Savitribai Phule Pune University Department of Information Technology

A PROJECT REPORT

ON

FACE MASK AND TEMPERATURE DETECTION WITH DOOR LOCKING AND ALERT SYSTEM

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

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OF

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BY

UTKARSHA	BARDE	71900094H
DHANSHREE	KADAM	71900303C
MANASI	PATIL	71900470F
KIRTI	SHIRNATH	71900610E

UNDER THE GUIDANCE OF

PROF. ABHIJEET KARVE

DEPARTMENT OF INFORMATION TECHNOLOGY

PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE.

2021-2022

Savitribai Phule Pune University Department of Information Technology

CERTIFICATE

This is to certify that the project report entitled

FACE MASK AND TEMPERATURE DETECTION WITH DOOR LOCKING AND ALERT SYSTEM

Submitted by

UTKARSHA	BARDE	71900094H
DHANSHREE	KADAM	71900303C
MANASI	PATIL	71900470F
KIRTI	SHIRNATH	71900610E

is a bonafide work carried out by her under the supervision and guidance of **Prof. Abhijeet Karve** and it is approved for the partial fulfillment of the requirement of Savitribai Phule Pune University for the award of the Degree of Bachelor of Engineering (Information Technology).

This project report has not been earlier submitted to any other Institute or University for the award of any degree or diploma.

Prof. Abhijeet Karve	Dr. Archana Ghotkar
Internal Guide	Head of Department
Department of Information Technology	Department of Information Technology

_____	Dr. R.Sreemathy
External Examiner	Principal
Date:	PUNE INSTITUTE OF COMPUTER TECHNOLOGY, Pune.
Place: Date:	

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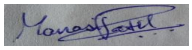
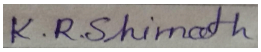
UTKARSHA BARDE	
DHANSHREE KADAM	
MANASI PATIL	
KIRTI SHIRNATH	

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ABSTRACT

The transmission of Covid inconvenience (COVID-19) is making step by step . The illness is causing a general accomplishment emergency .So as shown by the World Health Organization (WHO),one of the persuading measures to protect against Covid is wearing a facial covering in predicament squeezed areas. To keep away from the transmission of Coronavirus, state run relationship of different nations are convincing lockdowns. Different reports other than show that wearing covers out in the open spots lessens the bet of transmission of contaminations. The particular proof of individuals in cover or not is done in air terminals, Schools ,Colleges, focuses, working conditions and instructive regions. Anyway, face assertion with a cover is key as the extraction of a covered face is fairly assorted confined from standard face. Along these lines ,this second is the best an entrance to spread out a defended climate by utilizing AI. A facial covering exposure structure dataset unites the different pictures of individuals with cover and without covers. We will unite pi cameras for obvious face validation. We will utilize the Kaggle dataset to make a COVID-19 facial covering identifier with PC vision utilizing Python, OpenCV, and TensorFlow and Raspberry pi . The head objective of this advancement is to see whether the individual on video move is wearing a facial covering or not . additionally, If the framework considered any individual without cover then a consideration would be given to him/her by utilizing ringer and the section of a specific alliance wouldn't get open until he wears cover.

CHAPTER 1

INTRODUCTION

Numerous people in the world are getting through genuinely because of Covid at a higher rate.Thousands of people are kicking the container globally considering coronavirus.This ailment is spread through drops of a polluted person,when the corrupted individual hacks or wheezes the disease goes into the singular's body through dabs of the victim.It goes into the body at the hour of unwinding. Right when you contact the polluted surface and mistakenly contact your nose or mouth then similarly the potential outcomes entering a disease in the body increases.

The spread of contamination can be reduced by keeping the rules of social isolating and besides acquiring the penchant for wearing masks.Facemask acknowledgment structure through man-caused thinking will to show important to everyone for seeing people with cover or not. Of course, it will be attempting to see whether an individual has weared cover by any noticing systems.So,by considering we will cultivate a structure to check whether the individual is wearing a cloak immaculately or not.Also the structure will recognize temperature of individual with no human contact .If the system finds a person without shroud or with high inward intensity level than average then sign will boom to tell the person that he/she is can not enter without cover and he/she should wear a cover to open the entrance .

1.1 OVERVIEW

The COVID-19 Covid is an, generally speaking, issue and as such a likely preventive measure to wear a facial covering straightforwardly puts as shown by the World Health Organization (WHO). The COVID-19 scourge has obliged state run relationship starting with one side of the world then onto the next to finalize their approaches to negotiation with hindering the spread of the illness. Thusly, we suggest the utilization of a facial covering to the get-together and

edify the relationship in the event that anybody isn't wearing a cover and open the section at whatever point they are wearing it on the off chance that any individual isn't wearing the cover and maybe opening the entry when wear . We can other than work on our improvement to see expecting an individual is simply putting his hand over face or really wearing a cover . For execution of this design , we are utilizing dataset which combines the different pictures of individuals with cover and without cover. We will merge pi cameras for impelling face locale. We will utilize the Kaggle dataset to make a COVID-19 facial covering marker with PC vision utilizing Python, OpenCV, and TensorFlow and Raspberry pi.

1.2 MOTIVATION

1. As the coronavirus is spreading rapidly, the World Health Organization has suggested to maintain social distance and to wear facemasks.
2. The system also does not allow a person to keep a hand over the face while entering through the door.
3. Also having a Buzzer system will warn the person to wear the mask.

CHAPTER 2
LITERATURE REVIEW

2.1 EXISTING METHODOLOGIES

Over the period there have been numerous headways in profound learning towards object identification and acknowledgment in different application spaces .As a rule, the majority of the works center around picture remaking and face acknowledgment for personality confirmation. However, the primary point of this work is to distinguish individuals who are not wearing veils out in the open spots to control the further transmission of COVID-19.

Md. Sabbir Ejaz et al.(2019) carried out the Principal Component Analysis (PCA) calculation for veiled and unconcealed facial acknowledgment. It was seen that PCA is ecient in perceiving faces without a cover with an exactness of 96.25% however its precision is diminished to 68.75% in recognizing faces with a veil.[1]

Bosheng Qin and Dongxiao Li (2020) have planned a face cover ID strategy utilizing the SRCNet arrangement organization and accomplished a precision of 98.7% in grouping the pictures into three classes to be specific:right face veil wearing, wrong facemask wearing and no face cover wearing[2].

Li et al. utilized YOLOv3 for face identification, which depends on profound learning network engineering named darknet-19, where WIDER FACE and Celebi data sets were utilized for preparing, and later the assessment was finished utilizing the FDDB information base. This model accomplished a precision of 93.9%[3].

In a comparative examination, Nizam et al. proposed a GAN based organization engineering for the evacuation of the face veil and the remaking of the locale covered by the cover. Rodriguez et al. (2015) proposed a framework for the programmed discovery of the presence or nonattendance of the obligatory careful veil in working rooms. The target of this framework is to trigger alerts when a staff member isn't wearing a mask.This framework accomplished a precision of 95%. [4]

Loey et al., proposed a model that comprises two parts utilizing ResNet50 for highlight extraction.The next part is International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 09 Issue: 03 | Mar 2022 www.irjet.net p-ISSN: 2395-0072 © 2022, IRJET | Impact Factor value: 7.529 | ISO 9001:2008 Certified Journal | Page 1259 facemask classifier,based on an outfit of old style AI calculations. K. Yan, S. Huang, Y. Melody, W. Liu and N. Fan, created ‘Face acknowledgment dependent on convolution neural organization’ [5].

Rodriguez et al. (2015) proposed a system for the automatic detection of the presence or absence of the mandatory surgical mask in operating rooms. The objective of this system is to trigger alarms when a staff is not wearing a mask.This system achieved an accuracy of 95%.[6]

Mohamed Ali Hajjaji , Safa Teboulbi ,Seifeddine Messaoud implemented AI-Based Face Mask Detection and Social Distancing Measuring System for COVID-19 Prevention[7].

R. Suganthalakshmi ,A.Hafeeza proposed a model having four modules.The proposed model having surveillance cameras to detect faces and is combination of opencv,tensorflow and keras.The system achieve the highest accuracy and consumes less time.The system uses architectural features of VGG-16 as the foundation network for face recognition[8].

Jason Dsouza designed a system with two stage architecture for detecting masked and unmasked faces.First stage have trained RetinaFace model for robust face detection, after comparing its performance with Dlib and MTCNN.Second stage have the NASNetMobile based model was selected for classifying faces as masked or unmasked [9].

