RFID Based Attendance and Security System

ABSTRACT

In the present rapidly progressing world, automating various facilities to decrease human effort is of utmost importance. With ever increasing security threats especially faced by organizations, universities etc., human effort alone is not efficient enough to ensure safety. Also, efficient check-in/attendance systems are of utmost importance to save time and reduce human failure; due to which the use of currently employed manual systems should be discouraged. To cater for all these concerns, this paper describes the development of a prototype based on RFID (Radio Frequency Identification) technology; which shall focus upon the security of the university campus and regulating an efficient attendance system for all students, faculty, and administration.

Keywords

RFID, radio waves, Student attendance, security, Visual Studio

1. INTRODUCTION

As for any organization whether it be a university, an office etc., security is of foremost priority. Apart from a man power employed to ensure security, some automated system must play a role in this aspect. It's quite easy to tamper with the identity cards by the outsider to sneak into the campus causing imminent threat, where the manpower has a great chance to fail. Since we are undergoing substantial security threat in our country, these loopholes shouldn't be left un-noticed. Apart from catering for the security and monitoring of the overall institute, the attendance system which has been based upon the conventional manual register based entries should be revised. Manual attendance systems are time taking activities, hinders interactive learning session and can become a victim of human failure when manually transferring the attendance on a computer.

Jotting down these concerns, we have implemented a fully automated system based on RFID where both security and monitoring abilities of the system would be dually incorporated to enhance its scope. RFID provides no room for duplication and offers faster processing time due to which it is one of the most efficient identification systems and more dependable as compared to other existing technologies such as Bar-code, Finger-Print, Ocular and Facial Recognition systems.

The rest of the article is organized as follows. Section 2 briefly introduces the working of RFID technology, section 3 discusses the overview of the system, section 4 will describes the working mechanism and finally section 5 lists further improvements and conclusion about the work that has been presented in this paper.

2. INTRODCUTION TO RFID

RFID is based upon wireless communication, using radio waves as its spectrum which ranges from 300 KHz to 3 GHz. Since RFID systems generate EM waves, they are classified under radio systems. RFID system are most likely to interfere with nearby radio systems, because of which specified radio frequencies, termed as ISM frequencies (Industrial-Scientific-Medical), have been allotted for industrial, scientific, or medical usage.

2.1 Working of RFID:-

The RFID mechanism is divided into four components, which includes an Antenna, Transceiver (RFID reader), Transponder (RFID tag) and host computer to which the decoded data is sent from the reader.

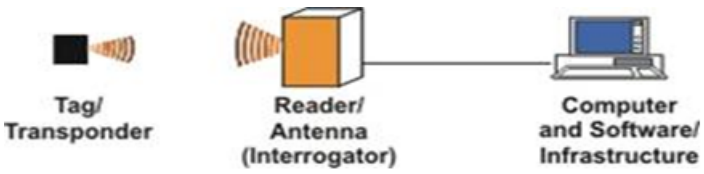

Figure 1: RFID Mechanism

An RFID-tag/Transponder is embedded with a microchip combined with an antenna. The tag's antenna picks up the emitted radio signals from an RFID reader and then returns the signal, usually with some additional data (like a unique serial number normally in ASCII or some other customized information). The reader in return decodes the incoming data from the tag's circuit and is then send to the host computer for processing and manipulation as illustrated in Figure 1.

There are two varieties of RFID tags available, known as the active and passive tags. While the active tags (operated by batteries or using solar power) can transmit data to the reader autonomously, the passive tags are in the absence of a battery due to which they get activated upon passing through the electromagnetic waves coming from the reader as current is induced in the tag's antenna.

3. SYSTEM OVERVIEW

In this section we shall discuss the hardware and software which have been employed for the fulfillment of the RFID system.

