云南大学信息学院期末课程报告

Final-term Course Report
School of Information Science & Engineering,
Yunnan University

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Topic: IOT based dormitory attendance system

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Group Members Self Evaluation

(Total $300)

	No.1	No.2	No.3	No.4	
No.1		**90**	**95**	**92**	**300**
No.2	**100**		**93**	**95**	**300**
No.3	**100**	**92**		**90**	**300**
No.4	**95**	**95**	**90**		**300**
Total	**295**	**277**	**278**	**277**	**1200**

Personal Contribution

No.	ID.	Name	Personal Contribution
1	20193290764	MINHAZUL ISLAM	PROGRAMMING AND SYSTEM DESIGNER
2	20193290734	RASHIK JAHANGIR	CIRCUIT DESIGNER
3	20193290711	YEASIN ARAFAT	IMPLEMENTATION of project
4	20193290609	SRISTY CHOWDHURY	Help on ppt and final report writing

Table of Content

Chapter one introduction

1.1 Project Introduction

The management of the attendance can be a great burden on the dormitory teachers if it is done manually. It is a demanding task in any organization. In traditional attendance system, the students are called out by the teachers and their presence or absence is marked accordingly. This is time consuming and tedious. To resolve this problem, smart and auto attendance management system is being utilized. But authentication is an important issue in this system. The smart attendance system is generally executed with the help of biometric. Many organizations use finger print and card-based attendance systems. But considering the current COVID – 19 pandemic situations, using contact based biometric verification for attendance marking systems is unsafe and risk too. This is the right time to switch towards a face-based attendance system to avoid direct contact. As face recognition is one of the biometric methods, we won't come across authentication issues. So we developed a project on IOT based smart attendance system using Face recognition module. ESP32 cam is used to authenticate a person. First, we need to enroll, all the information like student ID, name, class etc., after facing the ESP32 cam. When student come in front of ESP32 cam, it automatically detects, recognizes and stores the information in an IOT cloud. The staffs or any authorized person can assess these data at any time. Here we are using HTTPS, to store the student's data. If unauthorized persons in front of ESP32 cam, it will not take as a valid ID. Hence the problem of proxies can be easily resolved. Also, we will make face lock door system at our dormitory gate.

KEYWORDS: COVID-19 pandemic, fingerprint, IOT based smart attendance system, Face recognition, Esp32 cam

1.2 Compare and Contrast with Existing System

Currently the dormitory has analogue system which uses human help to detect the attendance. But with our IOT based attendance system we will be able to solve that issue and fix it properly. In this paper we have discussed it properly in details.

1.3 Survey

Zhang and A.K. Jain (2004) [1] proposed the design and development of a portable classroom attendance system based on fingerprint biometric is presented. Among the salient aims of implementing a biometric feature into a portable attendance system is security and portability. The circuit of this device is strategically constructed to have an independent source of energy to be operated, as well as its miniature design which made it more efficient in term of its portable capability. Rather than recording the attendance in writing or queuing in front of class equipped with fixed fingerprint or smart card reader. This paper introduces a portable fingerprint based biometric attendance system which addresses the weaknesses of the existing paper-based attendance method or long-time queuing. In addition, our biometric fingerprint-based system is encrypted which preserves data integrity.

Parvathy et.al (2011) [6] proposed a new system based on RFID. In the modern era, great developments have been done; which are based on Radio Frequency Identification Techniques. The applications are effectively applied to various diverse areas as transportation, agriculture, hospital / health care and other industries. RFID technique facilitates use automatic wireless identification through electronic passive and active tags with suitable readers. This paper illustrates a physical system which incorporates an application of RFID and wireless data base record entries. This system not only eliminates the time consumed in manual attendance but also maintains the record of entries which can be used for statistical purposes like allocation of appropriate attendance score and further administrative tasks.

E.Geoffrey et.al (2012) [7] proposed in the modern era, great developments have been done; which are based on Radio Frequency Identification Techniques. The applications are effectively applied to various diverse areas as transportation, agriculture, hospital / health care and other industries. RFID technique facilitates use automatic wireless identification through electronic passive and active tags with suitable readers. This paper illustrates a physical system which incorporates an application of RFID and wireless data base record entries. Our proposed system not only eliminates the time consumed in manual attendance but also maintains the record of entries which can be used for statistical purposes like allocation of appropriate attendance score and further administrative tasks.

P. Salunke et al (2013) [8] proposed the design and development of a portable classroom attendance system based on finger print biometric is presented. Among the salient aims of implementing a biometric feature into a portable attendance system is security and portability. The circuit of this device is strategically constructed to have an independent source of energy to be operated, as well as its miniature design which made it more efficient in term of its portable capability. Rather than recording the attendance in writing or queuing in front of class equipped with fixed fingerprint or smart card reader. This paper introduces a portable fingerprint based biometric attendance system which addresses the weaknesses of the existing paper-based

attendance method or long-time queuing. In addition, our biometric fingerprint-based system is encrypted which preserves data integrity.

Anionite et.al (2017) [9] proposed to maintain the attendance records, several government organizations and educational institutions in many countries still depend on the paper-based attendance approach. This approach has presented several disadvantages such as time-consuming and wastage of environmental resources. There is a necessity to change these traditional methods of attendance recording with more efficient ones. Thus, many works have been done in this direction. Moreover, this study aims to analyze the most recent studies on automated attendance systems regarding the timeline. Our critical review has highlighted studies in the existing literature concerning technology, application domain, and main findings. Moreover, shed light on most numerous studies on any of three previous aspects.

CHAPTER TWO

System development methods and related technologies

2.1 Internet of Things model

We aim to design a smart attendance system with the help of ESP 32 cam which will drive through Micro controller and the corresponding information will be stored on the cloud. We eliminate the use of RFID and biometric methods to avoid physical contact with the device. In this project, we are using ESP 32 cam to authenticate a person. The data of each person will be stored in IoT cloud using GSM SIM800C Module. When student come in front of ESP32 cam, it automatically detects, recognizes, gate open and stores the information in an IoT cloud. Here we are using HTTPS, to store the students' data. If unauthorized person come in front of ESP32 cam, it will not take as a valid ID and during that time a buzzer will alarm to indicate the invalid entry. Hence the problem of proxies and unknown outside people can be easily resolved. The authorized person can access these data's anywhere from the world using network connection.

2.2 SENSOR

ARDUINO MEGA 2560

The Atmel MCU ATMEGA16U2 MEGA 2560 R3 Improved Version CH340G Board is a micro-controller board base on the ATmega2560 which is shown. It has a USB

host interface to connect with Android based phones, based on the MAX3421e IC. It has 54 digital input/output pins (of which 15 can be used as PWM outputs); 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator; a USB connection, a power jack, an ICSP header, and a reset button. The MEGA ADK is based on the Mega 2560. Similar to the Mega 2560 and Uno, it features an ATmega8U2 program as a USB-to-serial converter. Revision 3 of the Mega ADK board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU(Device Firmware Upgrade) mode.

