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Location and Social Tie-Up Aware Recommender and Informative System

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ABSTRACT

This paper proposes a recommender System to help users to identify useful items. Additional information are provided to the users with specific query result along with extra features related to the query result, considering the spatial property of the users and also the items. This paper also proposes recommender system that leverages social proximity to generate recommendations to end-users. The recommendation answer is influenced by either the user or the social ties of the querying user. The more user u friends liking a venue v the higher the possibility user u will also like venue v. Social ties also incorporated in the collaborative filtering approach to recommend the more precise result to the querying user.

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INTRODUCTION

Recommender systems use the opinions of users to generate recommendation based on the choices. A normal recommendation system predicts product rating using the collaborative filtering method. The collaborative filtering is based on the concept, similar item will be voted by similar users. Collaborative filtering uses Memory-based collaborative filtering, known as user-based collaborative filtering, In this filtering method the correlation of users is based on the pattern on voting methodologies by different users. Prediction option is used for computing correlation among various groups of users. In case of real time application the prediction option may not work as it causes memory load in the recommender system. The user-based collaborative filtering could not produce proper recommendation in real huge datasets. The other filtering technique considered to be effective is Model-based collaborative filtering, this technique concentrates on similarity among the item that is already voted rather than focusing on user similarity, hence this technique is known as item-based collaborative filtering, and the scalability is maintained for both small and large datasets.

1.1 *Traditional filtering:*

Traditional collaborative filtering concentrates rarely on offline computation. The online computation efficiency increases with the number of customers and items. The methodologies followed by this algorithm reduced the recommendation system quality with improper results for huge data sets. The ratings and purchases of customers were wrongly matched. Constant evaluation of recommender system is still an unanswered and challenging question.

1.2 *Location –based system:*

In Bayesian Network the parameters are extracted from the dataset. The Mobile device is used for getting request from the user. The information include contextual, details about weather conditions, time zone etc. The mini map displays the services for the request or appropriated suggestion or list of items based on the user request and information. In this method logic is implemented in three ways. First part include log collection of context, including the when, where details and user profile information. Second part includes generation on recommendation and finally the details are mapped to the system to keep it updated. The Bayesian Network works based on the collected information. The Expectation-Maximization algorithm is used to pre-process the contextual data and it generates the CPT(Conditional Probability Table). When any request is received the most valued parameter is used, this has both merits and demerits. The database details are searched to get the final outcome, the size of the mobile devices were major constrain for this model.

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1.3 *Location history based recommendations:*

A real-world recommendation system was designed to generate recommendation to users based on the estimations from the past location history. This systems mainly recommends shops to users for purchasing items.GPS(Global Positioning System) was used to gather the location details of users, the current location and the preferred location and the distance to the destination are also considered. The item-based collaborative filtering is used to transform the stored location information in to list. The list includes the user rating to items, shops and the recent visited shops, these details are used while generating the recommendation to the user for shops. The system recommendation generation criteria included the user's preferable shopping routes, reachable destination from the current location and the shops in that destination. The system generated wrong information due to lack of few but important details about the user such as age, sex etc.

1.4 *Location-based social network:*

The Location-Based Social Network recommendation include,

1) Location recommendations, suggest user with sequence of travel routes and locations, 2) user recommendations, suggest users with list which user may like to be part of the community, the user may want to share details or gather information from the linked people. This system linked many people together and the idea of this system was well appreciated and it was used effectively, 3) activity recommendations, suggest users with the list of activities, the user might take part or consider to make use of the activities,4) social media recommendations, suggest users with the social media information like photos, video shows and web contents according to the user location and social media location. The Data sources gathered should have complete details to generate proper recommendation; the wrong data sources may mislead the user with invalid recommendations. The user location details generated with the help of GPS in each devices. The efficient recommendation generation is still in challenging and certain questions are still unanswered.

In all the recommender systems the spatial properties of the user and item are not considered which lacks the efficiency of the system. This paper overcomes the drawback of all the system.

