A Proper Selection of Web Service using Semantic Web Technologies

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시맨틱 웹 기술을 이용하여 적합한 웹 서비스 선택

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Abstract

Since the amount of available Web Services keeps growing and thus the problem occurs - how to find an appropriate web service matching the requirements amongst the vast majority of available. This research sets the following objective to be accomplished: to assist proper service selection by semantically describing customer's goals and provider's web service capability by means of carefully designed ontologies and logical expressions, and illustrate matching cases of customer's requirements and web services capabilities.

1. Introduction

Semantic web promises to yield better search results with data being now semantically related and described on the web. This notion can be also successfully applied Web Services, since the amount of available Web Services also keeps growing and thus the same problem occurs - how to find an appropriate web service matching the requirements amongst the vast majority of available. Semantic annotations added to web services make it possible to automate web service usage tasks such as discovery, composition, selection and enactment due to the reason that semantically described web services now become machine processible.

This research sets the following objectives to be accomplished: to assist proper service selection by semantically describing customer's goals and provider's web service capability by means of carefully designed ontologies and logical expressions and illustrate matching cases of customer's requirements and web services capabilities; to develop a prototyping system which implements the above proposed method using Auto Repair Service as the application area to illustrate the interaction of different components in the proposed method and how they work together to accomplish the goal of selecting the desired Web Services based on a given service request.

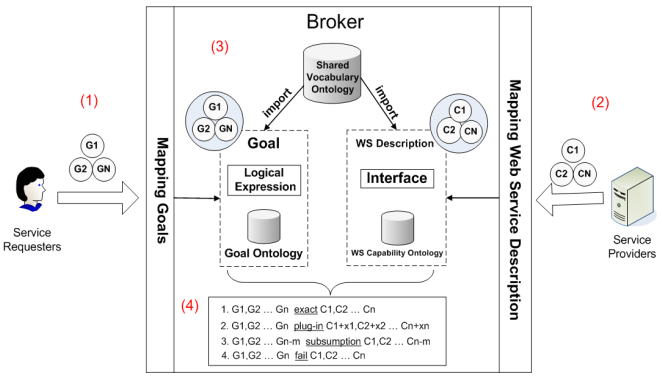
2. Related Studies

There have been much effort on improving selection of services. One of the ideas was to add semantic information to WSDL and UDDI described in [4], [5] where authors attempted to annotate web services based on shared ontologies, and then use these ontologies for discovery of relevant web services. Since the described above solution involves adding semantics to WSDL and UDDI, the resulting architecture still involves centralized UDDI registries.

Researches [7, 8] provide clear vision of how Web services can be applied to business process in order to fulfill customer's goal in Auto Repair Industry. The main difference of the approach proposed in this paper is that a given Auto Repair Case has been carefully mapped to corresponding ontologies, web service and goals expressed in WSML and web service discovery, selection and matching have been demonstrated in WSMX execution environment. These implemented semantic technologies can achieve better results in terms of matching correctly specified user goals with appropriate web services that have been semantically described.

3. System Design

Figure 3 represents the general design of the proposed system. We subdivided explanation into four parts to make it more comprehensible.



(Figure 1) General System Design

(1) The Service Requesters have multiple goals (G1, G2, G3) that are mapped through an intermediary mapping component into WSMO goals expressed in WSML in Broker.

(2) The Service Providers provide multiple services that are also mapped by means of intermediary mapping component to WSMO web services expressed in WSML

(3) The Broker itself implements the mentioned above intermediary mapping components that use WSMO Shared Vocabulary Ontology that represents the shared vocabulary of the terms used in this business case. This Shared Vocabulary Ontology is imported into each WSML Goal description. The other important component of web services discovery are the mapped descriptions of web services expressed in WSML. These web services also import the Shared Vocabulary Ontology and contain their own Web Service Capability (WS Capability Ontology) within themselves.

(4) The proposed architecture has been tested in WSMX execution environment, where we carefully mapped the Auto Repair Service business case participants into corresponding Web Services, Goals and Ontologies and established links between by means of ontology that allowed a decentralized discovery of the needed web service based on goal specification. The matching between goals and web services can fall into one of the following cases:

- Exact Match – all functionality provided by web services match what the goal requires
- Plug-in Match – web services provide more functionality than goal requires
- Subsumption Match – when part of functionality of web services match with part of requirements defined in goal
- Fail - any web services cannot fulfill user's goal

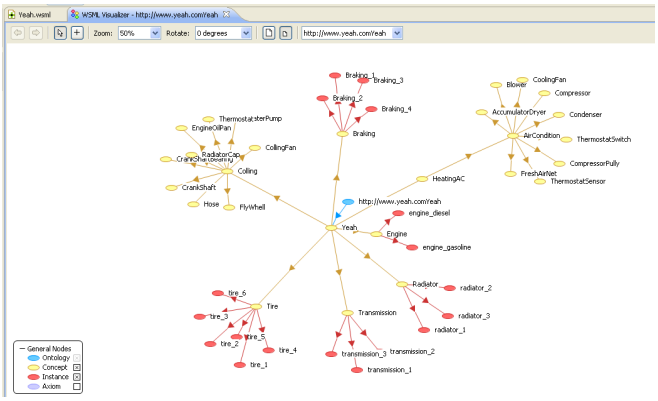
4. System Implementation

There are several well-known tools to implement our prototype such as WSMO (Web Services Modeling Ontology) OWL-S, WSDL-S. Among discussed technologies, we have selected WSMO for the reason is that, WSMO clearly models main components as well as provide enough flexibility to specify web service capabilities via decentralized ontologies interconnected via logical axioms, by means of which services can be discovered to match a goal. We have designed all mentioned concept (ontology, web services description, goals description) using WSMO. Here is how we did it:

- As the first step of the development of proposed prototype, ontology using concepts and attributes of car parts is developed. This ontology represents a common vocabulary used in Auto Part Shops and by the customer to describe the item for sale/purchase. A small part of car part ontology built in Web Services Modeling Toolkit shown in figure below.

- We carefully designed each auto part shop capability in order to enable testing of various customer goal specification scenarios.

- The requester goals are mapped in WSML to represent different possible scenarios for demonstration of match between goal and web service. Goals were purposefully varied to demonstrate different cases, such as exact match, plug-in match and no-match. We varied the requested product specification to achieve that effect.



(Figure 2) Screenshot of Ontology in WSMT

5. Conclusion

In this research, we achieve Matching customer goals and web service capabilities on WSMF through expressing customer goals, web services capabilities in WSML with the use of shared vocabulary ontology. We have demonstrated several matching cases in accordance with our Auto Repair Service Business Case. Moreover, we introduced a prototype of the proposed system integrated with WSMX and validated several user goal scenarios within WSMX execution environment.

6. Acknowledgment

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