PERSONALIZED TRAVEL SEQUENCE RECOMMENDATION BASED ON AUTHOR TOPIC MATRIX MODELING ALGORITHM ON MULTISOURCE BIG DATA

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Abstract

Nowadays, tour planning is the challenging task because of various interest preferences and trip restrictions such as limitation of time, source and destination points for each tourist. The resources collected from the Internet and travel guides, normally recommend familiarized Point of Interest (POI). Such resources do not provide sufficient information to the users interest preference. Compared to the existing approaches, this approach is both personalized and also able to recommend a travel sequence. Topical package space is constructed which includes representative tags, the cost distributions, visiting time and visiting season of each topic. These resources are mined to bridge the vocabulary gap between user travel preference and travel routes. It utilizes two kinds of social media: travelogue and community-contributed photos. The textual descriptions of both user and routes are mapped to the topical package space to get user topical package model and route topical package model. First famous routes are ranked according to the similarity between user package and route package. Then top ranked routes are further optimized by social similar users travel records. An Author Topic Matrix Modeling Algorithm (ATMMA) is suggested for personalized tours which suggest that the POIs are optimized to the users' interest preferences and POI popularity.

Index Terms - Point of Interest, Topical package space, travelogue, community-contributed photos, Author Topic Matrix Modeling Algorithm

1. INTRODUCTION

All humans are different as far as the own interests and abilities are concerned. It's not like, that everybody likes painting or everyone is fond of dancing, but yes, many people have interests in common. The interests are according to what people like doing more, some people can analyze in a better way than others while others might just learn what they are supposed to learn as it is. In earlier days, while planning to go to a trip people used to ask their friends or family when they were not very much sure about what could be a better plan, but still it was not very satisfying method. So in this era of internet a better solution called Recommendation Systems is developed.

1.1 OVERVIEW OF THE PROJECT

Recommendation systems and adaptive systems have been introduced in travel applications to support the travelers in their decision-making processes. Large amount of data can be collected from the Internet and travel guides, but these resources normally recommend familiar personalized Point of Interest (POI). This approach is able to recommend a travel sequence rather than personalized Points of Interest (POIs).

had been already developed by many travel agencies. These recommendations focused on query conditions. However, such recommendation result usually become involve in package tourism advertisements and lack of flexibility and such recommender mechanism could not replicate important word-of-mouse effect about traveling experience. So this concluded that the recommender mechanism should be revised for TSA problem solving. Hence, this research proposed an Intelligence traveling recommender (ITR) system based on commonsense reasoning (CR) algorithm. Intelligence travelling recommender system included two reasoning processes, the first was general reasoning and the second was exception one.

1.1.1 Social Based Recommender System

A Tourist-Area-Season Topic (TAST) model was developed, which represents travel packages and tourists by different topic distributions, where the topic extraction was conditioned on both the tourists and the intrinsic features like locations, travel seasons of the landscapes. Furthermore, the TAST model was extended to the Tourist-Relation-Area- Season Topic (TRAST) model for capturing the latent relationships among the tourists in each travel group. Finally, the TAST model, the TRAST model, and the cocktail recommendation approach were evaluated on the real-world travel package data. The cocktail approach was much more effective because experimental results show that the TAST model could effectively capture the unique characteristics of the travel data. Also TRAST model could be used as an effective assessment for travel group information, by considering tourist relationships.

1.1.2 Based on Location Based Social Network

People share their locations on location based social networks and write their likings and disliking about those places there. By these data i.e. crowd source digital footprints, one could guess user preference to locations. A prototype system was developed which obtained users travel demands from mobile client and thus generated travel package containing multiple points of interest and their visiting sequence. This approach dissipated and improvement in accuracy and diversity according to the experimental results.

1.2 OBJECTIVES OF THE PROJECT

The main objective of this project is to provide both personalized and sequential travel route for the users based on their POI's.

The main contributions are:

- To give a personalized travel recommendation rather than a general recommendation.
- Automatically mine user's travel interest from user contributed photo collections including consumption capability, preferred time and season which is important to route planning and difficult to get directly.
- Ranking is performed based on the similarity between user package and route package, and top ranked famous routes are further optimized according to social similar users' travel records.
- Author topic matrix modeling algorithm (ATMMA) is used to learn user's and route's travel attributes.
- It bridges the gap of user interest and routes attributes.

Takes advantage of the complementary of two big social media to construct topical package space.

