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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **NIKHIL CHANDAK (Reg. No.36110852)** and who carried out the project entitled "**SecuredAttendance System Using Nodejs and Microsoft Cognitive Services"** under our supervision from September 2017 to April 2018.

Internal Guide
Mr.S.DHAMODRAN M.Tech.,(Ph.D).,

Head of the Department
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Submitted for Viva voce Examination held on_____

Internal Examiner **External Examiner**

DECLARATION

I **NIKHIL CHANDAK** (**Reg. No. 36110852**) hereby declare that the Project Report entitled "**Secured Attendance System Using Nodejs and Microsoft Cognitive Services**" done by me under the guidance of **Mr.S.DHAMODRAN M.Tech.,(Ph.D).,** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Computer Science and Engineering.

DATE:

PLACE: **SIGNATURE OF THE CANDIDATE**

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of management of **SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to **School of Computing** and **Dr. S. Vigneshwari, M.E., Ph.D., Head of the Department, Department of Computer Science And Engineering** for providing me the necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Project Guide **Mr.S.DHAMODRAN,M.Tech.,(Ph.D).,**for his valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work.

I wish to express our thanks to all Teaching and Non-teaching staff members of the Department of **COMPUTER SCIENCE AND ENGINEERING** who were helpful in many ways for the completion of the project.

Highbrow Technology
Committed. . Delivered.

6/24/2018

TO WHOMSOEVER IT CONCERN

This is to certify that Mr. Nikhil Chandak, student of Sathyabama Institute of Science And Technology, Chennai has successfully completed internship at Highbrow Technology from 29th May 2018 to 22nd June 2018. He did the prototype online and the team had daily meetings regarding the project.

During the internship, he was actively involved in developing prototype for Secured Attendance System using

1. Raspberry Pi 3
2. JavaScript
3. NodeJS
4. Johnny Five framework
5. Microsoft Cognitive Services API.

We wish him good luck for his endeavors

Kumanan Murugesan

Vice President

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ABSTRACT

Automation is a necessity in the current times as it makes processes more economical and affordable in the long run. It also frees humans from performing banal tasks day in and day out. Once a process is automated the only check that is to be performed is whether it is turned on or not. Automated processes are not prone to errors and even if an error is identified rectification is easy and can be applied system wide without any delay. Taking attendance is a mundane but necessary task in many academic institutions. In this paper, an alternate and more efficient method of taking attendance is proposed that uses facial recognition and cloud based IoT technology to automate the entire system. The issue of Security is very paramount in any organization. Most security systems have a variety of components which can include finger print scanners, retina scan, Rfid tag detectors as well as a keypad that allows users to input pins to gain access. These components can either be hardwired, which requires a contractor to drill and run wires throughout the house, or wireless, which allows for easy installation and replacement. And among them face recognition is the one which is attracting a lot of attention in society of security access. Few confidential Areas like bank vaults, critical server locations etc. need to be secured, and is possible through facial recognition system. In this paper an explanation on creating a low-cost standalone device is showcased using Facial Recognition technology to process and identify authorized personnel. The project is developed using Microsoft's cognitive service. The implementation of the project is done using Raspberry Pi

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LIST OF ABBREVIATIONS

ABBREVIATIONS		EXPANSIONS
GPS	-	Global Positioning System
RFID	-	Radio Frequency Identification
VNC	-	Virtual Network Computing
PIR	-	Passive Infra Red
IOT	-	Internet Of Things
MAC	-	Media Access Control

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW OF THE SYSTEM:

Attendance is an important metric in judging a student's commitment to his/her coursework and sincerity in many educational institutions and professional environments. Currently in majority of educational institutions in India this process is carried out by the teacher, who manually calls all the students by name, verifies his/her presence and marks the attendance. This is a very labor-intensive process and is prone to errors (proxy attendance and incorrect marking). It also wastes a lot of time at the beginning of the class which could otherwise have been used productively. The solution to this problem must be a complete system, as it has to be implemented throughout the academic or professional institution for the solution to be even considered. IoT provides a perfect platform for a solution of this archetype. With the current rate of growth in the field and the ever-increasing demand for automation, the cost of sensors and other essential resources required to implement such systems has drastically reduced. With all this in mind, I decided to implement a feasible and efficient IoT based solution for the problem at hand.

1.2 DIFFERENT STAGES:

There are three different stages of this project:

Stage 1**:** Face detection was done with the help of Raspberry pi and camera module.

Stage 2**:** This detection was sent to azure storage for recognition

Stage 3**:** With the help of Cognitive Services, facial recognition was done

1.3 LITERATURE SURVEY:

1.3.1 RFID BASED ATTENDANCE SYSTEM

RFID based attendance system has been proposed to reduce the manual effort. The RFID was programmed to contain a key that identified a particular student. When the RFID card is flashed to the RFID reader in the classroom, it records the time and stores it in a cloud based storage service. In case of absence the student/parent will be informed with an SMS/email. This system however can be exploited by a single person carrying the IDs of multiple people.

