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Personalized Web Service Recommendation Based on User's Location and User's History

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Abstract: Collaborative Filtering (CF) is widely employed for making Web service recommendation. CF-based Web service recommendation aims to predict missing QoS (Quality-of-Service) values of Web services. Although several CF-based Web service QoS prediction methods have been proposed in recent years, the performance still needs significant improvement. Firstly, existing QoS prediction methods seldom consider personalized influence of users and services when measuring the similarity between users and between services. Secondly, Web service QoS factors, such as response time and throughput, usually depends on the locations of Web services and users. However, existing Web service QoS prediction methods seldom took this observation into consideration. In this paper, we propose a location-aware personalized CF method for Web service recommendation. The proposed method leverages both locations of users and Web services when selecting similar neighbors for the target user or service. The method also includes an enhanced similarity measurement for users and Web services, by taking into account the personalized influence of them. To evaluate the performance of our proposed method, we conduct a set of comprehensive experiments using a real-world Web service dataset. The experimental results indicate that our approach improves the QoS prediction accuracy and computational efficiency significantly, compared to previous CF-based methods.

Keywords: Web services, service recommendation, QoS prediction, collaborative filtering, location-aware.

I. INTRODUCTION

A. Web Services

Web services (sometimes called application services) are services (usually including some combination of programming and data, but possibly including human resources as well) that are made available from a business's Web server for Web users or other Web-connected programs. A Web service is a service offered by an electronic device to another electronic device, communicating with each other via the World Wide Web [12]. In a web service, web technology such as the HTTP, originally designed for human-to-machine communication, is utilized for machine-to-machine communication, more specifically for transferring machine readable file formats such as XML and JSON. In practice, the web service typically provides an object-oriented web based interface to a database server, utilized for example by another web server, or by a mobile application, that provides a user interface to the end user. Another common application offered to the end user may be a mash up, where a web server consumes several web services at different machines, and compiles the content into one user interface.

B. Collaborative Filtering

Collaborative filtering (CF) is a technique used by some recommender systems. [1] Collaborative filtering has two senses, a narrow one and a more general one.[2] In general, collaborative filtering is the process of filtering for information or patterns using techniques involving collaboration among multiple agents, viewpoints, data sources, etc.[2] Applications of collaborative filtering typically involve very large data sets. Collaborative filtering methods have been applied to many different kinds of data including: sensing and monitoring data, such as in mineral exploration, environmental sensing over large areas or multiple sensors; financial data, such as financial service institutions that integrate many financial sources; or in electronic commerce and web applications where the focus is on user data, etc. The remainder of this discussion focuses on collaborative filtering for user data, although some of the methods and approaches may apply to the other major applications as well.

C. Recommender System

Recommender systems or recommendation systems (sometimes replacing "system" with a synonym such as platform or engine) are a subclass of information filtering system that seek to predict the 'rating' or 'preference' that a user would give to an item.[1][2] Recommender systems have become extremely common in recent years, and are applied in a variety of applications. The most popular ones are probably movies, music, news, books, research articles, search queries, social tags, and products in general. However, there are also recommender systems for experts, [3] [4] collaborators, [5] jokes, restaurants, financial services, [6] life insurance, persons (online

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dating), and Twitter followers.[7] Recommender systems typically produce a list of recommendations in one of two ways – through collaborative or content-based filtering.[8] Collaborative filtering approaches building a model from a user's past behavior (items previously purchased or selected and/or numerical ratings given to those items) as well as similar decisions made by other users. This model is then used to predict items (or ratings for items) that the user may have an interest in.[9] Content-based filtering approaches utilize a series of discrete characteristics of an item in order to recommend additional items with similar properties.[10] These approaches are often combined (see Hybrid Recommender Systems).

II. LITERATURE REVIEW

As the number of Web services available on the Internet increases quickly, service consumers pay more attention to QoS instead of functionality than before. QoS mainly consists of non-functional attributes such as response time, throughput, availability, etc. It has been widely used in service selection (Wang, Wang et al. 2013), service composition (Feng, Ngan et al. 2013), service recommendation (Cao, Wu et al. 2013; Jiang, Liu et al. 2011) and other popular topics in the field of Services Computing. In this section, we present the related work of QoS-aware Web service recommendation

A. Rating-Oriented Services Recommender

The rating-oriented CF recommender is undoubtedly one of the most widely used approaches in the field of recommender systems, aiming at achieving better prediction accuracy of the missing QoS values for different service requestors. In general, it has two broad categories: memory-based and model-based approaches. The memory-based CF approaches focus mainly on the similarity between users or items and can be classified as user-based approach (Breese, Heckerman et al. 1998; Jin, Chai et al. 2004), item-based approach (Deshpande, Karypis et al. 2004; Sarwar, Karypis et al. 2001) and hybrid approach (Zheng, Ma et al. 2009; Zheng, Ma et al. 2011). In 2007, Shao et al. introduced CF into Web service recommendation and proposed a classic user-based CF approach (Shao, Zhang et al. 2007).

