ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 1, Issue 9, December 2014

Travel Recommendation by Mining Geo-Tagged Photos Using Internal Search Path Algorithm

Hari Baaskar.R
(Assistant professor)
Narasu's Sarathy Institute of Technology
Salem, Tamilnadu, India.
hari191986@gmail.com

S.Monika, B.Divya Bharathi, M.Kave Priadarsni, R.Bagath Singh
(students)
Narasu's Sarathy Institute of Technology
Salem, Tamilnadu, India.
smonikacse@gmail.com

Abstract—Planning route for the travel is an important step for a tourist to prepare his/her trip .As a main scenario, a tourist may have the following questions: 1)Are there any travel route plan for an unfamiliar place that I need to visit? 2) What will be popular path for the destination? 3) What are the places that I need to visit in the path? 4) Suggestion regarding the hotels and seasons? To facilitate a travel plan, in this paper, we concentrated on solving the problem of automatic travel route planning. Based on the information discovered from geo-tagged photos, we provide a better trip plan for the tourist, i.e., the popular destinations to visit, suggestion about the weather conditions, typical travel path, details of hotels in an interactive manner to guide the user of the system. A tagging option enables the user to tag the photos of the places that they have visited and this may be a rich source of data for the tourist to know about the places.

Keywords
Web Mining, Geo-Tagged photos, Trip Planning, Travel Route Mining

1. Introduction

Web is a collection of formatted documents. The World Wide Web has become one of the largest virtual space that is huge and complex which serves millions of users all over the world. As the documents that are linked via internet are very much noisy, it is difficult to find the relevant information from it. It is not enough to manage the information on the Internet.

In this aspect, Web mining gives a direction for gathering and analyzing the information on the Internet, which is formally explosive and unstructured.

The tourism has made travel increasingly popular in people's everyday life. Before travelling to an unfamiliar location, most of the people have their queries about how to plan their trips. For example:

-"I am going to visit the Forbidden City in Kerala. Who can offer me a route for that large place?"

In such cases the users prefer to search for relevant travel guide or they may ask questions in the web-based communities and this process is generally not efficient and the results are not customized. The general way for those users to find answers for their trip plan is to read some travelogues. These travelogues are only the records of individual footprints during a trip; it is very time-consuming for

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 1, Issue 9, December 2014

users to manually summarize a lot of travelogues to find a proper travel route for their preferred location. Moreover, the information in the travelogues are unstructured and they may vary from person to person, in languages and it is very hard for the users to follow.

In this case, an automatic travel route planning service would construct a customized trip plan.

Most of the previous studies that focused on recommendations have planned an automatic trip plan by mining the people attribute and the travel group types [1]. By analyzing the frequent trip patterns the route suggestion are made in some systems [2].In some systems [3] the travel route plan is made using the technique of GPS Trajectories, but they are not simpler to use in the real time system.[4,5,6,7] mainly focuses on the landmark recognition, scene visualization and recommendation.

In general, a simple trip plan suggestion is enough for the tourists to find their path. So, here we are providing an effective trip plan by mining the geo-tagged photo's information. Based on the information discovered from the geo-tagged photos, we can provide a customized trip plan for a tourist, i.e., the popular destination to visit, the suggestion about the weather conditions, typical travel path, details of hotels in an interactive manner to guide the user of the system. A tagging option enables the users to tag the photos of the places that they have visited and this may be a rich source of data for the forth coming tourists to know about the places.

Moreover the previous system provides only little suggestion about the trip plan. Here we are embedding all the suggestions i.e., the popular destination to visit, the suggestion about the weather conditions, the typical travel path, details of hotels etc.

