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Service Combination Using Lagrange Optimization Method and Evolutionary Algorithm

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Abstract

Various methods on the combination of web services have been implemented in the past. Each one of these methods is aimed at achieving an optimal service combination among the numerous ones; however, each method suffered from some disadvantages, regardless of its advantages. The selection of a suitable approach is key to adopting an optimal web service combination. The present study tackles the investigation of the Lagrange optimization method, which is a systematic approach based on the minimum distance between the user's request and the Lagrange curve. The results obtained from using the Lagrange optimization method indicated that this method provides a yielding output compared to other methods of web service combination. Also, given the features of Lagrange functions, it can be concluded that the Lagrange method can be used for higher service quality modes and settle multi-objective problems, while this might be unrealized in other related methods. Finally, the evolutionary algorithm of Single_EA (Single Evolutionary Algorithm) was used to implement the plan.

Keywords: Evolutionary algorithm, Optimization of Lagrange, Web service combination, Web service.

1. Introduction

Service oriented architecture provides a calculation model of loose coupling, in which business performance and API access data are defined (Griffiths and Chao, 2010). Most companies and organizations nowadays place their business on the internet platform and seek to downsize their physical structure by outsourcing the projects of different parts of their organization. Also, as time passes, the requirements of customers in business environments increase rapidly, and this may result in serious challenges confronting the development of information systems (Zhang, 2011). A single service cannot mostly meet the intricate needs of customers; accordingly, the aforesaid needs are expected to be satisfied with a combination of several services. Now, how can users select their desirable and suitable service from among the similar ones? Is this service always available? Is it a cost-effective service? Is the service able to reach the answer early, before the expected time duration? Is the selected service well known and reputable? Such questions have always been proposed on service quality criteria in electronic business and exchanges between enterprises (Zhao et al., 2012). Therefore, this study is aimed at providing a new approach to a proper selection and combination of web services in large-scale organizations based on service quality criteria so that users can adopt, from among the available services, the best service at the earliest time, based on the quality criteria of each service (Wang et al., 2007). Here, a question arises as to "How is it possible to reach an optimal service with the least limitation?" When it comes to m multiple dimensions in discussing web service combination, multi-objective optimization model problems come up, since favourite linear functions can be used only in convex spots, and fail to reach a right answer at non convex points (Sashay et al., 2010). It goes without saying that given the limited web service combination at an agreed upon level, using a systematic method based on the available models and its combination with a number of certain available algorithms may particularly settle the multi-objective optimization model problems. The current study provides a Lagrange optimization method, which could resolve current problems related to web service combination. This method also enjoys a better and shorter response time duration in the adoption of an ideal combination among the current methods.

2. Lagrange optimization

Lagrange optimization is one of the most common scalarization methods in multi-objective optimization (Funaro, 2008). Its main advantage lies in the fact that each request of the user is obtained through the minimum