MMN BASED COLLABORATIVE FILTERING APPROACH FOR SELECTION OF LOCATION AWARE SERVICES

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Abstract- Web services are a method of communication between two electronic devices over a network. The number of web services which are publicly available is increasing steadily on the internet which makes it difficult for the users to select a proper web service. Additional overhead in time and resources takes place when the developers are not able to select a proper web service. Therefore, effective approaches to service selection and recommendation are in an urgent need. Also using the same QoS values for all the users will not give a good recommendation for the user. In the proposed system, personalized QoS prediction is provided so that for each user the QoS values will be calculated and the best recommended web service is provided. A collaborative filtering based web service recommender system is used to help users select a quality web service. Using the location information and QoS values, the services are normalized using MMN based collaborative filtering approach and then it is ranked to give the best web service recommendation for users.

Key words: QoS, Personalized QoS prediction, MMN based Collaborative Filtering

I. INTRODUCTION

Web services have become the primary source for constructing software system over Internet. The quality of whole system greatly depends on the QoS of single Web service. QoS information is an important indicator for service selection. Web services have been employed by both enterprise and individual developers for building service oriented applications. The adoption of web services as a delivery model in business has fostered a paradigm shift from the monolithic applications to the dynamic set-up of business processes. QoS values evaluated by one user cannot be used by another. Therefore personalized QoS value prediction can be employed and it is predicted using the past user experiences. This helps the users to select optimal service among the equivalent ones.

A web service recommendation system is used to improve the prediction accuracy and also the time complexity. The web services are published with the QoS constraints in the registry by the admin and the services can be updated and viewed. The web services are parsed using support vector machine algorithm. Two types of search is carried out and they are keyword related search and QoS related search. Normalization is done using MMN based collaborative filtering approach which gives the normalized search results. In the proposed system, ranking is carried out to give the best recommended web service to the user. The performance evaluation is calculated and based on the location the best services are provided to the user.

II. RELATED WORK

Selection and recommendation of web services have been studied to find out the best service for the users. Xi Chen, Zibin Zheng, Qi Yu and Michael R. Lyu [1] proposed a collaborative filtering system to help users select web services with good quality. Selection of web services publicly will consume more time and resources. QoS values will change for different users with respect to time. Chengying Mao and Jifu Chen [2] proposed an effective way to predict the missing QoS values of web service using the provided existing information. QoS prediction for web services from the dynamic prespective should be further investigated. Lina Barakat, Simon Miles, Michael Luck [3] presents a correlation-aware composition approach where quality dependencies among services are modeled and considered during composite service selection. Analytical complexity is the major issue which needs to be addressed. Joyce El Haddad, Maude Manouvrier, and Marta Rukoz [4] presented a paper which addresses the issue of selecting and composing web services not only according to their functional requirements but also according to their transactional properties. Here the need for dynamic solutions should be addressed. Wancai Zhang, Hailong Sun, Xudong Liu, and Xiaohui Guo [5] proposed a Temporal QoS-Aware web services recommendation Framework that predicts missing QoS value under various temporal context. Since the work of web service QoS information collection requires much time and effort, and is impractical sometimes, the service QoS value is usually missing. More contextual information which influences the client-side QoS performance is considered to improve the prediction accuracy besides the temporal contextual information. Xi Chen, Xudong Liu, Zicheng Huang and Hailong Sun [6] presented RegionKNN, a novel hybrid collaborative filtering algorithm is designed for large scale web service recommendation. Web service recommendations are generally quickly using modified memory-based collaborative filtering algorithm. More research on some QoS properties on their internal relations should be conducted. Different from the existing work, this paper finds personalized QoS prediction for each user based on the location and also solves the scalability issue by giving the best recommended web service from the largely available web services.

III. SYSTEM OVERVIEW

In the existing system, Collaborative Filtering(CF) technique has been employed. The basic idea of CF is to predict and recommend potential favourite item for a particular user employing rating data collected from other users. CF is based on processing the user-item matrix. CF algorithm is divided into two broad classes: Memory based algorithms and Model based algorithms. Prediction accuracy is present when web services are recommended using this technique. Due to the lack of personalized QoS for each user and issues in scalability a proposed system is designed.

