International Advance Journal of Engineering Research (IAJER)
Volume 2, Issue 3 (Mar- 2019), PP 05-08
ISSN: 2360-819X
www.iajer.com

Research Paper **Open Access**

Spur and Helical Gear Sliding Loss Model with Load Tooth Distribution Pattern on Gear Tooth Surface

Dr. Sunanthasha
**Department of Mechanical Engineering, Faculty of Engineering, Chulalongkorn University, Phayathai Road, Patumwan, Bangkok 10330, Thailand*

Abstract. The objective of this study was to introduce the recommender system based on expert and item category to match the right items to users. In this study, the expert identification was divided into 3 techniques which were 1) the experts from social network technique 2) the experts from the frequency of rating technique and 3) the experts from other user's preferences. To filter the expert users by using the frequency of rating technique and the experts from other user's preferences technique, data about item category is used. For evaluation in this study, the researcher used Epinion for the performance testing to find out errors and accuracies in the prediction process. The results of this study showed that all the presented techniques had mean absolute error score at about 0.15 and 85 percentages of accuracy, especially the expert identification combining with item category, it can reduce 60 percentages of the duration of recommendation creating.
Keywords: Recommender System, Expert, Social Network, Frequency of Rating, User Like, Item Category.

I. INTRODUCTION

Currently, the information technology has been fast developed because of the growth of the internet and 2.0 website [1]. It causes a proliferation of information and news leading to a problem called "Information Overload" which has multiple effects including an effect for E-Commerce. The information overload originates the difficult determining to purchase the products and services for many users [2]. So the recommender system has occurred to suggest products or services [3] match the right items with the user's preferences. One of the popular approach used to create the recommendation is the collaborative filtering which analyzes the profile similarities among the users [4]. However, there are still some problems of recommender system; for example, data sparsity, cold start problem, and the requirement to improve accuracy for giving recommendation [5]. Therefore, there is the combination of many approaches to creating recommender system, to be ready for problems, and to improve the performance of recommendation. The purpose of this study was to present a creation of recommender system based on expert and item category because the expert recommendation is more reliable than friends or people [6], and the item category can help improve a performance of recommendation [7]. The researcher also tested an evaluation of performance for error and accuracy in prediction. The content of this study is arranged as follows: Section 2 is Related work, Section 3 is Proposed approach, Section 4 is Experiment, and the last section is Conclusion and Discussion.

II. PROPOSED APPROACH

In this section, the researcher is covering the detail of recommender system based on experts and item category. It consists of 3 processes that are expert identification, expert neighbor filtering, and prediction. The essential data consists in1) User - Item matrix, 2) User rating, 3) social network data, 4) item category, and 5) item database as shown in Fig. 1.

.

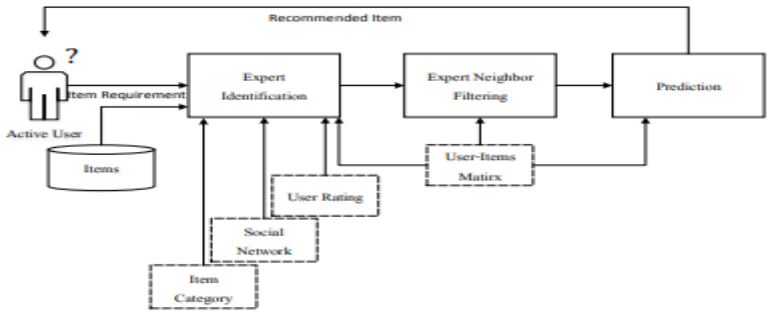

Fig. 1. Recommender system based on expert and item category.

III. EXPERIMENT

In this part, the outcome of the experiment and comparison of recommender system performance are presented. It covers datasets, experiment setup, evaluation metrics, and evaluation results.

