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Diversity Aware Web Service Recommendation Using WS-QOS and Service Usage Factors

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ABSTRACT: Over the past 10 years, it has been witnessed that tremendous growth of Web services as a major technology for sharing data, computing resources, and programs on the Web. With the drastic evolution, adoption and presence of Web services, design of novel approaches for effective Web service recommendation to satisfy users' potential requirements has become of paramount importance. Existing Web service recommendation approaches mainly focus on predicting missing QoS values of Web service candidates which are interesting to a user using collaborative filtering approach, content-based approach, or their hybrid. These recommendation approaches assume that recommended Web services are independent to each other, which sometimes may not be true. As a result, many similar or redundant Web services may exist in a recommendation list. In this project, we propose a novel Web Service recommendation approach incorporating a user's potential QoS preferences and diversity feature of user interests on Web services. It can be achieved through the absolute evaluation of service usage factors which is going to act a primary key for traditional collaborative filtering algorithm. User's interests and QoS preferences on Web services are first mined by exploring the Web service usage history. Then we compute scores of Web service candidates by measuring their relevance with historical and potential user interests, and their QoS utility. We also construct a Web service graph based on the functional similarity between Web services. Finally, we present an innovative diversity-aware Web service ranking algorithm to rank the Web service candidates based on their scores, and diversity degrees derived from the Web service graph. Our proposed Web service recommendation approach is found to be effective since it significantly improves the quality of the recommendation results compared with existing methods.

KEYWORDS: Web service recommendation, diversity, user interest, QoS preference, service usage history

I. INTRODUCTION

Web services are the internet enabled applications for performing business needs considered as the platform-independent and loosely coupled. A web service has three participants: a service provider, a service consumer and a service broker. A service provider sends a WSDL (Web Service Description Language) file to the UDDI (Universal, Description, Discovery, Interface). The service requester contacts UDDI to find the provider for that data it need, and then it contacts the service provider using the SOAP protocol. The service provider validate the service request and sends structured data in an XML file, using the SOAP protocol This XML file would be again validated by the service requester using an XSD file. The web service are majorly divided into two categories-Functional part and non-functional part. The functional part deals with the operations and behavioral aspects. The non-functional part deals with the QoS(Quality of service) parameters like performance, cost, security, usability etc. The quality of parameter can be measured on both client side and on server side. So, all these leads to a web service Discovery, Composition, Evaluation, Customization etc of services. The composite web service is the emerging trend. Thus selecting the best fitting web services are much important. The web service Discovery is a process of finding a suitable web service for a given task. Publishing a web service involves creating a software artifact and making it accessible to potential customers. Web service provider augment a web service endpoint with an interface describing using the Web Services

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Description Language so that a customer can use the service. Web services may also be discovered using multicast mechanisms like WS-Discovery, thus reducing the need for centralized registries in smaller networks. The web service Composition is a process of automatically assembling WSs to form compositions that optimize given user preferences.

II. RELATED WORK

The extract from literature based on the QoS prediction of the web service composition has been discussed in this section with which we can get knowledge of how their works are being used to achieve the desired goal.

[1] This approach helps us to finding out appropriate service selection and higher reputation with lower cost. The methodology used in this paper that models the reputation as a combination of both availability and reliability, giving a precise estimate of reputation. Estimation of QoS can be done with both factors considered together on the simple premise that availability tell about only the probability of that service being up/running, but not tell about its failure trend. The mathematical modeling of these predominant QoS factors was presented using Markov model and Weibull analysis. A scenario has been simulated using Colored Petri Net(CPN) to study the behavioral aspects. Results in selecting atomic service with robust, high performance and cost effective composite services.

[2] An AI planning based method that automatically converts a QoS-aware composition task to a planning problem with temporal and numerical features. The method first compiles a Q-WSC problem into a CSTE planning problem. Then the method applies SCP planner to handle the CSTE planning problem using temporal planning and numerical optimization and finds a composite service graph. State-of-art planners are used to handle complex temporal planning problems with logical reasoning and numerical optimization. This approach finds a composite service graph with the optimal overall QoS value while satisfying multiple global QoS constraints. The Metric FF is used to transform restricted class of Q-WSC to numerical planning problem. This results in quality and efficient enough for practical deployment.

