APPLICATION OF RECOMMENDER ENGINE IN ACADEMIC DEGREE AND POSTGRADUATE EDUCATION KNOWLEDGE MANAGEMENT SYSTEM

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Abstract: Now, Knowledge Management System (KMS) has been used in some universities, although, it does help to improve knowledge sharing and innovation capacity, another problem appeared: a large amount of data is submitted to KMS everyday, it is difficult to find proper content only by searching engine. Because we are not adept at accurately defining our needs with appropriate keywords and searching engine is hard to satisfy the individuality demand. However, Recommender Engine has emerged as a promising alternative to searching information due to its ability of recommend content to users based on the source of user's information, behavior and collection intelligence. This paper gives an overview of the concept of recommender engine, then introduce an architecture for building recommender engine in academic degree and postgraduate education KMS. Base on the project research, this paper proposes a new knowledge discovery architecture, which combines recommender engine with Searching Engine. The issues and solutions of Recommender Engine have been discussed in this paper and some recommender techniques also been proposed to show how a Recommend Engine work in academic degree and postgraduate education KMS.

1 INTRODUCTION

The development of academic degree and postgraduate education measures the academic level and teaching quality of a university. Advanced education theories, practices and experience should be applied in the management of postgraduate education. Now Knowledge Management System (KMS) has been used in some universities to improve the knowledge sharing and innovation capacity. As a result, a large amount of data is submitted to KMS everyday, such as official documents, academic papers, scientific research items, work plans and reports, the information about enrolment, education, academic degree, employment and so on. Although, KMS does improve education management on some level, another problem has arisen: it is difficult to find proper content only by searching engine in such huge database. With the data and content increasing in KMS, finding the just right information becomes so difficult. 1) The traditional Searching Engine can just find the information which we specialize exactly by keywords, but we can do nothing if we can't describe it with appropriate keywords. 2) Most valuable data and content has just been recorded, but we need a tool which can make the information we need appear in our screen automatically. 3) We can't use the data and content that is useful and valuable which was not recorded in the system.

Fortunately, recommender engine can forecast our interesting information with our behaviors and then push the information automatically. Because recommender engine records our behaviors when we use the system, it can keep the process of using data in KMS.

We propose a new architecture of KMS which combines with recommender engine, then analyzes the composite of the architecture. We also introduce an example to explain how to use recommender engine in the academic degree and postgraduate education KMS.

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2 RECOMMENDER ENGINE

Recommender engine is a specific type of information filtering system technique that attempts to recommend information items (books, news, images, web pages, scientific literature such as research papers etc.) that are likely to be of interest to the user. In recommender engine users' interest is expressed by rating their items. And recommender engine uses this data to predict the ratings of items which the users have not considered yet. Finally, recommender engine uses the predict ratings to recommend the most interested items for the users.

A typical architecture of recommender engine is as follows: Firstly, recommender engine collects the information which needs to compute. These sources include the users' features (e.g. age, profession, position and department), the item features (e.g. keywords, genres) and the user-item preferences data (gathered through questionnaires, explicit ratings, transaction data). Secondly, recommender engine compares the collected data with similar data which collected from others and calculates a list of recommended items for the users. Many techniques are used to implement the recommender, such as Demographic-based Recommender, Content-based Recommender and Collaborative Filtering (CF) which includes User-based Recommender, Item-based Recommender and Model-based Recommender. This technique is the core of recommender engine, which decides the accurate and personalized of recommender. As it was introduced by Amazon firstly, Collaborative Filtering is widely implemented. Thirdly, recommender engine pushes recommendation to the target user, and the content which given to the user is not considered yet. With the help of recommender engine, users can get more information than ever.

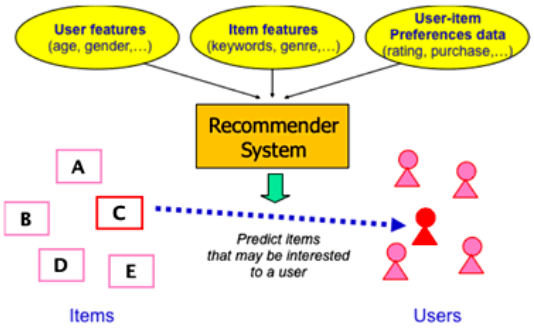

Figure 1: Overview of recommender engine.

3 ARCHITECTURE OF RECOMMENDER ENGINE

3.1 Collection Intelligence

As we know that a large amount of education information is added everyday, traditional searching engine only find what we can specialize by keywords. So knowledge is just stored in the database or hard disk. And in traditional knowledge management, collective intelligence locked in the data which has generated when people search content, download documents, and interact with others is ignored.

Obviously, we need a new architecture to mine the accumulated knowledge. Recommender engine has emerged as a promising alternative of searching engine due to its ability to discover items which users might not find by themselves. Recommender engine can use collective intelligence by tracing and recording users' behaviors, then predicting items.

