Absolute Attendance with Face Recognition Using IOT

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Abstract **–**Our paper involves the student attendance and faculty attendance .The student attendance is marked by face recognition .For face detection and face recognition the raspberry pi .The camera is connected to Raspberry pi USB port only images will capture of the scholars who are present within the class for face detection. The captured images recognizes with stored images then in that images we will recognize the faces of every student and according to that attendance will be given to that subject class. This process is carried out every class and students are given attendance accordingly .Attendance will be marked with date and time. We can mark the attendance at any time without any human intervention

Keywords: Raspberry pi, USB, Camera.

I Introduction

This is developed to mark the attendance for students and faculty without any person interference that makes very useful for colleges and schools to mark the attendance easily .This system helps for the people by saving time they can know the attendance academic performance anywhere by registering in student/faculty registration in web page which has been developed in this paper.

The present day attendance system is manual . wastage a considerable amount of time both for teachers and students .The waiting time of the students is increased if attendance is taken manually .There are still chances for proxies within the class attendance is taken manually .Manual attendance always a have a price of human error .Face is that the essential recognizable proof for any human .So automating the attendance process will increase the productivity of the category .To make it available for each platform we have chosen the Raspberry pi 3 for face recognition .A web cam is related to the raspberry pi module .Face identification separates faces from non faces and people countenances which will be perceived .This module can be utilized for different applications where face acknowledgment can be utilizes for validation in this proposed system we take the attendance using face recognition which recognize the face of each student during the class hours.

II Existing methods for face recognition

In the beginning of the 1970's, face recognition was treated as a 2D pattern recognition problem [2]. The distances between details where wont to recognize known faces, e.g. measuring the space between the eyes or other details or measuring different angles of facial components. But it is important that the face recognition systems to be fully automatic. Face recognition is such a challenging and interesting problem that it's attracted researchers who have different backgrounds: psychology, pattern recognition, neural networks, computer vision, and computer graphics . The next methods are used to face recognition

1. Holistic Matching Methods
2. Feature-based Methods
3. Hybrid Methods

1. Holistic Matching Methods:

In holistic approach, the entire face region is taken under consideration as input file into face catching system. One of the best example of holistic methods are Eigen faces (most widely used method for face recognition), Principal Component Analysis, Linear Discriminate Analysis and independent component analysis etc.

Holistic example:

The first successful demonsthine recognition of faces was made by Turk and Pent lands 1. In 1991using Eigen faces. Their approach covers face recognition as a two-dimensional recognition problem. The flowchart in Figure 1 illustrates the different stages in an Eigen face based recognition system. The

primary stage is to insert a group of images into a database, these images are names because the training set and this is often because they are going to be used when we compare images and once we create the Eigen faces 2. The second stage is to create the Eigen faces. Eigen faces are made by extracting characteristic features from the faces. The input images are normalized to line up the eyes and mouths. They are then resized in order that they need an equivalent size. Eigen faces can now be extracted from the image data by using a mathematical tool called Principal Component Analysis (PCA) 3. When the Eigen faces have been created, each image will be represented as a vector of weights 4.The system is now able to accept entering queries 5.The load of the incoming unknown image is found then compare to the weights of those already in the system. If the input image's weight is over a given threshold it is considered to be unidentified. The identification of the input image is completed by finding the image in the database whose weights are the closest to the weights of the input image. The image in the database with the closest weights are going to be returned as successful to the user of the system

