Chapter 8

A Recommender System for Learning Objects
Personalized Retrieval

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ABSTRACT

This chapter describes the development of a recommender system of learning objects. This system helps a user to find educational resources that are most appropriate to his/her needs and preferences. The search is performed in different repositories of learning objects, where each object has descriptive metadata. Metadata is used to retrieve objects that satisfy not only the subject of the query, but also the user profile, taking into account his/her characteristics and preferences. A multi-agent architecture that includes several types of agents with different functionalities is used. In this chapter, we describe the modelization of the Personalized Search Agent (PS-Agent) as a graded BDI (Belief-Desire-Intention) agent. This agent is responsible for making a flexible content-based retrieval and provides an ordered list of the resources that better meet the user profile data. A prototype was implemented, and experimentation results are presented.

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INTRODUCTION

Nowadays, there is a large number and diversity of resources that can contribute to the educational process. In the last years, repositories of different resources have arisen to gather materials for educational purpose. A Learning Object (LO) is any digital self-contained and reusable entity, with a clear educational purpose, with at least three internal and editable components: content, learning activities and elements of context. Learning objects must have an external structure of information to facilitate their identification, storage and retrieval: the metadata (Chiappe, 2007). LOs may be useful for a student who wants to learn a subject, or for a teacher who is trying to prepare didactic material for his/her class. LOs are stored in online repositories. Here are a few examples: the Ariadne Foundation for the Knowledge Pool (European Association open to the World, for Knowledge Sharing and Reuse), the OERCommons (Open Educational Resources initiative, created by ISKME, the Institute for the Study of Knowledge Management in Education as part of the Foundation’s worldwide OER initiative) and FLOR (Federación Latinoamericana de Repositorios, created by the Latin-American Community of Learning Objects). These LO repositories store useful and interesting resources about different subjects and most of them have a search engine to retrieve LOs according to a particular topic.

When a student or a teacher needs to find educational resources, he/she could submit a query to these repositories. But different users get the same list of objects for a given search. In general, users check only the top results, but in many cases, these top results are not the most suitable if the search is performed considering only subject keywords. This is because users have different personal characteristics and preferences, which should be also considered in the search. Recommender systems arise to help in this kind of problem. Then, they can be used to automatically select LOs that are more appropriate to each user.

For example, suppose that two Argentinean students at the university, José and María, need to study on Java language, and they decide to search a repository looking for a course about Java. But José and María are different. José is studying an informatics career and María studies industrial engineering. José handles English fluently, and he prefers to solve problems in a practical way to understand what he needs to learn. Maria has not knowledge of English, and she prefers a theoretical knowledge of the subject to understand. Furthermore, José has previous knowledge on programming languages but María has not it. Both made the search for Java programming language in the repository, and both get the same list of courses as a result. When José scrolls the list of results, he discards the top ten because they are theoretical or very basic, and he chooses to use the eleventh. María discards the first four items of the list because she does not have prior knowledge to understand them or are in English. She chooses to use the sixth item, which is theoretical and no prior knowledge is needed. Both José and María have spent time and effort to evaluate the retrieved list of courses, and they discard several of them for various reasons unrelated to the topic of interest. So, taking into account language, difficulty and learning style, etc. that the user prefers, the recommender system can make a ranking of the best LOs for that user, and it puts them as top results.

Agent based architecture seems to be a promising approach for recommender systems design. Agents are autonomous and intelligent software entities that are able to handle specific tasks with little or no human supervision. The aim of these agents is to explore and filter the best options from a user profile (personal data, preferences, characteristics, etc.) considering a large number of different possibilities. This requires a user profile extracted in an implicitly or explicitly way. One of the most remarkable agent architectures is the BDI agent proposed by Rao and Georgeff (Rao, 1995). This model is based on the explicit representation of the agent’s beliefs (B), desires (D) and inten-
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