The system holds the following modules,

- **Data collection and Extraction(Travel Route Mining)**
  Discovering worldwide destination is the first and major thing that we need to do for the travel route plan. To achieve this, the geo-tagged photos of a particular country or a place have to be collected.
  Here we are collecting these geo-tagged photos from the photos log site Panoramio.After the collection of those photos we need to extract the information from those photos, for which some effective techniques and tools are used. This collection of information from the photos will provide an effective travel route plan to the destination.
- **Internal Search Path Discovering(Trip Planning)**
  In order to discover the popular path to the destination (called internal paths) we are using the algorithm known as the Internal Search Path Algorithm. This constructs a complete path from an incomplete path to the destination. This gives the path to the destination and the suggestion regarding the popular places to visit.
- **Tagging of Photos**
  Tagging of photos would enable the users of the system to upload the photos of the places that they have visited. If a new user enters the system or if a user needs to know about a place then they can easily know the details by viewing this page. The uploaded photos are the rich source of information for the users to choose the trip places of their preference.

Geo-tagged photos are the good source of information to solve the travel route planning problem. The following sections brief about the web mining, its types, related works, data collection, extraction, path discovery and tagging photos.

2 .Web Mining

Web Mining aims to discover knowledge and relevant information from the Web hyperlink structure, page content and usage log. Web Mining is an application of data mining technique to extract knowledge from web data.

3. Web Mining Types

Web mining is classified into three major types such as,

1) Web Usage Mining
2) Web Structure Mining
3) Web Content Mining

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 1, Issue 9, December 2014

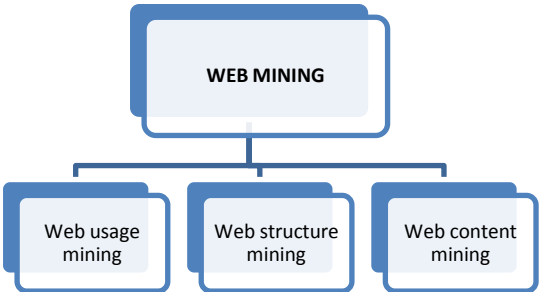


Figure 1: Types of Web Mining

a. Web Content Mining

Web Content Mining aims to discover knowledge from the content of web such as the multimedia documents that incorporates text, image, video and audio.

b. Web Usage mining

Web Usage mining has been defined as an application of data mining technique to discover usage patterns from web data in order to understand and better serve the needs of web based applications.

Preprocessing- The data present in the web is noisy and incomplete. In preprocessing, the data is treated as per the requirements. It includes data cleaning, integration and transformation.

Pattern discovery-In order to identify the patterns, different methods and algorithms such as pattern recognition, machine learning, and statistics are applied.

Pattern analysis-It is used to visualize and make interpretation to the generated patterns.

c. Web Structure Mining

It is the process of inferring knowledge from the Organizations and links on the Web. It works on the hyperlink structure of the web. The graph structure provides information about the search results of the page. It is the process of discovering the structured information from the web.

4. Trip plan under Content Mining

Our proposed work comes under the Web Content Mining. Generally Web Content Mining is the process of extracting useful information from the content of web documents such as text, audio, video, and image. Here we are extracting information from the geo-tagged photos for generating the route for the tourist. Thus the process of content mining is involved here.

5. Related Work

Little Existing work targets to solve the problem of automatic trip planning. Although [8] and [9] proposed to generate a tour guide from blogs, they did not consider the user manual tagging options and the suggestion about the weather conditions for the users.

Some work provides landmark mining using the generated text or photos [10] mined city landmarks from blogs. [12] Adopts people attribute detection and group type prediction on the generated photo trips.

We also distinguish our work from the existing ones on trajectory mining [11, 3] in which the GPS trajectory data was used.

However, GPS trajectory data is difficult to obtain and moreover it is not readily available. So in this case, geo-tagged photos are a good source of data for generating this automatic travel route plan. Thus, now a days there is an increasing tendency for obtaining information from the geo-tagged photos.

