

Sightseeing Spot Communication System using Four-Frame Stories

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Abstract— Recently, many people introduced their personal sightseeing trips on the Internet, with the effect that some of the introduced sightseeing spots have attracted the attention of tourists. In this research, we propose a sightseeing communication system based on making and sharing a sightseeing “story”. Users make a story consisting of four frames about the sightseeing by editing pictures taken at sightseeing spots. The story-creating process yields to new discoveries about the appeal of sightseeing spots, because the user will look for topics to feature in a story during their sightseeing trip. We expect that such a process will make the sightseeing more individual and creative. The produced story is also shared among other users, which we anticipate to generate interest in the sightseeing spots.

Keywords-Sightseeing support system, Four-frame story, Tourism recommendation.

I. INTRODUCTION

A great deal of importance is placed on the tourism industry in Japan. Domestic and overseas trips are one of the main leisure activities of Japanese people. In recent years, the sightseeing style of Japanese consumers is changing. Traditionally, the package tour has been the most popular sightseeing style in Japan. The package tour is a travel product wherein the entire process including destinations, routes and time schedule, is managed by a tour company. Thus, the participants enjoy their sightseeing simply by following the instructions of a tour guide. However, another sightseeing style has come into use significantly in recent years. This is a style wherein tourists determine the process of their sightseeing themselves and enjoy their trip without using a package tour. Ishimori [1] describes this as “autonomous tourism.” In addition, “Travelers Trends 2010” [2], published by the Japan Travel Bureau Foundation, calculated that the number of people who were interested in gourmet food, history, urban tourism, and strolling had increased by 10% in 2009 compared to 2007. With all these factors, it can be said that tourists are interested in various activities and want experiences of various types. Therefore, just as Ishimori points out, the sightseeing style in Japan is changing from moving efficiently along a predetermined route to freely visiting places of interest anywhere, anytime, and tourists are looking for new discoveries and chance encounters.

In planning such a personal tour, many people gather information about sightseeing spots from social media such

as Facebook and Twitter, and take into account word-of-mouth information from such sites. A tourist who had a positive experience and memories uploads some stories and photos of their trip to the Internet, and other people who are planning their own tours are affected by these shared stories and photos. Since people have diversified personal preferences, the attractive factors of a sightseeing spot differ from person to person. Thus, people select information on the Internet, which matches their preferences and plan their personalized tours. Therefore, a desired recommendation system for sightseeing spots should propose not only standard destinations but also personalized destinations for each user, and lead to new discoveries about the appeal of sightseeing spots.

This paper proposes a novel sightseeing spot communication system. Our goal is to invite tourists to visit various new sightseeing spots by sharing their experiences and memories about trips with each other. As a way of sharing experiences of the sightseeing spots, we focus on the interesting part of making and reading a “story” using photos taken at the spots. That is, users make a four-frame story about their sightseeing experience by editing photos taken at sightseeing spots, and share the story using our system. The shared stories are read by other users, which we anticipate to generate interest in the introduced sightseeing spots. We consider that the processes of creating and sharing the stories will yield new discoveries about the appeal of sightseeing spots, because the user will look for topics to feature in the story during their sightseeing trip in the story-creating process, and in the sharing processes, the user will have access to the various perspectives of many other tourists.

This paper presents the results of an evaluation experiment using our prototype system. These results demonstrate the effectiveness of our system in terms of occurrence of discoveries about new appeal of sightseeing spots by creating four-frame stories, guidance to new spots by sharing stories, and the addition of narrative to sightseeing information.

In this paper, we present the related works in Section II. Sections III and IV show the outline and details of our proposed system. The evaluation results are shown in Section V, and we conclude this paper in Section VI.

II. RELATED WORK

In this section, we introduce sightseeing navigation systems, which attempt to create opportunities for encounters, and systems for sharing edited photos.

A. Encounter-Creating Navigation Systems

Most traditional sightseeing navigation systems used by tourists during sightseeing offer the shortest route and methods of transport from a departure to a destination, and attach a high value to the efficiency of user movement. However, it can be said that the user's area of activity is limited, and opportunities for new discoveries and chance encounters that may happen during sightseeing decrease in order to realize high efficiency. Considering the sightseeing trends in Japan in recent years, such methods are not effective because tourists who demand fun and memorable sightseeing are increasing.

