

ADVANCING ATTENDANCE TRACKING: A COMPREHENSIVE STUDY ON IOT-ENABLED FINGERPRINT-BASED ATTENDANCE SYSTEMS

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ABSTRACT: A biometric time and attendance system uses a person's unique physical or behavioral characteristics to automatically identify them as an employee or student. Typically, biometric features such as fingerprints, iris scans, finger veins, hand veins, and facial features are utilized for employee and student identification. Students benefit from biometric systems because they facilitate easier attendance tracking. An easy-to-use method of keeping track of students' attendance is proposed, which involves a biometric scanner that uses fingerprints and an IOT system that stores attendance data in the cloud. When this system is implemented, the need to manually gather and maintain student attendance records is eliminated. Furthermore, proxy attendance is strictly forbidden, resulting in more precise attendance records. The records can be retrieved by the teacher whenever they are needed from a secure location.

Keywords:- Biometric, Fingerprint, IoT, Fingerprint Scanner, Attendance

1.INTRODUCTION

The smooth operation of any institution of learning or place of employment depends on accurate student and staff attendance records. Creating an excellent system for tracking attendance that students can use quickly and easily is the primary goal of this project. Currently, attendance is recorded manually, with the math and record-keeping done once a month. Students will not receive their attendance records until the last day of the school month as a result. Teachers and students will appreciate the time savings and improved accuracy of attendance records made possible by this system, which eliminates the need for roll call.

The concept of the Internet of Things is utilized in this approach to monitor the attendance of students. Implementing a fingerprint-recognition system into a mobile module and transmitting that information to a computer for student identification. A Wi-Fi connection is all that's needed to get the machine online for the first time. Therefore, a system capable of connecting to Wi-Fi is required, and the Node mcu (ESP8266 12e) was selected to fulfill this requirement. In order to

connect to any available Wi-Fi networks, the device will scan the area at startup and prompt the user to input the password. Students' fingerprints are scanned and recognized by the r-305 module the second they connect. The detected pupil's fingerprint identification number is sent to the server.

The moment a student receives their fingerprint ID, their attendance is recorded in the system. One definition of a server is a personal computer with the capability to record attendance and calculate the total number of attendees.

Students can view their attendance records in real-time through a dedicated website or an Android app. There are a lot of issues with the existing way of taking attendance, which is by roll call. Since teachers are required to rely on "attendance proxies" and only distribute students' attendance records at the month's conclusion, inaccurate percentages of attendance can result. This solution solves all of these problems: it uses fingerprints to verify students' identities, it prevents the recording of proxy attendance, it sends real-time attendance data to a server, the server handles all the math, and students can see their attendance records in

real-time.

2. UNDERSTANDING INTERNET OF THINGS

Following the dot-com boom, everyone is anticipating the next great idea that will lead to their financial independence. Since the advent of the internet, numerous changes have taken place in the world. While financial and statistical experts may disagree on specifics, they can all agree that the internet and other forms of integrated technology will play a significant role in the paradigm shift that will define the twenty-first century. Important groups are actually beginning to support the idea of the "internet of things" as a concept. The consistency of our actions, methods, and time will be disrupted when our physical environment becomes conscious and communicates with us.

The "Internet of Things," or "IoT," is a phrase that is gaining traction in the tech and commercial worlds. It's not going anywhere. An abundance of data points to the "Internet of Things" being a smashing success in the coming years; thus, the enthusiasm is well-deserved. By 2016, 6.4 billion IoT devices will be online, says Gartner. This is a 30% increase from 2015 levels. By 2020, experts predict that the global population will have swelled to 26 billion. A straightforward inquiry such as "What is the Internet of Things?" follows. As well as "In what ways will it influence our livelihoods and daily existence?" In order to make the network architecture understandable, I will do my best to keep this section basic, since the technology and terminology around the Internet of Things (IoT) can be confusing.