The Quality of Service (QoS) is the overall performance of a computer network seen by the users. To quantitatively measure the quality of service, several aspects of the network service are considered such as successability, throughput, availability and reliability. These QoS properties vary with each user based on the location. So personalized user based prediction helps user to select optimal sevice among the functionally equivalent ones. A location aware web service recommender system is proposed which emplys both web service QoS values and user location for making prediction based on the user. The published web services are parsed using support vector machine (SVM) algorithm and the service name along with the QoS constraints are normalized using MMN based collaborative filtering approach where a duplicate service names are eliminated so that redundancy does not occur while ranking the web services. Ranking of the web services are based on the feedbacks and QoS constraints and these are done to obtain the best web service for the user which improves scalability. The architecture of the proposed system is given in the below Fig 3.1

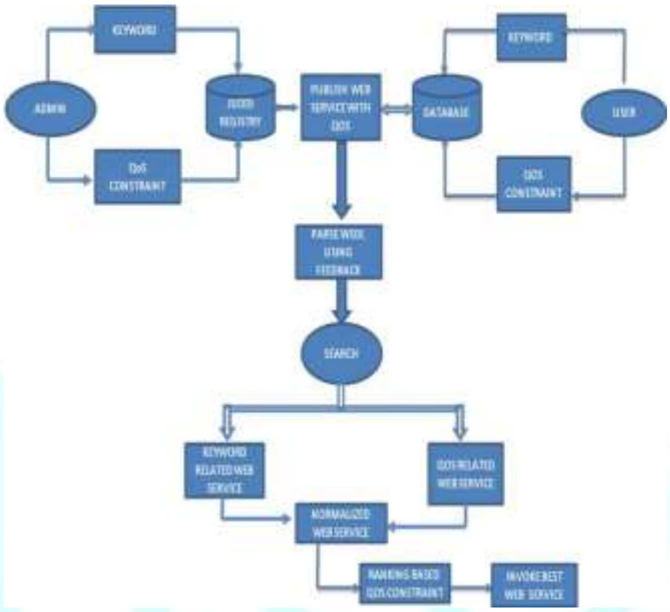

Fig 3.1 Overall System Architecture

IV. METHODOLOGY

Some of the QoS properties will have values which are different from one user to another. Some of the QoS properties mostly relate to the physical locations of users.

For example, one user may have a higher response time for a particular website and another user may have a lower response time for the same website. Based on this discovery, this algorithm takes location information into consideration to improve the recommendation accuracy. The four different phases for this web service recommendation algorithm is 1) Service publication in registry, 2) Parsing and QoS normalization, 3) Web service ranking, 4) User based prediction which will be presented in the following sections.

4.1. SERVICE PUBLICATION IN REGISTRY

The web services along with the QoS constraints which includes availability, successability, throughput and reliability is calculated using its respective formulas and published in JUDDI registry. The service name, its description and URL is provided by the admin. The published services can be updated and can be viewed along with the URL.

The admin logs into the system and provides the keyword(weather , money exchange and currency conversion) with its description and also the calculated QoS constraints. These QoS constraints are been set within a certain limit so that the values measured are correct and web services are published in the registry. Many new services based on the keywords are added to the registry and can be viewed by the admin.

4.2. PARSING AND QOS NORMALISATION

The various services and the operations of web services are identified. The service is invoked and the feedbacks are collected from the users. Parsing is done using support vector machine algorithm. Normalization of the web services with QoS is carried out after parsing the feedback values.

4.2.1 PARSING USING SUPPORT VECTOR MACHINE ALGORITHM

The web services along with its operations are been published. The service is invoked and collected from the users. The feedbacks are parsed as good and bad feedbacks. The good feedbacks are alone read and the bad feedbacks are neglected. The parsing is done using support vector machine algorithm. SVM is a supervised machine learning algorithm which can be used for classification or regression problems. It uses a technique to transform the data and based on these transformations it finds an optimal boundary between the possible outputs. The Support Vector Machine Algorithm for parsing is given below:

4.2.1.1 SVM ALGORITHM

```
store the published services;
collect the feedbacks from the published services; while(read all the feedback
values)
{
 increments till all the values are read; check++;
}
parse the feedbacks as good and bad if (feedbacks are good)
{ while( read all the good feedbacks values) {normalize using QoS values;
neglect the bad feedback values;
}
```

4.2.2 QOS NORMALISATION

The good feedback values are collected. Then the service name along with the QoS constraints are normalized where the duplicate service names are eliminated using first normal form so that redundancy doesnot occur while ranking the web services. The web services which had bad feedback values will not be normalized.

The first normal form exists only if the value of each attribute contains single value and does not have any redundancy in the representation of data. It should satisfy the conditions like : There should be no ordering of datas in rows or columns from either top to bottom or from left to right.