In order to resolve these problems, some sightseeing navigation systems, which attempt to stimulate new discoveries and chance encounters, have been proposed [3]. These systems adapt the idea of "Benefit of Inconvenience". Ichikawa, et al. proposes a system which shows a map consisting only of a rough handwritten route, some icons and the current position of the tourist (Fig. 1 (a)). In the system proposed by Tanaka et al., an electronic map hides the information related to the area immediately surrounding the tourist (Fig. 1(b)). By hiding detailed maps and routes, these systems promote interaction with the user's previously unnoticed surrounding environment, and foster new discoveries and chance encounters. As an extended system, Takagi et al. built a navigation system, which hides most of the map's information (Fig. 1(c)) [4]. In this system, only the current and destination positions, and some landmarks, are shown on the display. The landmarks are selected based on the user's preferences.

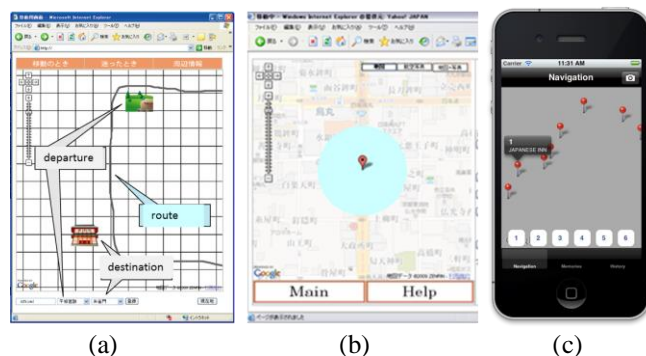


Figure 1. Screen images of navigation systems which promote interaction with the user's surrounding environment.

B. Edited Photo-Sharing Systems

Due to the widespread use of smartphones, in recent years some tourists use photo-sharing applications, such as LINE camera [5]. Users of these applications take photos at sightseeing spots using their cell-phone or smartphone camera, edit these photos in the application, and share the edited photos with their friends or all other users. In LINE

camera, a user can edit a photo by adding text, stamps featuring characters, and decorated frames. The edited photos are shared on LINE, Facebook, and Twitter. The goal of these systems is only the sharing of photos, not the sharing of information about sightseeing spots such as their locations. Thus, they do not provide a function of navigation to sightseeing spots.

Dinh Pham Quang et al. propose a navigation support system to sightseeing spots by sharing photos with "graffiti" [6]. A tourist takes a photo at a spot, and enjoys editing the photo by adding graffiti freely. The photo with graffiti and the location data of the photo are shared on the Internet. Other users see the photo with graffiti on an electronic map. Evaluation results demonstrate that the expressing sightseeing as a narrative by adding graffiti to photos attracts other users' interest. In addition, the system implements sightseeing spot navigation function by providing location information showing the place where the photo was taken. Some evaluators said that they would look for graffiti topics during their sightseeing trip. This fact indicates that the system creates opportunities for new discoveries and chance encounters.

Dinh Pham Quang et al. use only one photo to express a story. In our study, we use more than one photo; specifically, we use a four-frame story, because we consider that higher diversity of story will realize the provision of multiple opportunities for new discoveries and chance encounters.

III. OUTLINE OF PROPOSED METHOD

This paper proposes a novel communication system by sharing four-frame stories based on photos taken at sightseeing spots. The system targets tourists who are carrying out casual sightseeing on foot. Through the action of making and sharing stories, tourists obtain opportunities for new discoveries and chance encounters.

A. Benefits of Story-Making

Cognitive actions related to creative processes occur in a chain [7]. In order to perform a creative process, a human responds sensitively to various visual features and relationships between spatial locations of objects in a space, and then creates conceptual meanings for the objects. Thus, such responses lead to a new discovery for the human.

Our proposed method compels tourists to have active interaction with their environment at sightseeing spots by taking actions to create stories. This active interaction provides a chain of cognitive actions and new discoveries.

B. Basic Policy of Method

We propose a sightseeing spot communication system, which utilizes sharing of four-frame stories. A tourist takes photos during their trip, and creates short stories of four frames which introduce the trip. The created stories are shared using our system, and other users read the shared stories to learn about the introduced spots. In order to consider four-part narrative structure, which is traditional in Japan, we limit the length of the stories to four frames. This structure is used internationally, one of the famous

examples is SNOOPY's story [8]. Limiting the length of story simplifies the process of story creation.

The scenarios for both modes of use, creating a story and sharing a story, are as follows:

1) Scenario for the story-creating process

1. A tourist considers a four-frame story using photos taken at sightseeing spots when he encounters interesting objects such as scenery, buildings, shops, food, etc. During this time of consideration, it is important to conduct sightseeing with an awareness of whether there is anything suitable for a story around oneself, thereby developing sensitivity for sightseeing.
2. If the tourist can construct a story, they create a four-frame story by taking some photos and editing them. Editing methods include attaching text comments, appropriate characters and graffiti. More than one spot may be included in a story.
3. The created story is sent to the system's server in order to share the story. Location information for each photo in the story, obtained via GPS(Global Positioning System), is also stored on the server.