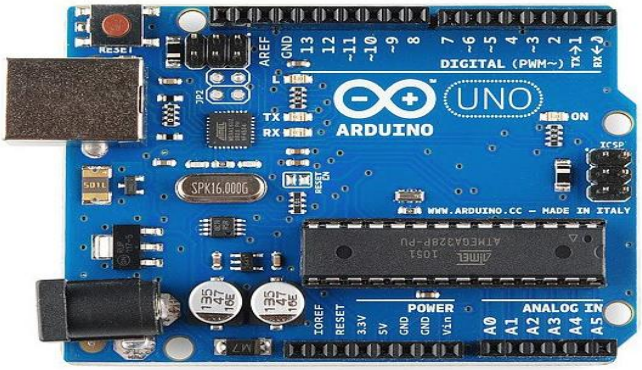


Figure 1: **ARDUINO MEGA 2560**

ESP32 Camera Module

The ESP32 CAM Wi-Fi Module Bluetooth with OV2640 Camera Module 2MP For Face Recognition has a very competitive small-size camera module that can operate independently as a minimum system with a footprint of only 40 x 27 mm; a deep sleep current of up to 6mA and is widely used in various IoT applications. ESP32S Wi-Fi Bluetooth combo module is an ultra-performance that is high ultralow-power consumption Wi-Fi and Bluetooth wireless platform based on ESPRESSIF ESP32 chipset. ESP-32S dual-core 448 Kbyte ROM | 520 Kbyte SRAM | 16 Kbyte SRAM in RTC | 802.11 b/g/n/e/I Wi-Fi | Bluetooth v4.2 BR | EDR & BLE | clocks & Times |peripheral Interfaces and security mechanism.

Figure 2 ESP32

Figure 3 GSM SIM800L

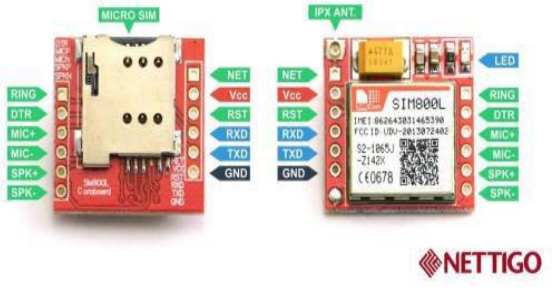


Figure 4 SIM800L

GSM SIM800L is a GSM module is shown here. This is Small SIM800L GPRS GSM Module Micro SIM Card Core Board Quad-band TTL Serial Port with the antenna; in this module two antennas have been included. SIM800L GSM/GPRS module is a miniature GSM modem, which can be integrated into a great number of IOT projects. We can use this module to accomplish almost anything a normal cell phone can; SMS text messages, make or receive phone calls, connecting to the internet through GPRS, TCP/IP, and more! To top it off, the module supports quad-band GSM/GPRS network, meaning it works pretty much anywhere in the world. First is made of wire (which solders directly to NET pin on PCB) – very useful in narrow places. Second – PCB antenna – with double-sided tape and attached pigtail cable with IPX connector. This one has better performance and allows putting your module inside a metal case – as long the antenna is outside.

SIM800L is a miniature cellular module which allows for GPRS transmission, sending and receiving SMS and making and receiving voice calls. Low cost and small footprint and quad band frequency support make this module perfect solution for any project that require long range connectivity. After connecting power module boots up, searches for cellular network and login automatically. On board LED displays connection state (no network coverage - fast blinking, logged in - slow blinking). This module has two antennas included which is shown in Fig. 6. First is made of wire (which solders directly to NET pin on PCB) - very useful in narrow places. Second - PCB antenna - with double side tape and attached pigtail cable with IPX connector. This one has better performance and allows putting your module inside a metal case - as long the antenna is outside.

Liquid Crystal Display

7DS3231 Real Time Clock

Buzzer

A liquid crystal display (LCD) is shown, is an electronically-modulated optical device shaped into a thin, flat panel made up of any number of color or monochrome pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector. It is often utilized in battery-powered electronic devices because it uses very small amounts of electric power. LCD has material, which continues the properties of both

liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered from similar to a crystal.

DS3231 RTC is a Precise Real-Time Clock Module with 32Kbit EEPROM and a built-in 10-bit temperature sensor having a resolution of 0.25C. The DS3231 RTC module Precise Real-Time Clock Module is a low-cost, extremely accurate I²C real-time clock (RTC) with an integrated temperature compensated crystal oscillator (TCXO) and crystal. The device incorporates a battery input and maintains accurate timekeeping when the main power to the device is interrupted. The integration of the crystal resonator enhances the long-term accuracy of the device as well as reduces the piece-part count in a manufacturing line. The ds3231 Arduino is available in commercial and industrial temperature ranges and is offered in a 16-pin, 300-mil SO package. The buzzer is shown. This is a Small PCB Mountable 12V Active Electromagnetic Buzzer. It is great to add Audio Alert to your electronic designs. It operates on 12V supply, uses a coil element to generate an audible tone.

2.2.1 Block diagram

The proposed system block diagram is shown in Fig. 2. The ESP 32 Camera is compatible with Arduino Micro-controller family which will detect the student face, and the digital information will be feed as the input to the controller. The already stored data in the SD card will be compared with the image captured. If the data matched, then the present status will be displayed in the LCD for the corresponding Student.

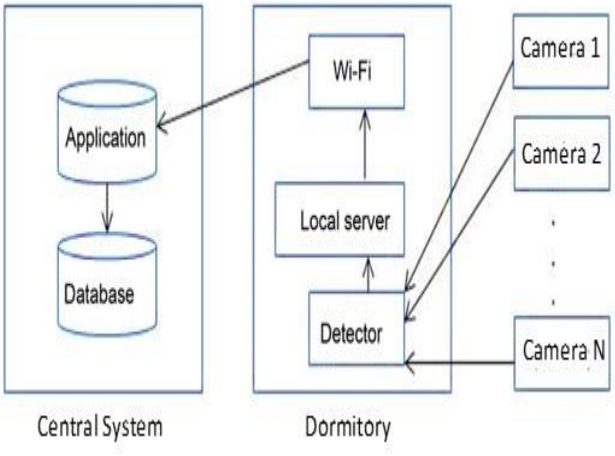


Figure 8 Center System

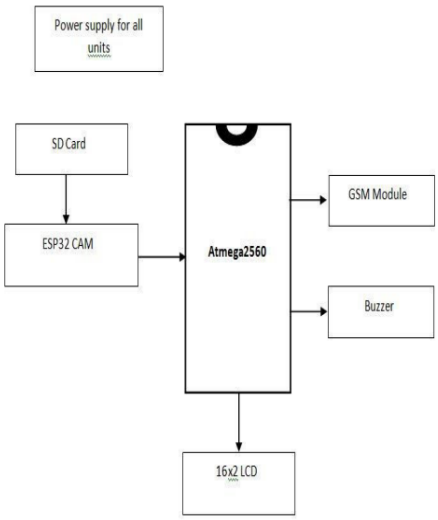


Figure 9 Proposed block diagram

The unmatched student's data base will be collected at the end of the day or after the given time and the absent information will be sent to their corresponding parents through GSM Module. If unknown person or unauthorized person to the particular class come in front the ESP cam32, then the system compares the existing person's details with the stored data. If there is no matching found, the system will ring a buzzer to alter the faculties or administrative executives about the presence of unauthorized person.

The application consists of the following main components:

Face Detector

The first main component is the Face Detector. Basically, it is a camera application that takes an image of the classroom and then detects the faces of the students that are sitting in the classroom, crops, and stores them in the database or a file. This component uses very strong face detection algorithms like Computer Vision and other techniques.

Face Identifier

The second main component is "Face Recognizer". It's a desktop application that recognizes the students' faces by comparing them with the faces that are enrolled in the face database and mark them as present or absent. The application can be designed using various programming languages like Java, C#, C++, Python, node js etc. The language implemented in this study is Python.