3.1 Hardware

Figure 2: RFID Tag and Reader

The model of RFID reader used in the prototype [Figure 2] is ACM-08Y, which is manufactured by a Chinese company called Schenzhen Goldbridges Industrial Co., Ltd. This RFID reader has a read range of 70-100cm, working frequency of 125KHz, communication interface of RS485/232 and it operates on a power supply that has a rating of 12V/100mA. In our project the reader will be used in RS 232 serial port communication configuration.

The RFID cards used for the prototype bears the model ACM-EMI-S100 Middle range Proximity ISO smart card passive RFID tags, which was used in accordance with the reader's requirement. This product is also manufactured by Shenzhen Gold bridge Industrial Co., Ltd. The specs include a storage capacity of 8 bytes and a working frequency of 125.

As for the power supply, a 12V 1 A SMPS (Switch mode power supply) was used in order to be provide highly efficient conversion of electrical power. It has an input rating of 100-240V 50-60Hz 300mA and output rating of 12V 1000mA.

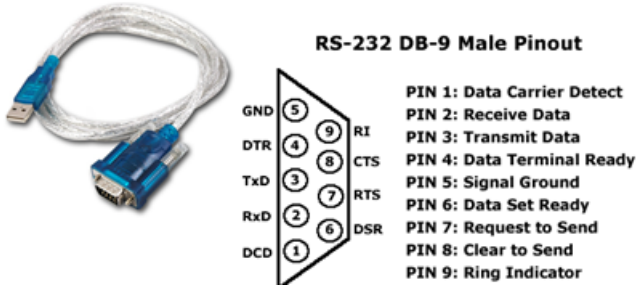

Figure 3: USB to RS-232 Connector

RS-232 connectors are intended to provide connection between the equipment and the serial port of the desktop. Other name for these is the DB-9. DB-9 has been used to connect with the RFID reader and it's configuration is given in Figure 3. The USB to RS-232 connectors (shown in Figure 3) had to be used since new computers doesn't include serial ports available in it, the USB portion of the connector will join the computer's USB terminal hence will provide successful serial connection.

3.2 Software

The whole computer program for the RFID system has been designed in an Interactive development environment (IDE) called Visual Studio (2010), made by Microsoft . It can be used to make console, windows (Windows forms), web, database applications etc. For the prototype, the entire coding was done in Visual Studio. For database management, SQL Server Management Studio Express Edition 2008 was used, which comprises of script editors and graphical tools which work with the objects and features of the server. In our prototyoe the requisite software was used for database modeling, making tables and iterations.

4. DESIGN METHODOLOGY

In this section we shall discuss the technical approaches taken to implement the functionalities done in the RFID system.

4.1 Interfacing of RFID reader

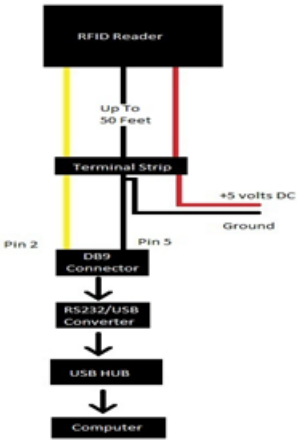

Figure 4: RFID Reader in RS-232 Configuration Connected with PC

The Red wire (DC power) and Black wire (GND) of the reader was used to connect with the power supply. Since only data transmission is to be done by the reader to the host computer, so only three wires will be required i.e. White (TX), Black (GND), Red (DC power). The Green (RX) has been ignored since the reader will not be used to write date. The DB-9 connector's pins 2 (RX) and 5 (Signal Ground) shall only be used in our case. Now after completing the connections the role of RS-232 to USB convertor shall play part. The DB-9 connector shall be joined with the convertor, and from the other part of the convertor the USB portion will be inserted into the computer USB port.

