Optimized Design of Student Attendance System Using RFID

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***Abstract*—**Web-based student attendance management system is required to assist the faculty and the lecturer for the time-consuming process. For this purpose, GSM/GPRS (Global System for Mobile communication/General Packet Radio Service) based student's attendance management system using RFID (Radio Frequency Identification) is a much convenient method to take the attendance. Student is provided with the RFID tags. When student comes near to the reader, it will sense the respective student and update attendance. The whole process is controlled using the microcontroller. The main advantage of this system is that it reduced the complexity comparison to student attendance system using RF technology. This system requires only one microcontroller for the operation, it is real time process. This paper reviews some of these monitoring systems and proposes a GPRS based student attendance system. The system can be easily accessed by the lecturers via the web and most importantly, the reports can be generated in real-time processing, thus, provides valuable information about the students' commitments in attending the classes.

***Keywords*—** Microcontroller; RFID; Student; GSM/GPRS,RF

I. Introduction

IN most universities, teachers take attendance by calling out the names and surnames of students, and then marking them, while, in others, teachers pass around a sheet of paper, asking students to sign in attendance sheet just next to their surnames. Both practices have their drawbacks. In the first case, if numerous groups attend the lesson, checking all of these students by name or surname might take precious time of each lesson; in the second case, friends of absent students may write down their names and surnames. These practices place university teachers and their institutions at considerable disadvantages when it comes to taking attendance. To rectify these systematic failings, am automatic RFID based attendance system is proposed.

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In previous method, attendance of student is take by using RF technology. RF technology uses two microcontroller, RF transmitter and RF receiver for the operation.The data collected by RFID reader is sends to microcontroller, this microcontroller is then sends that data to the RF transmitter .RF receiver is collect all the data from the RF transmitter and sends to the microcontroller. Microcontroller then sends this data to LCD (Liquid Crystal Display) and MAX 232 device for display the window on laptop.Student attendance system using RF technology shown in below fig 1.

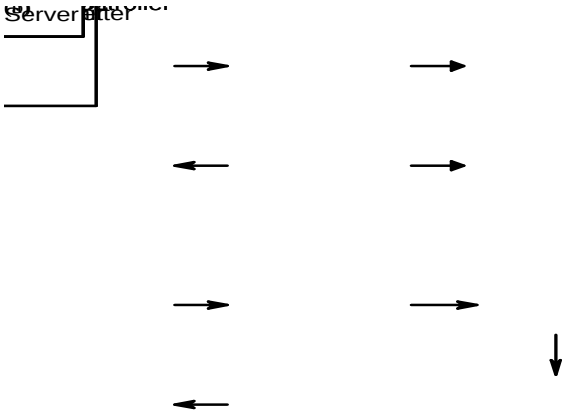

Fig 1.Block diagram of RF based attendance system
(a) Transmitter block diagram; (b) Receiver Block diagram

In this system, each RFID card has a unique ID, precluding the duplication of a card. These RFID-cards are given to students of University, and while entering classrooms, RFID readers will read these cards, identify the students from their respective RFID-cards and send the data to a database (Personnel Computer). The Personnel Computer (PC), in turn, sends all the data it has collected to the server by the end of lesson, or at the end of the respective day according to the preference of lecturer. This means no class time is wasted [9]

Section 1 basically is an introduction of the system. In this chapter, the discussion is all about the background, need and objectives of the project. The overall overview of the entire system is discussed in the section. Next section discusses about the literature review for the development of the student attendance using RFID System. Section 3 provides the necessary information about the proposed system. Last section

concludes the paper. This section also discusses about total costing involved and potential of the system for commercialization.