2.3 SYSTEM ARCHITECTURE

Perception Layer: This layer consists of various objects like sensors, transmitters, actuators, and controllers. It defines the environment of the system. In our proposed framework camera, ESP32 with and transmitter are connected to perform their operations as per the requirements. The camera is used to take pictures of the student and Arduino UNO is used to collect the data and send it to the next layer using a transmitter.

Network Layer: This layer is used to forward the gathered data from multiple objects to the next layer for storage and operation purposes without any interpretation. The transmission of data is handled by routing and transmitting it to other IoT devices which is the main function of this layer. Data filtering and data aggregation are performed on this layer. Internet gateways, switching, routing, and platform for cloud computing perform their functions using Bluetooth, 5G, Wi-Fi, etc.

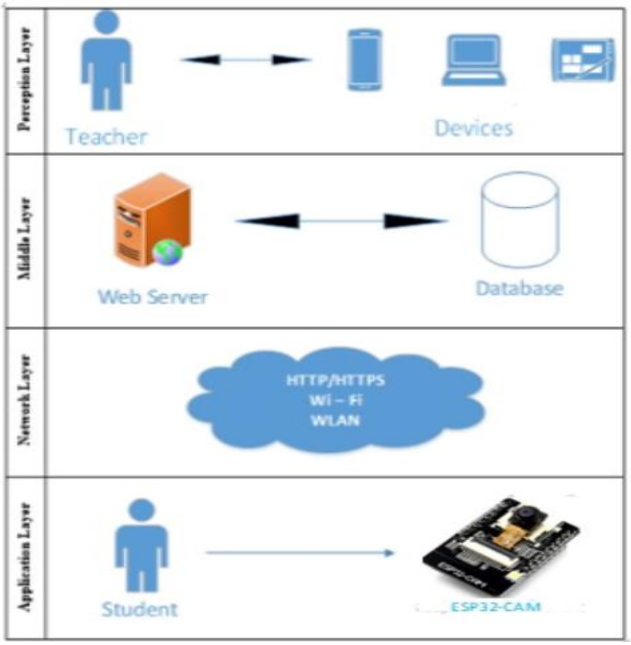


Figure 10 SYSTEM ARCHITECTURE

Middleware Layer: This layer is used for the storage of data collected from the various objects connected in the system on the perception layer. This layer contains a web server having a database that deals with all the queries generated by the authorized personnel using the web application. It also defines the operating system and the software which are used for the transfer of generated data between IoT devices and applications.

Application Layer: Data management and resource discovery are performed on this layer. It also provides interfaces to utilize the hardware resources. Mostly in IoT, the transfer of data is performed by various IOT protocols like HTTP, CoAP,MQTT, and HTTPS. The proposed system uses a request/response method using Restful API due to which HTTP and HTTPS are used for the transfer of messages in the system.

2.3.1 Flowchart of the proposed system

Our system is secure and fully cares about saving students' privacy that why we have only allowed the System Admin for logging in to the system with his/her username and password. No one else could use it directly without any permission. We have designed the system easy to understand and simple to deal with for everyone so there is no such hard and fast training needed to use it.

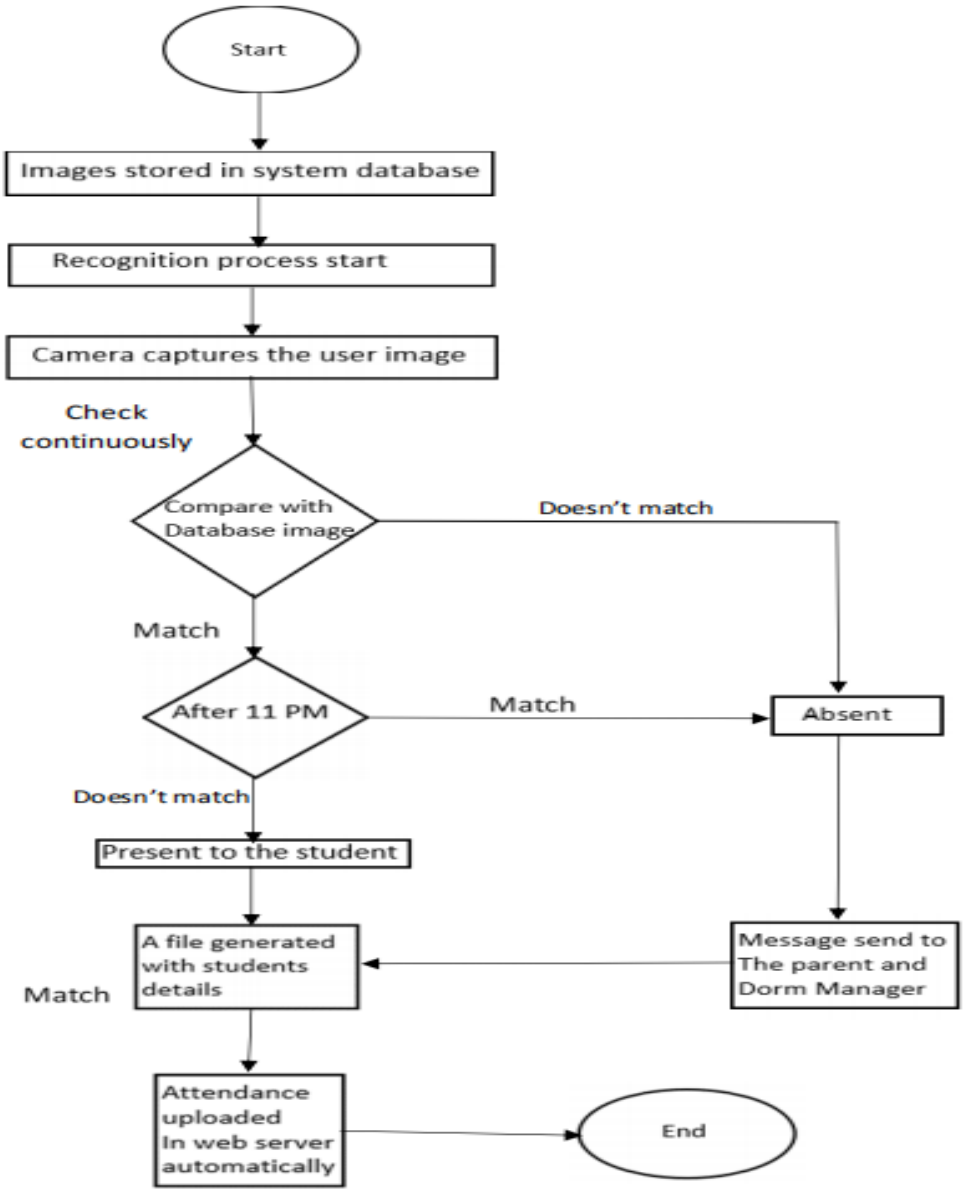


Figure 11 SYSTEM ARCHITECTURE

The proposed system also provides some services which are registration service, Data visualization service, and Data Management.

Registration Service: This service is being handled by admin staff for the entry of every person in the system. With this service, the username and the password are created and allocated to the person. By using these credentials, they can access the system for ease of concern.

Data Visualization: By using this service every user can view the record which is permitted to view by the admin. Parents can only view their children attendance record.

Data Management: The admin is responsible for the management of the data as there are many students and faculty members. So the record of every person is being handled by them and filtered accordingly.