[3] A Novel algorithm named QoS-GASP for solving the QoS-WSC at runtime has been proposed. The QoS Gasp is an hybrid approach that combines GRASP with Path Relinking. GRASP begins by creating an empty solution. Elements are added iteratively to it until a complete and feasible solution is found. Path Relinking ia an meta heuristic optimization technique that generates new solutions by exploring trajectories connecting promiing solutions. Our proposal GRASP with path Re-linking improves the QOS in terms of cost, increased availability and reductions of execution time.

[4] It deals with personalized web service selection and recommendation. A new similarity measure for web service similarity computation and a novel collaborative filtering approach called normal recovery collaborative filtering is used. This experiment is the largest scale experiment in the field of service computing, improving the previous record by a factor of 100. This results in prediction of better accuracy than other approaches.

[5] A novel collaborative filtering algorithm designed for large-scale web service recommendation. This approach employs the characteristic of QOS and achieves considerable improvement on the recommendation accuracy. To help service users better understand the rationale of the recommendation and remove some of the mystery, it uses a recommendation visualization technique to show how a recommendation is grouped with other choices. This approach was efficient and effective.

[6] This system aims at proposing a complete method to study the QOS of a composed Web Service at design time, i.e ,when the process is specified by using WS-BPEL starting from the non-functional properties of the WS to compose. The proposed technique is used to derive the non-Markovian Stochastic Petri Net models from WS-BPEL processes. The final goal of evaluating the parameters such as the service time distribution and the service reliability is attained.

[7] This factorization concentrates on performance prediction by collaborative filtering method. The metrics used here is RMSE (Root Mean Squared Error) to compare the similarities between two users. Finally performance is achieved using this approach.

[8] The approach deals with prediction of accuracy using NIMF. This proposes a collaborative quality-of-service (QoS) prediction approach for web service by taking advantage of the past web service usage experience of service users. First we apply the concept of user collaboration for the web service QoS information sharing. Then based on the collected QoS data, a neighborhood-integrated approach is designed for personalized web service QoS value prediction. This

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model uses Collaborative Filtering approach to achieve higher prediction accuracy. The NIMF approach in this paper can only be employed to predict client-side QOS properties. The effectiveness of this approach is achieved.
[9] This algorithm aim at accurately determining some type of QoS prediction method. The QoS is the critical parameter in service selection, composition and fault tolerance. With the increase in the number of web services, the prediction failure caused by the data sparseness has become a critical challenge. So, a new hybrid user-location-aware prediction based on WAA is proposed. The implicit neighbor search is optimized by incorporating location factors.
[10] This system aims at obtaining the web service composition, the best effective services with the composition of services based on maximum quality of services (QoS) and satisfy the user's requirements. The web service compositions build new services by organizing a set of existing services by providing reusability and interoperability. These results in QoS based service selection for composite service and to select a service for each task from its service group.
[11] The system aims at predicting the missing QoS values which become more important since it is an indispensible preprocess of numerous service-oriented applications. A novel collaborative location-based regularization framework is proposed to address the problem of personalized QoS prediction. First the robust neighborhoods are identified and then a location-based regularization are constructed, which are integrated to build up an unified Matrix Factorization framework. Finally an intermediate fusions are generated for better prediction.
[12] The service-oriented network applications has been considered for user's specific requirements. An order relation vector model I proposed which is used to represent and calculate user's specific QoS requirement. An preference order is applied to actual application, a QoS attribute matrix is introduced to manage QoS attribute value. The normalized Qos attribute matrix are used to calculate user's QoS attribute weight vector. Finally it delivers the user's QoS preference reliably.
[13] The more the services are available, the more difficult it becomes to find the most appropriate service for a specific application. The QoS plays an important role in the selection of web service. A novel prediction approach is presented for trustworthy QoS of web services. This results in the effective prediction of the web service selection.
[14] This deal with the quality of service(QoS) requirement for Internet of things (IoT) composite services which put forward optimization methods of the QoS metrics. The complex QoS calculation model is breakdown into four basic models, and each model is given a computational method. Combined with the QoS technology of the composite service, algorithm is used to find the sub-optimal service with an acceptable cost under the QoS constraints. This results in quickly providing the QoS computing services than other algorithm for large-scale IoT composite services.
[15] This system is designed and architecture by enabling re-use and sharing of services. In web services it is more important to make sure that the selected service is always reliable and available. An allocation scheme is proposed that minimizes the response time and cost subjected to reliability and availability. The algorithm discover services with high Qos performances, and reduce the execution time.

