Personalized Ontology-Based Recommender Systems for Multimedia Objects

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Abstract. A framework for recommendation of multimedia objects based on processing of individual ontologies is proposed in the chapter. The recommendation process takes into account similarities calculated both between objects’ and users’ ontologies, which reflect the social and semantic features existing in the system. The ontologies, which are close to the current context, provide a list of suggestions presented to the user. Each user in the system possesses its own Personal Agent that performs all necessary online tasks. Personal Agents cooperate each other and enrich lists of possible recommendations. The system was developed for the use in the Flickr multimedia sharing system.

1 Introduction

Multimedia sharing systems like Flickr or YouTube, as typical examples of Web 2.0 applications, play ever increasing role in the recent society. They enable their users to upload, download, manage, and browse multimedia contents such as photos, videos, animations called commonly multimedia objects (MOs). In most multimedia sharing systems, users simultaneously interact, collaborate and influence one another forming, in this way, a kind of social community. Hence, users can not only tag multimedia objects they have published but also comment the items added by others, include them to their favorites, etc. Additionally, users have the opportunity to set up new, direct relationships with other system users as well as establish groups of collective interests and directly enumerate their friends or acquaintances.

A typical multimedia sharing system accumulates vast amount of data about published multimedia objects, relationships between them, tags and various types of user activities. However, the information hidden in this data is poorly structuralized and do not provide any comprehensive view onto the relationships between MOs nor the system users. Besides, users often utilize tags and descriptions containing colloquial and improperly used terms, which are not really comprehensible for the others. Moreover, they tend to assign to the MOs they publish only a few relevant tags or no tags at all, so that many multimedia objects do not possess any appropriate and verified descriptions nor tags. As a result, there are many MOs in the system that contain similar multimedia content and completely divergent tags and textual description. The process of autonomous creation and assignment of tags to multimedia objects performed by their authors is often called folksonomy [7, 24].
This diverse and vast amount of data about both multimedia objects and user activities gives the opportunity to complex analysis. It can also be exploited to create complex ontologies that would provide the comprehensive view onto both the multimedia objects existing within the system, the relationships between them as well as the users operations connected with these multimedia objects. Next, the knowledge built into these ontologies can be utilized by the recommender system to suggest to the active user the items, which are the most suitable for them.

2 Related Work

Nowadays, recommender systems became more and more popular and often constitute the integral part of the recent web sites. They help people to make decision, what items to buy, which news to read [25], which movie to watch or even who they can invite to their social network [14]. On the other hand, especially in e-commerce, these kinds of system provide the powerful tool to maintain the loyalty of the customers and increase the sales [12]. Recommender systems are especially useful in environments with vast amount of information since they cope with selection of a small subset of items that appears to fit to the users’ preferences [1, 17, 23, 26].

Overall, the recommender systems are usually divided into three main categories: collaborative filtering, content-based filtering, and hybrid recommendation [1]. The collaborative filtering technique relies on opinions about items delivered by users. The system recommends products or people that have been positively evaluated by other people, whose ratings and tastes are similar to the preferences of the user who will receive recommendation [1, 8, 25]. In the content-based filtering the items that are recommended to the user are similar to the items that user had picked and rate high in the past [22]. The hybrid method combines two previously enumerated approaches [9, 12, 25].

However, in some cases, especially in Web 2.0 applications, we can use available knowledge about application domain in order to generate some recommendations [27].

An ontology is a conceptualisation of a domain into a machine-readable format typically in the form of a structure consisting of concepts, attributes, relationships, and axioms [6]. The problem of finding similarities between ontology elements and also between entire ontologies as complex structures plays important and growing role in shaping online user communities and managing the content of Web portals [11] such as Flickr.

There exist numerous researches that applied the idea of ontology in the recommendation process. The first examples were Quickstep and Foxtrot systems proposed in [19], where the collections of research papers were classified using ontological classes. The advantage of such methods is that they facilitate to take into account the relations between commonly used search terms and their possible role in the application domain under consideration. The similar approach, using ontologically grounded user profiles, was proven to be successful in [3]. Another example where the view-based search method developed within the information retrieval community was combined with the ontology-based annotations and search was presented in [10, 16]. As a result the authors worked out the ontology and vie-based image retrieval and recommendation browser Ontogator.