2.3 Network Diagram for IOT Technologies

In this project we are using same WIFI for that from several dormitory sending data throw same WIFI

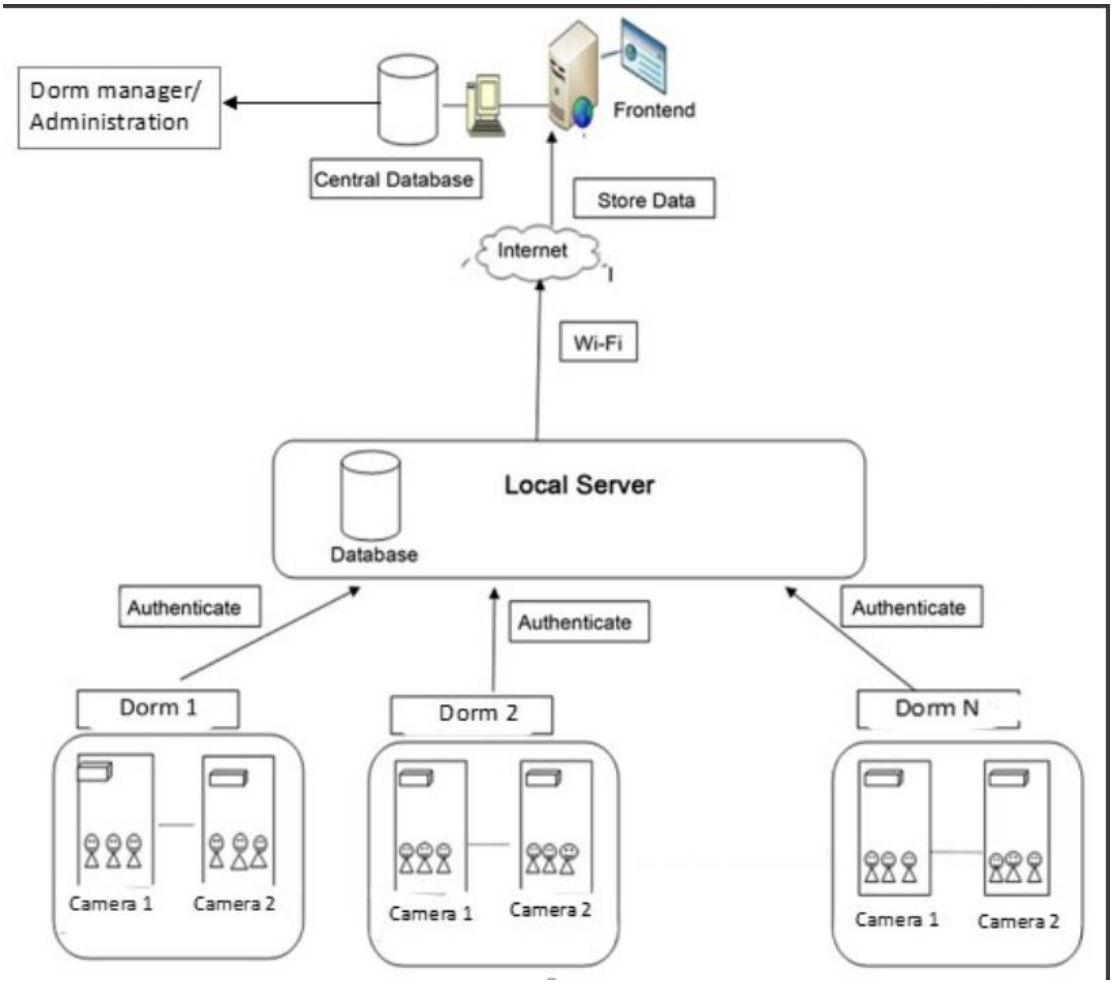


Figure 12 Network Diagram

CHAPTER THREE

SYSTEM DESIGN

3.1 General Design (System Structure)

The design of the smart presence system in Figure 12 has several stages of the work process, while the stages of the process are carried out as follows. The first stage is that students will register by filling out the form, after which the operator will enter the form data to the computer along with recording the image of the student through the ESP32 module on the Register Node. The operator will send the data to the server to save to the database. The

second stage is when students enter in dormitory, the activities that are carried out for the first time are attendance by using face recognition in the camera Node. Then all student attendance data will be sent from the Camera Node through the Thing Speak cloud and then the presence attendance data will be stored on the Server. For the third stage, namely when students enter before 11.00pm, the attendance will be done first through the camera Node then student attendance data will be sent from the Class Node through Cloud Thing Speak to Server.

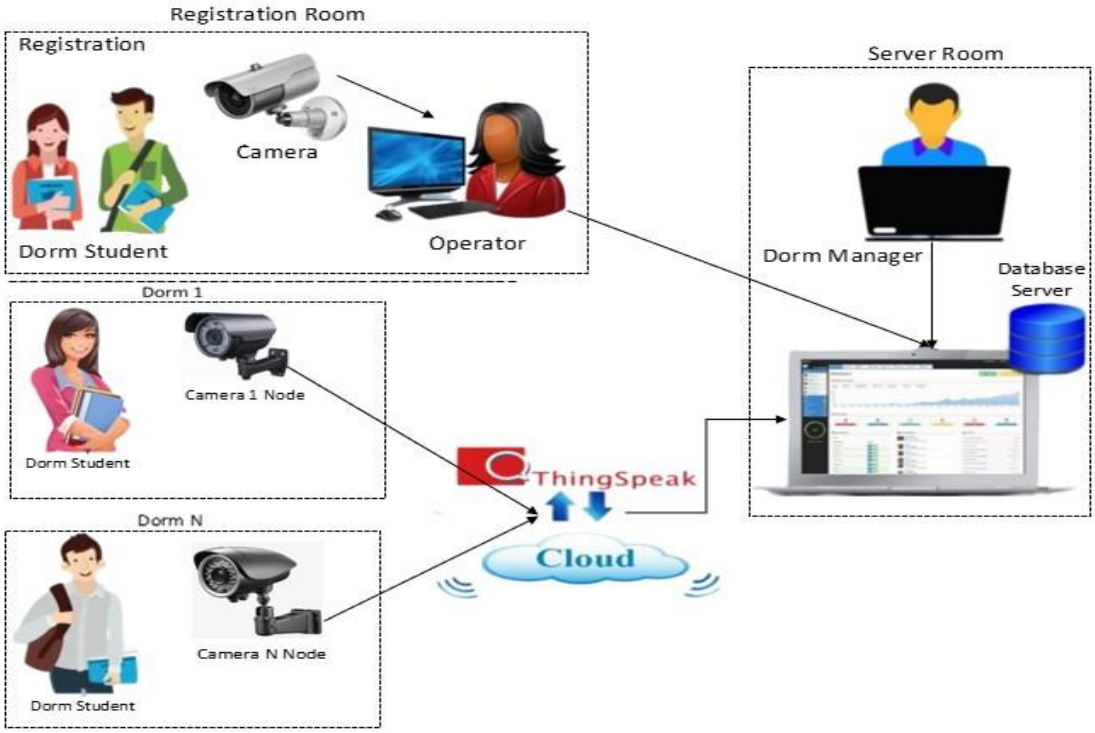


Figure 13 System Structure

3.1.2 Concept of Operation

The implementation plan will be enhanced and updated as new actions are introduced and as implemented to the system. The system tracks the performance of students regarding their attendance on a regular basis. The System Overview Attendance Monitoring System provides a foolproof solution for the existing problems of the business.