1.3.2 GPS BASED ATTENDANCE SYSTEM:

GPS based attendance system accompanied with a smartphone application that verifies the location of the device thereby eliminating the need to stand in queues in front of the attendance system. The staff in-charge activates the attendance process in her/his end of the application and all students must register their presence at the GPS location of the class on the app. This process is very complicated and is limited by the availability of GPS

1.3.3 BLUETOOTH BASED ATTENDANCE SYSTEM:

Bluetooth tag is programmed with student ID, it works with Android application through Bluetooth communication. Mobile Application reads the tag based on location and time and sends the data to the database. The mobile application in the professor phone will ping the student's Bluetooth connectivity and fetch the presence.

CHAPTER 2

AIM AND SCOPE OF THE PRESENT INVESTIGATION

2.1 AIM OF INVESTIGATION:

The purpose of developing attendance management system is to computerized the tradition way of taking attendance. Another purpose for developing this software is to generate the report automatically at the end of the session or in the between of the session.

Automated Attendance system has been implemented using different technologies available. Many systems have been proposed using RFID technology. This system is easy to implement but prone to fraudulent usages. System which is based on biometric details like fingerprint and iris, takes more time to give their attendance. So, the time-consuming process of traditional attendance system has not been eliminated by this system. There is system implemented using Bluetooth technology, the disadvantage of this system is configuring Bluetooth network (piconet). Each piconet can have maximum of 7 slave devices and one master. The automated attendance system implemented with face recognition using image processing with combination of IoT technology will overcome the disadvantages of other proposed technologies.

2.2 SCOPE OF INVESTIGATION:

The scope of the project is, once the photo is detected by the help of Raspberry pi. For recognition it will take the help of MICROSOFT COGNITIVE SERVICES whether face is detected or not. Later on the project can be modified by making a webpage.

CHAPTER 3
EXPERIMENTAL ,MATERIALS AND METHODS

3.1 SYSTEM ARCHITECTURE OF IoT DEVICE

Fig 3.1 System Architecture Diagram

I had a clear objective of making the attendance system effortless. IoT systems and technology have seen great improvement lately and they are perfectly suited for our purpose. In order to achieve this, I chose to deploy separate IoT devices in every classroom. The IoT device chosen here was a Raspberry pi board with camera. Each device was programmed such that it was connected to a trained data set present on Azure Cloud. Each data set stores about 5 pictures of each student in the classroom.

Eg: For a class of strength 50, the cloud stores 300 pictures. Similarly, for an approximately 100 sections it would store 30000 pictures for a single college. The entire image processing is done with these 300

pictures separately run using the devices. The consolidated data of the student attendance will be used for various purpose.

