

A PROJECT REPORT ON

IoT-Based Face Detection and Lighting Control (Raspberry Pi)

ABSTRACT

India, a land with immense population, implying enormous amount of energy and resources. But, with this enormous energy and resources, comes a major drawback that is WASTAGE. India has been blessed with enormous energies like Hydro Energy, Wind Energy and the most important and abundantly used, ELECTRICITY. As much as electricity is used in the huge sub-continent, it is also immensely wasted in unnecessary tasks. According to a Times of India News Article, nearly 5 Billion Units of Electricity is wasted yearly in Delhi alone. One such reason for electricity wastage is leaving lights, appliances, switches and other electric devices on unnecessarily. This reason alone accounts for about 30% of all Electricity Wastages in India.

To overcome this problem, we have created a Smart Supply System which is an IoT Device that is directly connected to the Main Electricity Board and is based on a Raspberry Pi Micro-Controller and has a Camera that detects the presence of a person in a room. When the camera detects that the room is Empty, the device automatically cuts the power connection of that specific room only. This process of detection using the camera happens with the help of Artificial Intelligence.

Moreover, we have added an extra Module to this IoT Device. Our device is capable of not just Detection, but also Recognition of a person's face. This Recognition feature is used to mark attendance of students in schools/colleges. We have used Machine Learning Algorithms to make our device capable of Recognition.

ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from many people and we are extremely privileged to have got this all along the completion of my project. All that we have done is only due to such supervision and assistance and we would not forget to thank them. A special gratitude. We respect and thank Mrs. *KIRTI BHATT* for providing us an opportunity to do the project under them and giving us all the support, guidance and also showing keen interest on our project which made us complete the project duly, We also thank them for guiding us all along till the completion of our project by providing all the necessary information for developing the system.

We would like to express our gratitude towards our parents and teachers for their kind co-operation and encouragement which helped us in completion of this project. We also thank the non-teaching staff of the college for their support. Lastly, we give ourselves credit and acknowledgement for the successful completion of the project.

Signature

Name:- farzan bulsara

Table of contents

Chapter 1: Introduction

1.1 Background	8
1.2 Objective	9
1.3 Purpose, Scope, Applicability & Achievements	9
1.3.1 Purpose	9-10
1.3.2 Scope	10
1.3.3 Applicability	10
1.3.4 Achievement	10-11
1.4 Survey	11-12

Chapter 2: Feasibility Study

2.1 Technical Study	13
2.1.1 Front-End	13
2.1.2 Back end	14
2.2 Survey of Technologies	14
2.2.1 Hardware	14
2.2.2 Software	18
2.3 Operational Feasibility	18
2.4 Economic Feasibility	18

Chapter 3: Problem Definition

3.1 Planning & Scheduling	20
3.2 Requirements	21
3.2.1 Software Requirements	21
3.2.2 Hardware Requirements	21
3.3 Conceptual Models	24
3.3.1 ER Diagram	24
3.3.2 Use Case Diagram	25
3.3.3 Activity Diagram	26
3.3.4 Sequence Diagram	27
3.3.5 Data Flow Diagram	28
3.3.6 Block Diagram	30
3.3.7 Circuit Diagram	31

Chapter 4: System Design

4.1 Work Breakdown Structure	32
4.2 Algorithm	33
4.3 Data Dictionary	36
4.4 Security Issues	37
4.4.1 Software Security Issues	37
4.4.2 Hardware Security Issues	37
4.5 Screen Designing	37
4.5.1 Raspbian OS	38

Chapter 5: Testing

5.1 Testing result	39
5.2 Implementation Approaches	40
5.3 Coding details & Code Efficiency	41
5.3.1 Coding Details	41
5.3.2 Code Efficiency	41
5.4 CODE & Output	42

Chapter 6: Cost Analysis

6.1 Cost Benefit Analysis	47
6.2 Cost Evaluation Component Cost	48
6.3 Analysis, Design & Coding Cost	48

Chapter 7: Conclusion

7.1 Conclusion	49
7.1.1 Significance of the System	49
7.1.2 Limitations	49
7.2 Future Scope	49

Chapter 8: Reference

8.1 References	50
----------------	----

Chapter 1

Introduction

1.1 : Background

India is a densely populated country with a huge area and an enormous population. Every country has a fundamental need for resources, these resources can be of various kinds, it could be Wind, Heat, Hydro, Solar and the most pivotal kind, ELECTRICITY. Electricity is a resource which is most abundantly used among all other resources. It is a highly essential and pivotal need for any country as Light is a basic necessity for all households.

