

# Development of a Sharing System for Virtual Graffiti of Tourism Information among Tourists using Image Recognition

Rei Miyagawa \*, Keima Kumano \*, Takayuki Kunieda †, Tetsuya Ikeda †, Naka Gotoda‡,  
Masanobu Kii§ and Rihito Yaegashi§,

\*Graduate School of Engineering, Kagawa University, Japan  
Hayashi-cho 2217-20, Takamatsu, Kagawa 761-0396, Japan

Email: s16g471@stu.kagawa-u.ac.jp  
†Ricoh Company, Ltd., Japan

Ginza 8-13-1, Chuou-ku, Tokyo 104-8222, Japan  
Email: takayuki.kunieda@nts.ricoh.co.jp

‡ Information Technology Center, Kagawa University  
Saiwai-cho 1-1, Takamatsu, Kagawa 760-8521, Japan

Email: gotoda@eng.kagawa-u.ac.jp

§Faculty of Engineering, Kagawa University  
Hayashi-cho 2217-20, Takamatsu, Kagawa 761-0396, Japan

Email: rihito@eng.kagawa-u.ac.jp

**Abstract**—We developed a sharing system for virtual graffiti of tourism information among tourists using image recognition. A tourist writes graffiti on a photo taken at a tourist spot using virtual graffiti interface and shares the graffiti among tourists who take similar photos on the system. Administrator of tourist destination need not to prepare for any information. Using our system, tourists can share tourism information with other tourists who visited the same place just by taking a photo. This paper describes the sharing system for virtual graffiti of tourism information among tourists using image recognition.

**Keywords**—Virtual-graffiti; Tourism-information; Image-recognition

## I. INTRODUCTION

The most important source of information for tourists is the reviews from other tourists [1]. Tourists can look at personal blogs and SNS to get reviews. However, when we focus on the information that tourists get during sightseeing, most of information is prepared by the tourist operator.

As the media to share reviews at tourists spot, there are communication notebooks (graffiti notebooks) which are put at shops and facilities, and graffiti on tourism resources. We can write whatever in our mind by handwriting, and notes by handwriting are more correct than typing [2]. It means that handwritten information is effective for sharing. However, it is insufficient that the tourists voluntarily share information without damaging the tourism resources in anywhere.

We developed the sharing system for tourist information that shares information at the tourist spots and encourages a casual input of information. Using the image recognition technology, this system realizes to attach the scenes at tourist spots to tourism information left by tourists by taking a photo at a touring spot which is the general behaviour during sightseeing. Besides, it does not limit the writing space for an individual, and many and unspecified tourist write something on an objective. The system provides virtual graffiti interface like real graffiti that people write on one object. This paper describes the development of a sharing system for virtual graffiti of tourism information among tourists using image recognition.

## II. DEVELOPMENT

This section describes the development of our prototype system, which can share tourism information. The system shares comments (Graffiti), which were written on a photo by a tourist with other tourists using image-recognition. 2.1 explains the outline of the system. 2.2 describes the flow of system utilization during sightseeing.

### A. System Overview

Figure 1 shows the outline of the sharing system for virtual graffiti of tourist information. The system consists of management server and virtual graffiti application.

We developed the Virtual graffiti application as Web application, and thus it can run on tourists' mobile devices access to the application without install special software. The application has four functions, upload function, display function, graffiti function and set up function. Upload function uploads a photo that was taken by tourist (taken photo) to the management server. Display function displays content which was created by creation function in management server. The content is the image which combines photos and some graffiti. Graffiti function adds graffiti to the content and tourists handwrite graffiti on the content. Set up function sets up the users' attribute which is given to graffiti.

The management server manages Graffiti Library. The management server has four functions, Registration function, Search function, Creation function and Save function, and has registered images and a library. Registration function registers a taken photo as a registered image. Search function searches registered images which are similar to a taken photo in Library. Search function uses Ricoh Visual Search (RVS) Technology [3] developed by Ricoh Innovations Corporation at Silicon Valley in U.S. It analyzes and quantifies the features of image, and can register the data and rapidly searches the database. Create function creates content which combines registered images with graffiti. Save function saves graffiti in library. In the graffiti library, there are taken photos and registered images in JPEG format and Graffiti in GIF format. Metadata include information of creating content and user type.