2 Our goal:

i) To propose a location and social tie-up aware recommender and informative system that uses location-based ratings and social tie-up to produce recommendations

ii) To consider spatial properties of users and items

iii) To allow users to select the items based on the preferences in his/her residing region by supporting spatial ratings via user partitioning technique

iv) To limit the travelling distance of users, when visiting these venues by supporting spatial items via travel penalty technique

v) To develop an informative system for the users provides recommendation for the specific query along with additional features belonging to that location.

3 Location aware recommender system:

Recommendation for the items only based on interest is not suitable for all the users. The user preference for particular item may vary based on his/her interest and other criteria, which include the user own option, item location and travelling distance. Preference Locality and Travel Penalty initiates the basic need for the recommendation system generating recommendation with Location-Aware criteria (Mohamed Sarwat, 2012).

Preference Locality:

Suggestions may vary according to the spatial regions of users. Preference locality suggests the idea of preference difference for particular item among users varied according to spatial location. The users from same location may prefer same items and like may vary from other spatial locality. Preference locality suggests that recommendations should be generated based on location-based ratings close to the user. The recommendation should be generated based on the influence of user preference unique to spatial region of the querying user.

Travel Locality:

Users wish to travel a reasonable distance to get the spatial items needed by the user. This process is known as "travel locality".

Suggestion:

When generating recommendation to users preference should be given to items that are reachable in distance to the requesting user.

Present recommendation systems recommend items to users without considering the travel distance, the systems consideration is only for the items rating given and not the travel distance, there is a possibility of huge travel distance for the user to reach the particular item and the user may not know the exact time or the distance to reach the item. The user may or may not have personal view on that item. This process is explored using a technique that partitions the ratings according to the user location. The rating is generated based on the ratings of users belonging to the querying user location. The preference is given to the next nearest location users rating, such that a hierarchy from top to bottom is maintained to generate recommendation. In this case the user will get recommendation for particular item if he has rated similar items in the previous visits.

It also produces recommendations for spatial items according to the rating given by user from

unknown location. These two techniques can be used together or separately to generate recommendation based on the spatial properties of user and item. This system also considers the social tie-up of the user with additional information.

Recommendations generated as below

$R = UR_n \cup RO$ (1)

Case 1: $R = UR \in EU$ (2)

Case 2: $R = NR$ (3)

R = Recommendation

UR = User Rating

RO = Rating Option(Rating option for new user)

Rating Option = R1 OR R2 (4)

= (Rating for item) OR (Rating for Category the item may belong to)

To generate the Location Aware Recommendation the following classes are considered (Mohamed Sarwat, 2012)

3.1 *Non spatial user-item recommendation system:*

This recommender system focuses on user ratings of particular item and generates recommendation based on the users previous liking. The traditional recommender system follows this approach based on the collaborative filtering technique. Rating prediction is also considered. This system should include use rid, itemed and corresponding rating for that item by the user.

There are n number of users and a set of m items. Each user expresses opinion about a set of items in terms of numeric value. For the user querying for a recommendation, this module outputs the list of recommended items the user will like the most based on prediction. Similarity for a pair of items is calculated using the cosine similarity. The items which share the common rating by the same user are taken as a pair for the calculation of similarity score.

Rating Prediction:

i) Non-rated item by user is provided the rating value by the process of rating prediction.

ii) List of items only rated by querying user is selected.

iii) Recommendation is generated based on the rating of the similar items and the similarity score between the similar items and candidate item.

iv) Top k items are recommended for the user from the predicted rating value

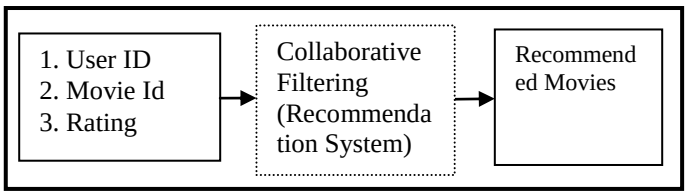

Fig.1: Rrecommendation using Non-spatial user ratings for Non-spatial items.