3.1. Datasets

There is a requirement to utilise data in this study; for example, rating item of users from the other user data, connection of users on social network data, and item category, so Epinion Datasets [25] is applied to this study. Epinion Datasets is derived from Epinions website where people can review and variously rate items in different categories: books, movies, music, etc. When the data is cleaned, there are 532,927 items rated from 20,355 users, and 30,738 items. The items are classified as 27 type, and one item can be classified in only one type. The rating scale is from 1 -5 level. Data density is at 0.085. User network connecting is directed graph, and there is Helpfulness rating that is from 1 – 5 level. To make sure that an experiment is correct, the researcher used K-Fold cross – validation, that were divided data into 5 folds, and 10 percentages blind data in each fold to test the prediction.

3.2. Experiments Setup

The expert neighbor filtering process is required to calculate the similarity between active users and expert users to be used for prediction calculate process; therefore, the popular distance-based similarity method [26] is applied, that are Manhattan Distance, Euclidean Distance, and Minkowski Distance as shown in following equation.

$$Distanc(A, B) = (\sum |RA,i - RB,i \,|\, r \; N \; i{=}1 \;)\; 1\; r/ \qquad (5)$$

where $Distance(A, B)$ is a distance between active user A rating and expert user B rating by various types of distance-based similarity method. RA,i and RB,i is i item rating value of active user A and expert user B that $i \in \{1, \dots, N\}$ while N is the numbers of the same type item that user A and user B have rated, and r is set as 1, 2, 3, 4, 5, 10, 50 and 100. After that, the distance points of user rating are brought to be calculated into a similarity value by an ad hoc measurement of similarity, based on Euclidean Distance accordingly shown in the following equation.[27], [28].

$$similarit(A, B) = 1\; 1{+}Distance(A,B) \qquad (6)$$

where $similarity(A, B)$ is similarity points between active user A and expert user B which are in [0,1].

An overview of the experiment suggest that ELA with no using item category is more efficient; however, there is small different when it is compared to the other methods.

Consequently, the researcher compared time used for recommendation creating process between process with item category and process with no item category. There are two features to compare; 1) average time for processing when data size is changing and 2) average time for processing when it compares with percentage of accuracy as shown in Fig. 5 and Fig. 6. As shown in pictures, process with item category can be reduced 60 percentages of processing time for recommendation.

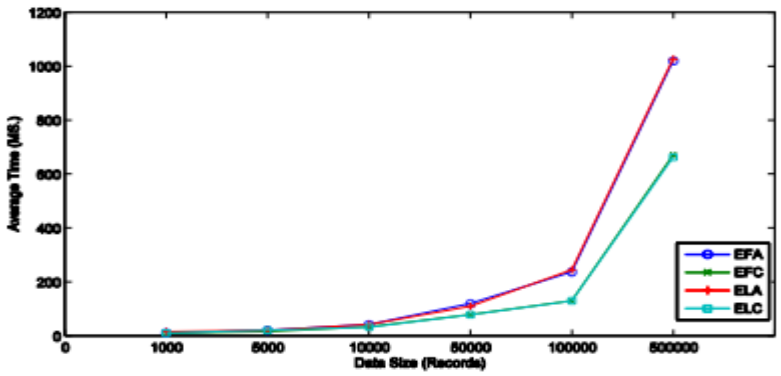

Fig. 1. The average processing time with changing data size

This process focuses on identifying expert users to recommended products. There are 3 types of experts in this study as followed, 1) the experts from social network, 2) the experts from frequency rating, and 3) the experts from the other's user preferences. The process starts from the system noticed by the active user's demanding in product. The system will match that product with target items that the users want to get the recommendation in the database. After that, expert users will be identified to recommended products as shown in Fig. 2

