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ISSN: 2277-9655
[Dwivedi*, 6(12): December, 2017] Impact Factor: 4.116
IC™ Value: 3.00 CODEN: IJESS7

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

A BRIEF INVESTIGATION ON RECOMMENDER SYSTEMS STRATEGY

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DOI: 10.5281/zenodo.1130893

ABSTRACT

In the era of World Wide Web, where the number of choices is irresistible, there is need to prioritize, filter, efficiently and effectively deliver significant information to solve the problem of information overload, which has posed a potential crisis for many Internet users. Recommendation systems answer this problem by penetrating through voluminous dynamically produced data to offer users with personalized information and services. This paper puts light on the various features and existing power in different prediction methods of recommender systems for assistance in research and practice in the area for developing powerful recommendation systems.

KEYWORDS: Collaborative Filtering, Recommendation System, Content based filtering, Web Usage Mining

I. INTRODUCTION

In today's competitive business environment where World Wide Web is deeply involved in almost every buying and selling of product and services. Every e-commerce strongly wishes to expand his business reach to wide range of customer. They apply different tactics to attract the customer to attain the bidirectional benefits. Due to drastic change in marketing strategies, it is impossible to grow any business organization depending on the traditional recommendation system. Somehow they need to switch to advanced web based automatic recommendation systems to detect the change in the customer's sentiments, buying patterns, personalization's etc. Thus, Recommender systems [1] or recommendation platforms /engines/ systems/ frameworks are a subclass of information filtering system that inquire about to predict the 'rating' or 'preference' that a user would give to an item. So far, various recommendation systems based different techniques have been developed. For example, while browsing an item (Watch - Sonata) in Amazon, based on the action figure you just bought. Amazon in fact takes it a step advance by recommending its own pack related to the product you're looking at. There are mainly three types of recommendation systems [1] [2]: Collaborative filtering, Content-Based Filtering and Hybrid Recommendation Systems.

Collaborative filtering- This method is generally anchored in gathering and analyzing data on user's behaviors, their preferences or activities performed and predicting what they shall like depending on the similarity with other users.

Content-Based Filtering - These methods are depended on the depiction of an item and a report of the user's favorite choices. In this, keywords are targeted to portray the items; besides, a user profile is formed to predict the category of item this user likes.

Hybrid approaches can be framed by performing content-based and collaborative-based predictions independently and then combining them, moreover, by joining content-based capabilities to a collaborative-based strategy and vice versa; or by unifying the approaches into a single framework. There has been much work on the collaborative filtering (CF).The classification of recommendation system in figure 1 shows detail taxonomy [3] of it.

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Impact Factor: 4.116
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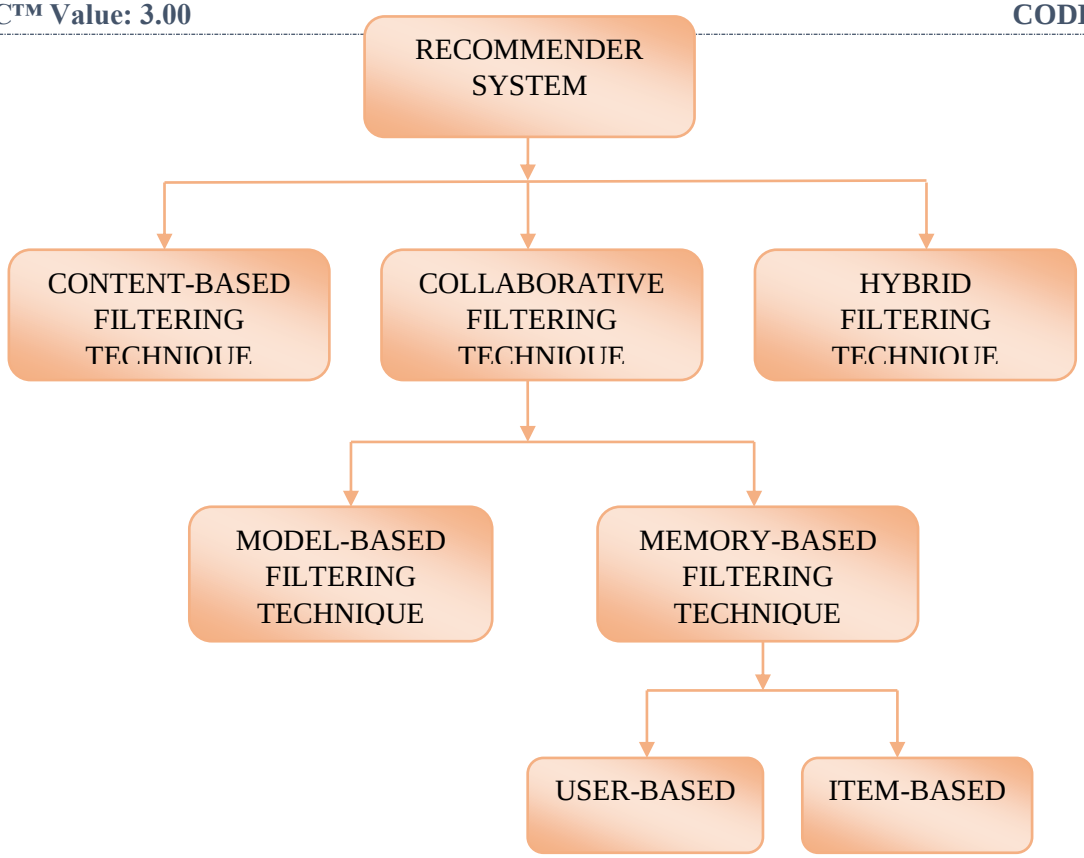

