A Collaborative Approach for Web Personalized Recommendation System

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***Abstract* - Collaborative filtering (CF) is an important and popular technology for recommender systems. However, current CF methods suffer from such problems as data sparsity, recommendation inaccuracy and big-error in predictions. A distinct feature of typicality-based CF is that it finds 'neighbours' of users based on user typicality degrees in user groups (instead of the co-rated items of users, or common users of items, as in traditional CF). To the best of our knowledge, there has been no prior work on investigating CF recommendation by combining object typicality. Further, it can obtain more accurate predictions with less number of big-error predictions.**

***Key Words* - Recommendation, Typicality, Collaborative Filtering**

I. INTRODUCTION

Recommender systems or recommendation systems are a subclass of information filtering system that seek to predict the 'rating' or 'preference' that user would give to an item.[8]

Recommender systems have become most common in few years, and are applied in lots of applications. The most popular ones are generally bollywood - Hollywood movies, songs, news, books, research articles, search queries and products. However, there are also recommender systems for comedy, hotels, financial services, insurance services (life insurance), persons (online dating) and twitter.[8]

An information filtering technology, commonly used on e-commerce websites, that uses a collaborative filtering to present information on items and products that are likely to be of interest to the reader. The recommender system will use details of the registered user's profile and opinions and habits of their whole community of users and compare the information to reference characteristics to present the recommendations.[9]

An example of a recommender system is WhatShouldIReadNext.com, a site where users can enter a title of a recent book they have read and enjoyed to see recommended books that they are likely to also enjoy.

One approach to the design of recommender systems that has seen wide use is collaborative filtering. Collaborative filtering techniques are based on gathering and analyzing a huge amount of information on users' behaviors, activities or preferences and getting predicted on what users will like based on their similarity to other users. A main advantage of the collaborative filtering approach is that it does not dependent on machine analyzable content and therefore it is capable of accurately recommending lots of complex items.

