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Facial Recognition Based Attendance System

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Abstract - *A This paper attempts to integrate Node MCU. It might be quite time-consuming for the teachers to manually manage attendance. To solve this problem, sophisticated and automatic attendance management systems are being deployed. The problem of proxies and students being counted as present even if they are not is easily resolved with this architecture. This technique records attendance via a live video broadcast. The video frames are extracted using OpenCV. The two main implementation tasks for this kind of system are face detection and face recognition. Following this, a relationship between them ought to be conceivable by comparing the identified faces with the database of students' faces. This model will be a useful tool for controlling staff and student attendance.*

Key Words: **Node MCU, Attendance, OpenCV, Database**

1. INTRODUCTION

Human faces play a significant role in our daily lives, particularly when it comes to identification. Face recognition is a sort of biometric identification in which facial features are extracted from a person's face and saved as a unique face print. Biometric facial recognition technology has captured the interest of many academics due to its wide range of applications. Face recognition technology is better than other biometric-based recognition techniques like finger, palm, and iris prints because of its non-contact operation. Face recognition algorithms can also identify someone from a distance without making eye contact or conversing with the individual. Face recognition software is currently employed at crime scene investigations, social media sites like Facebook, train stations, and airports. Face recognition software can be used to recognize individuals, and the captured image can be used in crime reports and recorded in a database. Facebook uses face recognition technology to automatically tag people in images. In order to identify a face in any circumstance, including when lighting, we need a huge dataset and intricate features to analyses factors like age and attitude. Recent research show advances in facial recognition technologies. Over the past ten years, there has been a substantial progress in recognition methods. However, at the moment, the majority of facial recognition algorithms can only function successfully when there are relatively few individuals in a frame, regulated lighting, and adequate conditions for the placement of faces in big data sets, and complex features are required for face identification in order to be able to manipulate several barriers like lighting, position, and ageing in order to uniquely identify the various participants. Recent years have seen major breakthroughs in facial recognition technologies. Face recognition technology has come a long way in the past ten years. Even when there aren't many individuals in the frame, the majority of facial recognition algorithms now in use perform effectively. These methods have also been put to the test using acceptable face positioning, controlled lighting, and clear photos. Without regard to illumination or facial location, the facial recognition system proposed in this study for an attendance system can recognize many faces in a frame. The abrupt coronavirus outbreak caused many adjustments in everyone's lives. For several days, the majority of the offices and institutions were closed. The most popular attendance method in many universities and colleges is based on the biometric system. Nevertheless, the biometric attendance system disseminates the virus. So Biometric attendance system is replaced by Face Recognition Based Attendance system to Maintain the safety of the students and faculty.

I. LITERATURE REVIEW MATERIALS AND METHODOLOGY

2.1. Literature Review

The authors presented a model for an automatic attendance system. One of the most important aspects of Although creating a computer system that is similar to human perception is still an active area of research, humans use our ability to perceive well on a daily basis. The earliest facial recognition study dates back to the 1950s in psychology and the 1960s in engineering (Bruner and Tagiuri 1954). Some of the earliest research in this area may be found in Darwin's (1972) study on emotional facial expression (also see Ekman (1998)) and Galton's (1888) study on facial profile-based biometrics. However, after Kanade's seminal work [1973], research on automatic facial recognition started in the 1970s [Kelly 1970]. In-depth research on a variety of aspects of face recognition by humans and robots has been conducted over the past 30 years by psychophysicists, neuroscientists, and engineers.

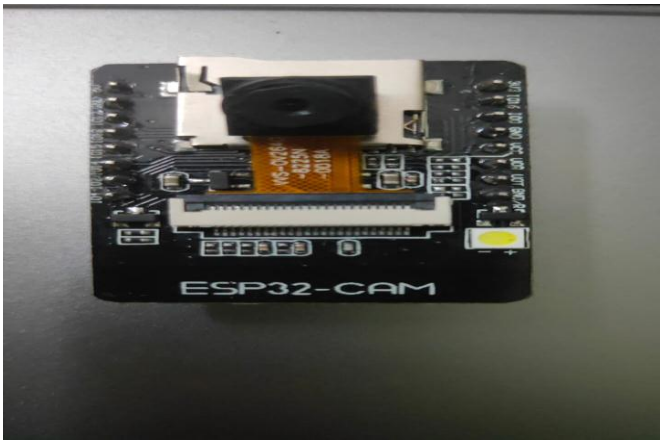
In the past 15 years, research has been concentrated on how to fully modularize face recognition systems by addressing issues like the localization of a face in a given image or video clip and the extraction of characteristics like the eyes, lips,

and so forth. In the meanwhile, significant advancements have been made in the classification model design for efficient facial recognition software. In tests using sizable databases, the efficacy of Eigenfaces (Kirby and Sirovich 1990; Turk and Pentland 1991) and Fisher-faces (Belhumeur et al. 1997; Etemadand Chellappa 1997; Zhao et al. 1998) has been shown. It has been quite effective to accommodate users appropriately when using feature-based graph matching [Wiskottet al. 1997].

