Analysis of Ontology Based Approaches for Web Service Discovery

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ABSTRACT: ***The Surge in the number of online services leads to rise of issues; thus, users have just a difficulty in discovering a web application that has been created and released. An essential problem in web service is the finding of web services. Semantic technologies enable specialization and extension of service requirements as well as service composition. Thus, a greater degree of automation and more accurate outcomes may be obtained. In this article, we are going to give an overview of existing ontology methods for Web Service Discovery. These study will allow researchers to choose the best and suitable ontology-based method for web service discovery, and that they might suggest a new way to minimize their drawbacks. For us, we concentrate on utilizing this research for a proposed software discovery and selection online services. It has been found that semantic based methods are easier and offer higher accuracy, but there are some drawbacks as well like less flexibility and more batch processing which impacts the performance.***

KEYWORDS: ***Web service, Web service discovery, Semantics, Ontology, OWL-S.***

1. INTRODUCTION

Throughout the last decade, a number of academics have focused considerable attention towards web services, an essential paradigm of Service–Oriented Architecture. Service-Oriented Architecture is an emerging technique in the creation of loosely connected distributed systems on the web. Web services are one of the methods to build service oriented architecture, a software system intended to enable interoperable equipment interaction across a network. Web services transform software programs into web applications, offer loose-coupling at middle-ware level and expose an interface to users without giving them information of the underlying technology or implementation specifics[1]. The idea of web service based on a set of technological requirements such as SOAP, UDDI and WSDL, is a service-oriented architectural approach. It offers services via standard web protocol to implement the communication of application services across various platforms. This web service architecture consists of three entities; the service provider, the service registry and the service consumer [2].

The service provider creates or just provides the online service. The network operator has to define the web service in a standard format, which is typically XML, and publish it in a common service registry. The service register includes further information on the service provider, including such address and contact of the supplying business, and technical data about the service. This service consumer gets the information first from registry and utilizes the service description received to connect to and execute the web service [3].

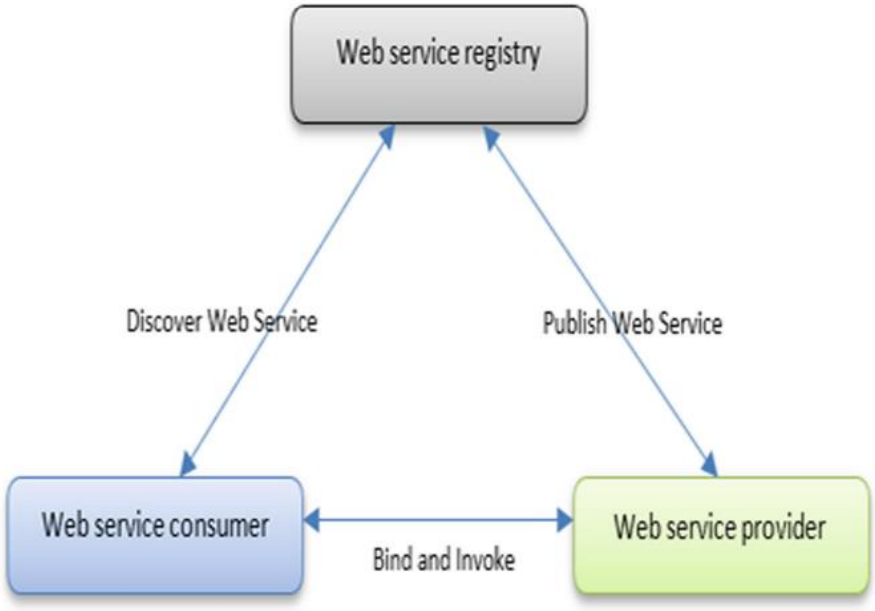

Figure 1: Illustrate the Web service model likes registry, consumer, and provider.

The online service discovery seems to be the user in some manner to search the various kinds of web services and may obtain it all elements of particular information. However, the XML based standards allow just the syntactical representations of the functionality offered by the services. Nevertheless, this still needs human inputs for the web service discovery. The assessment of semantic web has encouraged researchers to enhance the online services with the semantic information, which is interpretable by computers [4]. This automates the fundamental operations of web services including discovery, composition, choosing and invocation as illustrated n figure 1.

