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FACE RECOGNITION BASED ATTENDANCE SYSTEM USING ESP 32CAM

Sneha Medhavath, Madhurya Modium, Pallavi Pasula, Deeksha Begari, Anusha Chilupuri.
G. Narayanamma Institute of Technology & Science (For Women)Department of Electronics and Communication Engineering**,** Hyderabad, Telangana

Abstract: **Attendance recording is critical in current environment for increasing the quality of any industrial system. Accordingly, a strong computerised Face detection attendance recording system using an ESP32 camera is required. Every organisation has a stringent policy requiring attendance. Maintaining an attendance register manually involves effort and time. RFID and biometric technology, for instance, are two approaches to the same problem. This analysis describes an effective and inventive technique for validating attendance and detecting presence. The ESP32 microcontroller family has dual-mode Bluetooth and built-in Wi-Fi. In contrast to biometric attendance systems, this facial detection-based technology does not require someone to be close to the fingerprint reader module. When the same student or employee uses the biometric attendance system to record their attendance, the biometric device becomes contaminated. And in case of RFID chances of proxy is high. Using facial recognition technology, this forecast will track employee or student attendance.**

Keywords: **ESP32 CAM, Face Recognition, Face detection, IR Module, FTDI Module.**

I. INTRODUCTION

Face recognition-based attendance systems are dislodging other types of attendance systems, such as RFID systems and biometric systems. This endeavour aids in the reduction of proxies and the reduction of the infecting problem [1]. In this project, the ESP32 CAM module is used in conjunction with an IR module to detect an object, an FTDI module to control the board and transmit data from the cam module to the system, and a regulated power supply to provide the proper amount of power supply to the ESP32 module.

This solution is intended to reduce the shortcomings of the current manual approach by automating the organisation's attendance [2]. The infection spreads quickly using biometric attendance systems. The most popular attendance method is based on biometric technology in many institutions and colleges [3]. If an infected worker accidentally touches the biometric system to record attendance, the system will get contaminated, and the virus will have a chance to propagate quickly. The intention behind creating an attendance management system is to automate the manual process of taking attendance. The everyday tasks of attendance tracking and analysis are carried out by an automated attendance management system with little assistance from humans. The proposed approach in this paper makes use of facial recognition. Face recognition is frequently used in video surveillance, access control, and authentication applications. This technique uses an ESP32 camera sensor to track a person's face continuously. By eliminating the need for human attendance recording, this system will reduce the amount of paperwork. The new approach will also cut down on the overall amount of time needed to record attendance. To ensure the accuracy of the attendance data, the new system will collect individual attendance using facial recognition.

An effective method for face detection and recognition employing Viola-Jones, fusion of PCA and ANN approaches is presented by Deshpande, N.T., and Ravishankar [4]. When the suggested approach's performance is compared to that of other face recognition techniques now in use, it is shown that the proposed method achieves a higher level of recognition accuracy. Face detection and recognition using the Viola-Jones algorithm is essential for a variety of applications. Since a high rate of identification accuracy is sought in the majority of applications, the proposed approach can be weighed against others already in use.

The author [5] has talked about the state of the school system right now and other places where attendance is manually recorded. Despite the availability of numerous technologies, we continue to use the manual method of recording attendance. They personally record the attendance and update it on their separate portals. We can utilise RFID tags and the Internet of Things (IOT) to exploit this system, allowing us to automatically take attendance. With the Internet of Things, we may leverage the cloud as storage to boost speed

Because a person is too sluggish to attend a specific class, another person assists him/her in signing for attendance, despite the fact that the person did not attend the class, but the system misses this matter due to a lack of enforcement, according to author [6]. If the institution implements enforcement, it may have to waste large human resources and time, which is not feasible. As a result, the old system's recorded attendance is no longer reliable for research. The administrator enters the daily attendance into the database. When a specific student photograph is recorded, the

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information are retrieved from the database. The student attendance may be updated in the database, and the database can provide attendance facts to parents via mobile SMS [7].