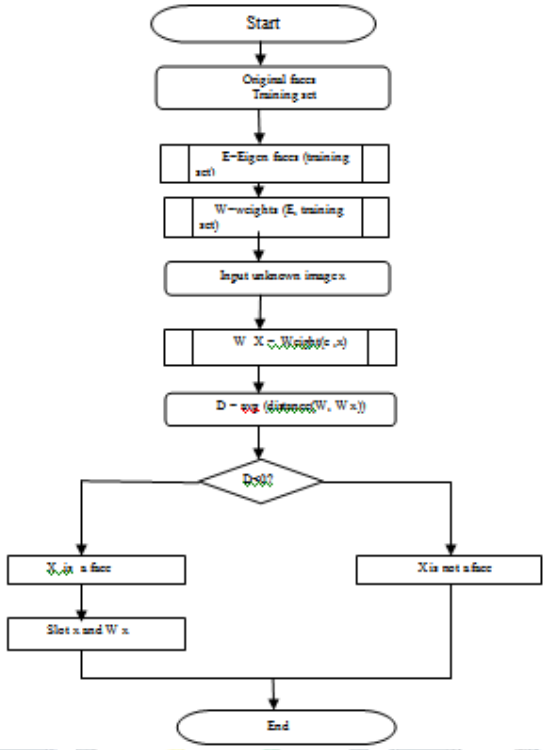


Figure 1: Flow chart of the Eigen face-based algorithm.

2. **Feature-based (structural) Methods**: During this method local features like eyes, nose and mouth are first of all extracted and their locations and native statistics are fed into a structural classifier. an enormous challenge for feature extraction methods is feature "restoration", this is often when the system tries to retrieve features that are invisible thanks to large variations, e.g. head Pose once we are matching a frontal image with a profile image. Distinguishes between three different extraction methods:

   I. Generic methods supported edges, lines, and curves

   II. Feature-template-based methods

   III. Structural matching methods that take into consideration geometrical Constraints on the features

3. **Hybrid Methods:**

Hybrid face recognition systems use a mixture of both holistic and have extraction methods. Generally 3D Images are utilized in hybrid methods. The image of an individual's face is caught in 3D, allowing the system to note the curves of the attention sockets, as an example or the shapes of the chin or forehead. Even a face in profile would serve because the system uses depth, and an axis of measurement, which provides it enough information to construct a full face. The 3D system usually precedes this Detection, Position, Measurement, Representation and Matching.

Detection - Capturing a face either a scanning a photograph or photographing an individual's face in real time. Position - Determining things , size and angle of the very best Measurement - Assigning measurements to every curve of the face to make a template with specific concentrate on the surface of the eye , the within of the eye and thus the angle of the nose.

Representation - Converting the template into a code - a numerical representation of the face and Matching - Comparing the received data with faces within the prevailing database. Just in case the 3D image is to be compared with an existing 3D image, it must have not any alterations. Typically, however, photos that are put in 2D, and there just in case , the 3D image need a few of changes. This is often tricky, and is one of the foremost important challenges within the sector today.

3. SYSTEM ARCHITECTURE:

From fig. 1 The USB Camera is connected to the raspberry pi camera slot. Live video stream of scholars is captured within the class with USB 1 camera, Raspberry pi takes those images as input images and uploaded to the AWS cloud platform and that we make use of face recognition service to match the input images with the prevailing image .Matched images are detected and attendance is marked with date and time for college kids present in school within the local data base using MYSQL. This process is administered for each period and students are given attendance accordingly. This happens thanks to importing the open CV packages at the initial stage of the event of the system. Faculty attendance is monitored with this project .The web application is meant for the output purpose to ascertain the list of students/faculty, present and absent for each hour within the class. Admin tracks the attendance of the scholars periodically or whenever required by the administration and finds the result. The result's displayed on the monitor screen. Student/Faculty attendance are going to be monitored and if the student/faculty is absent for that class then the notification will send to the HOD and parents.

