

Design and Implementation of The wireless RFID Glove for life applications

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Abstract

Radio Frequency Identification is increasingly popular technology with many applications. The majority of applications of RFID are in the field of supply chain management. In this paper, we proposed the development of wireless RFID Glove for various applications in real life. Proposed wireless RFID glove is composed of RFID reader of 13.56 MHz, RF wireless module, and power supply battery. Proposed Gloves were applied to two applications. The first application is the interactive leaning and the second application is meal aid system for blind people. The experimental results confirmed good performances.

Keywords: *Wireless RFID glove, RFID Reader, RF Wireless Module, Interactive learning, Meal aid system.*

1. Introduction

For many years we have heard of the existence of a wonderful new technology called RFID (Radio Frequency Identification). The RFID system is a wireless communication system in which the radio link between the base station and the transponders are furnished by the modulated back-scattered waves. The basic RFID system consists of an antenna or coil, a transceiver, and a transponder tag electronically programmed with unique information. RFID tags are microchips which can be attached to everyday products in order to identify them, are applied to miniaturization, low price, object recognition and USN environment. Its techniques exchange remotely information using radio frequency. Characteristics of radio frequency are long distance of recognition, the various mind tag of recognition and freely date of change [1-4, 7].

This system is a fast growing field and increasingly in many applications. This system has two major areas of application. The first application is the hand held non-contact IC cards for pay phones, commuter rail passes, mobile commerce etc. The second application is in the field of supply chain management in which RFID tags are used to manage the flow of products during physical distribution by being attached to containers, pallets or products. Also RFID technique was defined the radar concept in period of Second World War and the program development was begun in order to distinguish our military and the enemy air vehicle. Since the late 1960s, it is used hazardous materials monitoring, distribution, security and car differentiation. See also societies as a helper application in terms of people with disabilities are [3-7].

Recently iGlove and iBracelet was developed from Intel Research Seattle group. iGlove of the glove form and iBracelet of the bracelet form were developed with the wearing style RFID systems which use Mica2Dot sensor networks. According to conduct of the user RFID

read the tag which is used conduct of user and analysis of situation. In addition, Worn RFID that is able to game at the tag etc was developed [8-9].

In this paper, we propose the development of wireless RFID glove for various applications in real life. Developed the wireless RFID gloves is composed of RFID reader which read tag information, and the wireless module deliver tag information in the computer. In order to confirm the usefulness of developed wireless RFID we are implementing and two kinds of applications. First, number card game and puzzle etc is interactive learning program. Second, blind people apply meal aid system with one of the various welfare policies.

2. Proposed wireless RFID gloves

Proposed wireless RFID glove system is Figure 1. The PC operation signals send Base modules. Base modules with 433MHz radios deliver signal to RF modules. A RFID reader is operated by RF module delivered signal, and read the RFID tag information. That module receives the tag information is transmitted wirelessly to PC.

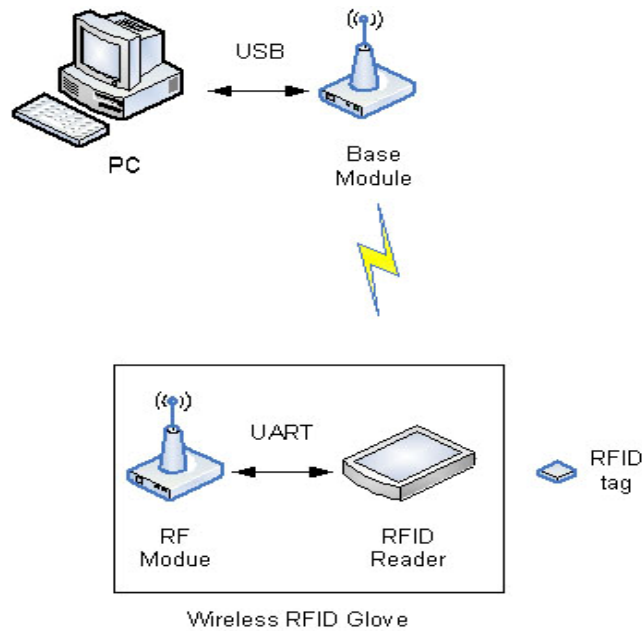


Figure 1. Block diagram of wireless RFID glove system

Figure 2. is the photograph of designed wireless RFID glove. A wireless RFID gloves is composed of RF wireless module, RFID leader and power supply battery.

