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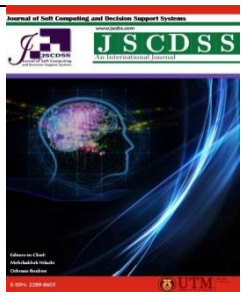

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A Review of Service Skyline Algorithms

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Abstract

The right combination of atomic services to provide services to users, is one of the main challenges of Web services. In this combination service, a selection of the appropriate atomic service is very important, in order to combine the desired qualitative parameters applied. To achieve this objective, a technique called Service Skyline has been provided to establish a dominant relationship between service providers. Also, a proper combination was done based on it. In this study, the service Skyline algorithms were reviewed and compared to the appropriate algorithm, in terms of complexity and runtime, to be selected for use in a real environment.

Keywords: Service combination, Service skyline, Dominance analysis, Quality of service.

1. Introduction

The increasing rate of web services will cause the emergence of services with similar functions. The combination of Web services is done based on the method of web service selection and according to performance and user requests. This performance is applied based on quality parameters of web service combination. The most important challenge in the field of Web service combination are redundancy, limited speed, scalability and other quantitative and qualitative parameters (Yu and Bouguettaya, 2008). To achieve this performance, Service Skyline technique is used.

The Service Skyline method results in the development of the right combination of services in a real environment. Service Skyline includes a set of combined Web services which provide the closest response at the request of users of all sizes. Based on service quality, a weight is assigned to each Web service, so a stronger weighting mechanism helps users to express their priorities in different and sometimes conflicting quality parameters such as combined numerical weight that will obtain the highest value of the objective performance (Yu and Bouguettaya, 2009).

There are two significant limitations in this method (Yu and Bouguettaya, 2013): In the first limitation, users cannot change their personal preference to numerical weight, hence users cannot make accurate decisions without full awareness of the quality of web service for existing compounds among different aspects of quality using weight mechanism. In the second limitation, whenever weight changes, it is necessary to perform a new search which is computationally expensive and accomplished compounds may exponentially increase with discussed numbers of services (Sun et al., 2008). The aim of this study was to combine the best of the Web service of a collection of services using the Service skyline method.

This study is structured as follows: Section 2 presents tasks are discussed in the context of service combination using Service skyline. Section 3 provides a comparison of the available methods will be reviewed and Section 4 provides conclusions.

2. Related work in the field of service combination by Service skyline

In (Bouanaka and Zarour, 2013) this part, different methods of Web service combination were introduced based on Service skyline. In a study by Bouanaka and Zarour an approach about using Service skyline to combine Web services was provided based on QoS, in which Integration of a combination of Web-based services were evaluated dynamically and without defects. Among the advantages of this method is the identification and selection of the best web service, as well as the use of a linear combination to reduce the number of Web services selected from the portfolio of services, based on service quality from the portfolio of services available. A disadvantage of this study is the failure to create Web services through the combination of real and unreal data set.

Benouaret and his colleagues offered a dominant fuzzy method for calculating the QoS-based Service skyline, in which key challenges including increased range of Web services and their qualitative aspects were considered. In this study, users are required to use the special weight features for each service. The benefits of this research includes creating a new concept named α – dominance of

Service skyline for Web service combination in high dimensions as well as the creation of a suitable algorithm which is used for calculating characteristics. The disadvantages of this research include numerous quality criteria between the services, as well as lack of enough information, for users to select characteristics through web services with high dimensions (Benouaret et al., 2011).

Benouaret et al. used top-k algorithm and fuzzy logic for prioritization of services and their combination based on user requests. In this way, the user's preference is modelled based on a fuzzy method. Also, the RDM algorithm uses it to determine the relationship between Web services. The benefits of this research are to improve diversity in the combination of web services along with keeping the service combination with the highest rate. The disadvantage of this research is limitation of fuzzy method in service combination, for regulating user requests using comparative methods (Benouaret et al., 2011).

