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Comparative Study of Web Services Using Evolutionary Algorithms.

*Priyanka Saxena [1], *U. Datta [2]

*[1]*Computer Science and Engineering Department, Maharana Pratap College of technology Gwalior.*
Putli Ghar Road, Near Collectorate, Gwalior-474006, Madhya Pradesh, India
*[2]*Computer Science and Engineering Department, Maharana Pratap College of technology Gwalior.*

Abstract- Web services are rapidly changing the landscape of software engineering .The web services provide the some functionality but having different feature. It became the important issue due to this quality. In the web service management quality of service (QOS). There is some global optimization problem and selecting QOS based services for web is one of them. In this paper improve genetic algorithm (IGA) is used for QOS based web-service composition. Here we compare improved genetic algorithm (IGA), Particular swarm optimization (PSO), Differential equation (DE). In the experimental results we found that IGA is the most feasible and more efficient method for web service selection.

Key words- web service; service composition; quality of service; service selection , IGA ,PSO,DE

1. INTRODUCTION

Now a days WEB services is widely known service-oriented architecture to research the hot spot for the support of Web services technologies are introduced, put forward a number of issues worthy of study, from which most of these problems is not difficult to see around web service composition targeted for the study. In the main issue is service composition, service discovery and service selection to meet the user's request. Although the current research literature on a variety of quality of service (QOS) service composition methods, these methods QOS based service selection are consider only a single optimization goal, however, the service selection for the global optimum QOS is not much research work. Through the processes of service composition of the various Qos constraint parameters linear weighted into a single objective function, using the basic principle of linear programming to solve the service election problem of global optimization QOS. Evolutionary methods for solving NP-hard optimization problems have become a very popular research topic in recent years. Among the many methods proposed, the three that are very similar and popular are the Improved genetic algorithm (IGA), particle swarm optimization (PSO) and differential evolution (DE)

2 .RELATED WORK

The existing work in the domain of QoS based web service composition apply various decisions making and optimization approaches to find the best composition plan. In a multiple criteria decision making with weighted sum model (to select a service) and integer programming (IP) approach with branch and bound (to select an optimal solution) has been proposed. In constraint satisfaction based solution which combines simulated annealing approach with Tabu search has been proposed. The Tabu search is used for generating neighbor plans and simulated annealing heuristic is applied for accepting or rejecting the neighbor plan. However this approach has a high probability of getting stuck in local optimum because it is unable to work on more than one composition plan at the same time. In we presented an approach in which genetic algorithm is used to find the optimal composition plan. This method applies improvements to the generation and selection of chromosomes to improve the speed of the algorithm while it used partial initialization of chromosomes to escape local optimums. Furthermore, this method works on a population of composition plans, in contrast to the Tabu method. There are different composition approaches a description of the different composition models is provided, which are orchestration, choreography, coordination and component. Orchestration is a description of how services that participate in a composition interact at the message level, including the order in which iterations should be executed as well as the business logic. Therefore, orchestration defines the interaction with the services it orchestrates, before any actual execution takes place. One of the languages for defining choreographies is the Web Service Choreography Description Language (WS-CDL).

This paper focuses on three very similar evolutionary algorithms: IGA, PSO and DE. While GA is more suitable for discrete optimization, PSO and DE are more natural for continuous optimization. The paper first gives a brief introduction to the three EA techniques to highlight the common computational procedures. The general Observations on the similarities and differences among the three algorithms based on computational steps are discussed, contrasting the basic performances of algorithms. Summary of relevant literatures is given on job shop, flexible job shop, vehicle routing, location-allocation, and multimode resource constrained project scheduling problems.

