

A New Hybrid Recommender System Using Dynamic Fuzzy Clustering

Baghbani Mojtaba
Dept. of Computer Engineering
University of Mashhad
Mashhad, Iran
mo_ba97@stu-mail.um.ac.ir

Monsefi Reza
Dept. of Computer Engineering
University of Mashhad
Mashhad, Iran
rmonsefi@ferdowsi.um.ac.ir

Abstract: In this paper¹, a new hybrid system is proposed for combining collaborative and content-based approaches that resolves some limitations of them. Specially, by the proposed system, the novelty and diversity of recommendations improve remarkably. Furthermore, the precision and recall of the proposed system is slightly less than those of the best existing hybrid system (collaborative via content) so that employing this system is justifiable. By this approach, the items that have not been yet rated by any user can be recommended. Collaborative and content-based systems utilized by this work, use a hybrid method based on fuzzy clustering model (fuzzy subtractive clustering) that combines model and memory-based approaches so that its precision is comparable with the precision of the memory-based approach and its scalability is comparable with the scalability of the model-based approach. Furthermore, in this work, a dynamic fuzzy clustering algorithm was proposed in which a measure is presented to determine the stage at which a complete reclustering is required. By applying this algorithm, the system is able to adapt to the dynamic and changing environment in a much less expensive manner in terms of computation times and resources.

Keywords: Recommender system, Content-based recommender, Collaborative recommender, Hybrid recommender, Relational fuzzy subtractive clustering, Dynamic clustering.

1 Introduction

Recommender systems have recently gained much attention as a new business intelligence tool for e-commerce business [14]. Applying a recommender

system for an online retailer store helps to enhance the quality of service for customers and increase the sale of products and services. The recent commercial success of recommender systems has been demonstrated in many online stores including Amazon.com, CDNow.com, Barnes&Noble.com, and MovieFinder.com [5].

Recommendation engines could be based on *content-based filtering* or *collaborative filtering* [8]. Content-based filtering exploits the product information, say, domain specific item attributes such as author and subject for book items, and artist and genre for music items. It does not require any previous implicit or explicit user rating or purchase data to make recommendations. Collaborative filtering (CF) is the most successful and widely used recommender system technology [13]. The goal of CF is to predict the preferences of a user, referred to as *active user*, based on the preference of a group of users. The key idea is that the active user will prefer those items that “like-minded” people prefer or even the ones that dissimilar people do not prefer. This approach relies on history, a dataset recording all previous users’ interests, which could be inferred from their ratings of the items at an online store.

[3] identified two major classes of collaborative filtering algorithms. *Memory-based* algorithms operate over the entire recorded user dataset to make predictions. These algorithms employ a notion of distance to find a set of users, known as neighbors, which tend to agree with active user. The preferences of neighbors are then combined to produce a prediction or top- N recommendation for the active user. *Model-based* algorithms on the

¹ This work was supported in part by Iran Telecommunication Research Center (ITRC).