6. System Model

6.1 Framework Overview

The proposed framework for the trip plan route mining is illustrated in Figure.2

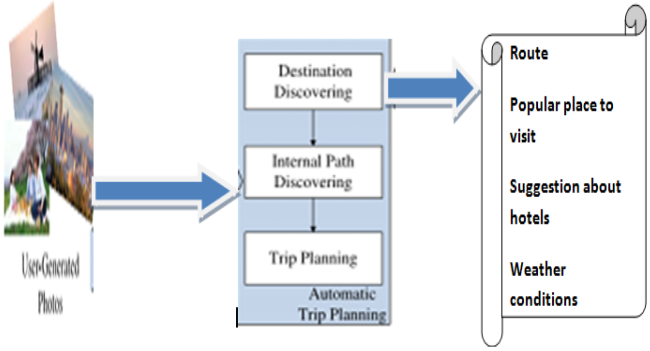


Figure 2: Framework overview

The Basic inputs of our framework are the source and the destination that a user needs to visit. First the user generated photos which are also known as the geo-tagged photos are extracted from the photo log websites like Panoramio. These photos will give the rich content of information about a particular place and furthermore, by using this information the route plan is generated by using the Internal Search path algorithm. The destination is discovered first and then the route is

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 1, Issue 9, December 2014

displayed from the source to the destination. Along with this, the details of the hotels and the weather conditions are also suggested. The popular places to be visited by the user are also generated. An Interesting option is the Tagging of photos, which enables the users to tag photos and their suggestion about a particular place .This may be very useful for the new user to know about the places.

6.2 Data collection and Extraction (Travel Route Mining)

This is the first module where the required datasets are collected and extracted to find the destination. A Route is different from a path,which is regarded as a footprint to the destination; A route represents a sequence of destinations. The travel route with travel path, popular destination to visit, suggestion about hotels, weather conditions provides a brief trip plan for tourists.

In order to generate travel routes for the source to destination, our system first discovers the photos along the path crawled from the photo log website Panoramio. Then by using some clustering algorithms, we need to cluster the route containing the photos that are scattered nearby.

Figure 3: Motivation illustration for the Internal Search Path Discovering Algorithm. Here both Person A and B walked from the front gate to back gate of Forbidden City, both of them only uploaded and shared five photos onto Web.

This is how the information is gathered from the photos that are scattered along the route. We have a detailed description of how the path is searched and merged using the algorithm.

6.3 Internal Search Path Discovering (Trip planning)

6.3.1 Motivation

In real situation, a user takes photos at discrete positions along his/her path, from this only smaller part might be uploaded to the photo log websites. Thus an incomplete footprint arises here. See Fig. 3 for an illustration. Although both Person A and B walked from the front gate to back gate of the Forbidden City, both of them have uploaded only five photos. Thus, we cannot receive their complete walking paths by only using the geo-tagged photos. So we are going for the upcoming algorithm.

6.3.2 ALGORITHM:

Internal Search Path Discovering Algorithm

Input: N fragments *{f1; : : : ; fN}*, in which each fragment

Contains N_i geo-tagged images: $I^f_{1\,i,\ldots,}I^f_{i\,Ni}$

1: Initialize the path collection: $R = \$$

2: for i=1 to *N* do

3: Initialize merged path: $f' = fi$

4: for $j \in \{1,2,....N\} \setminus \{i\}$

5: f' = Merged (f', fj) (see Fragment Merged Part)

6: end for

7: if the number od photos in $f' > 5$

8: $R = R \cup \{f'\}$

9: end if

10: end for

11: return candidate path set *R*

The Fig.4 represents how the individual fragments are merged to form a typical path.