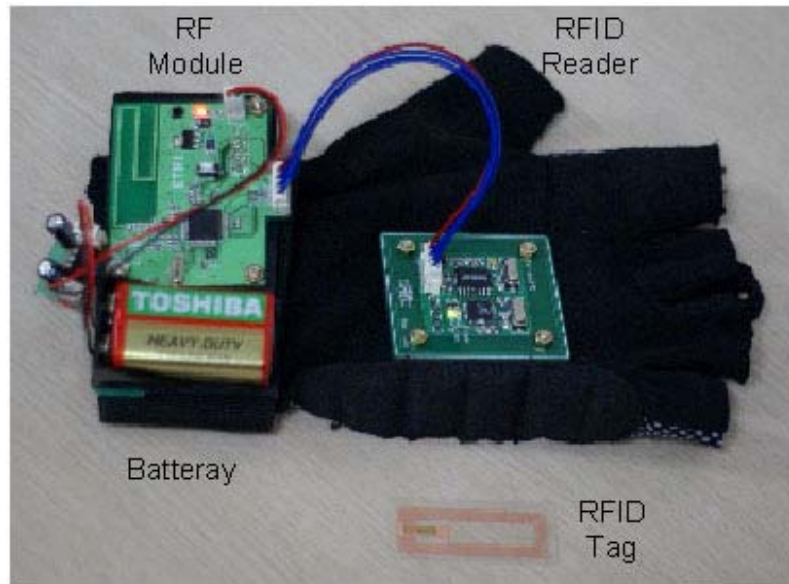


Figure 2. Wireless RFID glove

2.1. RF wireless module

Base module and RF module is Figure 3. Antenna at RF module is designed in the PCB by pattern, and it minimizes size of module.



(a) Base module



(b) RF module

Figure 3. Base module and RF module

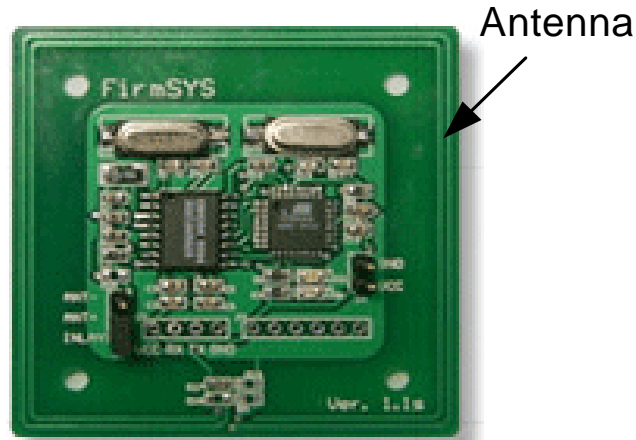
The CC1010 has a RF and 8051 in the single chip, and table 1 shows the specifications [10].

Table 1. Wireless module specifications

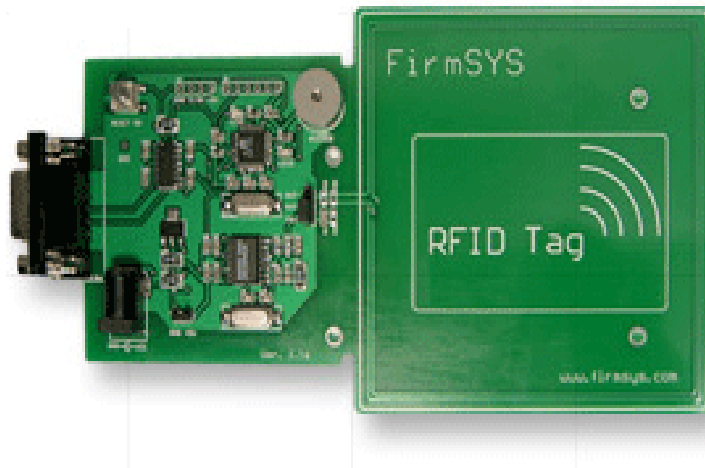
Information	Content
RF Frequency	433MHz
Modulation	FSK
RF Data Rate	38.4kbaud
RF Output Power	10dBm (10mW)
Range	interior : 50m outdoor : 140m
Microcontroller	8051 built-in
Memory	32kB flash memory
Power	3.3V

2.2. RFID reader

The RFID readers used 13.56 MHz, and implemented by connecting the wireless module and UART is used. An antenna is built substrate with pattern on the outside. Figure 4 is the photograph of RFID reader and its specifications are table 2 [11].



