Handheld Fingerprint Attendance System

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Abstract:
Our proposed system deals with the problem that occurs in the manual way of taking attendance. We try to design a student attendance system which could effectively manage attendance of students. Attendance is marked after student identification. For student identification, a fingerprint recognition based identification system is used. The fingerprint is considered to be the best and fastest method for biometric identification, because they are secure to use, unique for every person and do not change in one's lifetime. The proposed system provides facilities to calculate and generate daily and monthly report of attendance in MS Excel sheet. Security provided in an encrypted format, professors and administrator only can access the data.

Keywords: Handheld fingerprint, Biometric sensor, Attendance system, Arduino, Standalone system, Student attendance.

I. INTRODUCTION
It is expected today that an individual who wants to authenticate himself for a service should have a taken and/or password for example identity card, ATM card, driving license, health card and so on. Carrying different cards and remembering passwords for different services is a significant issue for individuals and organizations. To make the fingerprint attendance systems more secure and reliable for authentication, biometrics data are integrated into the fingerprint attendance systems. Biometrics technologies verify identity through characteristics such as fingerprints, retinal patterns, palm prints, faces, irises, voice, handwritten signatures, and so on. These techniques, which use physical data, are receiving attention as a personal authentication method that is more convenient than traditional methods such as a password or ID cards because it uses data taken from measurements and such data is unique to the individual and remains so throughout one’s lifetime. In these technologies, fingerprint becomes the most mature and popular biometrics technology used in automatic personal identification. The reason for the popularity of fingerprint verification is that fingerprint prints satisfy uniqueness, stability, permanency and easily taking. The proposed system is an easy assembly of components working in a perfect manner. It allows the students to record their attendance electronically by simply providing a fingerprint impression while the regular proceedings on the lecture are carried on. Thereby, the ambiguity of being marked absent, staying alert during the roll call or simply a human error on the lecturer’s part can be reduced. A digital record of data is created within the unit and that data can be accessed by the teacher with its default display being in an MS Excel sheet, the teacher’s work is reduced to hitting print! Thus, taking out the stride of going through 60–70 odd names and numbers on the roster. A capacitive display next to the fingerprint module gives the student an assurance of his or her attendance being recorded. Mounted on a sturdy power supply and a large capacity memory card to store the attendances, this unit is run by Arduino ATmega2560 microcontroller at its heart. With an effort to make the device highly portable and a delight to be used, we’ve adopted Surface Mounted Devices (SMDs) making it as handy as we can.

II. LITERATURE SURVEY
In the reference paper [1] author has mentioned, biometric is being spotlighted as the authentication method because of the need for reliable security. 80 percent of the public has biometric recorded. Thus, it is very well accepted by the government and also in the private sectors for better security. It has a long history in judicial science, complete with many studies which back up the use of fingerprints for identification. During the 14th century, in China, a European explorer, Joao de Barros recorded the rest known example of fingerprinting, which is a form of biometrics. Chinese merchants used ink to mark children’s fingerprints for identification purposes. Oloyede et al. carried out an extensive research on the applicability of the biometric technology to resolve the problem of staff attendance. However, the researchers did not provide any software to address the problems of attendance. This honorable history gives it weight and faith which are not available to newer identification systems. In reference paper [2] author has mentioned, Fingerprint identification is widely understood as highly accurate and very trustworthy since the statistical chance of two or people on Earth having identical fingerprints is very low. Most of the attendance marking systems uses paper-based methods for tracking and calculating attendance. Previously little work has been done regarding academic attendance monitoring problem. Some software has been previously designed to keep track of attendance. In reference paper [3], the system includes terminal fingerprint acquisition module and attendance module. It can realize automatically such functions as collecting information of fingerprint, processing, and wireless transmission, fingerprint matching and making an attendance report. After taking the attendance, this attendance system sends the attendance of every student to their parent’s mobile through GSM. In reference paper [4], the author presents a survey of various developments in fingerprint sensor technologies with respect to their strengths and weaknesses. Related issues on technology, underlying physics, liveness detection, performance assessment, limitations and standardization are discussed.
III. EXISTING SYSTEM

A Traditional way attendance taking and generating report has its limitations. It is well enough for 50-70 students but when it comes to taking attendance of students large in number, it is difficult. For taking attendance for a lecture, a conference, ambiguity of being marked absent, human error, staying alert on roll calls, and time waste over the response of students, waste of paper etc. are the disadvantages of manual attendance system.

Problems in existing system:

i) In Fingerprint Based Attendance System using microcontroller and lab view required always connectivity of computer system to synchronize the data.

ii) In Fingerprint Based Student Attendance System Using GSM, system security is provided with a mobile phone which is costly to afford in schools and colleges. The record of students is being addressed to their parents every hour, because of this parents may get disturbed in their work.

iii) Development of Fingerprint Biometric Attendance Management System using Wireless Connectivity uses the mobile network to accept biometric input and save the records of subsequent operations, because of this, if mobile is out of network then attendance system will not work properly.

IV. PROPOSED SYSTEM

The proposed system uses an automatic attendance management technique that combine fingerprint authentication into the process of attendance management.

