An Infrared Digital Contents Broadcasting Service for Mobiles

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Abstract:-This paper presents a contents delivering system for mobiles with Infrared devices that support IrOBEX. To realize digital contents broadcasting service by infrared communication, we developed a new Infrared data delivering protocol IrFAST and implemented the protocol in a Palm PAD platform already. It is not easy to implement the protocol IrFAST in most of mobile, because the mobile makers do not open the platform sources in their mobile products and also most mobiles do not support lower layer development. But recently more and more mobiles such as FOMA by NTT Dodomo have IrOBEX on board and also allow users to access IrOBEX in Java application. Therefore, we developed a portable infrared receiver, which support both IrFAST and IrOBEX. With our infrared receiver, we can get and save the broadcasting data with IrFAST protocol, then transfer the received data to a mobile with IrOBEX. The mobile users can browser the data transferred from the infrared receiver, and even access the URLs Those are included in the data. Here, we will introduce the system and devices, and give an outline about the every parts in the system. In order to confirm the performance of the infrared digital contents delivering system and its devices, we have been carrying out an experiment with more than 100 monitors in a university campus. This experimental broadcasting system provides teaching and living information and other commercial information. We hope that we not only confirm the performance of the infrared protocol and system, but also find some new application model for the new infrared broadcasting service.

Key-Words:-Infrared, IrDA, IrOBEX, Communication protocol, Broadcasting system and method, Database

1 Introduction

As a result of the first strategy of ”the e-Japan strategy” advocated by Japanese government, an IT foundation environment Has been almost realized by 2003, and now more and more researches are focusing on possible applications based on the rapidly prepared IT foundation environments. It is assumed that mobiles and personal digital assistants must show an leading role to realize a coming ICT society, but there is still a little service that is specialized to mobile users, while a personal digital assistant shows remarkable performance improvement. Because of remarkable increasing needs for higher speed communication and larger contents transmitting, it has been recognized that the current radio frequency resources will hardly cope with increasing larger capacity and demand of high-speed mobile data communication. In late years, rather than conventional sound service, mobile data communication service increases magnificently, and hides some future huge new markets and business possibilities. With advancing social diversification, it is expected that the demand of regional information delivering will increase greatly. Therefore, a new type communication media for mobile terminals, which provide a new style contents delivering service with a low electricity power consumption, will be a great support for coming ICT society. Here, we put our focus on infrared communication. It is well known that infrared can not pass any obstacle and has an strong directivity, but infrared has the following prosperities: 1) very higher rate communication than radio wave; 2) no bad influence to human as radio wave; 3) high security. With a broadcasting protocol and specialized infrared transmitter, a lot of reception areas without interferences each other, can be built easily in a spot space. With infrared broadcasting service, more

than one users can receive the broadcasting contents at the same time, the communication rate will not be affected by the number of users who use the infrared transmitter. We assume that the new infrared communication style will provide more possibility for coming ubiquitous information society under the condition of more and more demands for limited wave radio frequency resources.

We have developed a new infrared broadcasting protocol to realize the above purposes and had a very successful experiment in a JR station.[1] In this system, we developed a contents delivering system based on a Palm platform. Because it is the fact that the high performance mobile devices have been spread at a very high speed, it must be very important to realize our infrared broadcasting for the huge amounts of the mobiles. To realize it, we developed a new system, that allows the most mobile user receive the contents from infrared transmitters. In this paper, we will introduce our new system, devices, databases and data browser. Finally, the experimental contents delivering system in the campus is explained also.

2 Infrared Broadcasting System Summary

The infrared digital contents broadcasting system provides a new style communication media for delivering contents to mobiles or other portable information terminals. As shown in Fig.1, there are database and network access service, contents input clients, infrared broadcasting transmitter, portable infrared receiver and mobiles or other information terminals with infrared devices in the infrared contents broadcasting system.