2) Scenario for the story-sharing process

1. A user browses the shared four-frame stories from a location outside of the spots introduced in the story. However, the user cannot read the last frame of the story outside of the spots introduced in the story. This mechanism stimulates the user to wish to know the ending of the story, and to visit the introduced sightseeing spots.
2. The user conducts sightseeing based on the shared story that they are interested in. A photo of each frame in the shared story is shown at a corresponding position on an electronic map. Thus, the user can visit the spots that were introduced in the stories that interest them. At the sightseeing spots, the user can see all frames of the story, including the last frame.

IV. SYSTEM DETAILS

In this section, we describe our prototype system.

A. Development Environment

Our system is assumed to be used during sightseeing. Thus, the system needs to be developed for mobile computers. In our prototype system, we use the iPhone as a mobile computer. The system was developed as an iPhone application in Objective-C. The server requires a database function, for which we use XML and PHP.

B. System Architecture

Fig. 2 shows the architecture of our prototype system, which consists of an iPhone and a server. The server stores the four-frame stories uploaded by the user in a database. A unique ID is attached to each uploaded story. Photo data for each frame in the story are assigned a name with the ID of

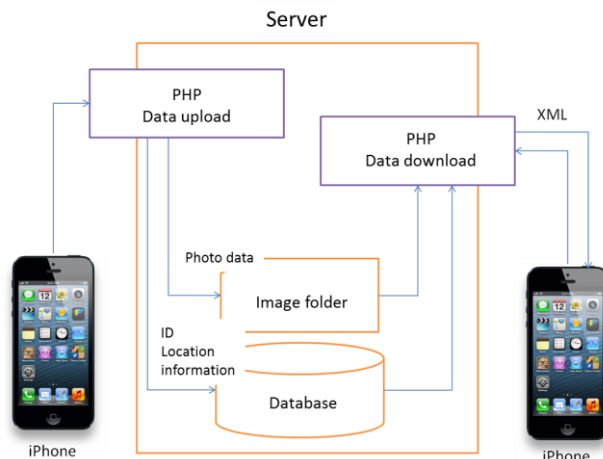


Figure 2. System architecture.

the story and its order in the story, and stored in an image folder. For each frame, the database stores its ID and location information obtained via GPS(Global Positioning System). The program to upload to and download from the server uses PHP(Hypertext Preprocessor). The iPhone device reads this PHP program in order to access the database.

C. System Functions

Our system consists of the following three functions:

1) Store the photos taken at sightseeing spots, 2) create a four-frame story, and 3) browse the shared four-frame stories. In this section, the details of these functions are described.

1) Photo Store Function

With this function, the user can take and store a photo. There is a camera button on the lower left of the main screen. When the user pushes this button, the equipped camera is activated. The user takes photos and stores them in the local memory of the iPhone. The stored photos are shown on the electronic map. Therefore, the user can see the photo image and the location where the photo was taken, and select some of the photos to use in making a story.

2) Story Creation Function

With this function, the user selects a photo from the stored ones in the iPhone, and edits the photo by adding texts, characters, and graffiti to the photo. Fig. 3 shows an example of screens during the creation process. Our system provides six functions to edit photos, each of which corresponds to a button at the bottom of the screen.

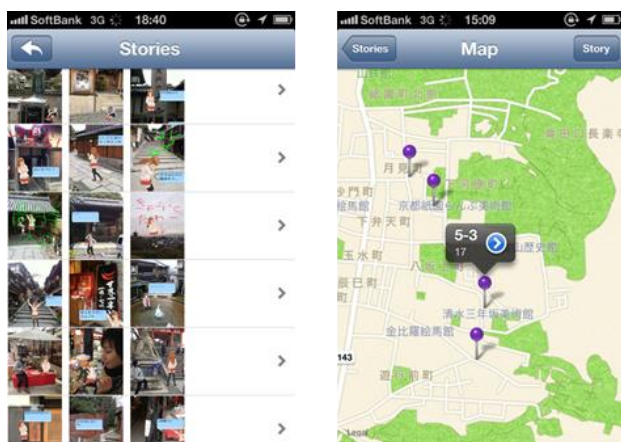
1. Pen button: When the user writes some graffiti on the photo, they tap this button. The pen color can be selected from three colors: red, blue, and green. The pen also has five width settings.
2. Callout button: When the user adds some text in a speech bubble, they tap the callout button. A speech bubble of default size appears on the photo. The user writes some text in the speech bubble, and then



(a) Use of speech bubbles (b) Use of characters
Figure 3. Examples of story creation function

moves it to an appropriate position in the photo (Fig. 3(a)).