3.2 IoT LEVEL DIAGRAM:

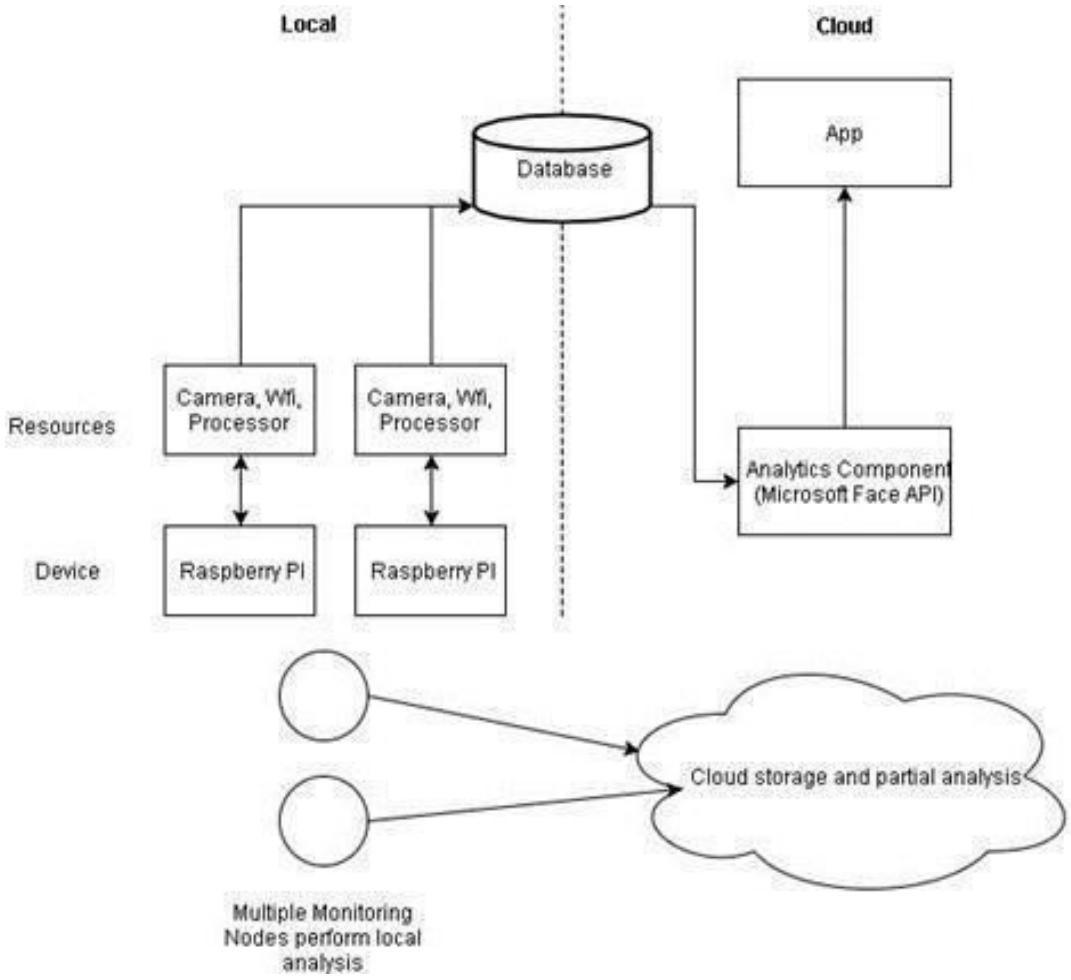


Fig 3.2 IOT Level Diagram

In this system, I had done automatic attendance system using face recognition and cloud based IoT technology to train 5 student faces with Microsoft Cognitive services for face recognition and verification. [Figure 3.1] explains pictorially how the face training process works. There are four major states in the training process. I used the Microsoft face API for face detection and recognition. Once a face is trained a unique ID for the face

and a group ID is generated. After training, the picture of the student is taken using a Raspberry PI Camera module.

The Raspberry PI also hosts a NGROK Cloud that contains the mapping of the student name/ID to the unique ID generated during training. If a face is recognized then attendance records of the student are updated appropriately. The proposed system will consist of multiple cameras each acting as a unique monitoring node each with its own unique ID. Data is processed on the cloud and is stored there, hence accessible from cloud for the mobile and web application. The IoT device also has a temporary local storage which keeps the pictures of the attendees. Thus, the system belongs to IoT level as depicted in [Figure 3.2]

3.3 SOFTWARE AND HARDWARE SETUP

3.3.1 SOFTWARE SETUP

Here I have used Node.js with Johnny-five framework

Step 1: Install node.js in raspberry, make sure your Pi is up-to-date!

```
$ sudo apt-get update
```

```
$ sudo apt-get upgrade
```

Step 2: After updating node, check for version

```
$sudo node -v
```

For downloading latest version of node,

```
curl -sL https://deb.nodesource.com/setup_8.x | sudo -E bash -
sudo apt-get install -y nodejs
```

(Or)

```
curl -sL https://deb.nodesource.com/setup_10.x | sudo -E bash -
sudo apt-get install -y nodejs.
```

3.3.2 INSTALL JOHNNY-FIVE AND RASPI-IO:

What is Johnny-five?

- Johnny-Five is a Javascript robotics framework that let us program microcontrollers easily with carious hardware APIs.

- Installation of Johnny-Five was done by using the command. What is Raspi-io?

- Raspi -io is a library which was used as an I/O plugin with JohnnyFive.

- Installation of Raspi-io was done by using the command

Step 1: Install Johnny-five

```
$ npm install johnny-five
```

Step 2: Install Raspi-io

```
$ npm install raspi-io
```

3.3.3 Hardware Setup

Hardware components:

Sno	Component Name	Quantity
1	Raspberry pi Board 3+	1
2	Pi Camera	1
3	PIR Sensor	1
4	Female to Female Connecting wires	3

3.4 BUILDING THE CIRCUIT WITH RASPBERRY PI3

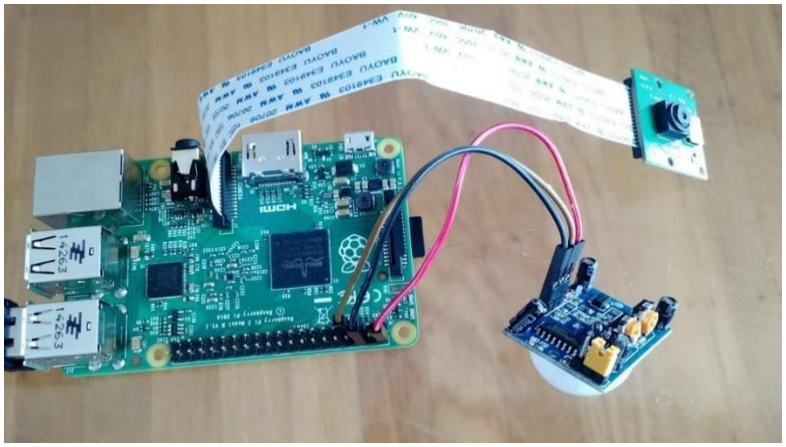


Fig 3.3 Circuit Model

Step1: Noobs was loaded into SD card.

Step2: SD card was inserted into Raspberry pi and Raspbian OS.

Step3: The pi was booted and based on the circuit the external hardware components were connected.

