Mashup Service Recommendation Based on Usage History and Service Network

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ABSTRACT

With the rapid development of Web2.0 and its related technologies, Mashup services (i.e., Web applications created by combining two or more Web APIs) are becoming a hot research topic. The explosion of Mashup services, especially the functionally similar or equivalent services, however, make services discovery more difficult than ever. In this paper, we present an approach to recommend Mashup services to users based on usage history and service network. This approach firstly extracts users’ interests from their Mashup service usage history and builds a service network based on social relationships information among Mashup services, Web application programming interfaces (APIs) and their tags. The approach then leverages the target user’s interest and the service social relationship to perform Mashup service recommendation. Large-scale experiments based on a real-world Mashup service dataset show that the authors’ proposed approach can effectively recommend Mashup services to users with excellent performance. Moreover, a Mashup service recommendation prototype system is developed.

Keywords: Mashup Service, Mashup Service Recommendation, Service Network, User Interest, Web Application Programming Interfaces (APIs)

DOI: 10.4018/ijwsr.2013100104
INTRODUCTION

With the emergence of Web2.0 and its related technologies, mashups, which are Web applications created by combining two or more services, are becoming a hot research topic. Mashup technology has many advantages (such as easier programming, shorter development time, higher quality plans, and more interested outputs (Elmeleegy, Ivan et al., 2008)), which make it becomes increasingly popular. For example, to April 2013, Programmableweb.com has published more than 7044 mashup services. Moreover, several mashup tools have been developed, such as Microsoft Popfly, Google Mashup Editor and IBM Mashup Center. Typical mashup applications include Map, Video and Image, Search and Shopping, News, Microblog Mashup, etc. (Lathem, Gomadam et al., 2007; Ding, Wang et al., 2010; Elmeleegy, Ivan et al., 2008). The rapid growth in the number of available mashup services, coupled with the myriad of functionally similar services, makes finding suitable mashup service more difficult. Currently, existing research works in Web service ranking and recommendation mainly focus on SOAP/WSDL-based services. The fundamental difference between SOAP/WSDL-based and RESTful services (usually referred to as Web APIs) is that the latter does not have a formal model or standard description of service capabilities, which make service search, ranking and recommendation even harder (Gomadam, Dayton et al., 2008). Despite this, several approaches for recommending mashup services, such as semantic-based (Li, 2011), QoS-based (Picozzi, 2010) and social network based (Maaradji, 2010; Maaradji, 2011), have been proposed. However, these existing service recommendation approaches seldom take users’ personal interests into consideration. Therefore the recommended services may not satisfy the needs of users. In addition, social relationship information among Mashup service, Web APIs and their tags has rarely been used to improve mashup service recommendation.

In this paper, we propose a mashup service recommendation approach. The approach exploits both users’ interests based on their Mashup usage history and the service network based on social relationships among Mashup service, Web APIs and tags, to recommend Mashup services to user. The contributions of this paper are as follows:

- **We propose a novel Mashup service recommendation approach based on user interest and relation among services.** The user’s interest is mined from his/her service usage history.
- **We use a dataset crawled from ProgrammableWeb.com, which includes 6076 Mashup services, 4492 Web APIs, and 1736 tags, to construct a large-scale service network and develop a Mashup service recommendation prototype system.**
- **We conduct a set of experiments based on real-world Mashup services.** Compared with other recommendation methods, the experimental results show that our recommendation system can effectively recommend preferred Mashup services to users.

The rest of this paper is organized as follows: the second section introduces related works. The third section presents our approach of Mashup service recommendation. The fourth section discusses the experimental results. The fifth section describes the prototype system implementation. Finally, we draw conclusions and discuss our future work in the sixth section.

RELATED WORK

A number of research works have been done on Web service recommendation. Most Web service recommendation approaches focus on SOAP/WSDL-based service recommendation (Zheng, Ma et al., 2011; Zhang, Zheng et al., 2010; Shao, Zhang et al., 2007; Zheng, Ma et al., 2009; Chen, Liu et al., 2010). Some of them takes QoS (quality of service) into consideration and tend to recommend services with optimal QoS to users based on prediction of missing QoS values of services via Collaborative Filtering.
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