

# InfoRod: A swing motion based information access method for a public area

Kyohei Kawada<sup>2</sup>, Jin Nakazawa<sup>1</sup>, Kazunori Takashio<sup>1,2</sup>  
and Hideyuki Tokuda<sup>1,2</sup>  
{kyo,jin,kaz,hxt}@ht.sfc.keio.ac.jp

## *Abstract*

*We present a swing motion based information access method for mobile devices in a public space. Recently, various media for public spaces exist, the poster, the signboard advertisement, and the street vision, etc. In InfoRod, the provider prints the swing motion code in those media. The user can access online information related to the media by swinging the mobile device according to the swing motion code, and the place where the code was seen. Therefore, InfoRod enables users to fetch online information even from a long distance.*

## 1. Introduction

The mobile devices such as a cellular phone and a PDA became widely used in the world now. We can access the network at any time and any place. URLs, two dimensional codes like PDF417, Maxi Code and QR Code that are the pointer of online information came to be drawn in the poster and signboard advertisement of media in the station, town and etc. The technique for taking a picture of two dimensional code drawn in media with the camera of a mobile device is the common method to access information in Japan now. However, this method must get close to the code nearby, and a user occasionally cannot approach the media in a public space. For instance, it is difficult to draw in front of the poster that exists on the other side of the platform at the station. The information access method should be available from a long distance.



Figure 1. Appearance of InfoRod use

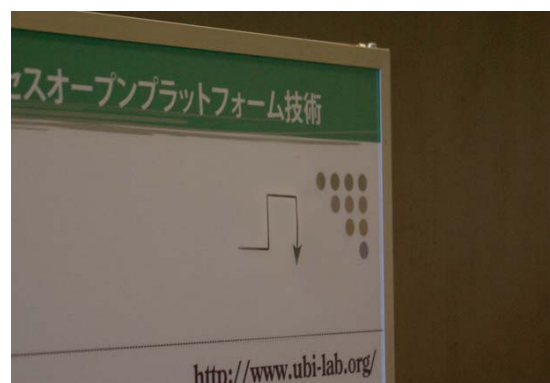


Figure 2. Example of InfoCode

<sup>1</sup>Faculty of Environment and Information Studies. Keio Univ

<sup>2</sup>Graduate School of Media and Governance. Keio Univ

## 2. InfoRod

InfoRod is an information access method in the real world that does not limit the distance between the user and the media. A user accessing information related to the poster by using InfoRod is shown in Figure 1. In InfoRod, the code of the swing operation is drawn on media as shown in Figure 2. We define this code as InfoCode. InfoCode of Figure 2 shows that the mobile device should be swung right, up, right and then down. The user acquires URL of online information related to the media by seeing InfoCode drawn on the media, and swinging a mobile device. The InfoRod application accesses the database, and inquires URL specified with the swing operation. We should design InfoCode to have many patterns so that InfoRod may specify information only by swinging operation.

### 2.1. Design of InfoCode

InfoCode has a role to inform the user of the swing motion necessary to access information. InfoCode should fill following three enumerated requirements. **1)** to generate abundant patterns, **2)** to operate in a short time, **3)** to recognize it from the distance. We designed InfoCode shown in Figure 2 that filled three requirements. The InfoCode is combination of some swing operations. The number of patterns that can be generated with the InfoCode is shown in Table 1. The InfoCode is easy to generate and manage the pattern, because it can express swing motion by the combination of four directional character string. For example, the InfoCode of Figure 2 can be expressed by the character string of "Right, Up, Right, Down". Moreover, the frequency that the user swings to one direction by all patterns is the same.

**Table 1. Number of patterns that can be generated**

Combined numbers	4	5	6	7
Number of patterns	108	324	972	2916

### 2.2. Combining with location information

InfoRod application specifies the targeted information by combining the swing operation and the location information. The targeted information can be specified only with the swing operation if InfoRod is used in limited space, but it can not be specified if InfoRod is used in infinite space. We enable the use of InfoRod by using location information. The provider relates and registers location information of media and the swing operation to the database. Subsequently, when the user accesses information by InfoRod, user's location information is acquired, and InfoRod Application is inquired of the database.

### 2.3. Feedback

InfoRod should return feedback to swinging operation to the user. In this paper, three kinds of feedbacks, the display to the screen, the vibration, and the sound are returned to the user. The user cannot recognize feedback by the display to the screen at the time of swinging. Therefore, a mobile device is vibrated as feedback to a swing operation. Moreover, different sound is produced depending on the swinging direction.

### 3. Implementation and Demonstration

The system of InfoRod is composed of the user side application and administrator side application and database. The system architecture diagram of InfoRod is shown in Figure 3. The user side application runs on the mobile device. After the swing operation is analyzed, the user side application accesses the database, and acquires URL. Afterwards, this application accesses online information by starting a browser. The manager side application is implemented as web application. The manager side application supports the management work of information on the network.

