Interactive Exploration of Multi-Dimensional Information Spaces with Preference Support

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Abstract

Users access large amounts of information resources mainly through search functions, where they type a few keywords and the web search or query engine returns a linear list of hits. While this is often satisfactory for focalized search, it does not provide enough support for exploratory information needs. Faceted and Dynamic Taxonomies (FDT) is a highly prevalent model for exploratory search, which allows users to get an overview of the information space and offer them various groupings of the results based on their attributes, metadata, or other dynamically mined information, enabling them to gradually restrict their focus through clicks and locate low ranked resources. The enrichment of such mechanisms with preferences could be proven useful for exploratory tasks. However, the current preference-based approaches seem to ignore the fact that users should be acquainted with the information space and the available choices for describing effectively their preferences.

In this dissertation we extend the interaction model of FDT with preference actions that allow users to express their preferences interactively, gradually, and in a simple way. We introduce a preference framework appropriate for information spaces comprising resources described by attributes whose values can be hierarchically valued and/or multi-valued. We define the language, its semantics and the required algorithms. The framework supports preference inheritance in the hierarchies, automatic conflict resolution, as well as preference composition. Subsequently, we enrich the FDT model with preference actions and we propose logical optimizations and methods for exploiting the intrinsic characteristics of the FDT-based interaction, aiming at making it applicable to large amounts of information. We present the design and the implementation of the web-based system `Hippalus`, which realizes the extended interaction model. Regarding user benefits, we theoretically analyze user gain in terms of the number and difficulty of choices, and we describe and analyze three user-based evaluations. The first investigates the degree of effectiveness of preferences when users are not aware of the available choices. We found that only 20% of the users managed to express effective preferences without knowing the available choices. The second comparatively evaluates FDT with other exploratory models, and shows that the majority of users preferred FDT, was more satisfied by FDT and achieved higher rates of task completion with FDT. The last one evaluates the preference-enriched FDT as realized by `Hippalus`. The results were impressive. Even in a very small dataset, with the preference-enriched FDT all users successfully completed all tasks in 1/3 of the time and with 1/3 of the actions in comparison to the plain FDT. Moreover all of the users preferred the preference-enriched interface.

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