Unlike simple and effective memory-based CF approaches, the model-based CF approaches introduce data mining, machine learning techniques to find patterns or train a prediction model based on training data. This type of approaches mainly includes clustering models (Xue, Lin et al. 2005), LFMs (Mnih and Salakhutdinov 2007), Bayesian networks (Singla and Richardson 2008), etc. Among these approaches, LFMs may be the most widely used one for Web service recommendation recently.

B. Ranking-Oriented Services Recommender

The rating-oriented CF approaches attempt to predict the vacant values in a given user-item matrix as accurately as possible, but in some real-world application scenarios, accurate rating predictions do not definitely lead to better recommendation performance (Zheng and Lyu 2013). For example, after the user u invoked two Web services si and sj, the observed QoS values about response time (in seconds) are 0.4 and 0.5, respectively. Suppose that the QoS ratings of si and sj (denoted by {qi, qj}) predicted by the recommendation models under discussion M1 and M2 are {0.3, 0.6} and {0.5, 0.45}, respectively, it is clear that M2 is better than M1 in terms of root mean square error (RMSE). Therefore, the system will recommend sj to the users similar to u according to the model M2, which is obviously improper in practice since si has a higher rank than sj with respect to response time.

Thus, the ranking-oriented recommender systems are more suitable for these application scenarios or requirements. The earlier study on the problem of learning how to order was conducted by Cohen et al. (Cohen, Schapire et al. 1997), and they proposed a greedy algorithm that was able to find a good approximation of the optimal ranking. Then, the related techniques and methods were introduced to the field of recommender systems. For example, to address the item ranking problem, Liu et al. (Liu and Yang 2008) proposed a ranking-based CF approach to movies recommendation, and the experimental result showed that their method outperformed traditional CF approaches significantly in terms of NDCG (Normalized Discounted Cumulative Gain). Yang et al. (Yang, Wei et al. 2009) also proposed a ranking-oriented CF method to solve the problem of the lack of user ratings, and their method achieved satisfactory effects on digital books recommendation based on users' access logs. Inspired by the topic models, Liu et al. (Liu, Chen et al. 2011) proposed an item-oriented model-based CF framework by user interest expansion via personalized ranking, which could address the problems of traditional CF approaches such as overspecialization and cold-start. According to matrix factorization models, Balakrishnan et al. (Balakrishnan and Chopra 2012) proposed a novel model that learned the features associated with the users and items for a ranking task, aiming at approximately optimizing NDCG for a given recommendation task. For more details of the ranking-oriented techniques for recommendation, please refer to the literature (Adomavicius and Kwon 2012).

In the field of Services Computing, as far as we know, only a few of researchers attempted to conduct Web service recommendation based on QoS ranking prediction recently. For example, Zheng et al (Zheng, Wu et al. 2013; Zheng and Lyu 2013) proposed a QoS-aware services ranking prediction framework based on the work mentioned above, and the superiority of the proposed methods to other related CF approaches was validated by the comprehensive experiments on real-world QoS data.

C. A Link Prediction Approach to Collaborative Filtering

The fundamental task of collaborative filtering (CF) is to predict the interestingness and relevance of an item to a user. This is typically done based on how closely this item is related to the user's tastes. Basically, proximity { the measure of closeness { lies at the heart of CF. The challenge of applying CF to UGCs translates into

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developing methods for calculating proximity that are both effective and scalable for large user-item spaces.
The hypothesis that the methods based on Link Prediction algorithms [11] provide an effective and scalable solution for CF in UGCs. Like CF, the underlying rationale of most Link Prediction algorithms is based on proximity. The Link Prediction problem is to predict the formation of links in a social network graph, and the corresponding solutions explore the principle that the closer two nodes are in such a graph, the higher the chance a link between them forms. Unlike classical CF techniques, however, some of the Link Prediction algorithms have been shown [16] to be highly scalable, performing well in massive and sparse social network graphs such as those of YouTube, Flicker, Digg, and Live Journal.