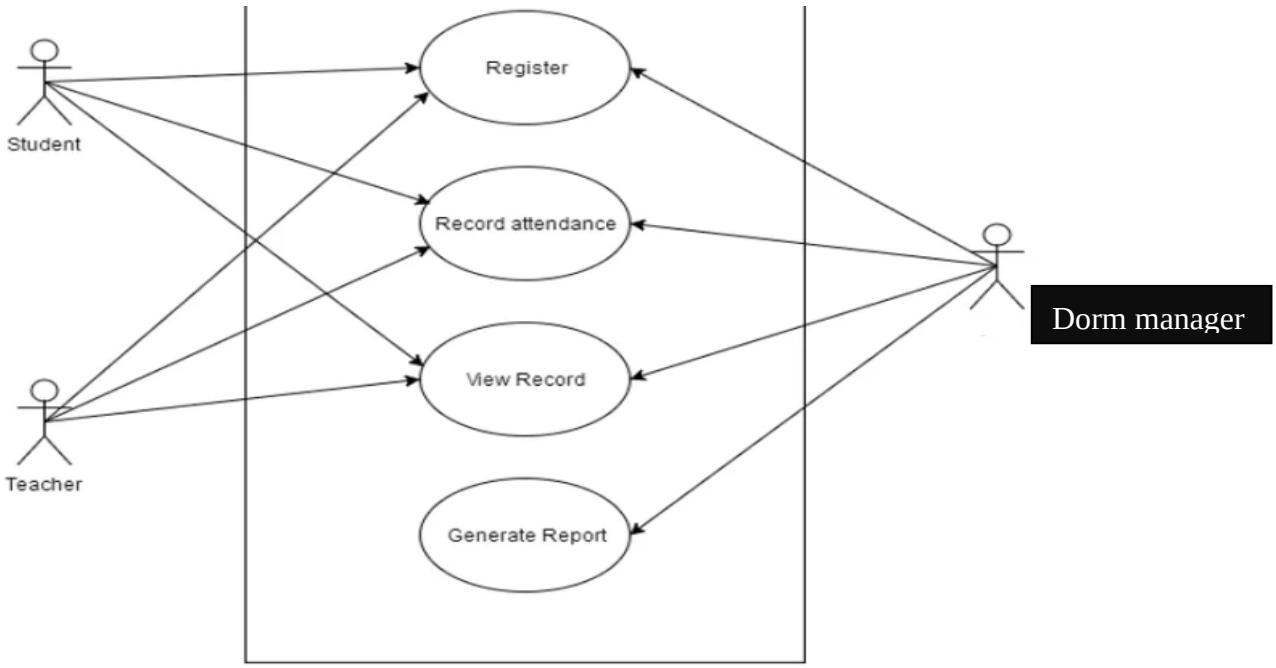


Figure 13.1 Use Case Diagram

Figure 13 shows how the system works and interacts with the actors. First, the staff will register the students and teachers after registration, the staff will record the attendance of the students and teachers using the provided identification number and save to the database. The staff can view attendance and create a report for the teachers and students. Students and teachers must request the staff to view their attendance records.

Use Case Description

Table 1: Register

Use Case Name	Register
Primary Actors	Dorm manager /Staff, Student, Teachers
Description	The staff will register the student's and teacher's information.
Stakeholder and Interests	Students and teachers – registering the basic information. Staff – Responsible for the inputting of the student and teacher's information.
Pre-condition	The student must be officially enrolled in the school
Post-condition	Student and teachers added as a new member
Main Success Scenario	Student and teachers will receive their ID Number.

Table 2: View Record

Use Case Name	View Record
Primary Actors	Dorm manager, Student, Teachers, Parents
Description	The students, teachers and parents can view their attendance detail.
Stakeholder and Interests	Students and Parents – want to view attendance records. Dorm manager – search for the attendance details of students or teachers.
Main Success Scenario	Dorm manager, Students and Parents view attendance detail.

3.2 Function Module Design

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.

3.2.1 Sensor and Connection Diagram

ESP32-CAM: The ESP32-CAM is a very small camera module with the ESP32-S chip that costs approximately $10. Besides the OV2640 camera, and several GPIOs to connect peripherals, it also features a microSD card slot that can be useful to store images taken with the camera or to store files to serve to clients.

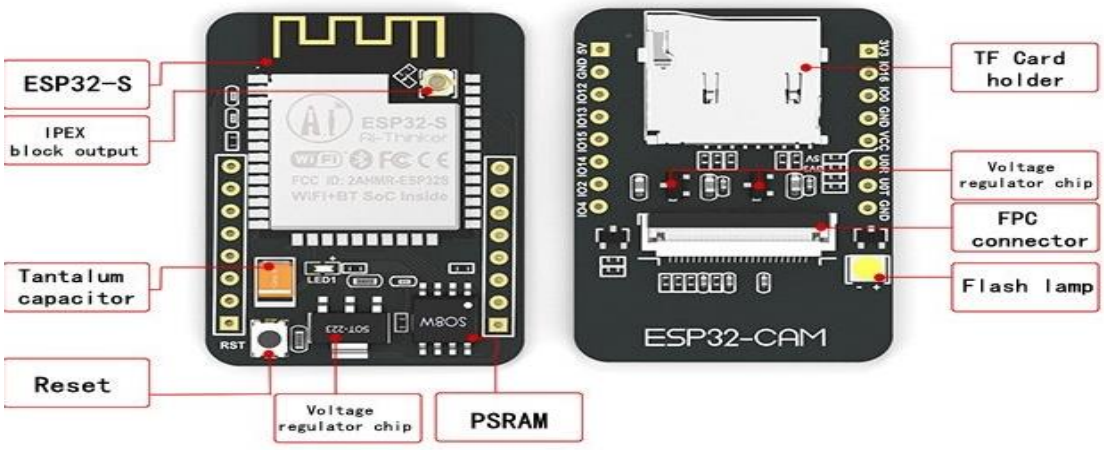


Figure 14 ESP32-CAM

The ESP32-CAM doesn't come with a USB connector, so you need an FTDI programmer to upload code through the U0R and U0T pins (serial pins).

Features

Here is a list with the ESP32-CAM features:

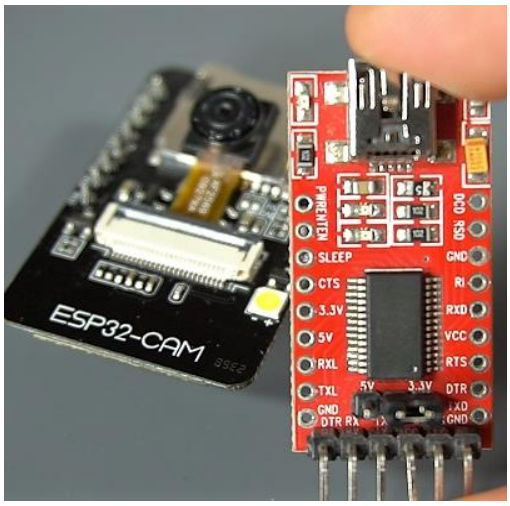


Figure 15 FTDI and ESP 32CAM

- The smallest 802.11b/g/n Wi-Fi BT SoC module
- Low power 32-bit CPU, can also serve the application processor
- Up to 160MHz clock speed, summary computing power up to 600 DMIPS
- Built-in 520 KB SRAM, external 4MPSRAM
- Supports UART/SPI/I2C/PWM/ADC/DAC
- Support OV2640 and OV7670 cameras, built-in flash lamp
- Support image WIFI upload
- Support TF card
- Supports multiple sleep modes
- Embedded Lwip and FreeRTOS
- Supports STA/AP/STA+AP operation mode
- Support Smart Config/AirKiss technology
- Support for serial port local and remote firmware upgrades (FOTA)

ESP32-CAM Pinout

The following figure shows the ESP32-CAM pinout (AI-Thinker module).

