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OpenCV Approach for Smart Attendance System Using Multi-Biometric

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ABSTRACT : Multi Biometric attendance system aims to automate the attendance taking procedure of aneducational 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 itpresent academic system, regular class attendance of students and it plays a significant role in performance assessment and quality monitoring. Calling the names or signing on papers are the methods followed by all institutions, which is highly time- consuming and insecure. This contain presents the automatic attendance management system for convenience or data reliability. The system is developed by the integration of ubiquitous components to make a portable device for managing the students attendance using Multibiometric system.

KEYWORDS –Fingerprint Scan, Face Recognizing, Update student who have less attendance, weekend alert.

I. INTRODUCTION

Keeping track of students in a class is one of the time- consuming activities in any school, institution, or educational place. Taking attendance manually, take lots of time of teacher and students both. If the instructor skips this procedure, the school and institute 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 attendance is checked and recorded regularly[1]. It is great to know those performed studies to address this problem; researchers tried to get benefits from various technologies available to date, including biometric-related systems, which are technology systems that use data about a person for identifying[2]. Face recognition is an important biometric feature, which can be easily acquirable and is non-intrusive. Face recognition-based systems are relatively oblivious to various facial expression. Face recognition system consistsof

two categories: verification and face identification. Face verification is a 1:1 matching process, it compares face image against the template face images and whereas is a 1:N problems that compares a query face images[3]. This sensor uses hardware & software combination techniques to recognize an individual's fingerprint scans. These are safety systems of biometrics, so that 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 be automatically generated numeric string of characters, which acts as a PINto authenticate various banking transactions. Valid only fora single transaction or login session, an OTP provides an extra layer of authentication than a user-created static password.

II. LITERATURE REVIEW

Attendance management is a critical aspect of organizational and educational institutions' dailyoperations. The paper "Automation Attendance Systems Approaches: A Practical Review" by A. Abbasi and H. Bamakan, published in 2022,

delves into various approaches to automate attendance systems[1].Face Recognition and RFID Verified Attendance System by MdSajid Akbar and co-authors, presented at the 2018 iCCECE

conference, explores an innovative approach to attendance management that combines face recognition technology and Radio-Frequency Identification (RFID)[2]. A Multifactor Student Attendance Management System Using Fingerprint Biometrics and RFID Techniques, presented at the 2016 ICTA conference, addresses the critical issue of student attendance management in educational institutions. The authors propose a multifactor system that combines fingerprint biometrics and Radio- Frequency Identification (RFID) techniques[3].Attendance Automation Using Face Recognition Biometric Authentication," presented at the 2017 ICPEDC conference, addresses the important issue of attendance management in various domains. The authors propose an innovative solution that leverages face recognition biometric authentication[4]. Biometric Fingerprint Attendance System: An Internet of Things Application" byGagandeep, J. Arora, and R. Kumar presents an innovative approach to attendance management by combining biometric fingerprint recognition with the Internet of Things (IoT)[5]. Aadhaar-Based Biometric Attendance System Using Wireless Fingerprint Terminals" addresses the critical issue of attendance management in various domains, particularly in the context of India's Aadhaar system. The authors propose an innovative solution that leverages biometric authentication and wireless technology[6]. Biometric Smart Attendance Kit with Fingerprint Scanner by Using Microcontroller" addresses the important issue of attendance management by proposing an innovative solution that integrates biometric technology with a microcontroller[7].Design and Development of Portable Classroom Attendance System Based on Arduino and Fingerprint Biometric addresses the important issue of attendance management in educational institutions. The authors propose a portable attendance system that integrates Arduino-based technology with fingerprint biometrics[8]. Automation of Attendance and Student Tracking with Face Recognition and Ultrasonic Sensor" addresses the critical issue of attendance management in educational institutions. The authors propose an innovative solution that combines face recognition technology with ultrasonic sensors for student tracking[9]. Wireless Attendance Management System Based on Iris Recognition" by S. Kadry and M. Smaili presents an innovative solution to the issue of attendance management in various domains. The authors propose a wireless system that employs iris recognition for attendance tracking[10]. The entry "Face Device" authored by M. Tistarelli is a part of the "Encyclopedia of Biometrics," which is a comprehensive reference work in the field of biometrics. This entry provides an overview ofthe concept of face devices, their applications, and their role in the broader context of biometrics.[11]

USED METHODOLOGIES

Choose appropriate hardware components such as cameras for facial recognition, fingerprint scanners, and a server system to store and process data.

Develop custom software that integrates facial recognition and fingerprint recognition algorithms. Ensure that the software generates OTPs for verified students and keeps a record of attendance data.

DATABASE MANAGEMENT

Student Enrolment : Create a student database with their biometric data (faces and fingerprints) along with their mobile numbers for OTP verification.