III. PROBLEM ANALYSIS

Different from the existing methods, which suffer from low prediction accuracy, we implement an effective CF algorithm for web service recommendation with the consideration of the region factor. We implement a location-aware QoS based Web services recommendation approach, in which we gain the QoS information and give personalized results to the user's. We use the process of filtering the results obtained from collaborative filtering (CF) technique based on the user's location information which significantly improves the recommendation accuracy by predicting and recommending potential favorite items for a user.

A key problem of collaborative filtering is how to combine and weight the preferences of user neighbours. Sometimes, users can immediately rate the recommended items. As a result, the system gains an increasingly accurate representation of user preferences over time. CF techniques can be generally decomposed into two categories: model-based and memory-based. Memory-based CF is also named neighbourhood-based CF. Depending on whether user neighbourhood or item neighbourhood is considered; neighbourhood-based CF can further be classified into user-based and item-based .In user-based CF, a subset of appropriate users is chosen as neighbours based on their similarities to the active user. Then, a weighted aggregate of their ratings is used to generate predictions for the target user. In item-based CF, a subset of appropriate items is chosen as neighbours based on their similarities to the tar-get item. Then, a weighted aggregate of the target user's ratings on those items is used to generate predictions for the target user. Pearson Correlations and Cosine Similarity are two fundamental methods for measuring the similarity between users or items. Their basic idea is that, two users are similar if they have similar ratings on their commonly rated items.

IV. PROPOSED ALGORITHM

Input: Search item and request for recommendation.
Output: Show the results of searched items and recommend web url's.

Step 1: Login to the System
Step 2: Search for the item
Step 3: Show results of searched items
Step 4: Request for recommendation
Step 5: Recommended web url's based on user's history

We proposed a system where user can search for web services such as image search, web search, video search, news search and so on. User will get the results of this entire search based on user's location. Users have to provide the location and the search item and then user will get the result which is according to user's location. As user is searching for various items, history of user will be maintained by the system. All user search items with its date will be saved to user's history. The proposed system will recommend web url's to the user based on users search history. The system will recommend the most visited url to the user according to his/her history.

We propose a location-aware personalized CF method for web service recommendation. The proposed method is called as personalized because each user have to register himself/herself to the system, the by login to the system user can use the system. Each user's account, history and recommendation are personalized by the system.

V. RESULTS

This section presents the screenshots of the Personalized Web in order to demonstrate the complete process.

The first screen after starting the system shown to the user is display below in the screenshots. It is the home screen of the project from where user can select for user login or signup.

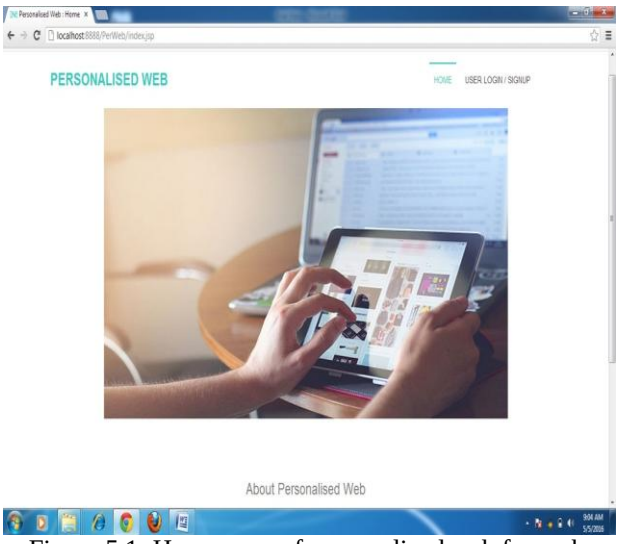

Figure 5.1: Home page of personalized web for web service recommendation

After this user can login or register. If the user is already registered then user can login by providing user id and password. If the user is not registered then user has to register first by filling the details.

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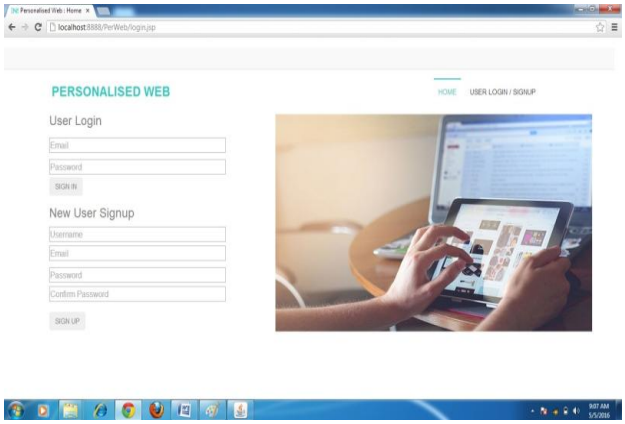

Figure 5.2: Login/Registration page

If the user is already registered then user can login by providing user id and password. If user successfully registered and login then following screen will appear.