Meghana Shinde, Soham Vaidya proposed a system "Facemask detection Alert System using Raspberry pie" in April 2021.The proposed system detects the face with mask or not and the person without mask gets an email with the screenshot that he has not worn the mask[10].

Following from the above setting it is obvious that exceptionally for cover discovery extremely set number of examination articles have been accounted for till date though further improvement is wanted on existing methods.So, we will create a facemask finder framework utilizing Raspberry pi .In our framework we will utilize bell which will sounds when an individual without mask is distinguished external the entryway of any association . Additionally the entryway won't open until the individual wears the mask.

2.2 PROPOSED METHODOLOGIES

MobileNetV2 -

We use MobileNetV2 here in our system because many of its uses.

MobileNetV2 improves the initial performance of mobile models for different tasks, tests, and different model sizes. A very efficient feature extractor for object detection and segmentation**.**

MobileNetV2 is a CNN that is 53 layers deep. It is light weight and has fewer parameters and is used for image classification,detection and segmentation. In our project mobileNetv2 is used for dataset training purposes. So in that having two models head model and base model. The output of the bas model is passed as input to the head model.

CHAPTER 3

REQUIREMENT SPECIFICATION AND ANALYSIS

3.1 PROBLEM DEFINITION

The facial covering recognition framework was prepared utilizing tensorflow , a profound learning calculation and can separate appearances with veil or without cover. After the ID, in the event that an individual isn't wearing veil bell cautions her/him to wear the cover. Assuming the individual is wearing a veil, temperature detecting is done and on the off chance that he/she has fulfilled the measures the entryway opens, else bell caution her/him to wear the cover and entryway is shut until he/she doesn't wear the veil with the assistance of Raspberry Pi.

3.2 CONCEPT

The governments of various countries all over the world are trying to find solutions to live with such virus safely. According to various research studies, it has been proved that wearing a mask in public places will reduce the transmission rate of the virus. So in this project, we propose a deep learning model that detects persons wearing mask or not along with temperature detection and it’s results will be used to determine the door locking mechanism in which if the system finds the person wears the mask correctly then the door will get open and the person will get entry inside the premises else there is a buzzer that will warn that person to wear the mask and the door will remain closed until that person wears the mask and has the normal body temperature with slight variation. This model is trained using tensorflow, a deep learning algorithm and also used Raspberry pi. This system can be used in crowded areas like malls, hospitals ,schools and colleges while entering into the premises.

3.3 SCOPE

The scope of this project can be extended by adding the following features into it:-

- Social distancing
- Oxygen level

3.4 OBJECTIVE

The principal objective of the "Face mask and temperature detection with door locking and alert system" project is to give some powerful innovation to control the spread of covid-19 infection.

- To Prevent the spread of Covid-19 infection by advancing the utilization of face masks with the help of deep learning and Raspberry pi.
- To make a model which identifies that person is wearing a mask or not using deep learning CNN algorithm and if the person does not wear the mask then the buzzer will warn that person to wear the mask and the door will be closed until the person does not wear the mask along with the temperature sensing system.

3.5 PROJECT REQUIREMENT

3.5.1 Dataset

In dataset 2000 masked images and 2000 unmasked images are present in dataset

3.5.2 Functional Requirements

Utilitarian Requirements of Face Mask Dataset:

The System should have in excess of 4000 pictures of both 'with cover' and 'without cover' classes.

The dataset shouldn't reuse tantamount pictures in preparing and testing stages.

Utilitarian Requirements of Face Mask Detector:

The framework should have the decision to stack the facial covering classifier model.

The framework can see faces in pictures and live video moves .

The design should have the decision to dispose of the Region of interest.

The framework should have the decision to show the outcome for any plan of picture nearby the rate.

Practical Requirements of Temperature Sensing System:

The sensor MLX90614 gives two frameworks for yield: TWI and I2C.

Sensor temperature range is between - 40oC to 125oC.

Logical Requirements of Door Locking System:

The framework should come by the outcome and in the event that the cover is worn, open the entry and close ordinarily after 3 sec.

The entry shouldn't open on the off chance that the cover isn't worn.

Sensible Requirements of Buzzer System:

The framework should be automically off after different times in the event that the cover isn't found.

3.5.3 Non-functional Requirement

- The model accuracy should be above 90% .
- The face should be detected by extracting some features and background must ignored .
- The person should stand in front of the camera in order to get correct results .
- The background should not be too bright or dark while detecting the face mask .
- The response time must be fast ,within few seconds .
- If more than one faces are present ,the system must be able to detect face masks
- The door should be closed after 3 secs of opening.
- Person should turn on the camera in the beginning .
- Person not wearing a mask should be verified again after wearing a mask.
- Skin color masks should be allowed by the system.

3.5.4 Hardware Requirement

- Raspberry Pi:

We are having options of using either arduino or raspberry pi.We decided to go with raspberry pi because of its advantages over arduino.

Raspberry Pi is on various occasions faster than Arduino, with PI, you can send messages, focus on music, play accounts, use the web, etc. Besides, as we referred to earlier it has memory, processor, USB ports, Ethernet port, etc. 'It needs external hardware for most exercises.

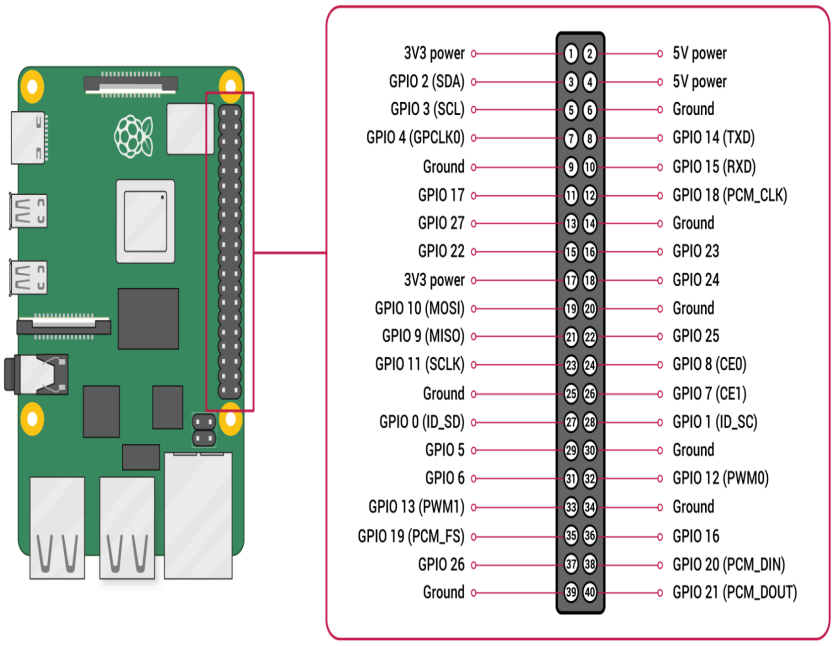


Fig. 1 Raspberry pi Circuit Diagram

- Buck:

  We hereby using a buck, connected to motor driver. The buck converter is a DC-DC converter. It positively converts high voltage into low voltage. Active power conversion extends battery life, reduces heat, and allows smaller gadgets to form. The backpack converter can be used in many good programs. Both step-up or step-down voltages are present here.

- L293D Motor Driver:

  L293D is a Motor Driver IC which allows DC motors to drive on either direction.L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It works on H-bridge concept.

