

## SMART ATTENDANCE SYSTEM USING FACIAL RECOGNITION: A REVIEW

Ms. Mulik Siddhi\*<sup>1</sup>, Ms. Wani Aasavari\*<sup>2</sup>, Ms. Taware Priya\*<sup>3</sup>, Ms. Snehal Sabale\*<sup>4</sup>

\*<sup>1,2,3,4</sup>Vidya Pratishthan's Kamalnayan Bajaj Institute Of Engineering And Technology Baramati, India.

### ABSTRACT

The significance of the human face lies in its ability to serve as a unique identification for every individual. Face recognition systems make use of facial features. Monitoring attendance in educational institutions is a significant concern. The human face is significant because it may be used to uniquely identify each individual person. Facial traits have been used by face recognition systems. One major concern is keeping track of students' attendance in educational institutions. Face recognition is the technique of figuring out whether a person's face in an image matches any faces in a database. This project's main objective is to build an intelligent attendance system for students at a school using an ESP32 Cam. The aim is to make the current attendance system more effective and efficient. We accomplish this by utilizing the ESP32 Camera module for face recognition and the OpenCV library for face detection. This system uses facial recognition technology to track attendance by recognizing.

**Keywords:** ESP32 CAMERA, Face Recognition System, Face Detection Process, OpenCV, FTDI Module, Jumper Wire.

### I. INTRODUCTION

Keeping track of who is present is a huge concern in offices, schools, colleges, and other institutions, thus it must be carried out daily. People usually have to do it one at a time by shouting out names or using roll numbers. The principal aim is to build an intelligent attendance system through facial recognition. We will switch from a manual to an automated process thanks to this solution. The Smart Facial Recognition Attendance System is one novel method of controlling attendance in educational settings. It keeps track of who is present and recognizes the faces of the kids. The system makes use of an ESP32 CAM Module to identify faces, using OpenCV to identify faces and record students' attendance. The project's objective is to use Python and the ESP32 CAM to develop a Smart Facial Recognition-Attendance system. Not only will this system allow us to determine who is present, but it will also allow us to record the details of each individual we locate. This is being done in an effort to improve and streamline the attendance system. In many schools and universities, the most widely used attendance system is based on biometric technology. By recording, this method will cut down on the quantity of papers. By utilizing RFID and the Internet of Things (IoT) to automatically take attendance, we may benefit from this approach. The data is taken from the database whenever a particular student's photo is taken. The database may be updated with the student attendance.

#### IR MODULE :

An Motion detection and temperature monitoring are two functions of an infrared sensor. All things in the infrared spectrum typically release some kind of radiation with a temperature. These rays are invisible to the human eye, but an infrared sensor can detect them. An infrared photodiode serves as the detector.

The resistance and output voltage of photodiodes changes with the amount of IR light they are exposed to.

**FTDI MODULE :-**The FTDI module refers to hardware modules or chips produced by FTDI, a company known for its USB interface technology. FTDI's modules are commonly used for USB-to-serial communication and are popular in various electronic applications, including microcontroller programming, industrial automation, and data logging.

FTDI modules typically provide a bridge between USB and other serial protocols such as UART or SPI. They are commonly used when a device needs to communicate with a computer over USB but lacks native USB support.

Some common FTDI modules include the FT232 series and FT2232 series, which offer various features and capabilities depending on the specific application requirements. These modules often come with drivers and software libraries that facilitate communication between the device and the computer.

**ESP32 CAMERA MODULE :** It is challenging to cover all of the specifications in this Getting Started with ESP32 guide because ESP32 has a lot more functionality than ESP8266. Thus, I've included a list of some of the ESP32's key specifications here. But I strongly advise you to consult the Datasheet for the full set of specifications. The ESP32-CAMERA module is a compact development board that combines an ESP32 microcontrollers with a camera modules, enables the users to create projects that involve wireless communication and image/video processing.