India has been blessed with this resource of Electricity despite shortage or absence of electricity in some parts of India. India is the third largest producer of electricity in the world. The national electric grid in India has an installed capacity of 403.759 GW.

Despite being the largest producer and consumer of electricity, India does not efficiently consume electricity. It is very often in India that electricity is abundant in several households but it is not used properly and as a result is wasted. Approximately Three billion units of electricity is wasted in a single year in India, which can easily provide necessary electricity and power to a small-sized country. The reason behind this enormous wastage of electricity is the ignorance of people. There are several reasons but one of the main reasons is, USING ELECTRICITY EVEN WHEN IT IS NOT NECESSARY.

People leave their appliances, chargers, devices, heavy load machines and many more electricity consuming devices ON even when they are not in use. This accounts for around 60% of total electricity wastage each year. These problems arise even in schools and colleges where students do not turn off the appliances in use like AC, fans, projectors etc. This poses huge utility bills for institutions to pay.

With the growing interest and scope of IoT, To overcome and rise from this huge problem of electricity wastage, we have built an IoT

device, a system, that is capable of controlling this problem by automatically switching all the devices and appliances off when it is not in use. The humongous wastage of 3 Billion units of electricity in a year is alarming and has led us to create such a device that can considerably reduce this number.

Moreover, marking attendance of students has always been a hectic task at schools, colleges and other educational institutes. Teacher's have to deal with several problems while taking attendance. And with the Gen-Z generation of today's students who are extremely clever and mischievous, teachers tend to make mistakes. Today's students use various cunning methods to mark their attendance and not attend lectures. To overcome this problem, our device can also mark attendance of students along with controlling the electricity.

1.2 : Objectives

The objectives we have in our project are that we want to create something which is helpful and can be used all over the world at the same time also at must be cost efficient and affordable to everyone. We aim to build this device for our college so that there can be no wastage of electricity. We also intend to take our device forward in helping to reduce the wastage of power in our country. Our country is placed at the top in terms of Electricity wastage, we believe our device is capable of saving billions of units of electricity if it is properly used.

1.3 : Purpose, Scope, Applicability And Achievements

1.3.1: Purpose

The main purpose of this project is to build an IoT device which is based on a Raspberry Pi Microcontroller. This device will be able to detect the presence of a person in a room and if it detects the room to be empty, the device co-ordinates with the Main Power Source and

automatically switches all the electric devices like ACs and fans in use.

We have built this device for our college as we believe in a huge college like ours, it is a hectic task to control and monitor the usage of all devices in the college. We further intend to take this device forward as a product that can be used in all institutes, households and industries.

1.3.2 : Scope

This project is useful to overlook large rooms equipped with many ACs , fans , projectors and other electric devices. We can control the electricity in a particular room and turn the power off whenever the electric devices in that room are not in use or the room is empty. Moreover, for professors, the device is capable of recognizing faces and marking attendance as well, the attendance sheet is generated in an excel sheet and the attendance is marked in real-time on our Windows Application which teacher's can use for monitoring attendance.

1.3.3 : Applicability

Our device is applicable anywhere where electricity is in use as electricity is everywhere. Anyone can use this device at their homes, colleges, offices and anywhere electricity is in use.

But this device is mainly designed for Schools /colleges and Offices as it has an extra feature to mark attendance of students and employees.

1.3.4 : Achievements

The students performing this project have Achieved numerous skills and knowledge. We have learned:

- How to operate a Raspberry Pi Microcontroller. ☐
Programming on Raspberry Pi ☐ Working with electricity mains.
- How to use Relays.
- Artificial Intelligence for detection of a person. (For Electricity Function)
- Deep Learning and Machine Learning for facial recognition. (For attendance)

1.4 : Survey

Q1. Have you ever seen an Electricity Board?

YES ☐

NO ☐

Q2. Do you know how it operates?

YES ☐

NO ☐

Q3. Do you know what Electricity is used for?

YES ☐

NO ☐

Q4. Are you aware of the system used to control the flow of Electricity?