1.1. Web Service Discovery:

The complexity of internet services varies in function from basic applications including weather reports, currency convertors, credit checking, credit card payment, etc. to complicated commercial uses such as that of Online Book shops, insurance brokering system, online trip planners etc. Current availability of web services in repositories such as UDDIs, Web portals, via the Internet, and then a further scope of fast future growth makes discovery of web services a significant problem from user's viewpoint. The identification of prospective online services may be achieved primarily via two methods; one is by utilizing centralized repositories including UDDI's and another one is by employing web crawling techniques. UDDI comprises metadata about web services and fulfils advertising obligations to service providers. It also offers search capabilities to users for posting and invoking services. Various standards including WSDL, SOAP, and UDDI have been created to enable discovery of web services, however sheer syntactic nature of all these standards results in efficient search methods. Because it has been noticed that existing discovery methods are restricted in their search capabilities because they are mainly focused on the keywords based matching.

The web service consumer looks for a web service in UDDI registry and inputs needs using keywords. Thus, a new method is required, one that involves finding online services on the basis of the capabilities they offer. Semantics methods in web service play an essential part in smooth integration of various services which are based on different terminologies. For illustrate, a service called "car" may not be returned from either the query "automobile" provided by a user, although they are clearly the same at the conceptual level. In inclusion of semantics to the web services via ontology associated technologies may improve the above stated syntactic related search. A few of the current difficulties encountered by web services include:

- Noticeably web services accessible on intranet, Internet or private subdomains are very high, and they make it necessary to have a highly precise procedure to identify the web services required by the user.
- Retrieval of services with comparable functionality as needed by a customer neither substantially provided as UDDI provides keyword based matching, nor as context based matching.
- There seems to be no provision for manual annotation of web applications description.
- Absence of deep understanding of semantic languages and associated toolkits for web services.

- Attempting to establish web service discovery procedures.
- There are many current methods or tools that enable the web service discovery; however, these approaches frequently lack distinct characteristics including quality of the service, reusability, integration of users' comments or annotations.

1.2. Semantic Web Service Discovery Methods:

The word "ontology" is used in various areas also including Artificial Intelligence, Software engineering, Technology architecture among others. Ontology is a structural framework for information processing or knowledge representations about the world or portion of a world, which defines a collection of ideas, their characteristics and connections among them. Ontology is a "formal definition of a common conceptualization". That offers a common language, and a taxonomy of a specific domain which specifies objects, classes, their properties and their connections. Ontology gives meaning to web services and their resources and may significantly enhance search algorithms. In order to achieve the concept of semantic web, academics have suggested various languages, algorithms and structures. Semantic web services are an element of the semantic web since of markup usage which makes data understandable by machine. Semantic web services utilize standard including such OWL-S, WSDL-S, WSMO, OWLS-LR and others. OWL-S: is an ontology language to describe web services; it is the mix of web services and semantic web, primarily to realize utilizing semantics to define web service. OWL-S includes three components: Service Profile, Service Model and Service Grounding. Service Profile defines the service features, Service search agent via the Service Profile to achieve Service matching, and offers a superclass of every kind of high-level representation of the service.

WSDL-S: Current WSDL standard works at the syntactic level and lacks the semantic to describe the needs and capabilities of Web Services. WSDL-S is a lightweight method for providing semantics to Web services. In WSDL-S, the semantic models are kept outside of WSDL documents and are accessed from the WSDL document through WSDL extensibility elements. WSMO: WSMO offers a conceptual framework and a formal language to define all essential features of Web services to enable the automation of service discovery using semantics. The general structure of WSMO is split into four major components. OWL-S is the most popular method, but there are many shortcomings in the OWL-S formalism, e.g. the absence of mediator support, pose difficulties in addressing real-life scenarios as described in fig 2. Towards resolving this, recent studies have investigated additions to the OWL-S framework. Extend OWL-S to specify and preserve inheritance connection between services.