Here we explain the information flow in Fig.1. The Access authentication server and communication management server provide services for networking accessing authentication from contents inputs clients and infrared transmitters and mobiles. Without the authentication, the above clients and devices cannot access the database for contents broadcasting or delivering. The contents server is used to store the contents data for data broadcasting. WEB servers provide more information that cannot be provided in the contents broadcasting. Based on broadcasting schedules or mobile users' request, the broadcasting data including the selected contents from the contents server will be created, then sent to the infrared transmitter device with

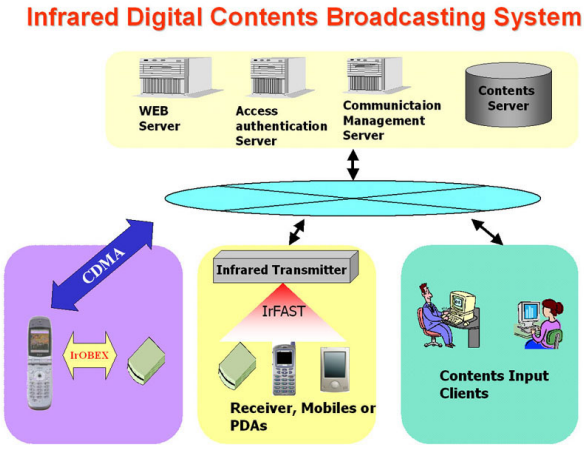

Figure 1: Infrared Digital Contents Broadcasting System

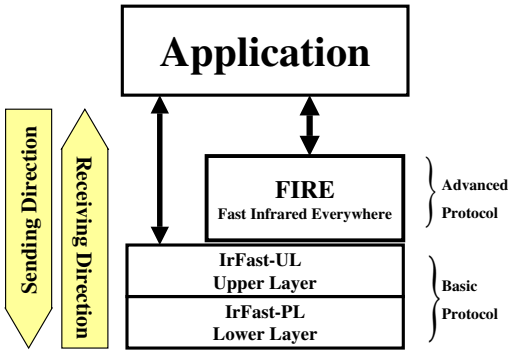

Figure 2: IrFAST protocol stack

Internet. The infrared transmitters send the contents data with IrFAST to some infrared receivers or mobiles or PDA, which are in the broadcasting area of the transmitter. Then the mobiles or PDA will show the broadcasting data. For those mobiles that cannot receive the broadcasting data with IrFAST, the portable infrared receiver will be a good selection. The IrFAST protocol shown in Fig.2 can provide a 1:n style communication without response from the receiver side. For transmitting the contents from the infrared transmitter to the portable infrared receiver, an IrFAST protocol is developed and adopted here. IrFAST protocol has following characteristics:

1) Any negotiation connection is not necessary for data transferring, therefore an infrared transmitter can provide broadcasting service for more than one device at the same time.

2) with proper setup, the broadcasting service area can be control at a very high accuracy.

3) very low power consumption, it is very important for a portable device.

4) If necessary, more powerful code correction algorithm such as BCH, may be used to achieve a better data transferring reliance.

For the receiver do not with display function to realize a very low cost, we need to transfer the data received from the receiver to a device that can show or operate the data. Here we use a mobile that support IrOBEX. To view the contents, the broadcasting data stored in the infrared receiver will be sent to the mobile with IrOBEX. While the mobile users view the contents, they can access the web sites, which URL are included in the data, for relation information. In following sections, we will describe the main parts of the system separately.

3 Contents Management Service

In order to realize an efficient contents broadcasting to most infrared receiver or mobile users, it is very important to provide an effective and high performance contents management service for the system. For contents management, at least, contents inputs or modifications, contents data storing, broadcasting data selecting, broadcasting data generating and security authentication for various clients and users should be provided by the contents management system. Because of the restrictions of the infrared transmitter and broadcasting data period, there is a limit for broadcasting data size. In order to broadcast the contents data from several contents providers and generate it under the restrictions, we present an approach to deal with the above problem. In our system, every contents providers (such as Client A, B, C in Fig.2) can input the contents to the database, then select the contents data as candidates. Based on the restrictions of every infrared transmitters (such as transmitter I, II, III in Fig.3), there is a pre-established model for every transmitter. Therefore, a correct broadcasting data can be generated based on the above data model.

