

Development of User Customized non-contact Platform based on Mini PC and Short-range Wireless Data Communication Sensor

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ABSTRACT

Due to a rapid growth of smart phone market, the development of a new network and the expansion of internet communication and platform technology make a huge amount of information exchange possible in real time. A smart phone market has transformed into a user-centered market, satisfying the user's requirements. The convergence of smart device and the IoT (Internet of Things) technology are underway using big data. This paper introduces the development of user customized non-contact platform connecting a mini PC and a short-range wireless data communication sensor. We verified the possibility of application of this platform in the household electric appliances.

1. INTRODUCTION

Since the smart phone had released nationally in 2009, the smart phone market has sharply grown (Serge A, Rijdsdijk & Erik Jan Hultink, 2009). In 2010, our society has become the hyper Connectivity Society (Romina Aducci *et al* 2008) because of the rapid expansion of the Internet network. The Internet users adapting to the new network environment exchange a huge amount of information in real time and use various service platforms. In addition, the smart device market has been expanded to meet requirements of the users who use smart phones (Robert W. Veryzer and Brigitte Borja de Mozota 2005). The customized service for users has become an important requirement to improve convenience and efficiency which provides various information without restriction of time and place by IoT technology (Atzori, L., Iera, A., & Morabito, G. 2010) using big data. So far, various smart devices provide a customized service which show desired contents by using a display in real time. Recently, the display of the smart device has been developed to provide the customized service using the short-range wireless data communication beacon, Wi-Fi, and NFC.

This has increased the need for research to recognize and analyze the users and to provide customized services.

This paper proposes a new platform to provide a customized information using a mini PC and a short-range wireless data communication sensor. The new platform is designed to use the user's cognitive technology based on the analyzed user settings. By developing a home model platform, a relatively small-scale unit, it is possible to confirm the possibility of development in all environments in the future.

2. DEVELOPMENT OF USER CUSTOMIZED NON-CONTACT HARDWARE MODULE

By developing a household appliance model, the user customized service platform is proceeded for a common household environment. It is a compact mini PC which is smaller than a desktop PC but has similar components and characteristics of low cost, high performance, and high efficiency. It can be easily developed because it provides an easy learning method, and an open source of mini PC. We developed a user customized non-contact platform with Raspberry-pi controller based on mini PC for the household. As shown in Figure 1, it consists of 1GB RAM, 900MHz quad-core, 4EA USB ports, Ethernet environment, and Broadcom Video Core IV with B type of single board computer Raspberry-pi 2 which is advantageous for image processing and high-speed processing functions (R. Matt and S. Wallace 2012).

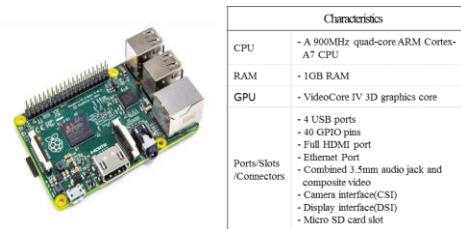


Figure 1. The characteristics of Raspberry-pi 2 Model B.

As shown in Figure 2, Raspberry-pi connects to the smart phone through the wireless data communication sensor beacon and Bluetooth to detect the access to the display and transmit the user's data.

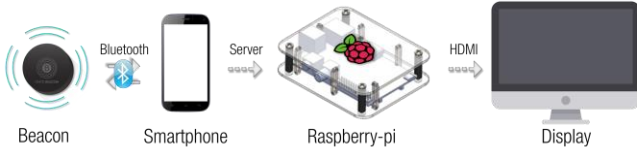


Figure 2. Hardware connecting system of Raspberry-pi and wireless data communication sensor.

As shown in Figure 3, Raspberry-pi, which transmits the user's data, was connected to the display by HDMI cable and the data output was performed.

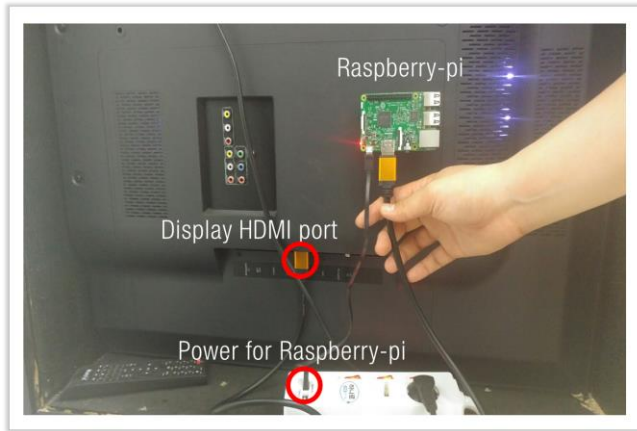


Figure 3. Connecting the back of the display and Raspberry-pi.

Beacon was attached to the back of the display to detect the distance between the smart phone and the display and transmitted the data in real time.

3. DEVELOPMENT OF USER CUSTOMIZED NON-CONTACT SOFTWARE

Since Internet-based mobile devices are advanced, the new networks have been expanded using smart phones and a diverse communication technology have developed and the research on IoT has been actively performed. As shown in Figure 4, we designed the configuration of a user customized non-contact platform that provides customized information through the IoT.