II. Comparison of earlier system

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. Reference [1] provides examples of a real RFID contact less data link deployments that utilize RFID technology for object tracking and automated data collection solution. RFID is a technology that uses radio waves to transfer data from an electronic tag, called RFID tag or label, attached to an object, through a reader for the purpose of identifying and tracking the object. In 1945, Leon Theremin invented an espionage tool (for spy activities) for the Soviet Union which retransmitted incident radio waves with audio frequency information. Sound waves vibrated a diaphragm which slightly altered the shape of the resonator, which modulated the reflected radio frequency even though this device was covert listening device, not an identification device or tag, it is considered to be a predecessor of radio frequency identification (RFID) technology because it was likewise passive, being energized and activated by waves from an outside source. Similar technologies such as the IFF (identification friend and foe) transponder developed in the United Kingdom, was routinely used by the allies in the World War 2 to identify aircrafts as friend or foe. Transponders are still used by most powered aircrafts to this day. Mario .W. Cardullo was the first to have received the United States patent for an active RFID tag with re-writable memory on January 23, 1973 [2]. In that same year, Charles Walton, a California entrepreneur, received a patent for a passive transponder used to unlock a door without a key. A card with an embedded transponder communicates a reader near a door, when the reader detects a valid identification number stored within the tag, the reader unlocks the door. Walton licensed the technology to Schalge lock of San Francisco, a lock maker and other companies [1]. Time and attendance systems are major part of today's human resource systems, take organization towards better human resource practice, systems and excellence. The implementation of time and attendance system has a lot of advantages for the manager. The kind of system that is implemented depends upon what the organization is trying to achieve by implementing the system. There are different types of automatic attendance systems each type of system is suited to different needs and requirements [3]. Some of the most common types include biometric attendance system, magnetic stripe attendance system, barcode attendance system, and RFID attendance system.

A. Barcode Attendance System

The barcode system is a common type of time and attendance system through which the efficiency of measuring and tracking employees' time could be increased to a great degree. With the automation through barcode technology, the errors previously made in the manual payroll or attendances are eliminated. As a result, the system provides high levels of accuracy and reliability in tracking of employee attendance. In addition, the costs associated with the installation of the system are not too much relative to the cost of payroll or attendance errors. The implementation of the barcode system is easy. Every employee is issued a badge/card in which there is a barcode. In order to check into or out of the company, the badge/card is swapped on the time clock, and the data is captured by the clock. This data from the clock can be downloaded by the manager or the administrator and then used for updating and maintaining time and attendance records. The Universal Product Code (UPC) is a unique 12-digit number assigned to retail merchandise that identifies a product and the vendor. The Universal Product Code (UPC) on a product typically appears adjacent to its barcode, the machine-readable representation of the Universal Product Code (UPC) The UPC for a particular product is always the same. The first six digits is the vendor unique identification number. All the products that the vendor sells will have the same first six digits in their UPCs. The next five digits identify the product. The last digit is called the check digit. This is used to verify that the UPC for that specific product is correct. Each time that UPC is read, typically by a scanner reading the barcode, a calculation is done. And, if the check digit is different compared from the one that is calculated, then the computer knows that there is something wrong with the UPC. Fig. 2 is a pictorial diagram of a barcode with its universal product code (UPC) [4].

Fig. 2 Pictorial diagram of Barcode

B. Biometric Attendance System

This is the study of measurable biological characteristics. In computer security, biometrics refers to authentication techniques that rely on measurable physical characteristics that can be automatically checked. There are several types of biometric identification schemes which include retina, hand geometry, vein, voice etc. The computer uses any of these biometric identification schemes to determine who you are, and based your identity a [5]. Under this system, there is time and attendance software that is paired with a time clock for employees which uses biometric technology for authentication purposes. When these systems are in use, the employees can use their finger prints for clocking in and clocking out. This method has the great benefit that the entire process is easy as well as quick. Other advantages include elimination of the cost previously incurred in getting the employees cards. In the magnetic stripe and barcode systems, there is an ongoing

expense associated with the damage, misplacement and stealing of cards and the continuous need for their restoration.