III. PROPOSED WORK

The proposed work contributes the following key features for the efficient web service quality evaluation approach for finding the best fit best web service. The major contribution is-
a) To measure the Neighborhood Integrated Matrix Factorization (NIMF) for Web Service QOS values at client side and at server side.
b) To construct Collaborative filtering of WS-QoS using NIMF which perform factorization for predicting similarities between the users.
c) To improve the accuracy of prediction for effective recommendation by incorporating a user's potential QoS preferences and diversity feature of user interests on Web services.

A. FRAMEWORK OF THIS APPROACH:

Now we describe the framework of our service recommendation approach which takes diversity into consideration as shown in Figure 1. In the framework, **W**eb **S**ervice **R**ecommendation with **D**iversity (WSRD) is the

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key component. For simplicity, we suppose that the service usage history and functional description information and QoS information of all services are already provided or acquired. The collected service pool can be updated dynamically by the service search engine. However, we assume that the number of services does not change in the small interval during the process of service recommendation.

WSRD has four subcomponents: functional evaluation, non-functional evaluation, diversity evaluation, and diversified Web service ranking, as shown in Figure 1. The functional evaluation can be further divided into two parts: Functional Evaluation 1 and Functional Evaluation 2. Functional Evaluation 1 evaluates the relevance of the user's historical interest with Web services based on a content-based similarity measure.

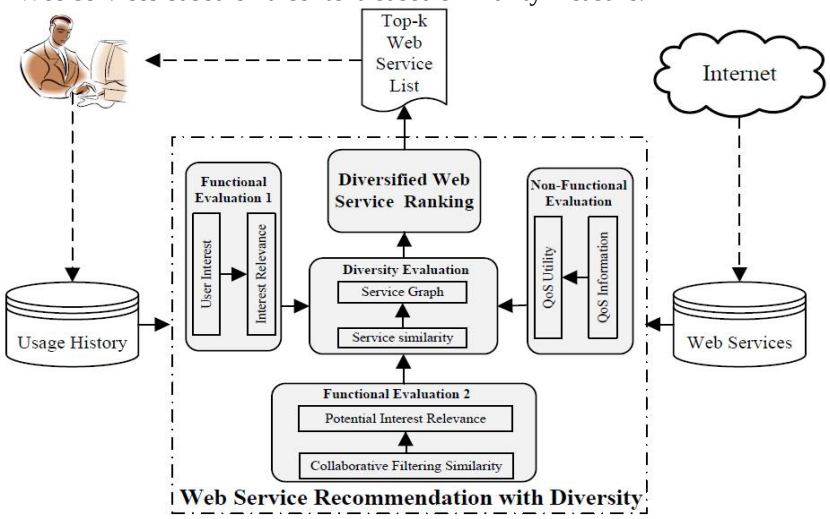

Fig.1 Framework of Our Service Recommendation Approach

Content-based similarity is acquired by text similarity. This work only considers Web services that are described by the Web Service Description Language (WSDL). Nevertheless, it is easy to extend our work to handle other kinds of Web services. The user's historical interest can be mined from his/her own service usage or query history. Functional Evaluation 2 predicts the user's potential interest and evaluates its relevance with Web services by employing collaborative filtering based user similarity. The user similarity is measured based on the service invocation history of all service users. Non-functional Evaluation first infers the user's potential QoS preference on a service candidate through mining the service's usage history, then calculates the QoS utility of the Web service with the obtained QoS information. Diversity Evaluation first calculates the functional similarity between service candidates, and then constructs a Web service graph with the computed similarity values between service candidates. After functional, non-functional, and diversity evaluation, WSRD performs the diversified service ranking algorithm based on the functional relevance, QoS utility and Web service graph to yield a well-diversified top-k service recommendation list for the active user.

