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Attendance Management using Biometrics with SMS Alerts

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Abstract: In this paper, development and management of attendance reports using biometrics is proposed. The system makes use of fingerprints, which is a unique identification for every person. The method proposed here would eliminate the use of stationary materials as well as reduce human efforts in the process of attendance development. This paper also provides design method for generating SMS alerts using GSM.
Keywords: Biometric, Fingerprint, python, Arduino, GSM

I. INTRODUCTION

Attendance is an important criteria for measuring the performance of any institute. For making this attendance management procedure simpler, fingerprints are one of the most common methods of biometric identification. Use of fingerprints for attendance at work places and academic organizations will be extremely useful because they are unique which will ensure that employees or students cannot clock in one for another, thereby preventing employee time theft and buddy. Also it is less time consuming as well as it records can be maintained easily. Instead of signing the attendance sheets or taking attendance by calling names, an individual can pass finger over the fingerprint module. The attendance records for manual attendance system are time consuming and they can be stolen or lost. In many institutions parents are informed about the weekly or monthly attendance of their children. An attendance management system using biometrics with SMS alerts provides the needed solution. This system is the combination of hardware and software which enables an individual to mark the attendance if its fingerprint match is available in the stored database. Hence the attendance for a day or for particular time slot is marked. This paper will discuss the general overview of the proposed system; details of design and operation of system in both hardware and software domain. It concludes the observations made and the future expansions that can be made to the system.

II. LITERATURE SURVEY

Authors in [1], proposed an Automated Fingerprint Attendance System (AFAS) which works on the principle of Automated Fingerprint Identification System (AFIS).Single fingerprint of every student is in enrolled in the database. The fingerprint scanner is connected to the computer directly via USB. The records are stored in Microsoft SQL (Structured Query Language) Server database .This database is very fast and it can store large number of records. In paper [2], samples of three or four fingerprints are captured and various image enhancement techniques as well as edge detection techniques are used. GSM is interfaced with microcontroller to send message alerts to the assigned number. This system is implemented with Microsoft's C# on .Net framework and Microsoft's SQL server at the backend. Authors Ansari et al (2011) demonstrated how an automation of attendance system can be implemented using RFID(Radio Frequency Identification) ,Biometric and GSM modem with .Net framework can be implemented in an institution[3]. RFID transponders are installed in every classroom, laboratory, staffrooms, libraries etc and when a student enters any of them the transponder will detect and store the student's last known position in the database [3]. There are many disadvantages of RFID; transponders are to be installed everywhere & use of RFID tags can cause buddy punching.

III. METHODOLOGY

A. Block Diagram

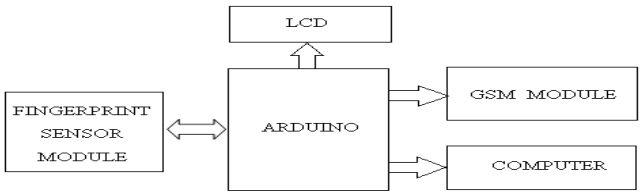


Fig. 1 Block diagram of attendance management system

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B. Hardware description

1) Fingerprint Sensor: There are many types of Fingerprint Sensor, but most commonly used are Optical Fingerprint sensors and capacitive fingerprint sensors. In this system optical finger print sensor is used. The working of the fingerprint scanner or module can be explained in two stages - a)It will capture an image of individual's finger and store it in database, b)It will examine the pattern of ridges and valleys during attendance with the ones which is already stored in database. If a match occurs then attendance will be recorded. Optical sensor uses CCD (charged coupled device). A CCD is nothing but an array of light sensitive diodes called photo sites, which generate an electrical signal in response to light photons. Each CCD records a pixel; a pixel is nothing but the tiny dot representing the light that hit that spot. Collectively, the light and dark pixels form an image of the scanned scene [8]. When you place your finger on a glass plate, the scanning process starts and photosites takes a picture. The scanner has an array of light-emitting diodes which are used to illuminate the ridges of the finger. In the CCD an inverted image of the finger is generated and in that darker areas represents the ridges of the finger with more reflected light where as lighter areas represents the valleys between the ridges with less reflected light [8]. If the processor finds that the image is properly exposed, then it will proceed for comparing the captured fingerprint with stored fingerprints in the data.

2) Arduino: Arduino is nothing but the microcontroller board. In this system Arduino Mega 2560 is used. The Arduino Mega 2560 is a microcontroller board based on the microcontroller IC ATmega2560. Arduino Mega has 54 digital input/output pins (of which 15 can be used as PWM outputs), a 16 MHz crystal oscillator, 16 analog inputs, 4UARTs (hardware serial ports),a USB connection, a power jack, an ICSP header, and a reset button. In this system Arduino board is interfaced with Fingerprint sensor, GSM module & LCD.

3) GSM module: GSM stands for Global System for Mobile communication. It is a mobile communication module which uses a SIM card, just like SIM used in mobile phones. In this system GSM300 module is used for sending SMS to parents about informing their children's attendance in school/college.

