Travel-Information Sharing System Using Tweets with Location Information

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1 Introduction

In this article, we propose a travel-information sharing system. Internet-based travel-advisory services have been widely used, and these sites allow users to search and garner information regarding tourist destinations more easily. However, with such services it is difficult to find live information about a particular location, including route information, owing to the quantity of information posted on the Web.

In this study, we focus on tweets containing location information from online posts on Twitter. Twitter users often post tweets that include travel information, such as information concerning traffic, stores, and accommodation. The proposed system automatically places these tweets on a map as a pictorial symbol. The symbols represent categories of information. Users who search for travel information will easily obtain live information by filtering the information according to the category or location, and by replying to the tweet to ask for additional details.

This paper is organized as follows: in Sect. 2, we describe the related service for sharing travel information. In Sect. 3, we explain our proposed system, which supports sharing travel information using tweets. A validation test for our system will be given in Sect. 4. Finally, we discuss conclusions and future work in Sect. 5.

2 Related Works

Google Places is one information-sharing service that uses a map [1]. Users share information such as addresses, photographs, and comments about popular locations. Most of the information relates to shops, and especially to restaurants, and users can evaluate the shops on five levels. In some cases, a lot of information may overlap so users cannot easily locate the information they are trying to seeking.

In existing systems or services that offer a shared digital-travel diary [2,3], users post reports about their experiences at a tourist destination in a shared diary. In general, the diaries are collections of multiple postings based on the respective viewpoints of various writers. Therefore, these include information

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that is unnecessary and descriptions that are redundant to users seeking pertinent travel information. Searchers must read through all of the postings, making it difficult to obtain travel information in a short period of time.

Approaches using geotagged photo data posted to a photo-sharing service are proposed [4,5]. They analyzed large quantities of photograph and extracted travel information such as activities or typical patterns of sightseeing. These systems provide users visual analysis result about attractive areas or example itineraries. Tiwari and Kaushik [6] proposed a tourist spot recommender system using enrichment information including weather conditions and traffic conditions. They assemble a database that contains location data and contextual information registered by users. Users could obtain detailed graphical information about a tourist area using these systems; however, users could not ask a question to investigate the location in more detail or to know the conditions under which the information was posted.

In order to solve these problems, we propose a system that can communicate information with a poster and a visitor using twitter. In Sect. 3, we describe the system's details.

3 System Framework

3.1 Goal

The kind of Information that tourists require differs according to the purpose, means of transportation, and the time during which they intend to visit. Our goal is to realize a system for both prospective tourists and those who have visited the destination so that they can share well-organized visual information about the location and routes. In this study, we focus on Twitter because tweets well reflect the situation at the time of posting.

Our system is an application that runs on an Android phone. Users can post a tweet, browse others' tweets, and use a map with the system. Users who post travel information can choose a category that corresponds to the content of their post. The tweets are plotted on a map based on position information. Users who are seeking travel information can view the contents of these tweets on the timeline and on the map.

3.2 Pictorial Symbols

Tweets are displayed as pictorial symbols on the map. Figure 1 provides an illustration of the map with some pictorial symbols. The pictorial symbols represent different selected categories. Figure 2 is a list of the available pictorial symbols. The pictorial symbols in this list denote (i) chances, (ii) road signs, (iii) events, (iv) accidents, (v) accommodations, (vi) landscape, (vii) souvenirs, (viii) stores (including restaurants), (ix) traffic information, and (x) other.

These ten categories were adopted based on the results of preliminary research that involved college students who use Twitter every day. The preliminary research was carried out in two steps.

Fig. 1. Pictorial symbols on the map.

Fig. 2. List of the pictorial symbols.

As the first step, we asked the eight participants to answer the question, "When you post a tweet about tourism on Twitter, what content do you post?". They answered questions about twenty kinds of content including landscape, festival, impressions of food, unexpected encounters with friends, unidentifiable things, and so on. We classified these answers into the ten categories.

Second, we investigated whether these ten categories were appropriate and could be chosen when users posted a tourist tweet. We collected actual tweets posted in tourist areas, and asked seven participants to classify them into the ten categories. The participants checked forty tweets, and multiple answers were allowed. The results of this classification are shown at Table 1. The values in Table 1 are the numbers of tweets.

