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Web Service Selection Based on User Constraint Values in QoS Using Fuzzification Method for Optimal Solution: A Case Study

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Abstract— Web service composition focuses on synthesizing individual, outsourced web services to create a new service. It aims to provide more value added service than single web services. The proposed approach dynamically composes web services and the composition plans are generated automatically[1]. We have considered six QoS criteria and also considered user's constraints over these parameters. Our system also allows user to computation time for ranking and composition based on different number of service providers and number to tasks. The experiments result showed that the fuzzification method is better than any methods like dominance and probability methods probability method in the QoS criteria is based on the composition plan such as min. lower execution cost and response time is considered for getting optimum solution.

Keywords— Web service composition, QoS Fuzzification and Probability.

I. INTRODUCTION

Like extant workflow models, it requires a specification of how to regulate component services to fulfill the user request. For example, when a user uses web service to take a business trip, the following steps are taken into consideration in the service process. First, the user would contact a travel agency's web service to make reservation for a flight ticket and hotel room and an cab system for rental[2]. Considering user schedule and financial condition, the user selects the best one among several reservation choices. The user then may request additional services such as car rental and insurance related to the business trip. After all services have been determined, the approval service will be activated. As this example indicates, a composite web service is a partially ordered collection of component web services. By choosing appropriate web services offered by different web service providers, specifying their coordination plan, and implementing the plan through an orchestration engine, the composite web service can provide more valuable and complete service than a single web service. It can also reuse individual web services more efficiently.

It is expected that there will exist hundreds of outsourced services with different QoS properties that offer the same business function, and, as the result, the clients will face the trouble of choosing or creating composition plans, among numerous possible plans, that satisfy their QoS requirements. For example, suppose a web service composition problem in which 3 tasks or component processes should be coordinated and 5 candidates outsourced web services for each process exist. Then the total number of possible plans is 125 including 5 candidates and 3 tasks. In engineering perspective, generating the composition plan that fulfills a user 's QoS requirement is a time-consuming optimization problem. In this respect, combining outsourced web services of high QoS values in a reasonable computation time has been recognized as an important problem of web service composition[3].

For web services to reach their full potential, however, the composition process needs to be automated. The automated composition has been researched in both semantic web and workflow communities. The semantic web based composition is goal-oriented. Broadly, depending on how the user represents service requirement (i.e., goal and constraint), different automation techniques have been proposed so far. Specifically, the requirement is declared using one of high level process description models such as OWL-S. In particular, OWL-S provides the user with well structured service ontology for defining composite process. It consists of service profile, service model, and service grounding[4] .The service profile profile contains service information, such as service name and service description for service advertising and discovery. The service model provides a basic process construct known as atomic process and a more complex process construct called composite process. The composite process may consist of more than one atomic or composite process. In addition, the service model provides flow control constructs, such as

The proposed algorithm below generates its 125 plan using fuzzy technique that a evaluates the aggregated QoS property values and computes if possible for the selection of the plan constraint violation of the objective function of the service composition ranking best of the plan in which the selection.We mean a composition plan in which some web services of the current plan is replaced with other web services[5].

II. ALGORITHM

Users can specify the types of services and user constraints like user defined cost rate for optimum value with aggregated QoS and using other constraints such as frequency successive rate, reputation obtain the quality of service using above constraints and user specification costs.

The frequencies for the composition plan are the no. of services to selected cost. The successive cost is evaluated by dividing cost by corresponding frequency. The successive rate the cost is computed as rats of their successive cost is computed as rates of their successive cost and total of all sources cost. The optional value to the reputation are considered and the quality of the services is calculates as the rates of frequency and their successive rate[6]. The availability is computed as divided the quality by reputation.

