



Hybrid Collaborative Filtering to Develop a Prediction Accuracy Using Location Aware Recommendation System

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Abstract— *The service recommendation and selection is widely used in the e-commerce and other web services. Collaborative filtering is the one that is widely used in prediction accuracy. The techniques that have been followed in the existing paper spotted with some advantages and disadvantages. As far as e-commerce is concerned recommendation plays a vital role by recommending the users to prefer a product. But there are few disadvantages in collaborative filtering were the prediction is not appropriate as of the user's interest. So here hybrid collaborative filtering approach finds the user's interest by clustering the similar data and this improves the prediction accuracy. Here the environment specific data collects the data and observes the need about that specific region by collecting the information from the nearest neighbors. The algorithm used in this paper is k-means clustering algorithm and two other approaches that are used are location aware recommendation system and location based geo-casting. This paper concentrates on the non functional properties like reliability and prediction accuracy by tracking the multicast location.*

Keywords— *k-mean clustering; prediction; recommendation; hybrid collaborating filtering; reliability; location aware recommendation system.*

I. INTRODUCTION

The web service has become one of the standard methods for sharing a data. The web service has developed a solution for the interoperability problem that was faced by the system integrators. The web service is not just static it is also a dynamic composition of services that meets the large no of changing requestors and controls the processing time based on the qos property. It is not necessary that a service should be created every time; it provides the opportunity of reusing the application. The advantage of web service is platform independent and not specific about their language. The communication between a provider and a consumer is done through the soap or rest protocol. These involve as the format of communication between both the function. Selection process in web service is done by the user on the basis of the reviews and the ratings that are given to the application. The process of selecting a service varies according to the user's interest. The dynamic web service recommendation provides the user a comfortable zone for the selection of the services according to the user interest. The recommendation is based on the user preference the more similar user who rates the same product, so that it will develop the prediction accuracy. The recommendation is the process of providing the best quality of service to the user. The following are the few examples of the service recommendation movie (movie lens), music (jukebox), books (amazon), hotels, resorts, vacation (trip advisor). The web service is a dynamic and distributed environment the nature of the property is service selection and recommendation considered to be the non functional properties or qos parameter. The qos properties such as reliability, cost, integrity, performance, availability, accessibility, regulatory, security. Now recommendation became as the part of everyone's life while seeing a doctor or trying a new restaurant. The references are made by our interest or by our known preferences. This influence a person to select an appropriate choice. This mainly based upon the commands and the ratings given by the user and the other people. The prediction is mainly based on the user who always visits the same site and their interest over that item. This also influence the cost of the user based the item we select can be filtered based upon the cost that the user provides to give according to their interest. there are many web services of the same functionality the user who use that asks to rate the web services so that used on the ratings a new user can prefer the web service and this rating forms a the recommendation to the other user. The ratings are also based on the qos parameters as based on the quality of the service and other qos parameters. Once the web service fulfil the interest of the user and the other services targets the highly recommended ratings. In the location aware recommendation system the user's id and current location are monitored by the gps and then if the user visits the restaurant, coffee bar, theatres so that user gives the ratings to that location and by this way the recommendation is made to the other.

II. COLLABORATIVE FILTERING

Predicting a service has lead to several approaches to find the accuracy in the recommendation of services. The collaborative filtering is the interest of the one user refers the preference to the group of similar users. Here the difference is between the likeminded people and the dislike minded people. In the case of memory based collaborative filtering the prediction accuracy is completely based on the user interest. This is done by the prediction of similar set of users whose

interest is merely same. The similar predictions are calculated between the active users. The weight age of the user preferences are based on the ratings given by the active users. In the memory based approach the like minded users are clustered together^[1]. The model based collaborative filtering the item are been rated the items or the service that the users regular usage. In the case of prediction accuracy the accurate results are produced in the static environment (movie ratings, song ratings). Producing a same result in the dynamic environment seems to be promising. The collaborative filtering is one of the techniques that are used to recommending items as of the users preferences by the ratings provided by the other user's^[1]. The collaborative filtering consists of the techniques like: memory based collaborative filtering, model based collaborative filtering, hybrid collaborative filtering^[2]. The traditional prediction methods are done through the user specific data types, which clusters the common interest of the user's ratings. Another method that is provided to predict the accuracy is environment specific which provides the recommendation of service based on their location. In the collaborative filtering the process is classified into two categories:

- similarity computation
- prediction generation
- Memory based collaborative filtering
- Model based collaborative filtering
- Hybrid collaborative filtering

A. Similarity Computation

Similarity computation is the subtracting the two highly rated web services. If the user uses the two web services the service ask to rate the web services. For example if there are two web services named as A and the other web service is named as B then the value of the two web services are subtracted^[3]. If A is been rated as the value of 20 and the web service B is been rated as the value of 50. Then both the values are subtracted then it is clear that the web service B is considered as the highly ranked web services. So by this way the recommendation are referred to the other users.

B. Prediction Generation

In the prediction generation predicts how a particular user will rate a web service. It computes how the prediction of services is done if the web service A and the web service B by computing the two web services summing the two web services gives the weighted average which web service should be used. This is inclusion of similar fields where the filtering is made between likeminded users. The similar minded users and their interest are indexed.

C. Memory Based Collaborative Filtering

The memory based collaborative filtering is one of the modest techniques that are used for the recommendation of the service or the product recommendation by the use of the user ratings^[3]. This prediction is done through the weight age of the similar user's and also through the nearest neighbors. The commonly used algorithms in the memory based collaborative filtering are Pearson-correlation approach. These combines the similar data from the active user's by use of training database and the ratings are combined together. The issues regarding the memory based collaborative filtering is data sparsity and inability to scale up problem. This problem refers to the small number of items in a database so that it will not support when a larger number of users and items.

D. Model Based Collaborative Filtering

The model based collaborative filtering collects the similar number of user and form them as a cluster. The clustering technique allows predicting the user of different opinion easily by taking the average of the similar user. The K-means clustering and the Bayesian algorithm^[4] use the statistical data set and machine learning which gives performance rate quickly. The rule based approach applies association rule to find association between co-purchased items and then generates items recommendation based on the strength of the association between items.

E. Hybrid Collaborative Filtering

The hybrid collaborative filtering is based on two processes one is user based collaborative filtering and another is item based collaborative filtering. The hybrid collaborative filtering incorporates the disadvantages from both the algorithms. The data that the evaluated here are given as true value, masked value and predicted value^[5]. These corresponding matrixes are done through the k-means similar users. So it is easy to identify the highly ranked recommendation. Hybrid collaborative filtering also overcomes the cold start and sparsity problem.

III. LOCATION AWARE RECOMMENDATION SERVICES

The location aware recommendation service not just specifies about the location but also gives the interdependent relationships among the users. So that users can share their locations and views. For an example a user can rate for your comment or a shopping. So this becomes a recommendation for the new user. This helps the user to track their friend's location and allows sharing the real life experience. It is an advantage that the location aware recommendation service is an ad-hoc network and is embedded in the mobile devices. The disadvantage over this is the LARS^[6] concentrates only on the user recommendation services. And the possibility of tracking is over the limited period of time and the limited geographical area. These recommendations are based upon the spatial data. That the user recent visit or the user regular visit to the particular place. This improves to know about the places nearby according to the user interest. By this way a user can share their location to their friends and this leads the other user to know about the places nearby. The usage of the spatial data allows nearest location and can be helpful in future. Processing a homogeneous request is easy than to

provide the heterogeneous request. To achieve the high recommendation the spatial data focuses on the user item network and user friendship network this is used to efficiently predict the ratings for the living items. By this a user can rate the environment and its services of the restaurants or the coffee bars. The location based system is not a static process. Every time the nodes keep on changing and the current location is updated. LARS is based on the two services LCA-LDA^{[6][7][8]} are the offline process that recommends about the interest of the each individual user and the other local preferences of the city in and around. We evaluate the result using the DoubanEvent and Flickr data set. The queries of the different user are recorded and the results are analysed by the query history. The new users will be interested over these queries and will be easy to visit the place.

