Development of a guidance system for tourism by using archived data

Mari Endo (Faculty of Information Design and Sociology, Hiroshima Kokusai Gakuin University, m.endo@edu.hkg.ac.jp)

Kiyofumi Motoyama (School of the Arts, Nagoya University of the Arts, motoyama@nua.ac.jp)

Mamoru Endo (Graduate School of Informatics, Nagoya University, endo@i.nagoya-u.ac.jp)

Mayu Urata (Graduate School of Informatics, Nagoya University, mayu@i.nagoya-u.ac.jp)

Takami Yasuda (Graduate School of Informatics, Nagoya University, yasuda@i.nagoya-u.ac.jp)

Abstract

In recent years, many tourists use their smartphones to receive tourism information, check a map, and take photos of tourism spots. We consider that it is very effective to use a smartphone application to provide tourism information. The goal of this research is developing a system for guiding people naturally from one spot to another. For that, we developed an Augmented Reality smartphone application using archived old photo data kept in museums, libraries, and local governments' institutions. In addition, we developed a system to upload photos taken by users and exhibit those photos with old photos at a museum. In this research, we implemented an experiment performed using the application and exhibition, and collected feedback with a questionnaire. After showing the results of the experiment, we consider the possibility of utilizing open data in tourism.

Keywords

augmented reality, smartphone application, tourism, townscape, open data

1. Introduction

There are two types of tourist attractions. One is famous buildings or facilities for recreation where the building is the core of tourism. The other is historical or characteristic areas where the whole area is the tourism attraction. In both cases, visitors move about the tourism spot, then go to another spot. If visitors can receive more information about the history and the character of the tourism attraction and move about the related area near the spot, it will become more active. We consider it is important that people who manage tourism spots provide information about the place that visitors should go to next. Although this tourism information is provided by maps, pamphlets, and web site at each tourism spot, information is independent in most cases.

On the other hand, smartphones have become very popular as a tool to receive information. Many visitors use their smartphone to check a map, search for tourism information, and take photos with the same smartphone at the tourism spot.

Under this present situation, we consider it is very effective to provide tourism information and guide people naturally by using a smartphone application.

Most historical data and tourism information for visitors are kept in museums, libraries, and public institutions. Some of this data is open to the public, and we can use this data in smartphone applications.

The purpose of this research is to consider and examine the effectiveness of the system for providing tourism information and guiding people naturally. For this purpose, we developed a smartphone application by using historical data and tourism information kept in museums, libraries, and public institutions

and developed the system for guiding people naturally by using the application. We implemented the experiment and considered if the system can provide tourism information and guide people naturally.

In addition, some cities open a variety of data to the public, including tourism information, as open data. We considered using open data as a way for providing more tourism information. We examined if tourism information can be provided as open data by not only the local government but also local residents through workshops.

2. Method of the guidance system

We developed an Augmented Reality (AR) application with geolocation by using archive data of old photos kept in museums, libraries, and local governments' institutions. Users tend to be more interested in photos than words, and are able to realize the information of pictures easier than letters, therefore we decided to use old photos. This application provides an environment that enables users to experience the change of townscapes in real towns, receive knowledge about the town, and understand where they should to go.

AR is a variation of Virtual Reality (VR). VR technologies completely immerse a user inside a synthetic environment. While immersed, the user cannot see the real world around him. In contrast, AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world [Azuma, 1997]. In this research, we focused on the experiences of users who walked around seeing the townscape and receiving historical information of the area using an application in real towns. Therefore, we adopted AR technology.

In addition, the system allows users not only to receive information, but also to upload their photos. This application's users have a stronger relationship with the area than other tourists, because they provide the information and record history by

themselves.

We estimate that this system is effective for providing information and guiding people if users can reach the destination, receive knowledge about the target, and feel like visiting the related spot by using our system.

3. Related cases

There are many cases where digital technologies, like AR and VR, are applied to tourism. For example, in museums, AR application is often used for navigation. TohakuNavi [Tokyo International Museum] shows visitors tour course and explanations about display items. This application uses both vision-based AR and location-based AR through measuring techniques using Wireless LAN [Koozyt]. London museum released a smartphone application named "StreetMuseum" in 2010 [Museum of London]. This application shows old photos of the same place where users run the application in London. Watanave (Tokyo Metropolitan University) developed the Nagasaki Archives and the Hiroshima Archives [Watanabe et al., 2011]. These applications display photos before and after the bombing on a digital globe, using Google Earth.

