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RESEARCH ARTICLE

SEMANTIC WEBSERVICE DISCOVERY FOR WEBSERVICE COMPOSITION

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Abstract — In the current trend many businesses publish their applications utilities on the web. The desideratum for supporting the classification and semantic annotation of services constitutes an important challenge for service–centric software engineering. Such a semantic annotation may require, in turn, to be made in acceptance to a specific ontology. Also, a service description needs to felicitously relate with other similar services. For a particular service request to relate an implicit service description, this paper overcomes the issues in web service discovery using semantics The service request along with web service composition is performed using categorization of semantic based service and enhancement in semantics in an ontology frame work.

I. INTRODUCTION

A webservice can be termed as a self-contained, modular application that can be described, published, discovered, and invoked over the Web. Web Services can be combined with each other in different ways to create business processes that enable us to interact directly with customers, employees, and suppliers.

The webservices are described using the Web Service Description Language (WSDL) and the described web services are stored in the applicable public repository called Universal Description, Discovery and Integration (UDDI) [4].

Services use the Web to perform application-to application integration and they are business process interfaces which are called as Webservices. Each Web Service is a point of interaction to give input and receive output from a business process. Further it allows previously incompatible applications to interoperate on the Web regardless of language, platform, and operating systems. A web service is a standalone function that can be called invoked by many different applications.

Webservices reduce the complexity by encapsulating business processes into reusable components and improve interoperability by acting as a wrapper around legacy or platform- specific applications. They are self-described (WSDL, UDDI) and can be used to develop applications much faster than before. A Web Service is a simple, reliable way to blend existing systems with new applications and services.

Ontology is an explicit formal specification of the terms in the domain and relations among them. It is used for domain information sharing, categorizing Web sites (Google) & products for sale (Flipkart.com). Further it defines classes, relations and axioms to support the modeling of time dependent activities.

Syntax - based search will produce the documents or services by comparing in the existing repository where the output produced may not be relevant to the user's request. Semantic - based search is a type of machine learning methodology in coordination with ontology where the user's request can be directed to the appropriate web service [1].

The performance of the semantic - based categorization can be improved by implementing the categorization techniques over the ontology. The augmented web service classification into functional categories using semantics is done at the Public Registry UDDI for semantic-based categorization.

II. RELATED WORK

The work done by Aabhas V. Paliwal, Student Member, IEEE, Basit Shafiq, Member, IEEE, Jaideep Vaidya, Member, IEEE, Hui Xiong, Senior Member, IEEE, and Nabil Adam, Senior Member, IEEE has developed a method for automated web service discovery based on semantics. They have performed semantic-based service categorization and semantic enhancement of the service request. The service request enhancement involves expansion of additional terms retrieved from ontology.

Xuanzhe Liu, Gang Huang, Member, IEEE, and Hong Mei, Senior Member, IEEE they described in recent years the Web communities have undergone a radical change to the "user-centric" environment where more and more users are able to directly participate in the Web-based computing. In such a user-centric environment, it is undoubtedly convincing that the services computing paradigm can bring more and more benefits and profits to the users. They have tried to propose an efficient service discovery approach from the service consumer's perspective in the paper entitled Discovering Homogeneous Web Service Community in the User-Centric Web Environment, IEEE transactions on services computing vol 2, no 2, April- June 2009.

Authors Yakup Yildirim, Adnan Yazici, Senior Member, IEEE, and Turgay Yilmaz, Student Member, IEEE have developed a framework for an automatic semantic content extraction system for videos which can be utilized in various areas, such as surveillance, sport events, and news video applications. The novel idea here is to utilize domain ontologies generated with a domain-independent ontology based semantic content met ontology model and a set of special rule definitions. Automatic Semantic Content Extraction Framework contributes in several ways to semantic video modeling and semantic content extraction research areas. First of all, the semantic content extraction process is done automatically. In addition, a generic ontology-based semantic met ontology model for videos (VISCOM) is proposed. Moreover, the semantic content representation capability and extraction success are improved by adding fuzziness in class, relation, and rule definitions in the paper entitled Automatic Semantic Content Extraction in Videos Using a Fuzzy Ontology and Rule-Based Model IEEE transactions on knowledge and data engineering , vol. 25,no 1, January 2013.

