Hybrid Book Recommender System for an E-Commerce Application

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Abstract: **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.**

Keywords: **Association rule, Collaborative filtering, Content based filtering, Recommendation system.**

I.   INTRODUCTION

Now-a-days many book selling websites are available on the internet. Many of them are having their own recommendation system to recommend books to the buyers. Generally the book recommended by most of the websites is not of the buyer's interest. Generally lots of information and recommendations are pushed to buyers, but most of them are of not relevant [7]. This paper presents a new approach for recommending books to the buyers. This system combines the features of content filtering, collaborative filtering and association rule mining to produce efficient and effective recommendations.

Paper is further organized as follows. Section 2 describes content recommendation system; Section 3 presents collaborative filtering based recommendation system; Section 4 describes major point of association rule mining; Section 5 describes major tables used in book selling website. Section 6 discusses our novel approach for recommending books to the buyers.

II.   CONTENT RECOMMENDATION SYSTEM

To provide relevant information to the buyers, Web Usage Mining (WUM) is used [5]. Web Usage Mining stores the user's behavior on the internet and processes that data. WUM generate information that is generally most appropriate and relevant to the user. Recommendation system is one of the examples Web Usage Mining [5]-[6]. Content recommendation system recommends books to the buyers based on the content of the buyers past book buying history. Buying history gives the content of the *overview of the books*, in which buyer is generally interested from the large amount of books.

Content recommendation system filter books based on the content of the book, in which buyer is interested [1]. Content recommendation system uses Content based filtering for doing the separation

III.   COLLABORATIVE FILTERING BASED RECOMMENDATION SYSTEM

Content based filtering cannot find out the quality of the item. To overcome this problem collaborative filtering system are used because they are based on opinion of the other users [2]. Collaborative filtering (CF) (sometimes called "social filtering" or recommender system) is one of the ways to do recommendation on the web [2]-[3]. One of the earliest used

collaborative algorithms and results were Group Lens and Ringo [4], [2]. Item based collaborative recommendation algorithm looks in to the set of items the target user has rated and computes how much similar they are to the target item *i* and then selects *k*- most similar items {i1, i2…..,i$_k$} to the set of items the target user has rated, the recommendation is then computed by taking the weighted average of the target user's rating on these similar items [8].

IV.   ASSOCIATION RULE MINING

Association rule mining finds interesting association and correlation relationship among large data set of items [9].Market basket analysis in considered as a typical example of association rule mining. In market basket analysis customer buying habit is analyzed for finding association between different items customer put together in their shopping cart. Let I = {i$_1$, i2…..,i$_m$} be a set of items. An association rule can be represented by this form A B, where A $\subseteq$ I, B $\subseteq$ I

And A $\cap$ B=$\emptyset$ [10].

In general association rule mining can be thought of as a two step process.

(i) Generating all items sets having *support* greater than or equal to the user defined minimum support.

(ii)Generate all the rules having the *confidence* factor greater than or equal to the user defined minimum confidence.

V.   MAJOR TABLES USED IN BOOK SELLING WEBSITE

While buying books from a website customer is using the following tables to finish the buying action. The website will store the data of each customer order in its database. It is the data from which information is extracted. Major tables used in the book selling website are as follows [11].

Customers' Information Table: Table of customer'sinformation stores information of all the customers like loginId, password etc. It is shown in table 1.

TABLE 1. CUSTOMER'S INFORMATION TABLE

Field Name	Description
Login Id	Customer login Id
Customer Name	Customer Name
Password	Customer Password
Email	Customer email used for sending push Information
Mobile number	Customer mobile number

Book Information Table: Book information table stores theinformation about all the books sold by the website. It is shown in the table 2.

TABLE 2. BOOK INFORMATION

Field Name	Description
Book Id	Book ID
Book Name	Book's Name
Category Id	Book Category Id
SubCat Id	Book Sub Category Id
Book Price	Book's Price
Book Rating	Book's average rating given by the registered customers who have bought the book.

Category Table: The category table stores the entire category Id and the corresponding book's category name. It is shown in table 3.

TABLE 3.CATEGORY TABLE

Field Name	Description
Category Id	Book Category Id
Category Name	Book's Category Name

Order Information Tables: Order information tables are usedto store information about the orders the customer has already placed. It stores the ordered, Book Id, quantity etc. It is shown in table 4 and 5.