a. Materials

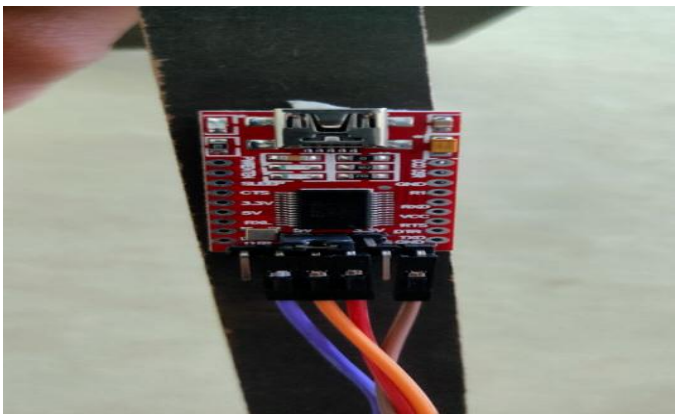
1. Node MCU:

Specifically created for Internet of Things (IoT) applications, NodeMCU is a developer board with open-source Lua-based firmware. It features hardware based on the ESP-12 module and firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems. Specifications and Features of the NodeMCU ESP32 Pinout Development Board. The NodeMCU ESP32 board is actively supported by ESPHome (also known as ESP32-DevkitC in some cases). Prefer ESP32 and nodemcu-32s as the board type when the ESPHome wizard asks for your platform. Because the ESP32 boards commonly use the internal GPIO pin numbering of the board, there is no need to bother about additional pins having predefined names. The ESP32 Camera Module was made by AI-Thinker. A Wi-Fi + Bluetooth/BLE chip and a 32-bit CPU form the foundation of the controller. Both an external 4M PSRAM and an internal 520 KB SRAM are present. The UART, SPI, I2C, PWM, ADC, and DAC are supported by its GPIO Pins. The module is combined with the The maximum camera resolution, up to 1600 1200, is provided by the OV2640 Camera Module. The 24-pin gold-plated connector used to connect the camera to the ESP32 CAM Board is used. SD cards up to 4GB in capacity can be inserted into the board. Images taken are saved to the SD Card.



2. Future Technology Devices International:

A popular IC for USB-to-TTL converters is the FTDI chip. They are utilized to USB-connect gadgets like Arduino to laptops. In other words, converting a USB signal to a UART signal that microcontrollers can understand is made incredibly simple by an FTDI chip. There is no programmer chip on the PCB. Therefore, this board may be programmed using any USB-to-TTL Module. FTDI Modules based on the CP2102 or CP2104 chip, or any other chip, are widely accessible.

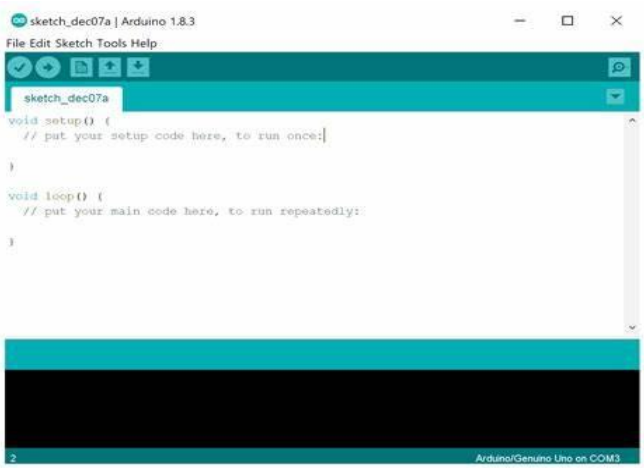


3. Connecting Wires:

The conductive connections between the elements in contact in any electrical circuitry are made via wires. They should have no resistance and offer flawless connectivity. They appear as attractive coloured jumper wires on the breadboard.