TABLE I
COMPARISON BETWEEN DIFFERENT TECHNOLOGIES

System Parameters	*Barcode*	*Voice recording*	*Biometry*	*Smart card*	*RFID*
Data quantity	*1–100 k*	-	_	*16–64 k*	*16–64 k*
Data density	*Low*	*High*	*High*	*Very High*	*Very High*
Machine readability	*Good*	*Expensive*	*Expensive*	*Good*	*Good*
Readability by people	*Limited*	*Simple*	*Difficult*	*Impossible*	*Impossible*
Influence of dirt/damp	*Very high*	_	_	*Possible*	*No influence*
Influence of (opt.) covering	*Total failure*	_	*Possible*	_	*No influence*
Influence of direction and position	*Low*	_	_	*Uni-directional*	*No influence*
Degradation/wear	*Limited*	-	-	*Contacts*	*No influence*
Purchase cost/reading electronics	*Very low*	*Very high*	*Very high*	*Low*	*Medium*
Operating costs	*Low*	*None*	*None*	*Medium*	*None*
	Slight	*Possible (audio tape)*	*Impossible*	*Impossible*	*Impossible*
Reading speed (including handling of data carrier)	*Low ~4 s*	*Very low > 5s*	*Very low > 5–10 s*	*Low ~4 s*	*Very fast ~0.5s*
Maximum distance between data carrier and reader	*0–50 cm*	*0–50 cm*	*Direct contact*	*Direct contact*	*0–5-m, microwave*

C. Magnetic Stripe Attendance System

In the magnetic stripe attendance system, data is encoded in the magnetic stripe of the employee card When the card, is swiped through the employee time clock, the information in the card's magnetic stripe is recorded by the time clock. Fig. 3 is a pictorial diagram of a card embedded with magnetic strip.

Fig. 3 picture of a magnetic stripe card

The use of Barcode is quite famous for the many application based systems. But the recent advancement in the RFID technology has stolen the spot light and proved to be the improved technology.

D. Fingerprint Identification

Fingerprint identification refers to specifying one's identity based on his fingerprints. The fingerprints are captured without any information about the identity of the person. It is then matched across a database contain innumerous fingerprints. The identity is only retrieved when a match is found with one existing in the database. So, this is a case of one-to-n matching where one capture is compared to several others. This is widely used for criminal cases. Fingerprint verification is different from identification in a way that the person's identity is stored along with the fingerprint in a database. On enrolling the fingerprint, the real time capture will retrieve back the identity of the person. This is however a one-to-one matching. This is used in offices like passport offices etc. where the identity of a person has to be checked with the one provided at a previous stage Irrespective of the procedure carried out, the fingerprint recognition has to be such that the fingerprint is well- represented and retains its uniqueness during the process. In the following pages, an approach to fingerprint recognition has been discussed that will deal with the representation of the same. Table 1 gives some of the differences of the auto-id technologies. [7,8].

III. PROPOSED SYSTEM

Proposed system mainly consists of RFID tag and RFID reader and the overall process is controlled by the microcontroller. RFID reader is used to detects the tag. These tags have provided to students with particular ID. As soon as the student with valid RFID card comes near to the RFID detector, detector will sense the card and collect the necessary information present in the card. The information is transmitted wirelessly using GPRS. The received information is then updated in the respective student's profile on the WEB. Microcontroller is used for controlling the events..

In PCB (Printed Circuit Board) design, power supply requires four diode which generates dc supply. This supply is sends to entire device. The major part of this system is LCD and microcontroller. Microcontroller is the heart of this system. Some points of this microcontroller is used for the

programming purpose.LED and register is used for indication of power supply. By using the jumper it is easy to program without inserting IC(Integrated Circuit).The PCB and block diagram of this system is as shown in fig 4and 5.