3.5 ASSEMBLING HARDWARE

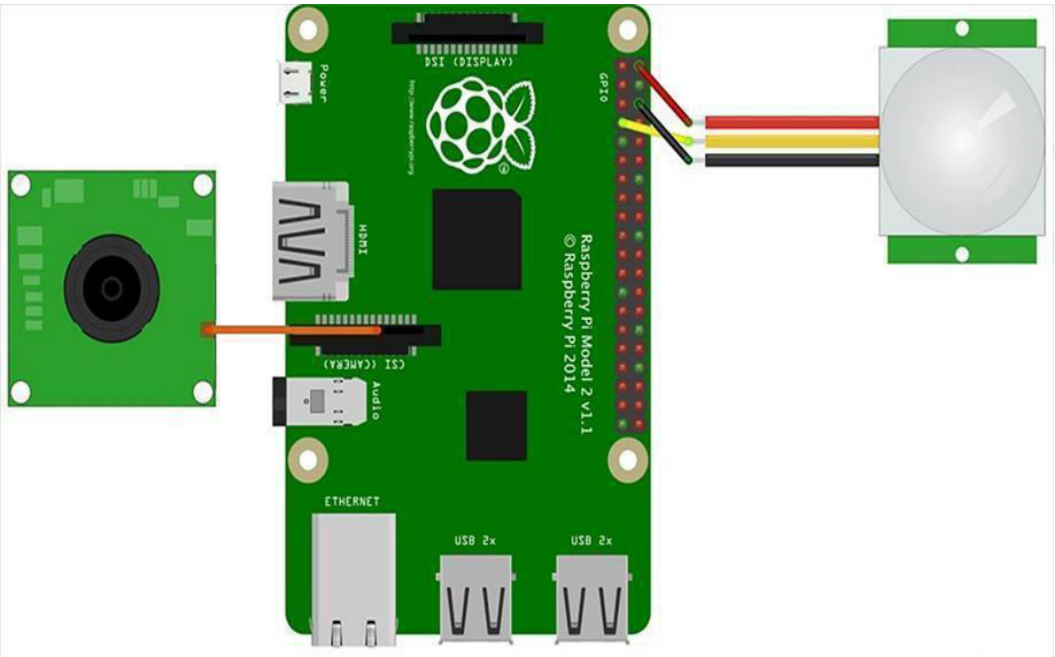


Fig 3.4 Circuit Diagram

Step 1: PIR SENSOR TO PI

- black wire: PIR-GND to Pi's ground (GND pin)

  PIR-VCC to Pi's 5V pin.

- 1 whatever color wire (brown in the photo):
  PIR-OUT to

  Pi's Pin 7 (GPIO 4)

Step 2: CAMERA TO PI

- Connect the camera module to the CSI port.

CHAPTER 4

SYSTEM IMPLEMENTATION

4.1 ALGORTIHM:

Step 1: I have imported Johnny-Five framework, Raspi - io library

and Pi - camera library.

```
// Johnny-Five for RPi
const PiCamera = require('pi-camera');
const raspi = require("raspi-io");
const five = require("johnny-five");
const board = new five.Board({ io: new
raspi() })
```

Step 2: To detect signal from PIR sensor which is connected to PIN-7

```
// Motion detected
motion.on("motionstart", () => {
console.log("motionstart");
```

```
  // Run raspistill command to take a photo with
 the camera module

  takePicture();

  });

  // 'motionend' events
  motion.on("motionend", () => {
  console.log("motionend"); }); });
```

Step 3: Created a function takepicture() which will take picture when motion sensor is detected.

```
function takePicture(){

 var time = new Date().getTime();

 let fileName = `test${time}.jpg`;

 const myCamera = new PiCamera({

  mode: 'photo',

  output: `${ __dirname }/${fileName}`,

  width: 640,

   height: 480,

  nopreview: true,

   });
```

4.2 WORKING REMOTELY FROM WINDOWS/MAC

A monitor, keyboard, mouse, was connected to my Pi and worked directly on Raspbian GUI, from my WINDOWS, like I usually did. This is how I worked remotely on WINDDOWS using VNC server. Usually there are two ways two connect pi remotely

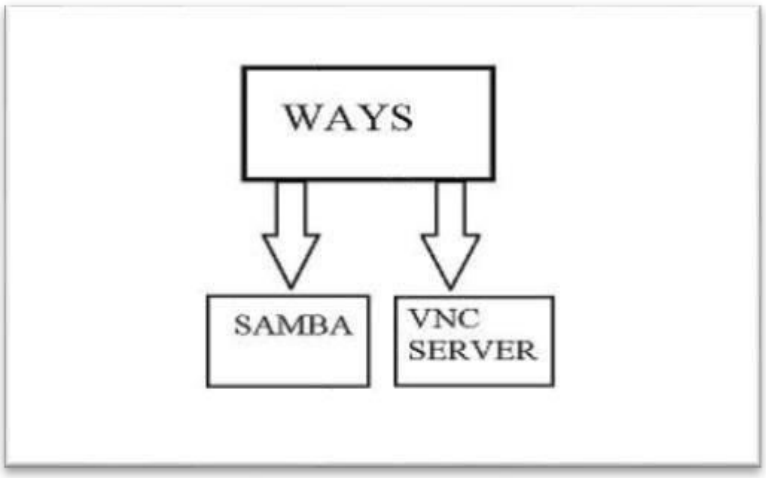


Fig 4.1 Two ways of classification

4.2.1 VNC SERVER AND VNC VIEWER

Virtual Network Computing (VNC) is a graphical desktop sharing system that uses the Remote Frame Buffer protocol (RFB) to remotely control another computer. It transmits the keyboard and mouse events from one computer to another, relaying the graphical screen updates back in the other direction, over a network.

