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Research paper

Travel Location Sequence Recommendation From User's Point of Interest

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Abstract

The major objective of any Travel Recommendation System is to recommend its users to visit the most suitable place in according to the selected location. We present this system of travel recommendation from the experiences of the previously visited users of that location. Apart from the existing systems, our approach not only limited to users traveling interest but also recommends a travel sequence. Our sys-tem also suggest best visiting time, most suitable season, preference of visiting the nearby places and traveling route to reach to your desired location. Here the user can create his friend list and can share his experience of visit to his friends. This user given experience is taken as a feedback by the system to update his recommendations.

Keywords: *Location; Page Rank Algorithm; Point of Interest; Recommendation; User Feedback.*

1. Introduction

A recommendation system is more important and valuable in both research and industry. We proposed a system in which Recommendation is from the user friend zone through his social media friend list (e.g., group, facebook, whatsapp etc.) In recommendation system we try to solve the challenging problems such as recommending the best places for travelling at that location where user want to travel. We also recommend the best season, time, hospitality facility, hotel, restaurants. And we are also trying to recommend best route to travel the places at that location in the given time. Our system is helpful to user because they do not need to search more about the places on different websites. Generally searching for food, restaurants, accommodation, visiting time is from different websites. So in our proposed system we recommend all this in one so that there is no need for the user to visit more websites and retrieving. We also recommend the path to visit the location with Google map as an addition point in our system.
In the proposed method the system automatically mines the recommendations from the user data as per its travel interest from his friend list and the type of places visited again and again. To solve the existing system challenges we improve our system with some extra recommendation parameters. We combine user topical interest from its profile where he gives all the information such as its hobbies, type of places he want to travel, his interest to visit the places and all the parameters in user profile. Where our proposed system in which first the user need to registered with his personal information and creates its own friend list where our system stores all data of all the user in a database so that we can use it for recommending the parameters. Where at first all the user have to build their own profile and submit all the information about the places and location that he already visited.
The paper is structured as follows; introduction is given in section 1, then related work is given in section 2, then we have described how we will do the implementation and proposed work which includes the algorithms we used in our proposed system i.e. the materials and methods in section 3, the we have given the tested results of our implemented work in section 4, and then the conclusion in section 5.

2. Related work done:

In this section, we mainly introduce three aspects of related works (1) places recommendation from user's friend list from his social media accounts such as facebook, whatsapp, instagram images etc..; (2) user points of interested places recommendation; (3) travel path and place location recommendation. We also show the differences between our works done and work done previously.

2.1 Collaboration and activity recommendation

In this paper the work done with collaborative filtering for recommendation. The activities are recommended based on the past GPS history data [1]. In this work done as they extract the region, feature extraction, extracting location from the activity, activity-activity correlation. This work will done in this paper for activity and location recommendation. The algorithms proposed or used in this are CLAR algorithm and ExtractStayRegion algorithm. The drawback is only the user having GPS devices can get the recommendations.

2.2 Trip mining and recommendation

In this paper work is done with use of searching and ranking algorithms. Flickr data is used as source of information for using the geo-tagged images [2], flikr is popular landmark for sharing photos. The process and system is designed in which the algorithms used are KNN, Apriori and mean shift algorithm [3] [4]. Where KNN and Apriori are used for category based searching and ranking based search. The recommendation is through the user ac-

counts data from flicker and user account. From that search results we get trip results.

2.3 Travel guide by automatic landmark ranking

In this paper work is done with the methods such as selection, filtering, refining, ranking and view generation [5]. First the landmark places are chosen from the geo-tagged images which are recognized and suggested. Most popular and tagged landmarks are preferred then from that noisy are removed and recommend the best landmark automatically by applying the above methods. The landmark ranking and view generation of landmark is done for the final output.

2.4 Recommendation from local experience and blog entries

In this paper work is done with Association rule mining. This applies on user blog entries for getting the blog experience, location and time period. blog watcher and time graph are used for community blog growth and getting the blog behavior. Text mining is also used to extract the result for recommendation based on the precision and recall of association rule. Without mining text from the blog the result is not obtained, here complete work done with the mining methods [6].

