OpenCV Approach for Smart Attendance System Using Multi-Biometric

[1] Mayuri P Jadhav , [2] Pravina K Pullam, [3]Shubham R Batrakhaye, [4]Akshay A Rathod,

[5] Sharad Jadhav

[1,2,3,4] Students, [5] Professor,
[1] Department of Computer Engineering,
[1]SPPU, Dr. D.Y.Patil College of Engg. & Innovation, Varale, Talegaon, Pune, Maharashtra, India

Abstract : **Multi Biometric attendance system aims to automate the attendance taking procedure of an educational institute using biometric technology. The automated attendance taking procedure is extremely efficient compared to the traditional name call out procedure. It saves the time consumed by the traditional method. It aims to regularly maintain the data and keeps the record long lasting. Basically it present academic system, regular class attendance of students and it plays a significant role in performance assessment and quality monitoring.**

Keywords—Fingerprint Scan, Face Recognizing, OTP Generation.

I. INTRODUCTION

Keeping track of employees or students in a class is one of the time-consuming activities in any school, institution, or educational place. Taking attendance, for example, takes up both the teacher's time and the lecture period. If the instructor skips this procedure, the school and community will be unaware of whether the students are participating in the classes. Various human and automated tracking approaches and techniques have been developed to ensure that users' and employees' attendance is checked and recorded regularly.

Face verification is a 1:1 matching process, it compares face images against the template face images whereas is a 1:N problem that compares query face images. This sensor uses hardware & software combination techniques to recognize an individual's fingerprint scans. These are safety systems of biometrics so that are used in smartphones, security industries, police stations, etc. Then to identify this A one-time password or OTP number is a unique security feature for online transactions. It will automatically generate a numeric string of characters, which acts as a PIN to authenticate various banking transactions. Valid only for a single transaction or login session, an OTP provides an extra layer of authentication than a user-created static password.

LITERATURE REVIEW

The literature review provides a comprehensive overview of existing research and developments in the field of multi-biometrics attendance systems. Keeping track of employees or students in a class is one of the time-consuming activities in any school, institution, or educational place. Taking attendance, for example, takes up both the teacher's time and the lecture period. If the instructor skips this product, the school and community will be unaware of whether the students are participating in the classes or not. Various human and automated tracking approaches and techniques have been developed to ensure that user and employee attendance is checked and recorded regularly. It is great to know those performed studies to address this problem; researches tried to get benefits from various technologies available to date, including biometric related system.

PROPOSED METHOD:

The proposed method follows a client-server architecture, with a central server managing the database and core functionality, and client devices (e.g., Raspberry Pi, web browsers) accessing and interacting with the system**.** Facial Recognition Module utilizes the Haar Cascade algorithm for facial detection and recognition, capturing facial images from the webcam and sending them to the backend server for verification. The communication module establishes communication with the backend server via RESTful APIs to initiate authentication, receive verification results, and record attendance.

