FUTURE INSTITUTE OF ENGINEERING AND MANAGEMENT

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MINI PROJECT ON:

Face Recognition Based Attendance System using ESP32 CAM

SUBMITTED BY

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Introduction - In recent times, attendance management systems have become an essential tool for tracking employee attendance in various organizations. Traditional methods of attendance management, such as manual punch cards, have become outdated and are prone to errors. To overcome these drawbacks, face recognition-based attendance systems have been developed. In this report, we will discuss the implementation of a face recognition-based attendance system using ESP32-CAM.

Project Concept - Introduces the topic of the Face Recognition Based Attendance System using ESP32 CAM Module. We will be using OpenCV & Visual Studio for this application. OpenCV is an open-sourced image processing library that is very widely used not just in industry but also in the field of research and development. Visual Studio is an IDE made by Microsoft for different types of software development & contains completion tools, compilers, and other features to facilitate the software development process.

In this project we will learn, how to create a Face Recognition Based Attendance system using ESP32 CAM and Python. The main heavy program will be at the server-side that is our computer, or one can even use raspberry-pi as a server. In this attendance system, we will not just detect the person but also store the information of the person detected in a Microsoft Excel File. Moreover, the duration of time they have stayed in the frame is also recorded into an excel sheet.

The tutorial also contains information about features, pins description, and the method to program ESP32 Camera Module using FTDI Module. We will also set up the Arduino IDE for the ESP32 Camera Module. We will also upload the firmware and then work on the Face Recognition part. The script for Face Recognition is written in the python programming language, thus we will also have to install Python and its required Libraries.

Component Used -

- ESP32-CAM Board AI-Thinker
- FTDI Module
- Micro-USB Cable
- Jumper wire

❖ **Hardware:**

The ESP32-CAM is a low-cost development board that integrates a camera module, Wi-Fi, and Bluetooth connectivity. It is based on the ESP32 microcontroller and can be programmed using the Arduino IDE. The board is equipped with an OV2640 camera module, which has a resolution of 2 megapixels.

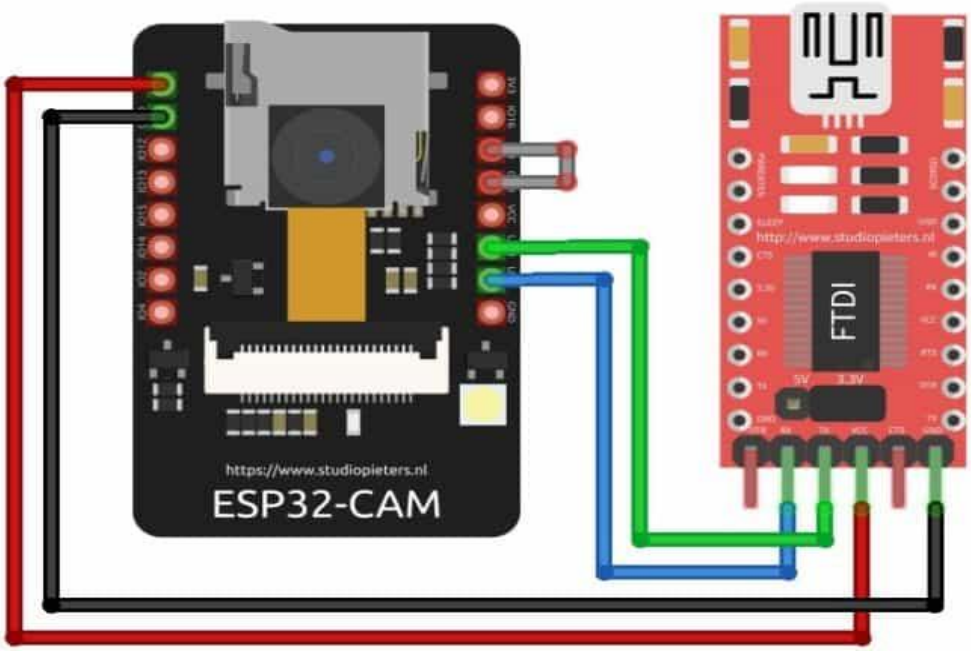
❖ **Software:**

The face recognition-based attendance system was developed using Python and OpenCV libraries. The OpenCV library is a popular computer vision library that provides various functions for image processing and recognition. The face recognition algorithm used in this system is based on the OpenFace library, which is an open-source implementation of the face recognition algorithm.

❖ **Working:**

The ESP32-CAM is connected to a Wi-Fi network and configured as a server. when an employee arrives, the camera module captures their image, and the image is transmitted to the server. The server then processes the image using the face recognition algorithm and identifies the employee. If the employee is recognized, their attendance is marked, and a notification is sent to the server.

