# JIKUKAN-POEMER: Geographic Information System Using Camera Phone equipped with GPS, and its Exhibition on a Street

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**Abstract.** In this paper, we introduce a geographic information system using camera phone equipped with GPS and its exhibitions. We have proposed a new kind of interface to see lost of pictures which have location information, and in the exhibition, we projected our system onto a shopping street in Japan and held it as a photography exhibition. We studied 700 pictures sent for the exhibition and three peculiar motifs were found.

## 1. Introduction

In the fields of town management and urban planning, the GIS (geographic information system) aimed at helping citizens to participate in making a city master plan or to exchange information among communities has been developed [1-2]. Users in these systems annotate physical spaces with text notes and photos, and share information in the real spaces, and exchange information. Some location-based systems allow users to participate as content providers for making social and dynamic information spaces [3-5], and users annotate text notes to physical spaces utilizing PDAs, and this allows users to submit information where they want to do it. However, in these researches, utilized devices need extra devices (a GPS card or a WLAN card) and users to utilize applications developed specially, and users can't annotate pictures. This paper introduces our GIS that utilizes camera phone equipped with GPS. Our purpose is same as [1-6], however in our system, users annotate not only texts but also pictures by sending an email from camera phone. When it contains a lot of pictures, it might not be appropriate to show each photo according to its location information accurately because some photos will be overlapped and it will be difficult to see a map below pictures. These problems are true for other GIS or various "moblogging" systems those post emails from camera phone to "blogging" homepages or map them onto a map. To cope with these problems, we have proposed a new kind of interface to see lots of pictures in parallel with fade-in and fade-out. This paper introduces its exhibition on a shopping street and our study of 700 pictures those were sent for it.
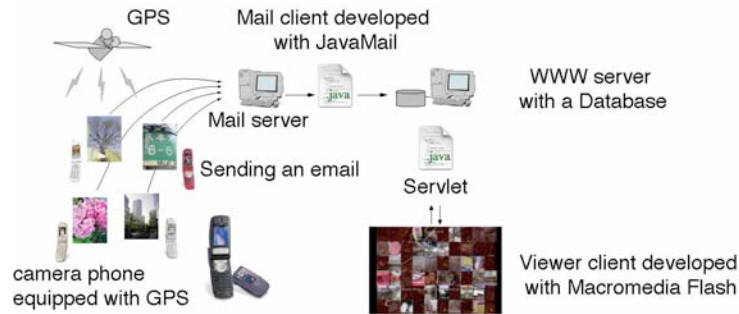
## 2. System



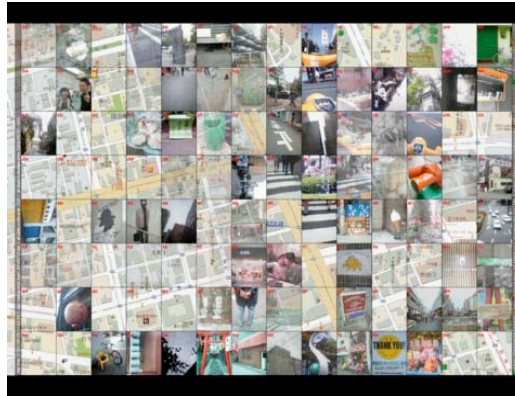**Fig. 1.** The system architecture in our system



**Fig. 2.** The viewer-client in our system: showing photos from camera phones on a map according to location information using a grid system.

Our system consists of a mail server, an email client developed with JavaMail API, a WWW server (Tomcat4.1.2) with a database (MySQL3.23.52), a Java Servlet and a viewer client developed with Macromedia Flash (Fig. 1). As a content provider, a person sends an email with a picture and location information attached to a destination email address which was decided beforehand. Then the email-client receives sent emails every one minute, and then obtains the email address of the user, the subject, the content text, the sent time, the latitude, the longitude and the attached picture from the received email and stores them into the database. The viewer-client sends a query which includes times, longitudes and latitudes to the Servlet every two minutes periodically. Then the Servlet sends a query to the database, and returns the searched result to the viewer-client. After receiving the searched result that contains information about sent emails, the viewer-client parses it and begins to download pictures from the WWW server, and shows pictures using location information on a map.

Our current viewer-client is assumed to show several hundreds pictures, and we have proposed a viewing interface that utilizes a grid system in order to cope with the

problems described in the section 1. In our system, each picture is mapped into one cell of the grid according to its location information. When a cell contains some pictures, it manages them with using a list sorted by the sent time. Each cell shows pictures sequentially with letting each picture fade in and fade out, and the loop of showing pictures is done in each cell in parallel. This enables us to see lots of pictures without overlapping and to see a map in an interval of a fade-out and a fade-in (Fig. 2).

