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# Semantic Based Service Categorization For Web Service Discovery

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## Abstract

*Describing web services with semantic provide the ability for automatic web service discovery, invocation,composition and interoperation. The two major aspects related to semantic based service discovery are semantic based service categorization and semantic enhancement of service request. To bring effective matching and accurate result, web service composition is introduced. In web service composition, multiple services have to be discovered so that they together match a service request. The web services can be discovered automatically and dynamically. Latent Semantic Indexing (LSI) is an efficient matching of the enhanced service request with the retrieved service description is achieved effectively.*

*Index terms: Web service discovery, Web service composition, and Service discovery process*.

## 1. Introduction

A web service structure supports to service oriented architecture and the creation of distributed application over the web.Web services is an effort to build a distributed computing platform for the Web. Web services are used for business application, resource sharing and makting places, etc.

In the existing system, the web service discovery adopt keyword matching technologies. This syntax based matching result does not produce accurate result. Only fewer services can be matched accurately. To reduce this approach, semantic based automated service is discovered. The two major issues related to automated service discovery: 1) Semantic based categorization of web services and 2) Selection of services based on semantic description. The semantic based service categorization of web services is perfomed at UDDI. UDDI (Universal Description Discovery and Integration) is a standard for publishing and discovery of web services.UDDI registries provide keyword searches for the web services. And we also combine ontology concepts for the semantic categorization to perform similar services together. Selection of services consist of two steps: 1) parameter based service refinement and 2) semantic similarity based matching. The purpose of refinement is to select the services from the service categorization based on the input and output parameters.The semantic similarity based matching involves ontology based request enhancement and LSI based service matching. LSI is to extend the indexing procedure from solely syntactical information to a semantic level.

In this paper,we extend our approach to web service composition. Combining of multiple services and producing the combined result to the service requester. For the accurate result and service produced to the user to be effective, web service composition is to be introduced for web service discovery. Multiple services are given to the user to gather more ideas about the user required.

## 2.Background

In this section, the web service compostion provide multiple service to the user as a result. In this service, the basic methods used here are semantic categorization of web service,parameters based service refinement and semantic similarity based matching.

The parameters based on semantic categorization of web service is ranking

relationship of semantic. Semantic relationship is based ontology concepts and ranking relationship is based on three parameters. The parameters are relevance, specifity, and span.

### 2.1.Relavance

For the web service discovery, the relavance requires related concepts to the required service. The client requires the service to provide relevant concept from the service.

### 2.2.Specificity

In this service, the client should specify the concepts to the service. We must address the requirement to the service with the required specification. By this specification the concepts are termed as the higher level concepts.

### 2.3.Span

The span of the service in semantic relationships requires the strength of the linkage with the concepts. The span requires power of the concepts in the web service.

The user specified weights are associated with these parameters like relavance,specify and span. These parameters are useful to rank the semantic relationship for the web service discovery

In the parameters based service refinement, hyperclique pattern technique is dicussed. Hyperclique patterns are based on the frequent item. The basic concepts used in this patterns are support and confidence. The support gives the user specified relationship to the frequient items and confidence captures the strength of the association rule.

In the semantic similarity based matching , the approach used here is Latent Semantic Index(LSI). It used to find relationship between the web service terms which includes service description and the parameters. The LSI translates it into concepts and finds the matching documents and required wb services.

## 3.Overview Of Proposed Approach

The proposed approach for semantic based web service discovery involves web service composition. This web service composition involves combining of multiple services and producing multiple services to the user. This service satisfy the user requester by efficient and accurate result. This web service discovery is also used to predict the related result to the user by this client can get satisfied without the mentioning to the service. The proposed approach is discovery of new web service discovery with the multiple services. The steps involved in creating web service discovery are semantic based categorization of web service and selection of services based on semantic service description. The first step for web service discovery involves the semantic categorization of web services.

This services are published in UDDI(Universal description discovery and integration). And ontology concepts are guided for this web service. The web services composition involves grouping of services with the similar functionality and different service categories. For grouping of web services, we apply clustering concept to produce combined result for the web service composition. The semantic categorization serves as the back end of the system and it is executed independently of individual service request. And the service selection process is executed for each service request and serves as a front end of the overall system. The semantic categorization of web services is followed by service selection from the relevant group of services.

The next step for web service discovery involves selection of services based on semantic service description. The selection of web service involves two steps : 1) parameters based service refinement and 2) semantic similarity based matching. Refinement of the web services are based on input, output and description parameters of the services. And the purpose of this refinement is to select a set services from the service categorization module representing the desired functionality in terms of input and output service parameters.

Similarity involves the enhancement of the web service request with the relevant ontology terms and matching of this enhanced service request with the set of web services for selecting appropriate service.

