GoTogether: A Tourism Recommender System Based on Social Network and Real-time Weather Information

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Abstract

Planning an itinerary is a cumbersome procedure. Tourism recommender systems pop up recommending users tourist attractions in their preference. We propose a system integrated with the social network, called *GoTogether*, aiming to provide users and their friends with the touring information according to the geometric and their common interests, but also combined with the real-time weather forecast. Due to the different types of information, efficient data storage and extraction is one of the challenges. On the other hand, the design of the cross-database recommendation procedure is another issue. As the following, we will focus on the database build-ups and system integration.

1 Introduction

Tourism recommender systems are built for providing users with the sightseeing spots' information based upon their touring interests and the geometry information. On the other hand, online social networks (OSN) nowadays are popular platforms for people to share with friends their interests, lives, and knowledge, etc.[1] In our work, we propose a tourism recommender system based on a social network to enhance the connection between friends without much time.

According to the friendships with the same hobbies in tourism, our system retrieves those friends' information. With the additional location information users specify, we extract the corresponding tourism information from our database and real-time recommend users and their friends the spots that they might prefer to travel. Besides, the weekly weather information is also provided not only as a notification message, such as high Ultraviolet Index (UVI), but also for users references whether to engage in the outdoor activities.

2 Prior work

Most of the existing works of tourism recommender systems take advantage of social networks to enhance personalized recommendations. Social networks may contain information about user preferences and metadata of items to recommend. For example, Flickr is an image hosting service that allows users to store, search and share photos. Each photo contains metadata such as location, time, attraction and UserID. User preferences can be captured from their historical posts. Another

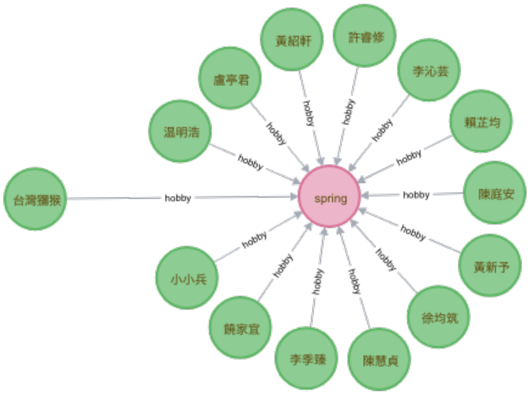


Figure 1: Social graph of the Formosan macaque.

example is Foursquare, a local search-and-discovery service mobile app recommend places to go to near a user's current location based on users' previous browsing history, purchases, or check-in history. [1]

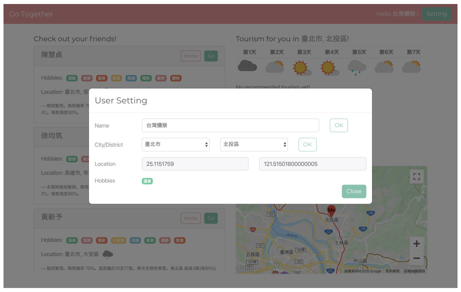
The main difference between our work and prior work is that our recommender system is designed for multiple users to take a trip together. Since an itinerary composed of places corresponding to common interests between people usually leads to a high-quality trip, we build the social network which explicitly records the hobbies of users. As a result, we do not need to analyze the user preferences from their historical traveling data to make effective recommendations.

3 System Design

3.1 Graph Database

To efficiently build up the social graph and extract the specific relationship from it, we adopt Neo4j Graph Database. We designed a questionnaire first to collect friends with their hobbies. Second, the friends were linked through the common hobbies. As soon as a user logs in, the friends in common hobbies are retrieved from the graph database automatically and the relevant information is also shown on our system interface.

For example, as shown in Fig.1, a Formosan macaque likes to go to a hot spring. The information of his friends who also like to go to a hot spring will be retrieved and shown immediately after he logs into *GoTogether*. (See Fig.2 and Fig.3)



Check out your friends!

Tourism for you in 臺北市, 北投區!

No recommended tourism yet!