3 WEB SERVICE DESCRIPTION MODEL

3.1 QOS Properties Description

The most important QOS properties are response time, execution time, availability, reputation and successful execution rate. Response Time can be defined several ways. Due to simplicity we measure it as the time between receiving a request by service provider and sending a respond to service requester. This time includes the queuing and execution time which are only affected by web service work load . This value must be continuously updated for each web service because the work load of a web service may change during the work time. Execution cost is a fee received by service provider from service requesters for each execution. This fee is determined by service provider and may change according to web service provider's financial policy. Availability is the degree that a web service is accessible and ready for immediate use. This value can be defined as [uptime/ (uptime + downtime)]. Downtime includes the time that web service is inaccessible and time taken to repair it. This value should be updated by service provider. Reputation is the average reputation score of a web service evaluated by the clients. The individual reputation scores are likely to be subjective, but the average score becomes trustable as the total number of the usages increases. Successful Execution Rate is the percentage of requests which a web service performs successfully when it is available and accessible. It is computed by dividing the number of successfully performed requests by the total number of requests. The QOS properties used in this paper are summarized in Table 1.

TABLE I. DESCRIPTION OF QOS PROPERTIES USESD IN THIS PAPER

QoS property	Description
Response Time	Time between receiving request and sending respond
Execution cost	Execution cost per request
Availability	$\frac{Up\ Time}{Up\ Time + Down\ Time}$
Reputation	$\frac{\sum Repi}{Total\ Number\ of\ Usage}$
Successful Execution Rate	$\frac{Number\ of\ Successful\ Request}{Total\ Number\ of\ Request}$

3.2 Aggregation value of QOS property

Generally, composition plans are constituted from serial, cycle, XOR-parallel and AND-parallel execution patterns. According to the definition of QOS properties, the aggregation value of web service composition is calculated according to its workflow
Pattern . The description and aggregation values of workflow patterns are as follow:

• Serial pattern is an execution pattern in which services are executed one after another and there is no overlap between execution periods of web services.

fig. 1 illustrates this pattern and table II represents the aggregation value of this pattern .According to Table II to calculate aggregation value of response time and execution cost, each web service value should be added to each other. Besides, in order to calculate aggregation value of availability and successful execution rate, Type equation here.web services values should be multiplied by each other because web services are independent from each other. The aggregation value of reputation is obtained by taking average of reputation values of web services. Fig. 1(a) depicts this pattern.

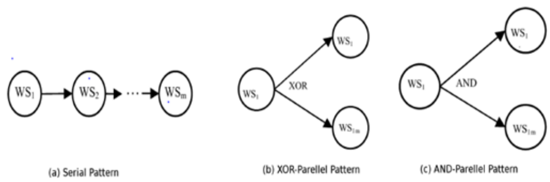

Fig. 1: Web service workflow pattern

XOR-parallel pattern is an execution pattern in which after the completion of the prior web service, only one of the following web services executes. In this pattern execution of each component is non-deterministic therefore to calculate the aggregation QOS effect of this pattern the worst case should be calculated. We can obtain aggregation QOS values of this pattern as de-scribed in table III. Fig. 1(b) depicts this pattern.

• AND-parallel pattern is an execution pattern in which after the completion of the prior web service, the entire subsequent web services are executed simultaneously. The aggregation QOS values of this pattern are described in Table IV.

Notice that to obtain aggregation response time, we use the Max function because all subsequent components are executed simultaneously. Fig.1(c) describes this pattern.

TABLE 2. AGGRIGATIVE QOS VALUE FOR SERIAL PATTERN

Response Time	$\sum_{i=0}^{m} WS.RT$
Execution Time	$\sum_{i=0}^{m} WS.EC$
Availability	$\sum_{i=0}^{m} WS.Ava$
Successful Execution rate	$\prod_{i=0}^{m} WS.Suc$
Reputation	$\frac{\sum_{i=0}^{m} WS.Re\ p}{m}$

TABLE 3. AGGRIGATIVE QOS VALUE FOR XOR-PARALLEL PATTERN

Response Time	*Max(WS.RT)*
Execution cost	*Max(WS.EC)*
Availability	*Min(WS.Ava)*
Reputation	*Min(WS.Suc)*
Successful Execution Rate	*Min(WS.Re p)*