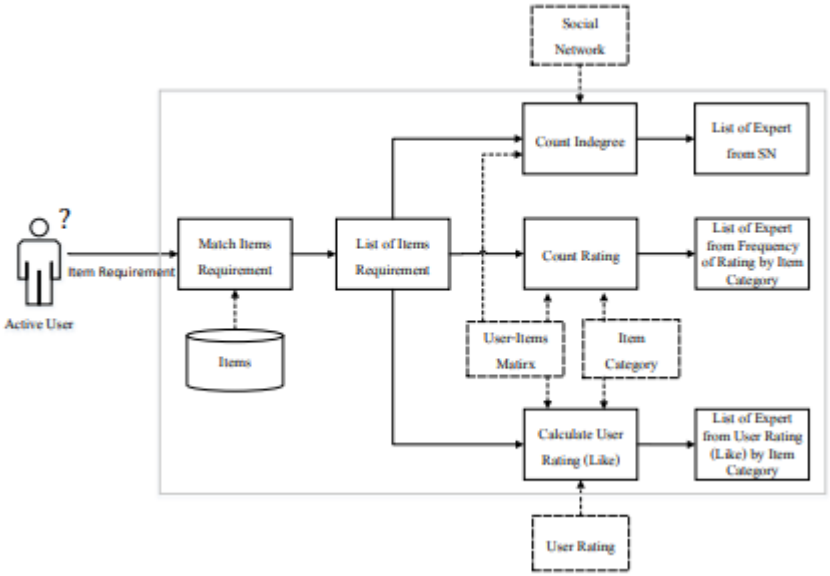

Fig. 2. Expert identification process.

IV. CONCLUSION AND DISCUSSION

This study presented the recommender system based on expert and item category by 3 types of expert identification techniques that are firstly, the expert from social network technique, expert from frequency of user rating technique, and lastly, the expert from other user's preference technique by using item category to identify experts from frequency of user rating and other user's preference. The advantages of the proposed research demonstrate the application of expert concepts, together with item category for recommended items. Although the results is not the highest accuracy, but it can greatly reduce the processing time. Also, the research has limitations among the experts from social network method which does not support Sybil Attack problem that may effect on the correctness of the degree calculation of neighbor user in social network. In the future, suggestively, trustworthy might be applied with experts to improve recommendation performance.

REFERENCES

[1] A. Albadvi and M. Shahbazi, "A hybrid recommendation technique based on product category attributes," Expert Syst. Appl., vol. 36, no. 9, pp. 11480–11488, Nov. 2009.
[2] G. Guo, J. Zhang, and D. Thalmann, "Merging trust in collaborative filtering to alleviate data sparsity and cold start," Knowl.-Based Syst., vol. 57, pp. 57–68, Feb. 2014.
[3] E. Q. da Silva, C. G. Camilo-Junior, L. M. L. Pascoal, and T. C. Rosa, "An evolutionary approach for combining results of recommender systems techniques based on collaborative filtering," Expert Syst. Appl., vol. 53, pp. 204–218, Jul. 2016.
[4] Y.-M. Li, C.-T. Wu, and C.-Y. Lai, "A social recommender mechanism for e-commerce: Combining similarity, trust, and relationship," Decis. Support Syst., vol. 55, no. 3, pp. 740–752, Jun. 2013.
[5] J. Bobadilla, F. Ortega, A. Hernando, and A. Gutiérrez, "Recommender systems survey," Knowl.-Based Syst., vol. 46, pp. 109–132, Jul. 2013.
[6] Z. Sun, L. Han, W. Huang, X. Wang, X. Zeng, M. Wang, and H. Yan, "Recommender systems based on social networks," J. Syst. Softw., vol. 99, pp. 109–119, Jan. 2015.
[7] L. Zhang, J. Xu, and C. Li, "A random-walk based recommendation algorithm considering item categories," Image Feature Detect. Descr., vol. 120, pp. 391–396, Nov. 2013.
[8] J. Lu, D. Wu, M. Mao, W. Wang, and G. Zhang, "Recommender system application developments: A survey," Decis. Support Syst., vol. 74, pp. 12–32, Jun. 2015.
[9] G. Adomavicius and A. Tuzhilin, "Toward the next generation of recommender systems: A survey of the state-of-the-art and possible extensions," IEEE Trans. Knowl. Data Eng., vol. 17, no. 6, pp. 734–749, 2005.
[10] Q. Shambour and J. Lu, "A trust-semantic fusion-based recommendation approach for e-business applications," Decis. Support Syst., vol. 54, no. 1, pp. 768–780, Dec. 2012.
[11] A. Jøsang, R. Ismail, and C. Boyd, "A survey of trust and reputation systems for online service provision," Emerg. Issues Collab. Commer., vol. 43, no. 2, pp. 618–644, Mar. 2007.