Fig.4 shows a layout of client window for contents management. With the client, the contents editing and contents selection can be realized in any browser platforms. The contents provider can use their own computer, which can access Internet, to input or edit their

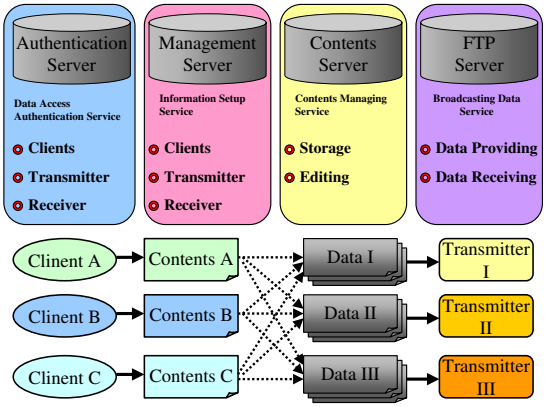

Figure 3: the Contensts Management System and Main Functions

contents for broadcasting. Such clients bring them much freedom for contents management.

Figure 4: a Client window for contents management

4 IrFAST Transmitter and Portable Infrared Receiver

As shown in Fig.5, the infrared transmitter has six parts: 1) a network interface, which provides a convenient connection or access with internet to get control or contents data from contents management system; 2) a data memory, which is used to store contents data and control data (broadcasting schedules or etc.); 3) IrFAST data converter, which provides a data convert service for broadcasting with IrFAST protocol; 4) a Infrared Signal Processor, which deals with the converted data for Infrared sending; 5) an infrared

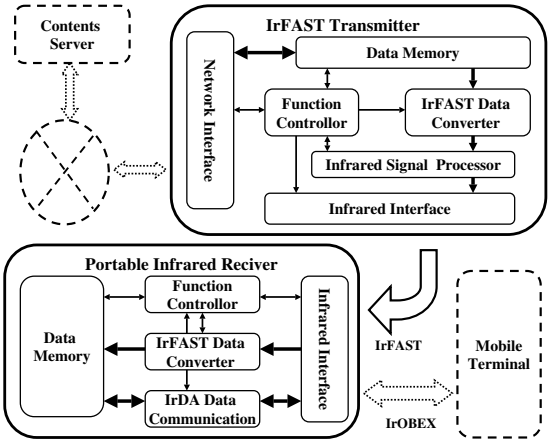

Figure 5: Infrared Transmitter and Reciver Structure

Infrared Transmitter Infrared Receiver and Mobile

Figure 6: photoe of Infrared Transmitter and Reciver

Interface, which supports IrFAST protocol and provides infrared signal generation. 6) a function controller, which controls other parts of the transmitter and achieve the broadcasting based on the broadcasting schedule.

Also in Fig.3, the portable infrared receiver has followings parts: 1) infrared interface, which supports both IrFAST and IrOBEX protocol, and realize the data receiving and sending in both IrFAST and IrOBEX; 2) IrFAST data converter, which proivdes a data converting function; 3) IrDA data communication, which support the IrDA protocol and realize data transmitting from the receiver to the mobiles; 4) data memory, which is used to restore the data received with IrFAST; 5) function controller, which control all other parts and have them cooperate smoothly.

Fig.5 shows that the data flow is from the infrared transmitter to the portable infrared reciver, then to the mobile finally.

The photoes of the infrared transmitter and the portable infrared reciver are shown in Fig.6. In this system, the highest data rate implemented is 115200bps for both IrFAST and IrOBEX. This transmitter can cover a sector shape area with 30 meters radius and 60° angles as service area. With an unique approach, up to 95is realized, it is much higher than normal IrDA. With the IrFAST, more than 10KB contents can be transfered in per second using SIR of IrDA.

