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ENHANCED RATING BASED RECOMMENDER SYSTEM FOR RESOLVING COLD START PROBLEM

Akash Abhishek [#1] and Dr. S. Ganesh Kumar [*2]

[#] *Student, Dept. Of CSE, SRM Institute of Science and Technology, Chennai, India*

[*] *Dept. Of CSE, SRM Institute of Science and Technology, Chennai, India*

***Abstract*— Recommender systems have developed in parallel with the web. They were initially based on demographic, content-based and collaborative filtering. Currently, these systems are incorporating social information. In the future, they will use implicit, local and personal information from the Internet of things. In this paper, we propose an enhanced rating based recommender systems which resolve the issues on cold-start products. Each profile of cold-start products are analyzed effectively and then rating is done. The main role of the proposed technique is to have a fine grained view on hidden profiles between cold-start products and existing products. In addition to, matrix factorization and neighborhood based collaborative filtering models are used for recommending the products. Experimental analysis has shown the effectiveness of the proposed systems.**

***Index Terms*— Recommender systems, collaborative filtering, content filtering, cold-start products and effectiveness.**

I. INTRODUCTION

Due to the development made in World Wide Web and information communication and technologies, the lifestyle of the human has changed. Large volume of data has been generated with respect to time. In order to extract the relevant and accurate knowledge from the information [1], a good recommendation system is required. The main task of recommender systems is to fill the gap persists between information acquisition and information filtering systems. The concept of recommender systems was introduced in 1997 which shown an effective changes towards collected information [2]. Recently, the recommender systems have created a greater impact over the websites. Several opportunities like knowledge sharing, information analysis and opinion analysis have shown tremendous changes in websites maintenance systems.

Though, the prior schemes in recommender systems have achieved greater success, cold- start problem is still a daunting tasks. Most of the real time applications have used cold-start items and each item is highly rated [3]. On the other hand, the effectiveness of the existing recommendation approaches (e.g., collaborative filtering) largely depends on the sufficient amount of historical ratings, and hence these approaches might quickly become ineffective for cold-start users/items that only have few ratings. Several collaborative filtering has been introduced that especially resolved the cold start issue [4]. The prior models has been categorized onto three classes, namely, a) efficient interview process, b) develop an association among entities/ items and c) develop privacy oriented systems.

The evolution of RS has shown the importance of hybrid techniques of RS, which merge different techniques in order to get the advantages of each of them. A survey focused on the hybrid RS has been presented in [5]. However, it does not deal with the role of social-filtering, a technique which has become more popular in the recent years through social networks. The neighborhood-based CF has been the recommendation method most popular at the beginning of the RS.

The rest of the paper is organized as follows: Section II describes the related work; Section III presents the proposed work; Section IV presents the experimental analysis and finally concludes in Section V.

II. RELATED WORK

This section reveals the priors works suggested on recommender systems. The author in [6] presented a quantitative survey on recommender system. They have surveyed about 80 approaches based on recommendation models. Each recommender approach model is explained and summarized with its merits and demerits. The similar study was performed by [7] with its shortcomings. They have stated the importance of collaborative filtering, graph based recommendation and its other related terminologies. The developed recommendation models has been concentrated with graph based recommendation approaches and its stereotypes models. In specific to, content based filtering models have been suggested for services like authored, tagged, browsed and downloaded.

The author in [8] discussed about the general recommendation algorithms and suggested three recommendation frameworks. They have applied on real time dataset which stated that internal metrics plays a vital role in achieving better frameworks. The similar evaluation metrics has been studied by [9] which analyzed dimensions such as correctness, novelty and coverage. In addition to, they have also analyzed associated metrics and presented practical directions. In general, the recommendation systems has two basic metrics namely, coverage and serendipity. They have estimated the trade-off between coverage and serendipity with recommendation quality. In order to enhance the user's requirements, the quality of the recommendation systems was explored.

