

FINGERPRINT-BASED STUDENT PROGRESSION SYSTEM

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Abstract

Information plays a crucial role within any system, and in the realm of academia, it holds particular significance. The accessibility and management of information are vital aspects, enabling students to register for courses, record attendance, participate in quizzes and exams, and review their academic performance. Additionally, post-graduation, students often request transcripts, some doing so promptly, while others return after a significant duration. Consequently, the handling of student records is of utmost importance, necessitating a system that is both easily accessible and secure, while also being sustainable. Traditional manual methods of accessing and storing student records are susceptible to human errors and lack security, leaving them vulnerable to unauthorized access. In response to these challenges, this paper presents the design and development of a biometric-based student record management system. This system serves as an interface between students and the institution, facilitating the timely retrieval of grades, monitoring academic progress, and efficiently recording attendance for each lecture using biometric devices.

Keywords – Fingerprint, attendance, registration, updation, deletion

1. Introduction

Information is the aspect that has its presence in every field that we see in our day-to-day lives. Information can be divided into two types: - Organized Information and Unorganized Information. Of these two types, the organized one is much more valuable. This system focuses on the 'Fingerprint Based Student Progression System'. This is designed to make the task of handling the data easier for both students and teachers who will be using this system. Students have to register for courses, take attendance, quizzes, and exams, and as well as check their scores. So, if students get a time-to-time review of what's going on with their let's say academic profile then they will know how much more effort they must take to achieve their target. It is very important to handle students' records in a way that is accessible, maintainable and secure.

In the past, these kinds of documents required manual upkeep, which proved to be problematic over time. Manual methods often led to inaccuracies and were challenging to sustain for several reasons. The manual process of gathering and storing student records was susceptible to human errors of varying degrees, and it also lacked security, leaving it vulnerable to unauthorized access.

Student records hold significant importance within the educational system of any institution. These institutions face the task of continuously tracking individual student progress and ensuring that all students meet established learning standards. The institute's capacity to alleviate this responsibility depends on its access to precise and pertinent student information.

The paper has Literature Survey, Proposed system model, Flowchart and algorithms, Results and Discussion, Conclusion, and References below.

2. Literature Survey

In this segment, we conducted an examination of various previously conducted studies and projects concerning student record management and biometric attendance management systems. This section delves into the most relevant of these studies and subsequently offers a comparative analysis, drawing comparisons between these previous works and our own system.

In their study titled 'An Attendance Monitoring System Using Biometrics Authentication,' Satoa, K. et al. introduced a system designed for monitoring employee attendance. This system was specifically created to provide a precise, rapid, and highly effective means of recording employee attendance. It employs fingerprint verification through the utilization of the minutiae extraction technique. The results of a survey conducted with this system indicated that fingerprint biometric identification was deemed appropriate for managing employee attendance within the institution/organization.[1]

Iidowu and colleagues have introduced an Attendance Management System that leverages biometric technology. This system is designed for the LASU Epe Campus and serves the purpose of recording student attendance during lectures by utilizing fingerprint recognition. Its primary advantages include enhancing the precision of attendance tracking, bolstering security measures, and providing an

efficient means of calculating attendance percentages. The system relies on a fingerprint identification mechanism, which cross-references students' biometric data with the records stored in its database [2]

Wireless Fingerprint Based College Attendance System Using ZigBee Technology by Gunjan. T, et al. This system utilizes ZigBee wireless technology to manage attendance. It generates attendance reports and dispatches them to the relevant department head or class supervisor every 15 days. Additionally, it can forward these reports to parents' email addresses. Some instances also incorporate RFID technology for student attendance tracking, as mentioned in academic publication "A Fool proof Biometric Attendance Management System" by Karthik.V.E, Shanmuganathan.S & Sumithra.A [3][4].