2. EXISTING SYSTEM

Mainly introduce three aspects of related works (1) travel recommendation on various big social media; (2) personalized travel recommendation; (3) travel sequence and travel package recommendation **Point of Interest Recommendation using Author Topic Collaborative Filtering (ATCF)**

In this approach, a study of latest POI recommendation drawback to predict the users' current cities is to be suggested. The challenge is tough to learn the user's ordered information and provide personalized recommendation model. This system collects the knowledge of the author and therefore the cities. Through ATM, both the category and the user's travel preferences are mined by modifying the latent model simultaneously. The ATM chiefly consists of two steps such as probabilistic generative model and Bayesian estimation model. Through ATM, the probabilities of every word to different topics are determined.

2.1 Drawbacks

- The existing studies related to travel sequence recommendation did not well consider the popularity and personalization of travel routes at the same time.
- It is far more difficult and time consuming for users to plan travel sequence than individual POIs.
- However, general travel route planning cannot well meet users' personal requirements.

Existing studies focused more on famous route mining but without automatically mining user travel interest.

3. PROPOSED SYSTEM

Automatic travel recommendation is an important problem in both research and industry. Big media, especially the flourish of social media offers great opportunities to address many challenging problems, for instance, GPS estimation and travel recommendation. Travelogue websites (e.g., www.igougo.com) offer rich descriptions about landmarks and traveling experience written by users. Furthermore, community-contributed photos with metadata like tags, date taken, latitude etc. on social media record users daily life and travel experience. These data are not only useful for reliable POIs (points of interest) mining, travel routes mining, but give an opportunity to recommend personalized travel POIs and routes based on user's interest.

In offline module, the topical package space is mined from social media combining travelogues and community contributed photos. Four travel distributions (i.e., topical interest, time, season and cost) of each topic are described in topical package space. It take the advantage of the complementation of the two social media. For example, the "date taken" of Flickr may be error with the influence of time difference. Sometimes observe in community- contributed photo the "date taken" of night scene is daytime. But the time descriptions of POIs of travelogues do not have time difference problem. In offline module, mine POIs and famous routes from community contributed photos, and obtain routes' packages through mapping travelogues, which are related to these routes, to the topical package space.

Online module focuses on mining user package and recommending personalized POI sequence based on user package. First, tags of user's photo set are mapped to topical package space to get user's topical interest distribution. It is difficult to get user's consumption capability directly from the textual descriptions of photos. But the topics user interested in could somehow reflect these attributes. For example, if a user usually takes part in luxurious activities like Golf and Spas,

he is more likely to be rich. Combine user topical interest and the cost, time, season distribution of each topic to mine user's consumption capability, preferred visiting time and season. After user package mining, rank famous routes through measuring user package and routes package. At last, optimize the top ranked routes through social similar users' travel records in this city. Social similar users are measured by the similarity of user packages.

3.1 Advantages

- The system automatically mines user's and routes' travel topical preferences including the topical interest, cost, time and season.
- Recommends not only POIs but also travel sequence, considering both the popularity and user's travel preferences at the same time.

4. SYSTEM METHODOLOGY

The project proposes a Topical Package Model (TPM) learning method to automatically mine user travel interest from two social media, community-contributed photos and travelogues. The system considers not only user's topical interest but also the consumption capability and preference of visiting time and season. As it is difficult to directly measure the similarity between user and route, a topical package space is build, and map both user's and route's textual descriptions to the topical package space to get user topical package model (user package) and route topical package model (route package) under topical package space.

4.1 Topical Package Model (TPM) learning method

The proposed system is a personalized POI sequence recommendation system which could automatically mine user's travel attributes such as topical interest, consumption capability, preferred time and season. The terms used are:

- Topical package space,
- User package and
- Route package

4.1.1 Topic package space

It is a kind of space in which the four travel distributions of each topic are described by (1) representative tags mined from travelogues which describe POIs within the same topic; (2) the average consumer expenditure of the POIs within this topic, which are also mined from travelogues; (3) distribution of the visiting season of the twelve months mined by the "date taken" attached with the community-contributed photos; (4) distribution of visiting time during the day from travelogues. The usage of topic package space is to bridge the gap between user interest and the attribute of routes.

4.1.2 User topical package model (user package)

User package is learnt from mapping the tags of user's photos to topical package space. It contains user topical interest distribution, user consumption capability, preferred travel time distribution and preferred travel season distribution.

4.1.3 Route topical package model (route package)

Route package is learnt from mapping the travelogues related to the POIs on the route to topical package space. It contains route topical interest, route's cost distribution, route's time distribution and season distribution. To save the online computing time, the travel routes and the attributes of the routes are mined offline. After mining POIs, to construct travel routes, the spatio-temporal structure of the POIs are analyzed among travelers' records. First, the users who only upload few photos or only take photos at one POI are removed. Second, to each user, the spatio-temporal structure of the POIs is constructed according to the "data taken". POI with the earlier timestamp is

defined as the "in" and the POI with a later timestamp, on the contrary, is defined as "out". Then the number of "in" and "out" times is counted from POI to others by the records of all the users after filtering. A greedy algorithm is then applied to find the time sequence of these POIs. Thus, the famous route mining is finished and famous routes of each city are obtained.