![System Block Diagram](image)

Figure. 1. System block diagram

In proposed system first, we have taken students and administrator enrollment for marking student attendance and administrator login respectively. Students and administrator have to place a finger over the biometric sensor. Admin has rights to assign unique enrollment ID for students and administrator. Admin can set enrollment ID manually during the enrollment process.

a) Enrollment:

To enroll the fingerprint the finger is to be pressed to the biometric sensor thrice. All the two times it creates a template for the finger that was put on the optical sensor, added to matches, the second time it also merges the two templates to generate the final template. On successful enrolling, the admin creates manually unique ID pertaining to the finger enrolled. This ID can be saved and later used for verification of the finger.

**Enrollment Steps:**

- i) Issue command to start enrolling over the past ID as parameter: Enroll Start (ID)
- ii) Take snapshot of the finger: Capture Finger
- iii) Create template of the 1st Image: Enroll1
- iv) Remove and press finger again
- v) Capture Finger
- vi) Create template of the 2nd Image: Enroll2
- vii) Remove finger: merge 2 templates:
- viii) Enrollment complete.

b) Matching:

After completion of the enrollment process, the second step is matching of the fingerprint with assigned ID’s. The matching process is done by fingerprint module R305. In this step of fingerprint matching, for 1:1 matching input fingerprint is matched with the template image generated and it generates an acknowledgment. For 1: N matching input is matched with the images in the library. It gives the matched image, a page id of the matched image which is generated.

c) Authentication:

The third step is authentication. During authentication, the biometrics of the user is captured and compared with all those that already exist in the flash memory to determine a match. If a match is found then attendance is marked against the person id. For marking attendance of new session administrator login is required. After Administrator login system assign a particular subject to selected teacher and screen display message for students to mark attendance. One’s all students marked attendance, administrator logout is required to complete a session. After administrator logout system returns to the main menu screen with options: Attendance, Record, New Enroll, Contrast, Light (ON/OFF).

V. SYSTEM ARCHITECTURE

![System Architecture](image)

Figure. 2. System Architecture

i. Arduino ATMEGA 2560

The Mega 2560 is a microcontroller board which is based on the ATmega2560. It has total 54 digital input/output pins, 16 analog inputs, 4 UARTs (hardware serial ports), a power jack, an ICSP header, a 16 MHz crystal oscillator, a USB connection, and a reset button.

ii. Nokia LCD Display

The Nokia 5110 is a primary graphic LCD screen for lots of applications. It uses the PCD8544 controller. The PCD8544 is
a low power CMOS LCD controller/driver, designed to drive a graphic display of 48 rows and 84 columns.

### iii. Fingerprint Module R305

This is a fingerprint sensor module with TTL UART interface for direct connections to system microcontroller UART or to PC through MAX232 / USB-Serial adapter. The user can store the fingerprint data in the module and configure it in 1:1 or 1:N mode for verifying the person. The fingerprint module can directly interface with 3v3 or 5v Microcontroller. Optical biometric fingerprint reader with great features and can be embedded into a multiple of end products, such as access control, attendance, safety deposit box, car door locks. The module R305 does all the heavy work of reading, identifying, and storing the fingerprint data. The module can store up to 256 different fingerprints.

### iv. RTC Module

The user can either directly solder the module to prototyping shield or solder a 5 pin or 6 pins header on the shield for easy removal of the module like we did. This RTC module stores current time information with the power of a coin cell lithium battery.

### v. Keypad

Keypad consists of six buttons. It has a simple user interface like a mobile phone keypad. Left upper button indicates ok and select operation and right upper button used for the back operation. Left, right, up and down buttons are used for moving the particular operation.

### VI. Working Model

![Figure 3. Handheld Fingerprint Attendance System](image)

This is overall attendance system working in perfect manner. All components are interfaced with Arduino ATMega2560.

![Figure 4. Home Screen](image)

This is simply a user home screen. The home screen displays a project name abbreviation HFAS with current time, date and menu option. After pressing the upper left button of the keypad, the menu screen will open with menu options.

![Figure 5. Menu Screen](image)

Menu screen display options like Attendance, Record, New Enroll, Contrast, Light (ON/OFF). Each Menu item has its specification.

![Figure 6. Attendance Screen with Administrator login](image)

After clicking on attendance, the system asks to place a finger over fingerprint module. Fingerprint module search and match appropriate enrolled ID with a fingerprint. Fingerprint module return ID number, after which is compared with ID condition and display the appropriate subject of a teacher or else it displays error message.

![Figure 7. Student Attendance Screen](image)

This screen displays the message on the screen for placing a finger over fingerprint module. Fingerprint module search and match appropriate enrolled ID with fingerprint and display a message on next screen with enrolled ID and roll number.

### VII. Conclusion

The Proposed System is an elegant and efficient way to track the presence of students in the class over an entire semester. The system helped to reduce many issues such as, denying the possibilities of cheating in marking the attendance, helps to ease the lecturers to keep data of students attendance, the encryption technique adds more security so there will be no unknown fingerprint which is
able to interfere with the recorded data, and the portability saves time in taking attendance instead of queuing in a line.

VIII. REFERENCES


[7]. https://www.tutorialspoint.com/matlab/index.htm Last Accessed on 15th January 2017 at 8:10pm.