Chapter 4
Association Rules-Based Gray Relational Approach for E-Commerce Recommender System

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ABSTRACT

Recommender systems cannot provide healthy results in case of similar products that cannot be identified in e-commerce sites. Insufficient information about users or items is one of the most crucial problems, especially with adding new users or products. The inability to perform relational analysis in the system is due to insufficient data. In this case, the system cannot recommend or bring the non-related items to the users. This chapter suggests the gray relational approach to identify more healthy recommendation lists when there are few relational items. The data was obtained from an e-commerce company and apriori algorithm was applied to the dataset that a randomly chosen user purchased. Gray relational analysis was applied for the most suitable recommendation by using support, confidence, number of likes, adding favorite, deleting from basket, and return information of the products in the dataset. In addition, the most appropriate product sequencing of the recommendation list was realized by gray relational degrees.

INTRODUCTION

The developments in information technologies change people's lives. As a consequence of these changes, electronic commerce (e-commerce) which is an internet based technology has become one of the most important factors that affect the social life. E-commerce, which caused radical changes in company structures, also has changed the traditional trade completely. The success of the e-commerce system is directly related to the effective use of the information technologies. With the using of the information systems, companies have gained more powerful tools to increase their customer loyalty. Thus, companies those go out of price competition for profit maximization use e-commerce applications that will gain new consumers and ensure to make the right decision in the buying process. E-commerce applications such as price warning, product evaluation, product comparison, auction, favorite list and recommendation systems emerge as new competition tools that provide the necessary data for business analytics of e-commerce companies.

The recommender system is one of the most useful applications in e-commerce. The system is designed to predict what the users look for and to offer options similar to the purchased product. Recommender systems that play an important role for sites like Amazon.com, Netflix, YouTube and Yahoo have boosted performance (Koren, Bell, & Volinsky, 2009). According to Mangalindan (2012), Amazon.com increased the sales 29% by recommendation system. It was estimated that Netflix profits among recommender system exceed one billion dollars in a year (Love, 2012).

The wide range of products increases the probability of selling products of e-commerce companies (Anderson, 2006). Besides, consumers choose vendors with a wide range of products in order to reduce shipping and return costs. For this reason, e-commerce firms increase the number of products as much as possible. But, large number of product is caused the problem for customers to find the product which want to buy. The e-commerce sites which have a wide range of products, need an effective grouping menu and product search to present the products. In this context, recommender systems that offer products for consumers are seen as a tool to increase the effectiveness of e-commerce both in terms of consumers and companies.

The recommender systems used in web pages with content such as movies, books, news, etc., began to be used intensively with the development of e-commerce. There are various algorithms developed for recommender applications. These algorithms are classified under two general groups as Content-Based Filtering (CBF) and Collaborative Filtering (CF). CF is expressed as the most successful implementations among these algorithms (Min & Han, 2005a). Main idea of CF is based on the principle of determining the relationship between users' buying tendencies and

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