Decision making system [10] is an important process in recommendation systems. Based on the classification, the

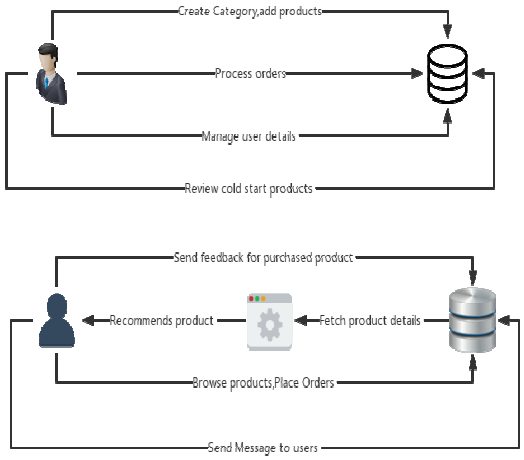
evaluation metrics are assigned for the interested tasks. They demonstrated how using an improper evaluation metric can lead to the selection of an improper algorithm for the task of interest. They also discussed other important considerations when designing offline experiments. The author in [11] presented a comparative study on web recommendation systems. Next, they have shown that a new metric emerges naturally from this framework. Finally, they have comparing the properties of this new metric with the traditional ones and then evaluate the whole range of recommender systems with this single metric.

In [12], three sorts of prediction strategies have been studied for defining user's rating. The authors have illustrated the significance of rating systems and then explored and evaluated the ratings. They have compared the different recommender systems and enhanced the performance of recommender systems. The recommender systems have further enhanced the level of trust [13] for efficiently and accurately predicting the profiles. In specific to, they have suggested a standard collaborative filtering model on standard test datasets. They have decreased prediction error with 22%. The similar recommendation models have been explored on historical student enrolment data systems. The interactions amongst the peer agents for generating recommendations are based on the trust network that exists between them.

Fuzzy oriented recommendation systems have studied about degree of membership, non-membership and uncertainty [14]. A dynamic approach that favors the mechanisms for RS explanations includes using conversational techniques, such as the CCBR (conversational case-base reasoning), explained into McSherry [15]. As CCBR they use an incremental nearest neighbor process based on the Pareto case dominance approach. In a different study, a dynamic approach is also adopted, but it employs a different perspective. Instead of attempting to justify a particular recommendation they focus on how explanations can help users to understand the recommendation opportunities that remain if the current recommendation should not meet their requirements. They generate compound critiques as explanations: Users have the opportunity to accept or critique recommendations. If they critique a recommendation, the critique acts as a filter over the remaining recommendations.

III. PROPOSED WORK

This section reveals the proposed methodology of our study. The aim of the proposed work is to eliminate the irrelevant data presented in the cart. By reducing the irrelevant data, the accuracy of the products and system's performance can be enhanced. Based on the ratings given to the available products, the products are assigned and displayed to the user's window. If the product is declared as cold, then it will be eliminated from the cart systems. In this way, the products are recommended. The proposed architecture is given in fig.1.



A.

Fig.1. Proposed architecture

The proposed steps are explained as follows:

a) Uploading the products: The admin takes care of uploading the available products and displayed on the window.
b) Browsing and ordering the products: Initially, the users have to get register with the websites. In order to receive the products correctly, the users has to provide valid address.
c) Cart Management: This phase ensures the payment of the order products. Based on the assurance of the payments, the products are delivered to the users.
d) Order Management: The ordered products are managed on both user and admin side. The ordered products are visible to the admin and also handled by them.
e) Feedback systems: Once the product is received by the users, the feedback process will execute. This task is to validate the quality and satisfaction of the users.
f) Cold product management: Cold start issue is the main issue which degrades the performance of the system. The main aim of cold start product is to remove the irrelevant products from the cart management.

The fig.2 presents the working flow of our proposed methodology.

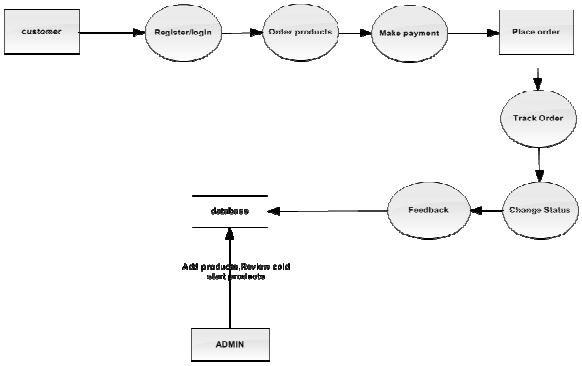


Fig.2 Working flow of proposed method

IV. EXPERIMENTAL RESULTS

This section reveals the experimental analysis of our proposed work.