YES ☐

NO ☐

Q5. Have you heard about IOT based Smart Supply and Attendance System?

YES ☐

NO ☐

Q6. Do you think it will help in the prevention of electricity wastage?

YES ☐

NO ☐

Q7. Do you think the system will help in the economy of a country?

YES ☐

NO ☐

Q8. Do you think the government should use the system?

YES ☐

NO ☐

Q9. Do you think the machine should be operated manually or automatically by a computer?

YES ☐

NO ☐

Chapter 2

Feasibility Study

2.1 : Technological Study

2.1.1 : Front End

Raspberry Pi Camera Module

The Raspberry Pi Camera module is among the main components which is essential for Person Detection for Supply Automation and also Facial Recognition for Attendance.

Windows Application

The Windows app is another essential prospect which will generate, store and display the attendance of the students.

Relay

A Relay is used in this project in order to merge the Electricity Mains of a particular room to the Device.

LED

To demonstrate the output and functionality of the device.

Resistor

To prevent damage to the device by high voltage.

2.1.2 : Back End

Raspberry Pi 4 Model B

The chief agent around which the whole project revolves is this device. It is the main Core of this project. It powers the device and

makes it capable of performing the functions the device is said to perform.

2.2 : Survey Of Technology

2.2.1 : Hardware

Raspberry Pi is the name of a series of single-board computers made by the Raspberry Pi Foundation, a UK charity that aims to educate people in computing and create easier access to computing education. The Raspberry Pi is a very cheap computer that runs Linux, but it also provides a set of GPIO (general purpose input/output) pins, allowing you to control electronic components for physical computing and explore the Internet of Things (IoT). The Raspberry Pi operates in the open source ecosystem: it runs Linux (a variety of distributions), and its main supported operating system, Pi OS, is open source and runs a suite of open source software. The Raspberry Pi launched in 2012, and there have been several iterations and variations released since then. The original Pi had a single-core 700MHz CPU and just 256MB RAM, and the latest model has a quad-core CPU clocking in at over 1.5GHz, and 4GB RAM. We are using Raspberry Pi 4 (8GB RAM) for this project.

The Raspberry Pi 4 features the following Specifications:-

- Broadcom BCM2711, Quad core Microcontroller.□
- 8GB RAM□
- 40 GPIO Pins.□
- 1.5 GHz Clock Frequency.□
- Gigabit Ethernet□
- 2 USB 3.0 ports; 2 USB 2.0 ports.□
- 2 × micro-HDMI ports (up to 4kp60 supported)□
- 2-lane MIPI DSI display port□
- 2-lane MIPI CSI camera port□

- 4-pole stereo audio and composite video port□
- Micro-SD card slot for loading operating system and data storage□
- 5V DC via USB-C connector (minimum 3A*)□
- 5V DC via GPIO header (minimum 3A*)□
- Power over Ethernet (PoE) enabled (requires separate PoE HAT)□
- Operating temperature: 0 – 50 degrees C ambient□

Raspberry Pi runs on the Raspberry Pi OS (formerly known as Raspbian OS). Raspberry Pi Imager is the quick and easy way to install the Raspberry Pi OS.

The Raspberry Pi 4 Model has the following pins:-

- **26 GPIO Pins:** These are the General Purpose Input Output Pins.□
- **2x 5V Pins:** The 5V pins are used to output the 5V power supply provided by the Type-C port. The pins are numbered 2 and 4 on the Raspberry Pi 4 device.□
- **2x 3.3V Pins:** The 3.3V pins provide a 3.3V power supply to the external components, numbered 1 and 17.□
- **8x Ground Pins:** The ground pins are used to close the electric circuits. The ground pins help you to protect your board from burning and play an important part in a circuit. The ground pins are numbered 6,9,14,20,25,30,34 and 39.□
- **2x Reserved Pins:** These pins are used to perform communication between I2C and EEPROM. If you are new to Raspberry Pi, you are advised not to connect anything with these pins, which are 27 and 28 number pins.□

RASPBERRY PI 4 MODEL B



2.2.2 : Software

Raspberry Pi OS / Raspbian OS:

Raspberry Pi OS (formerly Raspbian) is a Debian-based operating system for Raspberry Pi. Since 2013, it has been officially provided by the Raspberry Pi Foundation as the primary operating system for the Raspberry Pi family of compact single-board computers.

