Personalized Semantic Web Exploration Based on Adaptive Faceted Browsing

Michal Tvarožek
Institute of Informatics and Software Engineering
Slovak University of Technology
Ilkovičova 3, 842 16 Bratislava, Slovakia
tvarozek@fiit.stuba.sk

Mária Bieliková
Institute of Informatics and Software Engineering
Slovak University of Technology
Ilkovičova 3, 842 16 Bratislava, Slovakia
bielik@fiit.stuba.sk

1. WHAT IS THE POINT?

As of today, the Semantic Web has yet to achieve the widespread penetration that its creators originally envisioned. While the Semantic Web initiative is gaining momentum, the practical availability of Semantic Web content for end-users is still rather low due to limited content availability and support in major search engines and virtually no (visualization) support in typical web browsers.

Our goal is to bring the Semantic Web closer to end-users by providing usable *end-user grade exploratory search* tools that will enable them to search, browse and explore the Semantic Web in an intuitive user-friendly way.

2. WHAT DO WE DO AND HOW?

We focus on an extension and combination of approaches in Information retrieval, Human-computer interaction, Adaptive hypermedia and Semantic Web. We build on interface, interaction and facet generation ideas explored by browsers such as mSpace [6], BrowseRDF [5] and /facet [2], and combine them with the community based ideas of Piggy Bank [3] and exploratory search ideas similar to VisGets [1].

Our exploratory search interface acts as a front-end to, e.g., a SPARQL enabled Semantic Web repository and/or search engine. We focus on end-user experience, effective query construction and refinement, and search result visualization and exploration, while leaving web crawling, indexing and query evaluation to specialized third-party providers such as `Sindice.com` [4]. We specifically address:

- *Dynamic facet generation* – we define patterns in semantic metadata (i.e., the schema), which correspond to facets, and automatically generate new facets. For each generated facet we select suitable means of user interaction and visualization from a set of supported options (e.g., hierarchical facets, enumerations, interval facets; text-/image-based; single-/multi-selection).
- *Facet personalization* – we adapt the set of generated facets based on estimated user characteristics using a multi-layered relevance model based on in-session, short-/long-term user characteristics, global statistics and social relations; the order of facets; the number of visible facets, and the restrictions visible in each facet.
- *Search result exploration* – we provide list-based, table-based and matrix-based search result overviews which are interlinked with table-based, graph-based and image-based detail views. Furthermore, we personalize these views based on the estimated relevance of individual search result attributes. This includes smart selection of visible attributes and their ordering, and dynamic generation of new navigation options for further exploration of the result set.

3. HOW DO WE EVALUATE?

We have performed experiments with our faceted browser prototype in two application domains in projects NAZOU (job offers; `nazou.fiit.stuba.sk`) and MAPEKUS (publications; `mapekus.fiit.stuba.sk`). Despite bottlenecks with the throughput of our third-party semantic repository, our preliminary evaluation shows promising results with facet adaptation (i.e., improved response times, shorter task times, and fewer clicks necessary to perform user scenarios).

We plan to refine our prototype (see Fig. 1) and perform additional user studies to evaluate additional usage scenarios in three application domains which seem suitable for exploratory tasks – scientific publications, photographs and learning programming (with emphasis on tests and exercises [7]). We hypothesize that our approach will:

- Generate a faceted user interface which enables users to search and explore the open information space in an effective way without the necessity to configure anything GUI related. We also expect it to adapt to changes in information spaces such as new data attributes or concept types without human intervention.
- Adapt the potentially very large number of facets and search result attributes to specific needs of individual users thus making the interface practically usable by reducing information overload and providing guidance.
- Provide users with integrated means of exploration and suitable visualization allowing for both vertical navigation and query refinement (i.e., selection of what

