

Chapter 11

A Practical Approach to Enhancement of Accuracy of Similarity Model Using WordNet towards Semantic Service Discovery

Chellammal Surianarayanan
Bharathidasan University, India

Gopinath Ganapathy
Bharathidasan University, India

Manikandan Sethunarayanan Ramasamy
Bharathidasan University Constituent College, India

ABSTRACT

Semantic Web service discovery provides high retrieval accuracy. However, it imposes an implicit constraint to service clients that the clients must express their queries with the same domain ontologies as used by the service providers. Fulfilling this criterion is very tedious. Hence, a WordNet (general ontology)-based similarity model is proposed for service discovery, and its accuracy is enhanced to a level comparable to the accuracy of computing similarity using service specific ontologies. This is done by optimizing similarity threshold, which refers to a minimum similarity that is required to decide whether a given pair of services is similar or not. The proposed model is implemented and results are presented. The approach warrants clients to express their queries without specifying any ontology and alleviates the problem of maintaining complex domain ontologies. Moreover, the computation time of WordNet-based model is very low when compared to specific ontology-based model.

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INTRODUCTION

Automation in service discovery is an inevitable requirement of applications which have service composition in real time. Very frequently complex business applications are fulfilled by discovering and combining several services from different domains in a relatively short time. The central requirement of service composition is automatic service discovery with high retrieval accuracy and low computation time. Conventional Universal Description, Discovery and Integration (UDDI) based discovery is keyword based (Sohali & Zamanifar, 2009) and it does not support automatic discovery. Web Service Description Language (WSDL) based discovery has no explicit semantics and limits the discovery to manual methods (Sivashanmugam, Miller, Sheth, & Verma, 2005), Syeda-Mahmood, Shah, Akkiraju, Ivan, & Goodwin, 2005). Semantic service description languages such as (Guo, Le, & Xia, 2005), (Klusck & Kaufer, 2009), (Kopecky, Vitvar, Bournez, & Farrell, 2007) allow service providers to express their intended semantics using formal concepts in ontologies. The formal semantics of services makes services machine interpretable which leads to automatic discovery without human intervention.

Though semantic service discovery brought high accuracy and maximal automation into service discovery (Sycara, Paolucci, Ankolekar, & Srinivasan, 2003), it suffers from the following serious issues. Firstly, semantic service discovery imposes an implicit constraint that while querying, service clients should express their requirements using the same domain ontologies as used by the service providers. In practice service providers may develop their own domain ontologies to express their semantics but for service clients it is very different to express their queries using the same ontologies. Moreover, in Business to Consumer (B2C) environment, the service clients are human users and they are not very clear about even what they need and most of the times they are

unable to express their requirements in the same ontology as that of advertisement (Gopinath & Chellammal, 2010). Secondly, the creation and maintenance of domain ontologies are costly and require special expertise. Thirdly, semantic service discovery is time consuming (Lv, Zhou, & Cao, 2009), (Mokhtar, Kaul, Georgantas, & Issarny, 2006).

To alleviate the above issues we propose a new model for computing similarity between services using WordNet, a generic ontology with a special focus to enhance the accuracy of WordNet based similarity model to a level comparable to the accuracy achieved with similarity based on service specific ontologies. Comparing the efficiency of WordNet (generic approach) based similarity computation against similarity computation based on service specific ontologies is an important issue and existing literature has given little focus to address this issue. The proposed approach is supported by the following aspects.

The functional characteristics of a service are expressed through its input and output parameters. While finding matched services for a given query, the input and output parameters of services are the chief factors in deciding whether a query and an advertised service are similar. With a detailed survey on service descriptions, it is found that service providers tend to give meaningful English words such as *Author*, *Price*, *Book*, *Publication*, *Title*, *Film*, *ComedyFilm*, *RecommendedPrice*, *TaxedPrice*, *PreparedFood*, *Destination*, *Hospital*, *Hotel*, *WheeledCar*, *Duration*, *University*, *Lecturer_In_Academia*, *Postal_Address*, etc., to name the parameters. Almost each service tends to use meaningful words to name the parameters. As long as the input and output parameters of services are named using meaningful English words, WordNet, a generic ontology (rather than service specific ontologies), may be used to find the semantic similarity between words. WordNet (Miller, Beckwith, Fellbaum, Gross, & Miller 1990) is a lexical database for English which groups nouns, verbs, adverbs and adjectives into

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