Product Reviews in Mobile Decision Aid Systems

René T.A. Wietsma* and Francesco Ricci
eCommerce and Tourism Research Laboratory, ITC-irst
Via Solteri n° 38
38100 Trento (TN) Italy
{wietsma,ricci}@itc.it
http://ectrl.itc.it

ABSTRACT

Recommender systems provide decision aid and information filtering functions that have a great potential application in the mobile context. An aspect which has not been extensively exploited, in current recommender systems, are ways to better explain the recommendations, for instance, exploiting the opinion of users about the recommended products. In this paper we shall describe the foundations for a mobile product recommender system which incorporates both structured (supplier driven) product descriptions and more subjective product knowledge, provided by users reviews. We think this type of recommendation technology could be especially useful in the mobile context, where people must take decisions in a rather short period of time, with a limited availability of product information, and with limited device capabilities.

Keywords

Mobile decision tools, meta recommender systems, electronic word-of-mouth

1. INTRODUCTION

A recent article in the Wall Street Journal [15] points out some success factors of travel blogs, i.e., websites where people can post their travel experience in the form of a review. This article indicates that people look for different ways to obtain and share more objective information about tourist products. Where a popular travel broker may say: "This is great" or "Try this out", the personal reviews are expected to give a more nuanced view, supported by ratings and rich media data (photos, video, etc.)

Providing users with relevant recommendation information is a difficult task. In addition to the technical components, such as the user model representation and the algorithms to generate recommendations, based on the user model, one has to design an appropriate graphical interface. This must include the functions required to support the user in the decision process, and convince her about the appropriateness of the recommendations. In the mobile context this can be regarded as a challenging task. Users tend to limit the interaction with the system for many reasons: connection and data exchange costs, environmental disturbances (noise,light,etc.), parallel activities of the user (driving, travelling, etc.). Besides these external influences, the device itself brings additional constraints, such as, small computation capabilities and limited input and output modality.

Our research focuses on methodologies and techniques for improving the user acceptance of product recommendations and for explaining these recommendations in the mobile context. To achieve this, we have developed a new approach where both product descriptions and user reviews are incorporated. We believe this approach, exploiting the hidden knowledge inside the reviews, will bring to the user more confidence on the recommendations and better product understanding. The products considered by this mobile recommender system are hotels and tourism attractions.

A user reviews can be described as a subjective piece of non structured text describing the user's product knowledge, experiences and opinions, typically also summarized by a final product rating. This non structured content introduces a number of research challenges, regarding the effectively usage of these reviews. In fact, sophisticated filtering and search techniques must be exploited to find relevant knowledge in product reviews. User opinions and products reviews are not new in the web scenario. Many product advise guides can be found on the Internet offering basic functionalities to find products, their specification and the user reviews [1]. These sites can be classified as consumer opinion platforms, which incorporate 'word-of-mouth' principles, and facilitating the exchange of product opinions between non experts [9]. There are many different motivators for these web sites [6, 9], but the most relevant for our research are: advice seeking and user involvement.

The innovative aspect of our approach is the incorporation of reviews in a structured way into the recommendation process. This means that we regard reviews as an alternative source of recommendation information, in which one can find product information, product experience and product popularity from a user's perspective. To exploit this kind of information, we use information retrieval and recommendation technologies [19]. Traditional systems, like Epinion [4], have not offered smart ways to incorporate user reviews in the product recommendation yet.

This approach could be highly beneficial in the tourism context where the tourist experience is the travel main motivation [20]. Products, or better said tourism services, lacks the

*René is affiliated with both ITC-irst and the University of Twente, Enschede, The Netherlands.

feature of "try-before-buy" or "return in case the quality is below expectance". This implies that (online) buying tourist products involves a certain amount of risk, which could be lowered by providing the user with a better product description and recommendation explanation. Another aspect, is related to the fact that a user buys more an overall experience [20, 5], rather than a single product. This experience involves three phases: anticipation (before), consumption (during) and memory (after). Reviews could contribute to the first and last phase by providing a way to gather information of similar travellers or to process the user own travel experiences.

2. RECOMMENDER SYSTEMS

Recommender systems are applications exploited in eCommerce web sites to suggest products and provide to consumers information for facilitating the decision process [18]. These systems offer personalized recommendations by incorporating the user characteristics, in terms of a persistent or ephemeral user model, and product wishes in terms of user queries. These systems implicitly assume that the user wishes and constraints can be converted, by using appropriate recommendation algorithms, in product recommendations. The recommendation algorithms either use knowledge of the domain, e.g., in content- or knowledge-based filtering approaches, or data about user's past behavior, in social filtering approaches.