陳慧貞

徐均筑

黃新予

Location: 臺北市, 大安區

User Setting

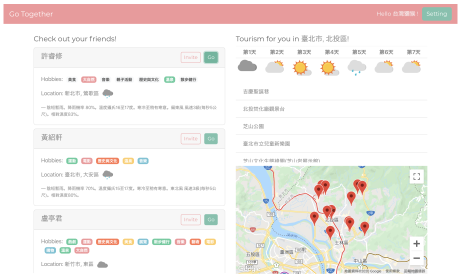
Name 台灣獼猴

City/District 臺北市 北投區

Location 25.1151759 121.51501800000005

Hobbies 溫泉

Figure 2: Login screenshot.



Check out your friends!

許睿修

Hobbies: 美食 大自然 音樂 親子活動 歷史與文化 溫泉 散步健行

Location: 新北市, 鶯歌區

— 陰短暫雨。降雨機率 80%。溫度攝氏16至17度。寒冷至稍有寒意。偏東風 風速3級(每秒5公尺)。相對濕度83%。

黃紹軒

Hobbies: 運動 電影 歷史與文化 溫泉 音樂

Location: 臺北市, 大安區

— 陰短暫雨。降雨機率 70%。溫度攝氏15至17度。寒冷至稍有寒意。東北風 風速3級(每秒5公尺)。相對濕度80%。

盧亭君

Hobbies: 戲劇 運動 歷史與文化 美食 展覽 散步健行 音樂 藝術 電影 購物 溫泉 大自然

Location: 新竹市, 東區

Tourism for you in 臺北市, 北投區!

吉慶聖誕巷

北投焚化廠觀景台

芝山公園

臺北市立兒童新樂園

芝山文化生態綠園(芝山岩展示館)

Figure 3: Friends list screenshot.

3.2 Relational Database

Tourism information and real-time weather information are stored in the relational database. We use MySQL 8.0 as our database. Tourism information is regularly crawled from Government Open Information Website (`https://data.gov.tw/`), Open Data Services of Ministry of Culture (https://opendata.culture.tw/), and GIS Tourism Database of Tourism Bureau (https://gis.taiwan.net.tw/Search.aspx). Appropriate spots and activities are organized and sorted based on location. The attributes we keep in the database are title, classification, geometry information, activity date, and description. The title is concise for the user to simply understand the spot or activity contents. Other detailed information is put into description. All spots and activities are classified and the classifications are corresponding to friends' hobbies. We will recommend the appropriate spots and activities to users according to their common hobbies with their friends. Geometry information includes address, latitude, and longitude. They are stored by spatial data type so that we can calculate distance when recommending. Spots and activities are different from timeliness. Activities are limited by a specific time. As a result, we will use the time when users log in as a filter to remove the expired activities.

Real-time weather information is a kind of time-series data. To provide instant information, we collect data from Open Weather Data Website (https://opendata.cwb.gov.tw/) on a daily basis. Not only numerical data such as temperature, UV index, humidity, but also the corresponding description we keep in our weather database. The real-time weather data are sorted as city, latitude, and longitude. Users can see the local weather information where his friends located at. Besides, the next seven days' weather forecasts at the place user is interested in will be shown by cartoon images. Using the weather information as a reference, the user can arrange the appropriate indoor or outdoor activities in their travel schedule.

3.3 Recommender System

We build a recommender system to recommend spots to the users by three conditions: friends, hobbies and location. First, when the users log in to our system, their friends can be found by searching for people who have at least one common hobby with them. The users are able to choose one of their friends to travel together. Second, the users' friend may have some hobbies which the users potentially interest in. It is a good opportunity for users to develop new hobbies and strengthen the bonds of friendship between them and their friends. Therefore, our system filters the spots related to these hobbies from the database. Third, given a location where the users want to travel to, our system only recommends the spots near the location. We rank spots by their distance to the location. The distance between the location and the spot is calculated by MySQL spatial convenience function — ST_distance_sphere(). Besides, we provide the weather information of the location in a week. Maybe the users would like indoor spots on a rainy day and outdoor spots on a sunny day. Finally, the users are capable to invite their friends to have a tour together based on recommended spots and weather information.