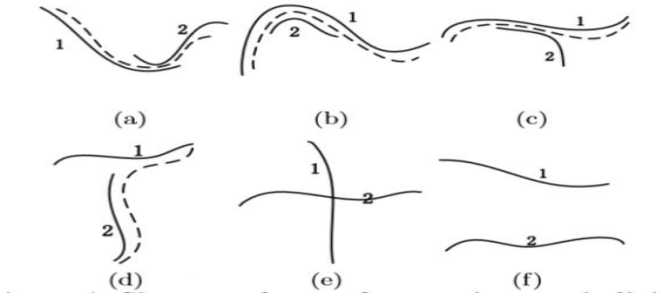


Figure 4: Various paths

Figure 4: Six general cases for merging two individual fragments, where fragments in (a),(b),(c) and (d) are excepted to be merged as corresponding dotted lines, while those in (e) and (f) should not be merged.

6.3.3 Fragment Merging

For this we should answer a couple of questions as: 1) how to decide whether two fragments could be

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 1, Issue 9, December 2014

merged together, 2) how to merge two fragments. Six general studies are made in the Fig.4, where the fragments in (a)-(d) are accepted to be merged. The dotted lines indicate the possible merging results. (e) Is not accepted to be merged as the direction of the two fragments is disagreed with one another. In (f), the distance between the two fragments is too large to be considered as on the same path. The distance of two fragments is defined as the distance of the closest photo pairs, denoted as on the Anchor Photos, as shown in Fig.5.

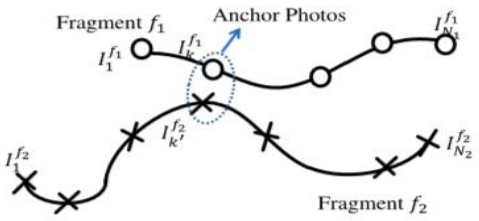


Figure 5: Merging two fragments f1 and f2.Photos on the fragments are in the chronological order. There are six ways to merge the two fragments, from which, we will select one path.

The further details like the suggestion about the hotels and weather conditions are given to user of the system.

The Weather conditions are given as the daily weather report and the user is suggested to visit the places in some other seasons if the required season is not good.

The links are provided for the hotels that are along the path using Google map contact extractor.

6.4 Tagging of Photos

Tagging of photos would enable the user of the system to upload photos of the places that they have visited. If a new user enters the system or if a user needs to know about a particular place then can easily know the details by viewing this page. The tagging here means uploading of photos. The uploaded photos are the rich data source of information for the user to choose the trip places of their preference. It is given in the Fig.8.

7. Numerical Results

7.1 Datasets

We collected much information about the geo-tagged photos. We particularly concentrate in the region Kerala where we took two places as the source and the destination. The data is collected from the website Panoramio(http://www.panoramio.com/),where the additional information such as the time taken and the photographer ID were also collected.

7.2 Internal Search Path Discovering

We have evaluated the Algorithm as per the [13] procedure. The efficiency of the algorithm has been improved and it gives more efficient path to the users.