5 Contents Browser uiRBC for Mobiles

In this system, a mobile with infrared device which support IrOBEX, is used to view the broadcasting contents, which are transferred from the infrared receiver, which support both IrFAST and IrOBEX protocol. It is necessary to provide an interface for data accessing and viewing. Fig.7 shows the main parts of the contents browser, which is named as uiRBC In browser uiRBC, there are four layers, 1) top menu window, which provide main categories selection icons and a system menu that is used for other system operation, such as user information setup, IrOBEX data transferring, data management, help information and etc.; 2) contents list for selected category; 3) a content display windows, which is used to show the contents itself in detail; 4)a module for showing available web information by URL that is given in the above content. We made a protocol for content data, which support content with characters and other multimedia such as image, voice and movies. The uiRBC have two version now, which support FOMA (NTT docomo) and Vodafone P5. For example, in order to use the service, a mobile user will download the Java program from a specified URL, then input user information and password for registration. After the above operations, the user can use the uiRBC to get data from the infrared receiver and view the data with his mobile terminal. As future function, which may bring the mobile user more freedom to access some detail information, which is concerned by him only, a network access ability using URL information in the contents, will be added to the uIrBC.

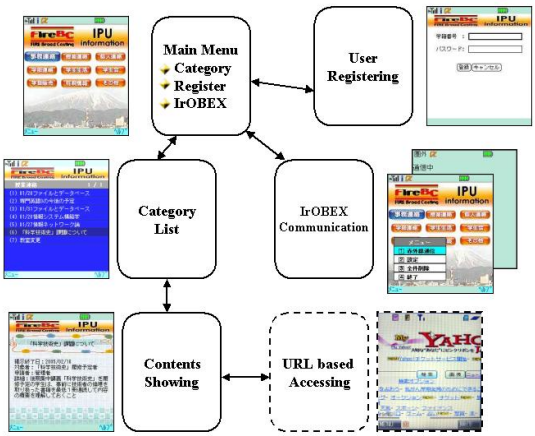

Figure 7: uIrBC Browser

Figure 8: Experiments in IPU Campus

6 the Field Experiment in IPU Campus

It is very important to estimate the performation of the infrared contents broadcasting system outside laboratory environment. It is also very helpful to get many ideas or comments from more users for future system improvement. Here, we planed an large scale field experiment in our campus (Iwate Prefectural University). To carry out the field experment in the campus is based on the following reasons: 1)almost all campus students have mobiles; 2)the young students are most active group for mobile users; 3)it is very easy to collect enough monitors for the experiments with a very low cost (for we do not need to provide mobile, what we have to provide is only the infrared reciver, which is much low cost than an high performance mobile) 4)in the campus, there are messrooms, shops, ATM cornor, library and etcs, we can use them for simulating possible applications in society environment, such as restaurants, shopping malls, banks or public facilities. In our experiments, as shown in Fig.8, we set 6 transmitters in campus shop lounge and break corner area, entrance areas of every faculties. For the monitors are mainly selected from students, the broadcasting contents are selected from teaching information (administration announcements, faculity announcements), stuents living information (parttime work information, apartment information) and shopping or entertaiment information for students.

7 Conclusions

To provide a new service for rapidly increased mobiles and other portable information devices, we present a new style information broadcasting system with infrared optical media. In the system. In this system, a new portable infrared receiver has been developed for providing a connection between IrFAST infrared broadcasting transmiter and IrOBEX mobiles. With the receiver, a mobile user can get the contents sent from a infrared transmitter, and view or access the data with his mobile terminal. To provide the contents with an efficient manner, a contents management server providing contents management service, transmiter control and mobile user security management is constructed. To confirm the performance of the new system and get more useful information from mobile users, we have been started a large scale field experiments in Iwate Prefectural Univeristy. Now the system provide students contents broadcasting service in six spots, we hope we can collect enough useful information for our future study.

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