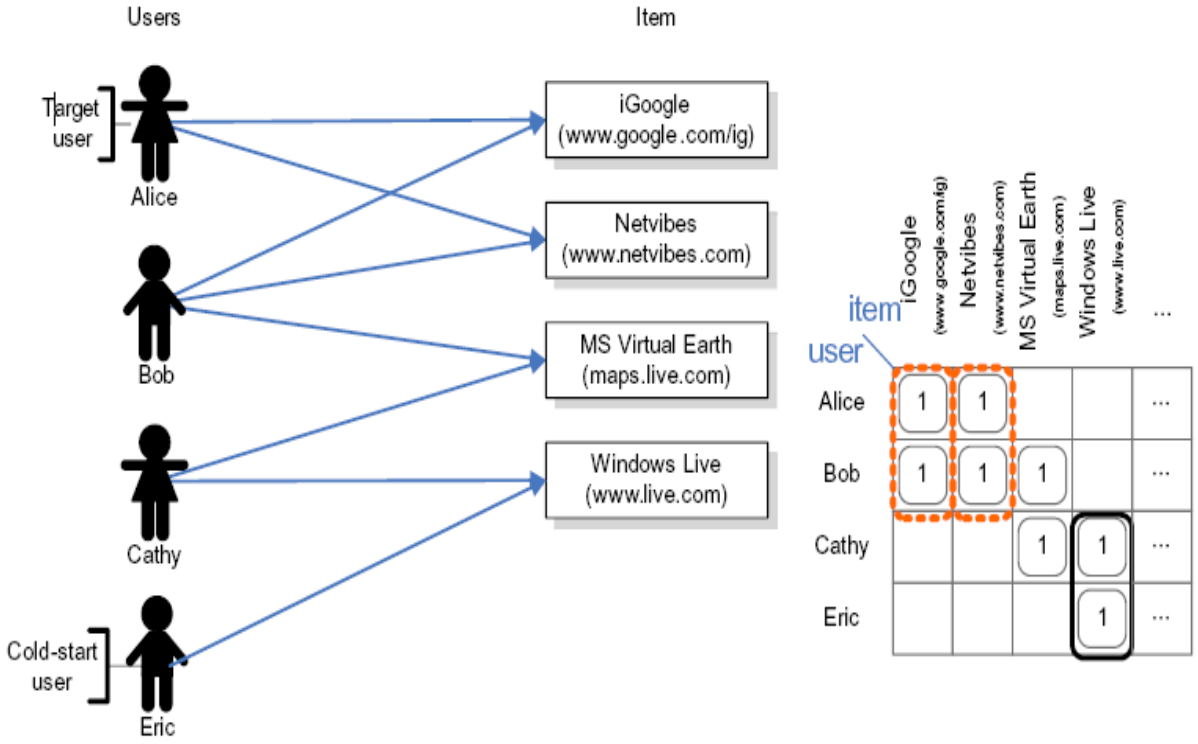

Fig.1: An example of a user–item matrix in classic CF

II. LITERATURE SURVEY

1. Typicality-based Collaborative Filtering Recommendation [3]

Collaborative filtering (CF) is an important and popular technology for recommender systems. However, current CF methods suffer from such problems as data sparsity, recommendation inaccuracy and big-error in predictions. In this paper, we borrow ideas of object typicality from cognitive psychology and propose a novel typicality-based collaborative filtering recommendation method named TyCo.

A distinct feature of typicality-based CF is that it finds 'neighbours' of users based on user typicality degrees in user groups (instead of the co-rated items of users, or common users of items, as in traditional CF). To the best of our knowledge, there has been no prior work on investigating CF recommendation by combining object typicality. TyCo outperforms many CF recommendation methods on recommendation accuracy (in terms of MAE) with an improvement of at least 6.35% in Movielens Data set, especially with sparse training data (9.89% improvement on MAE) and has lower time cost than other CF methods. Further, it can obtain more accurate predictions with less number of big-error predictions.

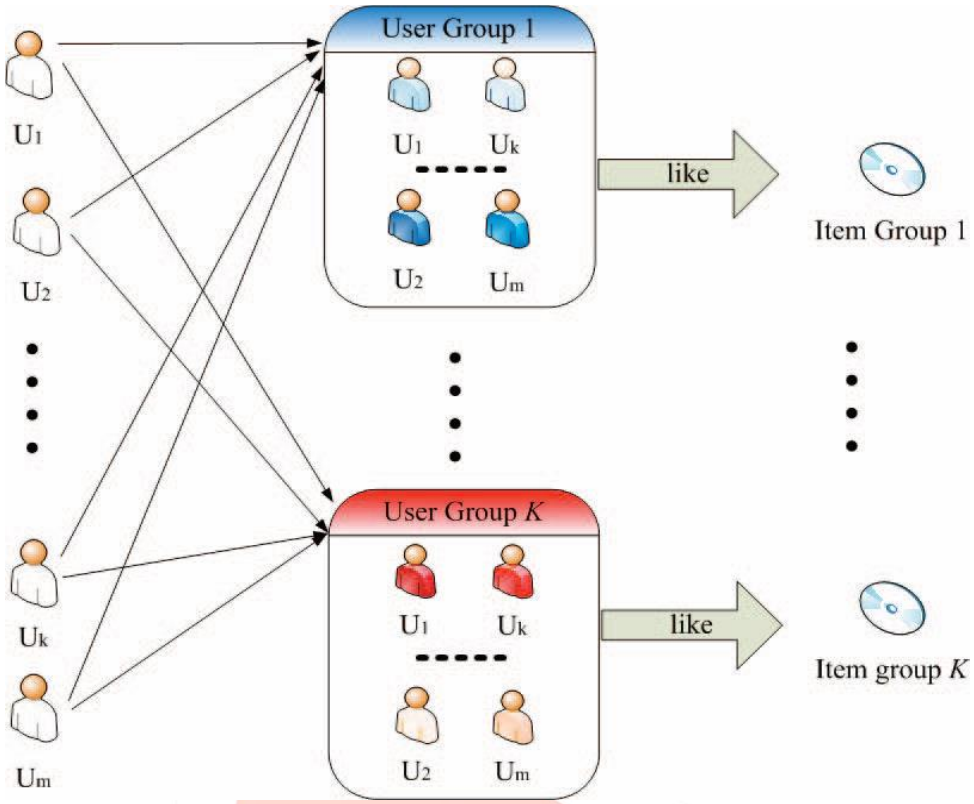

Fig.2: The relations among users, user groups and item groups

Data Sparsit - The data sparsity problem is the problem of having too few ratings and hence it is difficult to find out correlations between users and items [1]. It occurs when the available data are insufficient for identifying similar users or items. It is a major issue that limits the quality of CF recommendations [2].

Recommendation accuracy - People require recommender systems to predict users' preferences or ratings as accurately as possible. However, some predictions provided by current systems may be very different from the actual preferences or ratings given by users [2].

2. Simulation Resource Recommendation System Based on Collaborative Filtering [4]

The present simulation resource management systems are full of all kinds of simulation resources; it is inefficient to get the needed simulation resource with the traditional search methods. To solve this problem, the recommendation system based on collaborative filtering is applied to the simulation resource management system, which can recommend the most relative simulation resource to the user according to user's previous preference.