3.2 *Spatial user recommendation system:*

The rating or the user view may vary from one location to another location. The rating might be from home or any area and the item may include prediction or based on their like. The spatial location of the user is considered before generating the recommendation. The querying user location is considered and the user rating of other users are split up based on the location and the querying user location is used to find out in which location the user belongs to and recommendation is based on the choice of users from that particular location(Example – User A is the querying user and belonging to Kelambakkam the recommendation will be based on the ratings of user from this location).In case if no rating is available in the querying user location ,this system considers the next nearest location to generate the recommendation.

Location and Social Tie-Up Aware Recommender System produces recommendations using existing item-based filtering method along with attributes of ratings given by users within the spatial region of the querying user. The ratings varies with each user as it is unique, this system produces recommendation according to the ratings constrained to spatial region of the querying user.

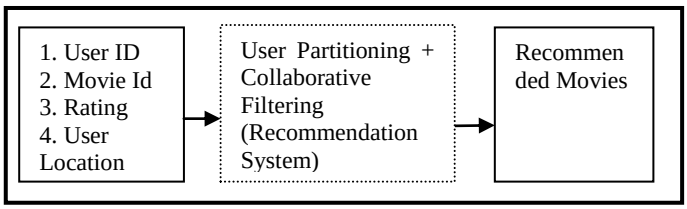

Fig. 2: Rrecommendations using spatial user spatial ratings for Location independent items module.

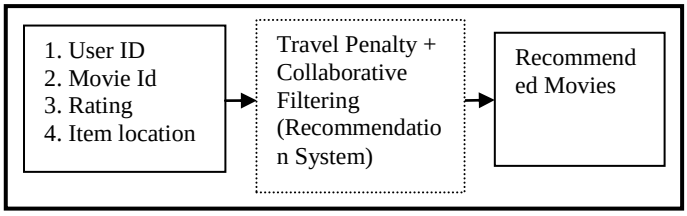

Fig. 3: Rrecommendations using User ratings for spatial items.

3.3 *Non spatial user recommendation system:*

This recommendation system considers the item location to generate the recommendation. The users could have rated the item from any location. The rating predication is based on the travelling distance of the querying user to that particular item location. If the travelling distance is more to that location then that item is omitted. The recommendations are based only on the limited travelling distance.

3.4 *Spatial user-item recommendation system:*

Spatial user-item recommendation system considers both the spatial properties of user and item. The user rates the particular item only based on his/her experience to that particular item(Example – Rating a movie in his/her location and he has already seen the movie).The location of the rating user and corresponding item location is considered before generating the recommendation. The criteria's are userid, user location, rating, item id and location. Both user partitioning and travel penalty techniques can be combined to produce recommendation for both spatial user rating and spatial items.

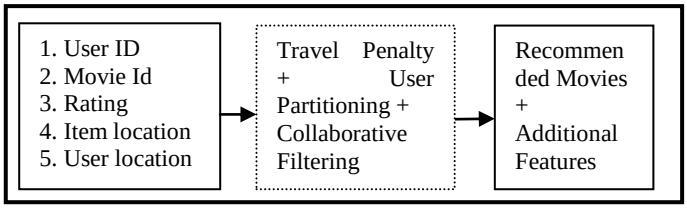

Fig. 4: Rrecommendation using spatial user ratings for spatial items Module.

Algorithm
1: /*Recommendation Generation*/
2: Function Recommendation(RC)
3: /* RC equals Recommendation Condition*/
4: if RC equals User Rating then
5: Generate Location Aware Recommendation and Information
6: if new user then
7: Rate for item or category
8: Generate Location Aware Recommendation and Information
9: return Rec
10: else generate alert to rate of either item or category
11: end if
12: else
13: if(Friend list)
14: Socialtie_up recommendation(Friend list)
15: /*Recommendation generated with friends like based on spatial rating and items spatial location.
16: else
17: /*No social link opt for Normal recommendation*/
18: Generate Location Aware Recommendation and Information
19: return Rec
20: end if
21: end if
22: /* Rec equals Recommendation */

In all stated recommendations, if the user has not rated for the item, he/she will be given a chance to rate the existing item so that recommendation can be generated in future for the particular user(Example – Rating a movie and giving chance of category rating in case of dislike in the given list of movies)

4 Social tie-up and informative system:

4.1 *Social tie-up:*

The social proximities are leveraged to generate recommendations to end-users. In this case, the recommendation answer is influenced by the social ties of the querying user.