3.4 Google Map API

3.4.1 Place Service

We embedded Google Map API on our website to present the geometry information in our database. The output of the recommendation system, the recommended spots, will be presented as markers on the map. (See Fig.4) And by clicking the marker, the detailed information will be shown as an information card. In addition to the origin place information, we added extra information by query from google map places service, including rating and photograph. (See Fig.5)

3.4.2 Customized user location

The default user location on the map will be the location data stored in the graph database. The origin data was formatted as city and district, and we encoded the location data to latitude and longitude by Geocoding API, in order to show on the map. Users can change their location by selecting on the user setting page.(See Fig.6) User can also click or drag the user icon on the map directly to change location, and we will encode the latitude and longitude information to formatted address by Geocoding API, and then update the user city and district shown on the website.

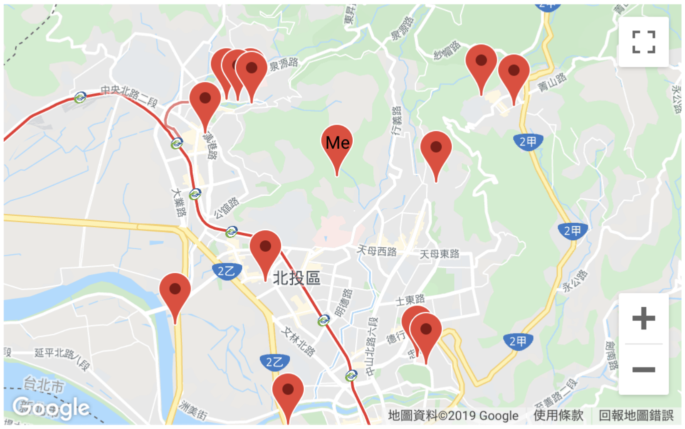
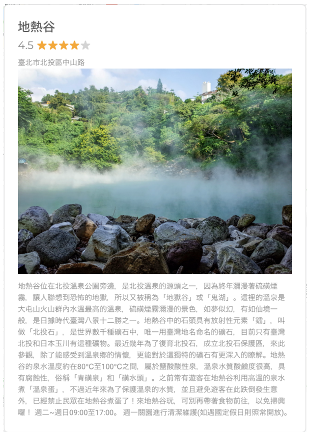


Figure 4: Embedded google map and markers.



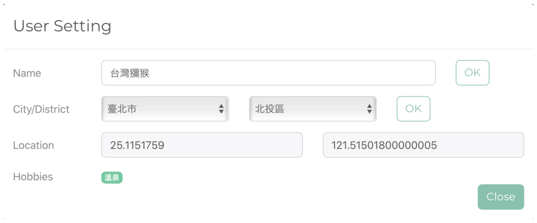
地熱谷

4.5 ★★★★☆

臺北市北投區中山路

地熱谷位在北投溫泉公園旁邊，是北投溫泉的源頭之一，因為終年瀰漫著硫磺煙霧，讓人聯想到恐怖的地獄，所以又被稱為「地獄谷」或「鬼湖」。這裡的溫泉是大屯山火山群內水溫最高的溫泉，硫磺煙霧瀰漫的景色，如夢似幻，有如仙境一般，是日據時代臺灣八景十二勝之一。地熱谷中的石頭具有放射性元素「鐳」，叫做「北投石」，是世界數千種礦石中，唯一用臺灣地名命名的礦石，目前只有臺灣北投和日本玉川有這種礦物。最近幾年為了復育北投石，成立北投石保護區，來此參觀，除了能感受到溫泉鄉的情懷，更能對於這獨特的礦石有更深入的瞭解。地熱谷的泉水溫度約在80°C至100°C之間，屬於鹽酸酸性泉，溫泉水質酸鹼度很高，具有腐蝕性，俗稱「青磺泉」和「磺水頭」。之前常有遊客在地熱谷利用高溫的泉水煮「溫泉蛋」，不過近年來為了保護溫泉的水質，並且避免遊客在此跌倒發生意外，已經禁止民眾在地熱谷煮蛋了！來地熱谷玩，可別再帶著食物前往，以免掃興囉！ 週二~週日09:00至17:00。 週一關園進行清潔維護(如遇國定假日則照常開放)。

Figure 5: Information Card.