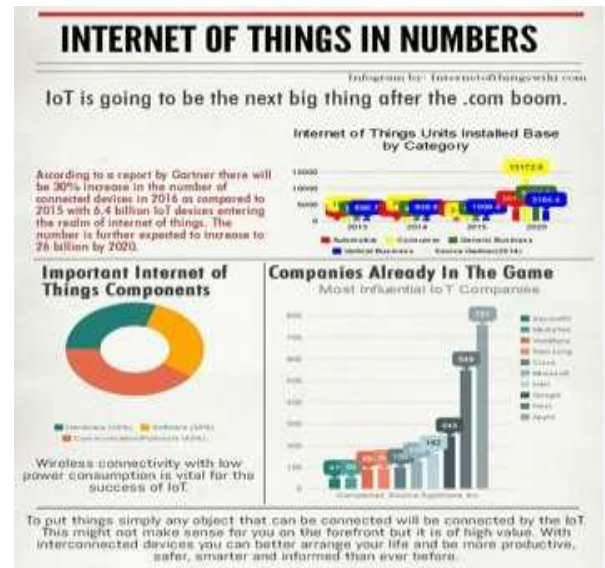


Fig: IOT

3. RELATED WORKS

The attendance system shortens lectures, simplifies paperwork, and maintains track of who is present using RFID technology. Students need to display their RFID IDs so the RFID scanner can keep tabs on everyone. After that, the lecturer may log each student's attendance each day by having the data sent to their phone using Bluetooth.

Integral to the iris-based attendance system is a little camera boasting exceptional resolution. After capturing an image of the iris, this camera will compare it to information stored in a database. When a person's recorded information matches what they provided, they are marked as present in attendance. Due to the fact that each person's iris pattern and color is unique, this device's high-resolution camera makes it more expensive, but it also makes it the most accurate method.

By utilizing biometrics, the wireless fingerprint attendance management system eliminates the need to manually set up the network and the possibility of human error in recording attendance. More precise and reliable logs of users' presence can be maintained.

The client's digital fingerprint is sent for verification by the Digital Persona Fingerprint USB Sensor after client registration on the computer.

format that is accessible on the web. Using this system, attendance is automatically recorded and

reported to teachers through email. An SMS message is also sent to the cell phone of the parent if a student is not in class.

4.COMONENT SELECTION

The system's practical requirements are satisfied by the ESP8266 12e. Students' names are displayed on an organic light-emitting diode screen once their fingerprints have been scanned. For fingerprint identification and analysis, the R305 fingerprint module is utilized. To charge the device, a 5 volt battery is connected. Additionally, components such as the printed circuit board (PCB), switches, and wires are required.

ESP8266 12e

This project requires a microcontroller. Because of its minuscule size—just 24.75 mm × 14.5 mm—it was selected. With its Wi-Fi capabilities, it can connect to the internet and be used with IoT apps.

5.FINGERPRINT SCANNER

Scanners couldn't have done their jobs without biometric readers. Recording your fingerprints and then locating them. The fact that R-305 can store over 250 fingerprints is a major factor in its selection. Its robust image processing capabilities allow it to operate with images with a resolution of up to 500 dots per inch, yet it only requires 5V of power. Its length is 55.2 mm, width is 3.0 mm, and height is 21.5 mm.

OLED DISPLAY

A screen displaying the names of the students whose fingerprints match should be displayed alongside the Wi-Fi networks. An OLED Display was selected to display all the data after much deliberation. The 0.96-inch organic light-emitting diode screen measures 128 by 64 pixels..

