"UBWALL", ubiquitous wall changes an ordinary wall into the smart ambience

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Abstract

This paper describes how smart ambience improves information services. For information services in a public space, UBWALL is developed named after "ubiquitous wall", which has a large display and eight-series of built-in RFID reader/writer so that people can get individual information appropriately by using IC cards (RFID cards) or mobile terminals. UBWALL is usually installed in a public space for the purpose of advertisements or directory services, where people can see both the public and personalized information at a time identifying user profile by touching with RFID cards. UBWALL was exhibited in several exhibitions and we confirmed its effectiveness and availability as a new system for information services.

1. Introduction

The purpose of ambient intelligence lay on that the computing capability would be embedded in anything and everything in the environment and that is getting into usual way to obtain necessary information at any time. We believe that the large display, being recently introduced for public spaces, shops or meeting rooms, will become core device for that purpose.

But at present, there is an issue that information displays show only unilateral and uniform information and it is not easy for people to find necessary individual information.

As for collaboration purpose, E. Scott et al. developed "Liveboard", the collaboration display device that supports group meetings even in separate area [1]. Liveboard propose innovative usage of the large display and is commercially available right now. Other approach is revealed in perceptual surfaces, which detects human hands by infrared ray camera and can interact with display [2]. Alois Ferscha et al. developed wall display which can access to the web site by mobile phones [3].

The purpose of those researches is only to interact with display easily but the problem is that the system cannot detect the person who is touching. If the system can not get the user's profile, the system cannot show the needed information for the person and results in people will be got lost in the forest of unuseful information.

If a system can detect who is touching or coming, information service will dramatically be changed. The personalized information should be provided in appropriate timing and appropriate location.

Most popular device in order to detect the objects or individuals is RFID tags [3]. Only touching a RFID reader by an ID card installed a RFID chip, the system can get the ID easily. RFID cards will be used for customer cards, commuter's tickets, and even for a boarding passes. Using the RFID card, the system can easily get the ID and make personalized information services quite conveniently.

As we described here, the circumstances themselves provide needed information to the right person at the exact time and location. We call the circumstances "smart ambience".

2. Developed System

In order to create smart ambience we developed interactive information service system that can get both public information and personalized information easily. An interactive display system UBWALL, which can sense individual preference and profile, and also provide needed information based on the identified attribution.

UBWALL consists of a large display, eight series of RFID reader, an infrared motion sensor and a controller (PC). To interact with UBWALL is quite simple; UBWALL displays public information to be aware by the people. A user get closer to watch that information, UBWALL detects the user by the motion sensor, and display some menu items. When the user selects one of the menu items by putting the RFID card on the RFID reader, the ID of the RFID card is input to the PC and detailed information or personalized information is displayed considering the user's profile.

This operation enables to provide information adapted for preference and situation of an individual since menu selection and ID input are done at the same time. UBWALL is equipped with wireless LAN as well, by which a user can download coupons or sample music to user's device and upload messages from the device. UBWALL is not only for getting information but also for providing information.

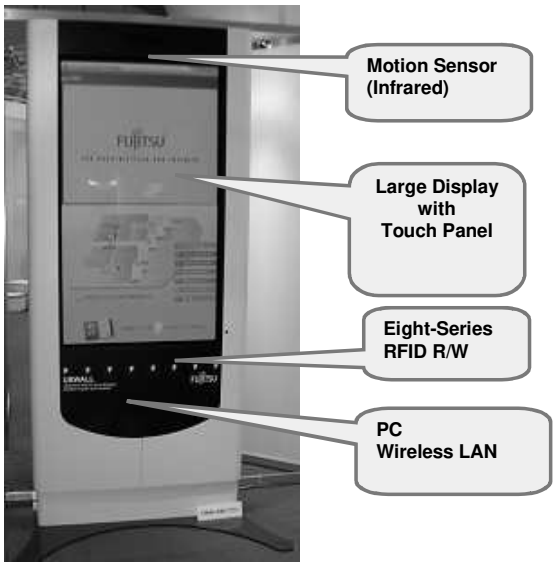

Figure.1 UBWALL PDP model

2.1. Appearance

UBWALL has different models: one is a PDP (Plasma Display Panel) model assembled with 63 inch PDP standing lengthwise, as shown in Fig.1, and another is a projector model assembled with 64 inch glass-screen standing breadth

wise in a wall of aluminum-framed small house, as shown in Fig.2. Other input/output devices and sensors are the same for both of two models except display unit.

Figure.2 UBWALL Projector model.

2.2. UBWALL Features

The feature of UBWALL is bidirectional interaction on "LARGE" display. It adds new functions to an ordinary display such as PC or mobile phone.
Another feature of UBWALL is easy design of the scenario using interaction rules to display information.

2.2.1. Large Display

Large display makes us easy understanding by allocating multiple data in an informative and visible ways, easy creation of findings of that in a ubiquitous environment, and easy corporation with advertisement or promotion on services and products.

2.2.2. Bidirectional interaction

We can operate UBWALL using personal belongings such as RFID card or mobile device. Personalized services are provided by identifying menu item as well as the ID in a single operation. It also allows simultaneous usages by multiple individuals or groups.

2.2.3. Easy design of scenario with interaction rules

We developed the XML base interaction rule format to display information based on a scenario, which enables UBWALL to act by touching with the RFID card. Only write down interaction rules like menu selection, display position, display timing and display individual information, you can easily add new scenario to UBWALL.

2.3. Applications

We think that most effective applications on UBWALL are information services in a public space such as guidance, advertisement, directory and any other similar information services. Simple operations with the RFID card improve customer services and effectiveness of promotion on large displays. Application examples of UBWALL are;

- Various information services at department stores or shopping centers
- Directory information and automatic coupon issuing at shopping centers and restaurant malls
- Promotion service of automatic download of sample music or promotion videos at music shops or cinemas
- Directory service at public spaces such as stations, airport terminals, hospitals, schools, town halls or museums
- Catalog delivery services

The following sections address scenarios we developed for UBWALL.