The existing work related to travel recommendation does not well considered, as per the popularity and recommendation of path to travel the places at the same time. What's more, the multiple parameters of users and routes (e.g., time, season, restaurants, hospitality, map to travel etc.) may not mine automatically. To solve these problems we proposed a system in which, first, user login himself and create its own friend list. From the post of friend list we retrieve the location and best places to travel using ranking algorithms. Second, we apply HITS algorithm for generating the information from the other user reviews and comments which gives us the proper information about that place. (Visiting time, season, best food etc...) Third, we also give a Google map route to travel that place at that location and also have an admin panel to correct the information in case of fault or noise occur.

3. The material and method

Personalized travel sequence recommendation algorithm:
First we implement page rank algorithm which we use to find the effective ranking for the location search by user, which can be calculated from ratings given by other user that can be done in process as follows:

3.1 Page Rank:

- Page Rank is used for Ranking all the complete graph and implement search.
- Ranks pages based on the number of backlinks pointing to them.
- Assigns pages a Total Page Rank based on the Page Rank of the backlinks pointing to the page.

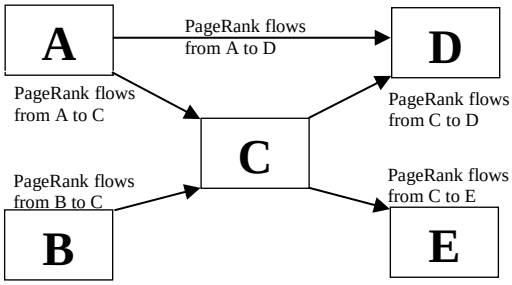

Fig. 1: Flow of Page Rank Algorithm.

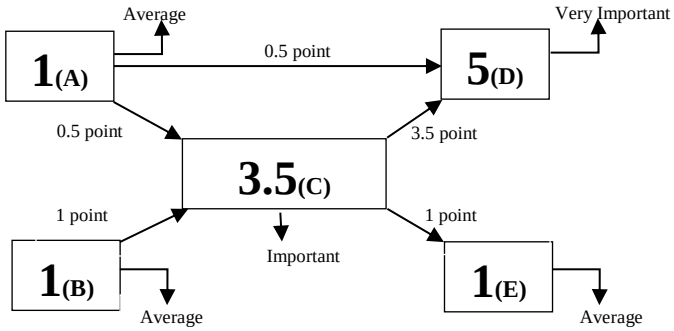

Fig. 2: Example of Page Rank Algorithm.

Working of Page Rank?

- Page D will be on the Top Result because it has a Page Rank of 5
- Page C will be on the 2nd Result because it has a Page Rank of 3.5
- Page A, B & E will be on the Top Result because they have a Page Rank of 1 (as shown in Fig. 2)
- Page Rank algorithm is an algorithm uses to measure the importance of website pages using hyperlinks between pages.
- Some hyperlinks point to pages to the same site (in links) and other point to pages in other websites(out links) (as shown in Fig. 1)
- Page Rank is a "vote", by all the other pages on the web, about how important a page is important.
- A link to a page counts as a vote of support.

The main concepts:

- In links of page i: These are the hyperlinks that points to page i from other pages. Usually, hyperlinks from the same site are not considered
- Out links of page i: These are the hyperlinks that point out to other pages from page i.

$$P(i) = \sum_{(j,i)\in E} \frac{P(j)}{Oj} \quad (1)$$

P(i)=Page Rank score of page i
Oj=Number of out links of page j

3.2 Hyperlink Induced Topic Search Algorithm:

HITS algorithm uses a simple approach to finding quality documents and assumes that if document A has a hyperlink to document B, then the author of document A thinks that document B contains valuable information.
In A is seen to point to a lot of good documents, then A's opinion become more valuable and the fact that A point to B would suggest that B is a good document as well.

Second we implement HITS algorithm which we use to find the effective review for the location search by user, which can be calculated from reviews given by other user that can be done in process as follows:

Steps of HITS algorithm:

- Starting from a user supplied query, HITS assembles an initial set S of pages (as shown in Fig. 3).
- The initial set of pages is called root set.
- These pages are then expanded to a larger root set T by adding any pages that are linked "to or from" any page in the initial set S.(as shown in Fig. 4)

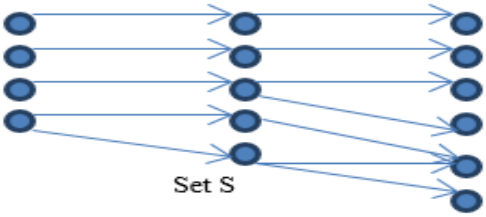

Fig. 3: Initial Set S of Pages.