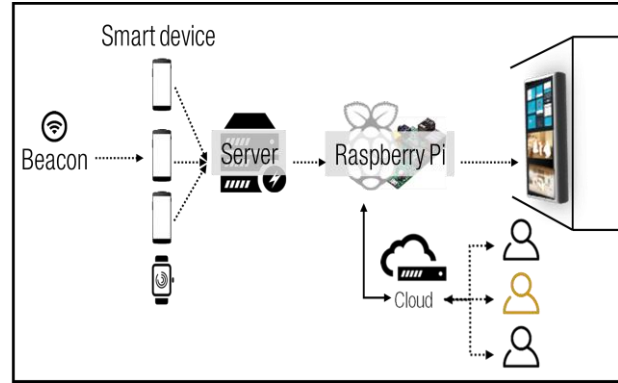


Figure 4. The system configuration of Raspberry-pi and wireless data communication sensor.

As you access your server through a smart phone connected via Beacon and Bluetooth communication, Raspberry-pi sends the user's unique number to the designated display to identify the user's location and detect the distance. As shown in Figure 5, the cord is configured to recognize the beacon in the smart phone.

```
private void checkDoorProximity(int rssi) {
    if(rssi > mCriteriaDoor) {
        time_detect_door = System.currentTimeMillis();
        if(isNearbyDoor == false) {
            if(time_detect_door_first == 0) {
                time_detect_door_first = System.currentTimeMillis();
            }
            if(System.currentTimeMillis() - time_detect_door_first > TIME_DETECT_DESIDE) {
                isNearbyDoor = true;
                time_nearby_door = System.currentTimeMillis();
                check_door.setChecked(isNearbyDoor);
            }
        }
    }
    /*
     * 비만이 멀리 떨어졌을 때
     */
    else if (rssi < mCriteriaDoor - 5) {
        if(isNearbyDoor == true) {
            if(System.currentTimeMillis() - time_detect_door > TIME_CANCEL_DESIDE) {
                time_detect_door_first = 0;
            }
        } else {
            mHandler.removeCallbacks(runnableFarfromDoor);
            mHandler.postDelayed(runnableFarfromDoor, TIME_KEEP_PASS_DOOR);
        }
    }
}
```

Figure 5. The recognition of smart phone and Beacon.

Figure 6 show the Apanata Tool in the PHP5 version to run the server system.

```
#!/usr/bin/perl
use strict;
use warnings;
use LWP::Simple;
use JSON;
use HTTP::Request;
use HTTP::Response;
use HTTP::Status;
use Data::Dumper;

my $url = "http://192.168.0.100:8080/api/v1/door/doorstatus";
my $header = {
    'Content-Type' => 'application/json',
    'User-Agent' => 'Mozilla/5.0 (Windows NT 6.0; WOW64; rv:31.0) Gecko/20100101 Firefox/31.0'
};

my $method = "POST";
my $body = {
    "door_status" => "open"
};

my $request = HTTP::Request->new($method, $url, $header, encode_json($body));
my $response = get($request);

my $json = decode_json($response->content);

my $door_status = $json->{door_status};

print "Door status: " . $door_status . "\n";
```

Figure 6. To provide the user customized data for drive servers.

In smart phone application, the login information stores information that accesses the server with unique ID value. The beacon ID value, signal strength (dB) attached to the display and user information is transmitted to the server. The user who accessed the display is identified, and the output information is determined by combining user information and Beacon information in the service.

4. USER CUSTOMIZED NON-CONTACT APPLICATION

The real-time display allows you to enter the user's information through the application of your smart phone. We can use other functions such as changing the display layout of the display. In addition, QR code recognition confirms the details of the information marked on the display. It detects the smart +phone of the user accessing the beacon mounted on the display that interface and the provided service by the user are grasped. Figure 8 shows a model in which a college student approached the display at a certain time.

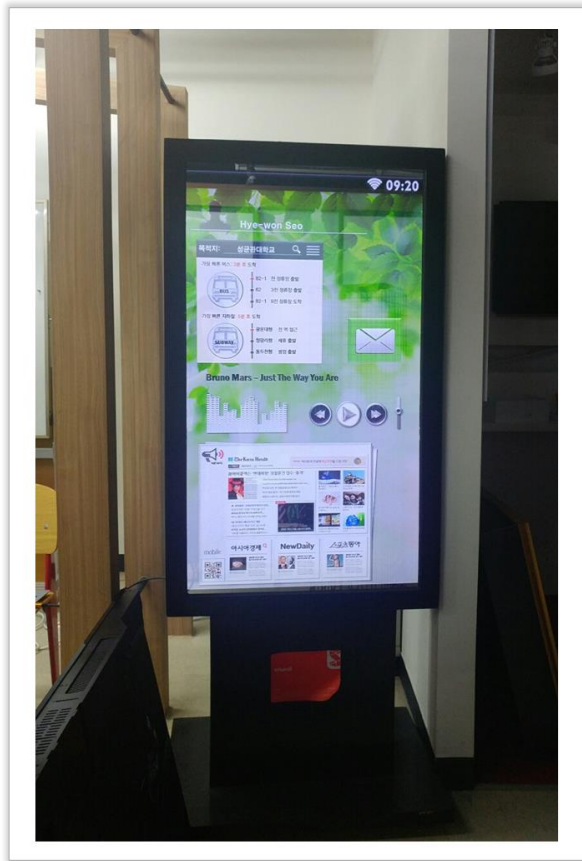


Figure 7. Providing information through real-time display in home environment.

By just reaching to the display, you can check real-time public transport information, check messages and set up music streaming service or news gathering service in your

spare time. When accessing the display, contents such as shopping information, movie information, TV program information, and SNS information can be checked according to the user's requirements. This paper shows the user customized non-contact platform. It can be applied to various places as well as home, and to provide information to users immediately.

5. CONCLUSION

The user customized non-contact platform based on mini PC and a short-range wireless data communication sensor provides user-customized streaming services in busy life through the real-time display. It is also expected to improve the quality of the life by the developed smart devices, providing the customized information.

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