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RFID Based Smart Attendance System with Arduino

Prajakta Hanumant Takale, Kavita Shivprasad Vishwakarma,

Babasaheb Devchand Nawale, Prof. Kranti Patil

Electronics and Telecommunication, Trinity Academy of Engineering, Pune

ABSTRACT

Abstract – Most educational institutions' administrators are concerned about student irregular attendance. Truancies can affect student overall academic performance. The conventional method of taking attendance by calling names or signing on paper is very time consuming and insecure, hence inefficient. Radio Frequency Identification (RFID) based attendance system is one of the solutions to address this problem. This system can be used to take attendance for student in school, college, and university. It also can be used to take attendance for workers in working places. Its ability to uniquely identify each person based on their RFID tag type of ID card make the process of taking the attendance easier, faster and secure as compared to conventional method. Students or workers only need to place their ID card on the reader and their attendance will be taken immediately. With real time clock capability of the system, attendance taken will be more accurate since the time for the attendance taken will be recorded. The system can be connected to the computer through RS232 or Universal Serial Bus (USB) port and store the attendance taken inside database. An alternative way of viewing the recorded attendance is by using HyperTerminal software. A prototype of the system has been successfully fabricated.

Keywords – Microcontroller, RFID, Universal Serial Bus.

1. INTRODUCTION

Radio frequency identification (RFID) refers to the use of radio frequency wave to identify and track the tag implanted into an object or a living thing [1-3]. It is a wireless mean of communication that use electromagnetic and electrostatic coupling in radio frequency portion of the spectrum to communicate between reader and tag through a variety of modulation and encoding scheme [4]. Modulation refers to the variation in the amplitude, frequency or phase of a high frequency carrier signal to convey information. Encoding is a process of converting information from one format to another. RFID system usually consists of RFID reader and tag. It is very useful because it can uniquely identify a person or a product based on the tag incorporated. It can be done quickly and this usually takes less than a second. A prototype of the system has been designed and fabricated. The RFID reader used in the system is passive type which has maximum range of detection of around 5cm above the reader. It operates at frequency of 125 kHz and 12V power supply. The system has ability to uniquely identify and take attendance for persons. The users only need to place their RFID tag on the reader to take attendance. They do not need to go through the long list to look for their name. Hence, it isVerytime efficient. Attendance will be taken if the encoded tag ID scanned matches the tag ID stored in the memory. Otherwise, an

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error message will be displayed. Attendance taken will be more accurate with the real time clock included in the system. RS232 and Universal Serial Bus (USB) port allow the system to display the information and attendance of a particular person on Personal Computer (PC). The In-Circuit Serial Programming™ (ICSP™) pins and serial programmer integrated in the system allow update of microcontroller firmware from time to time. The power supply system designed will automatically switch to batteries power if the ac power was removed. The size of the device is considered to be small. These two features make the system portable to be carried to class or other places.

2. LITERATYRE REVIEW

The use of Radio-frequency identification (RFID) technology in automated electronic environment and for tracking objects has been widely researched upon by researchers and deployed by various organizations as part of their automation systems. Hang Yuru, Chen Delong and Tan Liping ,April, 2013,suggested,The Research and Application of College Student Attendance System based on RFID Technology. Combined with the actual situation of college student's class attendance system, the design of student attendance system nodes based on RFID has been proposed. In this paper, the hardware node of system and the develop processes of related application have been detailed presentation. The designed system not only can improve the work efficiency, but also can save human and material resources[2].SumitaNainan, Romin Parekh and Tanvi Shah, January 2013,suggested that ―RFID Technology Based Attendance Management System. The proposed framework can give another, precise, and less bulky method for taking understudy participation in school and switch the worldview of understudy's address participation checking in classroom. An ease and cheap RFID Based Authentication System model have effectively created. The model of the framework can give a few advantages over the customary strategy for taking participation. This framework will help in programmed capacity of participation and guardians will be informed in instance of nonattendance. In this framework utilizing the AVR controller, guarantees quick operation, cost viability and low power utilization[3].AnkitaAgrawal and AshishBansal, ―Online Attendance Management System Using RFID with Object Counter says that, The Student Attendance System using Radio Frequency Identification technology with object counter will significantly improve the current manual process of student attendance recording and tracking system, especially in a university environment. The system promotes a fully-automated approach in capturing the student attendance and monitoring the student in the university campus. The attendance taken is secure and accurate. The system is user-friendly with easily accessible switches and communication ports. Attendance can be stored and s user-friendly with easily accessible switches and communication ports. Attendance can be stored and retrieved[4].

