

Attendance Management System based RFID

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Abstract

This work is about the design and construction of an RFID based electronic attendance register. It takes advantage of the wireless and cheap RFID technology. It is microcontroller based and the Arduino Micro-controller was used as well as the MFRC522 RFID module. Each subject of the register would be represented by a tag whose identity is already stored, which when placed close to the reader would cause the micro-controller to log the subject's information in LCD. The stages involved in this research are the design stage where the whole system was designed, the coding stage where the code for the microcontroller was written and debugged and the final build stage where everything was put together. 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.

Keywords: Attendance management, RFID, Arduino microcontroller.

1. Introduction

RFID, which stands for Radio Frequency Identification, is an automatic identification technology used for retrieving from or storing data on to RFID Tags without any physical contact [1]. Proposed system primarily comprises of RFID Tags, RFID Reader, Middleware and a Backend database. In traditional method, lots of difficulties exist which includes lost of attendance book, fake attendance and so on. If the book is lost, faculty has to create the new attendance book and therefore absented students get an opportunity to mark their fake presence in the new log book. RFID Tags are uniquely and universally identified by an identification sequence, governed by the rubrics of EPC global Tag Data Standard. In monitoring applications of the university, the use of RFID technology enables the university management to avoid attendance records from loss, misplacement and damages. This technology also will save money, time and decreases work endeavour's in dealing with the participation records. Universities bring progressively turned into great mindful of the fact that making methods more efficient and less time consuming, RFID Might assistance on accelerate those techniques and along these lines diminish the lead time in a few separate zones such as parking, attendance and others [4, 5]. Attendance is the concept of people, individually or as a group, appearing at a location for a prescheduled event. Measuring attendance is a significant concern for many organizations, which can use such information to gauge the effectiveness of their efforts and to plan for future efforts; it also goes a long way in sporting and entertainment industries to determine the success of such events. Radio Frequency or waves has been a vital part in electronics and communication, it denotes electromagnetic waves that have a wavelength suited for use in radio communication. It has over the years through detailed study and research produced result of very unique and ingenious applications in the field of Engineering as a whole such applications areas include; transportation, health-care, agriculture, the hospitality industry, academic and business settings to mention but a few. These unique applications of the concept of radio waves have made life

easier and led to the solutions to many of man's problems directly or indirectly. As for system development and implementation, it should be able to help in managing their student attendance systematically. The system must have database that contains employee/student information and it must be able to help lecturer to manipulate data, update database, alert manager accordingly, and also nice interface to make it easier to use. Finally, the attendance system must be user friendly for commercial purpose. Our project is going to solve these problems by using RFID technology. 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 are RFID Reader and RFID Tag

2. Literature survey

Until the mid-18th century, most people led simple one-dimensional lives as small-scale farmers, anglers, or artisans, and their work output depended on natural forces such as the sun and the wind. The concept of time management depended on several factors such as; agricultural tempos, tides, weather, and seasons. For instance, daylight hours determined work hours, inclement weather determined holidays, and productivity depended on the variations of the growing season. The sun and the moon, and disposition of the laws of the universe determined time management. (Curtin et al, 2006). The industrial revolution and subsequent developments enabled humans to harness nature for their ends. Big machines in factories ended the dependence on the weather, and the invention of electricity and deployment of artificial lighting rendered the concept of daylight hours insignificant. (Curtin et al, 2006). The invention of mechanical clocks made it possible to manage time, but the notion of time was still different from what it is today. The earliest of clocks could keep time to the second, but most early-clocks came only with an hour hand and indicated time to the closest quarter hour. People in the early industrial revolution still did not consider accounting for their time to the second to be important or necessary. (Davis, 2004). The history of time management in the early 20th century ran parallel to the evolution of management science. Taylor's scientific approach to management which was aimed at shop management, centered on the principle of effective time management. He attributed inefficiency of his worker to tendencies to work slowly, without any incentives to work fast. He advocated establishing specific work targets and paying workers for the tasks and goals met. This mandated better usage of time and became the basis for modern time management approaches. (Clarke, 2005). RFID (Radio-Frequency Identification) is a technology for automated identification of objects and people. Human beings are skilful at identifying objects under a variety of challenge circumstances. For example, a bleary-eyed person can easily pick out a cup of coffee on a cluttered breakfast table in the morning. Whereas, computer vision performs such tasks poorly but RFID may be viewed as a means of explicitly labelling objects to facilitate their "perception" by computing devices. (Curtin et al. 2006) Most histories of RFID technology can be traced back to the radio-based identification system used by Allied bombers during World War II. During the war bombers could be shot down by German anti-aircraft artillery, so they had a strong incentive to fly bombing missions at night because planes were harder for gunners on the ground to target and shoot down. Of course, the Germans also took advantage of the cover that darkness provided. Early Identification Friend or Foe (IFF) systems made it possible for Allied fighters and anti-aircraft systems to distinguish their own returning bombers from aircraft sent by the enemy. These systems, and their descendants today, send coded identification signals by radio: An aircraft that sends the correct signal is deemed to be a friend, and the rest are foe. Thus, radiofrequency identification was born. (Farragher, 2009) Shortly after the war, an engineer named Harry Stockman realized that it is possible to power a mobile transmitter completely from the strength of a received radio signal. His paper "Communication by Means of Reflected Power" introduced the concept of