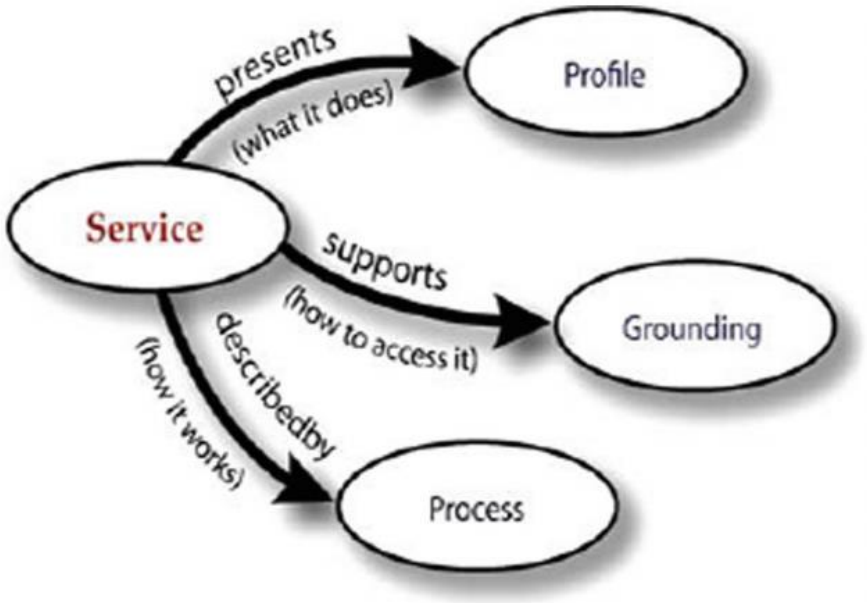

Figure 2: Illustrate the service ontology based on different ontologies

1.3. Ontology Based Approaches for Web Service Discovery:

Several of the discovery methods utilize the QoS based methodologies to narrow down the search. A framework utilizing ontology-based flexible exploration of semantic web services. They showed how a user's inquiry may be converted into queries which can still be handled by a matching engine. Another framework that enables semantic web service discovery known as natural language keywords. They used Normal Language Processing (NLP) to match user inquiry, which is stated in natural English language with both the semantic web service description. They also provided an efficient matching method to find out the semantic distance between ontological notions. An integrative method for automatic service discovery. Their method is based upon semantic-based service classification and semantic based service selection. Regarding service classification, they suggested an ontology based segmentation of web services into in the functional categories[5].

This led to improved resource provisioning by matching the customer order with such an appropriate service description. An OWL-S based method for web service discovery with the enhanced performance (remember and accuracy) of web service search. Their method utilizes service profile description enabling service matching and identification. The primary WSDL file characteristics utilized for matching are service name, inputs, outputs, service parameters and QoS related properties. They proposed the integration architecture including semantic matchmaker based on OWL-S mechanism into the UDDI framework. Furthermore, they detailed web service publication and discovery utilizing the suggested semantic matchmaker. They also revealed the matchmaker algorithm. A technique for hybrid semantic web service matching methodology in OWL-S dubbed OWLS-MX. This technique leverages both logic based reasoning and Information Retrieval (IR) approaches. Their experimental assessment showed that constructing semantic web service matchmakers based on description logic critical thinkers may be inadequate. For additional research, they suggested development of more robust methods to service matching on the semantic web across disciplines. They utilized an effective semantic service comparison which takes into account concept characteristics to correlate concept in web service and service customer request descriptions. Their method is based on an architecture consisting of four folds: Web service and request specification layer, functional match layer, QoS computing layer as well as reputation computing layer. Future effort includes to combine the capabilities of multiple web services into one composite and achieve customer choice and QoS-based web service construction. It has been demonstrated that how the non-functional requirements (QoS) may be integrated into the service discovery method so as to produce a list of services containing user functional needs. They suggested an ontology-based adaptable architecture for semantic web services discovery[6]. Their method is built on user-supplied, context-specific mappings from user ontology to appropriate domain ontologies to define web services.