II. APPROCH

The suggested system's goal is to create an attendance system based on face recognition techniques. Facial recognition technology is used to recognise and verify an individual based on their facial features, as well as to automatically mark attendance in a face recognition attendance system [8]. The software can be used to identify various groups of individuals, including employees, students, and labourers. The suggested attendance system detects people and stores information such as their names, dates, and time. The proposed attendance system's performance is entirely dependent on the photos collected from students, the resolution of the camera utilized, and the capacity of pupils [9]. The system based on the ESP32 camera was designed to be as simple to use as possible while not neglecting the analysis side, one of which is the temporal side of the camera's detection of the object in front of it, how far and fast this object can be expressly detected. resolution criteria used for face recognition and picture recognition, such as CIF and QVGA, indicate speed[10]. To determine attendance, a student image is recorded, and the details are retrieved from the database.

ESP32 CAM: ESP32 is a low-cost, low-power system-on-achip microcontroller family featuring built-in Wi-Fi and dualmode Bluetooth. The ESP32 series is powered by a Tensilica Xtensa LX6 dual-core or single-core microprocessor, a Tensilica Xtensa LX7 dual-core or a single-core RISC-V microprocessor, and includes built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power-management modules. Espressif Systems, a Shanghaibased Chinese firm, conceived and developed the ESP32, which is manufactured by TSMC using their 40 nm technology. It is the ESP8266 microcontroller's replacement. Since the original ESP32 was released, a variety of versions have been introduced and announced. They are part of the ESP32 microcontroller family. These chips have varying CPUs and capabilities, but they all use the same SDK and are mostly code- compatible. Furthermore, the original ESP32 was revised. The ESP-32CAM is suitable for a variety of IoT applications. It can be used for retail home appliances, industrial wireless controls, wireless monitoring, QR wireless identification, wireless positioning system signals, and other IOT applications. It's an excellent choice for IoT applications. This approach [11] use an ESP32 camera sensor to continuously watch a person's face. The authorised persons' faces are saved on the ESP32- Cam's SD card. When a person stands in front of the door, the esp32 cam recognises the individual's face by comparing it to authorised faces in the database. The "AI-Thinker" algorithm is utilised in detecting and recognising a person's face

IR Module: An infrared module is a type of electronic gadget that produces light in order to detect objects in its surroundings. An IR sensor can detect motion as well as monitor the temperature of an object. Normally, all objects in the infrared range emit some type of thermal radiation. These sorts of radiations are invisible to our sight, but they can be detected by an infrared sensor. The emitter is merely an infrared LED (light- emitting diode), and the detector is merely an infrared photodiode. A photodiode is sensitive to infrared light of the same wavelength as an IR LED. When infrared light strikes a photodiode, the resistances and output voltages change in response to the magnitude of the infrared light.

RPS: A regulated power supply is an embedded circuit that converts alternating current into continuous direct current. It turns the alternating current source into direct current with the help of a rectifier. Its purpose is to provide a constant voltage (or, less frequently, a constant current) to a circuit or device that must operate within particular power supply constraints. The regulated power supply's output can be alternating or unidirectional, but it is almost always direct current. The type of stabilisation utilised may be limited to ensuring that the output stays within defined limits under different load situations, or it may additionally incorporate compensation for variations in its own supply source.

FTDI MODULE: The FTDI is a high-quality, high-performance bi-directional USB to 5V TTL converter with a 9-pin connector. It consists of two products: a USB to RS232 Adapter (USB-232- 2) that uses the FTDI chipset and an RS232 to 5V TTL Converter. (TTL-232-5P). Any typical full-duplex USB port can be converted to a 5V TTL signal in either way. The item is powered by the USB connection and does not require any other power. It also has auto-turnaround data direction, which eliminates the requirement for flow management. When data is present, the autosensing data turnaround automatically activates the TTL driver, making the device plug-and-play. On the USB side, there is a Type A female connector, and on the TTL side, there is either a DB9 male connector or a 5-way terminal block. The package has a separate terminal block.

III. METHDOLOGY

To implement the system, first connect the devices as shown in the fig:1 below using a block diagram as illustrated in the above fig:2, and then turn on the power supply, where a 12-volt adapter is used to convert the AC power into DC power, and this power is supplied to the RPS, which supplies an equal amount of power to the devices, which in this case are an ESP32 CAM module, an IR module, and a buzzer.

