E-COMMERCE RECOMMENDATION SYSTEM: PROBLEMS AND SOLUTIONS

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Abstract – *The massive growth of internet in the past decade has lead to the birth of many E-Commerce websites and applications. More and more people prefer shopping online rather than going to retail stores. The main idea of online shopping is to ease the shopping experience by getting personalized recommendations of products. This is also what the E-Commerce websites are expected to do. The present recommendation system is ineffective because it doesn't handle three main problems: Limited resource, cold start and data valid time. The recommendation system consists of user model, recommended model and recommendation algorithm. This paper includes the proposed model that focuses on the improvement to the recommendation algorithm by providing solutions to limited resource and cold start problem. The proposed system aims at better customer satisfaction.*

Key Words: **E-commerce, recommendation system, limited resource, cold start, data valid time.**

I INTRODUCTION

With the rapid growth of the Internet and the development of many E-Commerce websites, the structure of E-Commerce system became very complex. Due to the stiff competition from peer websites, these websites made use of various techniques to better their website from the rest. One of the ways included by giving apt and personalised recommendation to the users. However, as the number of users increased as well as the range of items, this situation made it hard for the recommendation system to suggest users the perfect product for them.

Recommendation is the process of suggesting the right products to customers after mining their interests. An effective recommendation gives the desired customer satisfaction and at the same time helps to earn profit.

The aim of E-commerce recommendation is to take advantage of Ecommerce site to provide information and suggestion, to help consumers make right choices. Although there are many successful E-Commerce recommendation systems, there are still some challenges.

Nowadays, most popular E-Commerce websites incorporate hybrid algorithms based on item-based recommended algorithm.

Those recommender systems are able to give out some recommendations for customer, but, from the point of view of customers, there are still some problems which are needed to be solved.

From the point of view of existing E-Commerce recommendation system, some of the problems are:

- Limited resource: Personal recommendations for products with limited quantity should happen with priority, so that consumers can buy with ease.
- Data valid time: The records which are recorded to be older than three months must not be recommended because such records may become outdated and may not be accurate.
- Cold start: The visitor cold start means that a recommendation system meets a new visitor for the first time that is there is no user history and the system doesn't know the personal preferences of the visitor. Getting to know visitors is crucial in creating a great shopping experience for them.

II LITERATURE SURVEY

A. OVERVIEW

a) Deng Ailin, Zhu Yangyong, Shi Bole [1] proposed a collaborative filtering algorithm that is one of the methods used in recommendation system. The traditional algorithms focus only on user ratings and do not consider the changes of user interest and the credibility of ratings data, which affect the quality of the system's recommendation. Hence this paper presents an improved algorithm to solve this problem. The idea is based on the assumption that similar users have same preferences. Find users similarity to find the neighbors having the similar interest with that of the user.

Combine the neighbor's scores for giving the user's preference. Then the top-N items for that user are provided. But the similarity measurements in collaborative filtering algorithm pay attention to the similarity score rather than the user interest.
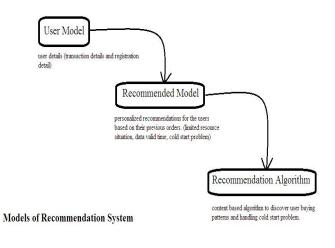
b) Wang Guoxia, Liu Heping [4] proposed survey in personalized recommendation systems. Service recommendation systems are very efficient. These are applied in a many applications. The number of customers has grown fast, resulting in big data analysis problem for the service recommendation systems. Collaborative filtering builds model from customer's past behavior as well as from similar decisions made by others having similar interests. Content-based filtering uses many attributes of an item to recommend more items having similarities in properties. These are combined to form hybrid recommendation systems. Each type of system has its advantages and

disadvantages. This paper helps to choose better algorithm strategies for recommendation based on the requirements and input set of the system.
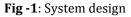
B. EXISTING SYSTEM

It is difficult for the customers to find the products they want in the existing E-Commerce recommendation systems. Limited resource situation, data valid time and cold start problems are some of the issues that have not been very well considered in existing E-Commerce recommendation systems. Various limitations are lack of consumer satisfaction, no personalized recommendation, unable to solve cold start problem, limited resource situation not properly handled, data valid time not handled properly and less efficient. The main disadvantage of collaborative filtering is that it requires data to be in order to be helpful. It has two major drawbacks that are sparsity, and scalability [6]. The drawback of content based filtering is the ability b to differentiate between a bad and a good item based on the information that is retrieved. A bad item having same keywords as that of good item will also is recommended. The other two major disadvantages are limited information about a user and overspecialization [6].