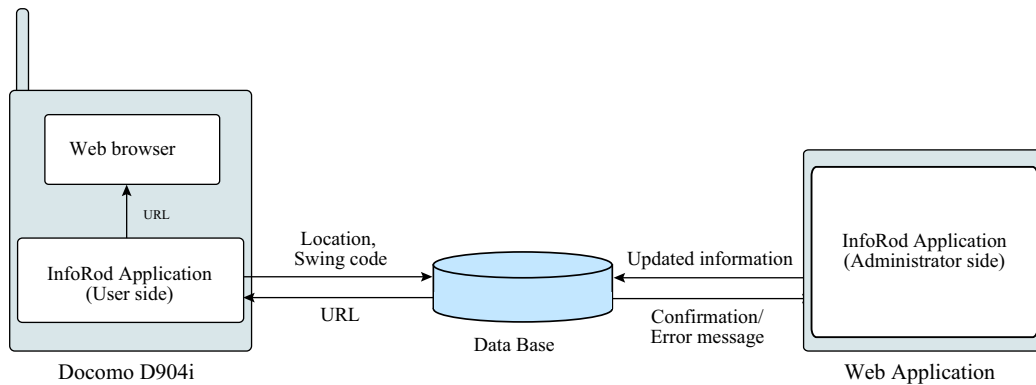


Figure 3. System architecture diagram

#### 3.1. Hardware

In the prototype, D905i of NTT Docomo, the Japanese cellular phone is used as a mobile device. D905i integrates three axis acceleration sensor and GPS. The user side application analyzes the swung direction from the data of the acceleration sensor. Moreover, it is also possible for D904i to reproduce the sound and the vibration.

#### 3.2. Software

We will demonstrate the detail of the user side application and the administrator side application.

##### User-side application

The user side application analyzes data from the acceleration sensor, and confirms the swing operation. When the swing operation is detected, three kinds of feedbacks are returned to the user. Figure 4 shows the screenshot of the swing operation is displayed. The location information is acquired from the database when the swinging operation is finished, it inquires of the database, and URL of information on the network is acquired. Afterwards, the application is accessed to the web page by starting a browser.

##### Administrator-side application

The manager side application manages information taht are to be accessed. In this application, information to be accessed can be registered, edited, and deleted. Registered information is displayed as a marker on GoogleMap. A detailed content can be edited by clicking the marker. Figure 5 shows

the screenshot of the administrator side application. After the user finishes working, the database is updated.

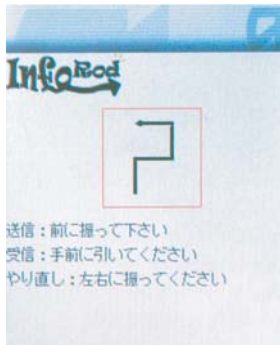


Figure 4. Screenshot of the user side application



Figure 5. Screenshot of the administrator side application

## 4. Related Work

The research that applies the focus to the distance between media and the user on a real space are "Mobile camera search" [1] and "Fractal Codes" [2].

Mobile camera search uses a technique to recognize a signboard by taking a picture of it in a town with the camera of the cellular phone. It registers the image of the media and the URL of related information in the database. Moreover, it analyzes the image of the media, and acquires the URL of information related to the media. This method can access information from a longer distance than the method of taking a picture of the small two dimensional code. However, the false recognition occurs when there are media of the design that is looks alike, because it analyzes the medeia by the image. Therefore, a media should look difference from each other.

Fractal Codes is a self-similar layout for two dimensional code complex. Fractal Codes solve the problem of recognizing narrowness that is the weak point of two dimensional code. However, this technique does not solve a fundamental distance restrictions.

## 5. Summary

In this paper, we proposed InfoRod that was an information access method in the real world that does not limit the distance of the user and media. InfoCode is the swing operation drawn in media on a real space. The user can access information on the network related to the media only by swinging the mobile device according to InfoCode. 29 people have tested InfoRod, and 93% of them answered it is suitable for distance use. In addition, 76% users were able to use without feeling the burden to operation that swings the mobile device.

## References

- [1] Takayasu Yamaguchi, Hiroshi Aono, and Sadayuki Hongo. Feature of signboard pictures using a mobile camera. In IEICE Tech. Rep., Vol. 104 of PRMU2004-105, pp. 1-6, Fukui, Nov. 2004. Thu, Nov 18, 2004 - Fri, Nov 19 : (PRMU).
- [2] Yuji Ayatsuka. Fractal codes: Layered 2d codes with a self-similar layout. Pervasive 2007 Advances in Pervasive Computing, pp. 83-86, 5 2007.