After analyzing the necessity of combining the recommendation system with the Simulation resource system, the simulation resource recommendation system is designed and realized. The realization includes three main procedures: collecting user preferences, finding neighbor users, recommending simulation resources. The recommendation system collects users' grading on used simulation resources as user preferences, and uses the Pearson correlation to calculate the similarity between users and then finds out the neighbor users.

In this simulation resource recommendation system, the way to get the preference of the resources is by means that the user takes some time to grade on the used resource. This method in obtaining the user's preference is a kind of burden to user, so it will be better to study some implicit evaluation obtaining method. Some data like click frequency and the browser time may have some relationship with user' preference, but we have no idea about what the actual relationship is, so in the next study, we could aim at finding out a reliable model for the relationship between these data and user' preference.

3. Collaborative filtering based on collaborative tagging for enhancing the quality of recommendation [5]

Our proposed method, a collaborative filtering method to provide an enhanced recommendation quality derived from user-created tags. Collaborative tagging is employed as an approach in order to grasp and filter users' preferences for items. In addition, we explore several advantages of collaborative tagging for data sparseness and a cold-start user. These applications are notable challenges in collaborative filtering. We present empirical experiments using a real dataset from del.icio.us. Experimental results show that the proposed algorithm offers significant advantages both in terms of improving the recommendation quality for sparse data and in dealing with cold-start users as compared to existing work.

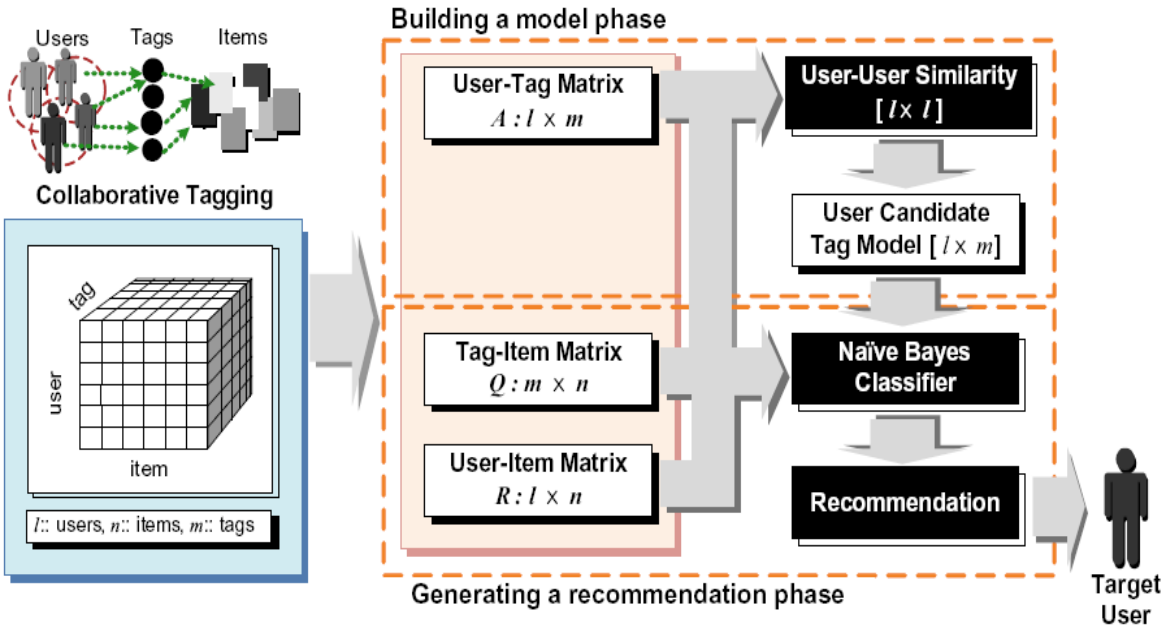

Fig.3: An overview of the proposed approach for item recommendations

There are several interesting research issues to address in order to successfully apply our algorithm to a practical environment. The empirical result showed that ‘‘noise” tags that have a bad influence on analyzing user preference can be included in the CTS. Such tags, due to the characteristics of the tag, personalized and content-criticizable (e.g., bad, my work, and to read), should be treated effectively for more valuable and personalized analyses. In addition, there remain common issues that have been mentioned in keyword- based analysis: polysemy, synonymy, and basic level variation (Golder and Huberman 2006). Semantic tagging is one of the interesting issues that we plan to consider for addressing these problems in the future.