Attendance Records: Set up a database to store attendance records, including entry and exit times, and mark the attendance when OTP verification is successful.

ATTENDANCE WORKFLOW

Entry Attendance: When a student enters the class, the system will capture their face and fingerprint data for verification. If both match, generate an OTP and send it tothe student's registered mobile number.

Exit Attendance: When a student leaves the class, the system will again capture their biometric data and mark the exit time.

NOTIFICATION AND ALERTS

OTP Notification: Send OTP notifications to students upon successful biometric verification.

Detention Alerts: On the 1st day of each month, automatically identify students with poor attendance and send detention alerts or notifications to their registered mobile numbers.

Holiday Notifications: Notify students of holidays and important academic dates through the multi-biometric system.

DATA ANALYSIS AND REPORTING

Attendance Reports: Generate attendance reports forteachers and administrators to monitor student attendance patterns and identify students with irregular attendance.

Detention List: Compile a monthly detention list for students with poor attendance and distribute it to class teachers and students via email.

SECURITY AND PRIVACY

Data Encryption: Ensure that all biometric data, OTPs, andattendance records are securely encrypted to protect student privacy.

Access Control: Implement access control measures torestrict unauthorized access to the system and student data.

TESTING AND VALIDATION

System Testing: Conduct rigorous testing to validate the accuracy and reliability of the multi-biometric attendance system under various conditions.

User Training: Provide training to teachers, administrators,and students on how to use the system effectively.

SCALABILITY AND MAINTENANCE

Scalability Planning: Design the system with scalability in mind to accommodate a growing number of students and faculty members.

Regular Maintenance: Establish a maintenance schedule toensure the system's continuous operation, including updates and troubleshooting.

FEEDBACK AND IMPROVEMENT

Feedback Mechanism: Create a mechanism for users to provide feedback on the system's performance andusability.

Continuous Improvement: Use feedback and analytics to make improvements to the system, enhancing its functionality and user experience.

COMPLIANCE WITH REGULATIONS

Ensure that the multi-biometric attendance system complies with relevant data protection and privacyregulations, such as GDPR or local data protection laws.

By following this comprehensive methodology, educational institutions can successfully implement a multi-biometric attendance system that streamlines attendance management, enhances security, and improves communication with students regarding attendance andacademic matters.
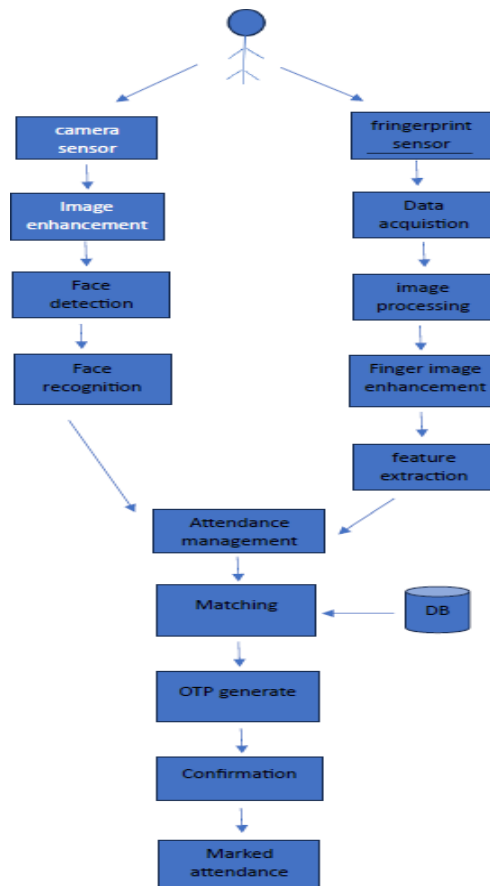
Fig. Block Diagram of Proposed System

USED COMPONENTS :

SOFTWARE :

1.   ARDUINO IDE :-

Fig : Arduino IDE

Arduino IDE is an open-source software, designed by Arduino.cc and mainly used for writing, compiling & uploading code to almost all Arduino Modules.
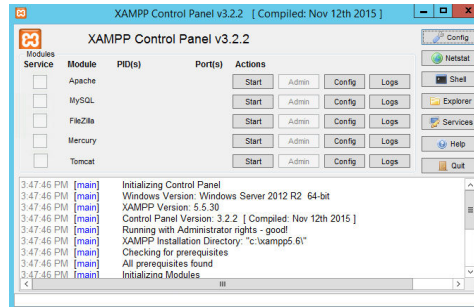
2.   XAMPP :-

Fig : XAMPP

and ultrasound [19]. Optical sensors can be implemented in different ways to capture the fingerprint image. The earliest and commonly used optical sensors are based on the working principle of frustrated total internal reflection (FTIR). Components for an FTIR-based optical sensor include a light source, a glass/plastic prism, a lens, and a charge-coupled device (CCD) or complementary metal- oxide-semiconductor (CMOS) camera. The CCD or CMOS camera captured the reflected light from the prism via the focusing lens as the user touches the top site of the prism. Basically, a fingerprint is characterized by different patterns of ridge and valley features [20].