3. PROPOSED SYSTEM

Figure 1 is the block diagram of our project RFID Based Attendance System using Arduino, RTC & LCD Display. Here Arduino UNO acts a central processor for controlling all other components as input/output

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unit. We have used 5 volt power supply to power all the components used in this project. RFID Reader module is interfaced with Arduino to read the data from RFID Card/tag. Real Time Clock (RTC) Module.

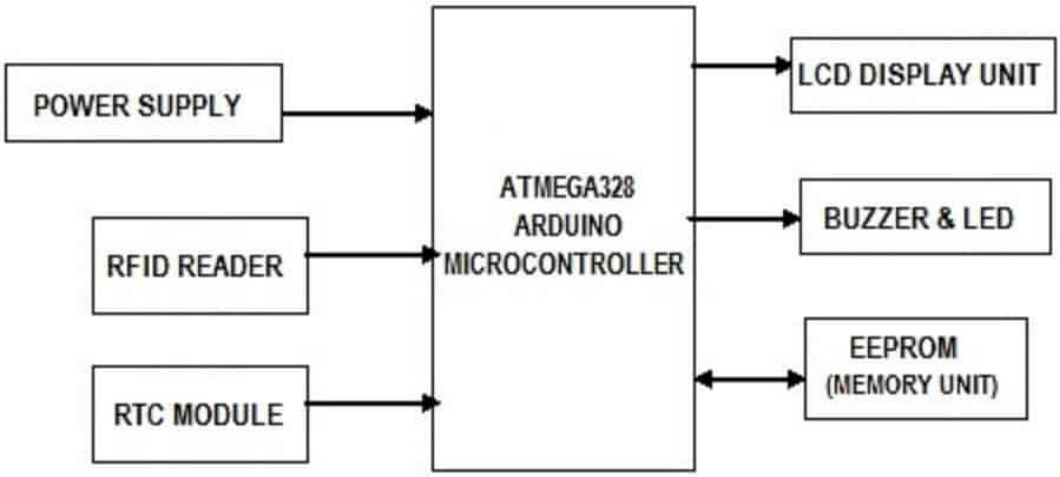

Fig. 1.Proposed architecture of RFID Based Attendance System

DS3231 is used to display the current time and date on the LCD as well as arriving and leaving time of the users. LCD displays every output like current date & time, information of users, no of staffs present or absent and menu options from 1 to 4. Red & Green LED is used for the indication of arriving and leaving. Similarly buzzer produces sound whenever the interrupt is detected. The very important part of this block diagram is EEPROM part. EEPROM stands for Electrically Erasable Programmable Read Only Memory. It stores the data whenever the users swap the card over RFID reader.

3.1 ARDUINO UNO

The Arduino Uno is open source microcontroller board based on the microchip ATmega328P microcontroller and developed by Arduino. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards9shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USE cable. It can be powered by the USB cable or by an external 9-vot battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Common website. Attribution Share Alike 2.5 license AM.

3.2 RFID RC522 MODULE

RFID or Radio Frequency Identification system consists of two main components, a transponder/tag attached to an object to be identified, and a Transceiver also known as interrogator/Reader.

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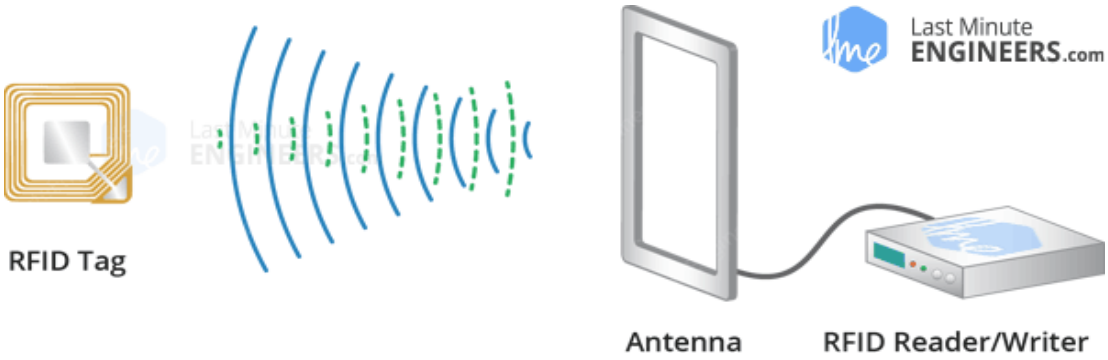