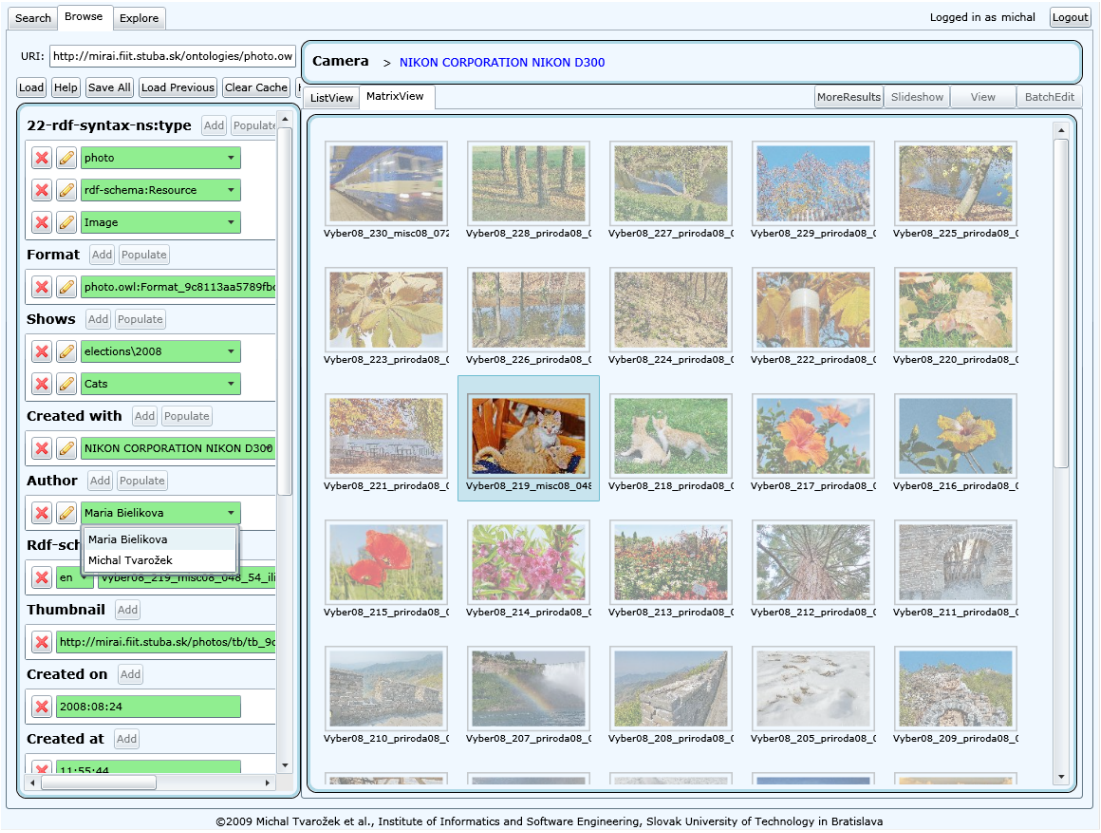

Figure 1: Example of our prototype adaptive faceted browser with an editing pane (left) and results (right).

to explore) and horizontal navigation and exploration (i.e., search results visualization and browsing).

4. WHAT IS THE CONTRIBUTION?

We stress the exploratory aspect and open-endedness of many contemporary user tasks (e.g., exploration, learning, analysis). We focus on end-user experience and provide users with means to search, visualize and explore arbitrary Semantic Web data by means of an intuitive user friendly interface. We see our interface as a possible extension/replacement of current web browsers as it allows users to search the information space and also to display and browse specific resources.

Our main contribution lies in *dynamic user interface adaptation*, i.e. the ability to adapt to the changing contents of the information space which reflects in the faceted user interface, and the ability to adapt the user interface to changing user requirements by promoting relevant information and providing guidance.

I have already presented partial results during my master's study at Adaptive Hypermedia'06 and my current doctoral study at WWW'07 (poster), ICWE'07 (demo), SMAP'07, WWW'08 (poster), HCIS'08, Web Science Workshop at HT'08.

5. REFERENCES

[1] M. Dörk, S. Carpendale, C. Collins, and C. Williamson. Visgets: Coordinated visualizations for web-based information exploration and discovery. *IEEE Transactions on Visualization and Computer Graphics*, 14(6):1205–1212, 2008.

[2] M. Hildebrand, J. van Ossenbruggen, and L. Hardman. /facet: A browser for heterogeneous semantic web repositories. In I. Cruz et al., editor, *ISWC 2006*, volume 4273 of *LNCS*, pages 272–285, 2006.

[3] D. Huynh, S. Mazzocchi, and D. Karger. Piggy bank: Experience the semantic web inside your web browser. *Web Semant.*, 5(1):16–27, 2007.

[4] E. Oren, R. Delbru, M. Catasta, R. Cyganiak, H. Stenzhorn, and G. Tummarello. Sindice.com: a document-oriented lookup index for open linked data. *Int. J. Metadata Semant. Ontologies*, 3(1):37–52, 2008.

[5] E. Oren, R. Delbru, and S. Decker. Extending faceted navigation for rdf data. In I. Cruz et al., editor, *ISWC 2006*, volume 4273 of *LNCS*, pages 559–572, 2006.

[6] schraefel„ m. c. et al. The evolving mspace platform: leveraging the semantic web on the trail of the memex. In *Proc. of Conf. on Hypertext and Hypermedia*, pages 174–183, New York, NY, USA, 2005. ACM.

[7] O. Vozár and M. Bieliková. Adaptive test question selection for web-based educational system. In *SMAP '08: Proc. of the 2008 3rd Int. Workshop on Semantic Media Adaptation and Personalization*, pages 164–169, Washington, DC, USA, 2008. IEEE Computer Society.

Additional information

Presenter's contact data: Michal Tvarožek,
E-mail: tvarozek@fiit.stuba.sk,
Tel.: +421-902-802-058,
Address: Budatínska 35, 85106 Bratislava, Slovakia

Graduate student

Affiliation: Institute of Informatics and Software Engineering, Faculty of Informatics and Information Technologies at the Slovak University of Technology

Advisor: Prof. Mária Bieliková

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