In the Arduino IDE, a program is created to control the ESP32 CAM module. The code written in the Arduino is

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dumped on the board using the FTDI module. For two-way communication between the ESP32 and the browser, this project uses the Arduino WebSocket library. The ESP32 is used for all face detection, capture, and recognition, and there are buttons that operate the ESP32. They are STREAM, which just streams the camera's frames, DETECT, which detects faces in the stream, CAPTURE, which captures the current face, and RECOGNISE, which matches a face from the camera to a previously captured face. When this ESP32 CAM is powered on, it begins streaming, and we can watch the stream using the network device finder app, which provides the IP address of the ESP32 CAM module. After copying the IP address and browsing it in the browser, the surveillance window is opened. On the monitor, we will see a settings option where we can start or stop the streaming, record the video, and adjust the resolution to our liking, as well as face recognition and face detection buttons. Below these two options, we will see another button labelled enroll. By selecting the enroll face button, the system begins taking pictures of the person to store in the database; here, it takes 5 samples of each person, registering the person.

When a person stands in front of the system, the IR module detects an object, indicating a person, which causes the esp32 CAM to begin scanning, recognising the person in order to mark the attendance. If the person is registered and their data is present in the database, their attendance is marked; if the person is not recognized, the buzzer sounds, indicating an unauthorised person.

IV. BLOCK DIAGRAM

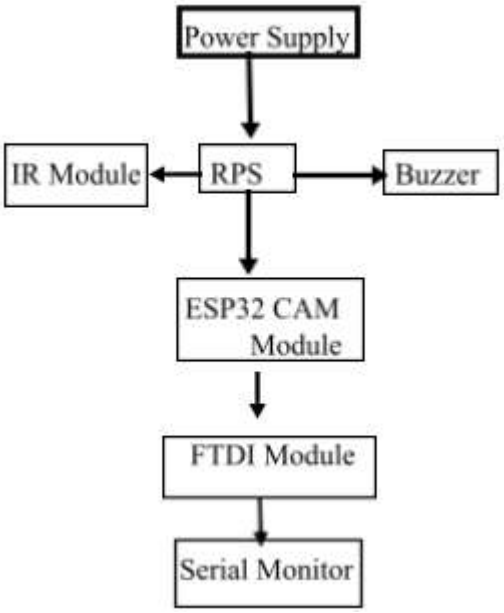

Fig.1.Block diagram

V. RESULTS

When the system is powered on, after browsing the resulted link we get a streaming window opened where we can see the option as illustrated in the below fig: 2where we need to switch on the face detection and face recognition button and then click on enroll face. After clicking that camera starts taking samples as shown below in fig: 3,4 after completion of taking samples, the data is stored.

Fig. 2. 3 Options for Face Recognition

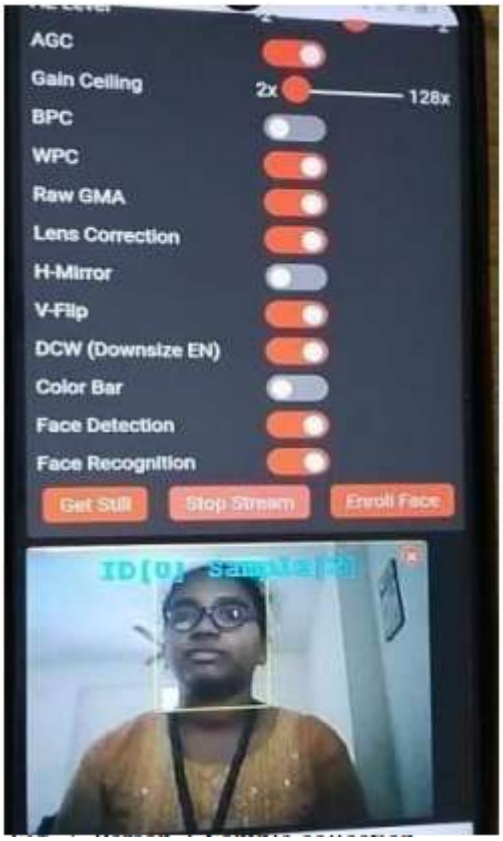

Fig.3. Person-1 Sample collection

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Fig.4. Person-2 Sample Collection