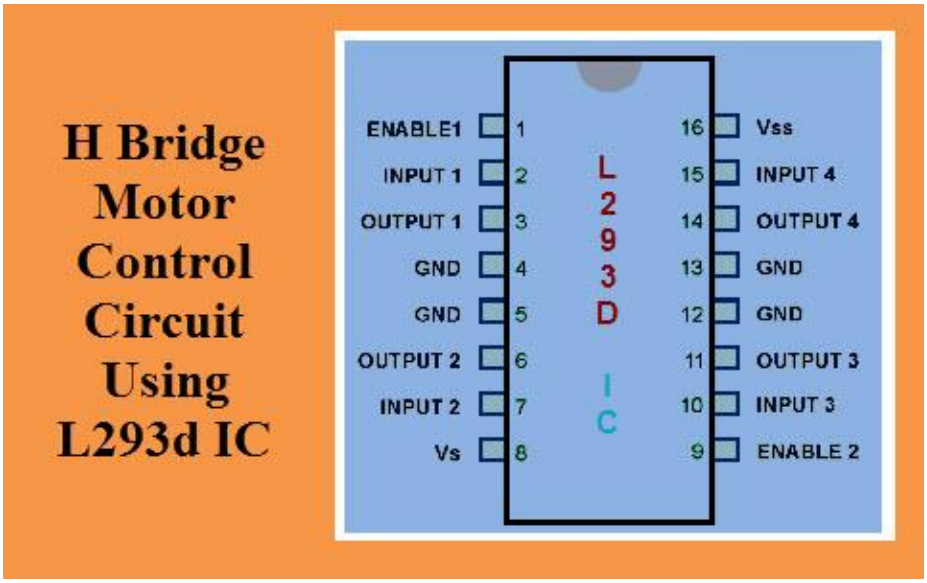


Fig.2 Motor Driver L293D Circuit Diagram

It has two voltage pins, one of which is used to draw current for the working of the L293D and the other is used to apply voltage to the motors.

- DC Motor:

  A DC motor is defined as a phase of electric motors that convert existing electrical energy into mechanical power. Small DC motors are used for tools, toys, and electrical items.Here we use a DC engine to lock doors. The engine only rotates 90 degrees clockwise or counterclockwise .The engine cannot be controlled directly from Raspberry Pi's GPIO pins, because it requires a different 5 volt supply. This means you need to enable it separately. DC motors have the advantage of having high initial torque, fast starting and stopping, reversing, variable speed with power input and easier and cheaper to control than AC. Driver driver results connected. on a DC motor. The DC motor is having 30 rpm.

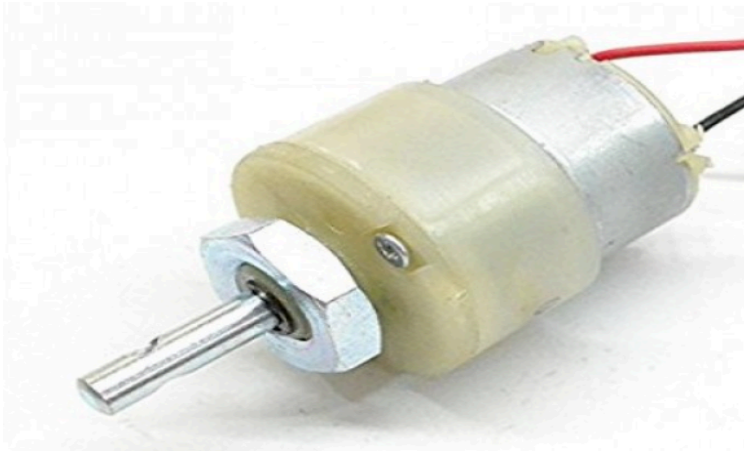


Fig. 3 Dc Motor

- Sensors:

  A sensor is a device that produces an output signal for the purpose of sensing of a physical phenomenon.In our project we use an IR sensor to detect the temperature .We use the MLX90614.The MLX90614 is an infrared thermometer for uninterrupted temperature measurements.The MLX90614 offers two output modes: TWI, I2C. Both of these output are simple and easy to use with Arduino. , Raspberry Pi and other small controls.Here,Sensor temperature range from -40 to +125 °C. The MLX90614 offers a standard accuracy of ±0.5ºC around room temperatures.

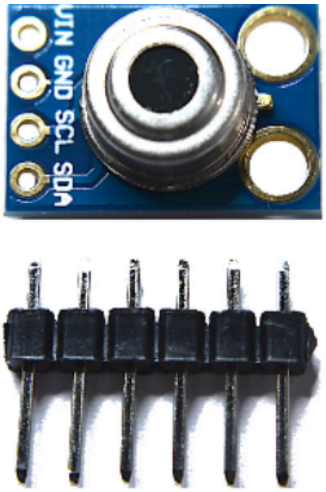


Fig.4 MLX90614 IR Sensor

3.5.5 Software requirement:-

- Raspbian Os
- Tensorflow>=1.15.2
- keras==2.3.1
- imutils==0.5.3
- numpy==1.18.2
- opencv-python==4.2.0.
- matplotlib==3.2.1
- scipy==1.4.1

3.6 PROJECT PLAN

3.6.1 Project Resources

Human Resources

Internal Guide: Prof. Abhijeet Karve

Group Members:

Utkarsha Barde
Dhanshree Kadam
Manasi Patil
Kirti Shirnath

Cost Estimate

Required Cost : Hardware cost Rs.9000-10000

3.6.2 Module Split-up

The dataset comprises certain pictures with face mask and without face mask. All pictures are separated from Kaggle datasets. By parting these datasets pictures into : preparing , test and approval of dataset. The motivation behind parting is to stay away from overfitting . The testing set will be a subset of the data set to prepare the model.

It mainly comprises of three phases:

I. Training:

First loading the face mask identification dataset from disk, preparing a model (utilizing keras/TensorFlow) on this dataset, and afterward serializing the face mask detector to a disk.

II. Deployment:

Once the first step is completed we can then move on to loading the mask detector. When the Region of Interest is separated, we will give this stage as a contribution to Raspberry PI. For setting up the CNN

model we fit our photos in the arrangement set and test set to progressive models using keras library.

III. Alert System:

With the help of udp connection through laptop and raspberry pi the input will be face mask is send to the raspberry pi. Further, if the person is wearing a mask then temperature will be sensed and if both the conditions are satisfied then the door will open. On the other hand, if a person is not wearing a mask then a buzzer would give a notification. Same goes for the temperature sensor.

IV. Door Locking System:

After correct mask wearing,temperature gets checked.If the temperature is greater than the 40 degree celsius then buzzer gets on otherwise door gets open for 3 second after that door will automatically gets closed.

3.6.3 FUNCTIONAL DECOMPOSITION

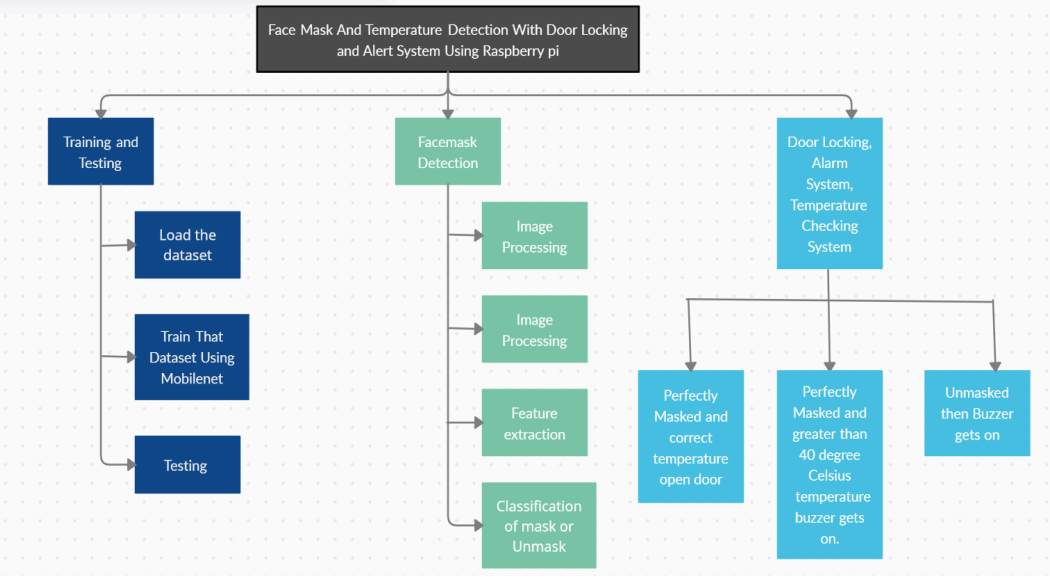


Fig. 5 Functional Decomposition

3.6.4 PROJECT TEAM ROLE AND RESPONSIBILITIES

Responsibilities -

Research paper study ,base paper study,Image collection ,Dataset generation, implementation , documentation , designing uml diagrams for project .

Each of the team members Utkarsha Barde , Manasi Patil , Dhanshree Kadam , Kirti Shirnath participated in every task performed.