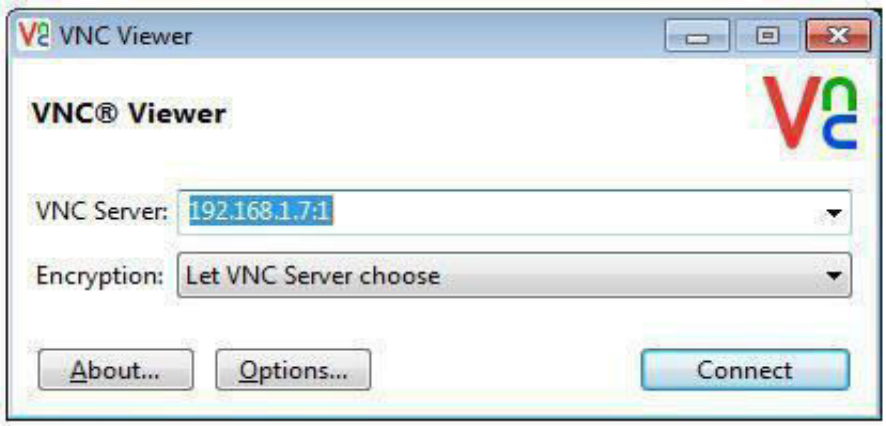


Fig 4.2 VNC viewer

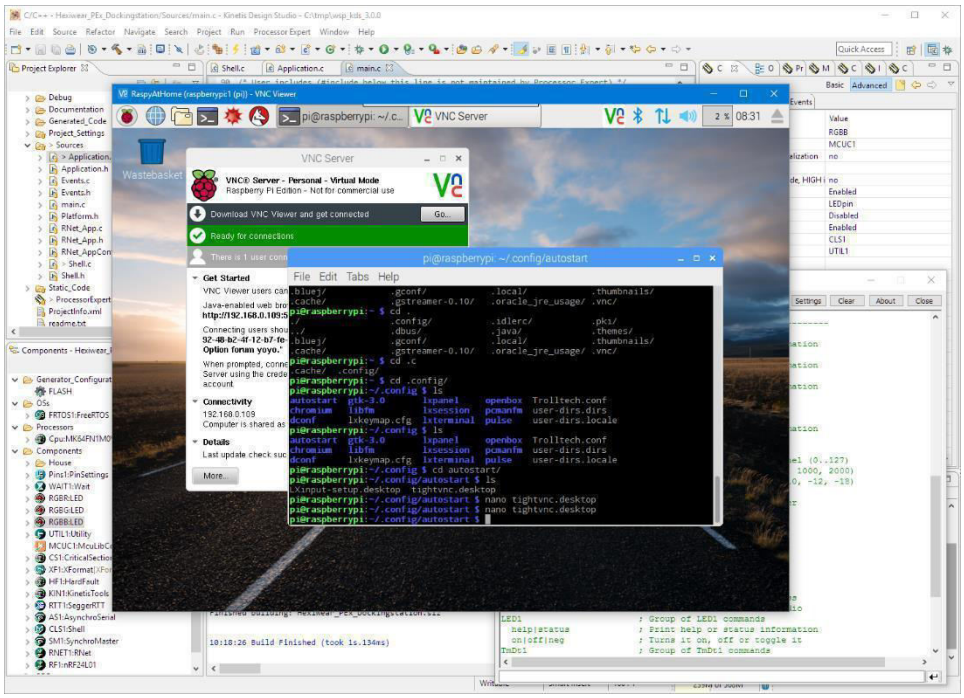


Fig 4.3 Pi-Windows configuration

VNC SERVER:

The VNC server is the program on the machine that shares some screen (and may not be related to a physical display – the server can be "headless"), and allows the client to share control of other computer

VNC VIEWER:

The VNC client (or viewer) is the program that represents the screen data originating from the server, receives updates from it, and presumably controls it by informing the server of collected local input.

4.3 MICROSOFT COGNITVE SERVICES:

COGNITIVE SERVICES

Microsoft Cognitive Services (formerly Project Oxford) are a set of APIs, SDKs and services available to developers to make their applications more intelligent, engaging and discoverable. Microsoft Cognitive Services expands on Microsoft's evolving portfolio of machine

learning APIs and enables developers to easily add intelligent features – such as emotion and video detection; facial, speech and vision recognition; and speech and language understanding – into their applications.