Eight of the ten categories were selected more than three times. Some participants responded that sometimes it was difficult to distinguish (vii) and (viii) and (ii) and (ix). Category (ii) was not selected even once. We applied these ten categories, including the two less-used categories, to our system, and we considered the need for the categories through an experiment.

Table 1. Result of classification of tweets.

Subjects	Categories										Total
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	
A	4	0	2	0	3	7	5	4	0	15	40
B	5	0	7	0	3	13	7	7	5	3	50
C	3	0	8	0	4	18	6	4	6	1	50
D	5	0	3	1	2	19	6	6	6	15	63
E	6	0	4	0	3	16	7	1	8	1	46
F	7	0	6	0	3	5	8	3	4	4	40
G	6	0	7	2	3	13	9	7	5	0	52
Avge.	5.1	0.0	5.3	0.4	3.0	13.0	6.9	4.6	4.9	5.6	48.7

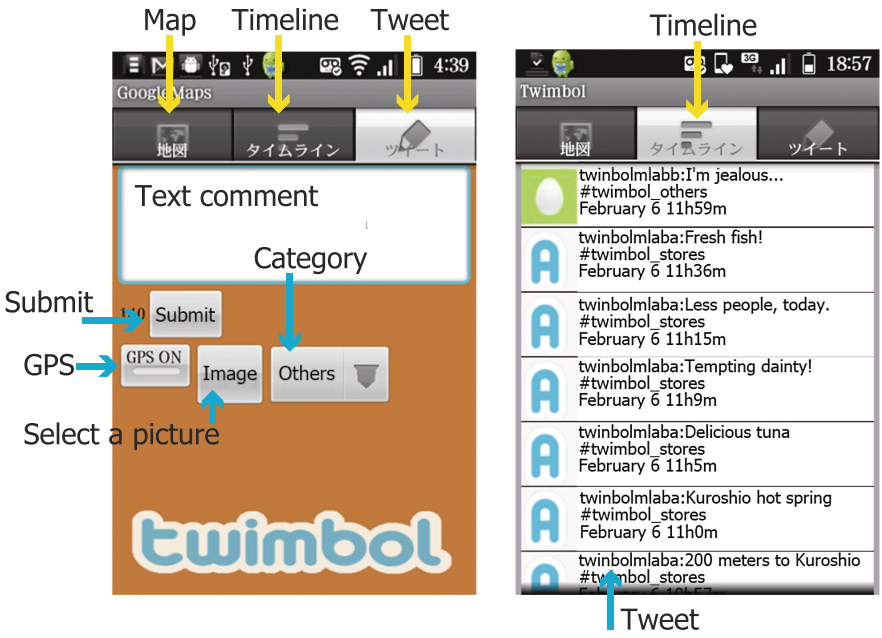

Fig. 3. Overview of the proposed system.

3.3 Post Screen and Browsing Screen

The overview for our system is shown in Fig. 3. Our system consists of two parts. One part is the post screen, and the other part is the browsing screen. An example of the post screen is in the left image in Fig. 3, and the browsing screen is in the right image in Fig. 3. The browsing screen is further divided into two parts. Users operate each function by switching tabs.

Users enter text in the text box in the posting screen and post a tweet by tapping the submit button. Users select a category to suit the content of the tweet using the category button. The category 'others' is selected by default. When the GPS button is turned ON, the system adds location information to the tweet. The image selection button is used when users attach an image to the tweet. Users can select an image from the image data stored in the Android device. They can also use image data captured by the Android device's camera. When users tap the category button, the list of categories is shown. The category name that users tap is automatically added to the tweet as a hash tag.

The right image in Fig. 3 is an example of the browsing screen that consists of a user's timeline. In its initial state, the most recent twenty tweets are displayed. When users scroll to the bottom, the next twenty tweets are shown. In this screen, users can logout of their twitter account, search tweets, update the timeline and run a category search. Furthermore, users can reply in order to ask a question about a place or a situation and they can retweet a tweet to share the information.

