STEF: Personalized Trade Exhibition Recommendation

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Abstract

In this study, a novel recommendation technique is proposed by integrating the user-based and item-based recommendation approaches. A recommender system, called Smart Trade Exhibition Finder (STEF), is proposed to tailor relevant trade exhibition information to particular business user, and to help exporters reduce the time, cost and risk involved in selecting, entering and developing international markets. This study aims to enhance intelligent government online services, especially in government to business service domain. The outcome of this study will significantly overcome the drawback of existing recommendation approaches.

Keywords: personalization, recommender system, user-based recommendation, item-based recommendation

1. Introduction

In the past ten years, personalization and recommender system techniques have gained much attention to overcome the information overload problems. Personalization is a relatively new field, and different authors provide various definitions of the concept. According to Eirinaki and Vazirgiannis [1], web personalization refers to the process of customizing the content and structure of a website to the specific and individual needs of each user taking advantage of user's navigational behavior. Web personalization can sharply respond to a user's unique and particular needs. Mobasher et al. [2] define web personalization as an act of response according to the individual user's interest and hobby on Internet usage.

Recommender system is the one of most popular application of personalization techniques and it refers to the systems which aim at filtering out the uninteresting items (or predicting the interesting ones) automatically on behalf of the users according to their personal interests and preferences. A recommender system helps either predict whether a particular user will like a particular item , or to identify a set of *N* items that will be of interest to a certain user [3]. The previous literatures show that most existing recommender systems adopt two types of techniques: content-based approach and collaborative filtering (CF) approach. A content-based approach relies mainly on content and relevant profiles to offer recommendations. CF approach offers recommendation based on the similarity of group users.

The Australian Trade Commission (Austrade) is the Australian government agency that helps Australian companies develop international markets. Austrade is represented in 109 locations in 57 countries all over the world. Organizing trade exhibition participation and helping more Australian companies succeed in export are the important tasks conducted by Austrade. International trade exhibitions are frequently used in exporting firms' marketing strategies and are of great value for exporting firms to communicate with potential and current customers from many countries in a short period of time (http://www.austrade.gov.au). As the number of trade exhibitions' visitors increase, trade exhibitions have become a relatively important promotion tool for industrial firms. It is vital that government help companies choose right trade exhibitions. However, Austrade can only offer the simple database match function from their online service websites. Therefore, to the end of this study, a recommender system prototype named Smart Trade Exhibition Finder

(STEF) is developed to help companies choose the right trade exhibitions.

This study aims to enhance intelligent government online services, especially in government to business service domain. The outcome of this study will significantly overcome the drawback of existing recommendation approaches. In the study, a novel recommendation approach is used to improve the existing techniques by the integration of user-based and item-based recommendation approaches.

2. Related Works

Various approaches for recommender systems have been developed that utilize either demographic, content, or historical information. Such a system suggests information based on user's preference and past behaviour. A variety of recommendation techniques have been proposed to overcome the problem of information overload. In the past ten years, recommender systems have been used in a number of different applications, such as email filtering [4], online news filtering [5], music [6], movie (e.g. MovieLens.com, MovieFinder.com,), expertise finder [7], and E-commerce domain (e.g. Amazon.com, CDNOW.com) etc.

There are four types of recommendation techniques in the existing research efforts, including content-based, CF-based, knowledge-based, and hybrid approach. In the content-based approach, it recommends web objects that are similar to what the user has been interested in in the past. With content-based approach, Mooney and Roy [8, 9] proposed a content-based book recommending using learning for text categorization. Gauch et al. [10] proposed a real time video scene detection and classification. Cheng and Yang [11] proposed a new content-based access method for video databases. Fleischman and Hovy [12] proposed a natural language processing approach for recommendation without user preferences. Carenini et al. [13] proposed a set of techniques to intelligently select what information to elicit from a user. Whereas in CF-based approach, one identifies users whose tastes are similar to those of the given user and recommends items they have liked. CF has been known to be the most popular recommendation technique that has been used in a number of different applications such as recommending web pages, movies, articles and products. A third type is knowledge-based recommender systems, where one uses knowledge about users and products to pursue a knowledge-based approach to generate a recommendation [14]. Knowledge-based recommendation attempts to suggest objects based on inferences about a user's needs and preferences. Some of these systems employ techniques from case-based reasoning [15] for knowledge-based recommendation, such as restaurant recommender Entrée [16]. A common thread in recommender system research is the need to combine recommendation techniques to achieve peak performance, because all of the known recommendation techniques have strengths and weaknesses.

3. Algorithms in STEF

Our approach involves the six steps. A summarized algorithm is presented in Table 1 below.

There are a list of M users $U = \{u_1, u_2, \ldots, u_M\}$ and N items $I = \{i_1, i_2, \ldots i_N\}$. Each entry $a_{m,n}$ presents the preference scale (rating) of the *m-th* user on the *n-th* item and it can as well be 0 indicating that the user has not yet rated that item, here m={1, 2,…, M}, n ={1, 2, ..., N}.