TABLE 4. AGGRIGATIVE QOS VALUE FOR AND-PARALLEL PATTER

Response Time	*Max(WS.RT)*
Execution Time	$\sum_{i=0}^{m} WS.EC$
Availability	$\sum_{i=0}^{m} WS.Ava$
Successful Execution rate	$\prod_{i=0}^{m} WS.Suc$
Reputation	$\frac{\sum_{i=0}^{m} WS.Re\,p}{m}$

3.3 Quality of Service Metric and Objective Function

There are many measures available for different QOS criteria, however, we consider the following five generic quality criteria for single services, also referred to as QOS parameters: reliability, availability, Reputation, execution duration, and execution price.

• **Response Time** (q1) is the time difference between request sent and response has been fully received.

• **Execution Cost** (q2) is the cost per request.

• **Availability** (q3) is the availability of a service is the fraction of time that the service is accessible . It basically measures the fraction of the total amount of time in which the service is available during the last defined period of time (threshold is set by administrator).

• **Success ability** (q4) defined the services that yield successful results over request messages.

• **Reputation** (q5) of a service is a measure of it strust worthiness and depends on the end user's experience of using a service. The value of reputation is defined as the average ranking given to a service by different end users.

• **Throughput** (q6) is the amount of process able data per time unit.

• **Accuracy** (q7) is the error rate that produces a service. It is calculated as the number of errors divided by the total number of executions.

• **Latency** (q8) is the difference between time when request was sent and time when response has started to be Received.

There are total 2500 web services that are divided into 10 number of tasks resulting in 250 web services in every task. Our goal is to maximize the overall QOS not only for one task, but for 10 task simultaneously. The overall objective function for the optimization of the workflows is the following:

TABLE.5
Qualitative comparison of GA, PSO, and DE

GA: genetic algorithm, PSO: particle swarm optimization, DE: differential equation

	GA	PSO	DE
Require ranking of solution	Yes	No	No
Influence of population size on solution time	Exponential	Linear	Linear
Influence of best solution on polpulation	Medium	Most	Less
Average finess cannot get worse	False	False	True
Tendency for premature converegence	Medium	High	Low
Continuity (density) of search space	Less	More	More
Ability to reach good solution without local search	Less	More	More
Homogeneous sub-grouping improves convergence	Yes	Yes	Na

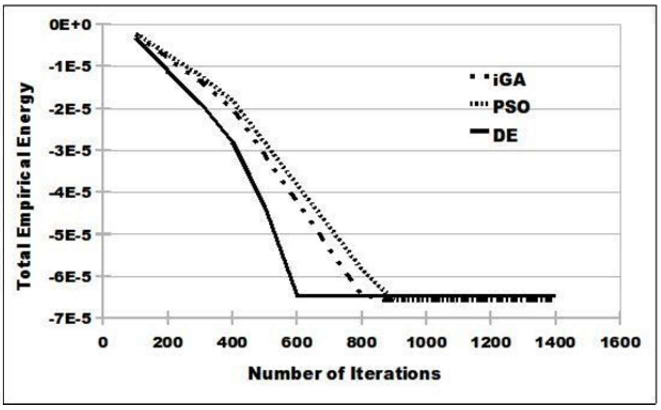

Figure 2.compare total empirical energy

CONCLUSION

This paper introduces the comparisons between the widely used algorithm .The above graph shows that comparative study of these three algorithms are IGA, PSO and DE. By calculating the total empirical energy in the respect of the number of tasks and iterations as well .In this approach we have applied some iterations and the total empirical energy being calculated. We observed that the IGA achieves the highest empirical energy range rather than the rest two algorithms PSO And DE.

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[7] "Optimization by Genetic Algorithm"University of Sannio, Department of Engineering Palazzo ex Poste, Via Traiano 82100 Benevento, Italy Richa Garg*GGITC, Ambala GGGI, Ambala India India, Saurabh mittal

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