

Attendance Monitoring System Using ZigBee and RFID

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ABSTRACT

Attendance Monitoring System Using ZigBee and RFID are designed to collect and manage student's attendance record from RFID devices installed in an educational environment. Based on the verification of the student identification in the class, the system could generate sophisticated student attendance database for analysis purpose. Attendance automation is based on personalized profile. Profile can be edited on the run time without making any changes in the hardware. The RFID system consist of an RFID tag, reader and a user interface computer. Passive RFID are used for access control application. When the tag is energized by the RF field, it transmits back the contents of its memory by modulating the incoming RF field. The reader detects and demodulates the signal and identifies the tag.

Keywords - Attendance Monitoring System; ZigBee; RFID.

1. INTRODUCTION

The major problem faced by institutions is time consuming manual attendance. Our project is going to solve these problems by using RFID technology. For wireless data transmission and networking between sensor nodes, the project uses ZigBee modules. The project is designed right now on the prototype basis with just few profiles but we can add even more when needed.

Radio Frequency Identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. So the RFID is a wireless identification. Normally the RFID system comprises of two main parts: RFID Reader and RFID Tag.

RFID Reader is an integrated or passive network which is used to interrogate information from RFID tag (contains antennas to enable them to receive and respond to radio-frequency queries from an RFID transceiver). The RFID Reader may consist of

antenna, filters, modulator, demodulator, coupler and a microprocessor.

2. SYSTEM DESCRIPTION

2.1 Sender Side

The sender side consists of a RFID reader module to read RFID passive cards, a ZigBee transceiver to transmit data, a 16x2 LED display and ATmega16 micro-controller

2.1.1 RFID Reader

An RFID reader's function is to interrogate RFID tags. The means of interrogation is wireless and because the distance is relatively short; line of sight between the reader and tags is not necessary. A reader contains an RF module, which acts as both a transmitter and receiver of radio frequency signals.

The transmitter consists of an oscillator to create the carrier frequency; a modulator to impinge data commands upon this carrier signal and an amplifier to boost the signal enough to awaken the tag. The receiver has a demodulator to extract the

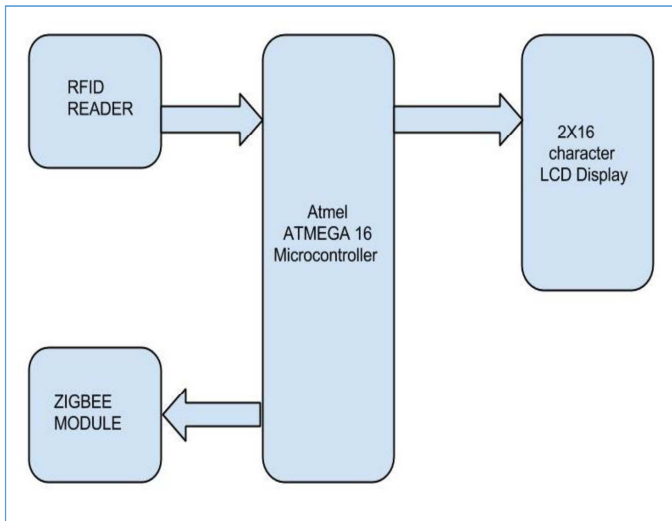


Figure 1: Sender Side

Returned data and also contains an amplifier to strengthen the signal for processing. A microprocessor forms the control unit, Which employs an operating system and memory to filter and store the data. The data is now ready to be sent to the network.

2.1.2 ATmega16 Micro-Controller

ATmega16 is an 8-bit high performance microcontroller of Atmel’s Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz. ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively. ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD. ATmega16 has various in-built peripherals like USART, ADC, Analog Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals

Frequency	16MHz
Flash Memory	16KB
Internal Memory	1KB
I/O s (max)	32
Typical Voltage	5V

Maximum Voltage	5.5V
Minimum Voltage	4.5V
Pin Count	40

2.1.3 ZigBee Transceiver

We selected ZigBee because of its low power consumption, low cost and moderate range 30 m to 1.6 Km. This range is suitable for our application where we want to wirelessly transmit data from RFID reader to the Database Server, where attendance is being managed. Another most important reason for using ZigBee module is that these modules come with serial interface therefore it will be easier for us to use these modules. These low-Rate WPAN standards have exceedingly secured wireless transmission over a very distant range. In the 2.4 GHz band there are 16 ZigBee channels, with each channel requiring 5 MHz of bandwidth.