3.6.5 PROJECT PLAN 3.0

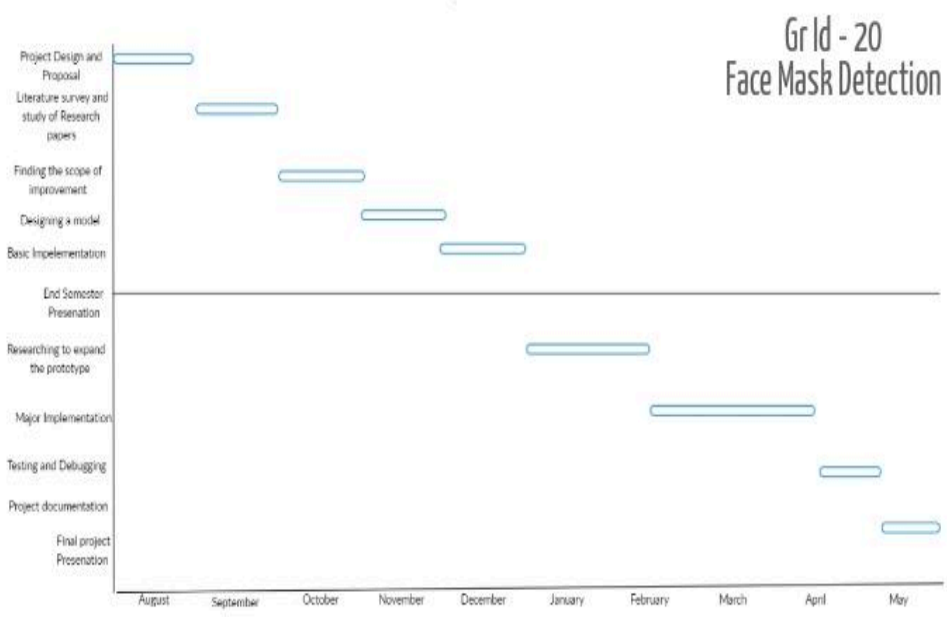


Fig 6 Gantt Chart

3.6.6 PERT TABLE

Activities	**Immediate Predecessor**	**Time**
Finalize Problem Statement	-	2 weeks
Literature Survey and Research	Finalize Problem Statement	2 weeks
Finding scope of improvement	Finalize Problem Statement	2 weeks
Designing the model	Literature Survey and Research, Finding scope of improvement	4 weeks
Basic implementation	Designing the model	4 weeks

Researching to expand the prototype	Basic implementation	2 weeks
Major Implementation	Researching to expand the prototype	4 weeks
Testing and Debugging	Major Implementation	4 weeks
Documentation	Testing and Debugging	2 weeks
Final Project Presentation	Documentation	2 weeks

