Chapter 6
An Approach to a Semantic Recommender System for Digital Libraries

José M. Morales-del-Castillo
University of Granada, Spain

Eduardo Peis
University of Granada, Spain

Enrique Herrera-Viedma
University of Granada, Spain

ABSTRACT
One of the key aims of the so-called Information Society is to facilitate the interconnection and communication of sparse groups of people, which can collaborate with each other by exchanging on-line information from distributed sources (Angehrn et al., 2008). In specific contexts, such as in the research and scholarly domain, where many times work is developed relaying on team-based research (Borgman, 2007), finding colleagues and associates to build collaborative relationships has become a crucial matter. Actually, this is one of the pillars of the conduct of research and production of scholarship (Palmer et al., 2009). Nevertheless, this task can be specially difficult when the research activity implies opening new multidisciplinary lines of investigation, since it is hard to know what’s hot and who’s in in a certain domain out of that of this specialization (even if both areas are related or close to each other).

INTRODUCTION
Due to this, scholarly libraries in general and digital scholarly libraries in particular (which are considered by the research and scholarly community as main nodes to access scientific information) must provide their users new services and tools to ease such kind of tasks.

In this paper we present a filtering and recommender system prototype for digital libraries that serves this community of users. The system makes available different recommender approaches in order to provide users valuable information about resources and researchers pertaining to knowledge.
domains that completely (or partially) fit that of interest of the user. In such a way, users are able to discover implicit social networks where it is possible to find colleagues to form a workgroup (even a multidisciplinary one).

**OVERVIEW OF THE PROTOTYPE**

The system here proposed is based on a previous multi-agent model defined by Herrera-Viedma et al. (2007), which has been improved by the addition of new functionalities and services. In a nutshell, our prototype eases users the access to the information they required by recommending the latest (or more interesting) resources acquired by the digital library, which are represented and characterised by a set of hyperlink lists called *feeds* or *channels* that can be defined using vocabularies such as RSS 1.0 (*RDF Site Summary*) (Beged-Dov et al., 2001). The system is developed by the application of different fuzzy linguistic modeling approaches (both ordinal (Zadeh, 1975) and 2-tuple based fuzzy linguistic modeling (Herrera, & Martínez, 2000)) and Semantic Web technologies (Berners-Lee, Hendler, & Lassila, 2001). While fuzzy linguistic modelling (Zadeh, 1975) supplies a set of approximate techniques to deal with qualitative aspects of problems, defining sets of linguistic labels arranged on a total order scale with odd cardinality, Semantic Web technologies allow making Web resources semantically accessible to software agents (Hendler, 2001). In such a way, it is possible to improve *user-agent* and *agent-agent* interaction, and settle a semantic framework where software agents can process and exchange information. Besides, the model uses fuzzy linguistic modelling techniques to facilitate the user-system interaction and to allow a higher grade of automation in certain procedures. To increase that grade of automation some techniques of Natural Language Processing are used to create a system thesaurus and other auxiliary tools for the definition of formal representations of information resources. Let’s review the main features of all these techniques and technologies.

**Semantic Web Technologies**

The Semantic Web (Berners-Lee, Hendler, & Lassila, 2001) tries to extend the model of the present Web using a series of standard languages that enable enriching the description of Web resources and make them semantically accessible. To do that, the project is based on two fundamental ideas: i) semantic tagging of resources, so that information can be understood both by humans and computers, and ii) the development of intelligent agents (Hendler, 2001) capable of operating at a semantic level with those resources and infer new knowledge from them (in this way it is possible shifting from keyword search to the retrieval of concepts).

The semantic backbone of the project is the RDF (*Resource Description Framework*) vocabulary (Becket, 2004), that provides a data model to represent, exchange, link, add and reuse structured metadata of distributed information sources and, therefore, make them directly understandable by software agents. RDF structures the information into individual assertions (resource, property, and property value triples) and uniquely characterises resources by means of Uniform Resource Identifiers or URI’s, allowing agents to make inferences about them using Web ontologies (Gruber, 1995) (Guarino, 1998) or work with them using simpler semantic structures, like conceptual schemes or thesauri.

As we can see, the Semantic Web basically works with information written in natural language (although structured in a way that can be interpreted by machines). For this reason, it is usually difficult to deal with some problems that require operating with linguistic information that has a certain degree of uncertainty (as, for instance, when quantifying the user’s satisfaction in relation to a product or service). A possible solution could be the use of fuzzy linguistic modelling techniques as
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