

CLUSTER-BASED AND GRAPH-BASED BROWSING AND EXPLORING SEARCH RESULTS

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Abstract. A number of search results presented by web-search systems often makes results and their relations to search queries incomprehensible for users. This problem is mostly visible in case of searches in domains that are new or unknown for users or in case when users do not exactly know what they are looking for. Approaches of exploratory search propose solutions to this problem but they are focused to specific domains and sub-problems. We proposed approach for exploring and browsing search results via views based on hierarchical clusters and graphs that are interconnected by semantic zoom. Our approach utilize partial solutions of existing exploratory search approaches and solves problem of comprehensibility of unknown domain and explains relations among results and between results and queries. We partially evaluated proposed approach via qualitative experiment with implemented prototype which works with a photo ontology.

1. Motivation

Users that are looking for some information provide three basic steps: formulate query, select result, refine query [4]. This information seeking process is well useable, when users exactly know desired results and they are able to describe desired results with right keywords. In cases when users are looking for unknown information, users are not able to formulate correct queries that lead to desired results. Partial solutions for this problem are provided via approaches based on a keyword-based query expansion [6] or a result or query recommendation. But these approaches are still usable only when users are able to formulate initial query. The solution can be found in support of information seeking process which allows novice users to learn source domains, i.e. investigate and learn features of resources and relations among resources [5].

2. Exploring and navigation in ontology

Exploratory search [5] enriches information seeking process by learning and investigation. This way it helps users to learn and understand unknown domains or to find expected information when users do not exactly know, what they are looking for. In our work [1] we utilize principles of exploratory search to support exploring and navigation in photo ontology. In our approach we define a scenario of exploring search results with four main steps with specialized search result views that are naturally interconnected by semantic zoom:

1. *Creating and refining search query* – at the beginning of searching sessions, users specify their search queries and refines queries following observations of provided search result sets. We support this process by clustering results into hierarchical clusters [3], whereby we visualized two levels of clusters (see Figure 1) and users can analyse clusters by zooming into them.
2. *Exploring individual result* – users can explore details of individual results by zoom-in to one result. Via zoom-out action, users are returned to the hierarchical cluster view.
3. *Exploring related results* – when users identify one result which mostly matched their preferences, they can explore similar or related results in search results graph visualization (see Figure 1). In this view, results and their attributes are visualized as nodes. In this graph, attribute nodes contain both attribute name and value, so users can explore only objects that have same attributes and they could not explore values of attributes. This can be provided by changing scope of explored results.
4. *Changing scope of explored results* – by zoom into attribute, the graph is visualized as RDF graph [2], where attributes' values and types are in separate nodes. This way users can explore attributes of all objects in the graph. By simple zoom-out, users are returned to simpler and clearer attribute graph view.

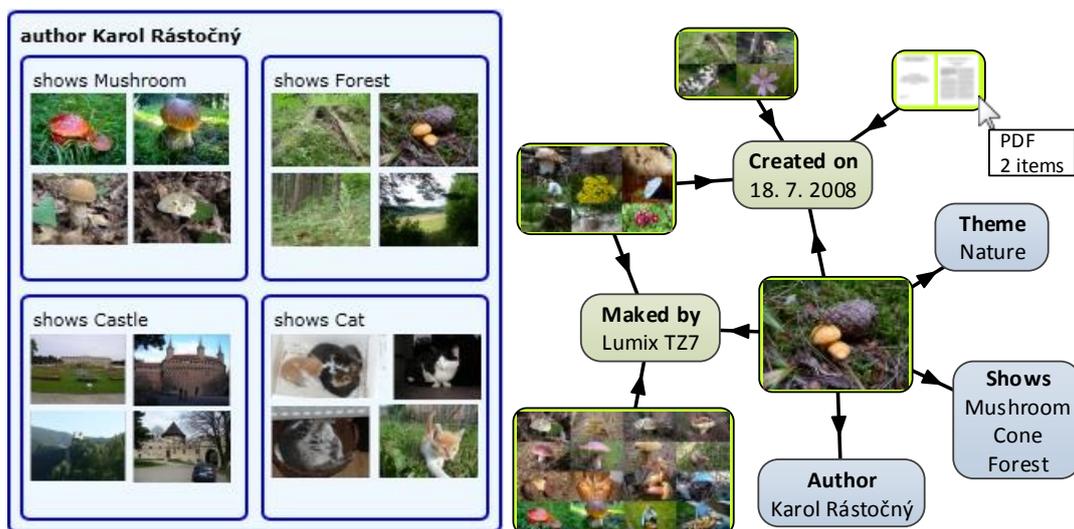


Figure 1. Examples of search results visualization in hierarchical clusters (left) and exploring search results via graph visualization (right) [1].

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References

to other papers publishing the results that are summarized here

- [1] Rástočný, K., Tvarožek, M., Bieliková, M.: Supporting search result browsing and exploration via cluster-based views and zoom-based navigation. In: *Proc. of the 2011 IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology Workshops*, IEEE Computer Society, (2011), pp. 297-300.
- [2] Rástočný, K.: Navigation Based on Adaptive Views. *Information Sciences and Technologies Bulletin of the ACM Slovakia, Special Section on Student Research in Informatics and Information Technologies*, (2011). vol. 3, no. 2, pp. 104-108.
- [3] Rástočný, K., Tvarožek, M., Bieliková, M.: Web search results exploration via cluster-based views and zoom-based navigation. *Journal of Universal Computer Science*, (2013). Vol. 19, no. 15, pp. 2320-2346.

Other References

- [4] Broder, A.: A taxonomy of web search. *ACM SIGIR Forum*, (2002). vol. 36, no. 2, pp. 3-10.
- [5] Marchionini, G.: Exploratory Search: From Finding to Understanding. *Communications of the ACM*, (2006). vol. 49, no. 4, pp. 41-46.
- [6] White, R. W., Marchionini, G.: Examining the effectiveness of real-time query expansion. *Information Processing & Management*, (2007). vol. 43, no. 3, pp. 685-704.