4.2 Interlinking for serial communication with Visual Studio

To get the code returend by the RFID reader connected to the computer, communication requirements such as the Stop Bit, Data Bit, Baud Rate, and Parity bit were set manually in C# coding. Stop Bit, which enables the receiving signal hardware to detect end of character and re-communicate with the character stream, was set to 1bit. Databit, which

depicts the bit of information carrying on the RFID tag, was set to 8 btis. Baud Rate (transmission rate) was set to 9600 bps and parity bit was set to none.

The code was recieving data is given as under:

"public CT = new SerialPort("COM2",9600, Parity.None, 8, StopBits.One);"

var INPUT = PORT.ReadExisting();

if (INPUT != String.Empty)

INPUT = INPUT.Substring(INPUT.Length + 1 - INPUT.Length, INPUT.Length - 4); //garbage value deletion

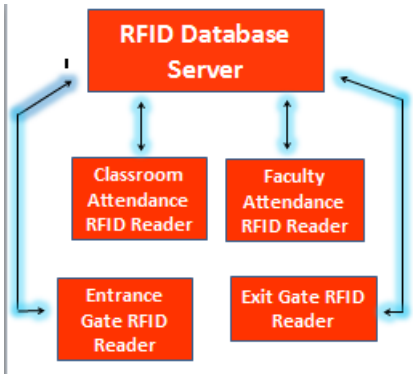

Figure 5: Overall RFID System

Figure 5 illustrates the overall system used for the prototype. The RFID readers are placed at the entrance and exit of the Universitiy's entrance, where the identification of every student is being conducted. Just as a student approcahes near the entrance of the gate, the RFID card id is read through the reader and the informatiom is retrieved from the database and displayed on the computer screen through which the security personal can easily dectect the idendity of student (as shown below in Figure 6).

Figure 6: Gate Entrance module

Similarly the RFID reader is placed in every classroom, which is connected with the database throguh local network. As soon as the student enter the class, his attendance is automatically marked without going through any time-taking procedure. To mark the attendance, the RFID system first detects if the student has entered in the universiy or not through the logs to identify if the person actually came to university or not. Since everything is automated, it's quite easy to track the attendance of anybody (as shown in Figire 7).

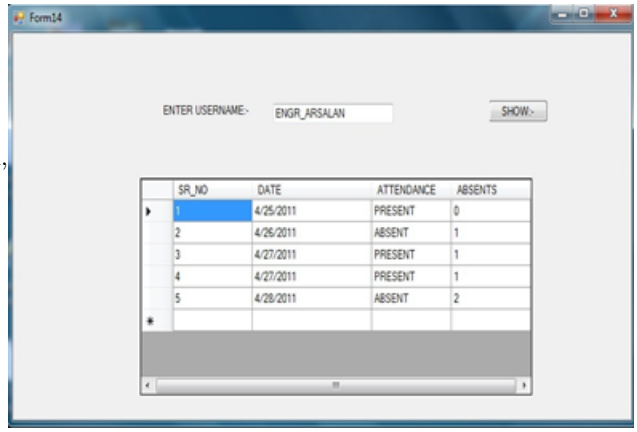

Figure 7: Attendance Tracking of Faculty

5. CONCLUSION AND FUTURE WORK

After completing this project it can be safely said that RFID will be a very viable, cheaper, faster resource implemented for security purposes and attendance. In security and monitoring purposes its future is vast, and as the technology gets cheaper it will get more accessible to the people and can fully make use of it.

Considering the diversity RFID holds, after completing the project its scope can be enhanced in educational institutes to other offices. Few points here have been chalked out to provide betterment for future purposes:

It can be used to detect RFID tags in case of accidental loss in the campus/office by using higher frequency RFID reader whose range can surpass normal 125 KHz readers (13.56 MHz readers and above), up to at least 50m. For this active tags would be used, since they are the only tags which have the longer range. This would be a costly endeavor, but there is never any alternative to provide quality security.

The activity of the person can also be monitored at all times by using high frequency readers and active tags. This is a very important feature, when cameras cannot reach at places not possible high range tags and readers can be used to detect the location for general and security purposes.

References

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