Chapter 16
A QoS Aware, Cognitive Parameters Based Model for the Selection of Semantic Web Services

Sandeep Kumar
Banaras Hindu University (IT-BHU), India

Kuldeep Kumar
Kurukshetra University, India

ABSTRACT

Semantic Web service selection is considered as the one of the most important aspects of semantic web service composition process. The Quality of Service (QoS) and cognitive parameters can be a good basis for this selection process. In this paper, we have presented a hybrid selection model for the selection of Semantic Web services based on their QoS and cognitive parameters. The presented model provides a new approach of measuring the QoS parameters in an accurate way and provides a completely novel and formalized measurement of different cognitive parameters.

INTRODUCTION

Selecting the most appropriate semantic web service is one of the important components of the semantic web service composition process. Most aspects of the Semantic Web Service (SWS) composition process such as automatic discovery, selection, and composition are tightly related to the quality of semantic web services (QoS). QoS can be defined as a part of service description and is an especially important factor for service composition (Zeng et al., 2004). In addition to the QoS, the cognitive parameters of service providers can also prove to be the deciding factors in semantic web service selection and composition. They can be used to decide on a particular SWS to invoke by the user among the numerous services discovered. Various cognitive parameters such as capability, desire, intention, commitment, trust, reputation etc. and a number of QoS parameters such as cost, response time, reliability, accuracy, security feature, execution time, exception handling feature, penalty on breaking service contract etc. have to be considered...

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in service selection. To our knowledge, the issue of service selection based on QoS and cognitive parameters has not been thoroughly addressed in the literature till now. This is primarily due to the complexity of QoS metrics and a lack of formal measurement of cognitive parameters. The work by Ermolayev et al. (2004) has presented a method for selection of service provider agents based on some cognitive parameters. But the agent selection model only considers capability and credibility assessment as the base for agent selection and then performs negotiation with each of the capable agent. But assessing these parameters alone may not result in the selection of the best performing agent.

The proposed Hybrid Selection Model (HSM) for service selection can be easily integrated with Multi-Agent based SWS composition process. HSM performs rating of the agents based on their cognitive as well as QoS parameters. Some of the novel features in the model are: providing the formalization and new normalization procedure for QoS parameters, providing the formalization of cognitive parameters, providing a method for measuring the reputation of agent, and providing a dynamic feedback system affecting the reputation of the selected service provider based on the quality of its present service. In support of this work, an evaluation and experimentation is also presented.

The remainder of the paper is organized as follows. Following the introduction section, section 2 describes some similar works. Section 3 provides a description of the hybrid selection model and the details of QoS and cognitive parameters based rating is provided in section 4 and 5 respectively. Section 6 discusses the evaluation of the presented model and some comparison with existing work. The implementation of a system providing service selection based on the proposed model has been discussed in the Section 7. Section 8 provides the conclusion and future work.

RELATED WORKS

In this section, some of the similar works reported in the literature have been discussed. Among others, some of the related works are (Liu et al., 2004), (Mou et al., 2005), (Menasce, 2002), (Wang et al., 2006), (Ermolayev et al., 2004) and (Kumar and Mishra, 2008). However, no work was found dealing with the selection of semantic web services based upon both QoS based and cognitive parameters based rating in hybrid form. Liu et al., (2004) have proposed the QoS parameters based rating of semantic web services. They have proposed an algorithm which is based upon the average ranking. Thus, their algorithm is neglecting the nuances in different quality properties. Further, they have not considered the various cognitive parameters while rating the services. The works by Mou et al. (2005) and Menasce (2002) have also proposed the QoS-based service selection. But, similar to the work by Liu et al. (2004), they have also not considered the cognitive parameters in the service selection process. Further, the works by (Liu et al., 2004), (Mou et al., 2005), (Menasce, 2002) have not considered the user-tendency towards the quality-attributes in the rating process. Wang et al. (2006) have also proposed a QoS parameters based rating of services. Their formulation has provided the proper normalization of various quality parameters and has also considered the user-tendency in the rating process. But, the quality index generated by their model is very discrete in the nature. This work has also not considered the cognitive parameters in the service selection. Kumar and Mishra (2008) have proposed the cognitive parameters based rating of semantic web services. But, they have not considered the QoS parameters based rating in their service selection model. A multi-agent based semantic web service selection and composition model has been proposed by Ermolayev et al. (2004). They have proposed cognitive parameters based rating of semantic web services. But in their model, they have considered the capability and
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