Fig.3. User's view of commercial websites

The above fig.3 presents the general websites of commercial sectors.

Fig.4. Based on user's keywords, the products are recommended.

The above fig.4 depicts the lists of available products. In specific to, the keywords are entered by the users. Relied upon the entered keywords, the products are listed and recommended.

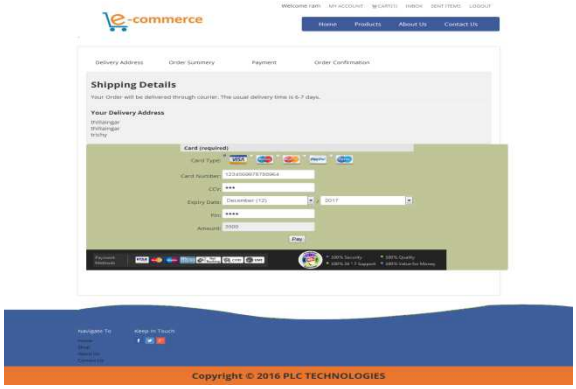


Fig.5. Viewing of shipping details

The above fig.5 presents the shipping details of the ordered products. The shipping details such as card type, card number, CCV etc should be entered by the users. Once all the details are filled correctly by the users, the payment process will begin.

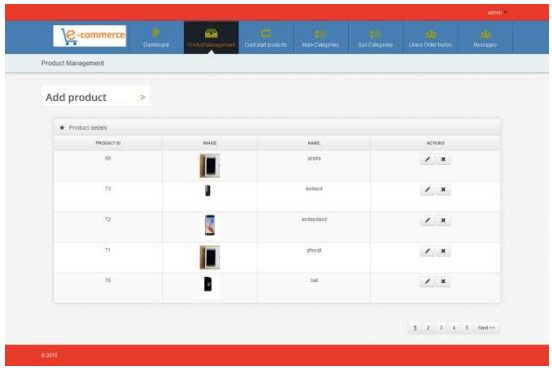


Fig.6. User's adding the items to the cart

The fig.6 presents the items added to the cart. The selected products will be added to the cart for further shopping.

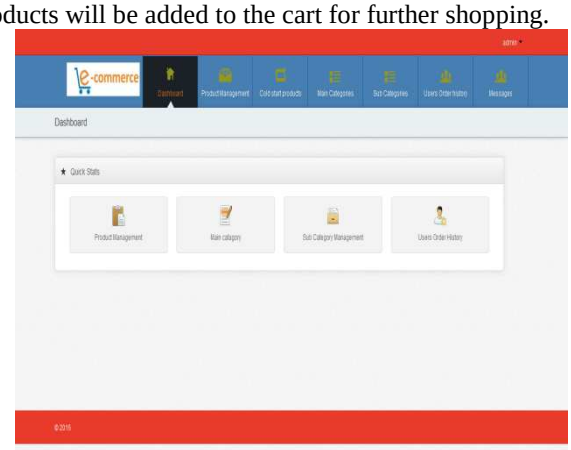


Fig.7. User's transactions viewed by admin side

The fig. 7 presents the user's transactions viewed by admin side. The task of the admin is to maintain the activities like order history, items viewed etc performed by users.

V. CONCLUSION

Recommender systems acts as the best tool for addressing the information overloaded over the websites. It has greatly revolutionized the web. Most of the recommenders systems use traditional websites to gather information from sources such as content based and demographic based data systems. The main aim of recommender systems is to enhance the accuracy of the recommendation models. This paper develops an enhanced rating based recommender systems for resolving cold-start problem on existing products. It is merely achieved by ELO rating system. Each profile of cold-start products are analyzed effectively and then rating is done. The main role of the proposed technique is to have a fine grained view on hidden profiles between cold-start products and existing products. In addition to, matrix factorization and neighborhood based collaborative filtering models are used for recommending the products. Experimental analysis has shown the effectiveness of the proposed systems.

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