3. Chara button: When the user taps this button, a list of the characters in this system is displayed. The user selects one of the characters, and double taps the position where they want to place the character. The character appears in a default size at the tapped position (Fig. 3(b)).
4. Size button: The size of text in a speech bubble, the speech bubble itself, and characters is changed by tapping the size button.
5. ID button: The order of the edited photo in a story is assigned by tapping the ID button. After tapping this button, the user inputs the order.
6. Save button: After editing a photo, the user taps the save button. When all frames in a story are created, they are uploaded to the server.



(a) List of shared stories (b) Locations of photos in a story

Figure 4. List screen of four-frame stories

3) Story Browse Function

Using the browse function, a user can see the shared four-frame stories and learn the locations where the photos in the story were taken. Fig. 4(a) shows an example of a screen of the list of shared stories. The user selects one of the stories that they want to read. Then, the user can read each frame of the selected story, and learn the locations where the photos in the story were taken. Fig. 4(b) shows an example of a screen indicating the locations of a story. Thus, when the user sees an interesting photo or story, they can go to the place introduced in the photo or story by using this map function.

When a user sees this list of shared stories from a place, other than where the photos in the story were taken, the last frames of these stories are not available for the user (Fig. 4(a)). This trick gives the user motivation to go to the sightseeing spots introduced in the stories that they found interesting.

V. EVALUATION EXPERIMENT

A. Experiment Method

We conducted an evaluation experiment with 12 human evaluators, who are students in Ritsumeikan University in Japan and are selected randomly from among applicants, in order to verify the effectiveness of this sightseeing spot communication system. The experiment was conducted with Kyoto as the experiment area, and subjects strolled in the eastern area of the city centered around the Kiyomizu-dera temple. The reasons why this area was chosen for the evaluation experiment are:

- (1) The area is suitable for casual sightseeing by foot, because there are various famous spots including historical places, cultural places, etc.
- (2) Tourists are able to enjoy the streetscape of Kyoto, which has many narrow alleyways.
- (3) Many of the evaluators in this experiment had not visited this area before.

The evaluators in the experiment were 11 men and 1 woman in their twenties who live in the Kansai area, which includes Kyoto. The first experiment was carried out in December 2012 with half of the evaluators, and the second one in January 2013 with the remaining evaluators. They were assigned randomly to three groups regardless of their gender, age, previous experience of sightseeing in Kyoto, etc. Each group consisted of two persons.

Each group enjoyed the streetscape freely in the target area with at least one iPhone device installed with our prototype system. First, at a start point in the area, we explained the target area and how to use our system easily to the evaluators, and instructed them to return to the start point in 90 minutes. One observer accompanied each group to observe the behavior of the evaluators.

We asked the evaluators to answer a questionnaire in order to gather evaluation data on the usefulness of the system. In this questionnaire, questions about the following three facts were asked:

- (1) For each story the evaluators created: “why did you want to create this story?”
- (2) For each visit to a spot which was introduced in a shared story: “why did you want to go there?”
- (3) For the whole process of sightseeing using this system: “how would this system affect your sightseeing?”

B. Evaluation Results

1) *New discoveries about the appeal of sightseeing spots*

First, we will examine the effect of creating stories during sightseeing. We expected that the act of looking for topics for stories would provide tourists with new discoveries about the appeal of sightseeing spots.

In answer to the question “How would this system affect your sightseeing?” evaluators gave replies such as, “I focused on various objects in the sightseeing spots to look for a topic for a story,” “I walked with greater care than usual because I wanted to find some interesting objects to create a story,” etc. Most of the evaluators conducted their sightseeing actively and creatively by searching for interesting episodes and objects during their sightseeing, and by thinking about using these for story creation. For example, one of the groups created a story about interesting signs. They could also find some interesting objects in addition to funny signs because they looked around with curiosity.

A further interesting finding is that this system fosters a competitive spirit in the tourists. Some of the evaluators reported this fact in the questionnaire. Because the created stories are shared with other users, the evaluators made an effort to create a good story to get others’ attention. Therefore, they looked around themselves carefully to find something funny or interesting. That is, it can be said that the communication of sightseeing spots based on four-frame stories is effective for the realization of creative sightseeing.

At the end of this evaluation, the evaluators talked about the stories that they had created. Such feedback from other users is good motivation for creating good stories. One of our future tasks is implementing a function for receiving feedback from other users in order to sustain motivation.