Raspberry Pi OS was first developed by Mike Thompson and Peter Green as Raspbian, an independent and unofficial port of Debian to the Raspberry Pi. The first build was released on July 15, 2012. As the Raspberry Pi had no officially provided operating system at the time, the Raspberry Pi Foundation decided to build off of the work done by the Raspbian project and began producing and releasing their own version of the software. The Foundation's first release of Raspbian, which now referred both to the community project as well as the official operating system, was announced on September 10th, 2013

2.2.3 : Operational Feasibility

- It is cheap
- It comes with an open supply hardware feature that permits users to develop their own kit □ For beginners, it is very simple to use.

2.2.4 : Economic Feasibility

COCOMO model

The Constructive Cost Model is a procedural software cost estimation model developed by Barry W. Boehm. This application derives the COCOMO software engineering metric as found in *Robert Pressman's "Software Engineering, A Practitioner's Approach"*, (McGraw-Hill, 97). The specific version utilized here is the "basic" model. Purpose:

The purpose of this site is to help the end user making an estimate using the COCOMO model and verify the same.

Instructions:

- Enter the lines of code in KLOC as per the type of the project and estimated lines of code.
- The result in the below table shows different values of Effort, Duration, and Staffing based on the type of the project.
- The values of a, b, c, d are also shown in the table.

Organic: Relatively small, simple software projects in which small teams with good application experience work to a set of less than rigid requirements.

Semi-Detached: An intermediate, (in size and complexity), a software project in which teams with mixed experience levels must meet a mix of rigid and less than rigid requirements.

Embedded: A software project that must be developed within a set of tight hardware, software and operation constraints.