5. SYSTEM ARCHITECTURE

The existing systems did not consider the attributes like consumption capability. focused more on famous route mining but without automatically mining user travel interest. The route recommendation is done with the help of
Author Topic Matrix Modelling Algorithm (ATMMA) to automatically mine user travel interest from two social media, community-contributed photos and travelogues.

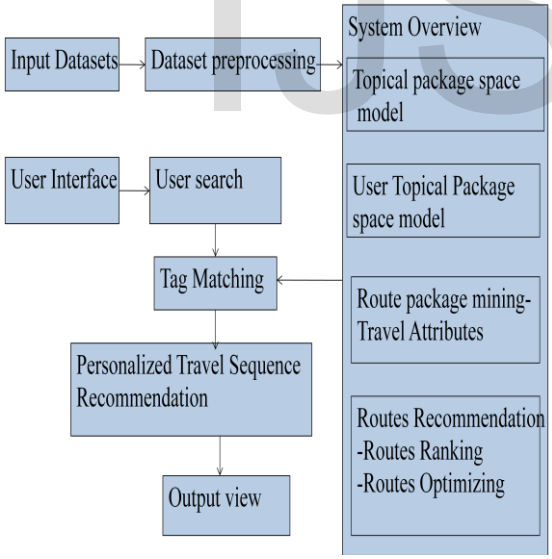

Fig. 1. System Architecture

5.1 Dataset Pre-processing

Data preprocessing describes any type of processing performed on raw data to prepare it for another processing procedure. Commonly used as a preliminary data mining practice, data preprocessing transforms the data into a format that will be more easily and effectively processed for the purpose of the user. The dataset consists of travelogues and community contributed photos.

5.2 User Topical Package Space Model User Topical Interest Mining Method

This module illustrates user topical interest mining method. Map the textual description (tags) of user's community photos to the topical package space to present the user's travel preference of different topics, which is defined as user topical interest distribution. Assume that if a user's tags appear frequently in one topic and less in others, the user has a higher interest towards this topic.

Cost, Time and Season Distribution Mining

The easiest way to obtain the time preference seems to analyze the "date taken" of the photo.

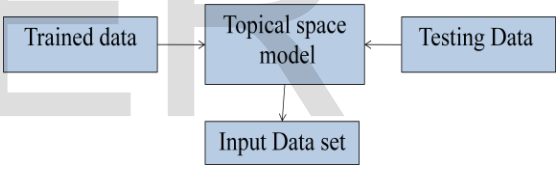

Fig. 2. User Topical Package Space Construction

5.3 Route Topical Package Model Route Mining

To save the online computing time, travel routes and the attribute of the routes are mined offline. After mining POIs, to construct travel routes, the spatio temporal structure of the POIs among travelers' records is analyzed .

Route Package Mining

It describes routes topical package model mining. Mine POI's package including POI topical interest distribution, POI cost distribution, time distribution and season distribution. Then to each route, compute average for all the POIs on the route to get route topical package model.

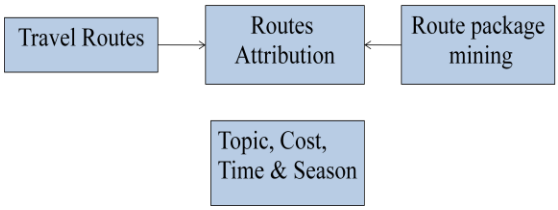

Fig. 3. Route Topical Package Space Construction

5.4 Personalized Travel Sequence Recommendation

After mining user package and route package, travel routes recommendation module is introduced. It contains two main steps: (1) routes ranking according to the similarity between user package and routes packages, and (2) route optimizing according to similar social users' records.

5.5 Routes Recommendation

Module Routes Ranking

Assume R = {r1; r2; :::; rn} is a set of n travel routes mined offline. Rank these routes according to the similarity between user package and routes packages.

Route Optimizing

After POI and route ranking module, a set of ranked routes ^R are determined. Further describe the optimization of top ranked routes according to social similar users' travel records. Firstly, introduce how to mine social similar users and their travel records. Then, the roads are optimized by social users' travel records.

6. CONCLUSION

ATMMA approach proposes a personalized travel sequence recommendation system by learning topical package model from big multi-source social media: travelogues and community-contributed photos. The advantages of this project are 1) The system automatically mines user's and routes' travel topical preferences including the topical interest, cost, time and season,

2) Recommends not only POIs but also travel sequence, considering both the popularity and user's travel preferences at the same time. The famous routes are mined and ranked based on the similarity between user package and route package and then optimize the top ranked famous routes according to social similar users' travel records.

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