For matching the enhanced service request with the refined set of web service description,we employ Latent Semantic Indexing(LSI) technique

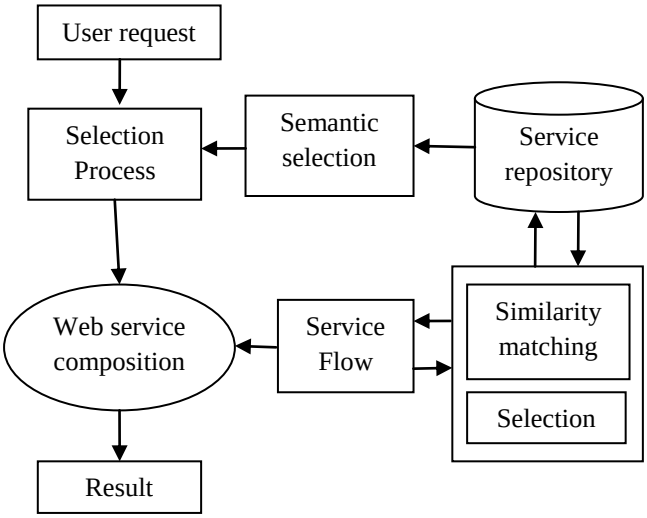


Figure 3.1 Web Service Composition

In this figure3.1 The web service composition method is introduced. User request to the service, the selection process is done and produced as the result. And this composition also produce the relevant appropiate service to the requester by similarity matching and selection process without the user required.

## 4.Semantic Categorization Of Web Services

In our proposed approach, web service composition is introduced to produce multiple service as a result. In this web service discovery, the first step is semantic categorization which involves UDDI concept and we combine ontolgy concept with the clustering methodology. The initial concept for the semantic categorization involves Sevice Description Vector(SDV). We achieve this vector for semantic categorization for improving semantic content of SDV with the relevant ontology concepts and terms. The steps involved for creating web service are

1.Build the web service description vectors.
2.Tag on the relevant ontology concepts and delete the irrelevant terms for the semantic ranking relationship
3.Extract the web service collection for clustering concept and connect the upper ontology concept for each cluster and relevant ontology concept for the equivalent subcluster.

The steps involved in semantic categorization of web services are given below:

### 4.1. Web Service Description Vectors

The semantic service description format includes OWL-S, WSDL(Web Service Description Language) and WSML. The WSDL file forms part of the intial set and its corresponding descriptions. The WSDL document processing includes extraction of association operation and next step involves removal of punctuation.

### 4.2. Ontology Concepts

The web service description vector enhanced from the ontology concepts. This ontology concepts are related to synonyms and bring the related concepts that provide the context.

The first step in this phase involves adding relevant ontology concepts to the intial service vector. The next step in this phase involves deleting irrelevant terms based on the ranking relationships. The next step of this phase is to find the parameters for ranking process. The parameters in ranking involve relavance, specificity, and span. This parameters makes the ranking process is more flexible.

### 4.3.Clustering And Ontology Concept Relations

After enhancing the service description vector with the ontology concepts, clustering of service is performed. Clustering is to group the functionalities with the similar services together. In this clustering, the set consist of all the concepts and duplicates concepts are eliminated.

### 4.4.Web Service Registry

In this phase, we extend our approach to UDDI. UDDI is a platform independent,open industry intiative which facilitates business to define their web services, discover other web services, and share information about how they interact in a global registry. To find the specific service in UDDI, a user needs to input basic information about the service, such as service name, keyword, and then browse the result.

This approach support for discvering the web services. For supporting semantic based web service discovery, the other approach adds service

categorization and service request enhancement as separate layers on top of the UDDI.

## 5.Parameters Based Service Refinement

In our proposed approach, web service composition is to be introduced as a web service discovery. In this web service composition, multiple service has to be introduced and combination of multiple services are produced as the result to the service requester. In this web service discovery, the first step of the proposed approach involves semantic categorizationof the web services. The next step deals with the selection of web services for a given request. This step involves two tasks: 1) Parameters based service refinement and 2) Semantic similarity based matching.

The first step involved in service selection is parameter based service refinement. The web service parameters include input, output and description,aid service refinement through narrowing the set of appropriate services matching the service request. To group web service input and output parameters,we apply a hyperclique pattern discovery approach. The steps involved in this approach are

1.Retrieval of service parameters to form association pattern items.
2.Hyperclique pattern is discovered for the association of pattern items.
3.Rank the associations between the terms.
4.Prune the association patterns.

### 5.1. Retrieve Service Parameters

In the WSDL document, the web service description are provided. To retrieve the relevant service parameters, the corresponding WSDL document is processed and extracted to the association parameters.