Circuit Diagram –



Code -

```
#include <WebServer.h>
#include <WiFi.h>
#include <esp32cam.h>

const char* WIFI_SSID = "ssid";
const char* WIFI_PASS = "password";

WebServer server(80);


static auto loRes = esp32cam::Resolution::find(320, 240);
static auto midRes = esp32cam::Resolution::find(350, 530);
static auto hiRes = esp32cam::Resolution::find(800, 600);
void serveJpg()
{
 auto frame = esp32cam::capture();
 if (frame == nullptr) {
  Serial.println("CAPTURE FAIL");
  server.send(503, "", "");
  return;
 }
 Serial.printf("CAPTURE OK %dx%d %db\n", frame->getWidth(), frame->getHeight(),
               static_cast<int>(frame->size()));

 server.setContentLength(frame->size());
 server.send(200, "image/jpeg");
 WiFiClient client = server.client();
 frame->writeTo(client);
}

void handleJpgLo()
{
 if (!esp32cam::Camera.changeResolution(loRes)) {
  Serial.println("SET-LO-RES FAIL");
 }
 serveJpg();
}

void handleJpgHi()
{
 if (!esp32cam::Camera.changeResolution(hiRes)) {
  Serial.println("SET-HI-RES FAIL");
 }
 serveJpg();
```

```
}

void handleJpgMid()
{
 if (!esp32cam::Camera.changeResolution(midRes)) {
  Serial.println("SET-MID-RES FAIL");
 }
 serveJpg();
}
void  setup(){
 Serial.begin(115200);
 Serial.println();
 {
  using namespace esp32cam;
  Config cfg;
  cfg.setPins(pins::AiThinker);
  cfg.setResolution(hiRes);
  cfg.setBufferCount(2);
  cfg.setJpeg(80);

  bool ok = Camera.begin(cfg);
  Serial.println(ok ? "CAMERA OK" : "CAMERA FAIL");
 }
 WiFi.persistent(false);
 WiFi.mode(WIFI_STA);
 WiFi.begin(WIFI_SSID, WIFI_PASS);
 while (WiFi.status() != WL_CONNECTED) {
  delay(500);
 }
 Serial.print("http://");
 Serial.println(WiFi.localIP());
 Serial.println("  /cam-lo.jpg");
 Serial.println("  /cam-hi.jpg");
 Serial.println("  /cam-mid.jpg");

 server.on("/cam-lo.jpg", handleJpgLo);
 server.on("/cam-hi.jpg", handleJpgHi);
 server.on("/cam-mid.jpg", handleJpgMid);

 server.begin();
}

void loop()
{
 server.handleClient();
}
```

Application –

Face recognition based attendance systems using ESP32 CAM can be used in a variety of applications where attendance needs to be taken quickly and accurately, without the need for physical contact or manual intervention. Here are some possible applications:

- Schools and colleges: Face recognition based attendance systems can be installed in schools and colleges to take attendance of students and staff members. This can help to automate the attendance-taking process and reduce errors.
- Office buildings: In office buildings, face recognition based attendance systems can be used to track the attendance of employees. This can help to streamline the payroll process and prevent employees from clocking in for each other.
- Government offices: Government offices can use face recognition based attendance systems to track the attendance of employees and ensure that they are fulfilling their duties. This can also help to reduce absenteeism and improve productivity.
- Hospitals: Hospitals can use face recognition based attendance systems to track the attendance of medical staff and ensure that there are enough staff members on duty at all times. This can also help to improve patient care and reduce errors.
- Events: Face recognition based attendance systems can be used at events to track the attendance of participants and prevent unauthorized access. This can be particularly useful for large events such as conferences and concerts.

Advantage -

- Fast and accurate: The system can recognize faces in real-time and accurately record attendance without any human intervention.
- Convenient: It eliminates the need for manual attendance marking, which saves time and reduces errors.

- Cost-effective: The system is relatively inexpensive compared to traditional attendance methods, such as paper-based systems or card swiping machines.
- Secure: The system provides an added layer of security as it ensures that only authorized individuals can mark their attendance.

Future Scope-

As facial recognition technology continues to improve, it is likely that more advanced systems will be developed that address some of the current limitations. For example, AI-powered systems may be able to accurately recognize faces even in poor lighting conditions or with changes in facial features. Additionally, there is potential for integration with other technologies, such as mobile apps or cloud-based storage systems, to further enhance the convenience and accessibility of these systems.

Conclusion - The implementation of a face recognition-based attendance system using ESP32-CAM is an innovative solution to the traditional attendance management system. It provides a more accurate and reliable method of attendance management, which saves time and effort. The system can be easily integrated with existing payroll systems, making it a valuable tool for various organizations.

THANK YOU…

STUDENT'S SIGNATURE **TEACHER'S SIGNATURE**

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