Algorithm

Steps

1. List out the task of given series n
2. Get the no of service (m=5)
3. Generate the total no of services for composition plan = m^n
4. Sum for all the cost in with ascending order.
5. Select the cost rate between user defined constraint
6. Save the composition plan(cp) table.
7. Calculate successive cost , successive rate ,availability in qos criteria.
8. Cheek all the composition plan satisfying the constraint by user.
9. Save composite services that satisfy constraint filtered composition plan.
10. Verify the above plan for probability, dominated value and in fuzification.
11. Calculate Successive Cost (CS) → the response time cost/ frequency.
12. Calculate Successive Cost Rate (SCR) → the successive cost / frequency *100
13. Calculate Quality(Q) → frequency/Successive Rate.
14. Calculate qualitative prob(QP) → the availability → Quality/reputation.
15. Select the probability value $0 \leq Qp \leq 1$.
16. Compute the Aggregated Qos rank for those probability.

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17. Construct the dominance way with undominated selection
18. Construct the Fuzzification method selected.
19. Calculate Alternatives with known criteria.
20. Select the Alternative as max cost.
21. Select the criteria AS the min. cost, max success rate, max frequency, min response time, max reputation and max availability.
22. Compute Aggregated Qos as sum of Multiplication of Alternatives corresponds with criteria.
23. Calculate the normalization to the Aggregated Qos
24. Sort out and save the composition in ranked composition plan list.

III. PROBLEM FOR CASE STUDY

Suppose there are tasks required to complete the user request and ranked services list contains candidate services for each task. So there can be m^n compositions possible

Step 1.

n= no of task =3.(flight, hotel, cab)

Step 2.

Cost of three plan for m candidates where m=5. Candidates service M =5 are A,B,C,D,E respectively. The cost of 3 tasks are flight , hotel, and cab and their total for respective service are given in the following table 1.

Table 1. Composition plan for candidate services

Candidate service	*Flight cost*	*Hotel cost*	*Cab cost*	*Total cost*
A	*916*	*140*	*20*	*1076*
B	*860*	*172*	*30*	*1062*
C	*760*	*223*	*67*	*1050*
D	*300*	*311*	*57*	*668*
E	*172*	*757*	*27*	*956*

The composition plan table is made of sum of composition of each cost the every other cost . therefore we get $m^n = 5^3$ =125 plan. Composition cost we get total of all 125 cost, Candidate service m=5 are A,B,C,D,E Take n=3are flight, hotel, cab

Step 3

The ascending order of composition plan according to the total cost.

Table 2. The ascending order of composition plan

Plan ID	*Flight Cost*	*Hotel*	*Cab cost*	*Total cost*
106	*172*	*140*	*20*	*332*
110	*172*	*140*	*27*	*339*
107	*172*	*140*	*30*	*342*
-	-	-	-	-
25	*172*	*757*	*67*	*996*
14	*760*	*223*	*20*	*1003*
-	-	-	-	-
45	*916*	*757*	*57*	*1730*
44	*916*	*757*	*67*	*1740*

Step 4

Case A: Using probability distribution

The frequencies for the composition plan are given. The no of services to be selected with respect to cost. The Successive Cost (CS) is evaluated by dividing cost by corresponding frequency[7]. The Successive Cost Rate (SCR) the cost is computed as ratio of their successive cost and total of all successive cost. The optional value to the reputation are considered as the Quality(Q) of the services is calculated as the ratio of frequency and their successive rate. The availability is computed as divided the quality of reputation.

Symbolically,

1 $SuccessiveCost = \frac{no.of\ .Suceesfulexxecution}{tota\ln umberofservicetrails}$

2. $SuccessiveCost = \frac{Cost}{Frequency}$

3. Service create (SR) = $\frac{S.C}{\sum SC}$

4. Quality (Q) = $\frac{No.of\ Service}{S.R}$

5. Availability = $\frac{Q}{reputation}$

Step 5.

Calculate the above constraint such as successive cost, successive cost rate ,Quality and availability .constraint for all response time. Calculate the above constraint for all selected values which lies between 0 and 1 and select the response time corresponding to the value in between 0 and ie $0 \leq Qp \leq 1$.Compute the Aggregated Qos rank for those probability and the ranking are obtained in the table with lowest cost to highest cost order in normalization rate.