**JUMPER WIRES :** Jumper wires has been commonly used in electronics and electrical prototyping to bulid up the temporary connections between different components on breadboard, or between a breadboard and other components such as microcontrollers, sensors, or LEDs. They typically consist of a flexible wire with metal pins or connectors at each end.

## II. METHODOLOGY

The methodology of a smart attendance system involves outlining the systematic approach used to design, develop, implement, and maintain the system. Below is a structured methodology for creating a smart attendance system.

### REQUIREMENT ANALYSIS:

Identify the requirements and objectives of the attendance system. This include understanding the target audience,the environment in which it will be deployed, and the desired features andfunctionalities

### RESEARCH AND TECHNOLOGY:

- Conduct research on available technologies suitable for the attendance system, such as RFID, biometric recognition, or facial recognition.
- Evaluate the pros and cons of each technology based on factors like accuracy, cost, scalability, and ease of integration

### 1. RESEARCH AND TECHNOLOGYSELECTION:

- Conduct research on available technologies suitable for the attendance system, such as RFID, biometric recognition, or facial recognition.
- Evaluate the pros and cons of each technology based on factors like accuracy, cost, scalability, and ease of integration.
- Select the most appropriate technology stack based on the project requirements andconstraints.

### 2. SYSTEM DESIGN:

- Design the system of the smart attendance system, including hardware andsoftware components.
- Define the data flow, interfaces, and interaction between different modules.
- Create the hardware and software components of the smart attendance system's architecture.

### 3. HARDWARE DEVELOPMENT:

- Design and prototype the hardwarecomponents of the attendance system, suchas sensors, microcontrollers, and connectivity modules.
- Select suitable hardware components based on performance, compatibility, andcost-effectiveness.
- Assemble and test the hardware prototypes to ensure functionality and reliability.

### 4. SOFTWARE DEVELOPMENT:

- Design and prototype the hardware components of the attendance system, such as sensors, microcontrollers, andconnectivity modules.
- Select suitable hardware components based on performance, compatibility, andcost-effectiveness. Assemble and test the hardware prototypes to ensure functionality and reliability.

### 5. TESTING AND VALIDATION:

- To confirm the smart attendance system's dependability, accuracy, and performance, thoroughly test it. Functional, usability, integration, and unit testing should be done to identify and address any issues or flaws.

- Verify the system's functionality against user needs and real-world circumstances.
- To hone and enhance the system, get input from stakeholders and end users.

#### **DEPLOYMENT AND IMPLEMENTATION:**

- Deploy the smart attendance system in the target environment, whether it's a school, workplace, or other institution.
- Install hardware components, configure software settings, and conduct user training as necessary.
- Monitor the architecture during the initial rollout stage to smooth operation and address any teething issues ensure.

#### **6. MAINTENANCE AND SUPPORT:**

- Provide ongoing maintenance and support for the smart attendance system, including software updates, hardware repairs, and troubleshooting.
- Establish a support system to address user queries and technical issues promptly.

Keep an eye on user input and system performance to spot opportunities for innovation and improvement.

#### **7. EVALUATION AND OPTIMIZATION:**

- Regularly evaluate the smart attendance system's performance and effectiveness against predefined metrics and objectives. Analyze attendance data and system usage patterns to identify areas for optimization and enhancement.
- Incorporate user feedback and technological advancements to improve the system functionality and usability.

By following this structured methodology, developers can ensure the successful development, deployment, and maintenance of a smart attendance architecture that meets the needs of its users and stakeholders.

#### **8. MAINTENANCE AND SUPPORT:**

- Provide ongoing maintenance and support for the smart attendance system, including software updates, hardware repairs, and troubleshooting.
- Create a help desk or support system to quickly handle user inquiries and technical problems.
- Keep an eye on user input and system performance to spot opportunities for innovation and improvement.