### 5.2. Hyperclique Pattern Discovery

Hyperclique pattern is discovered for web service discovery. This patterns are based on the frequent item sets. The process of hyperclique patterns can be viewed as the level wise pattern tree. Every level of the pattern has the same number of nodes. If the level increased by one,the pattern size also increased by one. Our algorithm for finding this pattern is breath first. The algorithm is very efficient for handling large scale items. The pattern indicate the support and h-confidence.

### 5.3.Ranking Semantic Association

To rank the semantic association, we find relavance,specificity and user specified span. This makes the ranking process more flexible. These three concepts are linked to the concepts specified in the upper ontology. The ranking is used for the sorting the association patterns.

### 5.4.Prune Association Pattern

In this asssociation pattern, pruning is done for large number of association pattern. In this prune association pattern ,irrelevant data are discarded for web service discovery. Combining of the multiple web service discovery makes the web service composition method.

## 6.Semantic Similarity Based Matching

The next step involved in service selection is semantic similarity based matching. This process involves the enhancing of the service request. The semantic similarity is based on the ontology concept and LSI based service matching. A discovery of web service is based to form web service request. It can be in two ways, syntactic web service request and semantic web service request. The combination of multiple semantic web service discovery forms the web service composition. It enables more effiective and productive services over the web.

For this web service discovery,the semantic similarity based matching includes some steps

1.Preprocess the service request and determine the web service for search.
2.Collect the web service description and retrieve the relevant service to request.
3.Retrive the concepts related to the initial service request form the ontology work.
4.Obtain the related concepts to expand the service request.
5.Perform SVD and project the description vector to determine similarity.

### 6.1.Preprocess Service Request

Preprocessing of service request includes removal of mark ups, translation of upper case to lower case characters,punctuation removal, and

white space. And service request terms are searched in the upper ontology to extract the related upper concepts.

### 6.2. Collect And Retrieval Of Service Description

The relevant service are collected and categorized in WSDL set. The selection of web service is categorized in the UDDI. The WSDL document process includes the extraction of terms. This extracted text forms service description.

### 6.3.Ontology Concept

This approach is based on the retrieval of relevant feedback for the information. Our approach builds to expand the service request based on the existing terms. The ontology concepts were extracted by ontology linking based on ontology to ontology mapping.

### 6.4.Expansion Of Service Request

The approach for linking ontology concept is based on the retrieval of concepts cross through the two links expressing an association. This concept restrict in gathering ontology concept at the same level. The expand request is the combination of the original terms and ontology concepts.

The service request expansion is implemented by using windowing and information display. The retrieved relevant terms are graphically displayed for the user. The terms chosen by the user are included to reformulate the expanded service request.

### 6.5.Perform SVD And Project SR

The Singular Value Decomposition (SVD) is used to calculate the best reduced dimension for transformed term document. This reduced dimensional representation is used for determining the web services.

The projection of Service Request(SR) involves description vector and request vector to determine the similarity. This is used for ranking the web services based on a higher similarity.

## 7.Algorithm

Step1: Initialization of web services
Step2: Initialization of applications
Step3: Default selection
Step4: Composition
Step5: Matching of similar services
Step6: Service selection module
Step7: Composition agent based service
Step8: Selecting the agent's access to the service.
Step9: Invoking the method of Web Services.
Step10: Web service context selection
Step11: Final result is delivered.

## 8.Related Work

In the existing approach,the automated web service is discovered for syntactic or semantic matching. The syntactic word does not match with the user request and cannot produce accurate result. In this existing approach, only some syntactic words can produce similar match and accurate result. For this, semantic method is applied to gather the information about the user requester aand produced as a result. This semantic web service produce the result based on the ranking method. In this semantic approach, ontology concept is extracted. And our approach appends the syntactic service description with the relevant semantic terms. This combines the syntactic and semantic approach for overall service matching and it requires minimal human interaction.

In this paper, our proposed approach is web service composition. This composition gives combination of multiple service and they together match the service request. Our approach has similarities to exiting approach of web service discovery. Combination of multiple services makes the web service composition. This composition also gives the extra relevant appropiate service to the user requester without the user required. By this the user can get the other related data of the user requested.

## 9.Conclusion

In this paper, we have discovered an approach web service composition for web service discovery. The two major aspect used for web service discovery are semantic based service categorization and semantic based service selection. For the semantic based service categorization is perfomed offline at the UDDI. The selection of web service for a given service

request involves refinement and enhancement of web services.

A Web service discovery is the process of finding an appropriate service provider for a service requestor through a service matchmaker. Web service compostion is introduced for the web service discovery. In web service composition, multiple service have to be discovered so that they together match a service request. To produce accurate result and in effective semantic ranking of the result the web service composition is to be introduced. This web service also produce related service to the user to be effective.

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