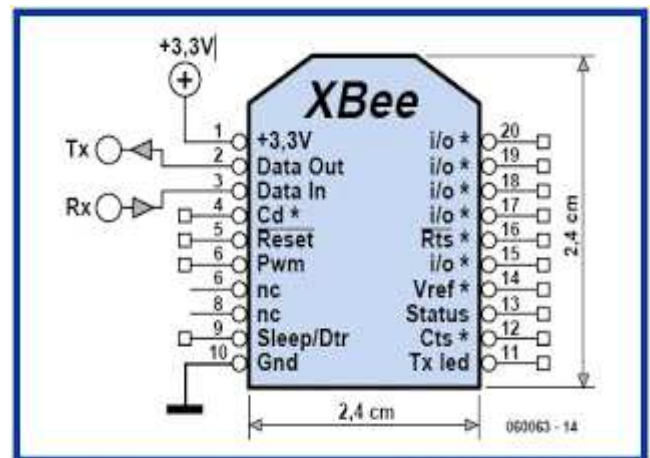


Figure 2: Zigbee Module

2.1.4 16x2 LED Display

It is used to display the RFID card no and the details of the professor and the Subject.

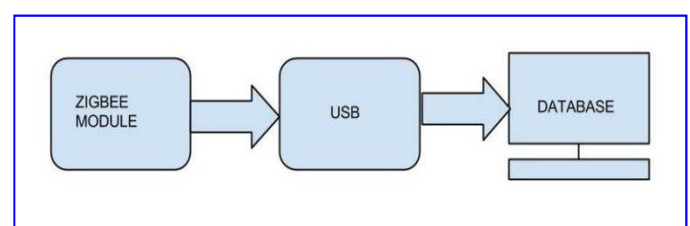


Figure 3: Receiver Side

2.2 Receiver Side

The Receiver side consists of a ZigBee module, a TTL to USB converter and a Personal Computer to Store the Data.

2.3 Software Requirements and Database

- Windows: Operating system
- Microsoft Access: Database to store attendance
- Bascom AVR: To Burn Microcontroller
- VB 6.0 :To Receive data using comp port

3 WORKING PRINCIPLE

The basic principle is as follows

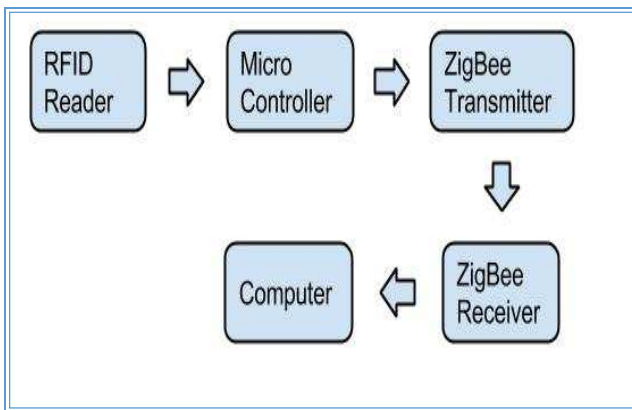


Figure 4: Working Principle

3.1 Read The RFID Tag using Micro-Controller

- The RFID Reader will read the RFID tag and Check if it belongs to teacher or student.
- It will also display the Tag no using the 16x2 LED Display.
- If the tag belongs to the teacher it will start transmitting the RFID tag no or else it will wait for the teacher to punch the card.
- It will also display the card when its punched.

3.2 ZigBee Transmitter & Receiver

- The Data will be send to a PC using a ZigBee Transmitter and received by a ZigBee Receiver.
- A TTL to USB converter is used to Transfer the data

3.3 Database

- After receiving the data, mapping of Database is used and the Id no of student, subject, day, time and year, present or absent is stored.
- Data is received using VB 6.0 Windows Application and a user friendly GUI is used to retrieve the information.

4 EXTENSION TO THE PROJECT

- We can interface a GSM module for sending message alerts to the students informing them about the attendance.
- The system can be made fully digital by including a function of sending email at the end of month.
- This project can be added along with feature for calculating salary of employees at the end of the month.
- With the inclusion of GSM module it can also be used widely in wireless alarm of access control system.

5 CONCLUSION

In our college the ID card which we are using are RFID card, so we used RFID and ZigBee. This project mainly comprised of development of attendance management system. Attendance management is very helpful in saving valuable time of students and teachers, paper and generating report at required time. This project presented a framework using which attendance management can be made automated and on-line. A general implementable approach to attendance management was proposed using ZigBee.

6 LIMITATIONS AND FUTURE SCOPE

The range of Xbee is up to 100 feet. So to increase the range repeaters will be required. A website will be hosted on the server for online access to attendance reports. For this purpose, html, JSP or ASP dotnet would be used. This idea can further be elaborated and used for security purposes at various places. As now a days there is a rise in the demand for personal authentication. Biometric authentication is very useful for such applications.

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