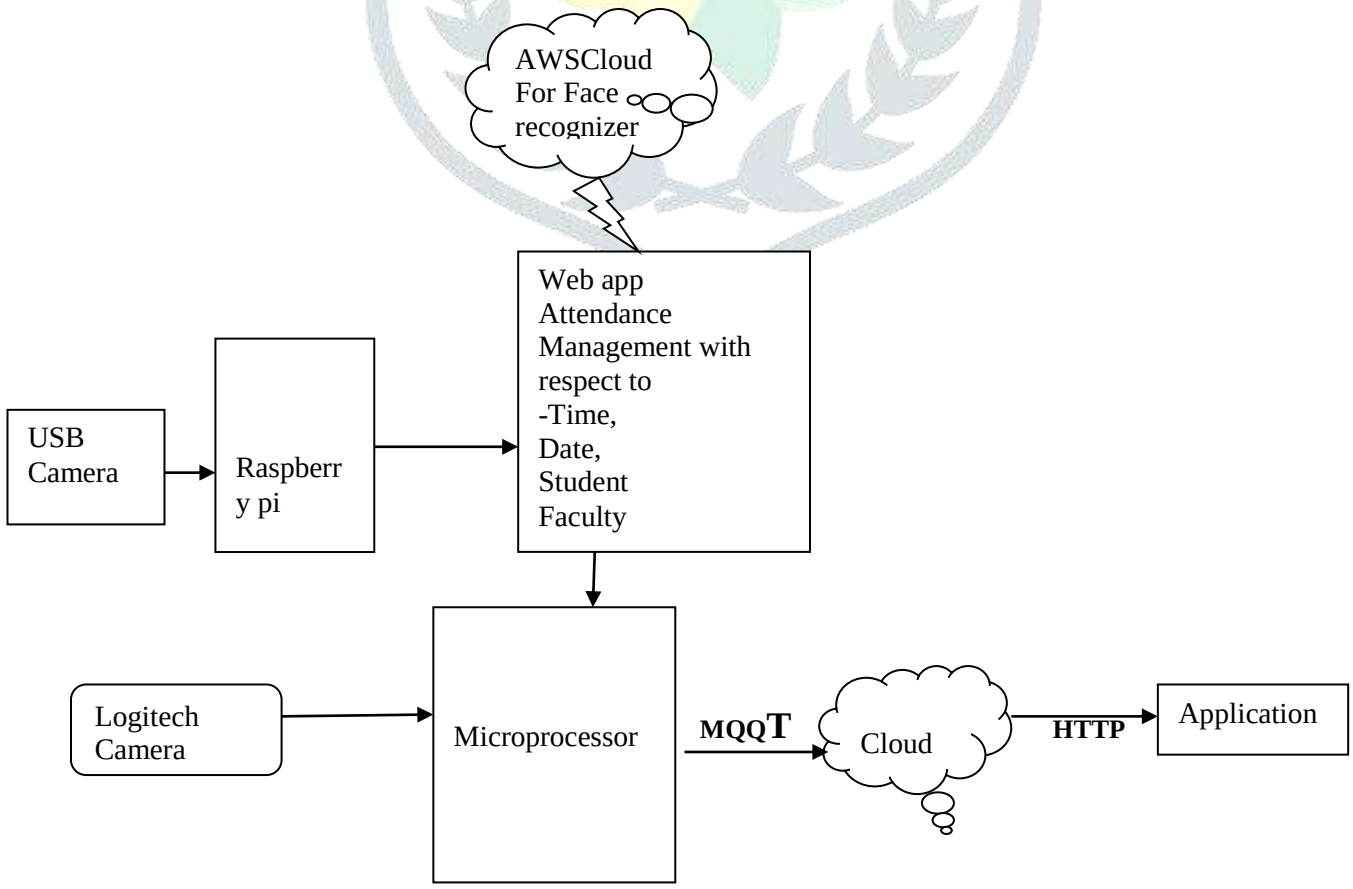


Figure2: Solution Block Diagram.

4. PROPOSED SYSTEM

In our proposed system the scholar attendance is marked by face recognition. For face detection and face recognition the raspberry pi is employed . If the camera is connected to Raspberry pi USB port then only images will capture of the scholars who are available within the class for face detection. The captured images recognizes with stored images then therein images we'll recognize the faces of each student and consistent with that attendance are going to be given thereto subject class. This process is administered for each class and students are given attendance accordingly .Faculty attendance is monitored with this project .The student database includes the stored images which can be compared by captured images to mark the attendance and school database includes their registered numbers which can be compared by RFID tag number then attendance for the school is marked.

4.1 Proposed System Flowchart:

The segmented image is compared with this data sets and faces are recognized. Admin records the attendance if the actual s: From the Fig3 Camera captures the pictures within the video streaming, while the face detection resizes the captured image up to certain point student and generates the report. The result's displayed within the monitor.