There should be no duplicate rows. Every row and column should contain exactly one value from the related domain. The value of each attribute should contain only a single value from that domain.

4.3 WEB SERVICE RANKING

After parsing and normalization of web services based on the QoS constraints, the values are collected based on the best QoS value and the user feedbacks. The bad feedback values are eliminated and with the good feedback values ranking is done. After collecting those values, ranking of the web services is done to obtain the best web service for the user. If the QoS value for the web service is comparatively good then it is ranked first. Each user will get the best recommended web service based on the location. After ranking, user based prediction is been performed which gives best recommended services for the user.

4.3.1 RANKING ALGORITHM

/*Input:

a set of n services s(f)=(s1, s2, s3…sn)

a set of constraints for desired services having 4 elements c=<c1, c2, c3, c4>;

//where c1,c2,c3,c4 are reliability, availability, throughput and successability values.

/*output:

An optimal service Sp ϵ Sf that fulfills functional and non functional requirements

/*initialization:

1.Enter service data //keywords used for publishing the services//

2.Admin enters constraints requirements

3.Calculate total no of services (n)

4.Compare the computed QoS values and the feedbacks for each services.

5.While i<=n do

6.For j=1 to 4

7.If Qij(Si)<Cj

8.Then sort the services in descending order based on the rank values

7.End if

8.End for

9.End while

10. The first service in the list is the best service.

4.3.2 PAGE RANK CALCULATION

The page rank of each page depends on the page rank of the pages pointing to it. This is calculated using a simple iterative algorithm. Without knowing the final value of the page rank of the other pages, calculation can be done. Remember the each value calculated and repeat the calculations lots of time until the numbers stop changing much.

The formula used for page rank calculation is:

$$PR(A) = (1-d) + d(PR(T1) / C(T1) + \ldots + PR(Tn) / C(Tn))$$

4.4 USER BASED PREDICTION

The user logs into the system and recommends for a best web service. The user gives a keyword to search for the best web service to use. The keywords related to weather, money exchange and currency conversion is been provided. Based on the given keyword, the QoS constraints are invoked and the ranked services for that user are fetched from the database. The best web service is then recommended for that user.

4.5 CALCULATION OF QOS CONSTRAINTS

The QoS values for all the web services are been calculated using the following formulas.

4.5.1 CALCULATION OF QOS AVAILABILITY

QoS availability indicates the total time the web service is available to the user. It is calculated as the ratio of minutes of uptime to the total number of minutes for a specific period.

Formula for QoS Availability is:

Availability = Minutes of uptime / Total no of minutes for a specific period

4.5.2 CALCULATION OF QOS THROUGHPUT

It is the rate of successful message delivery over a communication channel. These messages may be delivered over a physical or logical link or it can pass through a certain network node. It is measured in Mbits/sec or sometimes in datapackets/sec.

Formula for QoS Throughput is:

Throughput = (MSS/RTT)*(c/sqrt(Loss)) [c=1](Based on Mathis et.al formula)

4.5.3 CALCULATION OF QOS RELIABILITY

Reliability is the measure of failed invocations. The downtime failure for a specific period is calculated as the ratio of number of failures to the period of measurement.

Formula for QoS Reliability is:

Reliability = No of failures (downtime) / period of measurement

4.5.4 CALCULATION OF QOS SUCCESSABILITY

Successability measures successful invocations. Both successability and reliability are opposite metric of measure, but complements each other. It is calculated as the ratio of number of response messages to the number of request messages.

Formula for QoS Successability is:

Successability = 1- Reliability

V. CONCLUSION

As the number of the services published over the internet is growing at a very fast pace, selecting satisfactory web services among the candidate web services which provide the same functionalities is difficult. QoS is considered as the most important non-functional criterion for further filtering services. This criterion will change for every user, hence a personalized QoS prediction has. been provided for each user. The web services along with its description and QoS constraints is been published in the registry. Then the user feedbacks are collected and parsing is done using Support Vector Machine algorithm. The search based on the keyword is performed to retrieve the published services related to it. The past values are normalized and the search based on the QoS is performed.

After parsing and QoS normalization, the user feedback values will be collected from the web services.Ranking of the web services can be done based on the feedback values. The user will give a keyword to search for the best web service to use. The three main keywords used are weather, foreign money exchange and currency conversion. Based on the given keyword, the QoS constraints are invoked and rank values for each web services is determined. From those values, the highest ranked web service for that user is fetched from the database. This provides best web service for each user based on the location.

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