Case A: Conclusion for probability result

Since the probability is the ratio of quality and reputation, if it has the value of mixture of integer and fraction and hence we should be selected as and hence we should be selected as the fractional values, which likes between o and 1. For normalization of availability gives the order of preference is the minimum cost if the composition plans. Also if can be takes n as the normalization rate of the corresponding cost[8]. From the point if view for the probability order of preference as the rank of the composition plan and it could be shown that the first preference as the cost $ **550** as our selection and that order of ranking should be maintained for selection.

Case B: Using Dominance property

From the above table it should be revealed that the dominance property cannot be achieved in Pareto Optimal based on Selected List . We left out the above table and find out the quality of service using the fuzzification method, that will encage the uncertainty of the values to the certainty of quality of service.

Case: C Using fuzzification method

Construct the Fuzzification method selection and Save composite services that satisfy constraint filtered composition plan. Composition plan that satisfies the user constraints is saved in the Filtered Composition Plan (FCP) List and given to the Pareto optimal based selector

QoS criteria	*Response time*	*Cost*	*Frequency*	*Succive Cost*	*Repu-tation*	*Availability*
	q1	*q2*	*q3*	*q4*	*q5*	*q6*
Alternative	*a1*	*a2*	*a3*	*a4*	*a5*	*a6*

QoS properties can be classified as positive and negative QoS properties. QoS attributes like successful execution rate, reputation, frequency, and availability are positive QoS attributes. Higher the value of those positive QoS attributes; the efficiency of the composition process is high. Negative QoS attributes are response time and execution cost[9]. Lower the value of those negative QoS attributes; the efficiency of the composition is high.
In Cost column select minimum as q1 & Response time select minimum as q4.
Other Column elect maximum as q2, q3, q5, q6. Based on the QoS properties,

Response time (min)	*Cost (Min)*	*Frquency (Max)*	*Succ Cost rate(%) SCR Max*	*Repu-Tation (Max)*	*Availabiltiy*
500	*503 **	*48 **	*14.61263*	*8*	*0.410603839 **
464	*540*	*48*	*15.68751*	*13*	*0.235366075*
450	*543*	*46*	*16.46052*	*12*	*0.232880482*
550	*550*	*45*	*17.04322*	*14 **	*0.188596142*
650	*550*	*43*	*17.83593*	*13*	*0.185451082*
*400 **	*553*	*42*	*18.3602 **	*6*	*0.381259525*

Calculate Alternatives with known criteria values

Qo S criteria	*Response time*	*Cost*	*Frequency*	*Succive Cost*	*Repu-tation*	*Availability*
	q1 = 400	*q2= 503*	*q3 =48*	*q4 = 18*	*q5 = 14*	*q6 = 0.41*
Alternative	*a1*	*a2*	*a3*	*a4*	*a5*	*a6*

Compute Aggregated QoS as sum of Multiplication of Alternatives corresponds with criteria and calculate the normalization to the Aggregated Qos

Step 6.

Minimum cost rank for optimal solution

QOS	*Rank order*	*OPTIMAL COST*	*MINIMUM COST RANK*
16.01617555	*4*	*16.01617555*	*3*
16.20267335	*3*	*16.20267335*	*4*
15.94258676	*5*	*15.94258676*	*2*
17.47358053	*2*	*17.47358053*	*5*
18.87947911	*1*	*18.87947911*	*6*
15.48550469	*6*	*15.48550469*	*1*

Execute all the composition plan in Rcpl.