In "A Novel Web-Based Student Academic Record Information System" by Njamu O. et al., the authors propose a software solution designed to efficiently manage and process student data in an educational setting. This system offers seamless and interactive tools for tracking student academic progress and handling administrative tasks. It employs client/server technology, with the client-side developed in Visual Basic.NET and the server-side in MYSQL, and notably provides a three-year performance analysis for students enrolled in specific programs. [5]

In "Design of a Prototype Web-Based Students' Record Management System" Author Samson A. et al. described the design and development of a Web-based Students Records Management System. It is a full-featured information system that enables accurate record keeping of students' personal, academic, health and related data. In this System Microsoft SQL Server 2005 is used for backend and for frontend Microsoft Visual Basic.net is used [6]

Author Ezenma A, et al. presented a system for processing of results of secondary school students in Design and Implementation of Result Processing System for Public Secondary Schools in Nigeria authors used MYSQL for database management and PHP for frontend. The proposed system is more accurate and easier to use [7]

In Web Based Student Information Management System Author Bharamagoudar, S.R, et al. in this system a web portal is created with the help of html CSS and all information of students is made available on that portal. All data is stored in database and it is managed with the help of SQL [8]

The Online Biometrics-based Class Attendance Management System (OBCAMS) by Adetiba, E., et al. in this system SecuGen Hamster Plus fingerprint scanner is used to take fingerprint from user MS SQL is used for database management and web portal is created using Html CSS [9]

In "Development of Attendance System using Biometric Fingerprint Identification" author Norshidah, K et al. proposed attendance system for lectures to save time and human errors [10]

Rishabh.M and colleagues have recently submitted a thesis titled "Development of a Student Attendance System Utilizing Fingerprint Recognition and One-to-Many Matching." In their research, they have created an efficient attendance management system tailored for educational institutions such as NIT Rourkela. This system records attendance through the process of student identification, which employs fingerprint recognition technology for accurate recognition [11]

In the paper titled "Fusion of Radio Frequency Identification (RFID) and Fingerprint in Boarding School Monitoring System (BoSs)" by Herdawatie Abdul Kadir and colleagues, the authors propose a comprehensive monitoring system for boarding schools. This system utilizes metric cards with embedded RFID tags for tracking students' movements, and students' fingerprints are registered to grant access to various facilities. When a student swipes their metric card at an RFID reader, the system captures the data and sends it to an online database, allowing boarding school management to monitor students' activities and access privileges effectively. [12]

Wireless Biometric Attendance Management System presented by Shaikh Sardar Salim, et al. Fingerprint identification proof system was utilized for keeping up the participation record. The record of the fingerprints with their one-of-a-kind personality number of different understudies was kept up in a database. The correspondence between the PC and Module was done wirelessly over Bluetooth.[13]

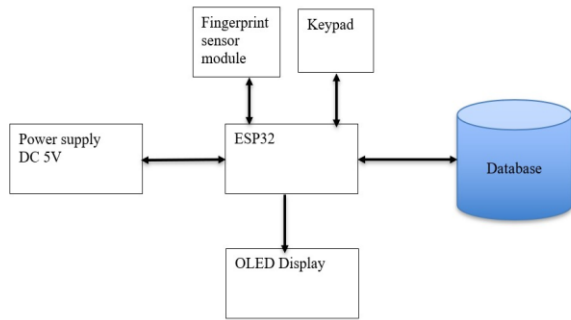
A Fool proof Biometric Attendance Management System by KarthikVignesh, et al. in this system Arduino UNO board, Wi-Fi Shield, GSM Shield, Keypad, LCD Display, Adafruit Fingerprint Sensor and Raspberry Pi is used it measures attendance based on lecture and send messages if student is absent [14]

Biometric Student Record Management System by Onuiri Ernest, et al. in this they proposed student record management system attendance of the student will be taken by fingerprint and will be stored in database and all other data such as result personal information of student is made available on web portal which is created using PHP [15]

Proposed System Model

2.1. Block Diagram

Below Figure 3.1 represents the basic representation of implemented system.