Limitations of ontologies in web service discovery:

- There seems to be less research effort in the area of semantic web service that aims to qualitatively enhance or update web service ontologies or may simplify the usage of ontologies and improve the recruitment process.
- It is a difficult job to create a standard ontology for numerous online services.
- It has been noticed that there are practically no details about the difficulties the researchers or projects encountered when utilizing the ontologies.
- Besides which, the bulk of currently existing services does not support the related semantics and there are difficulties on the possible conversion of existing non-semantic structure towards the semantic descriptions.

A solution to the issues connected to the absence of semantic information inside the LingWS description. Furthermore, they suggested an OWL-S modification to incorporate the nonfunctional linguistic characteristics and interactions between them, and they provided a concept encouraging the finding of the semantic LingWS. Indeed, they developed a semantic matchmaker, termed OWLS-MX matchmaker, which has also been suitable to identify LingWS utilizing non-functional linguistic characteristics [7].

A conceptual discovery architecture based on semantic representation of the capacity of web services to enhance the performance and quality of automated web service research has been described. Their approach enhances discovery speed by adding two prefiltering steps to the exploration engine and also addresses the scalability issue. In the first step, they contrasted ontology of the user request and Web service categories. In second step, they decreased number of test cases as the online services are removed based upon a deconstruction and analysis of

idea. They tested the suggested method using a new internet service repository, dubbed WSMO-FL test collection. Logical inference is utilized for matching, and guarantees that the user request is fulfilled by the chosen web service[8].

Throughout this article, the authors suggest an ontology-based OWL-S modification to adding QoS to web service specifications. They utilized an effective semantic service matching technique takes into account concept characteristics to match concepts in web service and service customer request descriptions. Their method is based on such an architecture consisting of four layers: Web service and request description layer, functional match phase, QoS computing layer and reputation computing layer. Future effort includes to combine the capabilities of multiple web services into one composite and achieve customer choice and QoS-based web service composition [9].

Resolved this issue of service matching demanded by consumers by making usage OWL ontologies and the OWL reasoner RACER. They developed framework called DECAF which includes an interface for pairing, which uses OWL-S for matching the requirements with web service descriptions. They proposed a novel method to connect ontologies using agents and reasoning the ontologies using RACER. Researchers believe that their prototype may be a suitable start point for transitioning to the developing semantic web and utilizing ontologies with mobile agents in a broader actual application [10].

2. DISCUSSION

It is demonstrated that following aspects will be further ended up working upon as illustrated below: Better matchmaking mechanisms. Usage Techniques for effective feature selections. User query expansion methodologies. Improving and better utilization existing ontologies standards. Usage methodologies for performance and accuracy improvement. This research will allow researchers to choose the best and suitable ontology-based method for web service discovery, and they may suggest a new way to minimize their drawbacks. For all of us, we concentrate on utilizing this research for a new system discovery and selecting online services. The above fact, possibly along with the way some questionnaire were posed, helped lead us to opportunity to learn and develop that, nevertheless interesting, did not necessarily match what designers expected from them. Furthermore, the participants aimed directly were procured from the people taking part at the OAEI contests, which are mostly academically oriented, consequently our study may well be biased towards outstanding academic researchers rather than just a balance between written examination and industrial researchers. Finally, this research study was the correct response to some misgivings that arose while undergoing the systematic review, and we recognize the results here with first evaluation.

3. CONCLUSION

Exploration system plays a key role in internet service model for effective website service retrieval. As web application discovery did involve manual intervention, it is a cumbersome but also time - consuming process task to discover the web services as set of materials as the consumer expects. This necessarily requires the resolutions for automatic brand strategies and takes attention of researchers. Currently, OWL-S based ontology language is perhaps the most standardized and perhaps is most comprehensive semantic web service technology deployed. This article provides a review of the state–of-the-art on semantic web service discovery systems. We examined more current discovery studies describing the major methods and discussing exemplary systems for each approach. Though our poll does not include all published publications. The aim of such survey was to gather information about the present status of the ontology matching area and the application of such methods to real-life settings. We have observed that most academics share the same worries regarding the practical application of the ontology matching methods, and the issue of having too many theoretical solutions but few applied ones. Nonetheless, owing to the structure of the survey, with open-ended questions, there is additional information that we have not represented in this study and which we intend on evaluating and utilizing in the future.

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