3.4 Search Function

Users have three ways to search for travel information using the search function. One of the ways is a timeline search as described above. The second way is to search on the map of tweets represented as pictorial symbols. The third way is to refine a search by using categories. In each search function, it is possible to narrow down the search by entering a radius starting from the current location. Figure 4 provides an example of a tweet search with the category search function. Users select a category in the left image in Fig. 4, and users enter the search range in kilometers from the current position in the right image. The search results

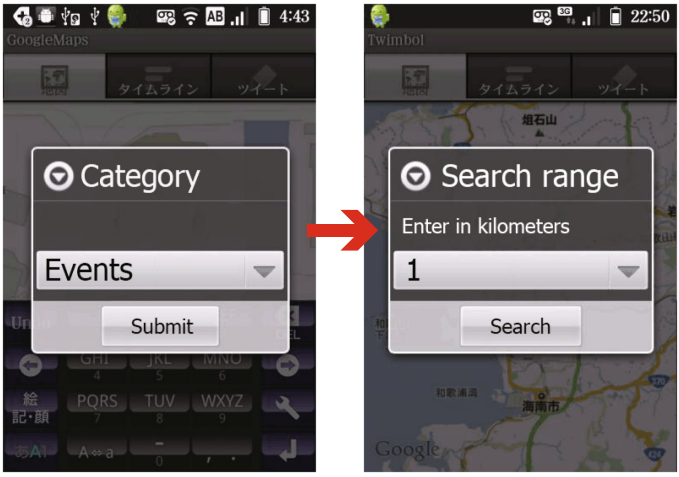

Fig. 4. Example of tweet search.

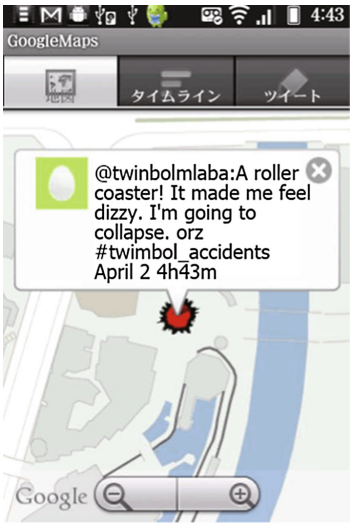

Fig. 5. Example of search result.

are shown as pictorial symbols on the map. Figure 5 provides an example of a search result. Users tap a pictorial symbol on the map, and then the detail of the tweet is displayed as shown in Fig. 5. Users can obtain detailed information by replying and retweeting this screen.

4 Experimental Results

4.1 Experimental Outline

We conducted two experiments to evaluate the interface of the proposed system from both perspectives - posting and browsing - and to investigate the effect of sharing travel information using categories and a map.

The experimental subjects consisted of nine college students - seven males and two females. They were divided into three groups.

In the first experiment, each group visited a tourist location. We asked the participants to act on the assumption that they were tourists and instructed them to tweet in the area. They were free to post impressions, messages, photographs, and information for one hour. The tourist destinations were a shopping mall along the beach, a Japanese castle, and an amusement park. At the shopping mall, people enjoy shopping and walking beside the sea, the Japanese castle provides some events, and in the amusement park, people can ride some attractions and enjoy the streetscapes.

Table 2. Average values from the posting questionnaire.

Questionnaire item	Avge.
(1-i) I could easily operate this system using an Android phone	3.3
(1-ii) I could easily select an appropriate category for each tweet	3.3
(1-iii) It was easy to reply to a posted tweet	3.4
(1-iv) It was easy to post a photograph	4.7
(1-v) I could feel the presence of other members' actions from the map	4.2
(1-vi) Post motivation increased by browsing from others	3.7

Table 3. Average values from the browsing questionnaire.

Questionnaire item	(a)	(b)
(2-i) I could easily search for travel information	4.2	2.6
(2-ii) I could easily browse the photographs	3.3	3.6
(2-iii) I could obtain the information that I wanted	3.8	2.9
(2-iv) I could easily understand the meaning of the pictorial symbols	3.8	-
(2-vi) I required the search function for the categories	4.6	-

In the second experiment, the same nine subjects browsed travel information indoors for ten minutes. Under condition (a), the participants only used the proposed system. The travel information they browsed was the data posted by a different group from the first experiment. Under condition (b), the data was not categorized, and tweets were placed using a simple marker on the map.