passive RFID systems. Work on RFID systems as we know them began in earnest in the 1970s. In 1972, Kriofsky and Kaplan filed a patent application for an “inductively coupled transmitter-responder arrangement. The system used separate coils for receiving power and transmitting the return signal. In 1979, Beigel filed a new application for an “identification device” that combined the two antennas; many consider his application to be the landmark RFID application because it emphasized the potentially small size of RFID devices. (Sorrells, 2000)

In the process of system development, literature reviews conducted to understand the theory, methods and technologies associated with systems that have been developed. Background research on the organization and comparative studies of existing systems is also done to understand the system requirements before the system was developed [4]. Student Attendance Using RFID System is an automatic record of student attendance developed especially for universities. It's generally said that the roots of radio frequency identification technology can be traced back to World War II. The Germans, Japanese, Americans and British were all using radar which had been discovered in 1935 by Scottish physicist Sir Robert Alexander Watson-Watt to warn of approaching planes while they were still miles away. The problem was there was no way to identify which planes belonged to the enemy and which were a country's own pilots returning from a mission. Radio Frequency Identification (RFID) research and discovery began in earnest in the 1970s. RFID is commonly used to transmit and receive information without wires. RFID readers and tags communicate through a distance using radio waves. There are a lot of advantages in RFID system, included their price, size, memory capacity and their capability. Advances in radar and RF communications systems continued through the 1950s and 1960s. Electronic article surveillance tags, which are still used in packaging today, have a 1-bit tag. The bit is either on or off. If someone pays for the item, the bit is turned off, and a person can leave the store. But if the person doesn't pay and tries to walk out of the store, readers at the door detect the tag and sound an alarm [5]. The First RFID Patents Mario W. Cardullo claims to have received the first U.S. patent for an active RFID tag with rewritable memory on January 23, 1973 [5]. Later, companies developed a low-frequency (125 kHz) system, featuring smaller transponders. A transponder encapsulated in glass could be injected under the cows' skin. This system is still used in cows around the world today. Low frequency transponders were also put in cards and used to control the access to buildings [5]. Today, 13.56 MHz RFID systems are used for access control, payment systems (Mobile Speedpass) and contactless smart cards. They're also used as an anti-theft device in cars. A reader in the steering column reads the passive RFID tag in the plastic housing around the key. If it doesn't get the ID number it is programmed to look for, the car won't start [5]. In the early 1990s, IBM engineers developed and patented an ultra-high frequency (UHF) RFID system. UHF offered longer read range (up to 20 feet under good conditions) and faster data transfer. IBM did some early pilots with Wal-Mart, but never commercialized this technology. When it ran into financial trouble in the mid-1990s, IBM sold its patents to Intermec, a bar code systems provider. Intermec RFID systems have been installed in numerous different applications, from warehouse tracking to farming. But the technology was expensive at the time due to the low volume of sales and the lack of open, international standards [5].

3. Proposed system

This research concept is based on a microcontroller approach that digitalizes analogue signals obtained from sensors used to monitor the receipt of signals from radio frequency chips implanted in tags and cards. It monitors persons or object and keeps record or a register of their attendance automatically through the aid of a timing mechanism, and stores the register information on an SD card through the SD Card Module incorporated into the project. The register information that is stored in the SD card can then be easily gotten by removing the SD card from the module and copying out

the data for further manipulation through the various software's available such as SPSS, Microsoft Access, and Excel.

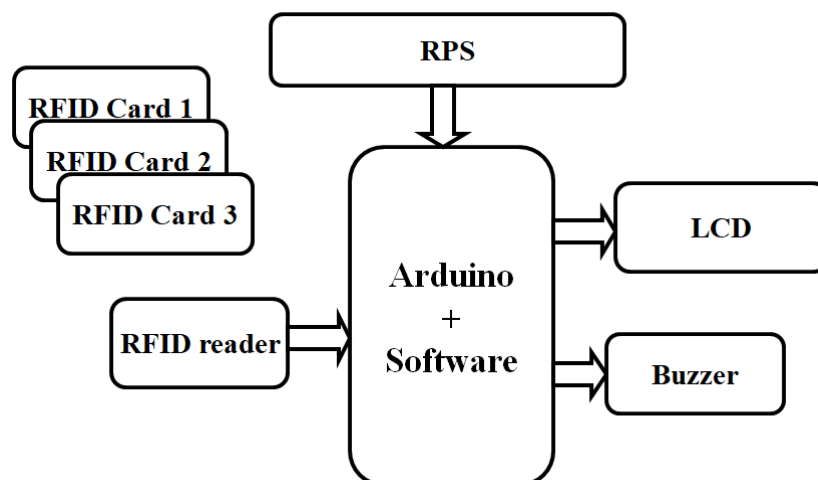


Fig.1: Block diagram of proposed system.