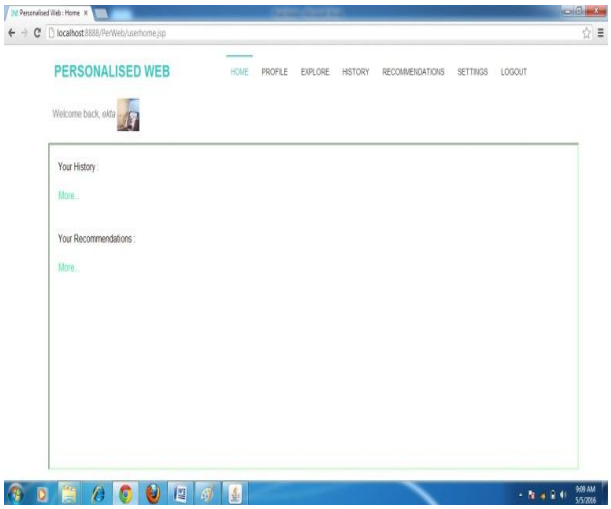

Figure 5.3: Homepage of the user

Now, after successfully login to the system user have various choices. User can select from the given choices like user can update profile, search for items, view recommendations, view history, change setting etc.
If user wants to update the profile then user can update by providing the details. Following screen will appear if user wants to update profile.

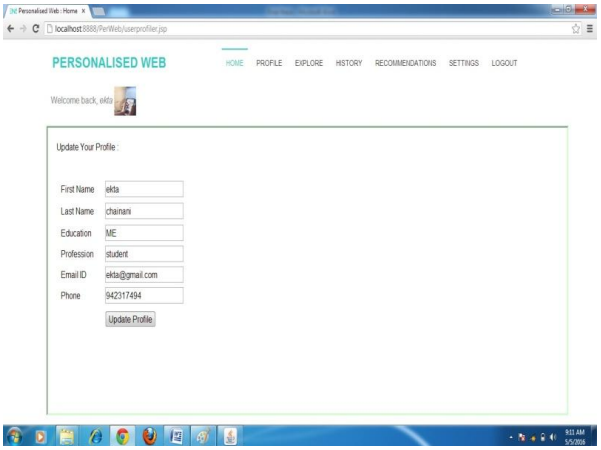

Figure 5.4: Profile update

If user wants to explore search i.e. if user wants to search then user can do it by selecting explore. After selecting explore, user can do web search, news search, image search etc. user can also provide location to get more accurate results. User has to insert search term for what user wants the information. When user search for item following screen will appear.

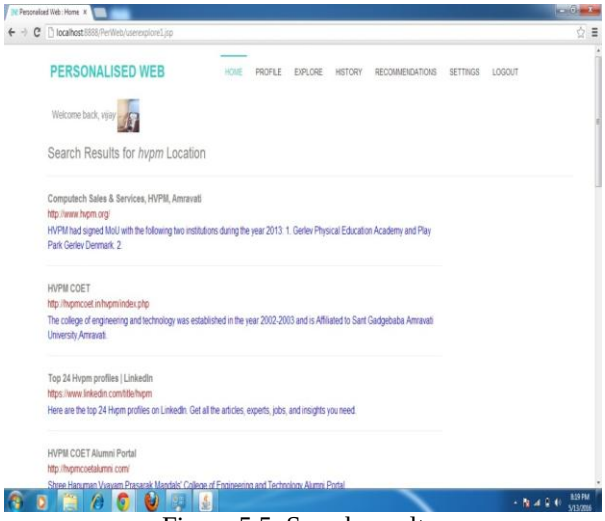

Figure 5.5: Search results

As user search for various web services like web search, image search, book search etc. all the data whatever user search is saved as user's history .User's all data like what user had searched, when it is searched is saved as user's history. So that whenever user wants to view history it is easily available. Following screen shows the history of user.

