Mobile Web Publishing and Surfing Based on Environmental Sensing Data

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ABSTRACT

This paper presents a framework for mobile web publishing and surfing of mobile content based on the environmental sensing data, which is recognized by a cell phone equipped with active RFID transmitter/receiver, GPS and so on.

Categories and Subject Descriptors

H.3.4 [World Wide Web (WWW)]

General Terms: Experimentation, Human Factors

Keywords: RFID, GPS, web publishing, web browsing, location, sensor, personalization

1. INTRODUCTION

The excess and wide distribution of digital content on the WWW makes it difficult for users to efficiently access their desired content under the environment of cell-phone based web access. At the same time, the demand for personalized, life-style enhancing services (e.g., publishing and/or surfing the customized contents) on a daily life will increase. This paper proposes the sensing mechanism of the user's situational information captured only "at that place" and "at that time" via a cell phone, and also describes the mechanism of the content publishing and content surfing based on such sensing data.

2. SENSING USER'S SITUATION

Cell phone terminals equipped with a camera, a GPS receiver, active RFID transmitter/receiver (reader) have been developed by KDDI for trial purpose. Java application software can control these all functions and the web browser can be called by this java application. The snapshot of a cell phone equipped with active-type RFID tag transmitter/receiver and its features are shown in Figure 1 and Table 1, respectively. A cell phone has a capability of both receiving and broadcasting the tag-ID and the number of tag-ID can be controlled by a java application on a cell phone. Stand alone type RFID transmitter/receiver also has the same functions.

We first assume that three types of active tags are set every room in a building. First one is associated with the indoor location (Indoor location ID), the second one with the recommended information (Content ID), and the last one with nearby person (User ID for identifying the user) illustrated in Figure 2.

When a cell phone receives tag-IDs, the corresponding

information is got from a networked database called ID management server. Thus environmental information around the user can be captured via a cell phone [1]. (There are some related works such as [2].)

A mobile commerce using a contact-less smart card system such as FeliCa will come into fashion in the near future. From this system, we can get the histories of user's purchased items. In combination with the parameters of time, location captured by GPS receiver and nearby information captured by active ID-tags, the snapshot captured by this cell phone is shown in Figure 3.

Moreover, by using this cell phone, histories of user activities described below are collected:

a) Browsing recommended information displayed on a cell phone (automatic web access)

b) Instant publishing of favorites pictures and its annotation with the environmental situation (e.g. time, location and nearby person)
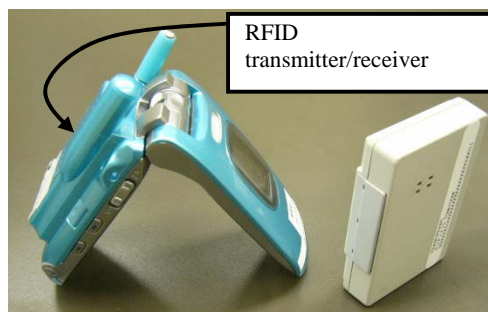

Figure 1. Active RFID transmitter/receiver. A cell phone attachment type (left) and a stand-alone type (right).

Table 1. Table captions should be placed above the table.

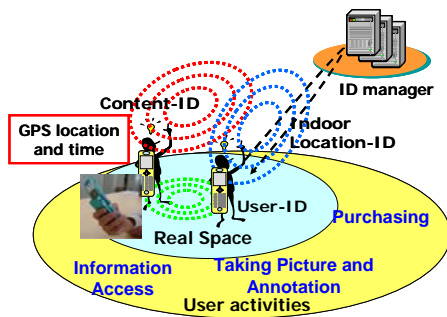|	
Operating frequency	315MHz
tag-ID bit length	variable (64 to 128 bit)
Read ranges	< 10m
communication protocol	RS-232C
Physical Characteristics	38mm*80mm*10mm
Rechargeable battery operation	Up to 10 hours

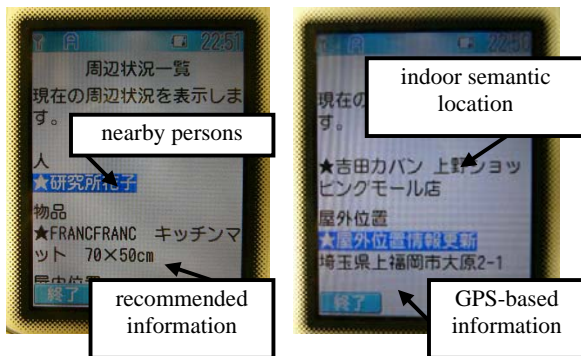**Figure 2. Resolving received tag-ID to corresponding information.**

Figure 3. A screenshot of cell phone display.

3. NOVEL MOBILE WEB PUBLISHING AND SURFING

3.1 Mobile Publishing

Figure 4 is an example of an instant publishing of a small content. This content is generated by time and location information, nearby persons, a favorite picture, detailed object information by using the technologies mentioned above. Blog-like web GUI could be also constructed by collecting these kinds of small contents generated by the user [3].

User activities in a daily life have been registered based on the user's intention via the proposed system. When a user comes back to the location where a user had registered some activities, a mobile terminal detects a current location and transfers this location information to this server via a web interface (http post/get). And then this server can get this user's current location, user activity information regarding previous activities at this location could be returned to the user's mobile terminal.

3.2 Personalized Content Surfing

The type of content that should be distributed to users may mainly depend on the user's current activities and/or demands. However it is difficult to obtain this information directly from users themselves. We therefore propose content recommendation according to the user's situational information and history of application usage on a cell-phone.

The content is also selected via the matching process between the user situation/usage history the content meta-data. Each time user movement from one area to another is detected, http request occurs automatically by a Java application and at the same time the situational information would be sent to a server, then the personalized content would be transmitted to a user's cell phone terminal.

Figure 4. A screenshot of cell phone based application.

4. CONCLUSION

This paper consists of a cell phone terminal equipped with an active RFID transmitter/receiver. The functions of capturing of both user situation and history of application usage on a cell phone have been developed and the typical publishing and surfing application have been also described.

In disseminating (publishing) user information, users are concerned about privacy issues. This reflects the tradeoff between permitting access to personal information and obtaining these kinds of services. So we are now in the progress of designing the privacy control mechanism using XACML [4].

5. ACKNOWLEDGMENTS

6. REFERENCES

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[4] XACML (eXtensible Access Control Markup Language), http://www.oasis-open.org/committees/ tc_home.php?wg_abbrev=xacml