C. PROPOSED SYSTEM

Proposed system is a better E-Commerce recommendation system that can give out effective recommendations for users which are satisfying to them to a great extent. Customers can get many benefits and also the trading volume can be increased and the above mentioned three problems are also overcome. Proposed system aims at implementing the recommendation system for customers to get the items they want. Proposed recommendation system mainly consists of 3 models namely –the user model, the recommended model and the recommendation algorithm as shown in fig-1. Proposed system satisfies the consumers to a better extent. Proposed system makes use hybrid algorithm to overcome the three problems.

Models of Recommendation System

Fig -1: System design

D. HARDWARE AND SOFTWARE REQUIREMENTS

Hardware requirements:

Processor: Intel i3/i5/i7 /AMD FX Series
Ram: 4 GB or higher

Software requirements:

Frame work: DOTNET
IDE: Visual Studio 2010
Front end: ASP.NET 4.0
Programming Language: C#.NET
Back End – MS SQL Server

III METHODOLOGY

The proposed system provides the following methods to overcome the problems and for giving personalized recommendations to users. They are explained as follows:

A. HYBRID ALGORITHM FOR LIMITED RESOURCE SITUATION

Hybrid algorithm is the combination of collaborative filtering and content based algorithm shown in the fig-2.
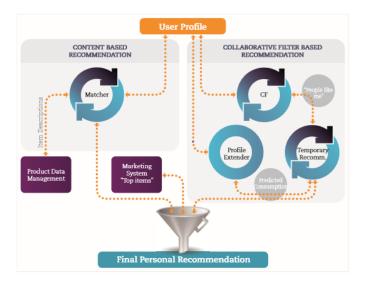

Fig -2: Overview of Hybrid algorithm

The recommendation system is developed as: first the user transaction records are scanned and support is determined for all items. Next collaborative filtering is used.

Based on the principle of collaborative filtering, the recommendation process for consumers is explained in three steps:

1. Representation of user's info. The purchasing history of attractions by consumer needs to be analyzed.
2. The generation of neighbors that is similar consumers. The similarity of consumers can be calculated according to the user's buying history

data and by applying the collaborative filtering algorithm. A neighbor consumer list is then calculated on the basis of these similarities.

3. Next is the generation of the attraction recommendations. Top-N items are then recommended to the consumer based on the purchasing history of his/her neighbors.

Neighbor customers are mainly generated based on the extent of similarity between each user. Suppose that the set of all consumers S={S1, S2... Sn}, for each consumer Si (i=1, 2... n), the system then calculates the list of neighbors and also includes the top N consumers for which the similarity is greater than the given threshold.
The similarity is calculated as:

$$Sim(Ti, Tj)=(|Si|\cup|Sj|)/(|Si|\cap|Sj|)$$

Recommendations are done by listing all the purchasing histories of the neighbors' so as to recommend the most popular ones. The various cases are shown in table-1.

B. SOLUTION FOR COLD START PROBLEM

To handle this problem, a modified random algorithm is used. At the time of new user registration, a field called area of interest is given based on which the recommendation is given to the new user.

1. Obtain the area of interest of the new user.
2. The probable users with the same area of interest and who have registered within 1 month and their purchasing histories are noted.
3. The trading volume of every product in the statistical results is calculated.
4. Trading volume is calculated using the following formulae:
   Volume = transaction containing that product/total number of transactions.
5. Sort the results by the trading volume and get top 10 products as the final recommendation.

Various cases	
Old user with history and with neighbours	Recommendation using hybrid algorithm
Old user with history but without neighbours	Recommendation using area of interest and hybrid algorithm
New user (without history)	Recommendation using area of interest through modified random algorithm

Table -1: Various cases

IV CONCLUSIONS

As the E-Commerce websites have evolved over time, personalized recommendation to users has been higher attention. Limited resource situation, data valid time and cold start problems have been some of the unsolved problems in existing E-Commerce recommendation systems. Here, a new approach has been provided that aims to provide solution to the limited resource situation and to cold start problem, which can ultimately give effective recommendations to the consumers. The solutions proposed here can be further incorporated into the various existing E-Commerce websites to improve customer satisfaction. Till now we have thoroughly understood the drawbacks of existing systems and have aimed to find solutions for them. Future work can involve incorporating many fields to handle cold start problem and also integrating user feedbacks to provide recommendations.

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