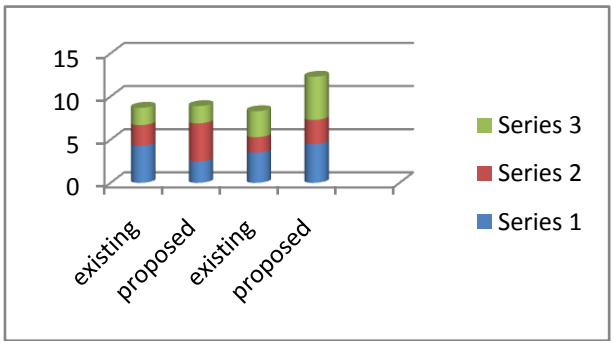


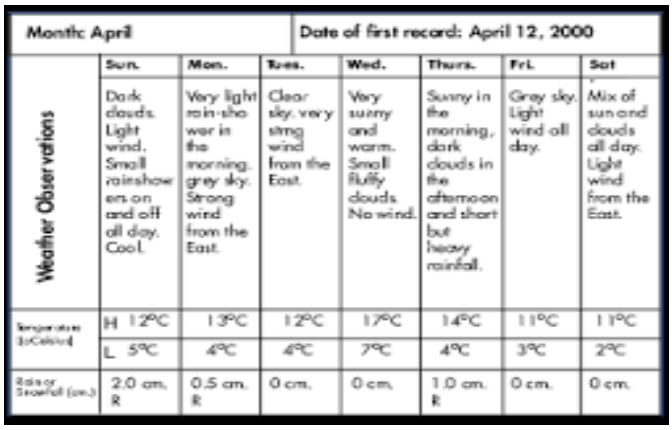
Figure 5: Efficiency Improvement

The Improvement in the efficiency than the existing system has been given clearly in the chart. In all the series, the proposed system has been improved. Besides the superiority for discovering website recommended path, compared with the original fragments, this algorithm finds a more diverse path.

7.3 Other details for Trip

The Suggestion about the Weather Conditions is given to the user generally (it will be cold, very cold, dry.etc,) this can be done using the many Weather extractors. The Web Scraping is used here for extracting the Weather details.

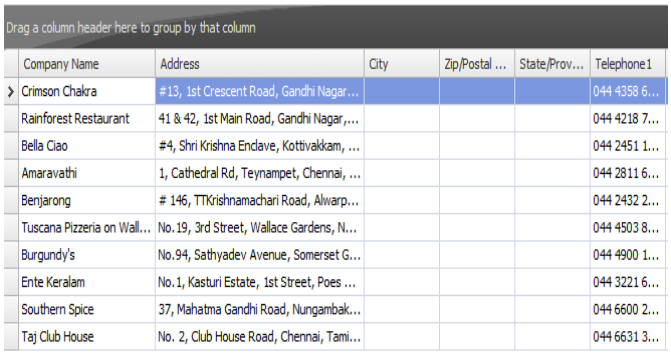
ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 1, Issue 9, December 2014



Month: April			Date of first record: April 12, 2000				
Weather Observations	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat
	Dark clouds. Light wind. Small rainshowers on and off all day. Cool.	Very light rain-shower in the morning. grey sky. Strong wind from the East.	Clear sky. very strng wind from the East.	Very sunny and warm. Small fluffy clouds. No wind.	Sunny in the morning, dark clouds in the afternoon and short but heavy rainfall.	Grey sky. Light wind all day.	Mix of sun and clouds all day. Light wind from the East.
	H 12°C	13°C	12°C	17°C	14°C	11°C	11°C
	L 5°C	4°C	4°C	7°C	4°C	3°C	2°C
	2.0 cm. R	0.5 cm. R	0 cm.	0 cm.	1.0 cm. R	0 cm.	0 cm.

Figure 6: Weather Extraction

In order to give the links for the hotels, the Google Maps Contact information with our data extractor is used. We can get the information directly from the extractor about the hotel links. A typical example for the extraction for the hotels in the Kerala is given in Fig.7.



Drag a column header here to group by that column

Company Name	Address	City	Zip/Postal ...	State/Prov...	Telephone1
Crimson Chakra	#13, 1st Crescent Road, Gandhi Nagar...				044 4358 6...
Rainforest Restaurant	41 & 42, 1st Main Road, Gandhi Nagar,...				044 4218 7...
Bella Ciao	#4, Shri Krishna Enclave, Kottivakkam, ...				044 2451 1...
Amaravathi	1, Cathedral Rd, Teynampet, Chennai, ...				044 2811 6...
Benjarong	# 146, TTKrishnamachari Road, Alwarp...				044 2432 2...
Tuscana Pizzeria on Wall...	No.19, 3rd Street, Wallace Gardens, N...				044 4503 8...
Burgundy's	No.94, Sathyadev Avenue, Somerset G...				044 4900 1...
Ente Keralam	No.1, Kasturi Estate, 1st Street, Poes ...				044 3221 6...
Southern Spice	37, Mahatma Gandhi Road, Nungambak...				044 6600 2...
Taj Club House	No. 2, Club House Road, Chennai, Tami...				044 6631 3...