#### **9. EVALUATION AND OPTIMIZATION:**

- Regularly evaluate the smart attendance system's performance and effectiveness against predefined metrics and objectives. Analyze attendance data and system usage patterns to identify areas for optimization and enhancement.
- Incorporate user feedback and technological advancements to continually improve the systems functions and usages.

By following this structured methodology, developers can ensure the successful enhancement, deployment, and maintenance of a smart attendance architecture that meet the needs of its users and stakeholders.

#### **10. EVALUATION AND OPTIMIZATION:**

- Regularly evaluate the smart attendance system's performance and effectiveness against predefined metrics and objectives. Analyze attendance data and system usage patterns to identify areas for optimization and enhancement.
- Incorporate user feedback and technological advancements to continually improve the system's functionality and usability.

By following this structured methodology, developers can ensure the successful bulidupment, deployment, and maintenance of a smart attendance system that meets the needs of its users and stakeholders.

#### **11. EVALUATION AND OPTIMIZATION:**

- Regularly evaluate the smart attendance system's performance and effectiveness against predefined metrics and objectives. Analyze attendance data and system usage patterns to identify areas for optimization and

enhancement.

- Incorporate user feedback and technological advancements to continually improve the system's functionality and usability. By following this structured methodology, developers can ensure the successful development, deployment, and maintenance of a smart attendance system that meets the needs of its users and stakeholders.