Table 3.1 Pert Table

3.6.7 PERT DIAGRAM

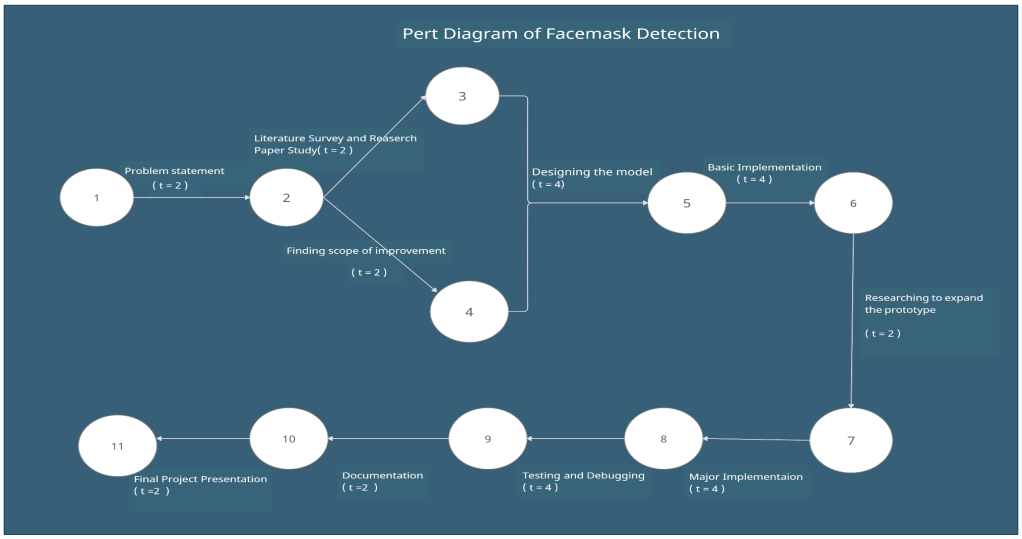


Fig. 7 Pert Diagram

CHAPTER 4
SYSTEM ANALYSIS AND DESIGN

4.1 ARCHITECTURE

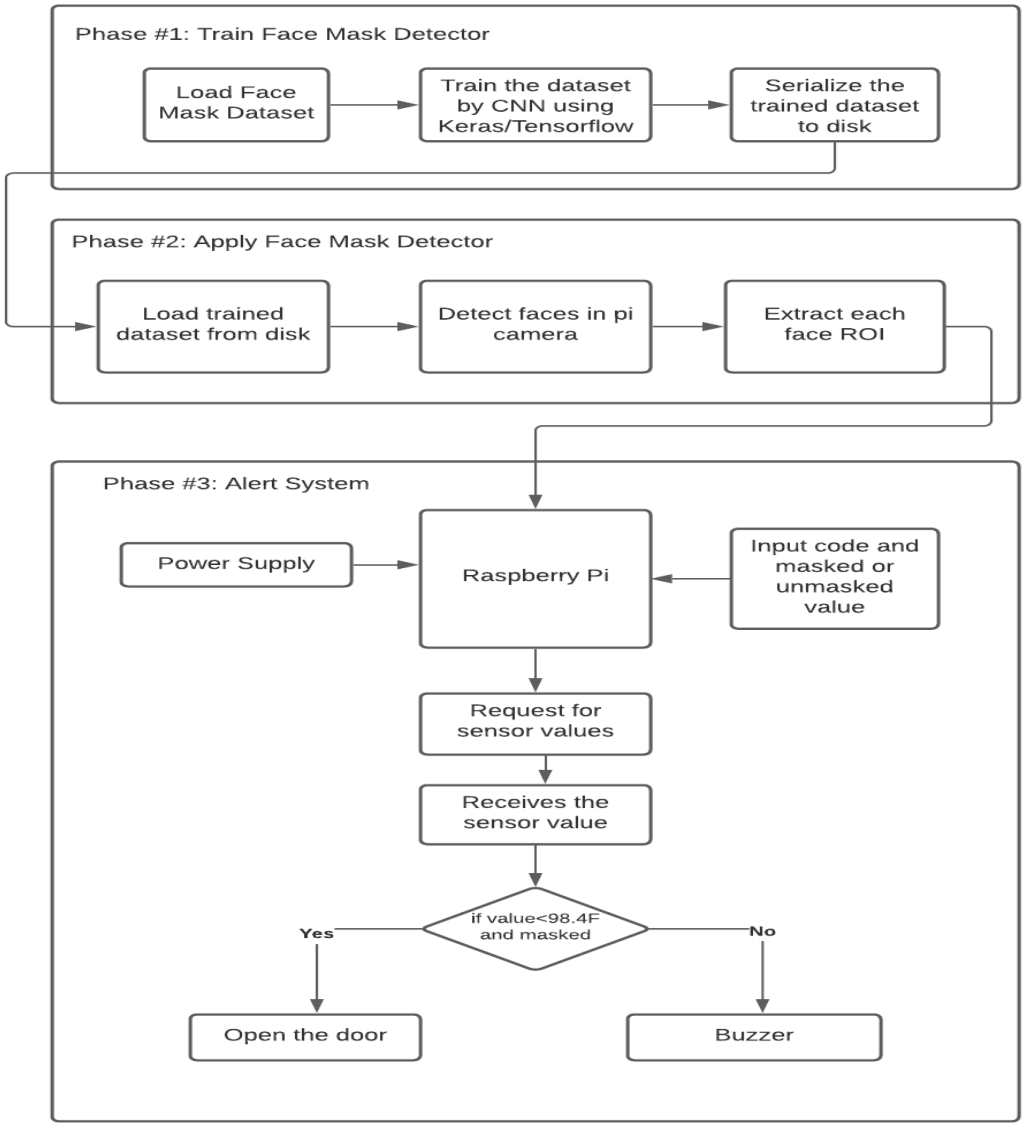


Fig.8 Architecture Diagram

4.2 BLOCK DIAGRAM

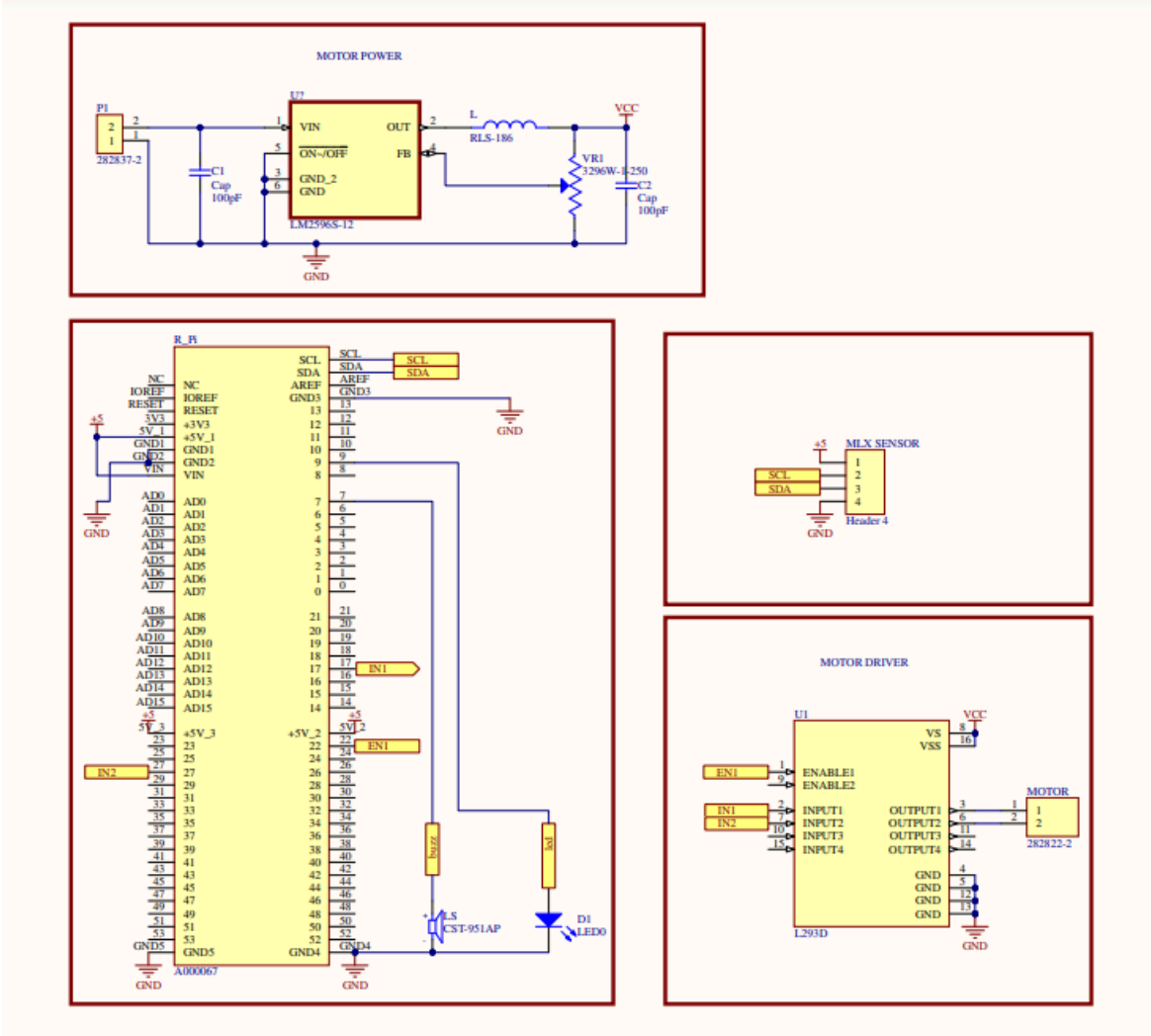


Fig. 9 Circuit diagram

4.3 DATA FLOW DIAGRAM

Inside an infinite loop, we are going to take input frame by frame from the Pi camera and convert each input frame from the pi camera to grayscale and the detect the faces. The system will run through a for loop for each and every face extracted from a frame and the region of interest will be detected. If the mask is there then temperature sensing is done and upon fulfilling the criteria the door gets open else the buzzer gets on. We will have a system which focuses on sharpening the blurred images.