C. System Operation

This system makes use of fingerprint for authentication purpose. Fig. 2 shows flow chart of attendance management system. In this process fingerprints of each student are captured and matched with data stored in the database. Biometric authentication consists of two stages:

1) Enrolment and

2) Authentication [1].

In enrolment stage fingerprints of each student are enrolled by assigning different ID to them. During this process, unique features of fingerprints of student are scanned, analysed using fingerprint sensor module. During enrolment of students, each fingerprint is analysed for very specific feature called as minutiae (where the lines in your fingerprint terminate or split into two). The fingerprint sensor module then converts it into the equivalent template and saves them into its memory as per selected ID by Arduino [9]. All the processes are programmed by Arduino like taking a fingerprint image and convert it into templates and storing as ID [9]. The enrolment process is carried out by administrator in this system [1].Authentication is the process of verifying an individual. If the fingerprint of the user matches with the data stored during enrolment, then the user is authenticated and the attendance will be registered and stored in database. In short process of authentication avoids buddy punching.

D. Memory Management

Arduino Mega 2560 has inbuilt memory of 4000 bytes. In this system attendance of 80 users can be stored for 7 days. Every attendance stores Date and Time, which requires 7 bytes each.

So total memory required 80*7*7 = 3920 bytes.

Memory of the system can be increased by connecting memory card module externally.

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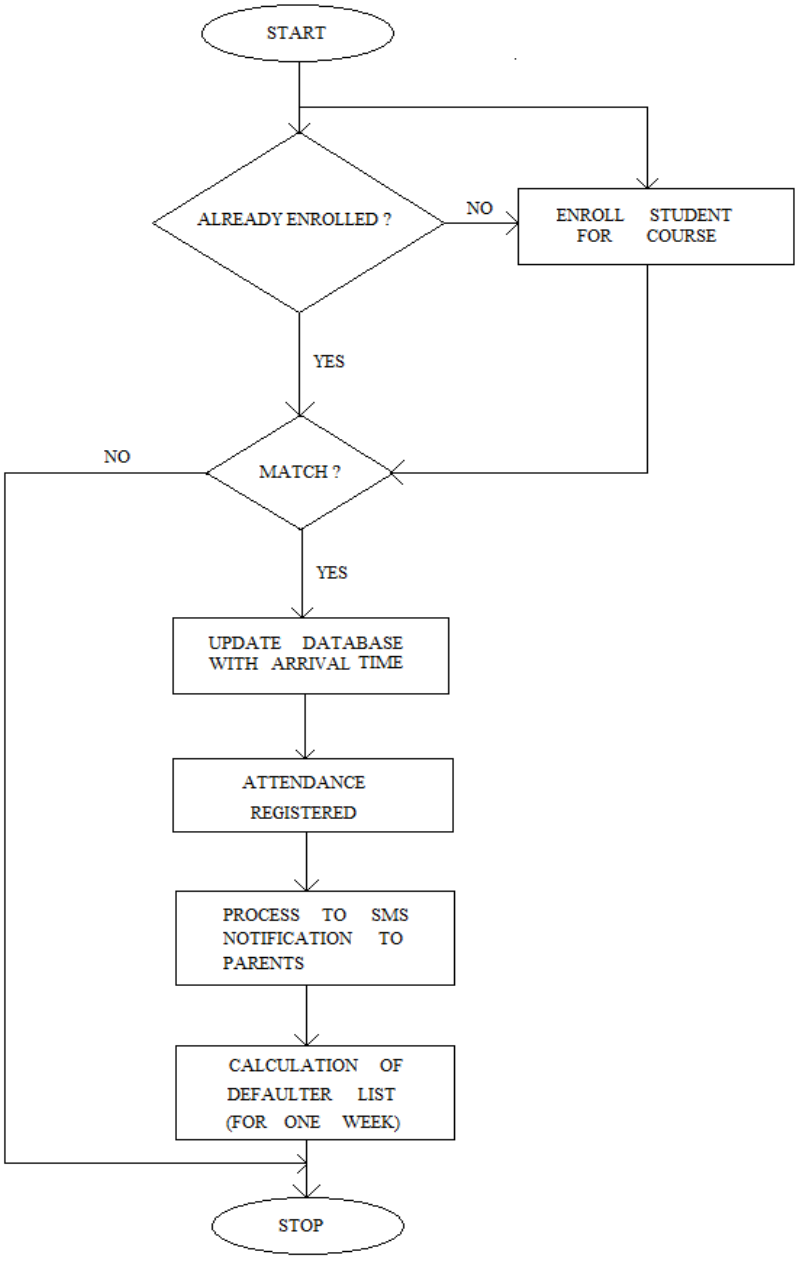


Fig. 2 Flow chart of attendance management system

E. GSM module in The Attendance Management System

In this system GSM module is used in order to send SMS to parents [3]. When student place his/her finger on fingerprint sensor, if the fingerprint matches with the data which is stored in database, then attendance will be registered and at the same time the SMS will be send to parent's mobile, indicating the presence of their child. In today's world parents are worried whether their children are reaching safely to school or college, this problem will be solved with this system.

F. .Use of Python in Attendance System

In this system python language is used to store the attendance data, which will be used to calculate the defaulter's list.

