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MEMORY-BASED COLLABORATIVE FILTERING FOR TOURIST HOTSPOT RECOMMENDATIONS

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ABSTRACT

As tourist places are one of the good revenue resource for every country and state, so government and private bodies working on this to attract maximum tourists and people. With the above considerations, I am writing this paper to give the recommendations of the tourist places based on the user attractions. This recommendation system is for the web and mobile applications which can be used to create the preference list for individual tourists based on their attractions. The collaborative filtering can be used very effectively and adapt-ably in this business domain. The visualization of the user information, collection of neighbor users and creating the attraction recommendations are the three steps which can be produced based on the collaborative filtering (CF) principle. In this we have used the Cosine method to find the similarities between the users based on the neighbor's generation. In the last, the attractive recommendations are can be generated based on the visiting history of the neighbor.

Keywords

Hotspot tourist places, Collaborative-Filtering(CF), neighbor selection , recommendation system, user behavior and interests.

1. INTRODUCTION

As today's era is for the internet and online and web services are growing very rapidly at very high rate, every business owner, private, government bodies moving their business on the internet throughout the world and massive public can access these web services from anywhere to sell their hot products and services to their tourists[1]. The service providers can easily can update and manage information of their services and products on very fast speed on their web-sites, internet or their online applications and on the other hand this internet gives the capability to the end user or tourists to search the services from globally. The recommendation system is used to make the tourists plan for the vacations, holidays or family trips etc. So the recommendation system plays very important role to make this action plan for the vacations based on the user's interests and personal preferences[2]. As the tourist packages demand is decreasing, so the recommender system is working more on the users personalized trips, tours etc. Already many recommendations techniques are applied such as content based filtering, collaborative filtering on the commercial data which is specifically suited for movies, books, tasty products etc and these techniques are not best suited for the other products like computer, car, tourists attractions, apartment etc[3]. As the tourist attractions are not visited very frequently so the the rating can't be predicted based on this very short data of a user. The ratings can be calculated using the collaborative filtering recommendation approach. So we have demonstrated the memory based users attractions recommendations system using then collaborative filtering approach.

This paper presents a Recommender system for e-Tourism to recommend tourism hotspots to the users. Work presented her proposes Memory- based Collaborative Filtering (MbCF) algorithm that augment Collaborative approach for generating highly precise recommendations and to handle sparsity matrix problem in tourism domain. The architecture of a tourist service or products is more complex than a book or a movie and hence customer profile modeling for this domain is much harder than most of other applications domains like songs, movies or books. Also the frequency of customer activities and rating in tourist application area are smaller than other domains. This possesses the complexity in designing and development of Recommender Systems in tourism domain. This paper is an attempt to generate relevant services for a

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customer in tourism domain using memory based collaborative filtering.

2. Related work

The collaborative filtering is one of the most widely used approaches for the recommendations system. The basic principle of the collaborative filters(CF) is the collecting and calculating the information for the user based on his preferences, historical activities and behavior and analyzing and predicting what will a user prefer based on their similar user i.e. neighbor user. The main advantage of this collaborative filtering approach is that it does not rely on the machines contents like movies without understanding the internals of this. In this topic of travel information recommendation, the very first attractive concern is the attraction recommendation [5]. [6] Propose a hand-held context-aware tour guide named the Cyberguide project which is a series of prototypes of a mobile applications. It is supposed in the in the Cyberguide what could be supported in the mobile with best way and then determine how technology will work. It is also assumed that based on the contents from the mobile applications like position of the user etc can be used to provide, recommend or offer the good services. The [7] proposes more personalized recommendations for the tourist attractions at his destination. It is also assumed that the Bayesian network is a very good approach to to support both of collaborative filtering and content-based techniques. But the real power of pure content based or collaborative filtering techniques very limited in this domain. The [8] targets on investigating the concerns in the location-based user's points of interest in the order to the recommender system. These recommendations systems use location as a key filter for generating recommendations on the based of recommended enhanced collaborative filtering approach.

3 Build the Recommender System

From the lasts few years, the internet services are blooming at very high rate and predicting this more in the coming years. A massive group of publics can access this information around the world or globally from anywhere as the smart devices are playing crucial roles to make this happen [10]. However, its competitive advantages and good prospective, the major advantage being data is generating very heavily and searching the right information from his data is time consuming. The personal recommender system [9,15] is one of the very effective ways to handle this very problem by recommending people in daily preferences and providing alternatives.