- **Fingerprint Module** – It is used for capturing the fingerprint input. This is going to trigger the whole model.
- **OLED** – OLED is used for showing the user whether his fingerprint is well captured and detected or not.
- **Database** – Database is used for storing the fingerprints of the students in a systematic manner Google Excel Sheet is used as a database.
- **Power Supply** – Power Supply of 5 volts is used.
- **ESP32** - ESP32 allows you to use Wi-Fi in Access Point as well as Station Mode. While it supports TCP/IP, HTTP, MQTT, and other traditional communication protocols, it also supports HTTPS
- **Keypad** - Keypad is used to operate system in admin mode while registration and deletion of finger

2.2. Algorithm for registration

- Step 1: Start.
- Step 2: Press ‘Admin Mode’ for the purpose of registering new fingerprint in the database.
- Step 3: Enter Password to access the Admin Mode.
- Step 4: If password is not correct then Error message will be displayed and if password is correct then it’ll proceed further to take choice from the user.
- Step 5: User will be provided with 3 choices in the Admin Mode i.e.
- 1) Add new finger
 - 2) ID that user wants to remove
 - 3) Clear Database
- One choice will be selected from the above provided choices.
- Step 6: If choice 1) is selected then user is supposed to enter ID and if the entered ID is not present then Error Message will be displayed.
- Step 7: If entered ID is present then the fingerprint for registration will be taken.
- Step 8: User will be asked to place the finger again.
- Step 9: The finger will be compared with the data that is present in the database.
- Step 10: If the finger matches with the data present in the database, then the finger will get registered.
- Step 11: If choice 2) is selected then The ID will be taken from user and the ID will be compared with the data present in the database and if the ID is present then it will get deleted.
- Step 12: If choice 3) is selected then all the data will get deleted from the database.
- Step 13: End.

2.3. Algorithm for attendance

- Step 1: Start.
- Step 2: Take Fingerprint from the user.
- Step 3: Compare whether the fingerprint captured matches with the fingerprint present in the database.
- Step 4: If Fingerprint match is found then attendance will get marked.
- Step 5: End.

2.4. Flowchart for registration

Figure 3.4.1 represents the flowchart of Finger Registration process. Flowchart represents the step-by-step process of how the implemented system registers the new finger.

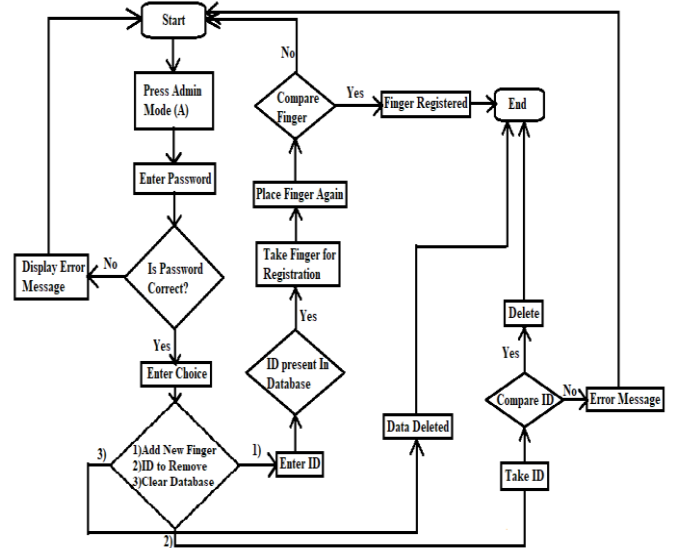
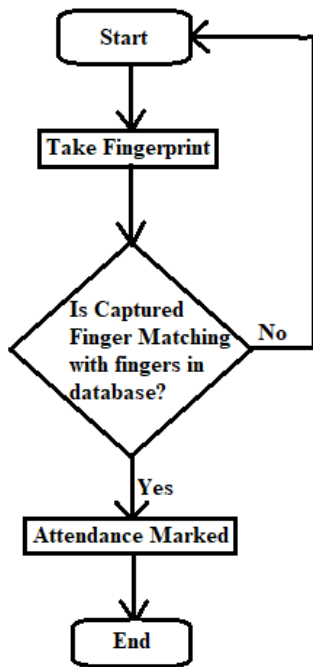


Figure 3.4. 1 Flowchart of fingerprint registration

2.5. Flowchart for attendance

. Figure 3.5.1 shows how the implemented system marks the attendance after the successful authentication of the finger.



3. Result and discussion

The implemented system works on 4 layered mechanisms. The one step that in this mechanism is registration of finger ID Another step is deleting the selected finger ID or deleting the whole database. Then the 3rd step deals with marking the attendance of those fingers which have assigned ID in registered database. The last step involves integration of student’s data such as personal details and obtained grades in each semester by using “V look up” table in excel sheet.