4. Book Recommendation System Based on Combine Features of Content Based Filtering, Collaborative Filtering and Association Rule Mining [6]

Recommendation systems are widely used to recommend products to the end users that are most appropriate online book selling websites now-a-days are competing with each other by many means. Recommendation system is one of the stronger tools to increase profit and retaining buyer. The book recommendation system must recommend books that are of buyer’s interest. This paper presents book recommendation system based on combined features of content filtering, collaborative filtering and association rule mining.

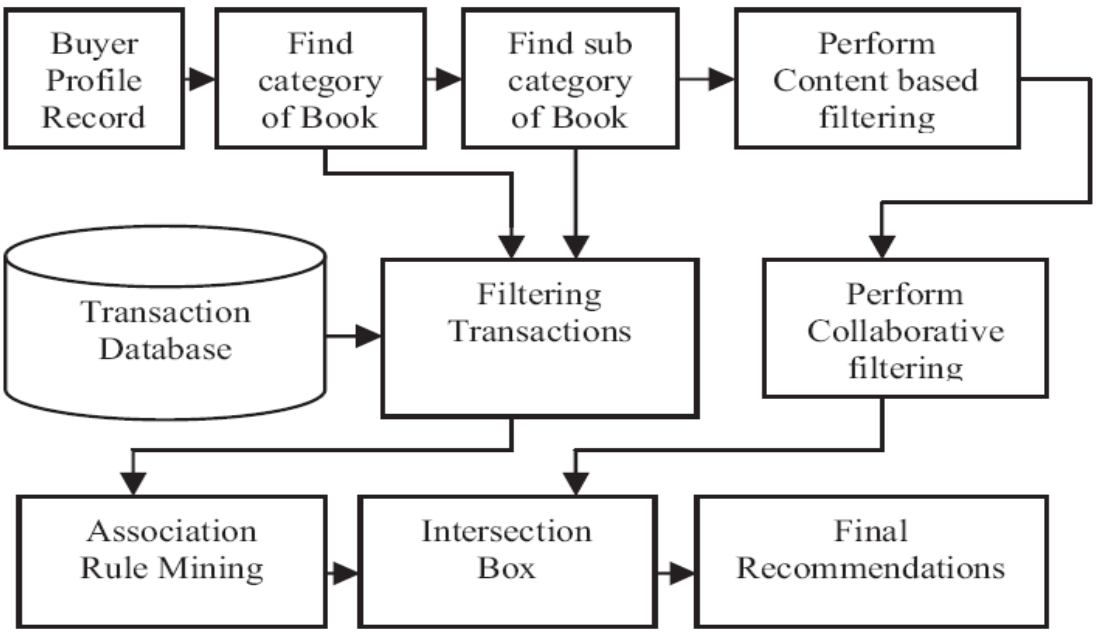

Fig.4: Block diagram of Book recommendation system

The goal of the most recommendation system is to predict the buyer’s interest and recommends the books accordingly. This book recommendation has considered many parameters like content of the book and quality of the book by doing collaborative filtering of ratings by the other buyers. This recommender system also uses associative model to give stronger recommendations. This system does not have performance problem since it built the recommendations offline.

5. Study of Collaborative Filtering Recommendation Algorithm - Scalability Issue [7]

Recommender systems provide an important response to the information overload problem as it presents users more practical and personalized information services. Collaborative Filtering technique is the most successful in the recommender systems field. Collaborative filtering creates suggestions for users based on their neighbor's preferences. But it suffers from poor accuracy, scalability and cold start problems.

The tremendous growth of the number of customers and products in recent years poses some key challenges for recommender systems in which high quality recommendations are required and more recommendations per second for millions of customers and products need to be performed. Thus, the enhancement of scalability and efficiency of collaborative filtering (CF) algorithms become progressively more important and difficult. This paper focuses on study of different collaborative filtering algorithms taking into consideration the scalability issue. The different algorithms studied are cluster based, item based and context based.