- HITS then associates with each page P a hub weight h (p) and an authority weight a (p), all initialized to one.

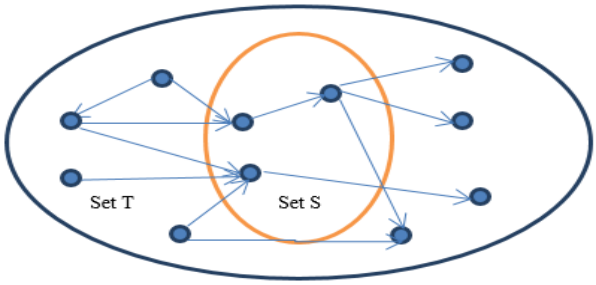

Fig. 4: Set T Expanded by Adding Pages Linked "to and from" the Pages in the Initial Set S.

- HITS then iteratively updates the hub and authority weights of each page.

Let p →q denotes "page p has an hyperlink to page q"
HITS update the hubs and authorities as follows:

$$a(p) = \sum_{p\to q} h(q) \quad (2)$$

$$h(p) = \sum_{q\to p} a(q) \quad (3)$$

Authorities are calculated using equation (2) and hubs is calculated using equation (3).

HITS algorithm applies two main steps:

- A sampling component which constructs a focused collection of thousands web pages likely to be rich in authorities.
- A weights propagation component which determines the numerical estimates of hub and authority weights by an iterative procedure.

4. Results and Discussion

In our proposed system our main task is to generate a database in which we can retrieve the best place at that location to travel for the users. For this we create a database structure as shown:
First we have created a database for Registered Users in which we have taken following attributes: id, fname (First Name), lname (Last Name), gender, age, email, mobile_number, and password. Here 'id' attribute is the primary key which is used for retrieving the information of the registered users. This 'id' attribute assures us the uniqueness of the registered user (No duplicate users). Form this any new users can register himself to the system. The registered users can also update their profile.
Second, we have created a database for Location in which we have taken following attributes: place_id, place, country, state, city, place_details, place_pic, and create_data. Here 'place_id' is the primary key which is used to store places places at the desired location, here no places are repeated. From this users can find the best place to travel with his point of interest. In this the registered user can view the details of the place like photo of place, best time to visit the place, and type of place.
Third, we have created a database for User Feedback in which we have taken following attributes: feed_id, email, country, state, city, place, rating, place_type, visit_time_in, visit_time_out, visit_month, review, create_date, and modified_date. Here 'feed_id' is the primary key which is used to store the feedback of the visited place by the user. It contains user ratings and reviews of the place which was submitted by the users who have already visited that place. From these ratings the new user can find the best place to visit that location. We can do this by implementing "Page Rank Algorithm" and "Hyperlink-Induced Topic Search" (HITS) Algorithm.
Existing system recommends very less places as per user Point of Interest (POI), which fails to give all the information about the places. This problem of user (POI) is solved in the proposed system. First preference is given to user POI. Comparison between the existing system and the proposed system is shown in the form of bar chart in fig. 5. The system is able to identify the user POI because the places are divided according to its type like Trekking spots, amusement parks, water parks, forts, museums, rivers and dams, historical places, temples etc.

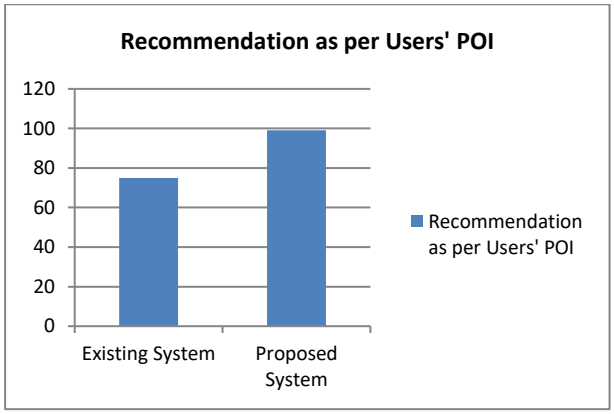

Fig. 5: Percentage of Recommendation as Per User Point of Interest.