User Setting

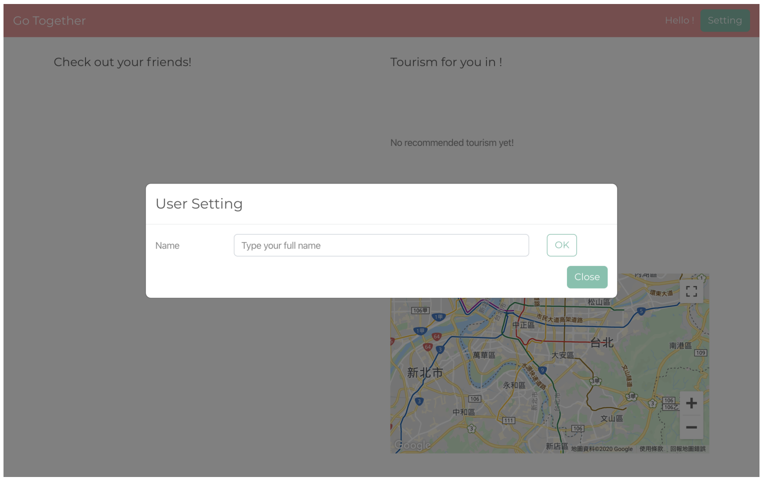
Name	台灣獼猴		OK
City/District	臺北市	北投區	OK
Location	25.1151759	121.51501800000005	
Hobbies	溫泉		

Figure 6: User setting.

4 Result Demo

We built our system with *Node.js* and *React*. We connected to MySQL engine and Neo4j in our backend server and returned data to the request from the frontend website. The main functions will be demonstrated below.

1. Login (See Fig.7 and Fig.8)
   Enter the user's name which is in our social graph.



Go Together

Check out your friends!

Tourism for you in !

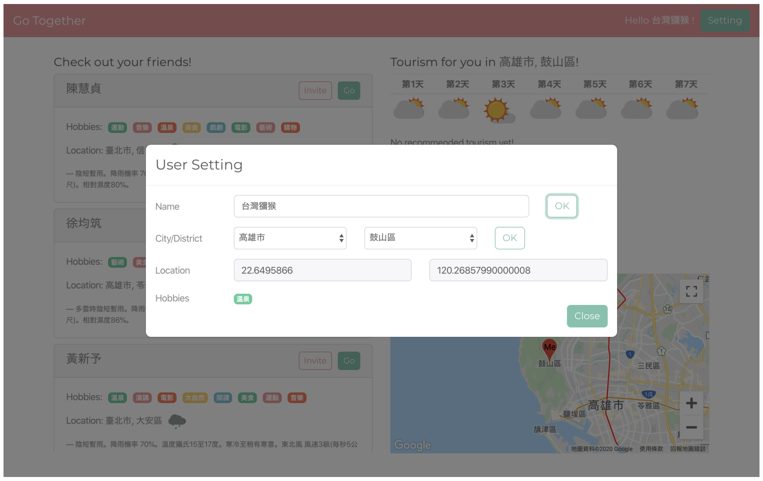
No recommended tourism yet!

User Setting

Name: Type your full name

Figure 7: Login page screenshot.

After entering the user's name, the user's default location and hobbies will be shown in the form. Then change the location to the user's interested location.



Go Together

Hello 台灣獼猴！ Setting

Check out your friends!

陳慧貞 Invite Go

Hobbies: 運動 音樂 溫泉 美食 戲劇 電影 藝術 購物

Location: 臺北市, 信

— 陰短暫雨。降雨機率 7
尺)。相對濕度80%。

徐均筑

Hobbies: 藝術 美食

Location: 高雄市, 苓

— 多雲時陰短暫雨。降雨
尺)。相對濕度86%。

黃新予 Invite Go

Hobbies: 溫泉 演講 電影 大自然 閱讀 美食 運動 音樂

Location: 臺北市, 大安區

— 陰短暫雨。降雨機率 70%。溫度攝氏15至17度。寒冷至稍有寒意。東北風 風速3級(每秒5公

Tourism for you in 高雄市, 鼓山區!