RESULT

Comparison Algorithm:

1. Start with aggregated rank.
2. Compute S. D. for prob.
3. Compute C. V. for Prob.
4. Compute S. D. for fuzzy.
5. Compute C. V. for fuzzy.
6. If CVP > CVF, Select composite plan for fuzzy.
   (C.V for the probability > C.V for the fuzzy)
7. Otherwise select composite plan for prob.
8. Create a plan based on fuzzy result

Probability				
F	*x*	*fx*	x^2	fx^2
48	*25.13*	*1206.24*	*631.5169*	*30312.81*
48	*14.40*	*691.2*	*207.36*	*9953.28*
46	*14.25*	*655.5*	*203.0625*	*9340.875*
45	*11.54*	*519.3*	*133.1716*	*5992.722*
43	*11.35*	*488.05*	*128.8225*	*5539.368*
42	*23.33*	*979.86*	*544.2889*	*22860.13*
272		*4540.15*		*83999.19*

To find Standard deviation for probability

S.D. = 5.496

C.V = 32.93

Fazzification				
f	*X*	*F(x)*	X^2	fx^2
48	*16.026*	*769.248*	*256.8327*	*12327.97*
48	*16.2*	*777.6*	*262.44*	*12597.12*
46	*15.94*	*733.24*	*254.0836*	*11687.85*
45	*17.47*	*786.00*	*305.2009*	*13734.04*
43	*18.88*	*811.84*	*356.4544*	*15327.54*
272		*4528.658*		*75752*

S.D = 1.37927

C.V = 0.40

IV. RESULT AND COMPARISON

We have obtained rank order of qualify using probability and fuzzification compare result of both and find wheather which is more important to select for using data and obtain the decision. First we have to calculate the s.d for the frequency and quantity for probability and then to compute the coefficient of variation for those probability[9][10]. Similarly we have to calculate the s.d for frequency and quality for fuzzication and then to compute the coefficient of variation for those fuzzication Here the C.V of fuzzy evaluate is very lowest values than that of the prob. Evaluation. From this comparision, fuzzification is more betters than the prob. Evaluation.

Coefficient Variation of Probability Value = 32.93

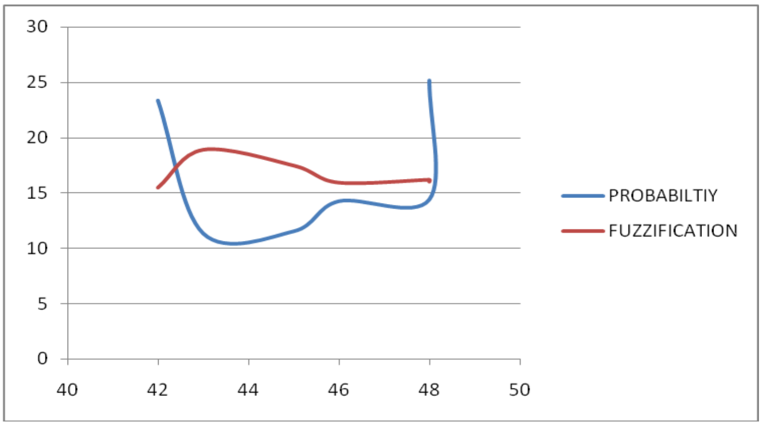
Coefficient Variation of Fuzzification Value = 0.40

32.93 > 0.40

(Prob.) (Fuzzification)

We have concluded that the rank order as fuzzification should be considered for selection of composition plan for the web services as among the service provider Result for graph based

FRQUENCY	*PROBABILTIY*	*FUZZIFICATION*
48	*25.13*	*16.026*
48	*14.4*	*16.2*
46	*14.25*	*15.94*
45	*11.54*	*17.47*
43	*11.35*	*18.88*
42	*23.33*	*15.49*



V. CONCLUSION

From the above graph indicate the trends line for probability differ the fuzzy trend line coincident with fuzzification. In the graph trend line for the fuzzificaiton does not coincide with that of probability. From the probability selection and from the composition plan table multiply the criteria value with the corresponding alternatives and total sum of 1 their value gives the fuzzification availability. Normalization for the availability should be calculate. The ranking order could be shown that rank of this fuzzification devite with that of probability.

The selection of fuzification it is more better than that of probability, since the calculation of coefficient of variance. From the point of view that first performance as the cost of **$ 503** as our selection and that order of ranking should be maintained for selection.

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