A Social Item Filtering Approach for a Mobile Semantic Desktop Application

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Abstract

In this paper we present an approach for personal information management on mobile devices based on the Semantic Desktop. One of the key features is an intelligent resource recommendation algorithm. In addition, we introduce the extension of our application by a social information filtering approach which allows for the integration of other users' ontologies and information spaces.

Introduction

Our goal is to integrate social computing [1] with a mobile Semantic Desktop application. The main idea of the Semantic Desktop is to allow users to formalize their view on their personal information space using ontologies [2]. While there are Semantic Desktop realizations available for servers and desktop computer use, there is little for mobile environments. However, support for personal information management appears to be even more important in a mobile scenario. For example, users cannot browse though many search results on the small screen of a mobile device; it is desirable to provide a useful filtering approach. Therefore, we have designed and implemented *SeMoDesk*, which is a realization of the Semantic Desktop idea for Windows Mobile Personal Digital Assistants (PDAs) [3]. We describe this application and its item filtering approach in the first part of the paper. The second part of the paper is devoted to an extension of the application which allows to include information spaces of other users in the personal social network – possibly in the near vicinity of a user's own mobile device – of the item filtering.

The Semantic Desktop on the Mobile Device

After starting up SeMoDesk, the user has the options to manage and browse her ontology, recommend resources of current interest, or display location-based items on a map. For the first task, users can define concepts such as projects, topics or subclasses of a "person" concept.

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The concepts are based on the predefined PIMO ontology [2]. Afterwards, users can define relationships between the concepts and resources on the mobile device, for example stating that an appointment is related to a project. Thereby, SeMoDesk assist the user as much as possible. The defined ontology can then be used for browsing (see Fig. 1) and retrieving relationships.

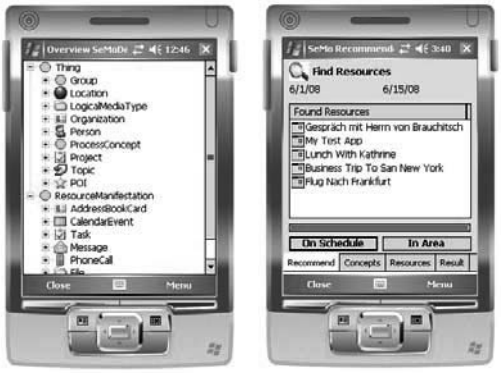

Figure 1. Browsing the personal ontology (left), and step one of the search algorithm (right)

In addition, we have designed and implemented an item filtering approach to find relevant resources in a given context. We do not apply reasoning on the ontology because of the limited resources with regard to computational power on a PDA. Instead, we use a search algorithm that traverses the directed graph of concepts and resources in the ontology. Our search method consists of two steps: 1. Finding current resources, i.e. resources that are of interest for the user right now, and 2. Recommending other items, starting from one instance found in step 1.

For step one, our system offers different options. Amongst other things, the system proposes items based on the current date and time (button "On Schedule" in Fig. 1, left), and location (button "In Area"). As a result of this first step, the system displays a list of resources which are of current interest to the user, as shown in Figure 1, left.

The user can now select one node and start the actual recommendation process. Thereby, our algorithm evaluates

nodes that are reachable via relations from the specified starting node in the graph by an evaluation function. Nodes with an evaluation result below a threshold are not considered anymore and its neighbors are ignored. The algorithm terminates after all meaningful nodes – according to the evaluation function – have been examined. After searching the item space as explained, a result list is shown to the user. The result set is ranked by how relevant the items are, according to the evaluation function. Only items above a configurable threshold are given as results.

While our approach deals with retrieving relevant items for one particular user based on her personal ontology so far, it seems intriguing to incorporate other users' ontologies and information spaces as well.

Extending the Application towards Social Interaction

Our key idea w.r.t. realizing the Social Semantic Desktop idea [1] is to extend the information space which is subject to the information item filtering by including parts of the information spaces of other users. To do so, we use the social network composed of the community's individual's contacts, already present in the basic application. The overall process of information sharing (which can be mediated by all available network infrastructures is then basically simple: An "inquirer" asks for related nodes to a specified node A from his own information space. While we generally limit the possible set of "inquired" persons to those that have a mutual social relation to the inquirer for privacy reasons, we provide certain more special modes for the determination of the actual set of "inquired" persons (besides the option to ask all mutual contacts): Either persons in the physical neighborhood are asked or persons with which the inquirer has a special relationship of type business or personal relation.

In order to do so we extend the PIMO ontology: While the problem of providing or collaboratively constructing an agreeable ontology of social relations is still at least partly open, we propose a basic intermediate solution by extending the PIMO ontology by introducing widely agreeable sub-concepts of "contact", namely "business contact" and "private contact". A second extension of the ontology regards the question which elements of the personal information space are made "publically" available: We introduce Boolean attributes "socializable" (with sub-attributes "business socializable" and "privately socializable") for every element of the personal information space with a default setting of FALSE. A more elaborate alternative is to share information items with a network of path length at most n away from the user ("intermediate"(n)). In order to implement the last policy we include information about the social network path into the inquiry-element of the agent interaction protocol.

After having determined the set of inquired persons, the social extension of the filtering or recommendation process then follows a "bootstrap" approach: Assume that person X seeks items related to her own item A in the information spaces of her business contacts. Assume further that person Y is a business contact of X and X is also a contact of Y. Then the sequence is as follows:

1. If Y does not turn down X's request, on request of agent X, Y virtually includes X's item A into his own information space. Virtual inclusion encompasses all "agreeable" semantic item relations from the common PIMO ontology that are present for A in X's information space. "Agreeable" relations have targets that are present in both information spaces.
2. Y then computes a set of related items from his information space with the algorithm described in the previous section with (virtual) start node A. With that step we find related items to A from Y's "perspective". After the computation, Y deletes the virtual node from her information space.
3. Y communicates the result set back to X
4. X virtually includes the result items from Y and other agents into her own information space and runs another instance of the filtering/ recommendation algorithm (restricted to those "foreign virtual nodes") with start node A. This step yields related items to node A from X's "perspective". Overall we thus realize a common "perspective" of X on the one side and Y and the other agents on the other side.

Actual access to foreign information items resp. nodes is subsequently implemented by a separate process, if demanded by user X.

Conclusion

We have presented a mobile Semantic Desktop application which allows users to define and manage a personal ontology to structure their information space on PDAs. This ontology can then be used to recommend items based on the current user context. We have already implemented and (rudimentarily) tested the individual search function in the SeMoDesk application. We are currently working on the social search that has been outlined in the second part of this paper.

References

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