The first step computes the similarity of two items i_p and i_q, here $p, q \in N$. Many measures can be used to compute the similarity between items. In this step, the correlation-based similarity measure [17] is employed in order to take into account the variances in user ratings. We denote the rating similarity between two items i_p and i_q as $I_{sim}(i_p,i_q)$.

After computing the similarity between items, in this second step, we look into the target users ratings and use a technique to obtain predictions value by the *weighted sum* approach.

Table 1. Algorithm for recommendation generation

Algorithm: STEF Recommender System
Input:
$a_{m,p}$, $a_{m,q}$ as the rating of user *u* on item i_p, i_q respectively;
$\bar{a}_p$ and $\bar{a}_q$ as the average rating value of the different users on *p-th* and *q-th* item respectively;
Output:
$P_{a,p}$ denotes the prediction value of target user *u* on target item i_k.

FOR a list of *M* users and *N* items, DO
(1) computing the similarity $I_{sim}(i_p,i_q)$ of two items i_p and i_q by correlation-based similarity measure, here $p, q \in N$.
(2) computing item-based prediction value by the *weighted sum* approach ;
(3) computing user-based similarities $U_{Sim}(i_p,i_q)$ using the standard vector-based cosine similarity;
(4) computing user-based prediction value;
(5) generating recommendations.
END

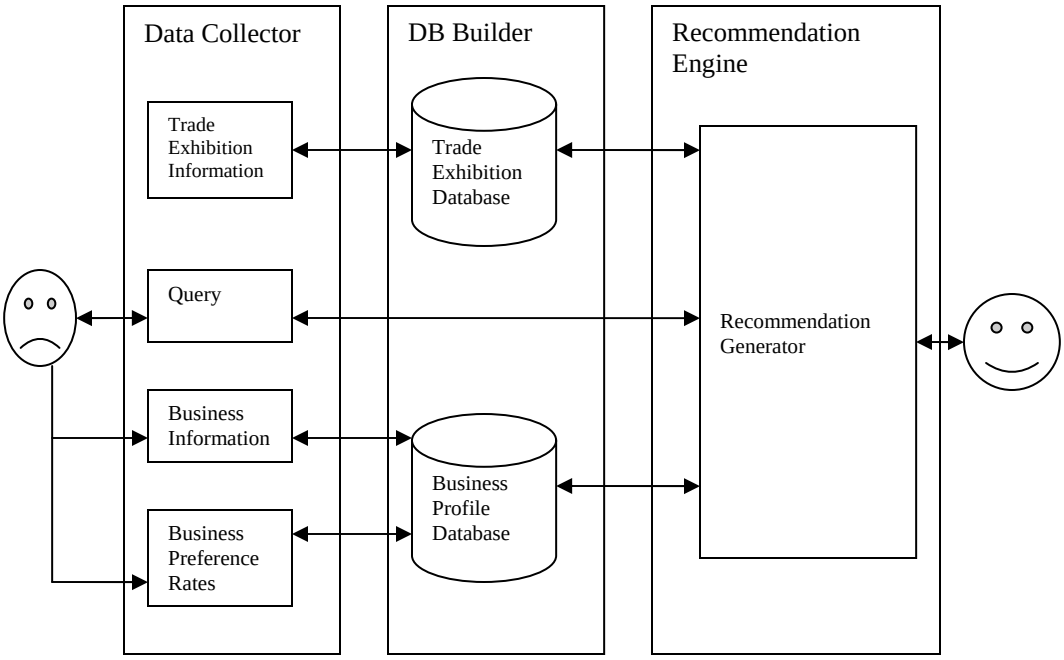

Fig 1. STEF Architecture

In the third step, we compute user-based similarity $U_{sim}(i_p, i_q)$,and the standard vector-based cosine similarity formula is used.

In the fourth step, we use all available neighbors, and compute a prediction value of the target user on the target item by performing a *weighted average* of deviations from the neighbor's mean.

Finally, in the fifth step, we represent the final prediction value of active user for target item by linear combination of user-based prediction value and item-based prediction value.

4. STEF Architecture

The STEF architecture is shown in Fig 1. The STEF recommender system constitutes of the three components:

- Data Collector. It involves the collection of business information, preference, and trade exhibition information;
- DB Builder. It involves the development of databases - business profile DB and trade exhibition DB;
- Recommendation Engine. It suggests trade exhibition to individual business according to user's preference.

The first two components, Data Collector and DB Builder, are fairly simple to build up by the database development techniques. The main part of the recommender system is the Recommendation Engine.

5. Conclusions and Further Study

International trade exhibitions are a fantastic way to find new markets and customers for international businesses. The benefits of an exhibition are numerous. It creates an awareness of your business in a foreign market, gains first hand knowledge or simply teaches about how international businesses are run. The study develops a recommender system STEF to suggest relevant trade exhibitions to exporters for the improvement of product export and international business. Furthermore, a novel recommendation technique by integrating the user-based and item-based recommendation approaches is proposed to overcome the weakness of the existing recommendation techniques. The further study will focus on the test of system accuracy and performance, and the different recommendation approaches also need to be compared in the further study. Also, we will improve the system by semantic approach to resolve the recommendation problem of less or no rating data of a new item.

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