The primary purpose of the Radio Frequency Identification system is to register student attendance wirelessly by a mobile device called a tag, which is read by an RFID reader. Tags and cards of 13.56MHz frequency were used. Also, an RC522 Arduino RFID reader which is of same frequency was used. The circuit simulation for the interfacing of the Liquid Crystal Display (LCD) with the buzzer with the Arduino microcontroller. The application is a web-based application. So, when we deploy it will have a server where all the web pages reside. All the data is stored in the database. The Client accesses this data using internet. The database is accessed via Server and the application works in the browser. To access the application in the browser, the user must have a valid RFID card (which is analogous to the one shown in the diagram above) and he needs to swipe it in front of the RFID Scanner. The block diagram of system is shown in Fig 1. RFID Scanner being plug and play can be replaced very easily without affecting the current application and there would be no data losses as there is no hardware storage involved in terms of the RFID Scanner. Moreover, the RFID Scanner and the cards are cost effective.

The working principle of RFID based attendance system is so much simple. It works on the principle of radio frequency waves. This system consists of a microcontroller and RFID reader. This RFID reader consists of a coil when a voltage is given to this coil it produces the electromagnetic field. When this electromagnetic field link with the RFID tag it produces current. These current transfers the data from the RFID tag to the RFID reader. Suppose when the RFID tag which have the student's information take this near to the RFID system then the RFID system which have the RFID sensor senses this tag and gives the signal to the RFID reader.

3.1 Arduino IDE

What is Arduino IDE?

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

A program for Arduino hardware may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for

their 8-bit AVR and 32-bit ARM Cortex-M based microcontrollers: AVR Studio (older) and Atmel Studio (newer).

3.2 Schematic diagram

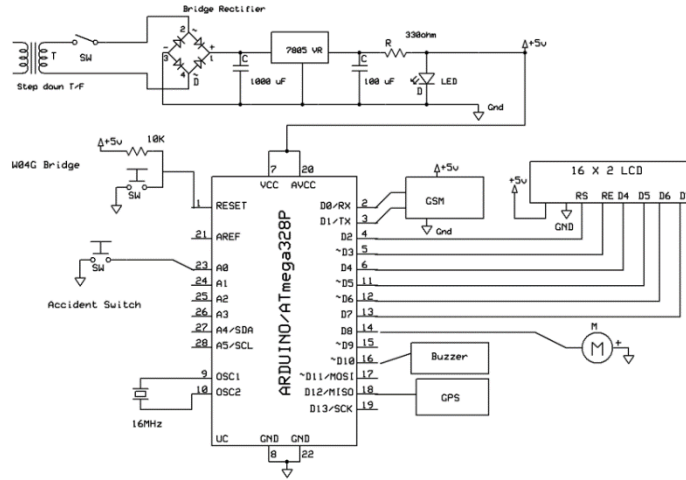
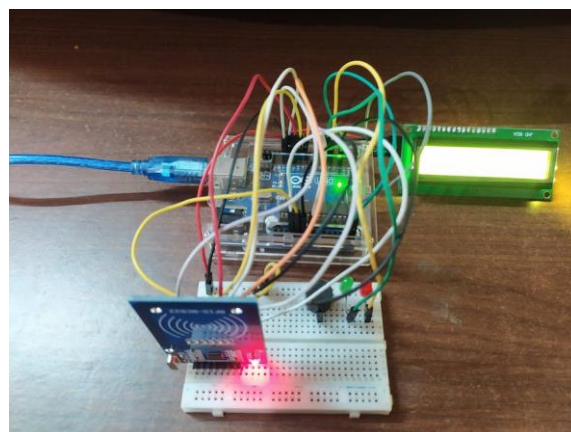


Fig. 2: Schematic diagram of proposed system.

4. Results





5. Conclusion

The proposed system of attendance management using RFID technology will improve the process of manual attendance, especially in an organization or school environment. In the long run, with reducing unit tag and reader costs, several businesses will be able to leverage the benefits of RFID technology. Thus, by implementing the proposed framework helps in identifying the actual attendance of the class. The device is also cheaper and small which is the current trend in today's technology. Anyone can easily own one for personal use. Lecturers can automatically take their attendance and accurately time students, workers attendance can be much more reliable, and it adds class in business environment at such little cost. It is a unique design which is very easy to implement by everyone.

5.1 Future Scope

Further improvement can be undertaken on this project for better enhancement: A webcam can be integrated into the system to monitor the person who swaps the card, thus avoiding the problem of a person scanning in for another person. The attendance system can be enhanced to biometric technology which is a full proof technique that captures unique biological or physical features and prevents unauthorized activities.

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