3.1 Recommendation process

Assuming the users with similar interests will prefer same items, so neighbor users with the similar interests can be calculated by analyzing the cached user's preferences and the recommendations can be proposed based on the neighbor user interest.

Following are the three steps in which the collaborative filtering approach can be divided.

1. Tourist user's information representation:-In this user's historical visiting history is analyzed and modeled.
2. Tourist user's neighbor generation:-Using the collaborative filtering algorithm similarities of the users can be calculated based on the visiting history.
3. Attraction recommendations generation:-recommend top –n attractions to the user based on the neighbors' visiting history.

So based on all the above steps, the basic information of a user and his past visiting history can be used to find and calculate the users list of neighbors which are stored in the database. When users use the system, the recommendations of tourist attractions can be shown based on the visiting experiences of his neighbors. This process of recommendation is shown in Fig given below.

3.2 Generation of Neighbors

The Neighbor users are generated based on the similarity between each user. The larger set of users have become void and null, so the system has to pre-process [11] user's data before generating neighbors. The preprocessing process basically consists of data cleaning, integration, conversion and reduction etc. This process can be done more streamline and accurate to get the list of last login user and most active users. To calculate the similarities between the users, the recommendations system can use the visiting history of the users who already have records for traveling. The user who are new to the system, for them sex, education, profession, login time etc[12] can be used to find the similarities in the users.

Assuming that the set of all visitors $T=\{T1, T2...Tn\}$, for each visitor Ti (i=1, 2... n), the system can find the neighbors list by taking top N tourists which have similarity higher than the given threshold 0.

The role of collaborative filtering approach [13] is the calculation of users/tourists' similarity. The similarity is checked between the users as :-

a).The ratings of tourist *Ti* and *Tj* are retrieved over the attractions.

b). Using different similarity models (Sim(Ti,Tj)) similarity between the users is calculated[4].

The main three methods to measure the similarity between the tourists are :- Cosine method, Correlation similarity method and Adjusted Cosine method [14].

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The Cosine method is used in this paper. The user ratings are assumed as n- dimensional vector in this. If a tourist has visited a attraction, then it is set to 1 otherwise it is assumed 0.
The similarity between two tourists is the angle between them as per the Cosine formula i.e.

$$sim(\mathrm{T}_i, \mathrm{T}_j) = \frac{R_{T_i} \bullet R_{Tj}}{\left\| R_{T_i} \right\| \times \left\| R_{Tj} \right\|} \qquad (1)$$

$$sim(\mathrm{T}_i, \mathrm{T}_j) = \frac{|S_i| \cup |S_j|}{|S_i| \cap |S_j|} \qquad (2)$$

On the basis of formula (2) and Table 1, we can calculate the similarity between T_1 and T_3, T_1 and T_2, T_1 and T_4, T_1 and T_5 as follows:

