Chapter 4

Multiagent Truth Maintenance Applied to a Tourism Recommender System

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ABSTRACT

This chapter presents a multiagent recommender system applied to the tourism domain. The multiagent approach is able to deal with distributed expert knowledge to support travel agents in recommending tourism packages. Agents work as experts cooperating and communicating with each other, exchanging information to make the best recommendation possible considering the travelers’ preferences. Each agent has a truth maintenance system component that helps the agents to assume information during the recommendation process as well as to keep the integrity of their knowledge bases. The authors have validated the system via simulations where agents collaborate to recommend travel packages to the user and specialize in some of the tasks available. The experiments show that specialization is useful for the efficacy of the system.

INTRODUCTION

The Internet is a rich source of information where users search for contents about products and services related to their interests and preferences. However, this has generated some problems. In fact, the overload of information may divert the users and ultimately make it very hard to locate the desired information (Maes, 1994). Moreover, the relevant data required is usually distributed over several repositories.

In the tourism domain a variety of services can be recommended such as restaurants, places to visit, better opportunities of accommodation,
or travel packages. Recommender systems have the objective of helping customers in selecting services more suitable to their needs. They have the ability of aggregating information in order to match the recommendations with the information users are looking for.

However, it may be possible that a single source does not have all the information needed to make the full recommendation process. The available data may be fragmented, overspecialized or over generalized, or even irrelevant to the recommendation at hand. There are several data sources and services distributed in the Internet, which are not always available, or are ambiguous or wrong.

A travel package recommendation is typically supported by several service providers for transportation, accommodations and attractions. Besides, specific knowledge is required to assemble all the components (Ricci, 2002). Usually this information cannot be found in a single repository. The tourism market is distributed, and several service providers and intermediaries manage and store service information and users data in their repositories. Also, the domain can change quickly, requiring the information to be frequently updated. To recommend a travel package, a travel agent must construct a model containing all the elements (information) required for generating this recommendation. This model can be implicitly defined in the travel agent’s mind, or explicitly documented in a formal plan stored at the travel agency. These elements would include resources (information, products or services), customers and their requirements, factors influencing the recommendation (such as the season), and strategies for finding the best options for the user.

To cope with these problems – distributed source of information and frequent updating – we propose the application and integration of two technologies: distributed recommender systems and multiagent technologies. We claim that a multiagent recommender system can be applied for retrieving, filtering and using the information that is relevant to the recommendation task, and deals better with dynamic changes that occur in the data sources, as compared with more traditional non-distributed recommender systems (Montaner et al., 2003).

The main goal of a multiagent recommender system is therefore to facilitate the cooperation among the agents. Each agent works as an expert, helping to compose the final recommendation. This work presents a distributed and knowledge-based recommender system implemented in a multiagent environment. The recommendation process (travel package) is based on the collaboration of multiple agents exchanging information stored in their local knowledge bases. A recommendation request is decomposed into sub-tasks handled by different agents, each one maintaining its own knowledge base and participating in the composition of the final recommendation.

The proposed model supports agent specialization where agents become experts in specific tasks. This agent specialization mimics what happens in the real world, where it is common for the travel agents to specialize in a particular kind of service (travel packages, interchanges, conferences, etc.) to provide better recommendation to the customers. Another feature presented in the proposed model is the ability to access and maintain the integrity of the exchanged information among agents. Agents employ a truth maintenance component that helps to revise the shared data among agents to guarantee the integrity of the agents’ knowledge bases.

This chapter is organized as follow: section 2 presents the background of recommender systems and truth maintenance systems and discusses related works on multiagent recommender systems. Section 3 describes the multiagent recommender approach and section 4 presents the experiments we conducted. Section 5 presents some ideas for future work and finally section 6 summarizes the contributions of this chapter.