Location Based Service Recommendation System Using Hierarchy Clustering Techniques

Ravikumar*1, Kaliraj*2, Boomathi*3

*1 II Year M.E & Computer Science and Engineering & Kongunadu College of Engineering and Technology, India
*2 Assistant Professor & Computer Science and Engineering & Kongunadu College of Engineering and Technology, India
*3 II Year M.E & Computer Science and Engineering & Kongunadu College of Engineering and Technology, India

Abstract - Recommendation techniques aim to support the users in their decision-making while the users interact with large information spaces. Recommendation has been a hot research topic with the rapid growth of information. In the field of services computing and cloud computing, efficient and effective recommendation techniques are critical in helping designers and developers to analyse the available information intelligently for better application design and development. To recommend Web services that best fit a user’s need, QoS values which characterize the non-functional properties of those candidate services are in demand. But in reality, the QoS information of Web service is not easy to obtain, because only limited historical invocation records exist. So in this project present a model named CLUS for reliability prediction of atomic Web services, which estimates the reliability for an on going service invocation based on the data merged from previous invocations. Then aggregates the past invocation data using hierarchy clustering algorithm to achieve better scalability comparing with other current approaches. In addition, the paper proposes a model-based collaborative filtering and location based recommendation approach based on supervised learning technique and linear regression to estimate the missing reliability values.

Keywords - hierarchy clustering, Prediction, QoS, Recommendation, Model-based collaborative filtering, Web services

I INTRODUCTION

In service computing, can be defined as “a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers these are dynamically provisioned and presented as one or more unified computing resources based on the service-level agreements established through negotiation between the service provider and consumers “the services through the network the consumer of the cloud can be obtained. Service can provide anything as a Service (AaaS). In general, web services provide the application, computation power, storage, bandwidth, database etc. With the occurrence of services computing and cloud computing, a large number of services are supplied by diverse service providers. By composing these services, service-oriented systems can be well built. Nowadays, service-oriented systems are become attractive large-scale and very complex. The huge amount of data is created by various service-oriented systems. It is difficult for users to find the right information they desire from such large volume of data. In the pasture of services computing, efficient and useful recommendation techniques are serious in helping designers and developers analyze the obtainable information intelligently for better application design and development. Recommendation techniques plan to support users in their decision-making while the users relate with large information spaces. The service oriented architecture flow as plotted in fig 1.

Fig.1 Service oriented architecture

II RELATED WORK

L. Cheung, focus on evaluating the performance of third-party WSs from a client’s perspective; specifically, we focus on the average response time estimation. The major challenge is the lack of information about the WS being tested. This includes (1) the structure of the WS: as a
client, do not know how often the WS being tested requests services from other WSs; and (2) the parameters of each WS that provides service to complete a client’s request.

Z. Zheng, propose a collaborative reliability prediction approach, which employs the past failure data of other similar users to predict the Web service reliability for the current user, without requiring real-world Web service invocations and also present a user-collaborative failure data sharing mechanism and a reliability composition model for the service-oriented systems.

L. Baresi, providing virtual infrastructures as services is gaining more and more momentum, and is imposing a more cohesive view of the different layers that constitute a software system. Applications, service platforms, and virtualized infrastructures have become tightly integrated. It is now possible to change software’s quality of service (QoS) by changing the configuration of the virtual machines it uses.

L. Coppolino, propose a formal approach that allows a workflow architect to perform reliability analysis of a SOA-based service. The approach exploits the concept of reliability patterns to derive an aggregate reliability function and it is suited for a wide class of workflow processes.

Q. Yu, develop a novel collaborative filtering algorithm for making QoS-aware service recommendations. The proposed algorithm effectively tackles the QoS data sparsity issue, which leads to accurate QoS predictions. In this regard, it can be modeled as a general matrix completion problem, which is to recover a large QoS matrix from a small subset of QoS entries.

III EXISTING METHODOLOGY

Collaborative filtering methods are widely adopted in recommender systems. A memory-based approach is one type of the most widely studied collaborative filtering approaches. The most analyzed examples of memory-based collaborative filtering include user-based approaches, item-based approaches, and their fusion. User-based and item-based approaches often use the vector similarity method and the PCC method as the similarity computation methods. Compared with vector similarity, PCC considers the differences in the user rating style when calculating the similarity. The rating-based collaborative filtering approaches try to predict the missing QoS values in the user-item matrix as accurately as possible. However, in the ranking-oriented scenarios, accurate missing value prediction may not lead to accuracy ranking prediction. Therefore, ranking-oriented collaborative filtering approaches are becoming more attractive. The existing collaborative filtering-based approaches have demonstrated promising results they suffer from potential scalability and accuracy issues. Specifically, these approaches require storing values for every observed service-user pair. Given millions of users and a substantially large number of services, such an approach does not scale. Similarly, the success of a service invocation depends on a variety of other factors that have previously been either only implicitly considered or not considered at all, which may hamper the accuracy of the predictions. The existing methodology described in fig 2.