The content based approach, filters the products according to the features specified by the user in a query [11]. This approach is especially useful when the product can be described by an extensive set of features. The user can specify her wishes either explicitly by providing product attribute values or implicitly, for instance, criticizing products shown by the system. Social filtering or collaborative filtering approaches can be described as technologies that try to mechanize the 'word of mouth' idea [8]. Here the recommendations are based on product rates given by a group of similar tasted people (neighborhood). Current research is mostly facing scalability issues and early-rater problems [16].

In our laboratory we have developed two recommender systems to support the user in travel planning. For the pre and post travel planning process, we have developed Nutking, a web based recommender system. Nutking enables the selection of travel locations, activities and attractions and supports the bundling of a personalized travel plan [12]. For the on-tour support, we have developed a mobile application, MobyRek [13], that supports critique-based product recommendations. In a critique-based recommender system, at every recommendation cycle, the user is allowed to criticize (i.e., to judge) the system's recommendation result [14, 3]. Both systems do not integrate reviews and, until now, we haven't found any recommender system that integrates reviews in the way we propose.

3. REVIEWS IN MOBILE DECISION AID SYSTEMS

3.1 Objectives

The overall objective of this research project is to design a methodology for mobile recommender systems that incorporates different knowledge sources and offer better recommendations in this context. The knowledge sources could be structured or not. In the first case, we consider product catalogues, where products are described with feature vectors, that can be easily queried with standard query languages. In the second case, we consider product reviews repositories, that are generated by a community of users interacting with a web site. To extract knowledge from this kind of repositories we will use social-filtering algorithms.

This methodology includes the design of a recommendation architecture in which the above mentioned sources of knowledge can be integrated together exploiting the best filtering algorithm for each available knowledge source. Some additional objectives, which will be derived from an empirical study, are the tuning parameters of each filtering algorithm and the approach for aggregating the results of the various filtering algorithms.

We aim at incorporating the previously mentioned hybrid product recommendation approach in a mobile application that users could access to obtain recommendations in a logical and straightforward way. The application will supply the user with additional functionalities (rank, sort and search) to revise the recommendations and better fit her wishes. Partly, these design principles will be derived from a user behavior study.

Moreover, we aim at providing an improved explanation of the recommendation to the user. In fact, in the currently available systems, the user only receives the recommended product together with an overall score indicating the appropriateness of such recommendation [7]. This kind of explanation is quite rudimentary and may raise doubts and questions to the user. We think to improve this explanation by providing the relevant reviews of similar tasted users. Moreover we aim at increasing the product acceptance rate. In fact, in current systems, a user is only able to retrieve the information provided by the supplier. As discussed before, travel decision making must consider the risk the service will fail to satisfy the user. Hence, we want to minimize this risk, and we hypothesis that reviews can contribute to attain this goal [6].

3.2 The Methodology

To convert our ideas into design principles, we have done a user behavior study in a group of 29 students. In this study we investigated the usage of product descriptions and reviews in the booking process of two different types of products: hotels and attractions. It is worth mentioning some differences found in the initial product filtering for the two product types. Hotel filtering was, in general, based on specific product features whereas for attractions people were more biased by the reviews. Another interesting result is the correlation between the perceived usefulness of product reviews and previous experience with product reviews web sites. These people, with previous experience in such type of content, where also more interested in negative reviews.

The design principles derived from this user behavior study together with our own ideas were incorporated into a system design. Since, one of the most important goal is to incorporate different knowledge sources we have adopted an meta recommender system architecture [17]. A meta rec-