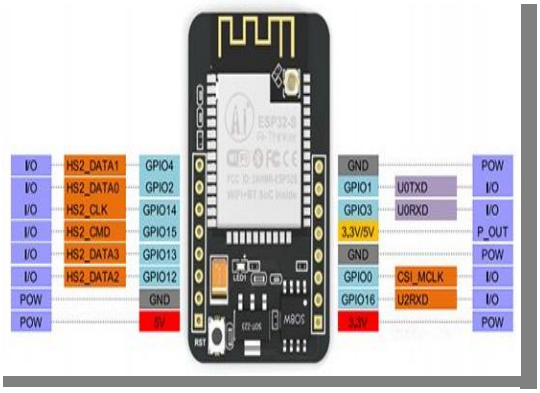


Figure 16 ESP32-CAM Pinout

There are three GND pins and two pins for power: either 3.3V or 5V.

GPIO 1 and GPIO 3 are the serial pins. we need these pins to upload code to our board. Additionally, GPIO 0 also plays an important role, since it determines whether the ESP32 is in flashing mode or not. When GPIO 0 is connected to GND, the ESP32 is in flashing mode.

The following pins are internally connected to the microSD card reader:

- GPIO 14: CLK
- GPIO 15: CMD
- GPIO 2: Data 0
- GPIO 4: Data 1 (also connected to the on-board LED)
- GPIO 12: Data 2
- GPIO 13: Data 3

ESP32-CAM Upload Code

Connect the ESP32-CAM board to your computer using an FTDI programmer. Follow the next schematic diagram:

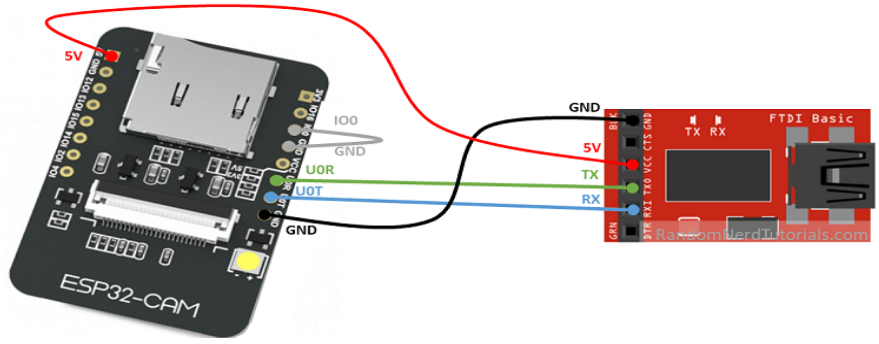


Figure 17 ESP32 CAM FTDI CONECTION

Source Code/Program for ESP32 CAM Module

```
#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();
}
```

Python Code for Face Recognition Attendance System

```
import pandas as pd
import cv2
import urllib.request
import numpy as np
import os
from datetime import datetime
import face_recognition

path = r'D:\python\attendace\attendace\image_folder'
url='http://192.168.231.162/cam-hi.jpg'
##'''cam.bmp / cam-lo.jpg /cam-hi.jpg / cam.mjpeg '''

if 'Attendance.csv' in os.listdir(os.path.join(os.getcwd(),'attendace')):
    print("there iss..")
    os.remove("Attendance.csv")
else:
    df=pd.DataFrame(list())
    df.to_csv("Attendance.csv")


images = []
classNames = []
myList = os.listdir(path)
print(myList)
for cl in myList:
    curImg = cv2.imread(f'{path}/{cl}')
    images.append(curImg)
    classNames.append(os.path.splitext(cl)[0])
```

```
print(classNames)


def findEncodings(images):
    encodeList = []
    for img in images:
        img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
        encode = face_recognition.face_encodings(img)[0]
        encodeList.append(encode)
    return encodeList


def markAttendance(name):
    with open("Attendance.csv", 'r+') as f:
        myDataList = f.readlines()
        nameList = []
        for line in myDataList:
            entry = line.split(',')
            nameList.append(entry[0])
            if name not in nameList:
                now = datetime.now()
                dtString = now.strftime('%H:%M:%S')
                f.writelines(f'\n{name},{dtString}')


encodeListKnown = findEncodings(images)
print('Encoding Complete')

#cap = cv2.VideoCapture(0)

while True:
    #success, img = cap.read()
    img_resp=urllib.request.urlopen(url)
    imgnp=np.array(bytearray(img_resp.read()),dtype=np.uint8)
    img=cv2.imdecode(imgnp,-1)
# img = captureScreen()
    imgS = cv2.resize(img, (0, 0), None, 0.25, 0.25)
    imgS = cv2.cvtColor(imgS, cv2.COLOR_BGR2RGB)
    facesCurFrame = face_recognition.face_locations(imgS)
    encodesCurFrame = face_recognition.face_encodings(imgS, facesCurFrame)
    for encodeFace, faceLoc in zip(encodesCurFrame, facesCurFrame):
        matches = face_recognition.compare_faces(encodeListKnown, encodeFace)
        faceDis = face_recognition.face_distance(encodeListKnown, encodeFace)
# print(faceDis)
        matchIndex = np.argmin(faceDis)
        if matches[matchIndex]:
```

```
            name = classNames[matchIndex].upper()
# print(name)
            y1, x2, y2, x1 = faceLoc
            y1, x2, y2, x1 = y1 * 4, x2 * 4, y2 * 4, x1 * 4
            cv2.rectangle(img, (x1, y1), (x2, y2), (0, 255, 0), 2)
            cv2.rectangle(img, (x1, y2 - 35), (x2, y2), (0, 255, 0), cv2.FILLED)
            cv2.putText(img, name, (x1 + 6, y2 - 6), cv2.FONT_HERSHEY_COMPLEX, 1, (255, 255, 255), 2)
            markAttendance(name)
    cv2.imshow('Webcam', img)
    key=cv2.waitKey(5)
    if key==ord('q'):
        break
cv2.destroyAllWindows()
cv2.imread
```

3.2.2 Network

The diagram below shows the architecture of the system.