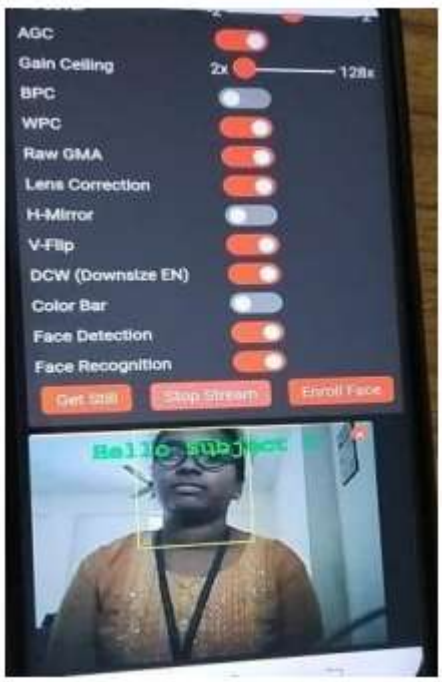

Fig.5.Person-1 detection

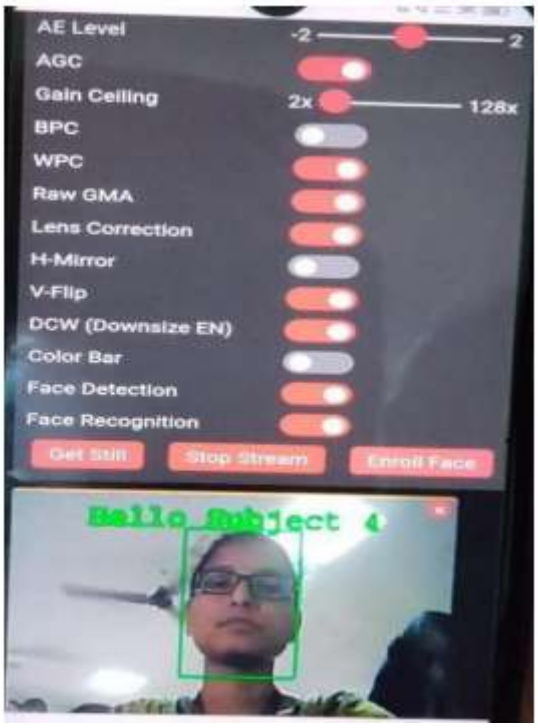

Fig. 6.Person-2 detection

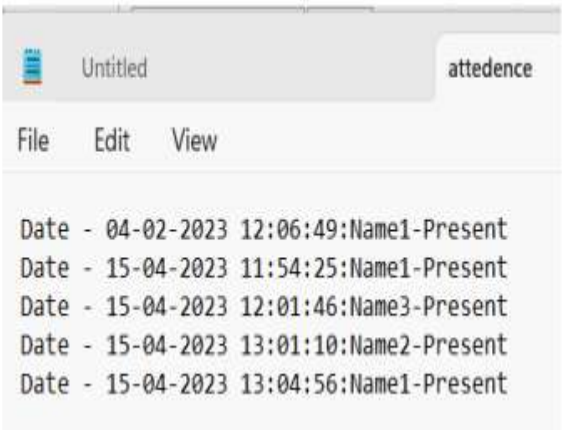

Fig.7. Attendance marked with date and time

After storing the samples of a person, it takes them as registered. then later when the person stands in front of the camera, if the person is already registered then it detects as shown in the fig.5,6 and marks them as present with the time and date as shown in below fig.7

VI. CONCLUSION

This project will greatly assist any organization in effectively managing their attendance system. Face recognition attendance management system is intended to address the problems of current manual systems. The system will save time, reduce the amount of work that the administration must do, replace stationery with electronic equipment, and reduce the amount of manpower needed for

the purpose. Using this framework, the issue of proxies and students being marked present even when they are not truly present can be readily resolved. Because this method does not require any touching, the risk of germs spreading is also reduced.

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