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Research paper

Implementation of Mobile Smart Key System using the NFC Function of the Smartphone

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Abstract

As the numbers of traveler increases and BYOD culture spreads, this study developed a smart key system using NFC of smart phone that allows people to use their smart phones to easily make room reservations and enter their rooms without separate keys. This system attempts to resolve difficulties experienced while managing and utilizing accommodations from a distance, difficulties experienced when users lose keys or forget their password and in communication between users and managers. The test results in the actual locker management, it is very useful to utilize of the locker administration in the various place, as well as useful accommodation. The implemented smart key system has the benefit to control the Doorlock without a secret number.

Keywords: *BYOD, NFC, Raspberry Pi, Smart key*

1. Introduction

Recently, many people have been finding interest in traveling such as in theme traveling and backpacking in order to gain a sense of freedom from work stress and unemployment problems. In actuality, travelers have increased 23% COMPARED to last year and domestic lodging and domestic traveling have increased 28% and 40% respectively. Also, foreign tourist inflow is also increasing due to differentiated marketing. At this, various forms of accommodation other than hotels such as pensions, apartments, and guesthouses are opening up.

Accommodations are the most needed thing to travelers. In fact, surveys asking factors of consideration when planning domestic travel showed that 68.2% responded that they considered 'accommodations' to be the most important, making it the second most chosen response. Also, after surveys were conducted on natives and foreigners on what was most inconvenient when traveling, foreigners responded that language problems give them the most inconvenience with a response percentage of 78% and natives responded that key management was the most inconvenient when using apartment or pension facilities. They responded that keys were often lost or pass codes forgotten.

At this, with the recent increase in travelers and the spread of BYOD culture, this study attempts to develop a mobile smart key system for home sharing with which people can easily reserve rooms at accommodations or use accommodations without separate keys using smart phones, which are now widely possessed.

2. Design of Smart key System

2.1 Sequence Diagram for System flow

The smart key system architecture is largely divided into the 3 functions of 'cellular phone', 'server', and 'door lock'. If reservations or payments are made through the web using a 'cellular phone', a pass code is transmitted to the server. The 'server' transmits the pass code received from the cellular phone to the Doorlock and keeps it registered. The 'server' sends the reservation/payment information to the manager via text. The cellular phone stores the pass code onto the NFC system. Because the NFC system acts as a smart key which opens the Doorlock, the 'Doorlock' receives the pass code and reservation dates from the server and stores them and if the dates have passed or are incorrect, the pass code changes back to its default value. The pass code received through the cellular phone's NFC system is compared with the registered pass code and if it matches, the door opens. If it does not match, an alarm sounds.

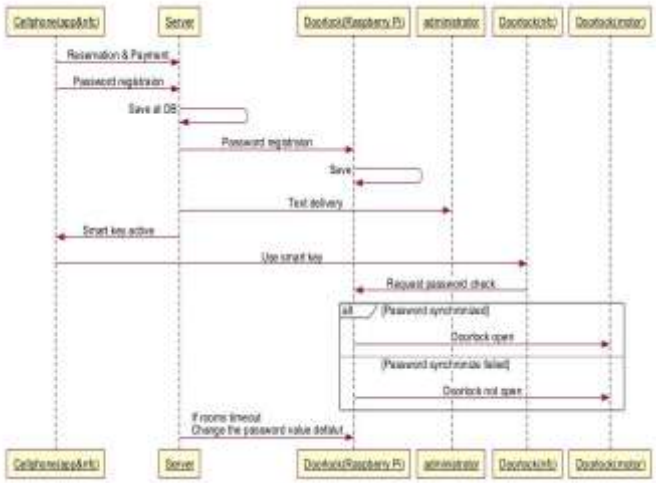

Figure. 1. Smart key System Flow Chart

2.2 The Execution Screen for Smart Phones App

The executing screen of the implemented app is shown in "Fig. 2". First, execute app and select pension. If booking is available on the date you want, after select the scheduled date click the schedule button. When you enter the correct password has been granted, the smart key button is activated when you click the button it is possible to use the smart key. ① Executed App ② After selecting pensions booking check availability ③ Click the reservation button ④ Creating a smart key button.

Figure. 2. The Execution Screen for Smart phones App

2.3 System Configuration, Application and Testing

This system consists of 2 Raspberry Pi, iptime, NFC, a breadboard, a smart phone, and a motor. The Raspberry Pi and iptime construct the server and another Raspberry Pi activates the NFC and motor according to the NFC input value. Fig.3-② is a region that recognizes the NFC, Fig.3-③ is a screen to install the Raspberry Pi with NFC inside a locker. Then shown in "Fig. 3".

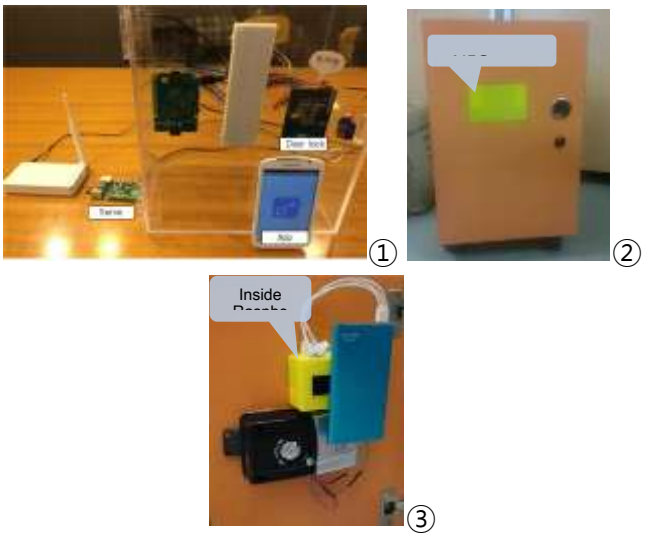

Figure 3. System Configuration, Application and Testing

3. Conclusion

Recently, the Internet of Things is a trend to control things with your smartphone. IOT is the technology that a built-in sensor and a communication function to connect to the Internet, various kinds of things. In addition to these technical people it was required for more convenient storage of data with high security and utilizing technology. As the number of traveler increases, this study attempts to solve the following inconveniences that travelers have in their use of accommodations. First, it attempts to solve difficulties that are experienced transferring keys when running accommodations from a distance. Second, it attempts to solve difficulties managing keys such as with the loss of keys. Third, many foreigners use tourist accommodations and it attempts to solve difficulties in communication by allowing foreigners to go through accommodations use processes through the internet without the need for face to face communication.

At this, it materialized a smart phone application, NFC, and server program which allows accommodation to be used automatically from reservation making to smart key use. Accommodations managers can manage reservations, smart keys, and check-outs automatically from a distance and users can use their smart phones to conveniently reserve accommodations and use smart keys. By using this system, the inconvenience of lost keys is removed, inconveniences due to language barriers reduced, and it allows for various accommodations to be managed automatically from a distance by a single person. If functions are perfected more, it will be possible for smart keys to be applied not only to accommodations, but also to studio apartments, accommodations for exam takers, gyms, and station lockers.

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