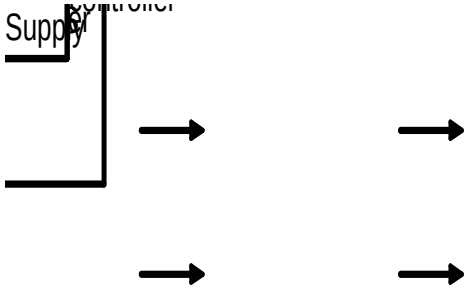

Fig. 4 Block diagram of RFID based attendance system using GPRS

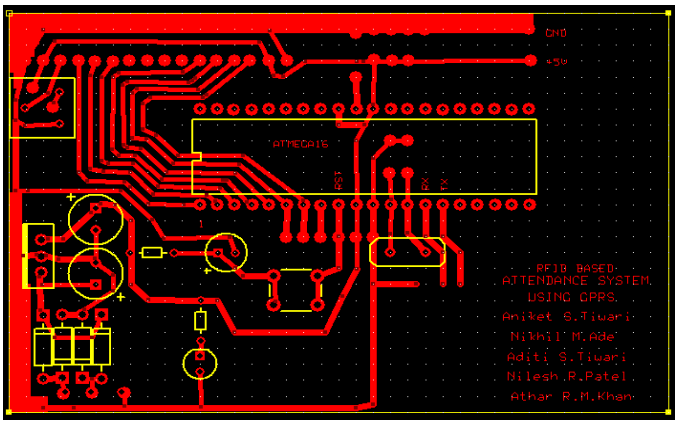

Fig. 5 PCB Layout

A. Circuit Design

With the help of circuit diagram it is easy to understand the actual working of the system. In this system step down transformer is used to convert 230v to 5v. This power supply is connected to switch, by pressing a switch button the current is through entire circuit. RFID reader collects all the data from the RFID tag. This information is sends to receiving port of microcontroller by RFID transmitter. Microcontroller continued the interfacing with the LCD and GPRS. After processing the data the microcontroller sends this information to the GPRS. With the help of GPRS the attendance is display on window. The fig 6 shows circuit design of attendance system.

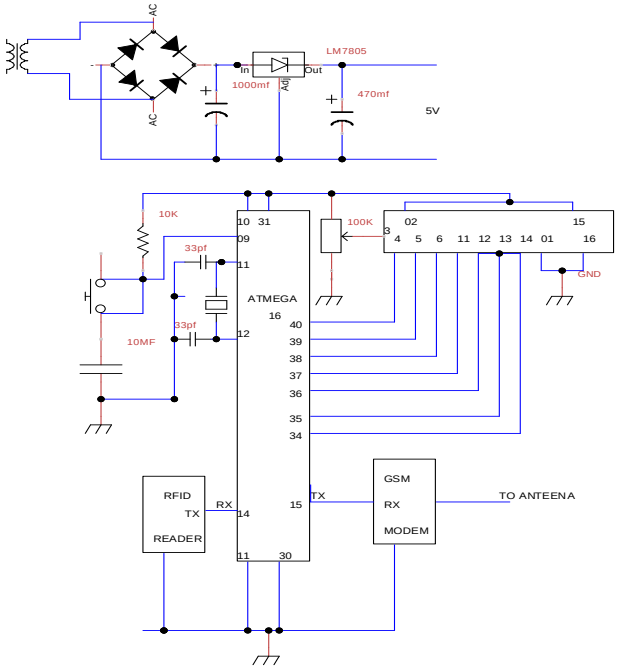

Fig.6 Circuit Design

B. LCD

Alphanumeric displays are used in a wide range of publications, including palmtop computers, word processors, photocopiers, point of sale terminals, medical instruments, cellular phones, etc. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. A full list of the characters and symbols is printed on pages 7/8 (note these symbols can vary between brand of LCD used). This booklet provides all the technical specifications for connecting the unit, which requires a single power supply (+5V).

Available as an optional extra is the Serial LCD Firmware, which allows serial control of the display. This option provides much easier connection and use of the LCD module. The firmware enables microcontrollers (and microcontroller based systems such as the PICAXE) to visually output user instructions or readings onto an LCD module. All LCD commands are transmitted serially via a single microcontroller pin. The firmware can also be connected to the serial port of a computer. As shown in fig 7

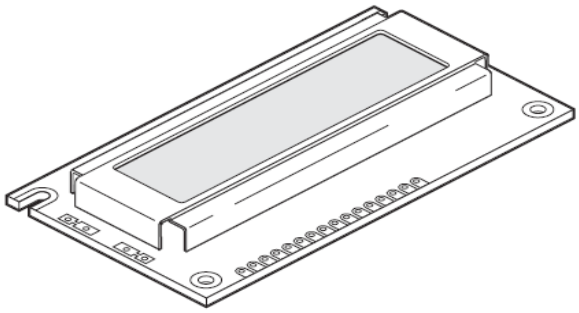

Fig. 7 LCD Display

C. GPRS Modem

The basic functions of a GPRS modem include wireless data communication and integration with several applications that require (universal serial bus) USB connections .It is frequently better to use a GPRS modem in data transmission. Users of GPRS benefit from shorter access times and higher data rates than they have now. In conventional GSM, the connection set-up takes several seconds and rates for data transmission are restricted to 9.6 k bit/s. GPRS in practice offers session establishment times below one second and ISDN- like data rates up to several tens k bit/s.