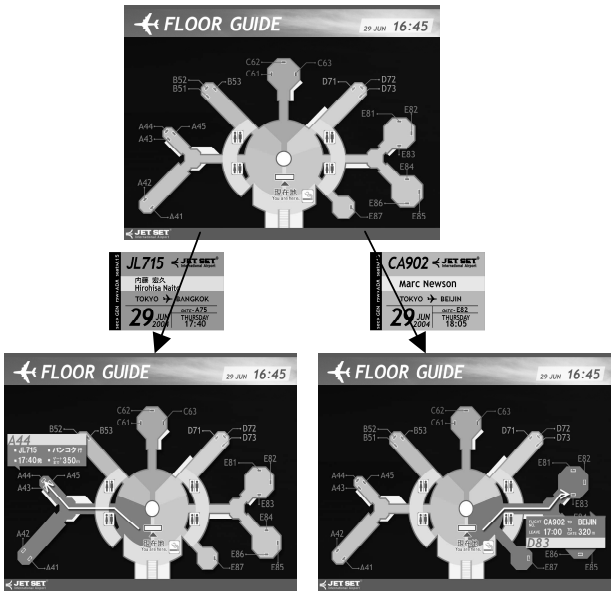

Figure.3 Screen Shots of Airport Scenario

2.3.1. Airport Scenario

Fig.3 shows some screenshots of an airport scenario. In an airport, there are flight information guide and gate map on large screen already. In general, users have to find out their concern information from many candidates showed on display. Using UBWALL we can avoid these inconveniences. We describe the scenario with UBWALL as follows:

1. UBWALL shows all departure/arrival information to all tourists.
2. For a tourist, first necessary thing is to get what should be done now depending on her/his flight.
3. When a tourist put his or her boarding pass or mileage card on the UBWALL RFID Reader, the ID is specified, then individual flight guide or gate information appears.
4. Shared and personalized information are under control adequately.

Figure.4 Display Image of Music Shop Scenario

2.3.2. Music Shop Scenario

UBWALL works for sales Assistance as a "KIOSK Board". It indicates "awareness", which assists shopping depending on customer's history, and helps sales promotion as well. Fig.4 shows display and PDA image of music shop scenario.

1. UBWALL shows music titles now on sales for promotion.
2. Customers find it and get interested.
3. Menu items are listed on your mobile device, and then customers can make selection for audition on it.
4. The music is transmitted to the mobile device wirelessly, and then it plays.
5. Customers can download the music after online payment on the device.
6. Multiple plays and downloads are permitted.

2.4. Interaction rule example

Interaction is written by the XML format. Fig.5 shows an example of an interaction rule for the airport map. Menu item's name to touch by the RFID card, the content's URL displayed depends on the ID, and so on are defined.

```
<Rule>
   <MenuName>airport.map</MenuName>
   <Id>D80001</Id>
   <Demo>AIRPORT</Demo>
   <Action
url="http://10.25.184.XX/WebService1/Service1.asmx"
method="putInfoOnPositionEx"
namespace="http://temp.org/">
         <Parameter name="width" value="1024"/>
         <Parameter name="height" value="48"/>
</Rule>
```

Figure.5 Interaction rule example

3. Discussions

UBWALL was exhibited in several exhibitions in Japan with more than 10,000 attendants for test marketing and verification of the system availability. We researched user's reaction especially about next items.

(1) Service value test
(2) User interface test
(3) RFID usability test

For that purpose we offered several scenarios described in section 2.3.

3.1. Service Value Test

User poll indicates that UBWALL is most appropriate for directory services and promotion services. We realized that those services at the airport or shopping mall are quite effective. Some raised privacy issues. UBWALL can detect ID by touching the RFID reader with user's ID card, which enables to display personal information directly. It will cause privacy issues, so UBWALL should be equipped not to display such information.
Though the data download services is effective, but right now there are few devices which can download the data with W-LAN in the market.

3.2. User Interface Test

Because of the touch panel display is very popular device, so at first, the people have the tendency to touch the display itself. Some people satisfied only touch and see general information with touch panel. In order to let them touch the RFID readers, we should consider adding incentives like discount service.

3.3. RFID Usability Test

To use RFID tag is quite effective because of easy interface and can detect who is touching, but some mentioned about how to deliver the RFID tag. In Japan, IC cards are getting very popular as a train ticket or prepaid cards, but other type of IC cards are required in other services. To possess many IC cards are very cumbersome, so compatibility or unification of IC card is important. Cellular phone with RFID or Unified ID card should be getting popular.

4. Next Development

In several exhibitions, the audience mentioned about the effectiveness, business potentials and problems of UBWALL. Considering these comments, we are planning to develop following issues:

(1) Seek variation of Wall materials (screen type, touch device type, and other sensor installation)
(2) Application Scenario: Home, Station, Office, etc.
(3) Improvement of issues of section 3
(4) Actual field trials

Current UBWALL has not enough intelligence as we can assert "smart ambience", so we are intending to install some intelligent functions. For example, smart station display that has agent ability to recognize user's profile by communicating with the cellular phone and provide smart information to guide them.
Also we are intending to analyze the advertising performance of UBWALL in a shopping center or a public space. To trace the most selected information, UBWALL can analyze which is the most valued information. We will also enhance the features of simultaneous use by multiple users and verify the result of usability and promotion effectiveness.

We hope UBWALL opens the next era of having more opportunity using computing through screens (walls) you happen to find out.

References

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