$P(\Sigma UR \cap \Sigma SR) = 0$ (5)

In first case recommendation is generated only based on the user rating for previous items. In second case recommendation is generated based on friends like. This system is mutually exclusive when generating recommendation.

The more user u friends liking a venue v the higher the possibility user u will also like venue v. This system gives the option for user to find out whether the recommendation is needed based on his/her like or depending upon the friend's opinion and recommendation is generated. Social ties also incorporated in the collaborative filtering approach to recommend the more precise result to the querying user.

4.2 *Informative system:*

This system mines data related to user query and recommends the additional features related to the user query along with the result of the user's query. For example if a user queries for best theatre in specific city, Additional features recommendation system provides the useful and interesting activities located in a city.

$R = UR + IM$ (6)

IM = Additional Information (Kids play station or restaurant)

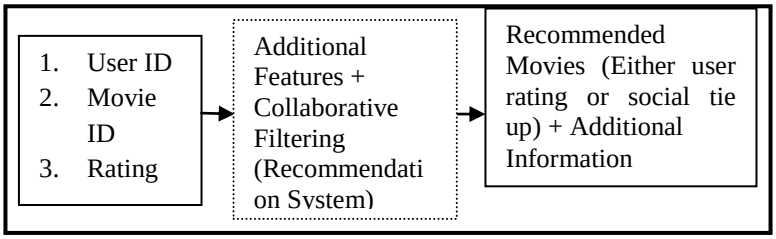

Fig. 5: Additional features recommendation system.

The advantages of this system includes

i) Provides personalized recommendations considering the rating user location and querying user location.

ii) Exhibits a more flexible trade off between locality and scalability

iii) Generates recommendation for huge data's with improved quality recommendations than traditional approaches.

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REFERENCES

http://www.cs.carleton.edu/cs_comps/0607/recommend/recommender/memorybased.html

http://www10.org/cdrom/papers/519/node7.html

In CSWC, 1994.MovieLens: http://www.movielens.org/."

Jie Bao, University of Minnesota, Yu Zheng, Microsoft Research Asia, David Wilkie, University of North Carolina, Mohamed F. Mokbel, University of Minnesota "*A Survey on Recommendations in Location-based Social Networks*"

Jie Bao, Yu Zheng Mohamed, F. Mokbel, "*Location-based and Preference-Aware Recommendation Using Sparse Geo-Social Networking Data*"

Levandoski, J.J., M. Sarwat, A. Eldawy and M.F. Mokbel, 2012. "*LARS: A Location-Aware Recommender System*," in Proceedings of the International Conference on Data Engineering, ICDE.

Linden, G., 2003. "*Amazon.com Recommendations: Item-to-Item Collaborative Filtering*," IEEE Internet Computing, 7(1): 76–80.

Mohamed Sarwat, J. Justin Levandoski†, Ahmed Eldawy and F. Mohamed Mokbel, 2012. "*LARS*: An Efficient and Scalable Location-Aware Recommender System*" transactions on knowledge and data engineering, 6(1).

Mouratidis, K., S. Bakiras and D. Papadias, 2009. "*Continuous monitoring of spatial queries in wireless broadcast environments*," IEEE Transactions on Mobile Computing, TMC, 8(10): 1297–1311.

Sarwar, B., G. Karypis, J. Konstan and J. Riedl, 2001. "*Item-Based Collaborative Filtering Recommendation Algorithms*," in Proceedings of the International World Wide Web Conference, WWW.

Venetis, P., H. Gonzalez, C.S. Jensen, and A.Y. Halevy, 2011. "*Hyper-Local, Directions-Based Ranking of Places*," PVLDB, 4(5): 290–301.