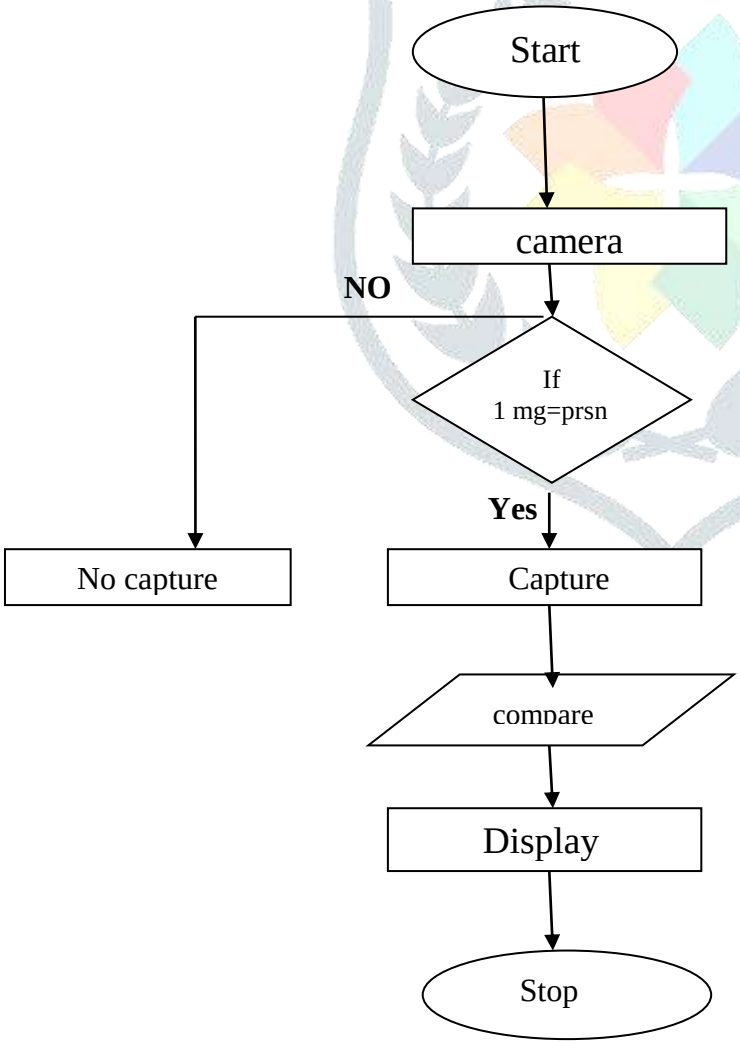


Figure3: Flowchart

4.2 Proposed System Algorithm:

A. The Algorithm of proposed system is as follows.

1. Write Raspbian OS in to the SD card and fix the card into the SD slot
2. Install all the open CV libraries into the raspberry pi
3. Fix the entire hardware setup.
4. Take the video data in that images of individual student from classroom camera
5. With the viola Jones Algorithm Face Detection is done.
6. Take the detected faces of students.
7. Crop the faces of the students.
8. In Exit folder the detected images of students will be stored.
9. The features of stored images and detected images will be compared
10. Marks the Student's Attendance based on recognized faces. 5

5. MATERIALS & METHODS

5.1 Raspberry Pi 3 :

The Raspberry Pi may be a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a typical keyboard and mouse. it's a capable little device that permits people of all ages to explore computing, and to find out the way to program in languages like Scratch and Python. This Raspberry pi equipped with ENC28J60 which may be a Ethernet chip to urge connected with internet [6].