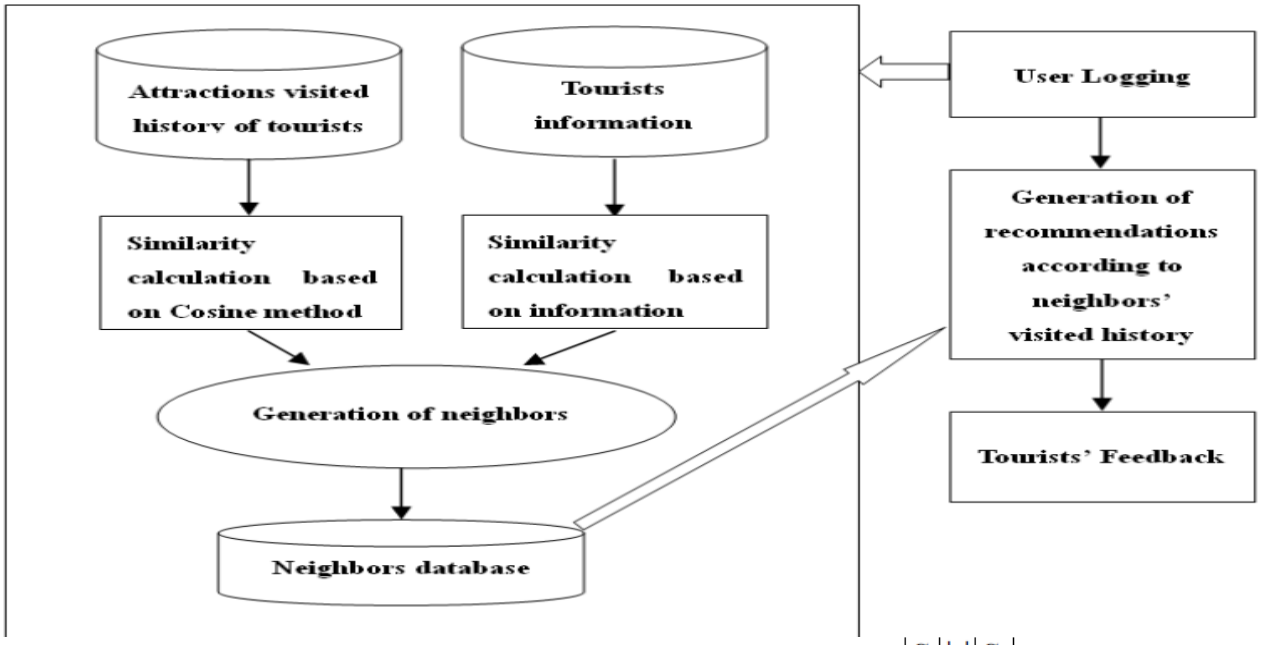

Figure 1. Generation process of attraction recommendations

$$sim(\mathrm{T}_1, \mathrm{T}_2) = \frac{|S_1| \cup |S_2|}{|S_1| \cap |S_2|} = \frac{3}{5} = 0.6 \qquad (3)$$

$$sim(\mathrm{T}_1, \mathrm{T}_3) = \frac{|S_1| \cup |S_3|}{|S_1| \cap |S_3|} = \frac{3}{5} = 0.6 \qquad (4)$$

Tourists	Attractions				
	A1	A2	A3	A4	A5
T1	1	0	1	1	1
T2	0	1	1	1	1
T3	1	0	1	1	0
T4	0	1	1	0	1
T5	0	1	0	1	0

Table -1 Attraction Visiting History of tourists.

Suppose that *Si* is the set that composed of all the attractions which the tourist *Ti* has ever visited. So, we can give out the calculation formula of similarity between *Ti* and *Tj*.

$$sim(\mathrm{T}_1, \mathrm{T}_4) = \frac{|S_1| \cup |S_4|}{|S_1| \cap |S_4|} = \frac{2}{5} = 0.4 \qquad (5)$$

$$sim(\mathrm{T}_1, \mathrm{T}_5) = \frac{|S_1| \cup |S_5|}{|S_1| \cap |S_5|} = \frac{1}{5} = 0.2 \qquad (6)$$

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If the value of threshold support count selected is 0.5, then *T2* and *T3* are the neighbors of *T1*.

During the computing recommendations for a specific user, the basic approach is to select the items preferred by other users that are similar to the target user. When new tourists enter the system, then his basic information like age, professional, sex,, income, vehicle etc parameters are used to find the cold similarities in the users.

3.3 Generation of Recommendations

The recommended attractions are calculated by the visiting times of neighbor users. Based on the calculations done in the previous step, neighbors of visitor T1 are T2 and T3, so we can use full history of listed attractions so as to get the most popular ones. As shown in the below given table-2, we get the maximum neighbor visited attractions are A3 And A4. Based on the calculations the attractions A3 and A4 can be recommended to the T1.

Tourists	Attractions				
	A1	A2	A3	A4	A5
T1	1	0	1	1	1
T2	0	1	1	1	1
T3	1	0	1	1	0
Total	2	1	3	3	2

Table-2

4 CONCLUSIONS

As the data is increasing every day and user is relying more on the internet so it has become rule of business to show the recommendations for which a tourist is interested based on these interests, visiting history. So for this the personnel recommendations system using the collaborative technique is a suited way to show the attractions to the visitors. In this paper more work can be done and more precise results can be computed.

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