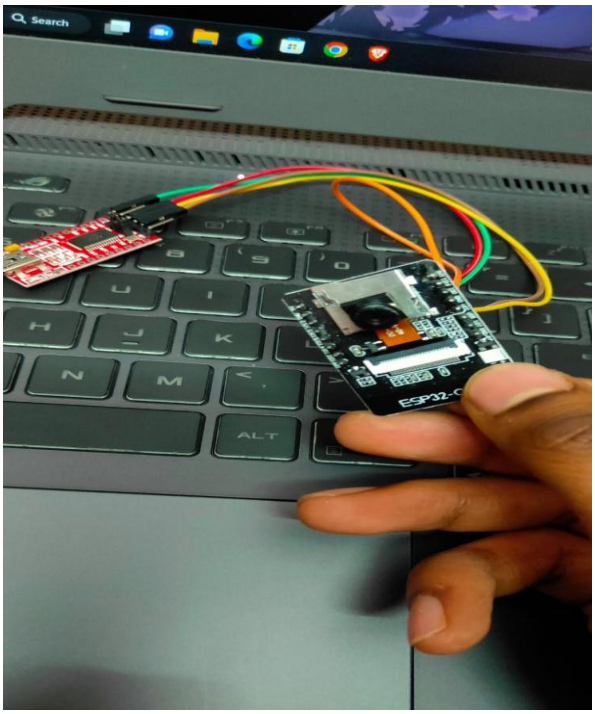
4. Arduino IDE compiler:

Arduino is an open-source electronics platform built primarily on user-friendly hardware and software tools. Our software is uploaded into the microcontroller using AVR-dude and an AVR-GCC compiler using the Arduino IDE. Open-source software called the Arduino IDE is used to create and upload code to Arduino boards. For different operating systems, including Windows, Mac OS X, and Linux, the IDE programmed is appropriate. The programming languages C and C++ are supported. Integrated Development Environment is referred to in this sentence.



2.3. Methodology

Using face recognition as a consideration, we gathered journal papers that matched the attendance system keywords. Journals, studies, and papers from the last five years, namely 2015, are what we gather. We encourage English-language papers across all the periodicals we gather. Connect the 5V and GND pins of the ESP32 to the 5V and GND pins of the FTDI module. Connect Rx to UOT and Tx to UOR Pin in a same manner. The IO0 and GND pins must be communicated, most importantly. The system will enter programming mode as a result. Once the coding is done, you can disconnect it. In this scenario, researchers will not employ the ESP webserver example as a whole, but an alternative streaming technique. We have to add another ESPCAM library as a result. The ESP32CAM library provides an object-oriented API for interacting. It is a frontend for the esp32-camera library. The code needs a small adjustment before being uploaded. Your Wi-Fi network's SSID and password should be changed. It should now be compiled and uploaded to the ESP32 CAM Board. But each time you upload, you need to take a few specific actions. To ensure that the IO0 pin is shorted to ground when you push the upload button, check it. If you notice dots and dashes during uploading, press the reset button right away. After the code has been uploaded, reset the button, and then disconnect the I01 pin from Ground. Press the reset button once again if the Serial Monitor's output is still not present. In order to capture the attendance from the URL, copy the accessible IP address. The users who need to be detected should now be added. We're finally prepared to go. Run the code then have the subject face the ESP32 camera while standing in front of it.



III. MODELING AND ANALYSIS

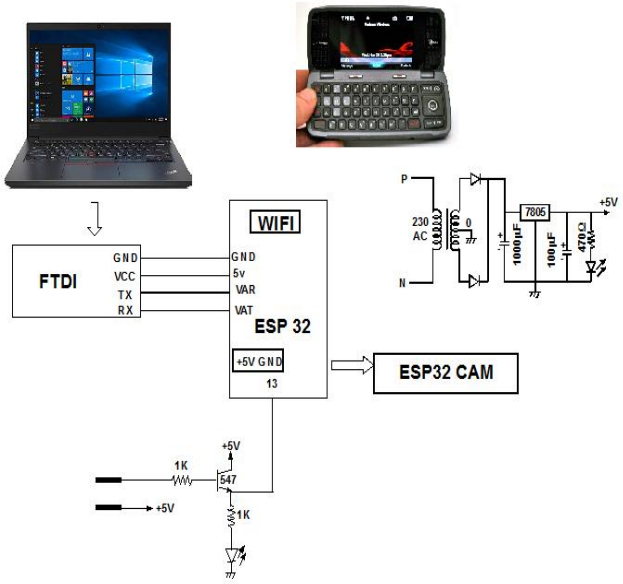


Figure 1: Model Block Diagram.