Figure 7: Details of the hotels in the Kerala region has been extracted using Google maps Extractor and is provided to the user to know about the details of the hotels in their path.

7.4 Tagging of Photos

The tagged photos are the source of data for the users to know about the particular place. If the photos are tagged along the map it will be difficult for the user to know about the place. Thus here we are providing a easy way of uploading the photos and the user can give some details about the places they have visited. This will be helpful for the new users to know about the unknown places. A Typical example for the uploading of photos is given in Fig.8.

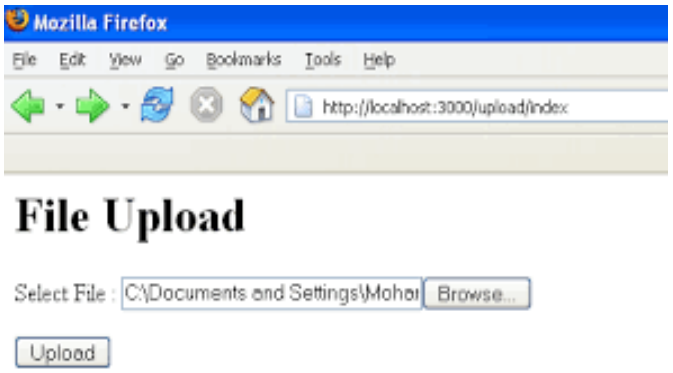


Figure 8: Uploading of Photos

8. Conclusion

In this paper we have given a novel Automatic travel route plan by mining the geo-tagged photos on the web and by using the Internal Search Path Discovering algorithm. We have also discussed about the web mining and its types.

In the experiments, we have built a trip database on the region of Kerala as a case study.

The effective travel route plan is given to find the popular destination to visit, the typical travel path, weather conditions, and suggestion about the hotels.

As the future work, we plan to apply this concept to many other areas across the world and to extend the system for providing the travel route plan for the tourists and we have planned to convert the whole system into an android app that fits into the mobile phone for making our system more handy to the users during the travel time.

9. References

[1] Yan-Ying Chen,An-Jung Cheng,and Winston H.Hsu, **"Travel Recommendation by Mining People Attributes and Travel Group Types From Community-Contributed Photos"**

[2]Yuki Arase,Xing Xie Takahiro Hara,Shojiro Nishio, **"Mining People's Trip from Large Scale Geo-Tagged Photos"**

[3]Yu Zheng,Lizhu Zhang,Xing Xie,Wei-Ying Ma, **"Mining Interesting Locations and Travel Sequences from GPS Trajectories"**

ISSN: 2348 9510
International Journal Of Core Engineering & Management (IJCEM)
Volume 1, Issue 9, December 2014

[4]D.J.Crandall,et al. **"Mapping the World's Photos"**

[5]L.Kennedy and N.Naaman**, "Generating Diverse and Representative Image Search results for Landmarks"**

[6]Q.Hao and R.Cai,et al.**"Generating Location Overviews with Images and Tags by Mining User-Generated Travelogues"**

[7]Y.T.Zheng,et al. **"Tour the World:Building a Web-Scale Landmark Recognition Engine "**

[8]H.Kori,et al. **"Automatic Generation of Multimedia Tour Guide from Local Blogs"**

[9]T.Kurashima,et al. **"Mining and Visulizing Local Experiences from Blog Entries"**

[10]R.Ji,et al. **"Mining City Landmarks from Blogs by Graph Modeling"**

[11]Y.Zheng,L.Zhang,X.Xie, and W.Ma.**"Mining Interesting Locations and Travel Sequences from GPS Trajectories"**

[12]Y.Zheng and X.Xie,**"Learning travel recommendation from user-generated GPS traces"**

[13]Xin Lu,Changhu Wang,Jiang-Ming Yang,Yanwei Pang,Lei Zhang, **"Photo2Trip: Generating travel Routes from Geo-Tagged Photos for Trip Planning"**