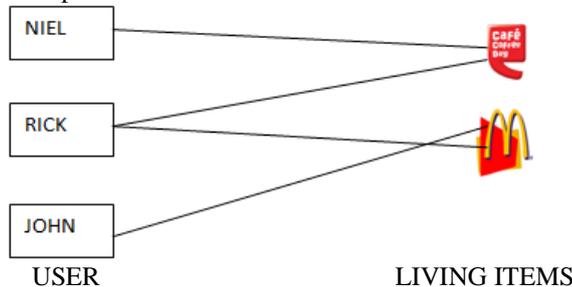


Fig. 1 user and location search

A. Location update strategy

As the recommendation process and the location is not a static one there need to concurrent update on the record of location. The strategy followed here is time based, movement based, distance based location. The above three follows different techniques to update the location. To find the accuracy in the recommendation^{[9][10]} the ideas are collaborated with the mobile computing concepts.

B. Time based location

In the concept of time based locating service the location is keep on updated in every T units of time. The time based location search is dynamic and so whenever the user enters into a location it's marked as I and when user moves to another location then that region is tracked by the time the user left the previous location^[11]. The time location is the travelling time between the old location and the new location. It is I+J or I-J. So when there is hopping between two base stations by the use of time based location it is easy to identify where the user is located.

C. Distance based location

The distance based location is between the current location and the last reported location. This is called as the residing area. The distance is been calculated as distance is calculated between the current location and last reported location^[12]. When there is a call arrives to the mobile station then location are traced and the current location is tracked. By this the user can check out for the new place. The places in and around it and could b recommended to the new users by the way of review or the ratings provided over the particular site.

D. Popularity based recommendation

In the case of popularity based location search. The visitor will view the recommendations given by the previous users the high positive commands are taken by the user. This is even used to view that current location (tourist spot, theatres, hotels) photos and then aggregate the results, so accuracy is high by this way of PR. For an example if a user searches for the restaurant in his city and that user likes to review about the place the PR system gives us the top most restaurants of that location and the highly positive and negative recommendation are also viewed. This would be easy for a new user to track about the location and its results. The results are been displayed in a dataset as no open source dataset are used the Flickr dataset^[13] which is a open source is used to collect the data from according to the user commands.

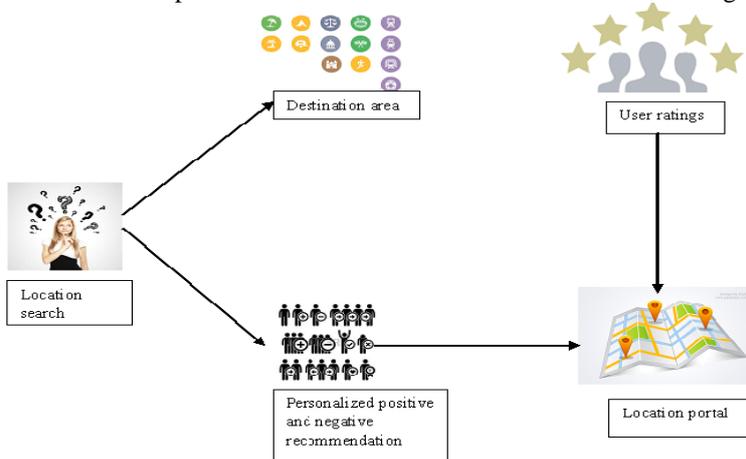


Fig. 2 Recommendation of location to the user

IV. HYBRID COLLABORATIVE FILTERING RECOMMENDATION

In the hybrid collaborative filtering the recommendations are based on user and the service based recommendations. The technique improves the similarity between both the user and the service. By the use of hybrid collaborative filtering it sorts out the top k-most similar activities which is similar among the user. The top most recommendations help the new user to see to their interest. The user can see the location of their nearest neighbor by the GPS^{[14][15][16]} system and track the location. This shows the user about the popular places around and the positive feedback about that location.

- Who checks in for the location?
- What the possibilities to track their friends location
- Do these commands will help the recommendation?
- How do a user ratings help their friends

The nearest neighbor node ranks the top popular searches and the rankings are based on the user who regularly searches for the same location and those are recommended to the other users. The recommendation is also based on the queries the user prefers about their search. The user likes and dislikes is been displayed under the location search.