In (Skoutas et al., 2010), Ranking and Clustering web services are provided using standard dominant relation in which retrieval, selection and combination of web services is examined according to increase in web services. Also, their synchronization is based on Criterion Matching using Skyline method in different quality parameters. The disadvantage of this method is the lack of comparative criteria to determine the similarity of web service parameters. Also, reduced weight characteristics in this method, lowers the accuracy of the recovery process which leads to the loss of important information and is a very close similarity. The advantage of this method is that it ranks suitable services for provided requests and defines dominance relations between services. Also, the Clustering method helps in defining the dominance relation between similar parameters. It has been shown in this research that the provided algorithm is effective on real requests of users on real and unreal data.

Yu and Bouguettaya have provided a method of calculating Service skyline for qualitative invalid data in which performance of services were examined according to the fluctuation of services in a dynamic environment. In this research, the quality of real services was formed by creating inherently invalid services. Also, existing services optimization approaches may not change the quality of services over time. Thus, characteristics weight feature with multiple and sometimes conflicting quality criteria should be used for the selection of each service. The problem of this method is that false understanding of weight characteristics by users leads to loss of services desired by the user. Among the advantages of this method is creating a new concept named P-Dominant service skyline which is suitable for weight characteristic and multiple qualitative parameters. Also, the structure of R-tree which uses dual pruning method is effective for combining web service in the skyline algorithm (Yu, Bouguettaya, 2010).

Alrifai et al. reduced candidate services by using Service skyline and created tree clusters using K-means cluster algorithm. This algorithm receives skyline inputs, gives back a dual tree structure and determines the root. In fact, it can be said that it has created dominance relation among services and has sorted them based on the quality characteristics of service and these services belong to skyline. The advantage of this method in eliminating invalid services and its limitation is limited calculation and long processing time which reduces efficiency (Alrifai et al., 2010).

In (Yu and Bouguettaya, 2013), Service skyline was used in order to reduce the amount of candidate services, DPA algorithm was used in order to create a tree to ascending sort of services. The BUA algorithm and linear strategy were used to prune the unnecessary services. The suggested algorithm makes the combination of service and skyline calculations efficient. The disadvantage of this method is that there is no study on data incompatibility.

The skyline for a collection of points in multi dimension space which is not surrendered by other services is as stated by (Chen et al., 2011). The first purpose of this method is to separate data existing in sites into undividable groups, in a way that skyline calculations can be provided in a parallel form and without change in final result. This matter was developed using the PaDSkyline, (Parallel distributed skyline) algorithm framework for parallel processing of skyline request among separated groups. Also, the intergroup improvement method and multi dimension filtering are improved for processing skyline requests. Particularly, skyline local points are sent along with a request, as filtered points to help identification of services in low quality points on the site by service skyline. Other advantages of this method include reducing response time to the request of users and increasing speed of web service combination. Also, this method is affordable and effective for special service combination. Among the disadvantage of this method is lack of examination in a structural and limited environment.

In (Rhimi et al., 2015), a research based on efficient calculations service skyline based on a combination of services with fuzzy relations priority was provided, in which services were examined as an effective process to ensure the combination of multi atomic web services, in order to create a customized web service. The existence of multiple web services with similar characteristics requires the selection of best non-functional criteria (such as response time, reliability and price). Skyline technique helps these challenges by reducing the search area as a complementary measure and optimum approach. In fact, the basis of the skyline method is to choose the best service in the search area based on a non-functional criteria. Also, a lot of service skyline is based on a dominance relation named Pareto-dominance. Among the advantages of this method, is calculating skyline points based on fuzzy approach that is provided according to user priorities. Also, this research provides a fuzzy model against web service combination limits. Among the disadvantages of this research, is lack of coverage in the whole combination process based on focused service quality.

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3. Comparing methods of web service combination based on service skyline

With regard to the methods investigated in the second section of that study, generally, there were disadvantages such as redundancy, speed limits, scalability and other qualitative and quantitative problems. The most important key challenges in the past procedures are the presence of several quality parameters, the emergence of incompatible data and also, the problem of creating weight characteristic for the web services. For example, in research of (Bianka and Zarour, 2013), according to this issue that the best combination service is chosen and provided, but because of the dominant relationship, the time of evaluation and comparison rises that is the cause of method's weakness; which this weakness in (Yu and Bouguettaya, 2013) and (Chen et al., 2011)'s study were solved. In addition, (Benouaret et al., 2011) and (Benouaret et al., 2011), due to lack of adequate information and the actual data, offering a combination service is difficult. In (Skoutas et al., 2010) and (Yu, Bouguettaya, 2010) and (Alrifai et al., 2010) and (Rhimi et al., 2015)'s study, despite offering the best combination and low processing time due to lack of attention to inconsistent data, the ultimate combination of services and providing for the users will be difficult. Table 1 presents the advantages and disadvantages of these methods.