Fig -2: Raspberry Pi 3

Features of raspberry pi 3:

- **CPU**: Quad-core 64-bit ARM Cortex A53 clocked at 1.2 GHz
- **GPU:** 400MHz Video Core IV multimedia
- **Memory**: 1GB LPDDR2-900 SDRAM (i.e. 900MHz)
- **USB ports**: 4

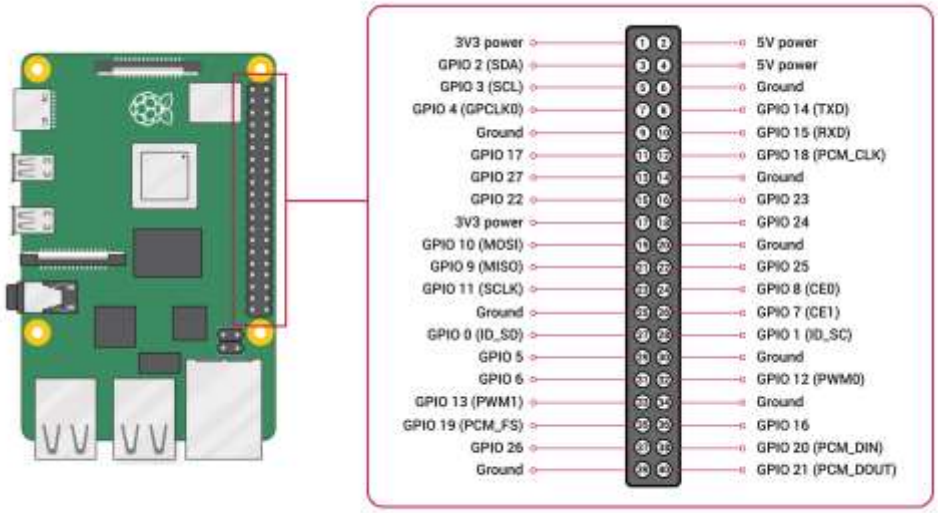
- **Video outputs:** HDMI, composite video (PAL and NTSC) via 3.5 mm jack
- **Network**: 10/100Mbps Ethernet and 802.11n Wireless LAN
- **Peripherals:** 17 GPIO plus specific functions, and HAT ID bus
- **Bluetooth**: 4.1
- **Power source**: 5 V via Micro USB or GPIO header
- **Size**: 85.60mm × 56.5mm
- **Weight**: 45g (1.6 oz)

5.2 Camera:

A camera is an instrument for recording or capturing images, which can be stored locally, transmitted to a different location, or both. the pictures could also be individual still photographs or sequences of images constituting videos or movies. The camera may be a remote sensing device because it senses subjects with none contact.

5.3 GPIO Pins :

General-purpose input/output (GPIO) is a generic pin on an integrated circuit or computer board whose behavior— including whether it is an input or output pin—is controllable by the user at run time.



5.4 Power Supply :

The facility Supply may be a Primary requirement for the project work. the specified DC power supply for the bottom unit also as for the recharging unit springs from the mains line. For this purpose center tapped secondary of 12V012V transformer is employed . From this transformer we getting 5V power supply.

6. Method

6.1 Set of Landmarks :

There is no common set of landmarks used across databases. are often "> this is often also due to the various applications landmarks can be used for. Generally one can differ between 2D and 3D landmarks. Most land marking methods, especially in the past predicted 2D landmarks. This was mainly due to the fact, that there were no data sets that contained 3D landmarks. The second main landmark set criterion is the number of landmarks. There are definitions with 5 landmarks covering the eyes, nose and mouth only [ZZLQ16]. And other sets with up to 194 Landmarks, like the HELEN data set [LBL+12]. Most definitions include key points of the face like the eye corners. These landmarks are the inner face landmarks. for many applications it's also important to record the general face size. Landmarks on the face silhouette are often one way of capturing the face size more precisely. Figure 3.2 shows sets of 68 2D landmarks visualized on a mean head from different poses. Green landmarks are 51 inner landmarks. The blue landmarks are 17 outer landmarks. For frontal pose images the outer landmarks are located at the silhouette of the face. The lower parts follow the chine line and end up close to the ears. Nevertheless there are two different definitions of how the outer landmarks should be placed for non-frontal views, visualized in 1.

7.Evaluation Methodology:

The (middle) and (right) of the figure. One option is defining the landmarks on lei on the 2D silhouette. For non-frontal views the outer landmarks remain at the contour of the face. Following this definition the landmarks haven't any fixed physical position on the face. as the yaw angle of the face changes the landmarks of the rear facing side wander closer to the center of the face. Following an alternate definition the landmarks for non-frontal views follow the physical chine line for both the front facing and back facing face side. This results in physically fixed correspondences between landmark and site on the top . Figure 3.1 shows that landmarks clicked by humans aren't consistent. there's significant uncertainty among the annotations.