Figure1: Classification of recommendation system

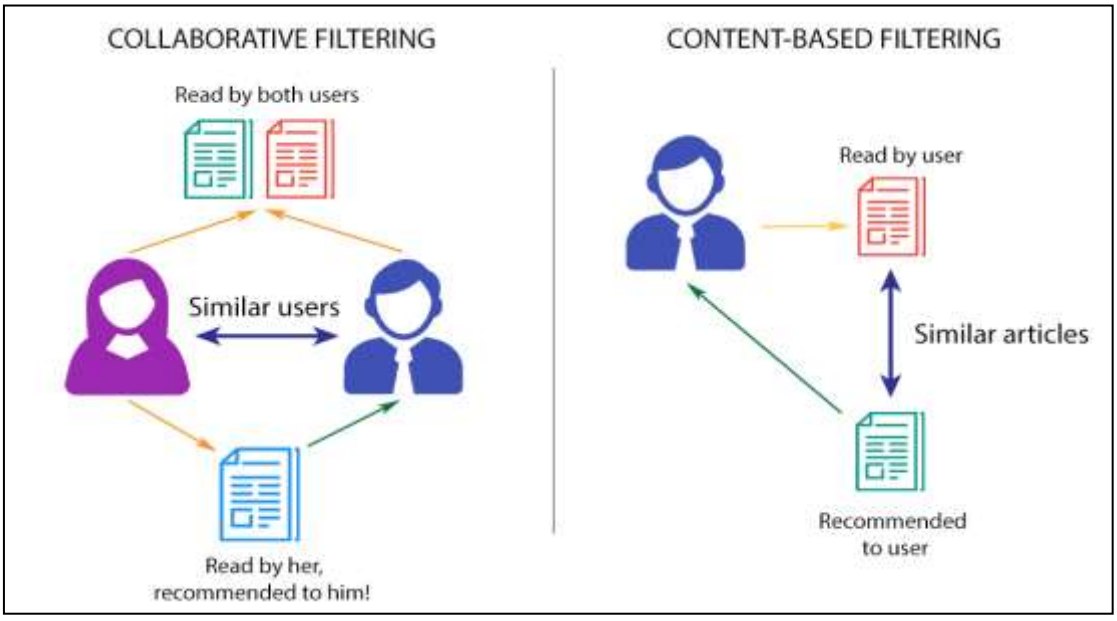

Figure: 2 Action figures of CF and CBF in Recommendation systems

II. RELATED WORKS

M. J. Wang and J. T. Han., [1] developed an algorithm of CF that has capability to calculate the rating of an article that has not rated by the customer based on study of the article quality. This method enhances the accuracy of recommender system and prediction in case of the sparsity of customer rating data. This scheme is

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based on content-based filtering so if article do not hold much information to discriminate each other, the system is not able to perform accurate prediction.

G. Zhoo,J.sun & Xueli Yu [2] proposed A framework for multi-type recommendation, it contains advantages of involving a few cases in online and adjusts the rating of primary items through associative other type items in order to find the perfect recommendation and also it is scalable but suffers with problem of cold start and Data Sparseness.
Y. Jiang, J.Liu and M. Tang [4] have given an effective web service recommendation method based on personalized CF; it has improved performance and Accuracy by developing an effective personalized hybrid collaborative filtering. The problem of privacy issue is not handled; mean absolute error and improvement in time consumption is still need to be addressed.
Q. Wang, X. Yuan and M. Sun [5] devised Collaborative Filtering recommendation algorithm based on hybrid user model which has scalable, improved accuracy. Still suffers with poor performance and Higher Model building time. There is need to work on algorithm side for optimized allocation and execution process.
C.Huang and J.Yin[6] developed the effective association clusters filtering to cold-start recommendation with the help of Combination of CF and clustering to improve scalability and sparsity problem. Privacy and time stamping is still a major problem.
Liang He and Faqing wu. [7] given a Time-context based collaborative filtering algorithm which has enhanced both the prediction accuracy & recall ratio of standard user-based CF with its easy implementation. Proposed TBCF algorithm was used to enhance the performance in traditional Collaborative filtering approach. Sparsity problem still persists as a problem in it.
S. G. Moghaddam and Ali Selamat [8] developed a novel hybrid recommendation technique that attains the benefit of both memory- based and model-based collaborative filtering methods by combining user-based collaborative filtering method with DBSCAN. The proposed system exploits density-based user clustering. This method enhances accuracy along with scalability.