In the proposed method, the Haar cascade algorithm is trained for effective object detection which is used to identify objects in images or video streams. The algorithm utilizes Haar features, which are simple digital image features that are used to detect objects. It is based on the concept that objects can be identified by the contrast between adjacent regions in an image.
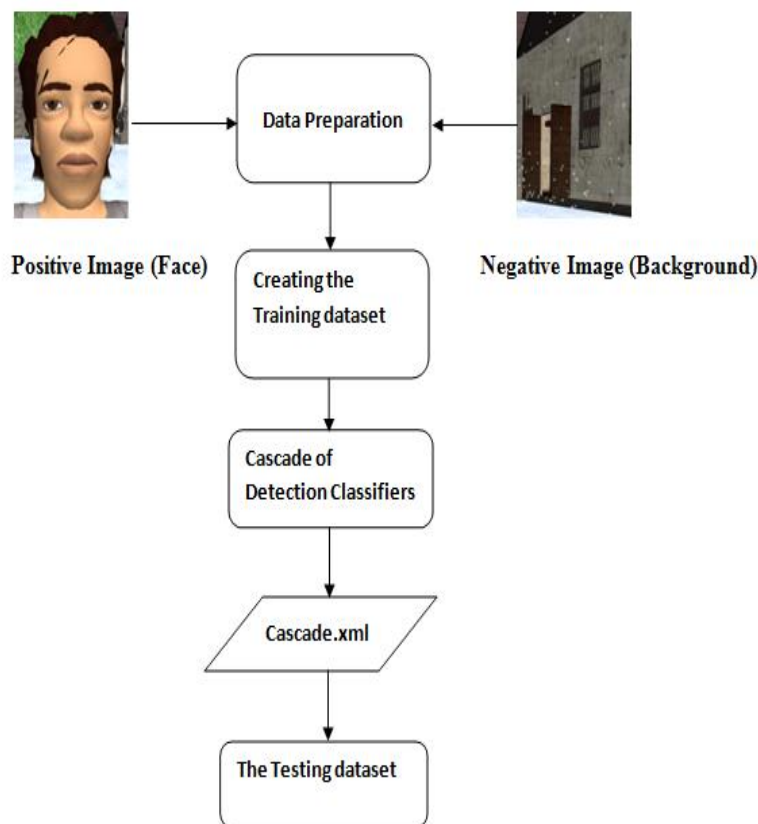

Haar cascade algorithm

DATABASE USED:

Data Storage in MariaDB will serve as the primary database management system (DBMS) for storing biometric data, user information, attendance records, and system configurations. Data Retrieval must support efficient retrieval of stored data for user authentication, attendance tracking, and administrative tasks. Data Security in MariaDB should enforce robust security measures, including encryption of sensitive data, access controls, and audit logging, to protect against unauthorized access and data breaches.
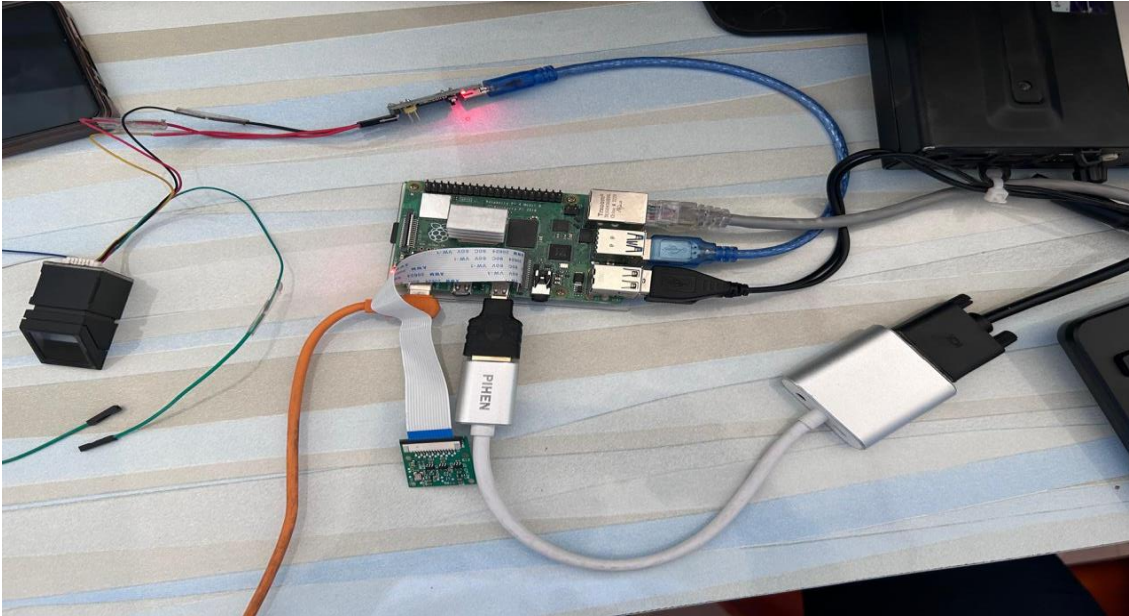
SYSTEM ARCHITECTURE:

The system architecture of the proposed multi biometric attendance system is designed to be modular, scalable, and adaptable to the dynamic nature of security and accuracy of data. Client device include Raspberry Pi setups with webcams and fingerprint sensors to register the student. Web application serves as the interface for users including students, faculty, and administrators. Server are used to hosts the application logic, processes biometric data, handles data storage, and sends OTPs for final verification. MariaDB is used to store user profiles, biometric data, attendance records, and configuration settings.
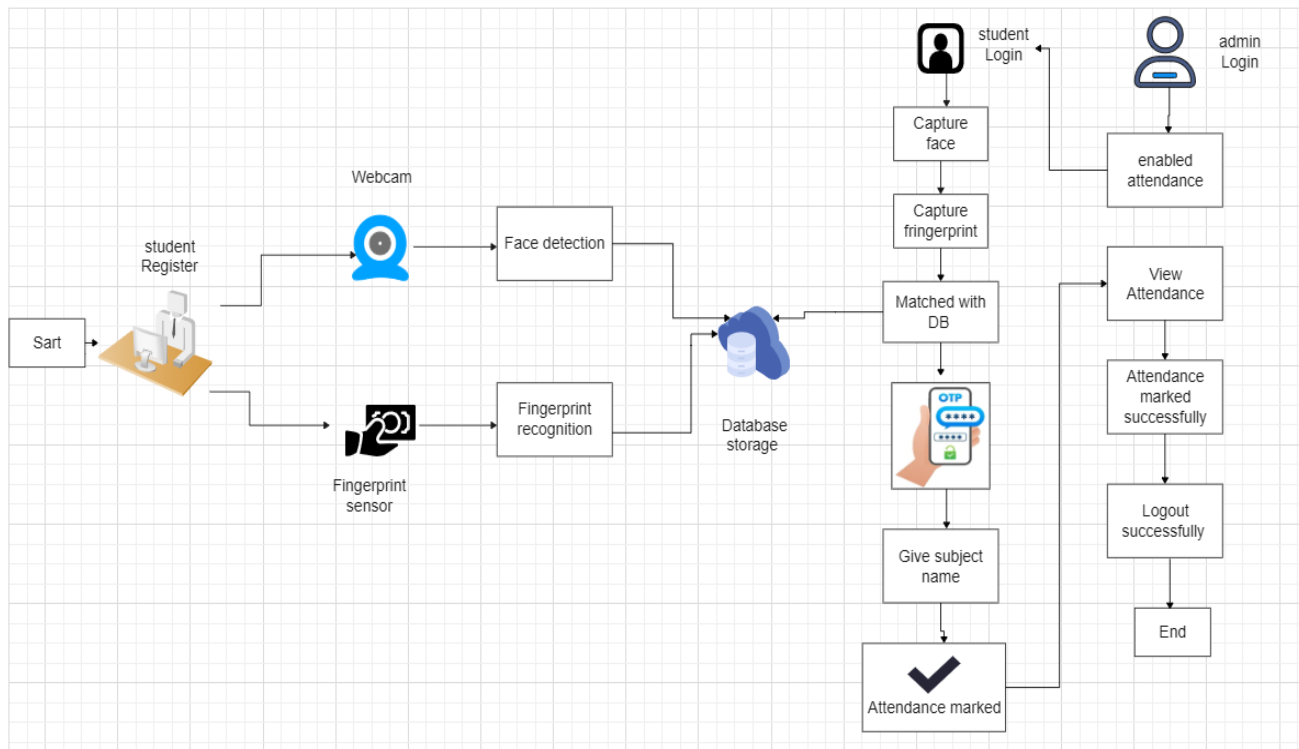
RESULT:

The implementation of the Multi-Biometric Attendance System is expected to streamline attendance management significantly. Manual attendance recording methods will be replaced with automated biometric verification, resulting in a more efficient and error-free process. The system's use of facial recognition and fingerprint technology will lead to enhanced data accuracy. Marking attendance in biometric system, students will be more habitat of attending lectures and practical regularly. Biometric verification ensures that students can only mark their own attendance, reducing the possibility of proxy attendance or errors in record-keeping. The system will provide real-time attendance monitoring, enabling teachers and administrators to track student attendance patterns more effectively and it is more useful. Teachers and administrators will benefit from reduced administrative tasks related to attendance tracking.