6.IMPLEMENTATION

Algorithm

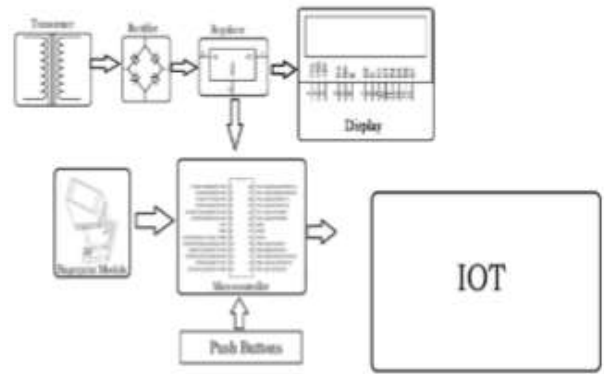


Fig: Architecture of fingerprint BAS using IOT

1. Begin the procedure.
2. To create a new fingerprint or delete an existing one, tap the symbol.
3. By default, the device will search for available wireless networks and connect to them.
4. It displays all reachable networks in the absence of known networks.
- The fifth option is to add the password to one of the newly created networks and then select it.
6. The biometric scanning process begins upon establishment of the link.
7. The teacher asks the students to identify the class and lesson for which they are registered as their fingerprints are being scanned.
8. Scanning biometrics of children is currently possible.
- 9 Upon detecting a pupil, it transmits a data packet including the pupil's fingerprint ID to the computer.
10. As soon as the computer receives updated information from the system, it updates the attendance record of the student.
11. After the attendance of all students has been recorded, the Android app can be used by any student to verify their presence.

7.RESULTS

An impression is left by every single person on this planet. This accumulation of fat is visually indicative of something. Up to the point where they are distinct and impervious to extinction Even after modifications, they remain the most effective biometric recognition method currently available. The user's fingerprint is photographed by the biometric reader. The term for this type of image is "live scan." A biometric template is

created using the extracted attributes after digital processing of the live scan. The matching process then makes use of this template, which is preserved. The following image shows the combined use of software and hardware techniques for fingerprint identification.



Selection of Class

The three primary functions of fingerprint processing are registration, identification, and verification. The utmost critical factor is enrollment. At least one photograph of the individual's fingerprints is required. The process of conducting a search involves a meticulous examination and comparison of the fingerprint you provide with a secure collection of fingerprints. Assembling the input fingerprint against a fingerprint that is already in the database constitutes an element of the verification procedure.



Image Process

Login Page-

The supervisor may utilize the login page to register in if they possess the appropriate username and password.



Login Page

ADMIN PAGE-

All of Admin's personal information, including name, email address, phone number, city, and title, can be entered and modified on this page.



Fig:-Admin Page

HOD LOGIN & MONITORING-

Accessing the monitoring website, the HOD enters their account information and password.



Fig:-HOD Login Form

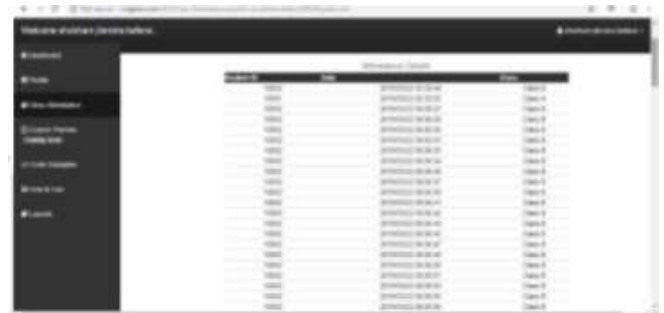


Fig:-Monitoring Page of HOD

TEACHER LOGIN & MONITORING-

A login and password are required for the instructor to access the monitoring website. The sole individual who will be in attendance is the instructor.



Fig:-Teacher1 Login Form

The teacher's visibility is limited to the individuals present in the individual classroom of each student.



Fig:-Monitoring Page of Teacher

STUDENT LOGIN & MONITORING-

In order to gain access to the system, students must input their designated username and password. The individual is limited to monitoring their own attendance.



Fig:-Student Login Form

Student can monitor his/her attendance in this page.



Fig:- Monitoring Page of Student

8.CONCLUSION

The manual process of maintaining and documenting student attendance is a labor-intensive and time-consuming tradition. The integration of a biometric authentication-enabled attendance monitoring device has the potential to optimize the overall operation. The implementation of an Internet of Things (IoT)-based movable biometric attendance system would be highly advantageous for academic establishments due to its high efficiency and security. Developing this system is significantly less expensive than developing conventional biometric attendance systems. Maintaining attendance records in the cloud facilitates information retrieval and utilization by instructors. The utilization of a biometric reader ensures the accuracy of the attendance record. The method's straightforward design facilitates its simplicity of use and comprehension.

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