With the above literature review, it is observed that the many researchers have done a lot in this area of research on recommendation systems, and now I came to know that there are different types of issues still present in different recommendation system. Such as scalability, cold start, sparsity, privacy issue etc

III. METHODS

The recommendation system generally works in four main important phases- 1.Collection of data, 2.Storing the data, 3.Analyzing the data, and 4. Filtering the data

The collection of data as the web log generated by the interaction of users with website, now, it is an easy task. The storage of data can be done in any database software (NoSQL etc.) where analysis can be performed.

The next analysis of data is a very complex and much technical task. Here, some of the ways in which data can be analyzed are given below:

Batch analysis targets to process the data periodically. This strategy puts constraints that sufficient data must be produced in order to get the analysis relevant, like- day by day sales volume. This might do fine to inform by an e-mail at a later date.

Real-time systems can process data as it's generated. This type of system usually involves techniques that can process and analyze stream data. This is very popular and demanding analysis in business environment. A real-time system would be essential to provide instant recommendations to user.

Near-real-time analysis lets you collect data swiftly so you are able to refresh analysis every few minutes or seconds. It is best for providing recommendations at some point in the same browsing session.
Filtering the data:

- **Content-based:** A popular, recommended product has similar characteristics to what a user views or likes.
- **Cluster:** Recommended products go well together, no matter what other users have done.
- **Collaborative:** Other users, who like the same products as another user views or likes, will also like a recommended product [10].

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Algorithm	General sketch of neighborhood algorithm
Input	Number of items to be recommended N ∈ ℕ Number of neighbors used for ranking k ∈ ℕ User to recommend items to u, List of all items , Items, User-Item matrix of rating R
Output	N items to be recommended **Foreach** item ∈ Items do If item ∉ u.rated_items then Item.rank ← rank_according_to_nearest_neighbours (k,u,item) descending_rank_sort(Items) **Return** top(N,Items)

Techniques such as K-Nearest algorithm, Jaccard's coefficient, Cosine Similarity, Dijkstra's algorithm are applied to better relate the data sets of user's for recommendation based on the rating. For example, the similarity among users can be obtained on the basis of the ratings to the items posted by users. If two users post nearly same ratings to an item then these two users are associated to each other. A formula is derived for computation of how much two users are associated to each other.
The formula is as follows -

$$\mathrm{Sim}(a,b) = \sum_{i=1}^{n} r_h - |r_{ai} - r_{bi}| \qquad (1)$$

Where,

a,b: Users
Sim(a,b): similarity between user a to user b
rai: rating of user a for item i
i: set of Items, rated by both user a & b
rh: highest rating
rbi: rating of user b for item i

Figure 3 shows the basic block diagram [11] of recommendation system of how the recommendation work flows through the intermediate steps. It takes the Rating Matrix as an input data, finds similarity value, predict the ratings and recommends the most preferable top N Items [9] from the list of items to the user.

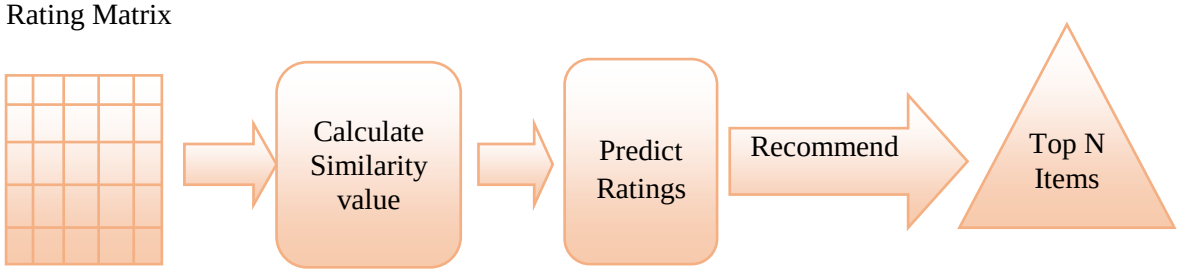

Figure: 3 Block diagram of recommendation system

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IV. CONCLUSION

Recommendation Systems now has become an inevitable in business, marketing and advertisement to expand the horizon of reaching to customers, due to excessive use of internet by the users has posed a problem of information overload. Recommendation system takes on these problems and generates revenue for organization by assisting in customer satisfaction personalization, new customer discovery and providing significant Reports. In future the work will be focused to research on these challenging issues- scalability, cold start, sparsity, privacy in collaborative filtering system.

V. ACKNOWLEDGEMENTS

This entire work was supported by Makhanlal Chaturvedi National University of Journalism and Communication, Bhopal, India for carrying out my research work.

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CITE AN ARTICLE

Dwivedi, S. (n.d.). A BRIEF INVESTIGATION ON RECOMMENDER SYSTEMS STRATEGY. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY, 6*(12), 559-563.