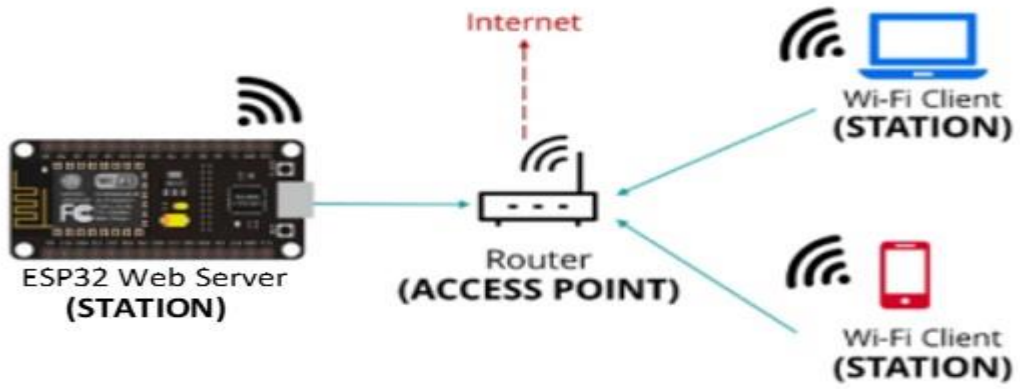


Figure 18 Network Diagram

Mesh Networking-Based Smart Dormitory management with ESP 32 Cam

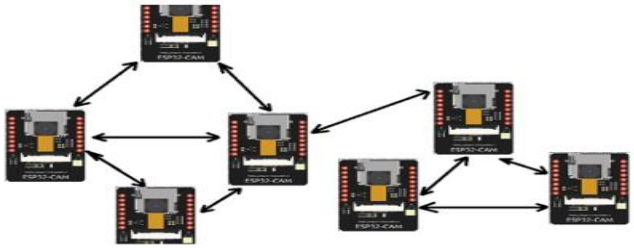


Figure 17 Mesh Networking

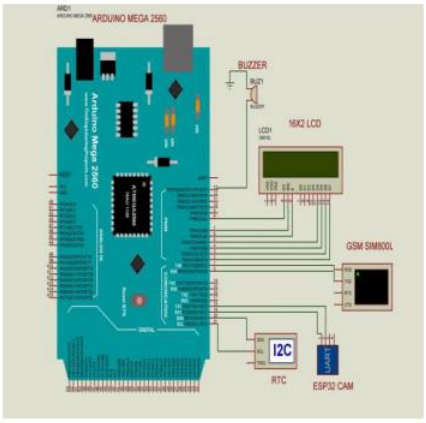
Mesh Networking is a wonderful technology in which multiple sensor nodes share data amongst each other. If somehow any one node or sensor nodes fails, then other nodes continue to transfer data in between themselves.

3.2.3 Application

Working Principle

The camera starts recording/capturing the images of the student crowd. After face detection and extraction of facial features, the system consults the database to check if the captured faces correspond to the ones in the database. If no, then the entities are not enlisted in the attendance and the system keeps checking for others. If the patterns match with the ones in the database with adequate confidence value, the subject is marked Present. The digital attendance record (Web application) is updated accordingly, with allowances made for exceptional additions by staff members. The ESP32 Camera Module (which is connected to the Arduino mega2560 micro controller) takes numerous images of each subject with varied facial expressions and stores this in the database. These images are then feature- extracted and an YML file is created which contains the numerical/vectored values of the features unique to each subject.

The recognition algorithm used in this project is Local Binary Patterns Histogram algorithm (LBPH). This algorithm is simpler to be implemented within the processing capabilities of the ESP32 cam. This algorithm analyzes each image in the database independently and the images are qualified locally. Inbuilt functions in the Open-CV (Computer Vision). library can be used to implement the LBPH algorithm for face recognition. The image is divided into many square regions, and each square region is converted into LBPH matrix, which is a binary matrix created as a result of the LBPH operator. This matrix has in it binary values that forms the histogram representation of the image. This histogram is then compared to the histograms of face images in the database, and the confidence value determines the output of the recognizer. Based on the obtained result of the recognizer, a spreadsheet is created which contains tabulated attendance in real time. The faces were recognized at confidence percentages of 41%, 41%, 46% and 56% to the database images.



Experimental Setup

Over view of the Proposed System

CHAPTER FOUR

RESULTS AND DISCUSSION

The overview of smart attendance system using face recognition. It has Arduino Mega 2560, LCD, GSM Module, transistor, RTC timer, Arduino Power Supply and transformer. This is can be used in real time applications for attendance marking in any organizations.

Figure 18 LCD

Before a person or a student comes in front of the ESP cam 32; it shows the current date and time in the LCD display as shown in the above. When a student comes near or in front of the camera module, it first detects the student's face and it immediately compares the detected face with the already stored data and finally it recognizes the person and it displays the name of the person in the LCD display. Along with the name that day and Present will be displayed in the LCD. This gives confirmation to the student or whoever stands in front of the camera module. The examples are shown in the above (middle and right). The data which is displayed in the LCD display is also stored in the Cloud for later use. Authorized persons can see the saved data at any time.

When any of the student or someone is absent, after the given time or at the end of the day, the person or the student is marked absent in the Cloud and the same information is sent to the respective parents and also dorm manager as SMS which is an emergency alert.