(a) Wireless RFID glove reader



(b) Set system reader

Figure 4. The photograph of RFID reader

Table 2. RFID reader specifications

Information	Content
RF Frequency	13.56MHz
RF Data Rate	26.kbps
Range	80mm
RFID reader	EM4094
Microcontroller	ATmega8
Interface	TTL UART
Power	5V

3. Two Applications

In this paper, proposed wireless RFID glove system applies to two kinds of application in order to confirm the usability.

3.1. Interactive learning

The first application is wireless RFID glove apply to number game of Interactive learning. The data structure of two-way data form between Base module and RF module is table 3. In order that various people participate in learning program at same time, each RF module has ID and between single Base module and 1: N is designed.

Table 3. Data Structure

Information	Size (byte)	Content
Destination ID	1	Receive device ID
Source ID	1	Outgoing device ID
Command	1	Operation instruction
RFID Data	3 ~ 12	Data

RFID data include RFID tag in Unique UID information, data of RFID tag memory and operation of RFID reader. Command data decide kind of data which send wireless module from Base module. Test program with wireless RFID glove is Figure 5.

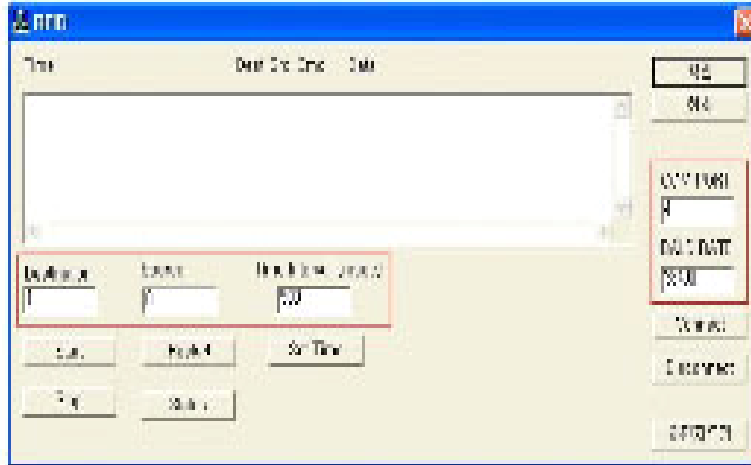


Figure 5. Test Program

Number game attached RFID tags in the card like Figure 6. Number, operation sign and input (enter) save RFID data memory. Multiplication table problem question at terminal and wireless RFID glove solve problem by reading the number card. Many people participate in game method, if wearers with wireless RFID glove give question for people by speaking to number and operation sign, the others input solution.

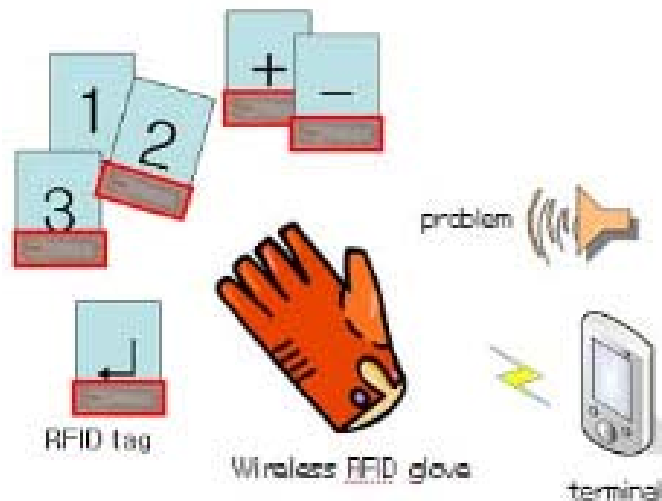


Figure 6. Number game

Various objects information card and color card etc is used in various learning, and can be used for a variety of interactive learning. Also, a treasure hunt and catch a tagger on the same play and learning can be applied by using the wireless RFID glove.