2) *Navigation function by sharing stories*

One of our aims in this study is to invite tourists to visit various new sightseeing spots by sharing their experiences as a story. In our system, the locations where the photos in a story were taken are shown on an electronic map. As a result, the behavior of visiting spots introduced in the shared stories occurred three times in the first evaluation, and seven times in the second evaluation. The reason that the number of such visits by the second group was larger was that the first group conducted experimental sightseeing under conditions where there were no shared stories in the system. That is, the

evaluators in the first group could not see the shared stories at first, so they focused on the creation of stories.

The visits to the introduced spots can be classified into three categories based on motivation:

(1) Eight visits were motivated by interesting photos in the shared story.

(2) Three visits were motivated by the distance to the introduced spot.

(3) One visit was motivated by the desire to complete an incomplete task.

Examples of the first motivation are photos of scenic views, a shop displaying favorite characters, and something unique. In answer to the question “Why did you want to go there?” some evaluators replied that they read an interesting story, and the story unfolded there. That is, they became interested in the photos by reading the shared stories. The second motivation is caused by the map function. In this system, a user can learn the locations of photos in shared stories. The evaluators found interesting spots close to their current position, and were able to go there easily.

Moreover, it was demonstrated that the users shared information about less famous spots by sharing four-frame stories, and that this communication yielded new discoveries about the appeal of these spots. An evaluator stated that he wanted to go to ordinary places using our system, whereas he had tended to go only to major spots introduced in guidebooks. Another evaluator also reported that he obtained interesting information about unique sightseeing spots that could not be focused on by simply following a tour guide.

By using this system, users encounter various perceptions of sightseeing spots. For example, one frames of two different shared stories are based on photos taken at the same shop. In one frame, the character good in the shop is perceived to be cute, but in the other, it is expressed as humorous. This was reflected by one of the evaluators, who reported that he realized that there are various ways of thinking about sightseeing.

3) *Effect of adding narrative to sightseeing information.*

In this section, we describe the effect of sharing stories based on photos, rather than sharing only edited photos. From the evaluators’ answers to the question “Why did you want to create the story?” we found that there are three methods of creating stories:

(1) The theme of story is decided previously.

(2) The story is created in chronological order of sightseeing.

(3) The ending of the story is decided first, and the other frames of the story are created subsequently.



Figure 5. An example of shared stories in this experiment(Since the story is written in Japanese, the text in the figure are translated into English.).

In the first method, the evaluators set a theme for their story such as interesting spots or funny signs, and created all four frames based on the theme. In the stories created by this method, the evaluators used characters which matched their feelings at the sightseeing spots. They also expressed their feelings for the spots by adding some text in speech bubbles, which could not be expressed only by using characters.

In the second method, the evaluators created four frames, which expressed only their experience of sightseeing. The evaluators who created their stories in this way added some information to the photos using characters, speech bubbles and graffiti to introduce interesting sightseeing spots. Fig. 5 shows an example of a story created this way.

In the last method, the evaluators got an idea for the ending of the story first, and then looked for the other three spots to create the remaining three frames. In this case, they conducted their sightseeing wanting to take specific photos which could lead to the ending. Thus, the observers saw that the evaluators looked at various objects at the spots in order to discover something interesting.

From the experiment results, we can identify the following effects of adding narrative to sightseeing information:

- (1) Motivation to visit spots: All of the evaluators in the second half of the experiment said that “we wanted to go there because we wanted to know the ending of the stories.” This motivation is derived from adding narrative to sightseeing information and the trick of making the final frames unavailable.
- (2) Self-expression: The evaluators tried to create good stories that would attract attention from other users. This behavior makes their sightseeing creative (see Section V-B-1).
- (3) Discovering less famous sightseeing spots: The shared stories are triggers to go to the spots introduced in the stories. In the questionnaire, there were some answers, such as “we had not been interested in that spot, but the stories and its edited photos were very fun, so we went there.”

VI. CONCLUSION AND FUTURE WORK

This paper proposed a sightseeing spot communication system based on making and sharing a sightseeing story. Users of this system make a story of four frames about their sightseeing by editing pictures taken at sightseeing spots, and share it among other users. An evaluation experiment demonstrated that our proposed system is effective in terms of making the sightseeing individual and creative. In addition, by reading the shared stories, people are interested in new spots introduced in the stories.

Our future works aim to evaluate this system with more evaluators quantitatively, because this paper showed the results from 12 evaluators, and compare with other application. In addition, we limit the length of story to four frames, but there are many choices of story length, such as two, six or eight frames. The effect of story length and giving the choices to users should be revealed.

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