These applications are very useful to show and provide information to users about culture, history, and tourism. However, we focus on the movement of users and our goal is constructing a system that helps users move naturally from one point to another.

4. Experiment of the guidance system

4.1 Target of the experiment

First, we implemented the experiment performed for Matsushige Rock Gate (Figure 1) and the Nagoya Urban Institute in Nagoya, Japan. Matsushige Rock Gate was built in 1932 for the purpose of water level adjustment between two canals. Though it is preserved as a cultural heritage, only a few people are aware of its existence and understand its historical importance. The Nagoya Urban Institute is an organization dedicated to supporting the urban planning of Nagoya city. There are many records and data of Nagoya's urban planning. Its exhibition space is quite large and the library has a huge collection.

Figure 1: Matsushige Rock Gate

4.2 Application and exhibition

We developed an AR application for iOS. Additionally, we exhibited photos, documents and books related to Matsushige Rock Gate at the Nagoya Urban Institute. When the users' location was far from Matsushige Rock Gate, the application indicated the distance and the direction to it (Figure 2, top). Users approached Matsushige Rock Gate following the directions on the display, and walked around. When the distance and direction are met, the application shows old pictures (Figure 2, bottom). Users can learn about the history of the building and compare the old photos with the present situation. When users tap the information button, texts about the history of the heritage are displayed. Photos taken using the application are uploaded to the server with Exif data and are immediately added to the exhibition at the Nagoya Urban Institute. The new photos are then exhibited together with old photos in a time series. Uses can interactively operate and see the photo which they want to see at the exhibition by selecting it from an iPad (Figure 3). We make users feel they contributed to the history of Matsushige Rock Gate by adding their photos at the end of the exhibition.

Figure 2: The application displays the distance and direction (top), and old pictures (bottom)

4.3 Experiment and result

We performed a first demonstration experiment using our system in November 2016. At Matsushige Rock Gate, we presented the application and collected feedback with a ques-
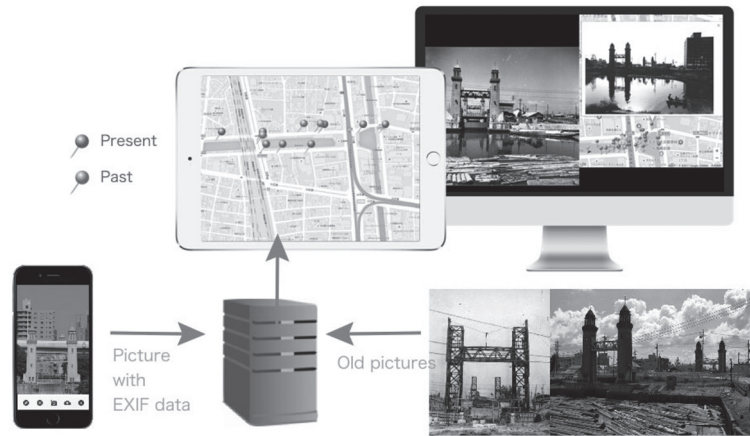
Figure 3: System image of exhibition

Figure 4: Demonstration experiment at Matsushige Rock Gate (top), and exhibition at Nagoya Urban Institute (bottom)
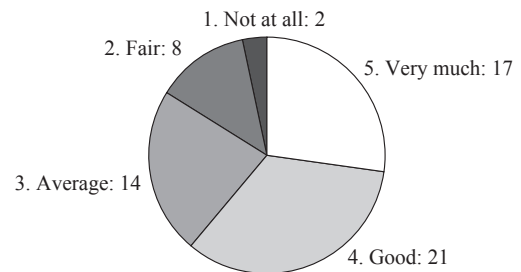

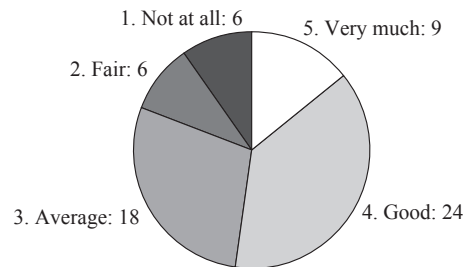Figure 5: Q. Could you know more about Matsushige Rock Gate by using this application?

Figure 6: Q. Do you want to go to the Nagoya Urban Institute to see the exhibition by using this application?

tionnaire filled in by 63 people (Figure 4, top). At the Nagoya Urban Institute, we made an exhibition and collected feedback with a questionnaire filled in by 26 people (Figure 4, bottom).

