Determining User Interests About Museum Collections

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ABSTRACT

Currently, there is an increasing effort to provide various personalized services on museum web sites. This paper presents an approach for determining user interests in a museum collection with the help of an interactive dialog. It uses a semantically annotated collection of the Rijksmuseum Amsterdam to elicit specific user's interests in artists, periods, genres and themes and uses these values to recommend relevant artefacts and related concepts from the museum collection. In the presented prototype, we show how constructing a user profile and applying recommender strategies in this way enable dynamical generation personalized museum tours for different users.

Categories and Subject Descriptors

H.3.3 [**Information Storage and Retrieval**]: Information Search and Retrieval—*Information filtering*; I.2.4 [**Artificial Intelligence**]: Knowledge Representation Formalisms and Methods—*Semantic networks*

General Terms

Design, Documentation, Human Factors, Standardization

Keywords

Recommender systems, User profiling, Semantic browsing, Museum collections, Personalization

1. INTRODUCTION

Personalization enables changing the museum mass communication paradigm into a user-centered interactive information exchange, where the "museum monologue turns into a dialogue", and personalization is "a new communication strategy based on a continuous process of collaboration, learning and adaptation between the museum and its visitors"[2]. In 1997, Picard outlined the need for personalization of online museum collections [3]. Now there are various examples of museum websites attempting to meet the needs of individual users.

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Figure 1: CHIP demonstrator display

Personalization improves museum website usability by supporting user navigation and assisting them in finding appropriate and interesting information. On the other hand, it also considers personal characteristics, such as age, education, previous knowledge, to support better comprehension of the collection. Studies show that understanding is stimulated when the system uses concepts familiar to the users (considering their interests and knowledge level) [2]. Thus, museums automatically adapt the content presentation using user data stored in a user profile. Users can explicitly fill in online forms to provide such data. Additionally, the system can monitor their activities to infer and record their preferences. We present an interactive approach for collecting user data and building user profiles for online museum collections.

The CHIP demonstrator[1], shown in Figure 1, uses content-based filtering techniques to track user behavior and preferences when they rate museum artefacts. Our demo then recommends both artefacts and related concepts that reflect the latest state of the user profile. The user can rate each item as either "interesting" or "not interesting". Based on those ratings, the system recommends related artefacts. The system also lets users rate their interest in concepts related to each artefact, enriching further the system's user profiles.

2. MUSEUM COLLECTIONS

While able to make quick impressions on novices, museum

[1]available at `http://www.chip-project.org/demo/`

artefacts occur in the context of a rich and complex knowledge structure developed by experts such as art theoreticians and art historians. Although requiring such knowledge can hinder novice users, this knowledge can help the recommendation process. It does so by providing a structured vocabulary for describing artefacts, thus defining properties for artefacts that content-based recommendation can use. Furthermore, because a large community developed these concepts to describe what they find interesting and important about artefacts, these properties are likely to correspond often to user interests. For example, when a user rates many paintings favorably that experts describe as "Impressionist", the system can then recommend web pages about Impressionism, even though the user had no previous knowledge of it.

The expert annotations of artefacts that the CHIP demonstrator processes originate from the ARIA database of the Rijksmuseum Amsterdam ("Explore the Collection"[2]). We use the RDF translation of this database that we have done in earlier work [4]. It annotates 740 artefacts, their artists, locations, other related concepts and related images.

We use Semantic Web queries and inferencing (via the Jena reasoner) to identify the related artefacts based on the domain model of ARIA. For example, we identify artefacts that relate to a common theme, period or location. We can deduce a selection of artefacts by a specific artist (e.g. all paintings by Rembrandt van de Rijn) or artefacts that represent a specific objects (e.g. 'women') or are of a specific type (e.g. 'male portraits', 'oil on canvas', etc.).

3. USER PROFILE

In the user profile we store property values (e.g. artist names, period/location of the artifacts, topics associated with them) for each artefact presented in the rating dialog (e.g. property "artist" — property value "Rembrandt"). We also store the user's rating for each of those entries.

The rating "1" for an artefact or concept indicates a positive interest, "0" indicates no opinion and "-1" negative interest. The system calculates predicted interests and lets the user confirm or change them, resulting in the system storing these new ratings. When a highly rated resource has a property that falls within a broader concept, the system adds that broader concept to the resource's clustering property set. We applied similar inheritance to clustering search results in earlier work [4].

4. PERSONALIZED INTERACTION

The CHIP prototype recommends concepts related to the artefacts that the user rated positively. For each concept recommendation, the user can see why it was recommended. The user can see which artefacts related to this concept were rated positively. Here users can also directly alter recommendations by indicating that, although the artefacts were rated high, they are still not interested in that specific theme. For each artefact presented by the system, the user can see the concepts (e.g. themes, periods and locations) that are related to it, and can indicate in which concepts are interesting. We implement this in a dialog with the user with which the system dynamically builds the user profile and uses it to generate further recommendations dynamically for the user to rate. This lets the user immediately see the result of the latest ratings in the user profile, thus providing fast validation of the profile and recommendation strategy.

[2] http://www.rijksmuseum.nl/collectie/

5. IMPLEMENTATION

The CHIP demonstrator has Java servlets serve HTML pages. The domain model and user models are represented in RDF and are stored on the server. The Jena API[3] is used to process the RDF data. The utterances in the dialog are executed as SPARQL[4] queries to the RDF data model.

6. CONCLUSION

The CHIP prototype demonstrates elicitation of user interests from rating the semantically enriched Rijskmuseum collection items. It offers an interactive way for users to indicate their preferences for selected artefacts as well as for specific concepts from their annotations. This information is then stored in a simple user profile, which is further used to recommend related concepts and artefacts from the collection. We intend to combine the current content-based filtering technique with a rule-based filtering, which would allow us to specify rules based on static and dynamic user profiles [1] and recognize situations and patterns in users navigation and interests, associations and correlations among sets of items, clustering and classification of concepts and artefacts. The user-interaction and the concept-based recommendation strategy have been evaluated with experts from the Rijksmuseum. Further work involves user studies with various visitor user groups on the Rijksmuseum website.

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[3] http://jena.sourceforge.net/

[4] http://www.w3.org/TR/rdf-sparql-query/

[5] http://www.chip-project.org/