B. PROPOSED WORK DESCRIPTION:

Web services have been rapidly developed in recent years and played an increasingly significant role in e-commerce, enterprise application integration, and other applications. With the growth of the number of Web services on the Internet, Web service discovery has become a critical issue to be addressed in service computing com-munity [1]. Since there are many Web services with similar functionalities and different non-functional quality, it is important for users to select desirable high-quality Web services which satisfy both users' functional and non-functional requirements. Recently, recommending qualified and preferred Web services to users has attracted much attention in terms of the information overload problem. Web service recommendation is a process of proactively discovering and

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recommending suitable Web services to end users. A number of works have been done on service recommendation based on quality of service (QoS). Most of them employed Collaborative Filtering (CF) techniques [2-6], some of them applied content-based approach, and a few of them combined CF approach with content-based techniques. They focus on predicting missing QoS values of Web services used by similar users for an active user.

However, there are drawbacks for these approaches. To begin with, they simply recommend users Web services with the best QoS values on a certain QoS criterion with-out exploiting the user's potential QoS preferences, which may likely be mined from his/her service usage history [7]. A user's QoS preference for services is certainly important for real service recommendation scenarios, since it can be used for measuring the QoS utility of a Web service in a more accurate and personalized way. Moreover, existing service recommendation approaches may have unneeded similar services in the top-k recommendation lists, since there is a default assumption that all the results are independent of each other, which may not be true in many times. As a result, the user's satisfaction degree may decrease in their experience of selection in the recommended list due to the redundant services in the limited top-k recommendation list. For example, suppose there is a certain category of services with similar or related function (i.e., in the same service domain) which match a user's interests and have comparatively higher QoS than the services in other categories. It is probable that existing service recommendation approaches will only recommend services in this category to the user in the final short recommendation list. From the user's viewpoint, however, the recommended services with similar functionality are redundant, and services in the other categories which are interesting to the active user should also be incorporated as many as possible in the only limited top-k recommendation list. In order to remove the redundancy in service recommendation list, and at the same time maintain the quality of the recommended services, diversity should be considered in recommendation.

In this paper, we propose a novel service recommendation approach by taking diversity into consideration. We incorporate the functional relevance, QoS utility, and diversity features of Web services for recommending well diversified top-k services to users. Specifically, the contributions are as follows.

1) We mine a user's functional interests and QoS preferences by exploring his/her service usage history. The user interests are two-fold: the historical user interest and the potential user interest. The historical user interest is mined through its own service usage history, query logs and profile, while the potential user interest is derived through collaborative filtering approach. User interests and QoS preferences are used for measuring the functional relevance and QoS utility respectively for Web service candidates.

2) We compute a score for each Web service candidate using the functional relevance and QoS utility. Mean-while, we construct a Web service graph based on the functional similarity between service candidates with a certain level of user interest relevance. A diversity measure is defined based on the Web service graph.

3) We perform a novel diversity-aware service ranking algorithm to find the optimal top-k Web services based on a proposed comprehensive ranking measure. The experimental results indicate that the proposed approach improves the performance of service recommendation compared with the existing methods.

IV. CONCLUSION AND FUTURE ENHANCEMENT

Using web service recommendation approach with diversity to find desired Web services for users. We incorporate functional interest, QoS preference, and diversity feature for recommending top-k diversified Web services. A diversified Web service ranking algorithm is proposed to find the top-k diversified Web service ranked list based on their functional relevance including historical user interest relevance and potential user interest relevance, non-functional relevance such as QoS utility, and diversity feature. Experimental results on a real world Web service dataset show that the proposed approach improves the Web service recommendation performance in terms of diversity, the combination of functional relevance and QoS utility, and the diversified ranking evaluation.