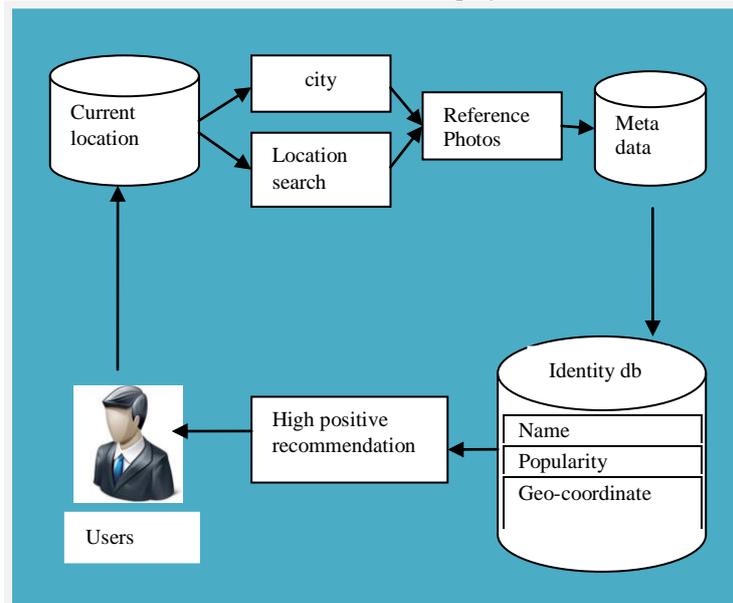


Fig. 3 Geo location of the user by the nearest neighbour

V. PROBLEM DESCRIPTION

A. Data sparsity

The data sparsity problem is caused by the cold start problem. Providing the recommendation is difficult when there is the large set of data collection. It is difficult to select the similar set of services and most of the users do not rate the item and there data sparsity occurs^[15]. The collaborative filtering is difficult in the case of data sparsity problem. The major problem occur over here is the negative impact because no user recommends the service or item. This reduces the prediction accuracy.

B. Grey Sheep

The gray sheep problem refers to the user whose opinion does not consistently match the user opinion. The set of users who does not agree or disagree with any of the group of people and thus does not benefit collaborative filtering.

C. Black Sheep

The black sheep are the opposite group of people whose idiosyncratic taste makes recommendation nearly impossible. This failure is acceptable and the non-electronic recommenders that will make the recommendation merely impossible.

D. Shilling attack

The shilling attack is that recommendation where everyone can give the ratings . People may give lots of positive rating for their own item and negative rating^{[17][18]} for their competitors. Shilling attack is identified and detected by the item-based collaborative filtering by Lam and Riedl this attack is much less affected than the user-based CF attack.

E. Cold start problem

The cold start problem is that the recommendation which is not unable to match the meaningful commands so there will be lack of positive ratings. A) In the case of new user firstly it is registered with the collaborative filtering so there

won't be any ratings^[19]. For an example if the new restaurant is added to the collaborative filtering and it is new and not yet rated in that case many user won't tend to try that restaurant that is not even rated once. The problem in the new user is the initially someone should rate the site. So to avoid this the few techniques can be used i) allowing user to aggregate their taste and rate it ii) to find the group of people with similar taste iii) initially telling the users to rate the service before they use it. B) In the case of new item is added to the collaborative filtering so that item will not acquire the ratings^[20]. For an example in rating a product the users are less interested in liking the product which is not even rated once. So in that case recommending a product without any recommendation is problematic. So the technique here used is i) asking the set of users to randomly rate the item ii) then analysing the product and rating it.

VI. CONCLUSION

In this paper location aware recommendation is based on the hybrid collaborative filtering and location aware and location based geo-casting system. This helps to know the user interest by the personalized location recommendation (like restaurant and coffee bars and theatres etc..) if the new user searches for the local places in a city the location aware recommendation help them to find a good place by the commands given by the people. The system is reliable and the data sparsity problem is minimized as the data are collected from the user and the service interest. The location aware recommendation helps to track the friend's location. As a suggestion hybrid collaborative filtering algorithm is used that minimizes the missing value and the prediction accuracy is high as the user and the service views are taken. By the k-means clustering algorithm the location is identified and the nearest neighbor node locates the place and then positive and negative recommendation is made by the previous reviews and the commands. By the LARS it is scalable and the prediction accuracy is comparatively high.

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