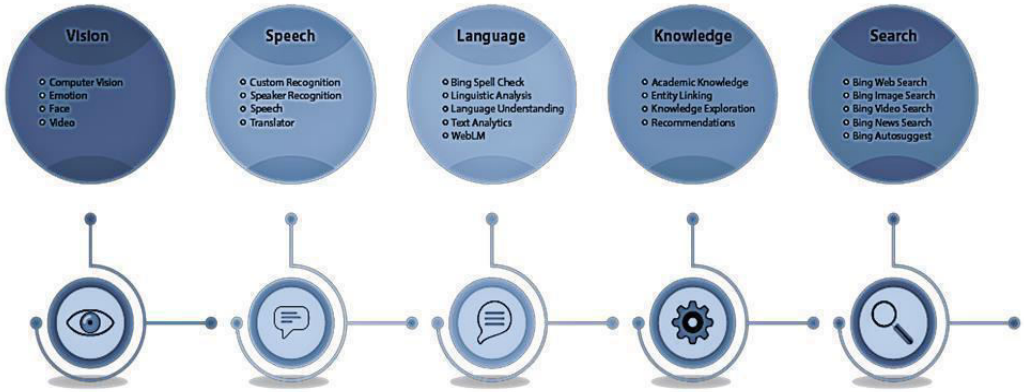


Fig 4.4 Classification of API

4.3.1 PROCEDURE TO APPLY COGNITIVE SERVICES

Step 1: FACE TRAINING

- Creating Group ID

A group is a collection of persons. An entire class is a collection of people. The representation of different classes is through a group ID that is entered by the trainer. It is expected that the group ID is represented in alphanumeric, all alphabets in lowercase and permits two special symbols which is the hyphen '-' and the underscore '_'. So, a group ID could be like "cse_m_2018", as shown in Figure 3. Representing expected 2018 batch of Section C students of the Computer Science and Engineering Department.

- Generating Person ID

Every student of the particular classroom will be identified with a unique person ID automatically generated by Microsoft Cognitive Services. The ID will be generated after a request is sent for each individual. Additionally, a name and certain user data is also sent as parameters (Figure 6). Here we

took the name of the student as the parameter name and the student's USN as user data parameter. After this a person ID is allocate to that person. This ID is auto generated by the server.

- Obtaining Persistent Face Id

Each person will be identified by the APIs ability to recognize him/her with certain amount of confidence. Multiple pictures are trained for each person. The face in each of these pictures is identified by a persistent face ID. In order to generate persistent face ID, the API is fed with the URL of an image Note that it is necessary to have the picture online in order to have it accessed through URL.

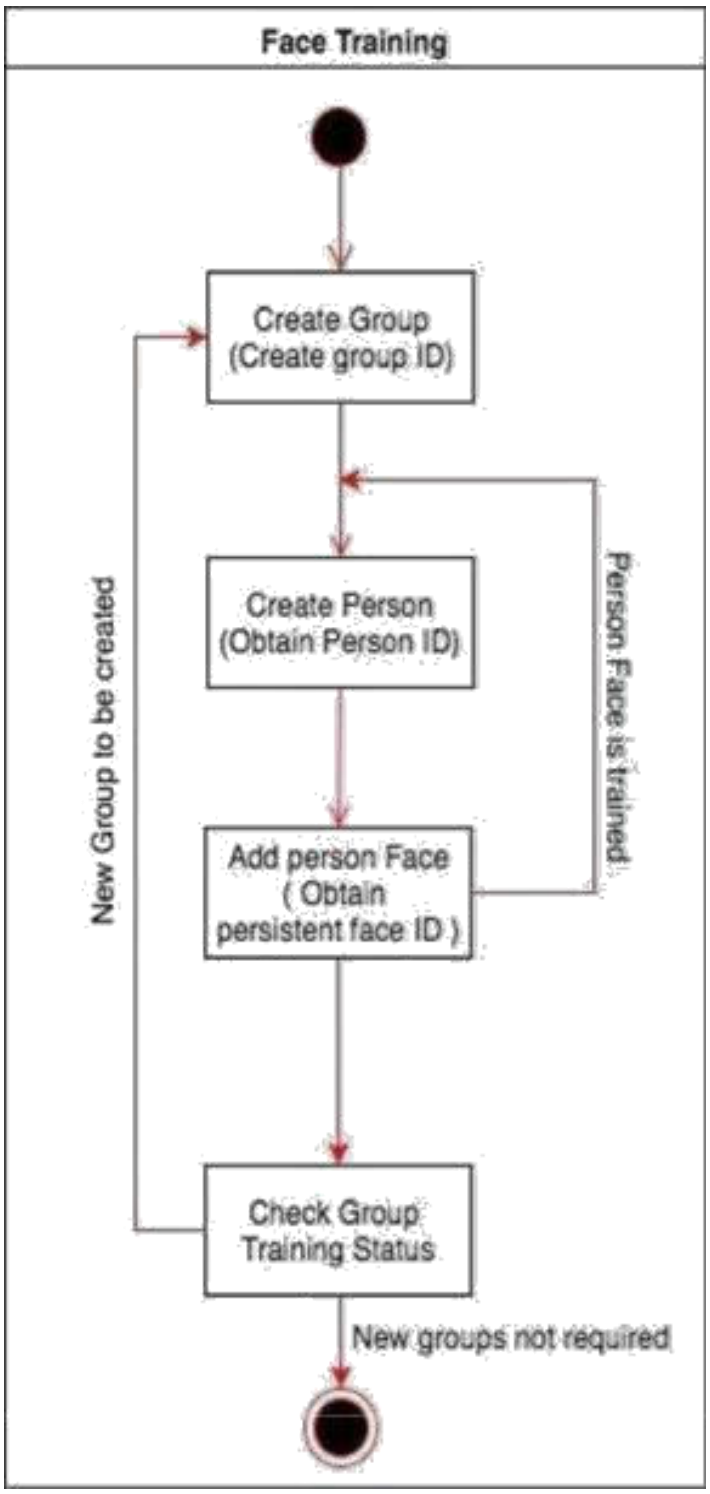


Fig 4.5 Flow Chart of Face Training

Step 2: FACE DETECTION

To initiate the entire process system needs to have a new face to work on. Camera is live throughout the day and tries detecting faces. Every time a student enters the class room the system detects a face i