8.SOFTWARE DESCRIPTION:

A. Python IDLE:

IDLE is integrated development environment for editing and running python2.x or python programs. Where we will see or check the output.

B. Raspbian O.S:

Raspbian may be a free OS which is employed run the applications. To run our applications install the Raspbian OS. Raspbian OS is best for Raspberry pi 3 controller for developing our system.

C. NOOBS:

NOOBS -New Out Of Box Software is an installation manager for the Raspberry Pi. We install this manager in SD card of Raspberry pi.

D. Python:

Python may be a programming language . Which has easy syntaxes to read that permits fewer lines of code to the programmers. This language is additionally suitable for other customized applications.

E. AWS Cloud:

within the Amazon Web Service Cloud "S3"(simple storage service) is employed to store the captured images ,those captured images are analyzed and compared using AWS "Recognition" service and results are remit to web application
time computer vision. In simple language it is library used for Image Processing.

F. Open CV :

(Open Source Computer Vision) is a library of programming functions mainly aimed at real-related to Images.

AWS

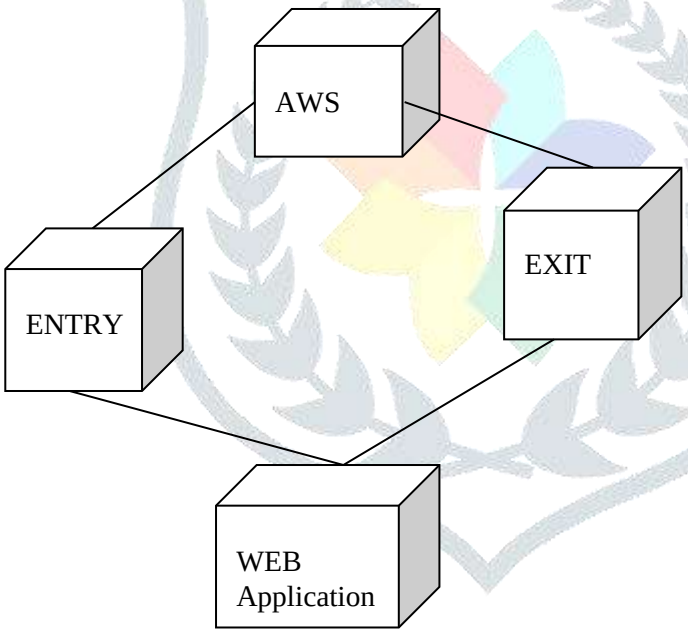


Figure2: Deployment Diagram

9. HARDWARE DESCRIPTION:

9.1 Raspberry Pi 3Model B:

Raspberry Pi 3Model B is an controller Built-on the newest Broadcom2837 chipset, 1.2GHz, 64-bitquard-core processor, 40 pin extended GPIO, 802.11bgn wireless LAN, WIFI, Bluetooth 4.1 connectivity, 1GB RAM, 4USB Ports, CSI camera port, Micro SD port, full size HDMI, and Micro USB Power source. In our project Keyboard, Mouse, Camera cables are connected to the three USB ports. HDMI cable is connected to the HDMI output, 1GB micro SD card with installed NOOBS.Raspberry Pi 3Model B is an controller Built-on the latest Broadcom2837 chipset, 1.2GHz, 64-bitquard-core processor,

40 pin extended GPIO, 802.11bgn wireless LAN, WIFI, Bluetooth 4.1 connectivity, 1GB RAM, 4USB Ports, CSI camera port, Micro SD port, full size HDMI, and Micro USB Power source. In our project Keyboard, Mouse, Camera cables are connected to the 3 USB ports. HDMI cable is connected to the HDMI output, 1GB micro SD card with installed NOOBS.