The accuracy rate of information given by the existing system regarding the location is very low i.e. several existing system might have different information about the same place so it become faulty whereas the proposed system giver accurate details of the location. Comparison between the existing system and the proposed system is shown in the form of bar chart in fig. 6. Details of the location includes reviews of that location, its past history, nearby restaurants, hotels, hospitality facility, accommodation and the best route to travel these places and the facilities in less time and in the minimum cost.

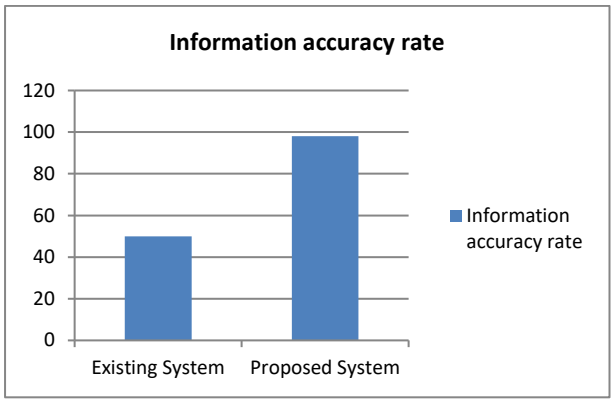

Fig. 6: Percentage of Information Accuracy Rate.

The sequence of path to visit different places given by the existing system may or may not be accurate but the sequence to places recommended by the proposed system is almost accurate. Comparison between the existing system and the proposed system is shown in the form of bar chart in fig. 7. This recommended sequence of path to travel different places of one location reduces wastage of time and money.

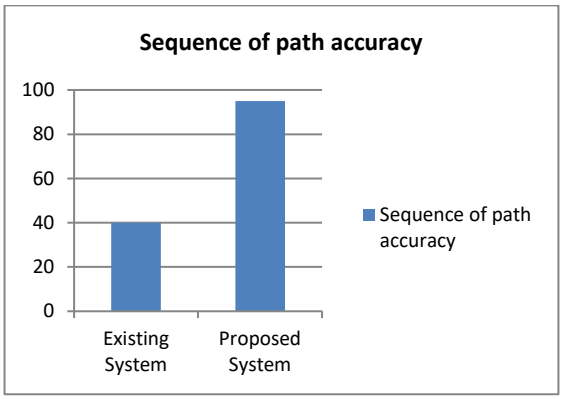

Fig. 7: Percentage of Accuracy Rate in Sequence of Path.

Result Window: Page Rank Algorithm is implemented and the user is able to visit the best places in that location.

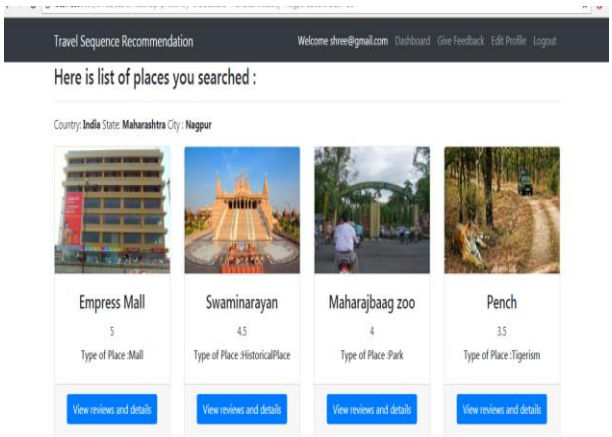

Fig. 8: Best Places to Visit at the User Desired Location.

Place Detail: HITS Algorithm is implemented for getting information about the place with reviews given by previously visited user.

Fig. 9: Details of the Selected Place.

5. Conclusion

In this paper, we propose Travel Sequence Recommendation System which suggests best places to visit according to the user's point of interest (POI). The users can also give their feedback in the form of ratings and reviews of the visited place. These user feedbacks are helpful for other users to select the best place for them to visit. Finally, our system is able to suggest the names of the places to visit at a particular location along with short description of the place and the best time to visit that place.

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