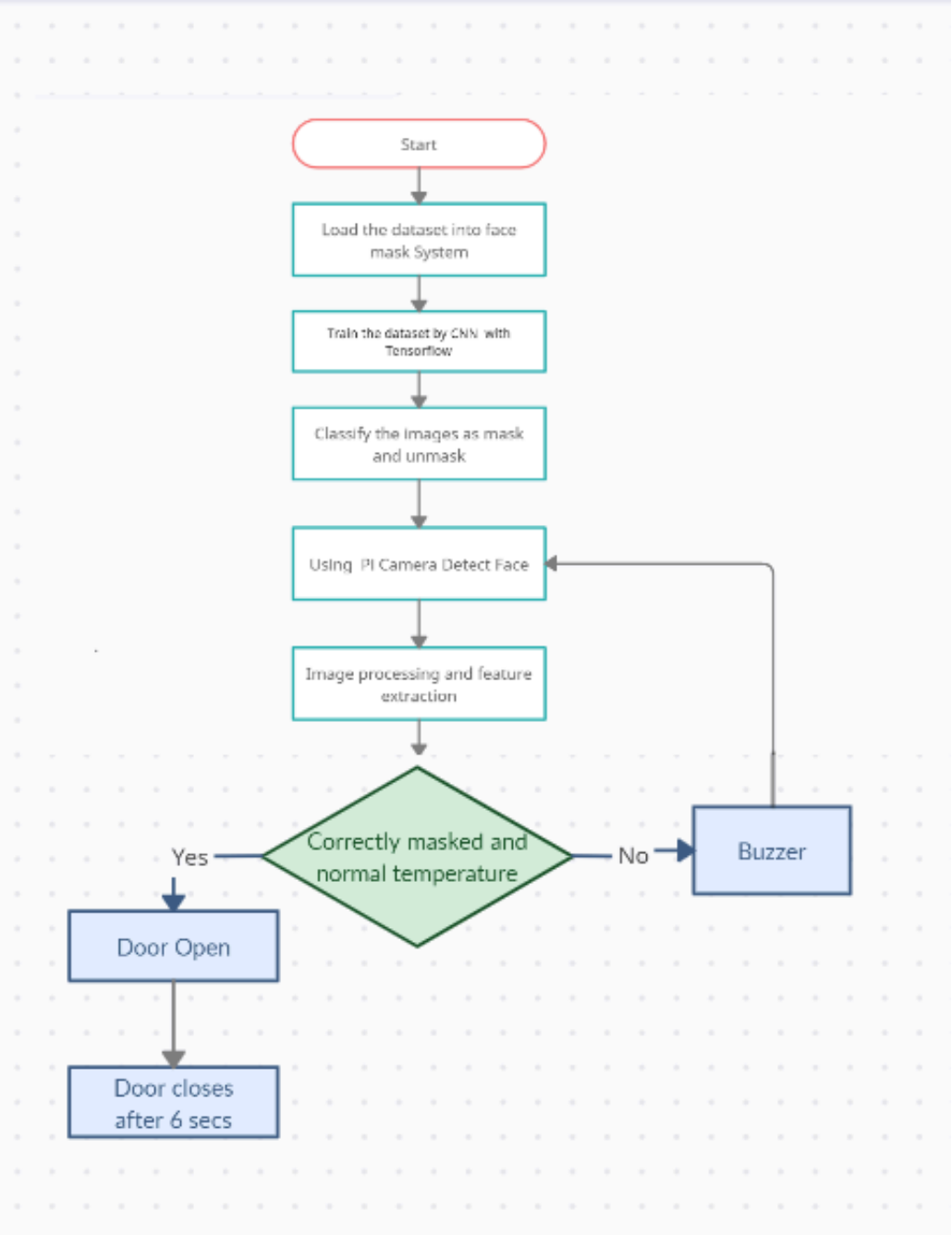


Fig. 10 Data Flow Diagram

4.4 STRUCTURAL DIAGRAM

4.4.1 CLASS DIAGRAM

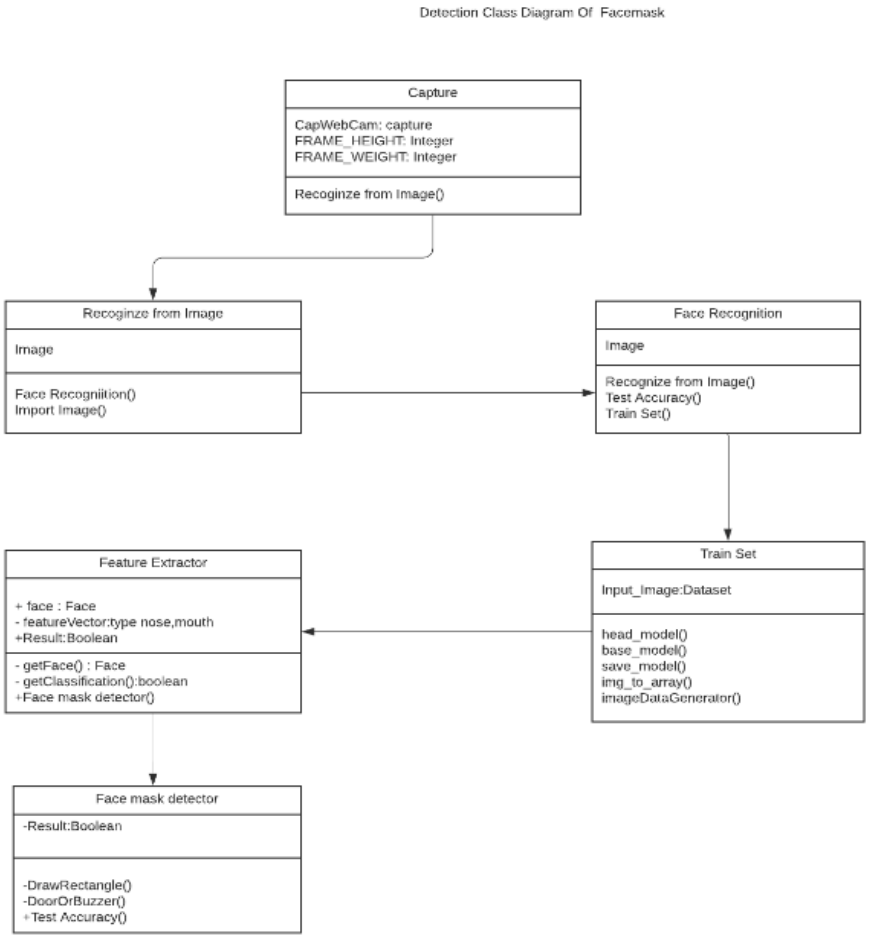


Fig. 11 Class Diagram

4.5 BEHAVIORAL DIAGRAMS

4.5.1 USE CASE DIAGRAM

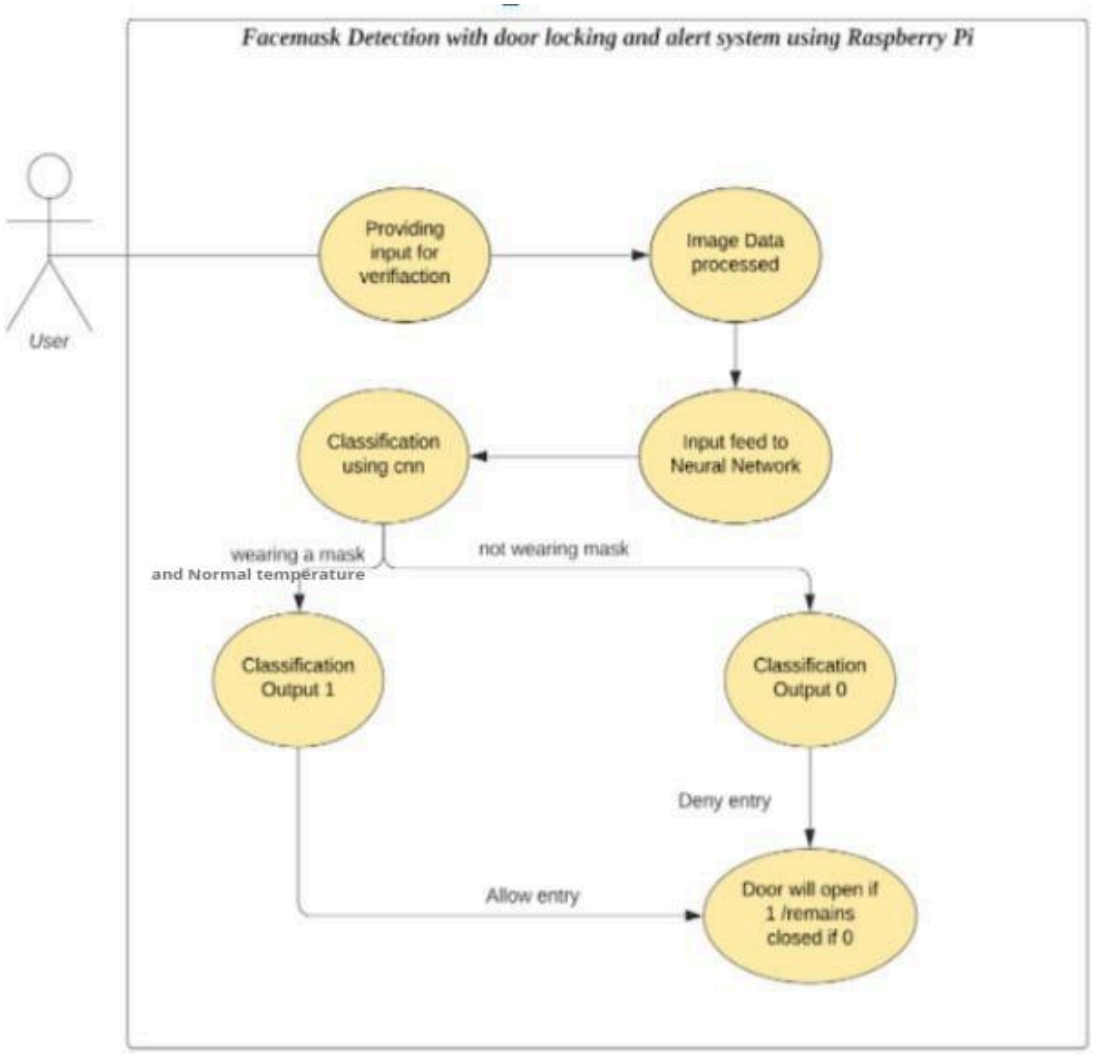


Fig.12 Use Case

4.5.2 ACTIVITY DIAGRAM

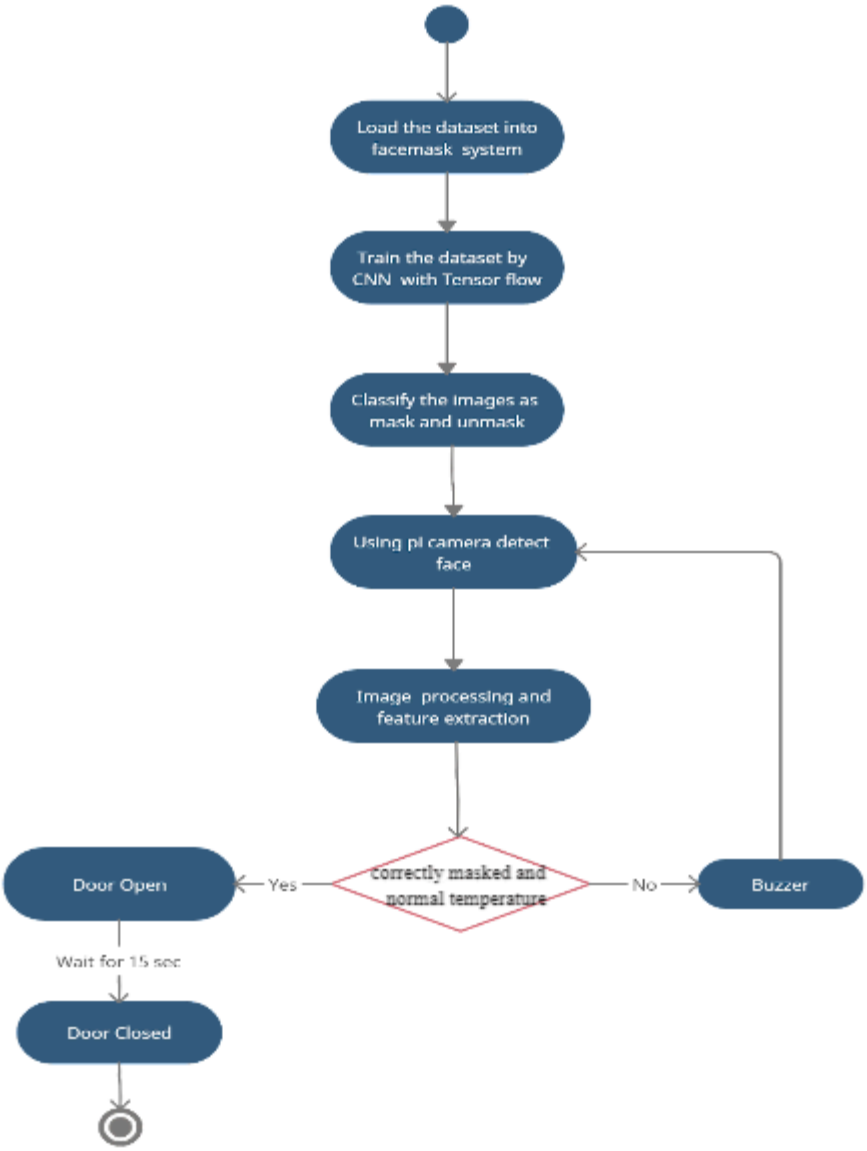


Fig.13 Activity Diagram

4.5.3 SEQUENCE DIAGRAM

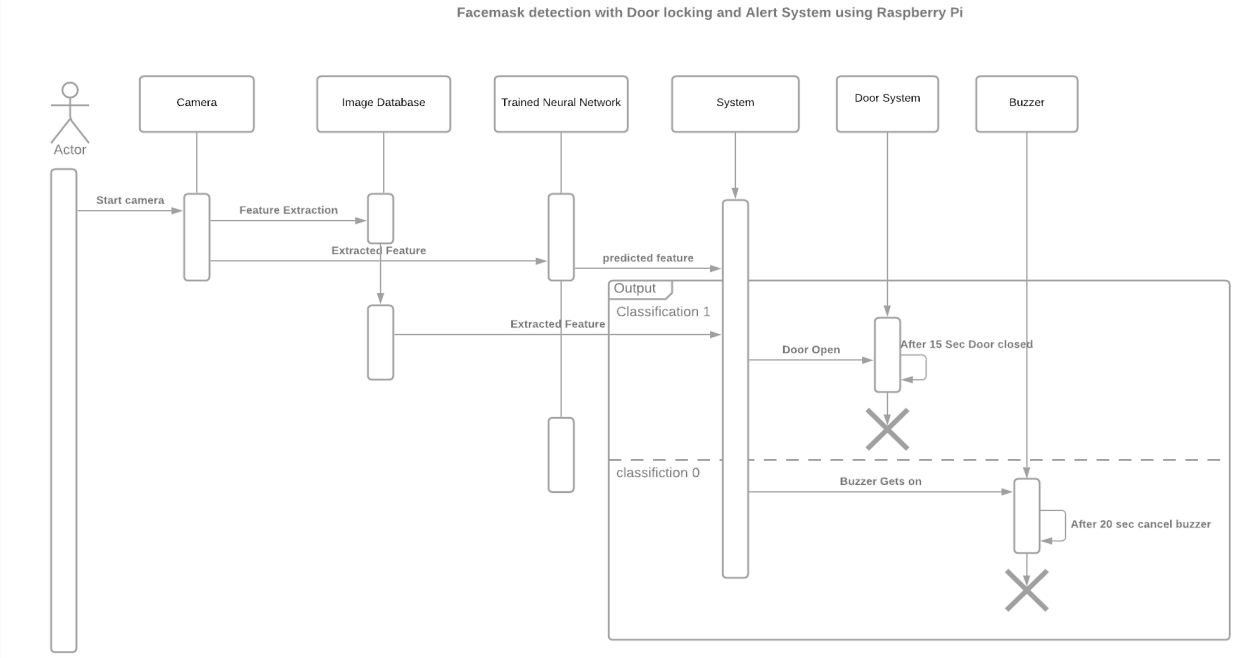


Fig.14 Sequence Diagram

4.6 ALGORITHM AND METHODOLOGIES

Algorithm 1: Data processing and testing

1. Load the images.
2. Process the images i.e., resizing, conversion into array.
3. Load the images with their corresponding labels.
4. Perform data argumentation and the split data into training and testing batches.
5. Load mobileNetV2 model form keras. Train it on a training batch and compile it using adam optimizer.
6. Save the model.

Algorithm 2: Deployment of model

1. Load the real time constant feed from Opencv.
2. Read the feed outline by outline.
3. Apply the face detector to detect the face in frame in real time.
4. Apply the facial covering finder and get the area of face arranged and anticipated veil and non cover precision.

Algorithm 3: Ir_temperture

1. Using laptop IP and port number establish connection between raspberry pi and system.
2. Convert the temperature celsius to faraday.
3. Pass the temperature to raspberry pi pin and if temperature is high then buzzer gets on.

Algorithm 4:Door_locking

1. If the system finds a person with mask then it will not generate any random number.
2. As the person in mask is detected further his/her temperature is measured .
3. If the temperature is less than 40 degrees then door will open .
4. Door will open by using dc motor having 30 rpm and rotate in 90 degrees.

Algorithm 5:Motor_buzzer

1. If the system finds a person without mask then it will generate a random number.
2. As the person without mask is detected there is no need to check temperature .
3. The buzzer will beep and notify the person that he/she is without mask.
4. It takes 6sec totally to beep the sound.

CHAPTER 5

IMPLEMENTATION

5.1 STAGES OF IMPLEMENTATION

5.1.1 PREPARATION DATA

Data Preprocessing:-

a) Take the dataset from kaggle a having to categories with mask and without mask
b) Convert images to array using img_to_array() function.
c) Add the images and labels into the data and labels list.

d) Convert the label list into binary values that are 0 and 1's as following:

```
lb = LabelBinarizer()
labels = lb.fit_transform(labels)
labels = to_categorical(labels)
```