Figure Sending notice to Parent's

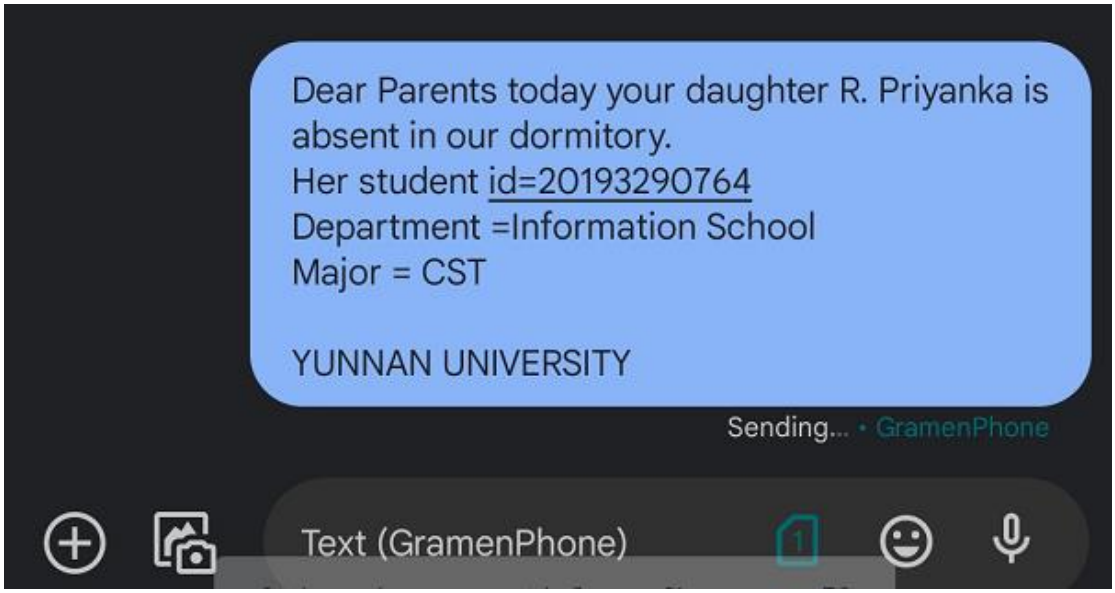


Figure Parent's received notice

Dorm manager can check everything

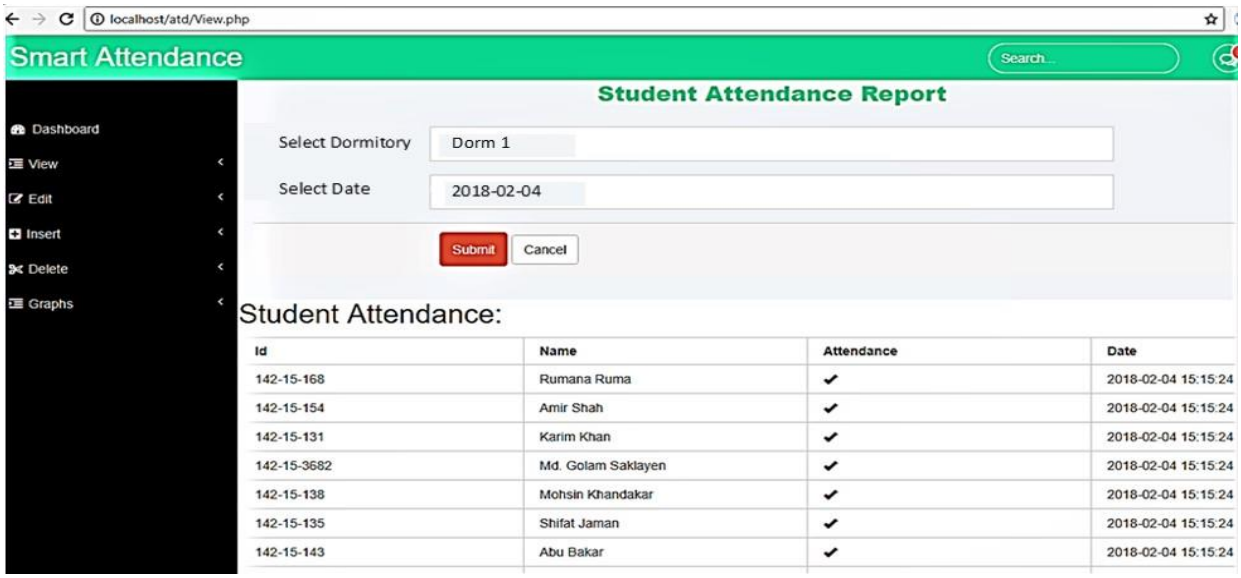


Figure Dorm manager view

Data Dictionary

The tables below show the list of conceptual databases. It shows the attributes, data types, and descriptions to be included in the database. This ensures that the information needed was captured by different databases.

Table Student Data Dictionary

Field Name	Description	Type	Length
STD_ID (pk)	Student ID number	int	11
STD_FNAME	First name	varchar	30
STD_LNAME	Last name	varchar	30
STD_ADDRESS	Address	varchar	50
STD_YEAR	Year Level	varchar	10
STD_SECTION	Section	varchar	10
STD_BIRTHDAY	Date of Birth	varchar	30
STD_AGE	Age	int	3
STD_GENDER	Gender	varchar	10
STD_CONTACT	Student Contact Number	varchar	30

Table Student Attendance

Field Name	Description	Type	Length
SATT_ID (pk)	Student Attendance ID	int	11
STD_ID (fk)	Student ID number	int	11
SATT_DATE	Attendance date	varchar	30
SATT_AM_IN	Am Login	varchar	10
SATT_AM_OUT	Am Logout	varchar	10
SATT_PM_IN	Pm Login	varchar	10
SATT_PM_OUT	Pm Logout	varchar	10

Database

Here we used mongo dB database.

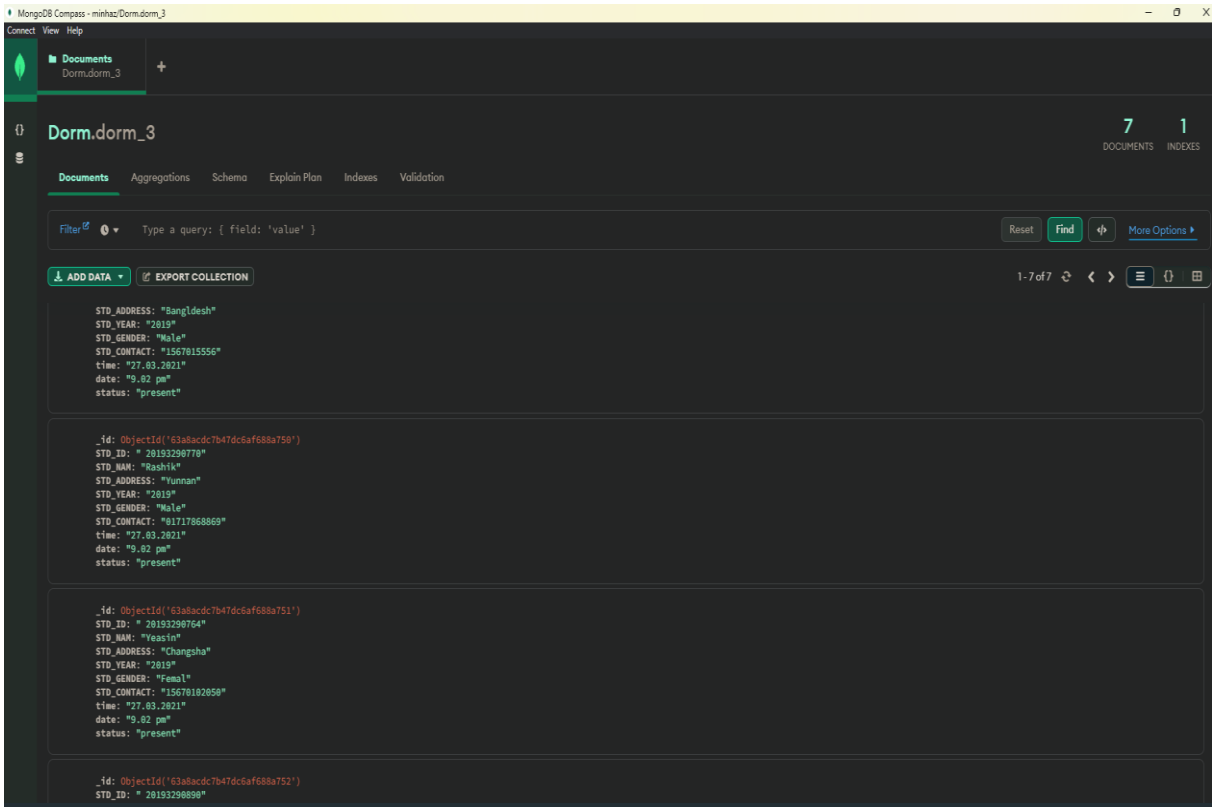


Figure Mongo DB Database

dorm_3

	STD_NAM String	STD_ADDRESS String	STD_YEAR String	STD_GENDER String	STD_CONTACT String	time String	date String	status String
1	"R.Priyanka"	"Nanchang"	"2019"	"Femal"	"156701569"	"27.03.2021"	"11.02 pm"	"Absent"
2	"Minhaz"	"Bangldesh"	"2019"	"Male"	"1567015556"	"27.03.2021"	"9.02 pm"	"present"
3	"Rashik"	"Yunnan"	"2019"	"Male"	"01717868869"	"27.03.2021"	"9.02 pm"	"present"
4	"Yeasin"	"Changsha"	"2019"	"Femal"	"15670102050"	"27.03.2021"	"9.02 pm"	"present"
5	"R.S.Akshaya"	"Changsha"	"2019"	"Femal"	"15670102050"	"27.03.2021"	"9.02 pm"	"present"
6	"K.Devi"	"India"	"2019"	"Femal"	"15670102050"	"27.03.2021"	"8.30 pm"	"present"
7	"R.S.Akshaya"	"Changsha"	"2019"	"Femal"	"15670102050"	"27.03.2021"	"9.30 pm"	"present"

Figure 27.03.2021 data base

CONCLUSION

To sum up we have designed a system to replace the current method used in our dormitory. We are hopeful that this prototype will work well. But there are still lot of time to improve in this system. We have implemented the IOT technologies but there are still lot to improve. We want to build android app and a whole dedicated database system to improve the overall system. We might continue to work on this project in the upcoming future as well.

FUTURE SCOPES

The project that we have chosen is not limited only to this application but also extended to of greater use if it is remodeled using more complex equipment more sensors can be employed to make the complex system robust. A Handy and portable hardware device with door accessing method can be used anywhere with less effort. And given a keypad and can ask for the password whenever the card is scanned and can add the separate windows for every student and it can allow them to see that window. It can also extend as a security device in banking sectors or in a gated community.

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