IV CLUSTER BASED THE MODEL

COLLABORATIVE FILTERING

Quality-of-service can be measured at the server side or at the client side. While server-side QoS properties provide good indications of the cloud service capacities, client-side QoS properties provide more realistic measurements of the user usage experience. The commonly used client-side QoS properties include response time, throughput, failure probability, etc. In this project focuses the scalability and accuracy issues in existing approaches. And avoid ideal recommendation from dissimilar invocation data. So we can implement model based collaborative filtering with clustering approach to cluster similar services. We propose a two-phase, that is, 1. Web Service Clustering Phase. Due to the uncertainty of web service data, we can cluster user, service specific parameters using K means clustering to create two dimensional matrix and combine environment specific parameters to provide three dimension data. 2. Web Service Prediction Phase. To achieve the reliability prediction from the variety of historical probability values, the regression analysis method is employed after obtaining a set of statistics data of Web service reliability. The proposed framework is plotted in fig 3.
Filtering the web service based on keywords

Extracting the QoS values from WSDL document

Forming the cluster using the extracted QoS values

Selecting the most suitable web service from

V EXPERIMENTAL SETUP

In experiment, we analyse the performance of our proposed system. Clustering based model collaborative filtering approach does not require extra inputs of users and suits different types of services. The clustering algorithm used in proposed methodology need not consider the dependence of nodes. We can evaluate the performance of the system using mean absolute error. In statistics, the mean absolute error (MAE) is a quantity used to measure how close forecasts or predictions are to the eventual outcomes. The mean absolute error is given by

$$\text{MAE} = \frac{1}{N} \sum_{i=1}^{n} |y_i - \hat{y}_i|$$

Rating similarity calculation

$$R_{sim}(s_t, s_j) = \frac{\sum_{U_{ij} \in E(st)} (r_{ui, st} - \bar{r}_{st})(r_{ui, sj} - \bar{r}_{sj})}{\sqrt{\sum_{U_{ij} \in E(st)} (r_{ui, st} - \bar{r}_{st})^2} \sqrt{\sum_{U_{ij} \in E(st)} (r_{ui, sj} - \bar{r}_{sj})^2}}$$

- Service - st and sj
- $U_t$ is a set of users who rated st while $U_j$ is a set of users who rated sj, $u_i$ is a user who both rated st and sj, $r_{ui}$ is the rating of st given by $u_i$ which is gotten from service. $r_{st}$ is the average rating of st, and $r_{sj}$ is the average rating of sj.

Enhanced Rating similarity

Based on the enhanced rating similarities between services, the neighbors of a target service $st$ are determined according to constraint formula

$$N(s_t) = \{s_j | R_{sim'}(s_t, s_j) > \gamma, s_t \neq s_j\}$$

- $R_{sim'}$, is the enhanced rating similarity between service $st$ and $sj$ computed by formula (5), $\gamma$ is a rating similarity threshold.

Predicted Ranking

If the predicted rating of a service exceeds a recommending threshold, it will be a recommendable service for the active user.

$$P_{u_{\alpha}, st} = \frac{\sum_{s_j \in N(s_t)} (r_{u_{\alpha}, sj} - \bar{r}_{sj}) \ast R_{Sim'}(s_t, sj)}{\sum_{s_j \in N(s_t)} R_{Sim'}(s_t, sj)}$$

- $r_{st}$ is the average rating of st, (st) is the neighbour set of st, $s_j \in E(st)$ denotes sj is a neighbour of the target service st. $rua.sj$ is the rating that an active user $ua$ gave to sj, $r_{sj}$ is the average rating of sj, and $R_{sim'}$ st.sj is the enhanced rating similarity between service st and sj.
Fig 3. Propose frame work
TABLE 1

<table>
<thead>
<tr>
<th>Existing system</th>
<th>Proposed system</th>
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<tbody>
<tr>
<td>Fail to recognize the QoS variation</td>
<td>Consider QoS variations</td>
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<tr>
<td>Time complexity in memory based systems</td>
<td>Time complexity is reduced in model based systems</td>
</tr>
<tr>
<td>Difficult to maintain large number of users and services</td>
<td>Dynamically access large number of users and services</td>
</tr>
<tr>
<td>Recommendation system accuracy is less</td>
<td>Recommendation accuracy is high</td>
</tr>
<tr>
<td>Dissimilar datasets can be occurred in recommendation system</td>
<td>Dissimilar data sets can be eliminated at the time of clustering using Hierarchy clustering.</td>
</tr>
</tbody>
</table>

**Table for existing and proposed system**

In all, our methods spend less computation time than Item-based CF. Since the number of services in a cluster is fewer than the total number of services, the time of rating similarity computation between every pair of services will be greatly reduced. The performance of the proposed system as shown in

![Fig 4. Evaluation Report](Image)

![Fig 5. Performance Chart for Existing System and Proposed System](Image)

**VI CONCLUSION**

Recommender Systems (RS) typically apply techniques and methodologies in service computing. In this paper, we implement CLUS approach to implement in service computing applications. At first, services are integrated into clusters using K-means algorithm. Then we implement rating similarity between services with time period. We conclude that, CLUS is efficient than the IBCF and UserCF. Then CF algorithm is applied on the services within the same cluster. Clustering-based Collaborative Filtering approach is proposed in future, which aims at recruiting similar services in the same clusters to recommend services collaboratively. Clustering is done automatically using agglomerative hierarchical clustering.

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