TABLE 4. ORDER INFORMATION

Field Name	Description
Login Id	Customer login Id
Order Id	Customer's order Id
Order Date	Date of Purchase
Total Amount	Total amount
Email	Email of the Customer.

TABLE 5.   ORDER DETAILS TABLE

Field Name	Description
Order Id	Customer order Id
Book Id	Book's Id
Quantity	Total Number of books bought by the Customer

VI.   BOOK RECOMMENDATION SYSTEM

Purpose of this book recommendation system is to recommend books to the buyer that suits their interest.This system has following seven steps [12]:

1. Find out the category of the book that the buyer has bought earlier like novel, science, engineering etc from the buyer's web profile.

2. Find out the subcategory of the book if there is any in the step1 found category.

3. Perform content based filtering in category / subcategory found in step1 and 2, to find out the books that are much similar to the books that the buyer has bought earlier based on the books overviewcontent from the buyers past history record.

4. On the result of step 3 perform item basedcollaborative filtering and find out the list of books inthe descending order of recommendations. In this step system actually evaluate the quality of the recommending books based on the rating given to those books by the other buyers.

5. From the book transaction database find all those transactions whose category and sub category (if there is any) is same as found in step1 and step2. Apply association rule on those transactions and find out the books that the buyer can buy afterward. Adjust the support and confidence parameters to get stronger rules.

6. Find out the intersection of the result of step 4 and 5. Arrange the intersection result in the descending order of recommendations as given by the step 4.This step is actually more refining the recommendations generated by the step 4.

7. Outcome of the step 6 is the final recommendations for the buyer. All these steps are performed when the buyer is offline and the results are stored in the buyer's web profile. When the buyer comes online next time the recommendations will be generated automatically

VII.   CONCLUSION

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.

REFERENCES

[1] Foltz, P. W. and Dumais, S. T. 1992. Personalized information delivery: an analysis of information filtering methods. Comm. ACM35 (12), pp. 51–60.

[2] Shardanand, U. and Maes, P. 1995. Social information filtering: algorithms for automating "word of mouth". In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'95).ACM Press/Addison-Wesley Publishing Co., New York, NY,pp. 210–217.

[3] Resnick, P.,and Hal, R. V., 1997. Recommender Systems, Communications of the ACM, 40, 3, pp. 56-58.

[4] Resnick, P., Iacovou, N., Suchak, M., Bergstrom, P., and Riedl. J., 1994. Group Lens: An Open Architecture for Collaborative Filtering of Netnews, Proceedings of ACM 1994 Conference on Computer Supported Cooperative Work, Chapel Hill, NC, pp.175-186.

[5] Baraglia R., Silvestri F.: Dynamic Personalization of Web Sites Without User Intervention. Comm. ACM, Vol. 50, 2 (Feb., 2007): pp. 63-67.

[6] Eirinaki, M. and Vazirgiannis, M.: Web Mining for Web Personalization. ACM Trans. On Internet Technology, Vol. 3, 1 (Feb., 2003): pp. 1-27.

[7] Thede, L.,Marshall, V.A.,RickW.:An Economic Answer to Unsolicited Communication. EC'04. (2004).

[8] SARWAR, B., KARYPIS, G., KONSTAN, J., AND REIDL, J. 2001. Item-based collaborative filtering recommendation algorithms. In Proceedings of the 10th International Conference on World Wide Web (WWW'01). ACM, New York, NY, pp.285–295.

[9] J. Han, M. Kamber, Data Mining: Concepts and Techniques, The Morgan Kaufmann Series, 2001.

[10] Agrawal, R., Imielinski, T., Swami, A. N. "Mining association rules between sets of items in large databases".In Proceedings of the 1993 ACM SIGMOD International Conference on Management of Data, 207-216, 1993.

[11] LuoZhenghua, "Realization Of Individualized Recommendation System On Books Sale" IEEE 2012 International Conference on Management ofe-Commerce and e-Government. pp.10-13.

[12] Anand Shankar Tewari,AbhayKumar,AsimGopal Berman. 2014. IEEE   International Advanced Computing Conference (IACC).