IV.RESULTS, DISCUSSION, AND CONCLUSION

The "**Facial Recognition Based Attendance System**" project has been successfully implemented and tested. It was created by merging features from all of the hardware used. Every module's existence has been carefully considered and arranged, which helps the unit function at its best. Each face that is recognized and matched with an enrolled face has attendance recorded in the respective database. In addition to having a quicker response time, this approach will be more effective at distinguishing several faces from a single frame. Users can communicate with the system using a graphical user interface (GUI). The three main choices available to users are student registration, teacher registration, and attendance marking. Students must thoroughly fill out the student registration form. When you press the register button, the camera instantly turns on, opens a window, and starts looking for faces in the background. After that, until 7 samples have been gathered or CRTL+Q has been depressed, the camera will start shooting pictures automatically. Following pre-processing, these photographs are saved in the training images directory. In the database are included the person's name, attendance date, and time. The strategy described above will produce the best results. This is accomplished by combining OpenCV for frame extraction with dlib for facial recognition. This approach will be more precise in Then, based on psychological research and the lessons we've learned from creating algorithms, we provide research hypotheses concerning face recognition. We hypothesize that many processes are involved in human identification of both familiar and unknown faces.

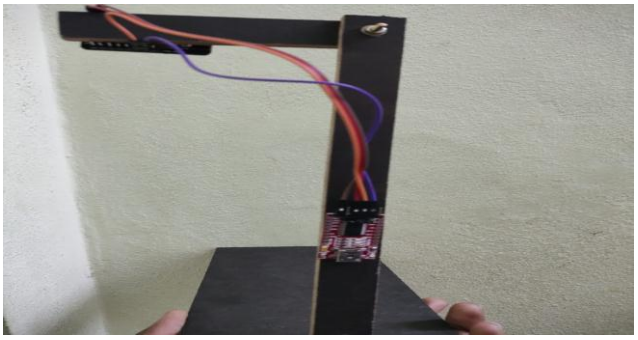
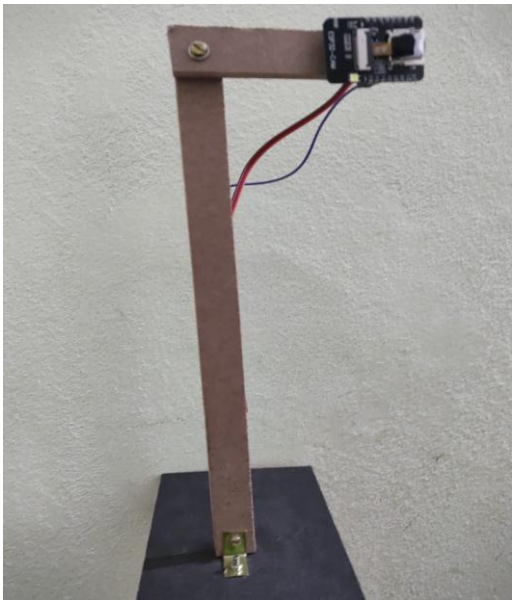


Figure 2: Setup of the ESP32 Cam Module via FTDI



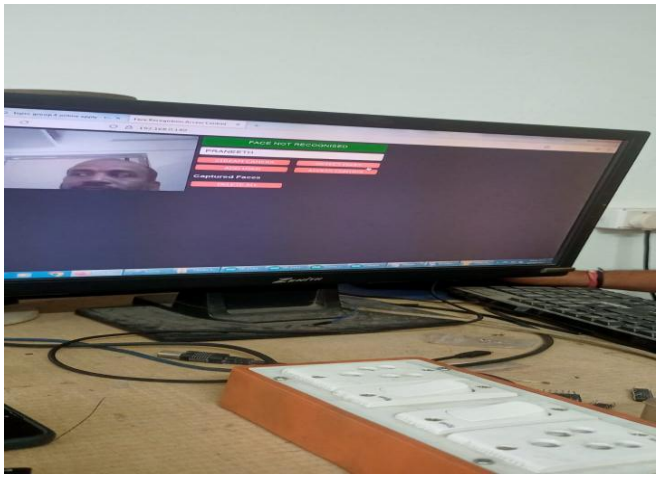


Figure 3. Attendance Evaluation

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