Python language is object-oriented, general purpose programming language that uses interpreter and can be used in a vast domain of applications [11].

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G. Some of The Characteristics Of python are Listed Below

1) Python is portable: It works on any operating system like windows, Linux, UNIX, Mac OS etc. And interesting part of this is the output of the program is same in all these operating systems.

2) Python is very flexible: It can use modular components that were designed for other programming languages. For example, you can write a program in C++ and import it to python as a module [11].

3) Python supports other technologies: It supports COM, .Net etc.

4) Python is very expressive: In fewer lines of codes, greater functionality can be obtained.

Python supports various kinds of programs like system programming, graphical user interface, database programming, numerical programming etc. So in this system to store the database python language is used.

IV. CONCLUSION

The system is able to take students attendance successfully. As this system is less time consuming, the performance and efficiency of the system is much better than traditional way. Attendance data is stored in database along with updated date and time.SMS notification about the attendance is successfully sent to parent's mobile using GSM. Stored data of attendance is used for calculating defaulters list.

V. FUTURE WORK

This paper describes biometric identification using fingerprint authentication. Biometric technology is rapidly expanding as a trusted, secure means of personal identification. Future identification can include facial and iris recognition. Facial recognition requires no contact and face Images can be captured from long distances. Iris recognition is the safest and most hygienic biometric attendance method.

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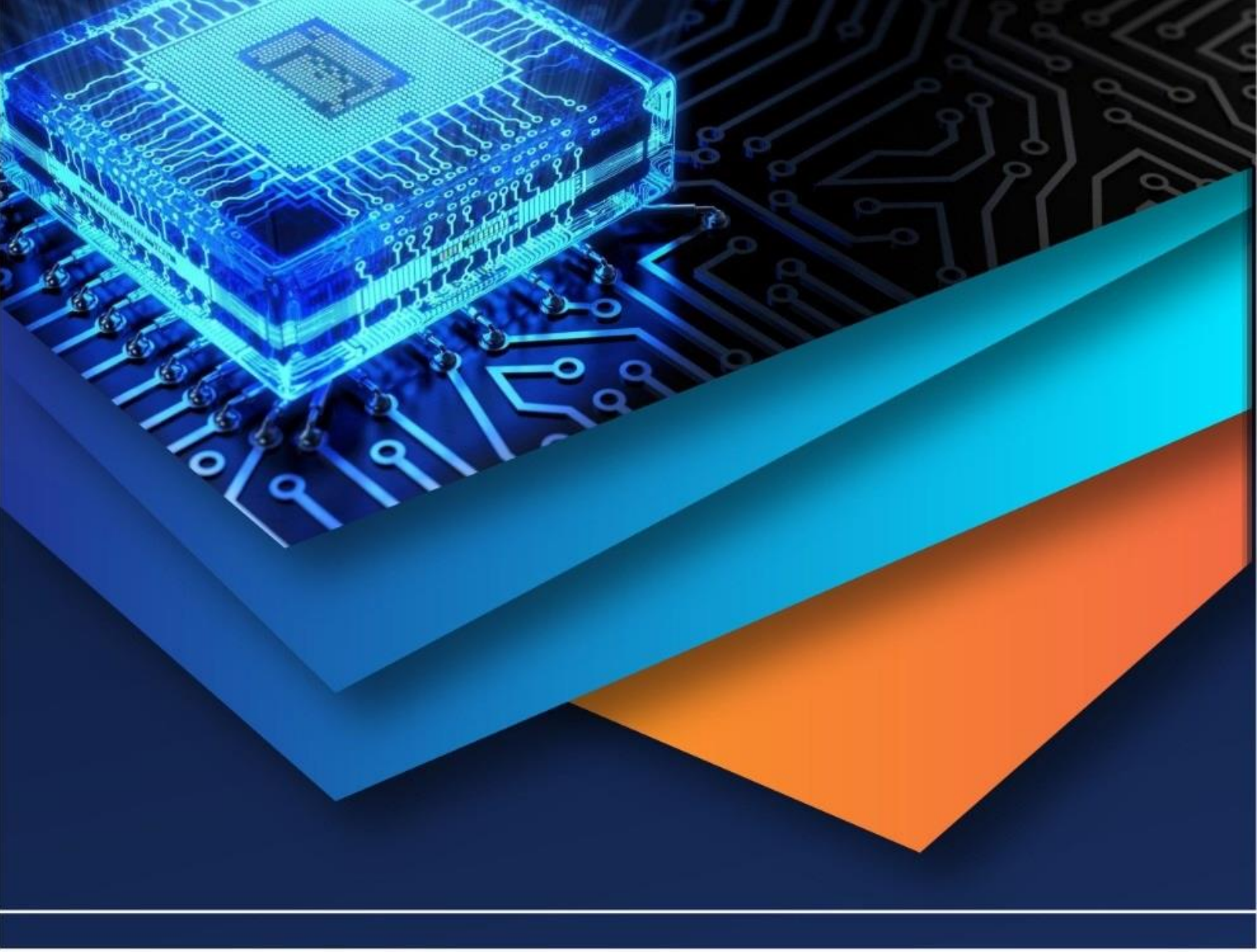
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