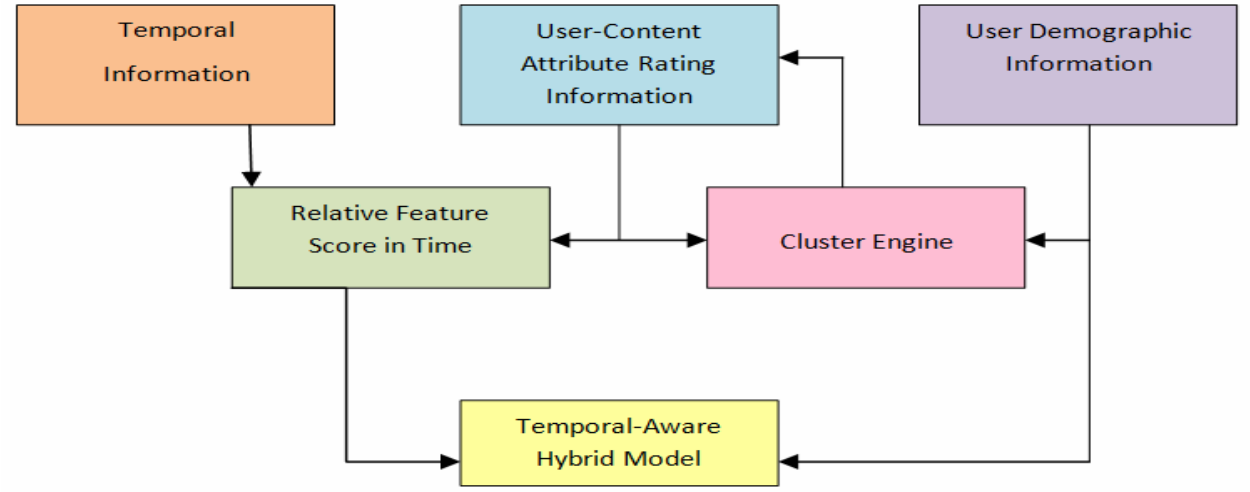

Fig.5: Offline working of hybrid recommender system with temporal information

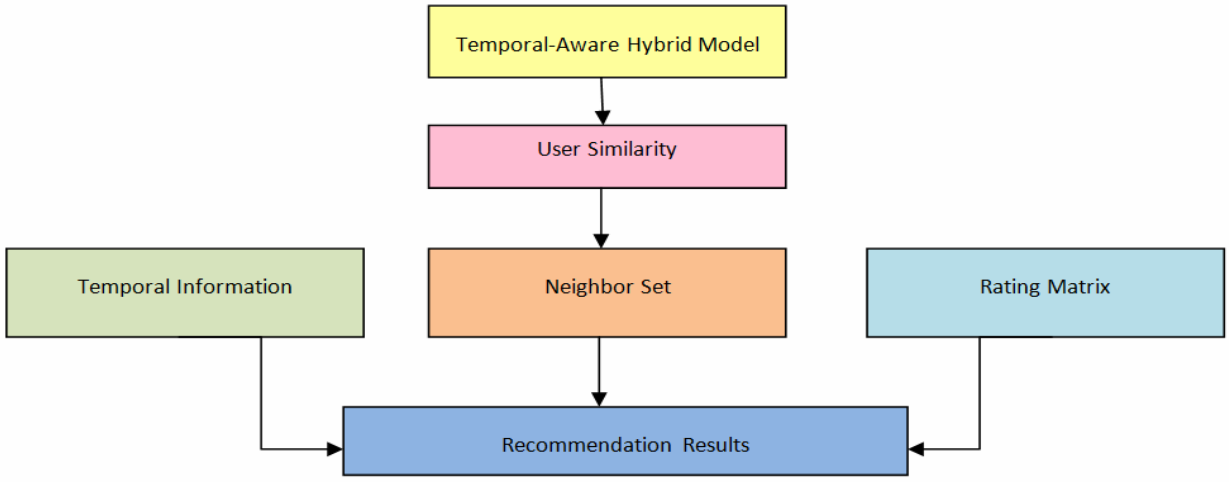

Fig.6: Online working of hybrid recommender system with temporal information

The hybrid recommender system with temporal information is best method from all methods which we have studied. Because it constructs offline to make the recommendation system to recommend item for a user within user bearable time which will also reduce the computational time. Also, it solves scalability, sparsity and cold start issue and provides final recommendation quickly and accurately.

III. CONCLUSION

In this paper, we investigate the collaborative filtering recommendation from a new perspective and present a novel typicality-based collaborative filtering recommendation method . In this method, a user is represented by a user typicality vector which can indicate the user's preference on each kind of items. A distinct feature of this method is that it selects 'neighbours' of users by measuring users'similarity based on their typicality degrees instead of corated items by users. Such a feature can overcome several limitations of traditional collaborative filtering methods.

There are several possible future extensions to our work. In this method, we do not specify how to cluster resources so as to find out item groups and the corresponding user groups. One possible future work is to try different clustering methods and see how the recommendation results are affected. How to using parallel computing methods (e.g., MapReduce) to handle the large scale applications is also one of the possible future works.

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