### III. FLOWCHART

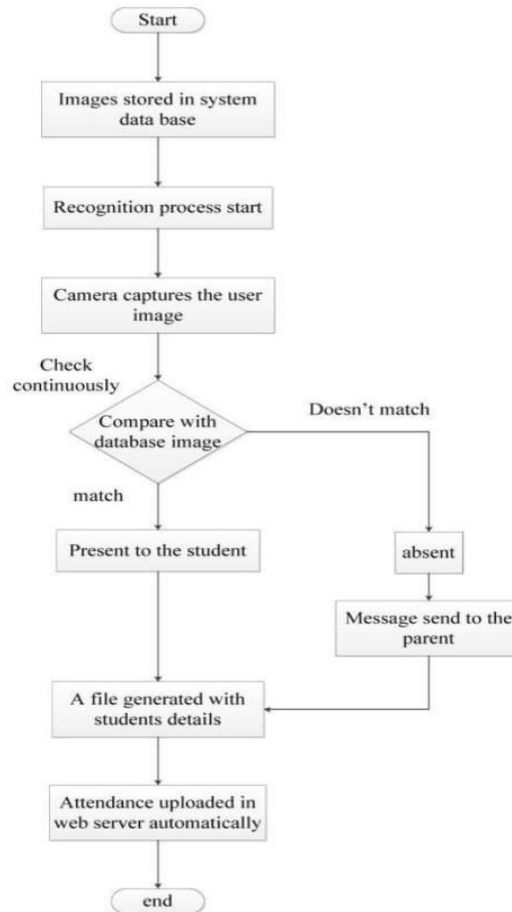


Fig no 1- Flowchart

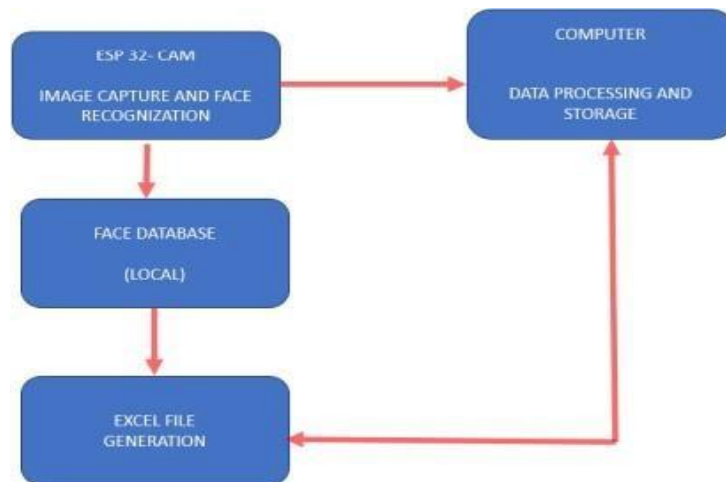
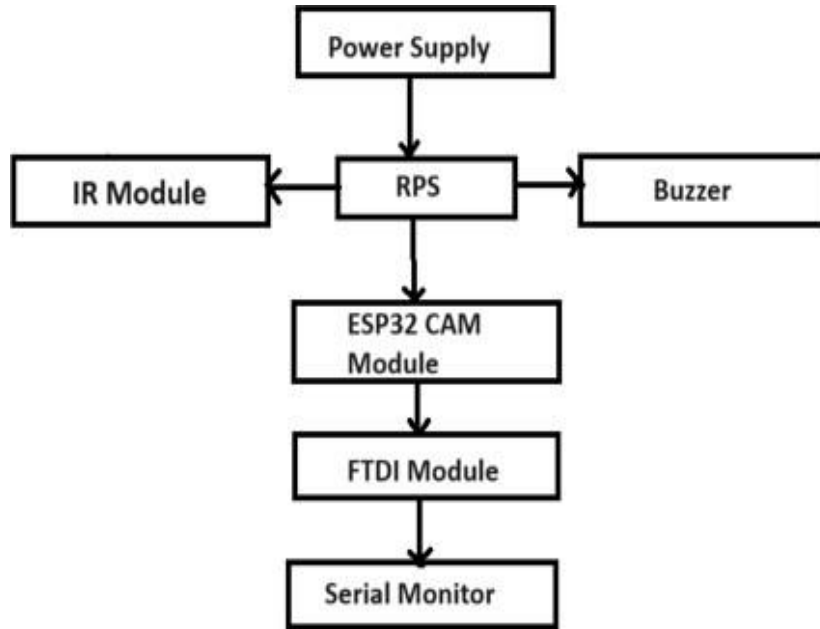


Fig.no 2- General flow diagram of system

This flowchart outlines the sequential steps involved in the operation of the Smart Attendance Management System using ESP32- CAM. It begins with system initialization, proceeds to image capture and facial

recognition, records attendance data, stores information, and optionally provides display or notifications. This process ensures efficient and accurate attendance tracking in various environments.

**IV. BLOCK DIAGRAM**



**Fig no 3- System Block Diagram**

Explanation of the block diagram:- Once an individual's samples are stored, it considers them registered. Afterwards, if the individual is already registered, the camera will recognize them and record their presence along with the time and date when they stand in front of it.

**IR MODULE :-**An Infrared (IR) modules has been used in a facial recognition smart attendance system to improve performance under different lighting situations. IR sensors increase the accuracy and dependability of the system by assisting in the detection and capture of face characteristics even in dimly illuminated or nighttime environments.

**RPS:-** A RSP is an electronic circuit or device which provides a constant, stable output voltage or current regardless of variations in input voltages or load conditions. Regulated power supply are commonly used in a wide scale ranges of electronic devices and systems to ensure consistent and reliable power delivery.

**BUZZER:-** An audio buzzer within a facial recognition smart attendance system can serve as a means of providing feedback regarding the success or failure of recognition.

**ESP32 CAM:-** The ESP32 has integrated Bluetooth and Wi-Fi, making it simple to communicate with other devices or a central server. This makes it possible to integrate cloud services or update attendance data in real-time. The ESP32 has networking feature that make Internet of Things (IoT) integration easier. Sending attendance data to cloud servers is a simple process that allows for remote control and monitoring.

**FTDI MODULE:-** Some common FTDI modules include the FT232 series and FT2232 series, which offer various features and capabilities depending on the specific application requirements. These modules often come with drivers and software libraries that facilitate communication between the device and the computer.