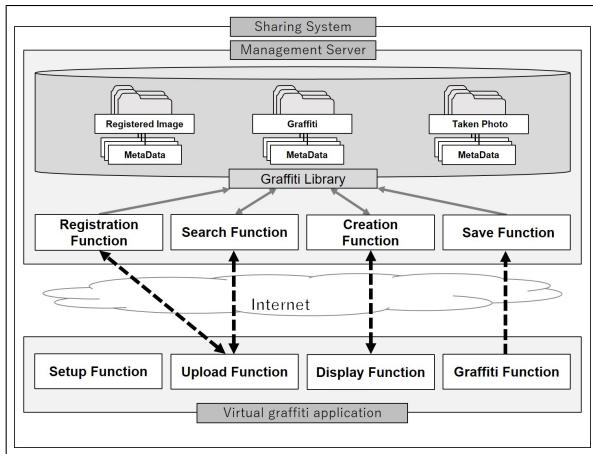


Figure 1. The Outline of the Sharing System for Virtual Graffiti of Tourist Information

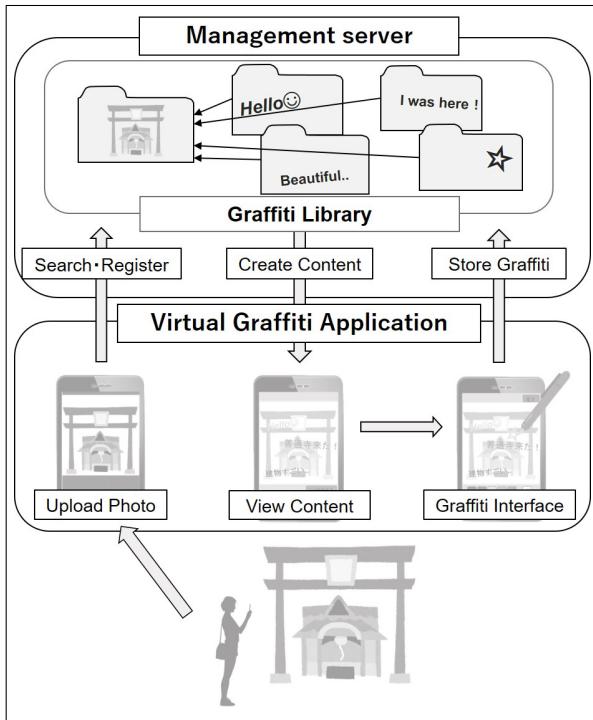


Figure 2. The Use Image of the Share System for Virtual Graffiti of Tourist Information.

### B. Workflow of the System

Figure 2 shows the use image of the share system for virtual graffiti of tourist information. Users of the system are tourists who visit tourist spots. A tourist takes a photo in tourist spot. The taken photo is uploaded to management server and registered image is searched. If there is not registered image which is similar to the taken photo in the library, it will be registered in the library as a new registered image. If there is a similar image, content which is added to past graffiti will be created and sent to virtual graffiti application. Tourists look at the content and add graffiti on it. Figure 3 shows the screen of graffiti interface which a user wrote graffiti.



Figure 3. Screen of Graffiti Interfacen

### III. CONCLUSION

This paper described the development of a sharing system for virtual graffiti of tourism information among tourists using image recognition. Using the image recognition technology, the system provides virtual graffiti interface, which is attached to a scene in tourist spot and add new graffiti. The system shares comments as graffiti which were described on a photo by tourist with other tourists using image-recognition. We have realized the system to provide the virtual graffiti interface to a scene by taking a photo at a touring spot which is the general behaviour during sightseeing. The sharing system of tourism information gives metadata to the registered image, graffiti, and taken photos. We can analyze graffiti and tourism behaviours using metadata. Now, we are planning to conduct a demonstration experiment from stored images and graffiti to confirm the effect of this system on the sharing of tourism information at tourist spots.

### REFERENCES

- [1] S. W. Litvin, R. E. Goldsmith, and B. Pan, "Electronic word-of-mouth in hospitality and tourism management," *Tourism management*, vol. 29, no. 3, 2008, pp. 458–468.
- [2] M. D. Hamzah, S. Tano, M. Iwata, and T. Hashiyama, "Effectiveness of annotating by hand for non-alphabetical languages," in *Proceedings of the SIGCHI conference on Human Factors in computing systems*. ACM, 2006, pp. 841–850.
- [3] "Ricoh Visual Search (RVS) Technology," 2017, URL: [http://www.ricoh.com/technology/tech/044\\_search.html](http://www.ricoh.com/technology/tech/044_search.html) [accessed : 2017 – 02 – 19].