## 3. Exhibition on a street



**Fig. 3.** Exhibition on a shopping street in Sendai.

We introduced our system on a shopping street in Sendai where is a large city in Japanese Tohoku region from 28/05/2003 to 01/06/2003. The client was projected onto the street using two projectors those were set on the shopping arcade (Fig. 3). We put a screen of 5.4m x 3.6m. It is made of retro-reflective sheet, which consist of thousands of precise prism particle per square inch and have superior reflection ability. The members of the photography club in Miyagi Univ. took and sent pictures to our mail server. They usually take pictures with single-lens reflex cameras and have also general exhibitions in galleries with putting their photographs in frames. Some members have mobile phones equipped cameras, however, it was the first experience for them to hold a photography exhibition using cameras in mobile phones and to have an exhibition on a street. They used the mobile phones equipped with cameras of 1.5M pixels and we showed about 700 pictures sent from mobile phones. However most of emails were sent beforehand by the photography club members, some visitors sent emails with using their own mobile phones in the exhibition period. This fact would show the merit that the utilized devices in our system are popular consumer products.

The street is one of the most active shopping district in Sendai and its location was in front of a long-established department store, and more passers-by watched it than persons who visited in order to watch it. They enjoyed seeing pictures sent from mobile phones while walking on the map. Such experiences, which are different from watching the client with a PC monitor, might encourage social communications

between users more actively. Estimating from the number of the leaflets that we handed, the number of the persons who heard our explanation is approximately 1000. Old and middle age persons tended to admire the technical features in our system which utilized location information by GPS and updated shown pictures automatically. On the other hand, persons from 10's to 30's tended to have interests in expanding the potential of sharing pictures mutually. Some persons asked us if they can send pictures taken with their own mobile phones or if they can send their own favorite pictures stored in their own mobile phones, and such reactions were peculiar to young generations. This difference would be resulted from the fact that sending emails with pictures from mobile phones is a daily activity to most of young persons but is unusual for most of old and middle age persons.



**Fig. 4.** Three motifs which would be peculiar to our exhibition in Sendai, "funny one" (top), "ground" (middle) and "one's back" (bottom).

We studied the motifs of the 700 pictures and had interviews with the members of the photography club. We compared the motifs taken by cameras in mobile phones with ones taken by single-lens reflex cameras those they use usually, and we found three motifs peculiar to mobile phone cameras. They are "funny one", "ground" and "one's back" (Fig. 4). "Funny one" means the pictures which took strange signboards or funny objects as they are without photogenic compositions. Such an activity will be caused from the feeling that they want to show such pictures to others naturally and to share such discoveries. In taking a picture and sending it to friends, a camera phone is quite easier than a general digital camera or a single-lens reflex camera, and this fact might had promote taking "funny one". The "ground" means pictures which took own feet, zebra crossings or manholes with turning cameras to the ground. The members of the photography club told that they had never taken pictures of such compositions in single-lens reflex cameras. The restriction of adding location information in taking pictures seemed to have aroused interest in the ground which is the coordinate plane to prescribe the place. The "one's back" means that there are few pictures taking a

person from the front, however, there are many pictures taking a back of a person. As a camera phone becomes popular, it has been worried that cameras in mobile phones might be used for taking a picture furtively. Some people show wariness when a stranger aims a camera in a mobile phone to them, and according to the members of the photography club, more people seem to show such wariness than when a single-lens reflex camera is aiming. Therefore it would be difficult to take a picture of someone else from the front, and as the result, pictures taking someone's backs seemed to increase.

## Discussion and conclusions

In this paper, we introduced our GIS using camera phone equipped with GPS and its exhibition on a street with a large horizontal screen. Such a spatial and public information space showing linked to the physical space would bring more chances of conversations between citizens than PC monitors or PDP displays. When walking on our map, most persons seemed to think that some interactions would occur by stamping the screen or according to the location of person. However we don't have developed such interactions, we will bring some interactions with embedding sensors in the floor screen or putting location sensors using image-processing or ultra-sonic above the screen in the near future. A camera in a cellular phone is different from a general digital camera in the point that it is equipped to send pictures to friends or acquaintances. When people send a picture from a camera phone, they would be motivated with emotions that they want to introduce their impression as a short message and a small picture. We studied about 700 pictures sent for our exhibition and found three motifs which would be peculiar to our exhibition. These motifs would bring discussions on a new photography in city spaces and on a new viewpoint to city spaces which mobile devices have brought us. Our system is developed not only for photograph exhibitions but also for supporting communications between citizens. We held workshops about town management in a city of the suburbs of Tokyo and will evaluate how our system can promote information exchanges among citizens and stimulate communications between citizens and bureaucrats of the city.

## References

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