3.2.1 Basic Operation

A basic RFID system usually consists of a RFID reader and RFID tag which contain a coil that serves as antenna for transmitting and receiving signals as shown in Fig. 3. All kinds of RFID system operate using similar concept. RFID readers generate radio wave that reaches the RFID tags. Then, RFID tags use backscatter technology to reflect back the radio wave which has been combined with the data through modulation to the reader

3.3 RTC MODULE (DS1307 or DS3231)

Real time clock is used to keep record off time and to display time. It is used in many digital electronics devices like computers, electronics watches, date loggers and situation where you need to keep track of time. RTC has a CMOS battery. Using DS3231 IC as the main component, several manufacturers developed DS3231 RTC Modules with all the necessary components. Almost all the modules available today consist of an additional IC, 24C32N (orsomething similar). This secondary IC is an EEPROM IC of 32Kb size. Since both RTC and EEPROM ICs are interfaced through I2C. Protocol, you won't need any extra pins as both these I2C Devices can act as slaves while a microcontroller acts as a master. Since RTC is all about maintaining time irrespective of the power supply, you can connect a 3V CR2032 Lithium Battery to theRTC IC to keep the clock ticking. In the DS3231 Module, there is a provision for you to connect a battery using the battery holder provided on the back.

3.4 HARDWARE DESIGN.

The hardware of the system consists of Microchip ATMEGA328p microcontroller, RFID reader and tag, DS1307 real time clock integrated circuit (IC), MAX232 serial communication IC, 16x2 Liquid Crystal Display (LCD), and power supply system. A simple universal serial has also been integrated to the system which allows update of microcontroller's firmware from time to time. The reason of choosing Peripheral Interface Controller ATMEGA328P microcontroller for the project is because ATMEGA328Pmicrocontrollers are cheap and contain internal Electrical Erasable Programmable Read Only Memory (EEPROM), and other on-chip peripherals are readily available. ATMEGA328P has been chosen as the microcontroller for the system. It supports Serial Peripheral Interface (SPI), Universal Serial Bus (USB) communication and has large program memory for the development of the program code for the system. The real time clock (RTC) function of the system is realized by using DS1307 IC. DS1307 communicates with ATMEGA328P microcontroller serially

through inter-integrated circuit (I2 C) interface (pin RB0/SDA and RB1/SCL). This IC uses a 32.768 kHz crystal to generate accurate clock. It is connected to a 3V button type of backup battery which keeps the oscillator running even when the main power has been cut off. The serial communication is accomplished by using MAX232 IC. The power supply of the system includes a relay used to switch between power adapter and battery power. The block diagram of the RFID based attendance system is shown in the Fig. 4. Fig. 5 shows the overall schematic diagram for RFID Based Attendance System. P FFFFFFFF NNNNNNNNNNNNNNNN P Leading Parity Bit (Even) Facility Code (8-bit) Card number or User ID (16-bit) Trailing Parity Bit (Odd) 26-bit Wiegand data format RFID Reader Antenna RFID Tag Radio wave Modulated radio wave 0 | 0 0 0 1 0 1 0 0 | 0 1 0 1 0 1 1 0 1 1 1 1 0 0 0 0 | 1 DATA0 DATA1 77