III. METHODOLOGY

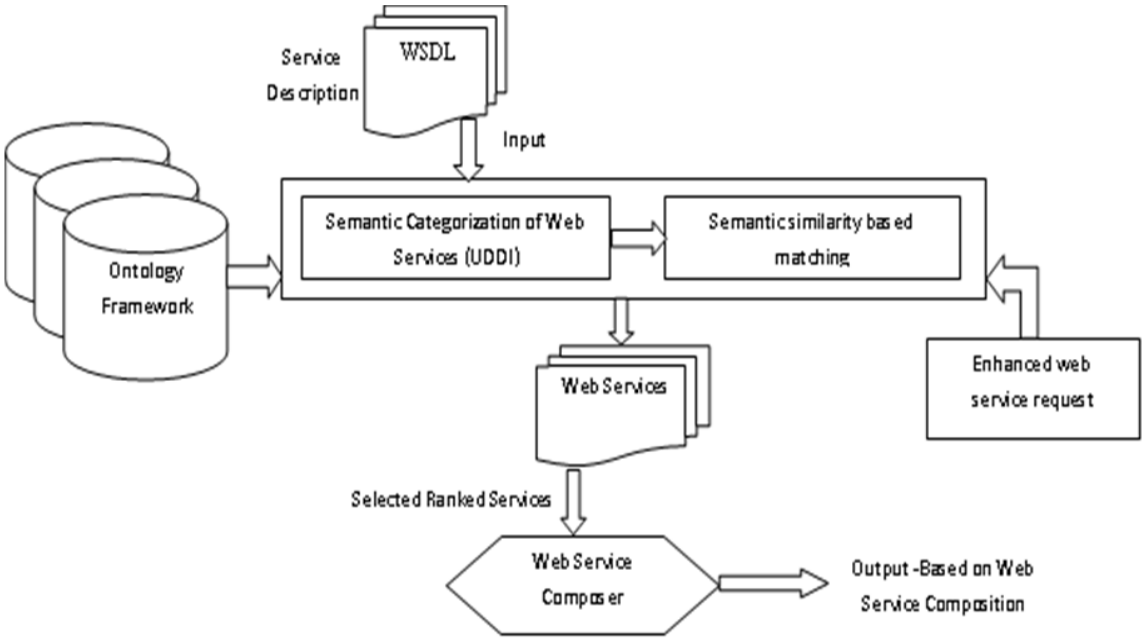
Semantic based search on web services gives the related services from the repository as the service consumer's expectation. That is achieved by creating and maintaining the ontology which is more domains dependent. When ontology is created for a specific domain, which consists more terms which refers to a single web service. When the service consumer requested for a web service that appropriate service is discovered from the UDDI (Universal Descriptive Discovery and Integration) with the help of domain dependent ontology. The domain dependent ontology is developed by using associate ontology clustering algorithm [1].

The established clustering methodology is combined with ontology for semantic based categorization of UDDI. In the relevant ontology a concept is formed for every term in service description. A concept is added to the service description if a match is found. Based on semantic relationships among the concepts, the irrelevant terms are removed and the additional concepts are added. The clustering is performed by finding the relationship among the service description and concepts in ontology leading to a set of service description [4] The efficient service categorization is obtained by adding the relevant semantic information to the UDDI.

After the refinement of services from the registry when more number of services are required by the service consumer, the composition of web services is performed. The web service composition is achieved through web service choreography and web service orchestration. Web service orchestration is a method when more number of services are required to finish or meet the customer's requirement where the web services should be executed in a particular order.

For example a customer would like to have a round trip through Luxury Volvo and also he/she may be in need to book a hotel and a local call taxi. Here the service to book the Volvo Bus ticket must be executed first followed by booking the remaining services depending on the customer's requirement. The functional behavior of each web service is called the web service choreography, i.e., the execution process must be carried out sequentially which means that without booking of Volvo bus tickets, the services used for booking a hotel or taxi should not be performed by the service provider. By maintaining this approach for web service composition using semantic based web service discovery is achieved, which provides a better service to the service consumer.