- IMAGE CAPTURE

It starts taking images in a burst. It uploads each picture to the cloud analysis. After which it continues to stream the video parallel to processing for attendance.

- UPLOADING

Processing on the cloud requires the face in the frame of the picture to be assigned with a face ID. In order to obtain a face ID, the program under execution require to send a web link to an image resource.

Fig 4.6 Face Detection Process

Step 3: FACE RECOGNITION

Face Identification is done using recognition techniques developed by Microsoft and embedded in its API**.** The API was built using algorithms like Principal Component Analysis, Linear Discriminant Analysis and Independent Component Analysis. Most of the tools and techniques Microsoft has implemented remains classified and only specific materials are offered for the developers to build under the IoT Core Build Program.

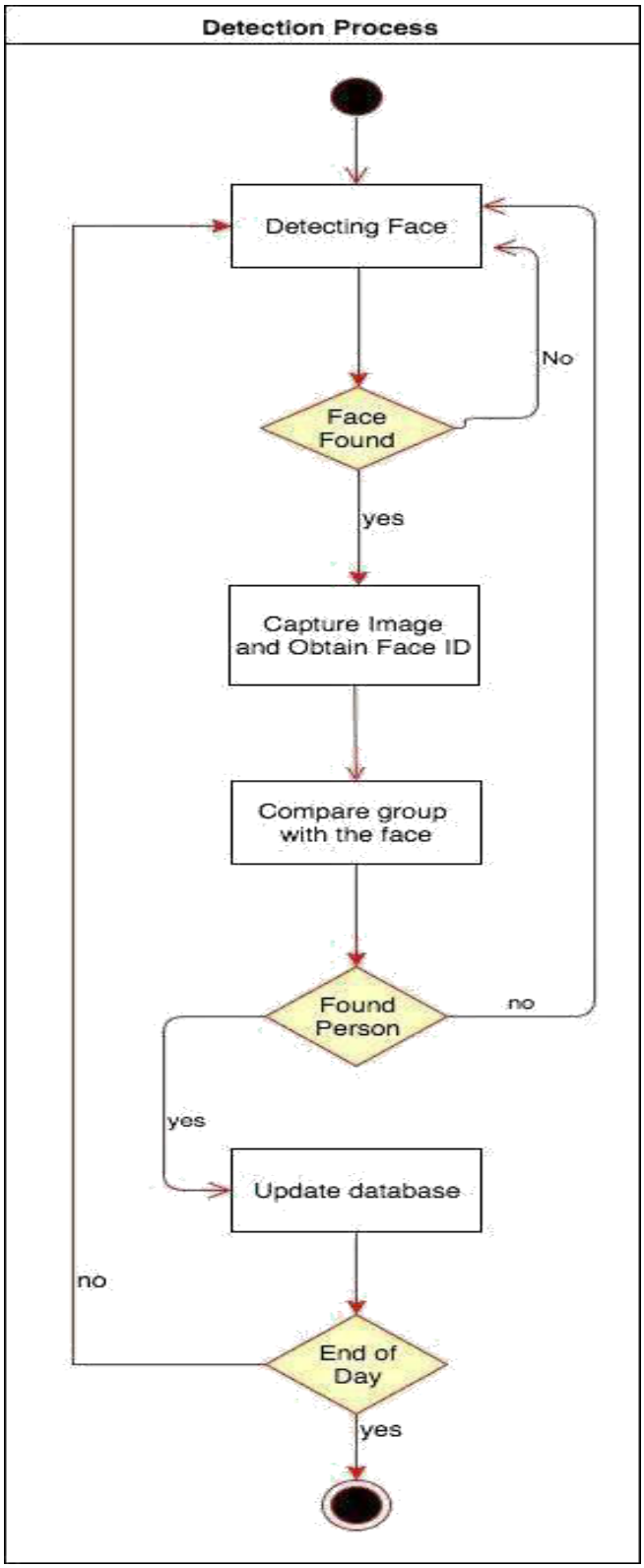


Fig 4.7 Flow Chart of Detection process

CHAPTER 5

SUMMARY AND CONCLUSION

5.1 CONCLUSION:

Thus by implementing, Nodejs code and some dependencies like

- Jonnny - five frame work,
- Raspi - io library,
- Microsoft Cognitive Services

The Attendance System can be speed up and can save lot of time for school and college staffs in Educational Institution as well as in any Industrial Sectors.