Registration process can be accessed from “Admin Mode” in implemented system. This process pop ups on 1st position. By completing this process, system assigns Unique Finger ID to each and every registered student. Deletion process can also be accessed by “Admin Mode”. It appears on 2nd as well as 3rd option for selected finger ID deletion and for whole database deletion respectively. By completing this process single finger ID as well as whole database can also be deleted. In the process of Attendance marking, if and only if registered user places finger on fingerprint module, then it marks user’s attendance according to appropriate class and division under current date’s column in excel sheet. In Integration process, student’s data such as obtained grades and personal details are stored in excel sheet by using “V look up” table and this sheet is easily accessible to teachers for purpose of assessment of students. The snapshots of those 4 layered mechanisms are attached below.

3.1. Hardware Model



Figure 4. 1.1 Snapshot of Hardware System

Figure 4.1 shows Hardware model of prop osed system. It contains 4x4 keypad to enter the roll number while registering and accessing admin mode. OLED is used to display IP address of connected wi-fi network and current date and time. And used to display appropriate message according to situation

3.2. Registration

	A	B	C	D	E	F	G
1	Roll No.	Student Name	Course	Year	Division	Contact No.	Finger ID
2	42023	Varun Gadgil	E&TC	BE	A	9370519655	3
3	42268	Shantanu Soma	E&TC	BE	B	9518738948	5
4	32022	Yash Gadappa	E&TC	TE	A	9523466341	6
5	32274	Sushil Waghmar	E&TC	TE	B	8007746690	2
6	22016	Gaurav Dharank	E&TC	SE	A	9881654749	0
7	22002	Tofik Bagwan	E&TC	SE	A	9584576409	0
8	01720	Kapil Joshi	E&TC	FE	B	8788312567	1
9	01755	Vedant Shirdhor	E&TC	FE	B	8159329518	0
10	01610	Chetan Channe	E&TC	FE	A	7365498210	0
11							
12							

Figure 4.2. 1 Excel before registration





Figure 4.2.2 Registration Proceeding on Hardware

Roll No.	Student Name	Course	Year	Division	Contact No.	Finger ID
42023	Varun Gadgil	E&TC	BE	A	9370519655	3
42268	Shantanu Soma	E&TC	BE	B	9518738048	5
32022	Yash Gadappa	E&TC	TE	A	9523466341	6
32274	Sushil Waghmare	E&TC	TE	B	8007746690	2
22016	Gaurav Dharank	E&TC	SE	A	9881654749	7
22002	Tofik Bagwan	E&TC	SE	A	9584576409	0
01720	Kapil Joshi	E&TC	FE	B	8788312567	1
01755	Vedant Shirdhor	E&TC	FE	B	8159329518	0
01610	Chetan Channe	E&TC	FE	A	7365498210	0

Figure 4.2.3 Excel after registration

Above figures demonstrate the registration of the new student. It is observed in Figure 4.3.1 there is no '0' in the finger id column of Excel and in Figure 4.2.2 we can see registration proceedings on hardware from Figure 4.2.3 after registration a new finger id is given to the particular student

3.3. Attendance

Figure 4.3.1 Snapshot of Attendance

Figure 4.3.1 contains Attendance of registered students' according to their class and division. Above figure shows attendance record of BE A Division student till date

3.4. Marksheet

Figure 4.4.1 Snapshot of Marksheet

Figure 4.4.1 displays subject wise progress of all students. In this figure roll no of student is displayed with subject wise marks from semester 1 to semester 8 with credits grade point and SGPA.

3.5. Data Integration Sheet

Figure 4.5.1 shows integrated datasheet to get data of particular student's personal information and marks.

4. Conclusion

The attendance system effectively recorded attendance by seamlessly capturing and storing new fingerprints in its database through the biometric device. When individuals placed their scanned fingerprints on the sensor, the device successfully compared them with the stored fingerprints. The system exhibited strong performance, notably for its swift execution. Given its efficiency and the potential to address proxy-related concerns and reduce human errors, the system is being seriously considered for full-scale implementation. During testing, the system received positive feedback and generated significant interest among users, showcasing its promising potential for the institute's needs.

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