved set of documents are selected into the cloud. For each visualization type, the same method of navigation leads' selection was used which computes relevancy of keywords extracted from abstracts by AlchemyAPI¹ by taking into account also tags added by users and keywords identified by the articles' authors.

We conducted a user study with five participants – bachelor and master students, whose task was to explore new domain using the provided navigation interface in a web-based bookmarking system Annota². We hypothesized that visualizing leads in the text or under it will prove to be more immersive, thus resulting in more interaction with the search results (more time spent reading the abstracts as well as more read abstracts) in comparison with the visualization in a cloud and that consequently the users will acquire better understanding of the domain and the problem at hand with less (extraneous) cognitive load.

In order to evaluate our hypotheses we used different metrics, such as task success, time spent on task etc. We also collected gaze tracking data using the eye-tracker *Tobii X2* and used *Tobii Studio*³ for the evaluation of the collected data. The audio and video of the experimental sessions was recorded as well.

Extended version was published in Proc. of the 10th Student Research Conference in Informatics and Information Technologies (IIT.SRC 2014), STU Bratislava, 212-219.

Acknowledgement. This work was partially supported by the Slovak Research and Development Agency under the contract No. APVV-0208-10.

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¹ <http://www.alchemyapi.com>

² <http://annota.fiit.stuba.sk>

³ <http://www.tobii.com/en/eye-tracking-research/global/>