FTDI modules have gained popularity due to their reliability, ease of use, and wide availability of documentation and support resources. They are widely used by hobbyists, electronics enthusiasts, and professionals alike in.

**SERIAL MODULE:-** Developers can find and fix problems with the code or the face recognition algorithm by using the Serial Monitor to print debug messages and variables. The Serial Monitor can be used to give developers or users more information about system events or failures if the system has user interfaces like displays or LEDs.

## V. CONCLUSION

Facial detection and identification are used in the proposed attendance system to automate the management of student attendance. The Python face recognition module's built-in capabilities are used to develop face recognition capability. As shown in Table 2, the system creates attendance reports that include the recorded timings along with the names of the corresponding students. This data is also kept on file in an Excel spreadsheet for future use. Additionally, administrators and educators benefit from an additional layer of accessibility and ease thanks to the system's capacity to store this data in an Excel sheet. Because face recognition is contactless, it complies with modern health and safety regulations, which makes it especially applicable in different workplace and educational environments.

## VI. REFERENCES

- [1] Madhura D. Joshi, et al. Published in: 2020 International Conference on Innovative Computing and Communication (ICICC) DOI: 10.1109/ICICC50144.2020.9138900
- [2] S. Hemalatha, et al. Published in: 2020 International Conference on Inventive Computation Technologies (ICICT) DOI: 10.1109/ICICT50158.2020.9272990.
- [3] N.K. Deshpande and R. Ravishankara, "Face Detection and Recognition using Viola-Joneses algorithm and Fusion of PCA and ANN," 2017.
- [4] K Gupsta, A.P. Kumaar, A. S. Jawed , "student attendance system based on the face recognition of webcam's image of the classroom," 2016.
- [5] V. D.Suresh, S. Chakravarthi Dumpa, C. Deepak Vankayala, and P. Rapa, "Facial Recognition Attendance System Using Python and OpenCv," 2019. [Online]. Impact Factor:-5.18,doi:-10.356Available: www.questjournals.org
- [6] Abdulrhman Khalafallah, et al. Published in: 2019 2nd International Conference on Computer Applications & Information Security (ICCAIS) DOI: 10.1109/ICCAIS.2019.8746739
- [7] R. R. Lakshmi, et al. Published in: 2019 International Conference on Communication and Electronics Systems (ICCES) DOI: 10.1109/CESYS.2019.8889616.
- [8] T. Lima, S. Sim, and M.S. Mansor, " RFID based attendance system ", in Industrial Electronics and Applications, 2009. ISIEA 2009. IEEE Symposium on, vol. 2. IEEE, 2009, pp.778782e-ISSNR:2395-0056 Volume:10 Issue:08.aug 2023
- [9] P.S Barretou Face tracking based on Haar-like features and eigen faces. 5th IFAC Symposium on Intelligent Autonomous Vehicles, Lisbon, Portugal, July 5-7 , 2005. ISSN : 2229-6093ISSN:2229-60983
- [10] Hemantha Kumar MS, ESP32-CAM for Face Mask Detection, February 2022, International Journal of Advanced Research in Science, Communication and Technology ( IJARST), DOI:10.48175/IJARST-2509 ISSN (Online) 2581-9429 Volume 2, Issue 1, February2022 Impact Factor: 6.252
- [11] Pooja Kulkarni, et al. Published in: 2018 IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT) DOI: 10.1109/RTEICT.2018.8491182
- [12] A.O. Akinboro, et al. Published in: 2017 International Conference on Computing Networking and Informatics (CCNI) DOI: 10.1109/CCNI.2017.37
- [13] A. Surendran, et al. Published in: 2019 International Conference on Information Technology (ICIT) DOI: 10.1109/ICIT.2019.00057
- [14] A.O. Akinboro, et al. Published in: 2018 International Conference on Information and Communication Technologies (ICICT) DOI: 10.1109/CICT.2018.8531109