Semantic Annotation of Web Services: A Comparative Study

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Abstract. A Web service is software that provides its functionality through the Web using a common set of technologies, including SOAP, WSDL and UDDI. This allows access to software components residing on different platforms and written in different programming languages. However, several spots, including the service discovery and composition, remain difficult to be automated. Thus, a new technology has emerged to help automate these tasks ; it is the Semantic Web Services (SWS). One solution to the engineering of SWS is the annotation. In this paper, an approach for annotating Web services is presented. The approach consists of two processes, namely the categorization and matching. Both processes use ontology matching techniques. In particular, the two processes use similarity measures between entities, strategies for computing similarities between sets and a threshold corresponding to the accuracy. Thus, an internal comparative study has been done to answer the questions: which strategy is appropriate to this approach? Which measure gives best results? And which threshold is optimum for the selected measure and strategy? An external comparative study is also useful to prove the efficacy of this approach compared to existing annotation approaches.

Keywords: Annotation, Web Service, SAWSDL, Semantic Web Services, Ontology Matching.

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R. Lee (Ed.): *SNPD*, SCI 492, pp. 87–100.
DOI: 10.1007/978-3-319-00738-0_7

1 Introduction

The Web services technology allows accessing to heterogeneous software, in terms of languages and platforms, through the Web with common standards, including SOAP[1], WSDL[2] and UDDI[3]. However, the syntactic nature of these standards has hindered the discovery and composition of these services. To resolve this problem, semantic Web services have emerged. To add semantics to a service, it is possible to annotate the elements of this service with the concepts of an existing domain ontology. The annotation consists to associate the WSDL elements of a Web service with concepts of an existing semantic model. Often this model is a domain ontology of the Web service.

In preliminary work, an annotation approach has been proposed in [3]. It consists of two main processes: categorization which classifies the WSDL document in its corresponding domain, and matching which associates each entity of the WSDL document with the corresponding entity in the domain ontology. Both categorization and matching are based on ontology matching techniques [7] which in turn use similarity measures between entities. A similarity measure quantifies how much two entities are similar. In particular, WordNet based similarity measures are used [17].

To compare the results from the annotation approach using different similarity measures (internal comparison), and compare this approach with other existing approaches (external comparison), a tool called SAWSDL Generator has been implemented. The tool receives as input a WSDL file and a set of domain ontologies, and then generates a WSDL document annotated according to the SAWSDL standard [8].

This paper presents an internal comparative study to improve, optimize and determine under which conditions the annotation approach provides its best results. An external comparative study is also presented to show clearly the effectiveness of this approach over other annotation approaches.

The paper is organized as follows: the next section presents a summary of the approaches of Web services annotation which exist in the literature. Section 3 presents the annotation approach presented in [3]. Section 4 and Section 5 detail a comparative study. The final section concludes our work while presenting the main contributions that the comparative study enabled us to provide.

2 Literature Review

The annotation of a Web service consists in associating and tagging WDSL elements of this service with the concepts of an ontology [16].

[1] http://www.w3.org/TR/soap/
[2] http://www.w3.org/TR/wsdl
[3] http://www.uddi.org