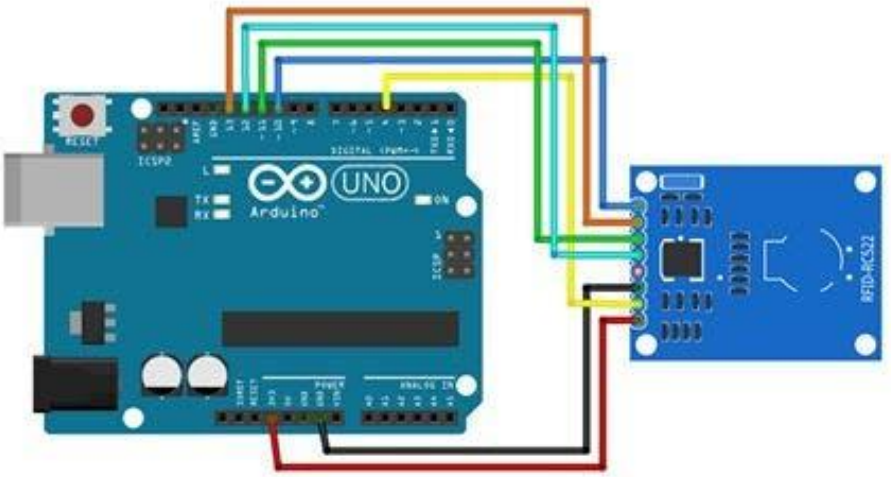

Fig .4 Schematic diagrams for RFID Based Attendance System

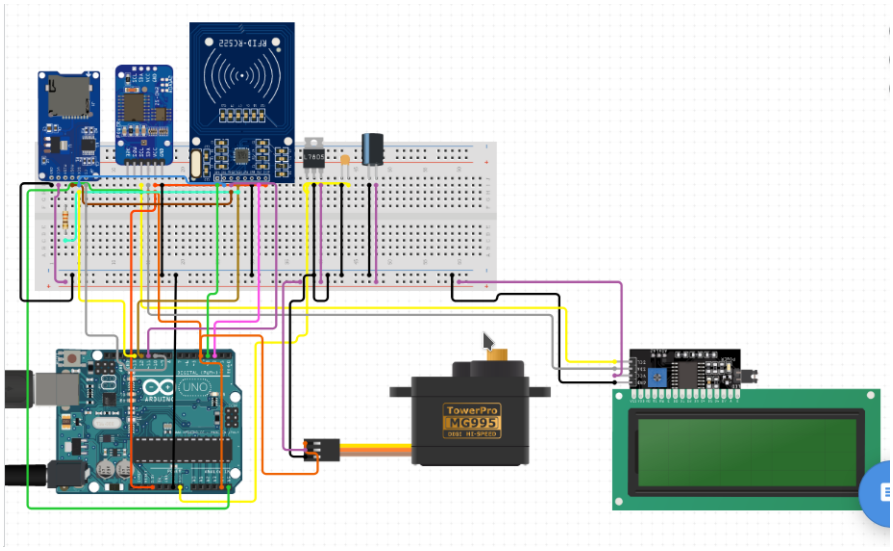

Fig .5 Schematic diagrams for RFID Based Attendance System

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4. RESULT AND DISSCUSSIONS.

4.1 RESULT

The proposed system is achieving objective is to register, record, and manage a student attendance using RFID tag, The traditional method for taking student absence report is usually done by using paper-work and handwriting on the advertisement wall. Hence, paperwork method consumes workforce requirements, duplication of the efforts, and imposes time-consuming and inefficiency.

The proposed system provides facilities for both students and staff by reducing time to take absence, as well as, providing a database system that holds all the student's information (i.e. there is no need for archiving shelf and paper works).

One of the possible future extension works for this project is implementation of Multimedia Card (MMC) in the system. With MMC included, attendance can be retrieved directly from files stored inside MMC card. The attendance in those files can be updated together with the time of attendance being taken. Student information can be obtained and displayed based on the RFID tag scanned.

5 .CONCLUSION:-

A low cost RFID Based Attendance System prototype has been successfully developed. The prototype of the system provides several advantages over conventional method of taking attendance in class. The prototype developed in this project is compact and light weight. Besides, it can run using power adapter or battery power. Therefore, it is very portable and can be carried to the class for taking the attendance. The attendance taken is secure and accurate since the tag ID encoding is done using Wiegand 26-bit format. The prototype is user-friendly with easily accessible switches and communication ports. Attendance can be stored and retrieved easily. Another advantage of the system is it has high identification and verification speed. This system can be applied not just in the classes but also in working places with the feature total working hours can be recorded.

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