4.2 Experimental Results

We asked the participants to complete a questionnaire at the end of each experiment. The results from the questionnaires are provided in Tables 2 and 3. The values listed are the mean values on a five-point scale. The number of tweets at each tourist destination from the posting experiment is shown in Table 4.

Based on comments written in the free description field in the posting questionnaire, users felt the need to categorize tweets, and they enjoyed the symbols that appeared one after another in the map in real time. On the other hand, as

Table 4. Number of tweets at each destination.

Tourist destination	Tweets
Shopping mall along the beach	46
Japanese castle	35
Amusement park	35

Table 5. Average values from the questionnaire concerning the proposed system.

Questionnaire item	Avge.
(3-i) The system facilitated the communication for obtaining information	3.9
(3-ii) The photos was helpful in obtaining the travel information	4.6
(3-iii) When I search the travel information, I want to use this system	3.9

shown in Table 2, the values for ease of operation (1-i), selection of categories (1-ii), and reply (1-iii) were low. One of the reasons for the low values was that the Android phone we had rented in the experiment had a low-resolution display, so it was difficult to operate outdoors because it was too small. Some participants pointed out the flaw on the questionnaire.

Next, we discussed the numbers of tweets and selected categories. At the 'Amusement park', where people enjoy the scenery, nine tweets were categorized to the landscape category. At the 'Japanese castle', the participants enjoyed some events so they often selected the chances, events and accidents categories. At the 'Shopping mall along the beach', the percentages of souvenirs and stores were higher than in the other areas. The posting experiment started upon arrival at the destination and the experimental period was one hour. Therefore, road signs, accommodations and traffic information were usually not selected.

As shown in Table 3, the values for items (2-i) and (2-iii) are higher for our system under condition (a) than the values under condition (b). From these results, we infer that information that was appropriately categorized and expressed is a supportive feature for users when they are searching tweets with using the location information on the map.

The results from the questionnaires on the proposed system are provided in Table 5. The evaluation method was same one that was used in Tables 2 and 3. The participants answered that the proposed system was helpful for searching and obtaining travel information. High evaluations were obtained for the functionality of the system; however, there were some comments in the free description fields on the questionnaires regarding the improvement of the interface.

5 Conclusion

In this article, we proposed a travel-information sharing system that aims to provide comprehensive and visual live information. From the results of two experiments and an analysis of the data, it is clear that users can detect the presence and actions of other users in the vicinity from the map plotted tweets. In addition, users' ability to search for tourist information is supported by and plotting information with symbols on a map and appropriately classifying information.

In the browsing experiments in this article, we did not compare our system to other systems in which photographs are posted to a photo-sharing service. We need to experiment using the reply and retweet function on our system in order to investigate the effect of users communicately directly through exchanging

tweets. Furthermore, the low evaluation could be due the performance of the Android device, and therefore, it is necessary to conduct the experiment again using an Android device with better performance.

References

1. Google Places API - Google Developers. https://developers.google.com/places/. Accessed 29 October 2014
2. 4travel, Inc. http://4travel.jp/. Accessed 29 October 2014
3. Ushio, S., Ito, Y., Okada, K., Kitahara, T., Tsuji, H., Moriguchi, S., Narita, M., Kato, Y.: The digital travel diary system using the network service platform. In: Proceedings of the International Conference on Advanced Information Networking and Applications (WAINA), pp. 890–895 (2011)
4. Kisilevich, S., Krstajic, M., Keim, D., Andrienko, N., Andrienko, G.: Event-based analysis of people's activities and behavior using flickr and panoramio geotagged photo collections. In: 2010 14th International Conference on Information Visualisation (IV), pp. 289–296 (2010)
5. Popescu, A., Grefenstette, G., Moellic, P.: Mining tourist information from user-supplied collections. In: Proceedings of the 18th ACM Conference on Information and Knowledge Management (CIKM), pp. 1713–1716 (2009)
6. Tiwari, S., Kaushik, S.: Information enrichment for tourist spot recommender system using location aware crowdsourcing. In: IEEE 15th International Conference on Mobile Data Management (MDM), vol. 2, pp. 11–14 (2014)