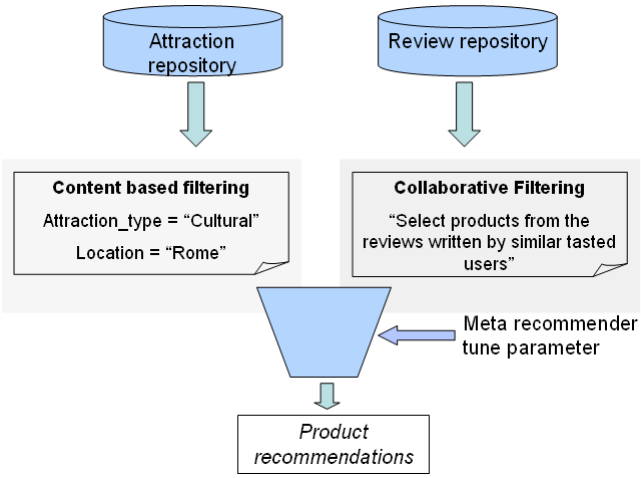

Figure 1: Meta recommender architecture

ommender provides users with personalized control over the generation of a single recommendation list, formed from a combination of rich data [17]. This personalized control can be implemented letting the user to explicitly control the influence of a specific data sources. Or, when using an implicit approach, it is up to the system, exploiting past user interaction, to decide how to balance the different knowledge sources. In our approach, if the product to be recommended has a rich structured description (e.g. a hotel), then the system tends to use more the content-based filtering approach. Conversely, if the product is poorly described, in term of attributes, then the system relies more on social-filtering. Burke [2] has also proposed to combine two recommenders into one 'mixed' hybrid recommender.

Figure 1 displays an overview of our approach. The attraction repository contains the tourist products to be recommended, and the review repository contains reviews about those attractions and a link to the review writer description. To filter the tourist product repository, we will use a content based filtering approach. The user can either specify the searched attraction or criticizes those recommended by the system.

Conversely, we will use a collaborative based approach to derive product review recommendations. We hypothesize that the products to be recommended are those having very popular reviews written by similar tasted users. Hereby we make a distinction between a positive review, which contributes in a positive way to the product score computation and a negative one that brings an opposite effect.

The final product recommendation score is computed by integrating the results of both recommenders. At this moment, we are considering different options regarding integration approach, such as a minimum or maximum function, which takes either the minimum or maximum score of both recommender as output, or a weighted average function, where the weights can be derived from either explicit or implicit user preferences for a certain recommender.

3.3 Screen Shot of the Prototype

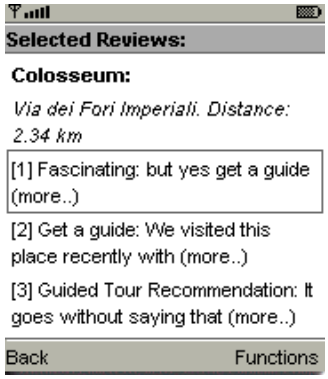

Figure 2: Screenshot of the prototype

Figure 2 presents a screenshot of the prototype recommender system. With this product recommendation, the user can find three summarized reviews written by the most similar users, that reviewed this product. In case the user is interested in reading the whole review, she can retrieve it by using the "Get complete review" functionality. Other functionalities are the retrieval of the next five best recommendations, the search for reviews satisfying some given constraints (text-length, date, review attitude) or those containing some keywords.

Before this stage, the user could filter some products and get recommendations, either entering her preferences or giving feedback, in the form of wishes and critiques, to some offered product recommendation.

3.4 Expected Results

3.4.1 *Increase Trust*

When booking a tourist product, the user wants to be sure that the product will satisfy her travel wishes and desires. In fact, nothing is worse than staying in a place you don't like. As we mentioned above, travel services cannot be "try-before-buy" and the traveller cannot return goods if they do not meet her taste. Our idea is that reviews will increase the user trust in the recommended products, since she can read more objective views, both positive and negative, of a large group of similar users.

3.4.2 *Increasing User Loyalty*

The availability of reviews can further push the user to share his knowledge and travel experiences. This makes the user more loyal to the system, since the user feels himself part of a community (system users). Moreover, the user can obtain recognition from other users, and this could eventually lead to a higher status inside this community [10].

3.4.3 *Better Product Understanding*

Reviews can be provided to the user as an explanatory tool. Reading comments written by similar people, the user can better understand if a product is (or is not) suitable for her. Product reviews can also be beneficial in understanding how to formulate a better product query and hence to simplify and shorten the human/computer interaction.

3.4.4 Exploring Hidden Knowledge

We hypothesize that reviews can provide 'local-available' knowledge. Local available knowledge can be described as knowledge you gain once you have visited the place, but you can not find using the product descriptions. For example, a review writer could suggest to visit a really nice fish restaurant after having enjoyed the view of the Garda lake.

4. CONCLUSION

This paper presents a new and innovative approach to incorporate different sources of knowledge in a mobile recommendation process, by using an meta-recommender approach. We believe that this approach will lead to more personalized and better recommendations.

Further research will be done in the field of user behavior modelling, exploiting a general agreed framework, such as that provided by an ontology. Besides this, we will look for ways to adapt the reviews to the mobile context. Hereby we will investigate summarization techniques and functionalities to retrieve reviews with a specific attitude, either positive or negative.

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