

A Bluetooth Based Mobile SW Platform Application: Smart Finder

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Abstract - With the development of smart high technology related terminals, people's life style has been gradually changed. While electronic devices become smaller and smaller, people often misplace their belongings. This can arise to seriously problems for the person in case of valuable information lost. However, most smart devices have Bluetooth capability. Bluetooth is a radio networking protocol in a short range to communicate electronic terminals wirelessly. In this paper we propose a system, smart finder, to find misplaced objects based on Bluetooth technology. We reviewed Bluetooth technology and then designed hardware and software architecture for smart finder application. It has been shown the possibility and capability for many applications.

Keywords: Bluetooth, smartphone application, RF communication, smart finder

1 Introduction

As of 2012, research shows that 63.7% of the current population owns a smart device and that the average household has 0.64 of these devices. This dramatic increase shows that smartphones can provide effective information processing for daily activities [1]. Most smartphones have Bluetooth capabilities that can provide easy wireless connections. In the current complex society cognitive abilities and memory is becoming a major interest. Many problems can arise from the inability to remember. For example if you lose your car keys, wallet, phone etc. you use time to find those objects. If you lose a USB or something that contains valuable information, that information can be used against you. We explored this project to prevent from accidents as mentioned above.

2 Related Research

2.1 Bluetooth

While there has been an increase in smartphones that have NFC (Near Field Communication), there has not been an increase in applications that use NFC. Google enabled the use of their Google Wallet app without the use of NFC [2]. Unlike NFC that is limited in use of terminals, Bluetooth is supported by various terminals and is a short range, low power, low cost wireless interface. It uses 2.4GHz, ISM (Industrial Scientific Medical) frequency band which does not require a separate

license to use. Also the 1MHz bandwidth is divided into 79 channels and uses FHSS (Frequency Hopping Spread Spectrum) to hop through the channels. The range of Bluetooth is from 10 - 100m depending on the power class and the fastest transfer speed is 1Mbps (723.2kbps) [3]. We listed some prominent features of Bluetooth below

- Low energy cost
- From Bluetooth 3.0, transfer speed of 24Mbps has been supported. Possibility of short distance wireless LAN connections using the advantages over massive data transfer.
- From Bluetooth 4.0, it has been reported that the energy usage has been reduced upto 100 times.

2.2 Lost protector

As the number of electronic devices has increased, we looked to create an App that could prevent missing items. We used RF which is wireless to ring an alarm when the distance increases beyond the set limit between the user and object.

3 Implementation Design

For this research we attached a reduced H/W to the missing object. The final goal of this research is to integrate the compact tag to Bluetooth communication and distribute commercially.

3.1 Experimental system and H/W design

The smartphone application we used in this research was developed using Eclipse development tool¹. H/W coding was done through AVR Studio 4.1 and the Bluetooth module and MCU parts were manufactured by Firmtech Corp's FB155BC² and atmega128³ respectively. Figure 1 shows a specification of BT configuration that is one of utilities provided by Firmtech Corp. for Bluetooth module setup. By assigning the role as "slave" and the smartphone as "master", we allowed the smartphone to find missing items.

As the Bluetooth module FB155BC requires 3.3V, we need a regulator that matches it. We selected a LM3940⁴ regulator that can lower 4.5V from three basic AAA batteries to 3.3V. In order to find a missing item, we used GEC-33A as

¹ <http://www.eclipse.org/jdt>

² <http://firmtech.co.kr>

³ <http://www.atmel.com>

⁴ <http://www.ti.com/lit/ds/symlink/lm3940.pdf>

a buzzer for the user. We used module MAT128-100 circuit as the MCU in order to experiment using the breadboard. Figure 2 shows how the MCU works. We first initialized UART (Universal asynchronous receiver/transmitter) because the Bluetooth module and the MCU communicate using the UART [4]. After initialization it operates in an infinite loop according to the transmitted character. If the value is null, it means that no character was transmitted thus the loop runs again until '0' or '1' is returned. Depending on the value the GPIO of Atmega128 turns the buzzer on or off.

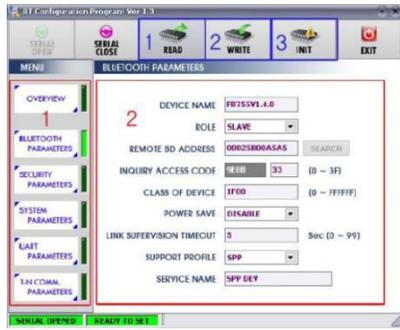


Fig. 1. Specification of BT Configuration provided by Firmtech Corp

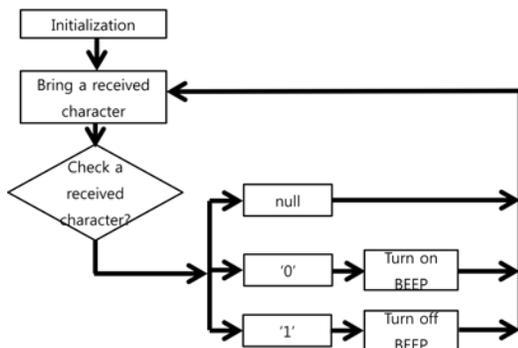
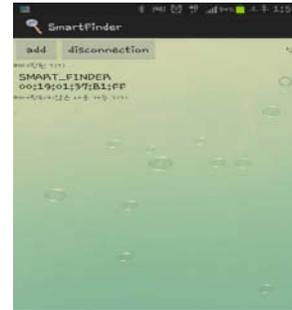


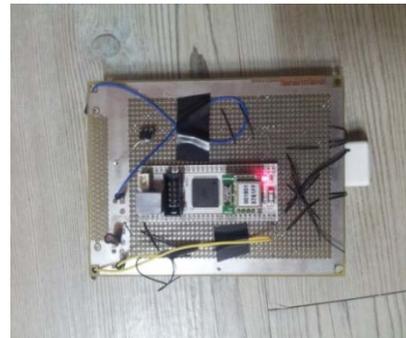
Fig. 2. Design diagram for MCU operation function

4 Discussion and Conclusion

This paper implemented a smart finder application based on Bluetooth technology. Though it was a simple design for the experiment, we think it can be useful. Also there needs to be competition between the final product size and price. If we consider that the Bluetooth range is 10m it may be difficult to find the object in a large room. Although we used Bluetooth for our experiment we advise for future works to use a different wireless communication method to increase the search range. In this experiment we relied on the user to find the object using sound, but as sound decreases over longer distances some modifications will be needed for commercial use.



(a)



(b)

Fig. 3: Initial experimental prototypes for smart finder application, (a) GUI and (b) H/W configuration

3.2 Application design

By assigning the roles, the smartphone and Bluetooth of H/W can communicate through the Bluetooth socket. By assigning the UUID as "00001101-0000-1000-8000-00805F9B34FB" it can communicate with H/W through serial communication. The GUI of the smartphone application is showed in Figure 3(a). The add button prints out the Bluetooth enable devices nearby. The list has both paired devices and unpaired devices and by clicking on a device the phone can start communicating with the selected device. If it is successful H/W receives a value of '1' and in the status is changed to "connected". If the communication is unsuccessful then a error message is shown. By communicating the H/W sounds the buzzer and the person finds their missing object, they can disconnect Bluetooth. By disconnecting the buzzer from H/W is turned off. Figure 3(b) shows a completed initial design.

References

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