In future work, we will study Web service clustering methods to improve the similarity computation and con-duct real user survey to evaluate the usefulness of our method further. In addition, our proposed diversified ranking measure mainly focuses on the immediate neighborhood information of S in the Web service graph. More tests will be performed by our diversified ranking measure with k-hop nearest neighbors in the future work.

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REFERENCES

[1] Bruneo.D; Distefano.S; Longo.F; Scarpa.M; Parallel and Distributed Systems"Stochastic Evaluation of QoS in Service based system." IEEE Transactions 2013.
[2] Guobing Zou, Qiang LU, Yixin Chen, Senior Member, IEEE, Ruoyng Huang, You Xu. "Qos – Aware Dynamic composition of Web Services using Numerical Temporal Planning." IEEE Transactions on Services Computing, September 2012.
[3] Guosheng Kang, Mingdong Tang, Jianxun Liu, Xiaoqing(Frank) Liu "Diversifying Web Service Recommendation Results Via Exploring Service Usage History." IEEE Transaction on Service Computing , 2015.
[4] Hai-hong E, Jun-jie TONG, Mei-na SONG, Jun-de SONG, The journal of China Universities of Posts and Telecommunications, "A location-aware hybrid web service Qos prediction algorithm." Volume 21, supplement 1, July 2014.
[5] Huifeng Sun; ZibinZheng, Member IEEE Juliang Chen;Lyu , M.R. Services Computing , "Personalized Web Service Recommendation via Normal Recovery collaborative Filtering." IEEE transaction On volume 6 , 2013.
[6] Jianwei Yin, Wei Lo, Shuiguang Deng, Ying Li, Zhaohui Wu, Naixue Xiong, Information and Sciences, "Colbar: A collaborative location-based regularization framework for QoS prediction." Volume 265, 1 May 2014.
[7] Jose Antonio Parejo , Sergio Segura , Pablo Fernandez , Antonio Ruiz – Cortes. Experts Systems with Application, "Qos – Aware Web Service Composition using GRASP with Path Relinking." Volume 41, July 2014.
[8] Ming ZHOU, Yan MA, The Journal of China Universities of Posts and Telecommunications, "Qos aware computational method for IoT composite service." Volume 20, Supplement 1, August 2013.
[9] M.Rajeswari, G.Sambasivam, N.Balaji, M.S.Saleem Basha, T.Vengattaraman, P.Dhavachelvan, Journal of King Saud University – Computer and Information Sciences, "Appraisal and analysis on various web service composition approaches based on QoS factors." Volume 26, Issue 1, January 2014.
[10] Qian Tao, Hui-you Chang, Chun-qin Gu, Yang yi, Expert Systems with Applications, "A novel prediction approach for trustworthy QoS of web services." Volume 39, Isue 3, February 2012.
[11] Rajeev Pratap Singh, K.K. Pattanaik, AtalBihari Vajpayee – Indian Institute of Information Technology, Gwalior, India Procedia Computer Science, "An approach for composite Qos parameter based Web Service selection." Volume 19, September 2013.
[12] Ruslan Salakhutdinov &AndriyMnih., Advances in neural information processing systems, "Evaluating probabilistic Matrix Factorization on Data set." Pp. 1257- 1264, 2007.
[13] Shengjun Qin, Yan Chen, Xiangwei Mu, Information and Science, "An Optimal Service Selection with Constraints Based on QoS." Volume 25, August 2013.
[14] Xi Chen; ZibinZheng; Xudong Liu; Zicheng Huang; Hailong Sun, service computing, "Personalized Qos-Aware Web Service Recommendation and Visualization." IEEE Transactions 2013.
[15] Wei Zhou, Hunhao Wen, Min Gao, Junwei Liu, Optik – International Journal for Light and Electron Optics, "A QoS preference-based algorithm for service composition in service-oriented network." Volume 124, Isue 20, October 2013.
[16] Zibin Zheng;Shenzhen Res.Inst.Chinese Univ.of Hong Kong, Shenzhen, China;HaoMa;Lyu,IEEE, M.R.;King,I. "Collaborative Web Service QoS Prediction via Neighborhood Integrated Matrix Factorization." IEEE Transactions September 2013.