IV. ARCHITECTURE



This figure System Architecture for Web service composition Web services published by the service provider will be stored in the UDDI registry where all the services are described using WSDL. In the ontology framework, we have more number of domain dependent ontology created and connected within the UDDI to discover the relevant web services to satisfy the request given by the service consumer.

The ontological framework is used to identify the basic categories in the specific domain and gives the relationship within the categories in coordination with the relationship constraints [2]. The domain based ontologies are created using semantics which are helpful to identify the appropriate web services available in the UDDI. If more number of services is needed to complete the user's request, then they have to be executed in a specific manner, i.e., by implementing the web service composition which includes an order of performance and the control of functional behavior in the web services.

A set of predefined ontologies provide the web service elements to represent the semantic based web service categorization. By applying the categorization method, a well refined automated web service discovery is attained. The composition of the similarity and the functionality of the ontologies activate the semantics of the metadata. The interaction of the predefined patterns with one another at execution level and message level collaboratively forms the web service orchestration.

Webservice choreography is defined in XML-based business processing language which describes the web service participants collaboratively for the services to behave as peers and the interaction will last for longer time. In the architecture of shown in fig.1, web service composition, there is a component termed as web service composer, whose responsibility is to make the order of execution of the services and to control the service orchestration along with the service choreography, which finally leads to a composed set of web services.

V. EXPERIMENTAL RESULTS

For an efficient web service discovery and web service composition, the three services namely travels booking, hotel booking and taxi booking are defined in three separate ontologies there by forming an ontology framework. When the request from the service consumer is given, the air ticket booking process will be executed first using semantic based service categorization [1] and the appropriate service is identified. Further the other two services i.e., hotel and taxi booking will be executed depending on service consumer's necessity where the service composer delivers the adequate output to the service requestor.

The following are the steps involved in the web service composition:

(i) First the service consumer opts for the required travels service by selecting one among the list of travels given from the ontology which also gives the time of the Volvo bus departure and the cost per person. The mode of display will be by producing the cheapest travels as the first one in the list. The user can go with the cost constraint given by the service discovery, or manually select the travels to meet the time phenomenon

(ii) For example if a customer wants to travel from Bangalore to Kodaikanal, the following information will be retrieved from the relevant ontology.

TABLE I: TRAVELS SERVICES RETRIEVED FROM RELEVANT ONTOLOGY

Travels Name	Bus No.	Time of Departure	Tariff
Sharma	SH405	14:00pm	Rs.1500
KPN	KPN009	18:00pm	Rs.1400
Kallada	KLDA18	23:00pm	Rs.1800
KSRTC	TN056	23:50pm	Rs.800
TNSTC	K0090	02:00am	Rs.100

(iii) If the customer is willing to book the hotel available at Kodaikanal, the following information will be displayed by fetching from the hotel ontology.

TABLE II: HOTEL SERVICES RETRIEVED FROM RELEVANT ONTOLOGY

Hotel Name	Status	Facilities	Tariff per day	Honey moon package
The Carlton	5star	Near to Lake	Rs.10000	Rs.25000
The Hill Country	5star	Near to Blackberry hills	Rs.8000	Rs.40000
The Sterling Resorts	3star	Near to Golf club	Rs.6000	Rs.30000

(iv) Further, if the customer essentially needs a taxi, he/she can choose the feasible taxi service available, which are produced from the taxi ontology and few are given below:

TABLE III: TAXI SERVICES RETRIEVED FROM RELEVANT ONTOLOGY

Vehicle Name	Tariff Per KM
Toyota-Innova	Rs.15
Skoda-Rapid	Rs.18
Volkswagen-Vento	Rs.18
Suzuki-SX4	Rs.17
Mahindra-Xuv	Rs.18
Mahindra-Scorpio	Rs.15

(v) After selection of the services, the booking for all the services will be made by the service consumer.

VI. CONCLUSION

In this paper we have concentrated on creating domain dependent ontologies, semantic based service discovery and web service composition along with service orchestration and choreography, effectively.

VII. FUTURE WORK

As a future enhancement of this work, regarding payment to different services can be made as a single payment which can be managed through SLA (Service Level Agreement) among the service providers. So that the service consumer need not to pay for individual service which in the service composition.

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