In addition, GPRS packet transmission offers a more user-friendly billing than that offered by circuit switched services. In circuit switched services, billing is based on the duration of the connection. This is unsuitable for applications with busty traffic. The user must pay for the entire airtime, even for idle periods when no packets are sent (e.g., when the user reads a Web page). In contrast to this, with packet switched services, billing can be based on the amount of transmitted data. The advantage for the user is that he or she can be "online" over a long period of time but will be billed based on the transmitted data volumeTo sum up, GPRS improves the utilization of the radio resources, offers volume-based billing, higher transfer rates, shorter access times, and simplifies the access to packet data networks

D. ATMEGA16 Microcontroller

The ATMEG16 microcontroller used in this lab is a 40-pin wide DIP (Dual In Line) package chip. This chip was selected because it is robust, and the DIP package interfaces with prototyping. supplies like solder less bread boards and solder-type per-boards. This same microcontroller is available in a surface mount package, about the size of a dime. Surface mount devices are more useful for circuit boards built for mass production. Figure 8 below shows the 'pin-out' diagram of the ATmega16. This diagram is very useful, because it tells you where power and ground should be connected, which pins tie to which functional hardware, etc.

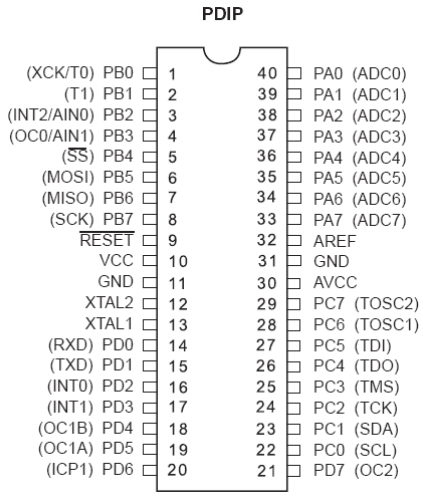

Fig. 8 Pin Configuration of ATMEGA16

E. Power Supply

Power supply is used to supply required power to the system. By using transformer to power supply the power of system is maintains. Electronic device requires wide variety of voltage level to operate correctly, for this purpose power supply is needed.

IV. Result

The student can see their attendance by clicking on log in window. The student will login to attendance system with their name or college ID. After login, the result will appear. Such type of result window will obtain as shown in fig.9 result window. If students want more information then they can add their information as per convince. The students can see their name, attended lecture time, attended lecture in result window as shown in fig. After clicking on logout button the window will disappear.

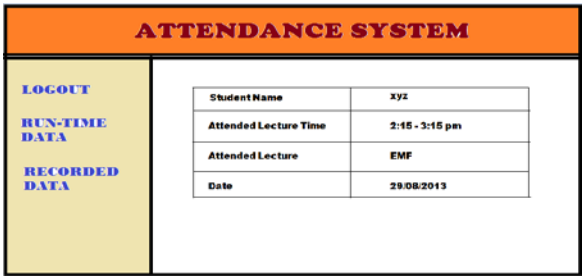

Fig. 9 Result Window

V. Conclusion

The developed Web-Based Student Attendance System using Radio Frequency Identification technology will significantly improve the current manual process of student attendance recording and tracking system, especially in a university or school environment. The system promotes a semi-automated approach in capturing the student attendance, i.e. by having the students to flash their student cards to the RFID reader. In addition, a number of other advantages are gained by having an online web-based system, acting as a central repository of student attendance record. Firstly all processes of managing the student attendance record are performed online, allowing administrators and lecturers to view or modify the users' data through any computer via the web browser, as long as they are connected to the Internet. This way, no specific software installation is required. The captured student attendance data are also processed and analyze automatically with less risk of data loss, compared to a manual filing approach. Specific to lecturers or teachers, they can easily monitor their students' attendance online and this could improve the quality of teaching since less time is needed to manage the student attendance record. The developed system can be improved and upgraded further, e.g. by extending the system with new features and modules or by improving the web-interface layout with new display style. Better yet the system can be enhanced further to offer another significant enhancement where the system can be extended to

monitor staff attendance record. Finally it can conclude that GPRS based students attendance system is chipper as well as reduced complexity upto 50% that of using RF technology.

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