Below are the screenshots of the project which will help you understand better.

Hardware connection

Register student

Face detection
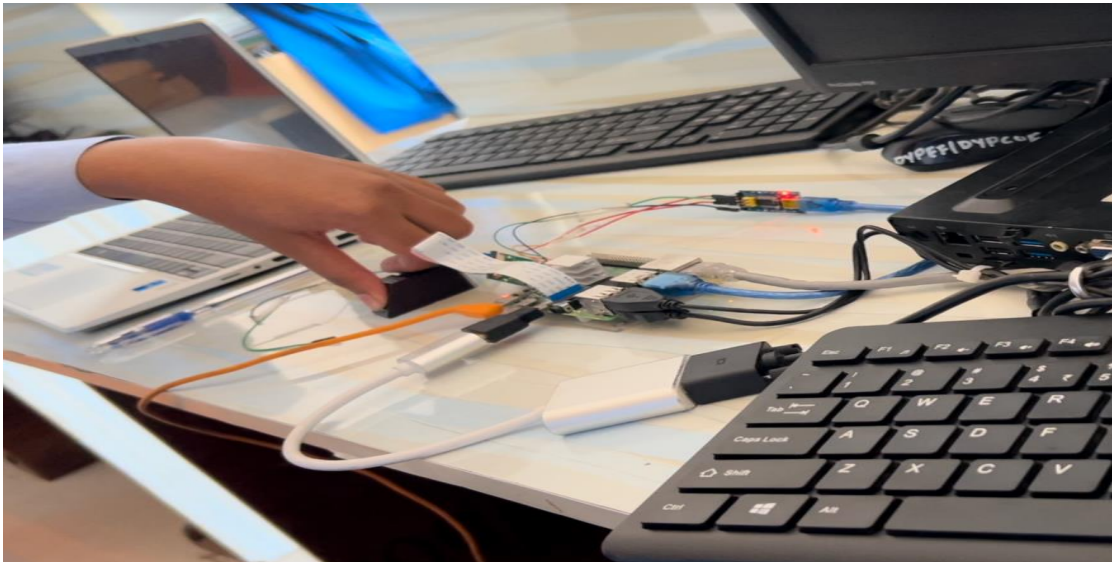
Fingerprint Recognition

Admin Login

Attendance marked

OTP generate on Email
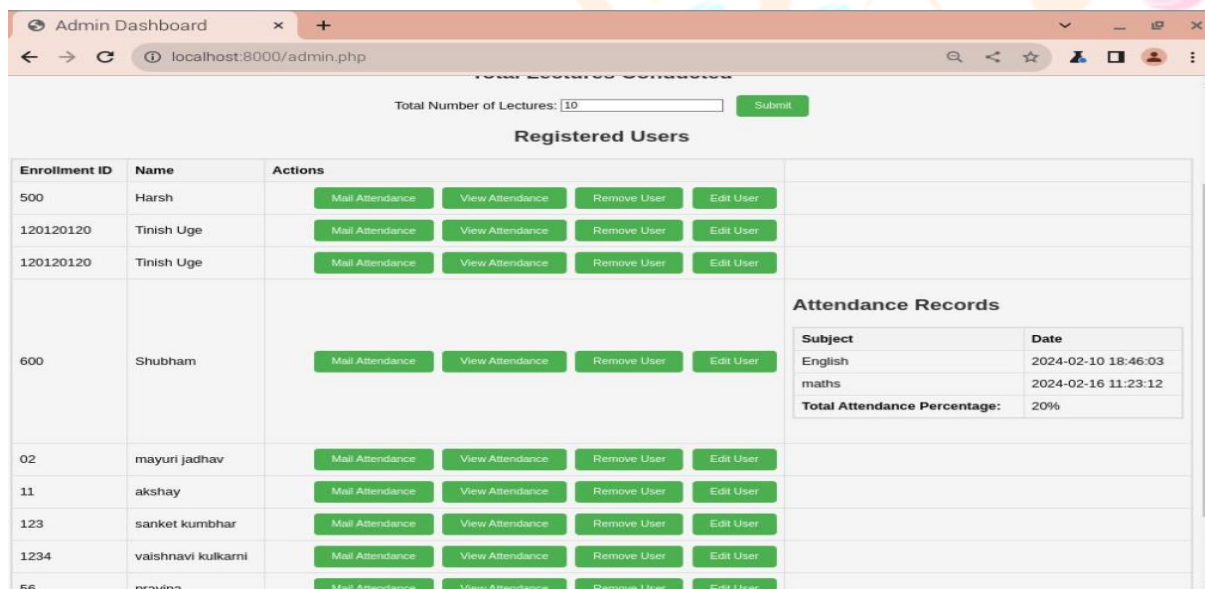
View Attendance

FUTURE SCOPE:

Future development in biometric smart attendance system with OpenCV have a great deal of promise. Further research and development can concentrate on improving accuracy using deep learning techniques, which will allow the system to consistently identify people in a variety of circumstances, including changing lighting and facial expressions. Faster attendance tracking and analysis will be possible because of real time processing optimization, which will allow the system to manage massive volumes of data efficiently. The system's capabilities will be further enhanced by integration with artificial intelligence, which will enable it to adapt to and learn from fresh data, gradually increasing accuracy. It will be imperative to address privacy and security concerns, which calls for the use of strong encryption techniques, and adherence to legal requirements. Investigating the integration of multiple biometric modalities, such as merging facial recognition with QR code modalities.

REFERENCES:

[1] Abbasi and H. Bamakan, "Automation Attendance Systems Approaches: A Practical Review," BOHR Int. J. Internet Things Res., vol. 1, no. 1, pp. 7–15, 2022.

[2] Akbar, Md Sajid, et al. "Face Recognition and RFID Verified Attendance System." 2018 International Conference on Computing, Electronics & Communications Engineering (iCCECE). IEEE, 2018.