e) Convert data and label lists into smaller lists :

```
data = np.array(data, dtype="float32")
labels = np.array(labels)
```

f) Give the 20% images for training purposes.

```
(trainX, testX, trainY, testY) = train_test_split(data, labels,
  test_size=0.20, stratify=labels, random_state=42)
```

5.1.2 PROCESSING

Training of dataset :-

a) First we will set the first reading level to 1e-4 because as the reading level is small the number of losses will be calculated correctly, the epoch is placed at 20 and the total size = 32.
b) To generate more images from a single image by using some parameters we use imageDataGenerator.
c) We will create a base model and head model and pass the output of the base model to the input of the head model.
d) In the base model we use imagenet for weights; it sets the default weight and gives the size of the image in input_tenor() .

```
baseModel =
```

```
MobileNetV2(weights="imagenet",include_top=False,input_tensor=In
put(shape=(224, 224, 3)))
```

e) In the head model, first parameter is output of base model then we do pooling, flatten the layers, adding dense layer with 128 neuron with activation function reLu and add dropout to avoid overfit of model.Output has 2 layers one for with mask and one for without mask and activation function is softmax.

f) Place the fully connected model on the top of the base model.

g) Then compile our model.

```
opt = Adam(learning_rate=INIT_LR, decay=INIT_LR / EPOCHS)
model.compile(loss="binary_crossentropy", optimizer=opt,
metrics=["accuracy"])
```

h) Then train the head of the network.

i) We will make prediction of the model as follow:

```
predIdxs = model.predict(testX, batch_size=BS)
```

j) for each image in the testing set we need to find the index of the label with corresponding largest predicted probability

```
predIdxs = np.argmax(predIdxs, axis=1)
```

k) Then we will get a classification report and we will save the model.

Use The Model for real-time face Detection **:-**

a) Firstly we will connect the our system to the raspberry pi using UDP connection.

b) We will first do a face detection model and then face mask detection model use.

c) We will initialize the video stream src=0

```
vs = VideoStream(src=0).start()
```

d) We will define the function which will return the location of x and y coordinates of the face and prediction accuracy.

e) We will pass the any integer value to through the packet if person is not wearing mask then if person have correct mask the nothing gets passed through packet.

f) Using that return value we will draw the rectangle and the mask and unmask percentage.