5.2 FUTURE ENHANCEMENT:

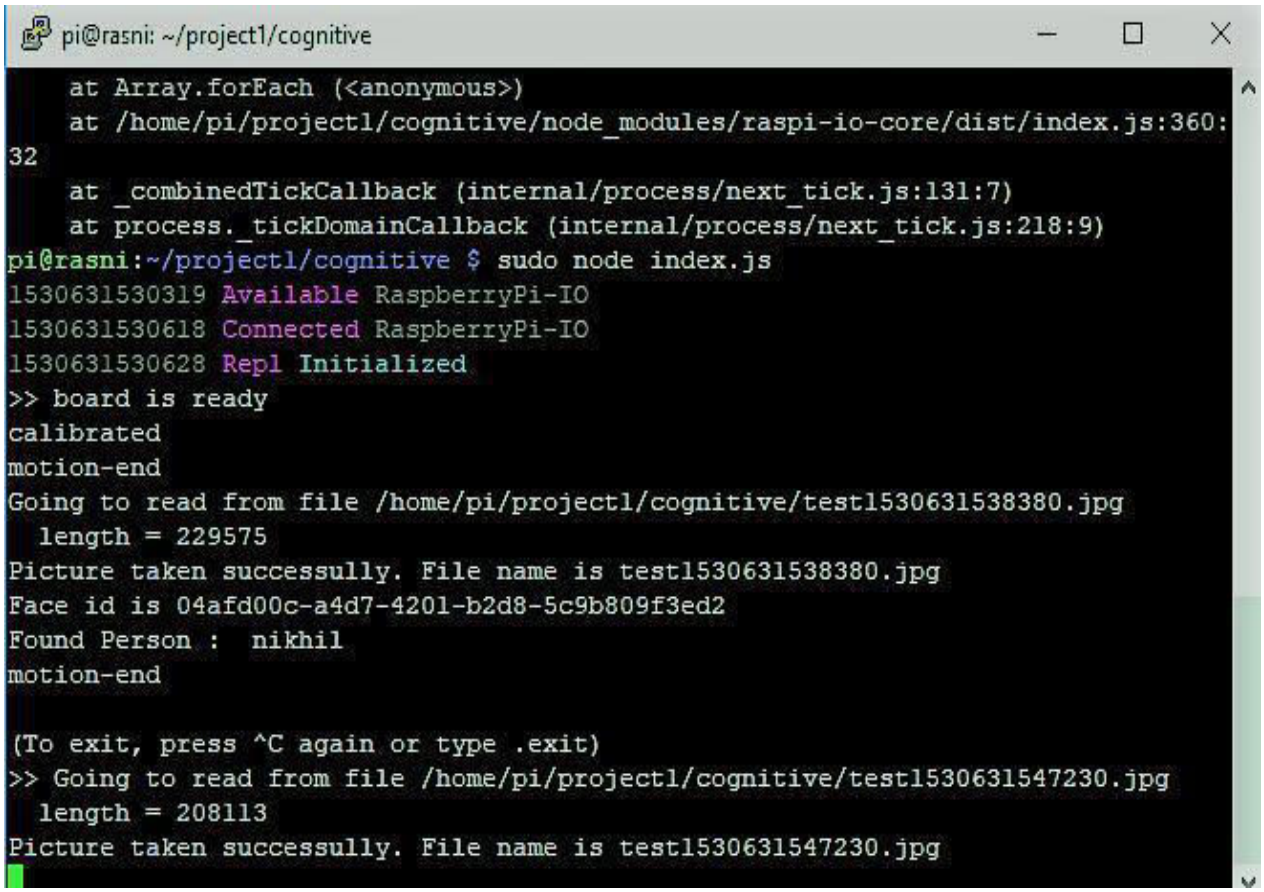
DATABASE DEVELOPMENT

A table will be developed on the cloud. Once a person is identified, it is necessary to check if the person is already marked present for the day. If not, the person is marked present by incrementing his/her attendance count by one.

MOBILE APPLICATION

The institution's faculty and management can access the database on their mobile phones via a mobile application. The mobile application can also be integrated with other applications of the institution. It can also act as a content provider which would provide data for other applications.

OUTPUT


pi@rasni: ~/project1/cognitive
at Array.forEach (<anonymous>)
at /home/pi/project1/cognitive/node_modules/raspi-io-core/dist/index.js:360:
32
at _combinedTickCallback (internal/process/next_tick.js:131:7)
at process._tickDomainCallback (internal/process/next_tick.js:218:9)
pi@rasni:~/project1/cognitive $ sudo node index.js
1530631530319 Available RaspberryPi-IO
1530631530618 Connected RaspberryPi-IO
1530631530628 Repl Initialized
>> board is ready
calibrated
motion-end
Going to read from file /home/pi/project1/cognitive/test1530631538380.jpg
length = 229575
Picture taken successully. File name is test1530631538380.jpg
Face id is 04afd00c-a4d7-4201-b2d8-5c9b809f3ed2
Found Person : nikhil
motion-end
(To exit, press ^C again or type .exit)
>> Going to read from file /home/pi/project1/cognitive/test1530631547230.jpg
length = 208113
Picture taken successully. File name is test1530631547230.jpg

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