[3] Ahmed, O. M. Olaniyi, J. G. Kolo, and C. Durugo, "A multifactor student attendance management system using fingerprint

biometrics and RFID techniques," in International Conference on Information and Communication Technology and Its Applications (ICTA 2016), pp. 69–74, Minna, Nigeria, November 2016.

[4] V. Soniya, S. R. Swetha, T. K. Swetha, R. Ramakrishnan, and S. Sivakumar, "Attendance automation using face recognition biometric authentication," in 2017 International Conference on Power and Embedded Drive Control (ICPEDC), pp. 122–127, Chennai, India, March 2017.

[5] Gagandeep, J. Arora, and R. Kumar, "Biometric fingerprint attendance system: an internet of things application," Innovations in Computer Science and Engineering, vol. 32, pp. 523–530, 2019.

[6] N. Dhanalakshmi, S. G. Kumar, and Y. P. Sai, "Aadhaar based biometric attendance system using wireless fingerprint terminals," in 2017 IEEE 7th International Advance Computing Conference (IACC), pp. 651–655, Hyderabad, India, January 2017.

[7] F. Mazhar, O. Ahamed, and M. Rasedujjaman, "Biometric smart attendance kit with fingerprint scanner by using microcontroller," in 2015 International Conference on Electrical & Electronic Engineering (ICEEE), pp. 13–16, Rajshahi, Bangladesh, November 2015.

[8] N. I. Zainal, K. A. Sidek, T. S. Gunawan, H. Manser, and M. Kartiwi, "Design and development of portable classroom attendance system based on Arduino and fingerprint biometric," in The 5th International Conference on Information and Communication Technology for The Muslim World (ICT4M), pp. 1–4, Kuching, Malaysia, November 2014.