In the results of our questionnaire-based survey, over 80 % of the users of our application answered they could learn more about Matsushige Rock Gate (Figure 5). Although 10 people who answered with a value of 1 or 2 in Figure 5 said they could not learn so much, seven of them answered they already knew about Matsushige Rock Gate. On the other hand, 25 of 52 people who answered with a value of 3 or 4 or 5 in Figure 5 said they did not know about Matsushige Rock Gate before.

In addition, over 80 % of the users answered that they wanted to visit the Nagoya Urban Institute (Figure 6). The reasons why they wanted to visit were that they were interested in Matsushige Rock Gate and old photos using by the application, and they wanted to see photos taken by themselves.

Over 70 % of the visitors to the Nagoya Urban Institute answered that they wanted to visit Matsushige Rock Gate (Figure 7). The reasons why they wanted to visit were that they wanted to see not only photos but also the real building, and they wanted to use the application and take photos.

Over 70 % answered that they wanted to use this application (Figure 8). The reasons why they wanted to use it were that they felt it was interesting to exhibit photos taken by themselves as a piece of work and join the exhibition, and leave photos to posterity.
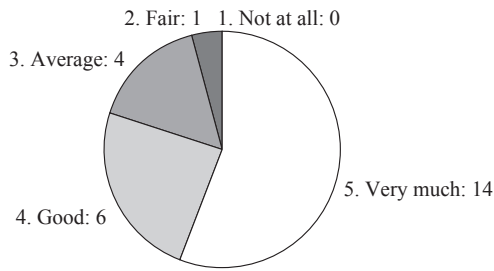
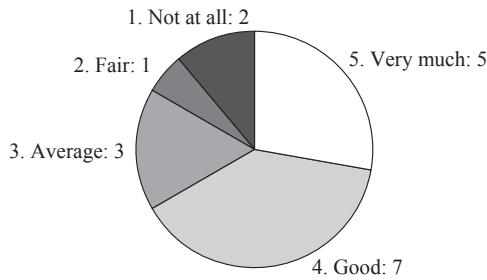Figure 7: Q. After seeing the exhibition, do you want to go to Matsushige Rock Gate?

Figure 8: Q. After seeing the exhibition, do you want to use this application?

Based on these results, most of users could reach the destination by the arrows on the application and they could receive information about the place. In addition, most of users who visited Matsushige Rock Gate felt like visiting the Nagoya Urban Institute, because an exhibition using photos taken by users was held at the place.

5. Focusing open data

5.1 Feedback from the project at Matsushige Rock Gate

We received some feedback from our questionnaire-based study related to additional functions, improvement of the user interface, request for an Android version, and expanding to other areas. We will improve these points and develop the next version based on the feedback. The target of this project was one specific cultural heritage site. We will try to expand the scope to more areas.

5.2 Open data

We are focusing on using open data as a way to expand the scope to more areas. According to the web site of the Ministry of Internal Affairs and Communications, the term "open data" refers to "data formats that are suitable for machine reading and data that have been released on the use of rules that allows secondary use", which "allows secondary use without requiring a lot of manpower" [MIC]. By using open data, we can reutilize digital contents and make it easier to access for a larger number of users.

5.3 Open data workshop

Yasugi City (Shimane pref.) is one of cities that have introduced open data. They opened a wide variety of data as open data on their catalog web site (Figure 9) [Yasugi Data Catalog Site] and dashboard web site (Figure 10) [Open Data Japan].

We had workshops to expand and utilize open data in September 2017 and February 2018 at Yasugi. At the workshop, high school students discussed tourism spots of Yasugi and searched for those places on the Internet according to five categories. Those categories were cultural facilities, nature, restaurant, tourism spots for the citizens, and tourism spots for foreign visitors. They discussed, searched and uploaded this data to the data catalog web site as open data (Figure 11).

5.4 Utilization of open data

This data uploaded by high school students includes the lati-

Figure 9: Yasugi data catalog site

Figure 10: Yasugi dashboard site

Figure 11: Tourism spots uploaded by high school students

tude and longitude of the spot. We consider we can develop the next version of the application by using this data.

6. Conclusion

Based on the results of the experiment at Matsushige Rock Gate, we conclude that this system has a certain effect on providing information and guiding people naturally. We consider that the fact of not only using an application and seeing the exhibition but joining and participating is an important factor for attracting people.

From this conclusion, our focus is that citizens and visitors join efforts to create new data and become more involved with the tourism spot. Through workshops at Yasugi City, the important thing is that these spots are recommended by the citizens. We consider open data has a great potential for creating new data by not only the local government but also local residents and contribute to the future development of tourism.

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