9.2 USB Camera:

USB camera is employed to capture the pictures for marking the scholar attendance. during this the Logitech C110 camera is employed . The USB camera is connected to the Raspberry Pi USB port. C. ESP8266: Esp8266(espressif) is an controller and has 32pins inbuilt Wi-Fi module with 32-bit processor, one core, CPU frequency of 80mhz, RAM of 160kb, flash of 16mb, one ADC pin, 4 busses (SPI, I2C, UART, I2S), GPIO pins of 17. Esp8266 setup is placed at the entry of the category were OLED are integrated with esp8266 and connected to cloud.

Fig: Hardware connection

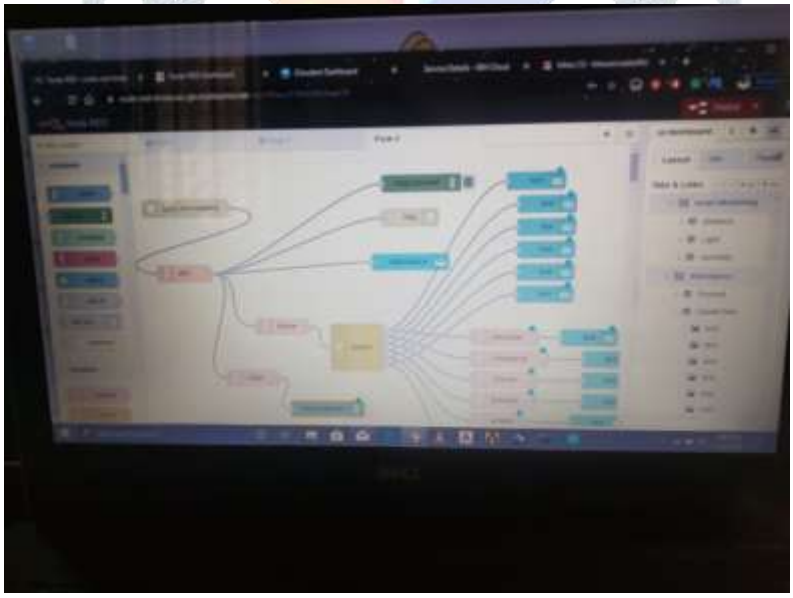


Fig: Software of node red setup

10. RESULT:

IOT Based Automated Attendance With Face Recognition System

10.1 Student Registration:

The following are the login credentials provided to the student to login into the registration portal. Then student needs to login with username and password provided to them.

10.2 Face Recognition:

To get the Face recognition first detect the face. First the image is cropped the region of interest and comparing them to enrolled images in the face database. For the face recognition, the faces are verified one by one using the AWS face recognition service.

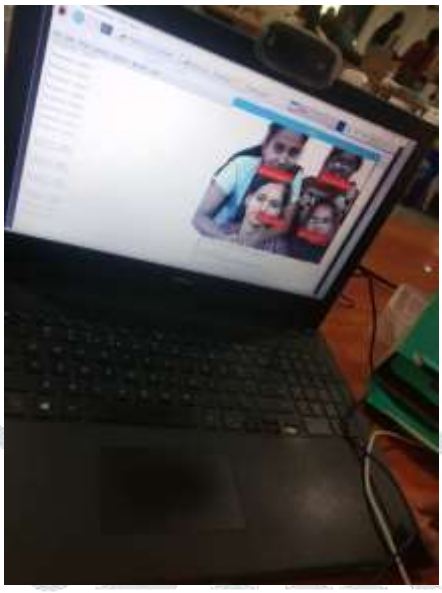


Fig.8: To mark the attendance of a student first it captures the image in the form of rectangular box**.**

Fig: software result

11. CONCLUSIONS & FUTURE ENHANCEMENTS

In this developed system ten faces were detected and recognized, the attendance was marked hour wise and monthly wise percentage of each Student/Faculty are stored in web app and SMS will be sent to Parents/HOD. Further, Raspberry Pi development board is a cost effective fully functional computational system can be used for many applications, Camera modules are also cost effective and can be used for surveillance systems. Using Python and Open CV in Raspberry Pi made our project flexible and adoptable to any required future channel

12. REFERENCES

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