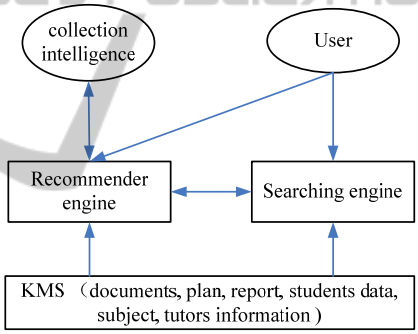

Figure 2: Architecture of Recommender engine in KMS.

And the excellent advance of this architecture is that the collective intelligence is to be recorded in KMS by recommender engine. As we know, collective intelligence is an important part of organizational knowledge, and we can use it to predict accurate items for special users and discover more knowledge which we would never find it by traditional technology.

3.2 Recommender Engine Versus Searching Engine

Although, traditional searching engine has advantage in mining knowledge, we shouldn't abandon it in KMS. So recommender engine and searching engine must be used together to provide searching service. Here, we propose a new architecture of KMS (Figure 2).

Figure 3 shows that recommender engine has the same importance of searching engines. Both engines get data from KMS which has the same architecture as before. We also see that recommender engine uses the index of searching engines to increase systemic efficiently.

3.3 User's Interested Data Collection

It is believe that the more the recommender engine understands the users the more accurate it can recommend. So first of all, we adopt recommender engine in KMS which collects users' interesting. There are two methods to collect the data. The first is explicit method which collects interesting data by asking the user directly. Sometimes the user gives his rating to special items or content. The second is implicit method which collects interesting data by tracing user's activities or behavior. This process is completed automatically, but the implicit data must be filtered before used to predict because the behavior can't reflect the interesting of users.

However, all the users of the KMS have the duty to contribute their knowledge to KMS. So we can make some regulations to require users to submit all the interesting data to the engines. It can not only increase the accurate of recommender but also record the collection intelligence in the KMS.

3.4 Security and Privacy

The problem of security of items is also existent in the recommender engine. To protect the security of data, a secure architecture is needed to filter the recommender information. In addition, recommender engine knows the interests and behaviors of the users. Most of these data is privacy and the engine needs to protect those data.

4 RECOMMENDER TECHNIQUES

The techniques used by recommender engine can be classified based on the information they use. According to the features of the academic degree and postgraduate education, this paper pays more attention to these recommender techniques as follows: Rule-based Recommender, Non personalized-based Recommender, Content-based Recommender and Collaborative Filtering-based Recommender.

4.1 Non-personalized Recommender

Non-personalized Recommender is simple because it uses any information of the users to compute the recommender items. It recommends items just base on the importance or popularity of items. The knowledge management can use these techniques to push new contents, popular contents and important contents to each user. All the users are categorized by department, and the users in same department may have the same interest. So the engine can recommend items based on the department.

4.2 Content-based Recommender

Methods use the information about item features and the ratings a user has given to items (Thomas Hess, 2009).When user searches information in KMS, his or her behavior is recorded by the Recommender Engine. The engine uses the individual information to predict items which have the similar attribute to the ones preferred in the past. The underlying assumption of the Content-based Recommender is that those who interest in the past tend to interest the similar in the future.

4.3 Collaborative Filtering-based Recommender

Obviously, both recommender technique discussed above ignore the contribution from others. And the collection intelligence is not considered. Collaborative Filtering-based recommender is used wildly in most of the e-commerce web sites. Collaborative filtering is a method of making automatic predictions about the interests of a user by collecting taste information from many users. There are three main techniques can be distinguished: user-based, item-based, and model-based approaches. But these approaches can be reduced to two steps:

1. Look for users who share the same rating patterns with the active user whom the prediction is for.

2. Use the ratings from those like-minded users found in step 1 to calculate a prediction for the active user. The following example of CF explains how recommender engine works.

If user A likes item A and item B, and user b like item A and item B, we can discover that user A and user b have same interest. So if user c likes item c, we can recommend item c to user A.

In the real recommender engine, all the above and other approaches are combined together to provide recommender service. There is an open

source project named Mahout which currently provides tools for building recommender engine through the Taste library.

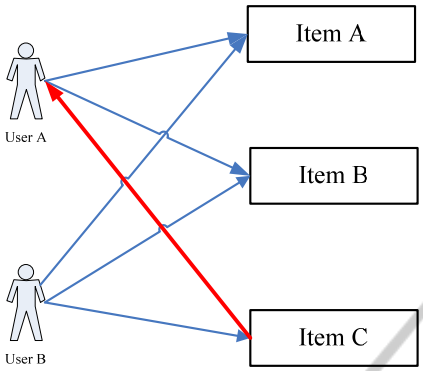

Figure 3: User-based Collaborative Filtering.

5 CONCLUSIONS

The architecture of the academic degree and postgraduate education KMS has been discussed in this paper. Recommender engine is important as the searching engine in this KMS. Both engines are combined together to provide searching and discovery service. Recommender Engine will help to find new contents which user have no idea but interesting about. Furthermore, an important feature of recommender engine is that they can record and use collection intelligence to predict interesting content to users.

This paper is a precursor to discuss the application of recommender engine in the academic degree and postgraduate education KMS. With the developed of recommender technology, the recommender's accuracy, scalability and performance will be increased. And education managers will profit by finding new interesting knowledge to improve their efficiency.

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