第1天 第2天 第3天 第4天 第5天 第6天 第7天

No recommended tourism yet!

User Setting

Name: 台灣獼猴 OK

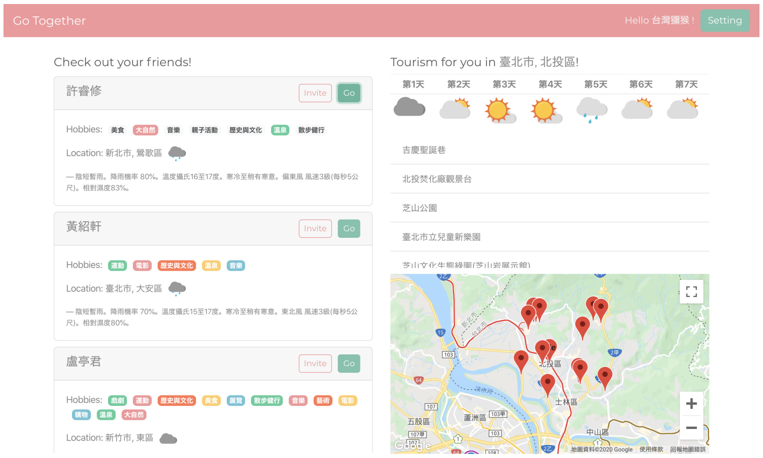
City/District: 高雄市 鼓山區 OK

Location: 22.6495866 120.26857990000008

Hobbies: 溫泉

Close

Figure 8: Login page with entered name screenshot.



Go Together

Hello 台灣獼猴！ Setting

Check out your friends!

許睿修 Invite Go

Hobbies: 美食 大自然 音樂 親子活動 歷史與文化 溫泉 散步健行

Location: 新北市, 鶯歌區

— 陰短暫雨。降雨機率 80%。溫度攝氏16至17度。寒冷至稍有寒意。偏東風 風速3級(每秒5公尺)。相對濕度83%。

黃紹軒 Invite Go

Hobbies: 運動 電影 歷史與文化 溫泉 音樂

Location: 臺北市, 大安區

— 陰短暫雨。降雨機率 70%。溫度攝氏15至17度。寒冷至稍有寒意。東北風 風速3級(每秒5公尺)。相對濕度80%。

盧亭君 Invite Go

Hobbies: 戲劇 運動 歷史與文化 美食 展覽 散步健行 音樂 藝術 電影 購物 溫泉 大自然

Location: 新竹市, 東區

Tourism for you in 臺北市, 北投區!

第1天 第2天 第3天 第4天 第5天 第6天 第7天

吉慶聖誕巷

北投焚化廠觀景台

芝山公園

臺北市立兒童新樂園

芝山文化生態綠園(芝山岩展示館)

Figure 9: Main page screenshot.

2. Main functions (See Fig.9)

   After logging in, the left part of the main page is the user's friends list. All the friends' information will appear on a friend card, including name, hobbies, location, and the weather in the city. The upper right part of the main page is the 7-day weather forecast at the user location, which provides the user with suitable days to travel.

   User can pick one of the friends listed in the left part, and choose the hobbies used to filter spots. Then, the recommended spots will be listed on the right part and shown on the map. Users can click on each of the spots to check out more detail information. At last, the user can pick the interested spots and invite one of the friends to "Go Together", and an e-mail will be sent to the friend's address.

5 Conclusion

We proposed a tourism recommender system in combination with social networks. Not only the sightseeings spots' information but also corresponding real-time weather information would be provided to users instantly. The issue is that different types of data are difficult to merge efficiently in a database. One of our primary contributions is information extraction and data storage. Besides, we connect MySQL engine, Neo4j, Google Map API and frontend website by Node.js and React. Stably sharing data cross databases and connecting between different systems is another contribution. The final recommendation results are presented on a beautiful and concise interface, which is friendly to users.

References

[1] 1.Menk, Alan & Sebastia, Laura & Ferreira, Rebeca. (2019). *Recommendation Systems for Tourism Based on Social Networks: A Survey.*