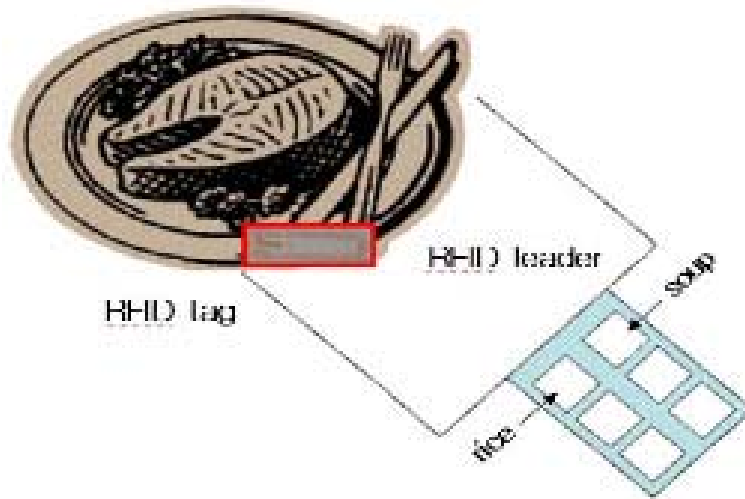
3.2. Meal aid system

The second application is Meal aid system for blind people. Various welfare policies increase activity territory of blind people. But helper necessary works still remain. Especially the case of meal occupied the major portion the role of the helper.

When the blind people to eat with the helper will go, the helper put the blind people hands on the table gives spoon, to inform the location and a type of the food, blind people is able to meal [12]. In order to improve discomfort, meal aid system of blind people apply wireless RFID glove. The configuration of blind people meal aid system is Figure 7.



(a) Using device



(b) Setting device

Figure 7. Meal aid system for blind people

RFID tags attach in the food plate. Food set-up of kind through set device save RFID tag. Blind people wearing wireless RFID glove read RFID tag and they confirm food present location and kind. Kinds of food appear device through output sound. As shown in Figure 8, the experiment was wearing gloves.



Figure 8. Wireless RFID Glove User

Because commercial product size fixed, RFID reader consider attached location. In order that hand moving and operation is not influenced, RFID reader experiment on palm and back of hand Attachment. The result of recognition rate is shown Figure 9.

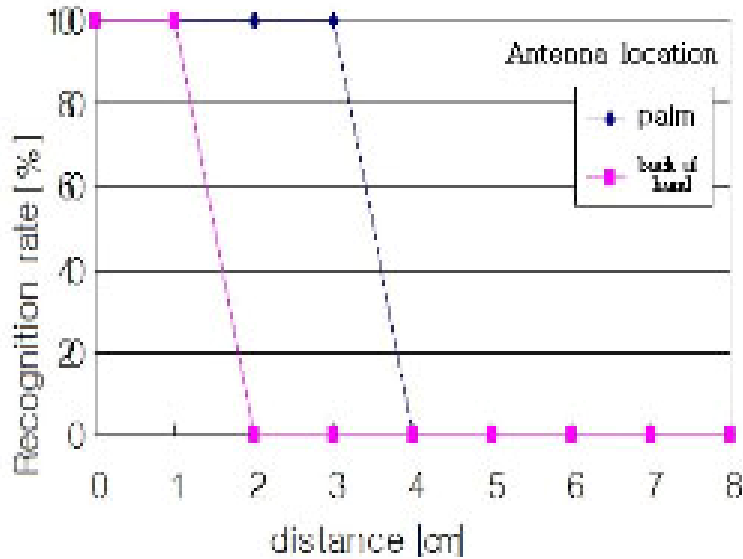


Figure 9. The recognition rate of RFID tag and reader distance between

In the Figure 9, the RFID reader attaching in the palm has been recognized in the tags within 3cm.

4. Conclusion

In this paper, we proposed the development of wireless RFID gloves for various applications in real life. Developed the wireless RFID gloves is composed of RFID reader which read tag information, and the wireless module deliver tag information in the computer. The RFID readers used 13.56 MHz, and implemented by connecting the wireless module and UART is used. The wireless module system is composed of base module and RF module. The wireless RFID glove apply to two applications in order to confirm practicality of that. First, number card game and puzzle etc is interactive learning program. Second, blind people apply meal aid system with one of the various welfare policies. Through two experiments confirmed the usefulness of the proposed wireless RFID gloves.

Project in future increases RFID recognition distances, and miniaturization of wireless RFID glove.

Acknowledgement

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