UDP Connection : -

a) We are connecting our Raspberry pi with laptop using UDP i.e.

User Datagram Packet which is a protocol used for communication throughout the internet.

b) Firstly a UDP socket is created :

```
sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
```

c) Socket is bind to the port :

```
host, port = '0.0.0.0', 65000
server_address = (host, port)
sock.bind(server_address)
```

d) Message received from face mask detection algorithm is unpacked. This message helps to identify the masked or unmasked status of a person.

```
x = unpack('f', message)
```

e) Length of that message is calculated using len function :

```
y = len(message)
```

f) If the received message is garbage value then the person is wearing a mask and the buzzer remains off. But if person is not wearing a mask then a 4 byte number is generated through random function which implies that person is not wearing a face mask and buzzer gives its indication for 6 seconds :

```
if x is not None and y == 4:
    import motor_buzzer
    time.sleep(6)
```

g) From this, the code gets to know whether the person is wearing the mask or not.

Temperature checking :-

a) We use the I2C protocol. We have to establish connection through udp to send the temperature to the client part

b) C_am = sensor.get_ambient()

F_am = (C_am * 1.8) + 32

C_obj = sensor.get_object_1()

F_obj = (C_obj * 1.8) + 32

We are converting celsius into faradays

c) If the temperature is greater than 40 degree import the motor buzzer else import door_lock.

Door locking and motor buzzer:-

a) In this system, first face mask detection part is done,which tells whether the person has worn the mask or not and if it finds a person without mask then it generates a random number and gives a signal to the buzzer that the person did not wear the mask and the buzzer starts to ring-
   1) For using the buzzer in our system we will import GPIO's of Raspberry pi which are general purpose input output pins . Also we will set warnings to false so that to enable warnings . It tells that gpio is already in use.
   2) GPIO.setmode(GPIO.BCM) i.e Broadcom-specific PIN codes are one of the two PIN-encoding systems we use here. It follows the lower level numbering system .Then we are using setup function to declare whether the pin is input or output pin, GPIO.setup(buzzer, GPIO.OUT) and GPIO.setup(LED, GPIO.OUT) tells that both buzzer and led acts as output.
   3) To write a pin high or low ,we are using GPIO. output() function . Initially we are setting buzzer and led to high for 0.2 sec and later setting it to low for next 0.2 sec And this will continue for 15 times i.e total time taken is 6 sec. In this way the buzzer works.

b) If the system finds person with mask then it will not generate random integer then it will further check the temperature if the temperature if greater than 40 degrees then it will not open door and again the buzzer will make sound to notify that the person is without mask and should wear it. The door opening mechanism works as follows-
   1) Initially we will import GPIO of Raspberry pi , then setwarnings(false) will indicates

      the warnings are enable means the gpio are in use.

   2) Then we will initialize the pins for motor driver as-

      Motor1A = 17

      Motor1B = 27

      Motor1E = 22

   3) We are using BCM numbering scheme . Motor1A , Motor1B , Motor1E are all acts as output pins. In the further steps, in the 1st rotation of motor, the output pins i.e Motor1A , Motor1B , Motor1E are set to high , low , high respectively. After this much of rotation the motor will take a pause of 3 sec and again it will move in the backwards direction and then the Motor1A , Motor1B , Motor1E pins are set to low , high , high respectively. Again it will sleep for 3 sec more. In this way the motor rotates in 90 degrees i.e the door will open in 90 degrees.

5.2 ELABORATE IMPLEMENTATION ISSUES/ TECHNIQUES/ SOFTWARE

TOOLS.

Hardware connection ,integration of various modules in hardware.

CHAPTER 6
RESULTS AND EVALUATION

6.1 EXPERIMENTS

6.1.1 DETAIL DISCUSSION OF EXPRESSIONS CARRIED OUT

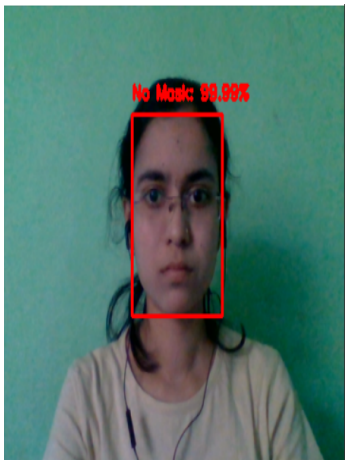
Classification report :

	precision	recall	f1-score	support
with_mask	0.99	0.99	0.99	383
without_mask	0.99	0.99	0.99	384
accuracy			0.99	767
macro_avg	0.99	0.99	0.99	767
weighted_avg	0.99	0.99	0.99	767

Table 6.1 Classification Report

6.1.2 RESULTS OF EXPERIMENTS

Face with mask



Face without mask

Face with mask, facing in other direction

- Green rectangle representing correctly masked with the percentage
- Red rectangle representing no mask with percentage.
- Body Temperature and surrounding temperature displayed.
- If the temperature and correctly weared mask then motor rotated in clockwise direction 90 degree after 3 sec it will again rotated in anticlockwise direction.

Input	Actions
Correct masked and normal temperature	Door will open for 3 seconds.
Incorrect masked	Buzzer will warn.
Correctly masked and abnormal temperature	Buzzer will warn.

Table 6.2 Input -Action

6.2 TESTING

6.2.1 WHITE BOX

6.2.1.1 UNIT TESTING

1. Face detection : The isolated part of the code load model from disk and performs face detection and is fit to use for project code.

2. Mask prediction : The function accepts face detector,mask detector and image streaming and returns rectangular coordinates fo r representation and percentage .

3. Door Locking: Door will keep locked until it gets output.It opens with as masked and normal temperature . It keeps open for 6 secs.

4. Buzzer : If the person is unmask or temperature is abnormal then buzzer get on.

6.2.2 BLACK BOX

6.2.2.1 TEST CASES

Sr No.	Test Cases	Pass/ Fail
1.	The response time of the system(1-2 sec)	Pass
2.	Door opening response time(3sec)	Pass
3.	Buzzer response time(15 time)	Pass
4.	Temperature display time(1-2sec)	Pass
5.	Masked face and normal temperature door opening.	Pass
6.	Door keep locked for masked face and abnormal temperature	Pass
7.	Unmasked Face	Pass
8.	Dark background behind user	Fail

Sr No.	Test Cases	Pass/ Fail
1.	The response time of the system(1-2 sec)	Pass
9.	Multiple person detection	Fail

Table 6.3 Test Cases

6.2.2.2 SUMMARY OF BLACK BOX TESTING (E. G. NO. OF PASS, FAIL ETC.)

No of Pass :	7
No of Fails :	2

Table 6.4

CHAPTER 7

7.1 CONCLUSION

We have successfully implemented a system for facemask detection. It will be having door locking functionality to lock if not masked or for the high temperature and unlock if mask and temperature is ok. We have a properly working system using raspberry pi, to which we provide connections with a MLX sensor and buzzer. Also we have used buck to step down the dc to 12V. We hereby have a DC motor to rotate the lock to lock or unlock the door by rotating 90 degree.We are further extending the project where we will be having external camera input and the model will be deployed on raspberry pi. However we have fully functioning design implemented.

7.2 LIMITATIONS

The limitations in basic implementation of the project is done are:

- Hand over the face and skin face mask.
- Multi Person detection
- Dark background

7.3 SCOPE

The scope of this project can be extended by adding the following features into it:-

- Social distancing
- Oxygen level

CHAPTER 8

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Appendices

i. Base Paper(s) :-

ii. Plagiarism Report

Curiginal

Document Information

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Sources included in the report

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W	URL: https://pyimagesearch.com/2020/05/04/covid-19-face-mask-detector-with-opencv-keras-tensorflow-and-deep-learning/ Fetched: 2022-05-17T10:28:49.2900000	7
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W	URL: https://pesquisa.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/pt/covidwho-1351657 Fetched: 2022-05-17T10:28:30.0300000	1

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iii. Review Sheets (Checklist and Student Performance Evaluation of each review)
iv. Monthly Planning Sheet
v. Details of project achievements with proofs
    a. Published Research Paper
    b. Certificates of project competitions
    c. Patent details