Table 1
Advantages and disadvantages of skyline algorithms.

Study title	Method	Advantages	Disadvantages
Combined web-based service using Skyline QoS (Bouanaka and Zarour, 2013)	Combine services dynamically based on quality and integrity	-Identify and select the best web service from a collection of services -Use linear combination s to choose the best service	- Failure to investigate the creation of combined real and fake Web Services data sets -Long review -Do not use a dominant relationship
Using fuzzy dominance model , to calculate Skyline QoS-based service (Benouaret et al., 2011)	Increasing range of web services and qualitative aspects	-Web service combination on large scale -Review of Web Services	-Lack of sufficient information for users to choose features -Select low speed service -Do not use incompatible data.
The combination of Web services by top-k algorithm fuzzy absolute relationship (Benouaret et al., 2011)	The combination of web data service according to user preferences complex	-Improving diversity by combining Web services -Maintain a Web service combination	-Lack of appropriate criteria for the selection and implementation of services -Non review collection service space -Use absolute phase relationships and Non testing in a real environment
Rating and categorize Web services using standard dominant relationship (Skoutas et al., 2010)	Recovery, selection and combination of Web services due to increased service and Web service-based integration of adaptive measures	-Ranking services for user requests -Using qualitative criteria -Use of incompatible data	-Lack single comparative criterion to determine parameters like web services -Loss of service - User's low weight to use features
Skyline calculation service for invalid qualitative data (Yu, Bouguettaya, 2010)	Service combining performance with respect to fluctuations in the dynamic environment services	-The theme features a weight problem and multiple quality parameters -Use of services in the real environment -Using dual pruning	-The loss of services and lack of credible enforcement measures -Lack of testing with fuzzy -Lack of large-scale test -Do not use dominant relationship
The use of service Skyline to reduce the number of candidate services (Alrifai et al., 2010)	Using clustering Attributes algorithm skyline	-Removal of Invalid service - Large Scale testing - Dominant use of the relationship	- Complex calculations and processing time -The complexity of clustering
The use of service Skyline to reduce the number of candidate services and the use of algorithms DPA (Yu and Bouguettaya, 2013)	Sort Ascending services and then a linear combination	-Pruning unnecessary services -Reduces processing time	-Lack Of Checking was incompatible
Using Skyline method for calculating a set of points in a multidimensional space (Chen et al., 2011)	Separation of data in non-proliferating sites	-Improves intergroup and filtering multidimensional optimization techniques -Reduces processing time -Speed combination	-Failure to check in structured and limited -Failure to experiment with different services
Use of services with priority-based service in combination with fuzzy relations (Rhimi et al., 2015)	Reduces the search space	- Calculation of Skyline based on fuzzy vision -Overcomes the limitations of combining Web services	-Lack of coverage in the whole process of combination

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4. Conclusion

An increase in web services has resulted in users having problems like differentiation, selection and combination of best services. According to the methods which were executed in this research about web service combination, the overall disadvantages include redundancy, speed limits, scalability and other qualitative and quantitative problems. The most important key challenges in past methods include the existence of several quality parameters, the emergence of incompatible data as well as weight characteristic creation problem. By complete processing of web services environment, Service Skyline eliminates unrelated services and only chooses valid services to combine suitable combination which increase characteristic weight problem as well as service combination speed.

In the combination of Web services, the best method is the method that considers all quality parameters. It should be mentioned that time and speed play an important role in choosing the method that parallelism can expedite this matter. The methods using Skyline service in this research for the optimal combination, have limitations in terms of scalability, high time of combination process that, in Qi and his colleagues' method, this issue has been solved by dominant relationship and BUA algorithms of expressed limits. However, this method has also its weaknesses, including a lack of attention to inconsistent services and the dynamics of services. In line with this research in the future, taking into account the quality parameters, parallelism of Skyline service and limiting the services using the appropriate algorithm, we can resolve the problem of combination speed and service inconsistency.

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