XAMPP helps a local host or server to test its website and clients via computers and laptops before releasing it to the main server. It is a platform that furnishes a suitable environment to test and verify the working of projects based on Apache, Perl, MySQL database, and PHP through the system of the host itself.

HARDWARE :- BIOMETRIC SENSOR :

Biometric sensors are used to capture the biometric characteristic of an individual. In the biometric-based attendance system, the sensors are used for two purposes. First, sensors are used to capture the biometric data to be stored as templates. After that, each template is tagged with the corresponding name or roll number of a student. All of the templates along with the students' information are then stored in a database as references for comparison with new biometric data captured subsequently. This process is done only once at the start of an academic semester. The next purpose of sensors is to capture another copy of new biometric data from each student whenever there is a class. In order to mark the class attendance, the identity of each student must be recognized. Hence, the new biometric data captured are compared to the templates to record the correct name, date, and time of those students who are present in the class.

1.   FINGERPRINT SCANNER :-

Fig : Fringer print scanner

Various types of sensors are used to capture the fingerprint image. Basically, the image sensor for fingerprint can be categorized into three types which are optical, solid state,

2. FACE SENSOR :-

Facial image acquisition devices or sensors are usually referred as cameras used to capture images or record video frames. Acquired face data can be in two-dimensional (2D) form of intensity image, three-dimensional (3D)

representations consisting of intensity and depth information, or infrared [21]. The crucial parts inside of a camera include the image sensor and lens [22]. Generally, the image sensor operates by converting light travelling through the camera lens into electric charge and further converting to electronic signals. The electric charge in the image pixel is proportional to the illumination intensity whereby brighter images contain more charges compared to dim image. There are two types of image sensors which are charged-coupled device (CCD) and complementary metal-oxide-semiconductor (CMOS). The fundamental of these sensors is based on the accumulating charge proportional to the intensity of light striking at each pixel. For a CCD sensor, charge from one pixel is moved sequentially to the other pixel until a common output node is reached for voltage conversion. Moreover, the CCD sensor has an analogue output. In a CMOS sensor, charge to voltage conversion happens directly in each pixel [23].

OTHER COMPONENTS :-

Besides the mentioned hardware, there were other hardware used in the biometric-based attendance system. The liquid crystal display (LCD) and thin film transistor (TFT) touch screen were used to display information to the users [4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18]. The
information shown may be the user's ID, roll number, date, time, course code, welcome message, or authentication status. In order to determine when the attendance was taken, a real-time clock (RTC) keeps track of the time, date, and day. The models for the timekeeping chips used were DS1302 or DS1307 [12, 15, 17]. For a portable attendance system, batteries were used to power up the devices [5, 9, 11, 12]. Lithium-ion (Li-ion) batteries were normally used for portable devices because of high energy density that enables longer operating time after each charge. In addition, regulators were used to obtain fix output voltages for the portable device [8, 12].

III. 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. The implementation of the system's notification and alert features will improve communication between the institution and students. Students will receive monthly detention alerts will serve as a reminder to improve attendance. The use of solar panels to power the system is expected to reduce the institution's reliance on conventional electric sources, leading to energy cost savings and contributing to environmental sustainability. The system will prioritize data security and privacy by encrypting biometric data and ensuring secure access control. Compliance with data protection regulations will be maintained to safeguard student privacy.

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

4. Communication Technology and Its Applications (ICTA2016), pp. 69–74, Minna, Nigeria, November 2016.
5. 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.
6. 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.
7. 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
8. 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.
9. N. I. Zainal, K. A. Sidek, T. S. Gunawan, H. Manser, and
10. 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.
11. P. Divyaharitha, B. Gayathri, and A. S. Parvin, "Automation of attendance and student tracking with face recognition and ultrasonic sensor," Research Journal of Pharmaceutical, Biological and Chemical Sciences, vol. 7, no. 4, pp. 343–347, 2016.
12. S. Kadry and M. Smaili, "Wireless attendance management system based on iris recognition," Scientific Research and Essay, vol. 5, no. 12, pp. 1428–1435, 2010 Techopedia, "What is a Biometric System?," Techopedia, 2012.
13. M. Tistarelli, "Face device," in Encyclopedia of Biometrics, pp. 452–459, Springer Science+Business Media New York, 2015.
14. D. K. Sarker, N. I. Hossain, and I. A. Jamil, "Design and implementation of smart attendance management system using multiple step authentication," in 2016 International Workshop on Computational Intelligence (IWCI), pp. 91–95, Dhaka, Bangladesh, December 2016.

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