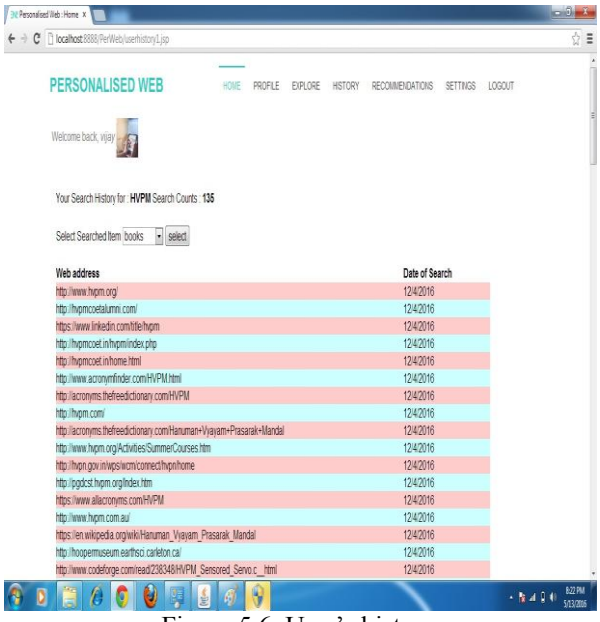

Figure 5.6: User's history

If user wants recommendations for different web services then user has to request for web services then user gets various recommendations from which user can select according to their choice.

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Figure 5.7: Recommendation of web urls

VI. CONCLUSION

With the increase in the number of web services, developers are facing difficulties in finding appropriate services which fit their requirements. In order to make the developers work easy, we have implemented a recommender system. In this project, we are trying to give recommendations to users based on historical location information of the user, through which the user can select most visited links using services. As the existing approaches lack location based recommendations, we have overcome this in our project.

Our system will provide facility to search for the item by providing search keyword and location and user will get the searched results as per the location. With the search user history is also saved as per the user's search. With the help of location and user's history user get its most visited urls as recommendation.

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REFERENCES

[1] L.-J. Zhang, J. Zhang, and H. Cai, "Services computing", Springer and Tsinghua University Press, 2007.

[2] T. Yu, Y. Zhang, and K.-J. Lin, "Efficient algorithms for web services selection with end-to-end qos constraints," ACM Transactions on Web, 1(1):6, 2007.

[3] L. Shao, J. Zhang, Y. Wei, J. Zhao, B. Xie, and H. Mei, "Personalized QoS prediction for Web services via collaborative filtering," Proc. IEEE International Conference on Web Services (ICWS 07), 2007, pp. 439-446.

[4] Z. Zheng, H. Ma, M.R. Lyu, and I.King, "WSRec: a collaborative filtering based web service recommendation system," Proc. IEEE International Conference on Web Services (ICWS 09), 2009, pp. 437- 444.

[5] X. Chen, X. Liu, Z. Huang, and H. Sun, "RegionKNN: a scalable hybrid collaborative filtering algorithm for personalized Web service recommendation,"Proc. IEEE International Conference on Web Services (ICWS 10), 2010, pp. 9-16.

[6] E. Rich, "User modeling via stereotypes," Cognitive Science, Vol.3, No.4, 1979, pp. 329-354.

[7] G. Linden, B. Smith, and J. York, "Amazon.com recommendations: item-to-item collaborative filtering," IEEE Internet Computing, 2003, pp. 76 - 80.

[8] J. S. Breese, D. Heckerman, and C. Kadie, "Empirical analysis of predictive algorithms for collaborative filtering," Proc. 14th Conference on Uncertainty in Artificial Intelligence (UAI 98), 1998,pp. 43-52.

[9] Y. Jiang, J. Liu, M. Tang, and X. F. Liu, "An effective Web service recommendation method based on personalized collaborative filtering," Proc. IEEE International Conference on Web Services (ICWS 11), 2011, pp. 211 - 218.

[10] L. Zhang, B. Zhang, Y. Liu, Y. Gao, Z. Zhu, "A Web service QoS prediction approach based on collaborative filtering," Proc. IEEE Asia-Pacific Services Computing Conference, 2010, pp.725-731.

[11] P. Resnick, N. Iacovou, M. Suchak, P. Bergstrom, and J. Riedl, "Grouplens: An open architecture for collaborative filtering of net news," Proc. ACM Conference on Computer Supported Cooperative Work (CSCW 94), 1994, pp.175-186.

[12] R. R. Shelke, Dr. R. V. Dharaskar, Dr. V. M. Thakare, "Data Mining For Mobile Devices Using Web Services", International Conference on Industrial automation And Computing (ICIAC - 12th & 13th April 2014) , Jhulelal Institute of Technology, Nagpur.

[13] R. R. Shelke ,Dr. V. M. Thakare, Dr. R . V. Dharaskar, **"Study** of Data Mining Approach for Mobile Computing Environment**",** International Journal on Computer Science and Engineering (IJCSE) , ISSN : 0975-3397, Vol. 4, 12 Dec 2012 , pp.1920-1923

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