Effort = $a \cdot \text{loc}^b$

Duration = $c \cdot \text{effort}^d$

Staffing = effort/duration

KLOC=0.6

Effort= $2.4 \cdot 0.6^{1.05}$

= 1.40

Duration= $2.5 \cdot 1.40^{0.38} = 2.84$

Staffing= $1.40/2.84 = 0.49$

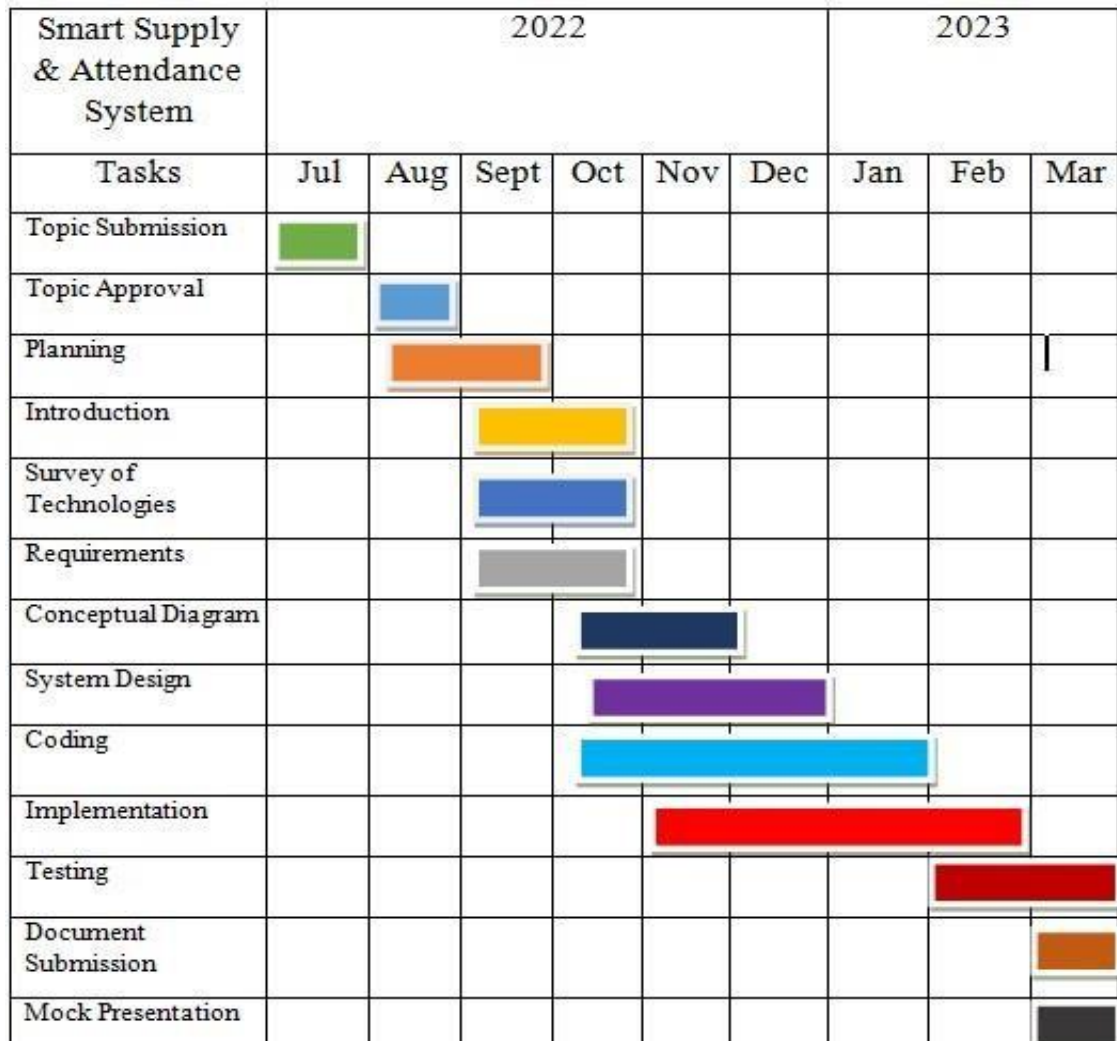
Chapter 3

Problem Definition

3.1 : Planning and Scheduling

Gantt Chart:

A Gantt chart, or harmonogram, is a type of bar chart that illustrates a project schedule. This chart lists the tasks to be performed on the vertical axis, and time intervals on the horizontal axis. The width of the horizontal bars in the graph shows the duration of each activity.



3.2 : Software & Hardware Requirements

3.2.1 : Software

Raspberry Pi OS / Raspbian OS

The Raspberry Pi comes with an in-built OS which we have to install while configuring the Raspberry Pi. You shall require an SD Card for installing the Raspberry Pi OS on your Raspberry Pi device. You can simply install the Raspberry Pi OS in your SD card that is attached in your Raspberry Pi Device and you are ready to go.

3.2.2 : Hardware

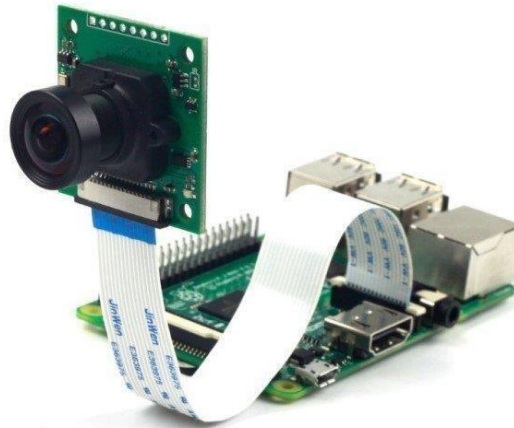
Raspberry Pi 4 Model B (8GB)

The Raspberry Pi 4 Model B is among the most advanced devices of all the Raspberry Pi devices. It comes with the Broadcom BCM2711 Processor.



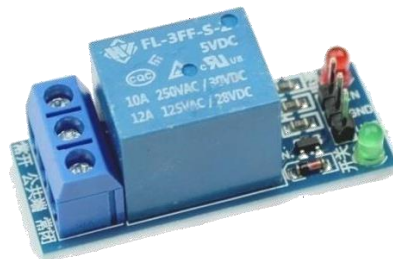
Raspberry Pi Camera Module

The Raspberry Pi Camera Module is used in order to Detect the presence of a person in a room and along with that, it is also capable of Recognizing registered faces for marking attendance.



Relay

A Relay is a simple electromechanical switch. While we use normal switches to close or open a circuit manually, a Relay is also a switch that connects or disconnects two circuits. But instead of a manual operation, a relay uses an electrical signal to control an electromagnet, which in turn connects or disconnects another circuit.



LED

An LED is used in this project in order to demonstrate the functionality of the device. The LED will turn off when the device detects the room to be empty and the LED shall keep glowing if the device detects the presence of a person.



Resistor

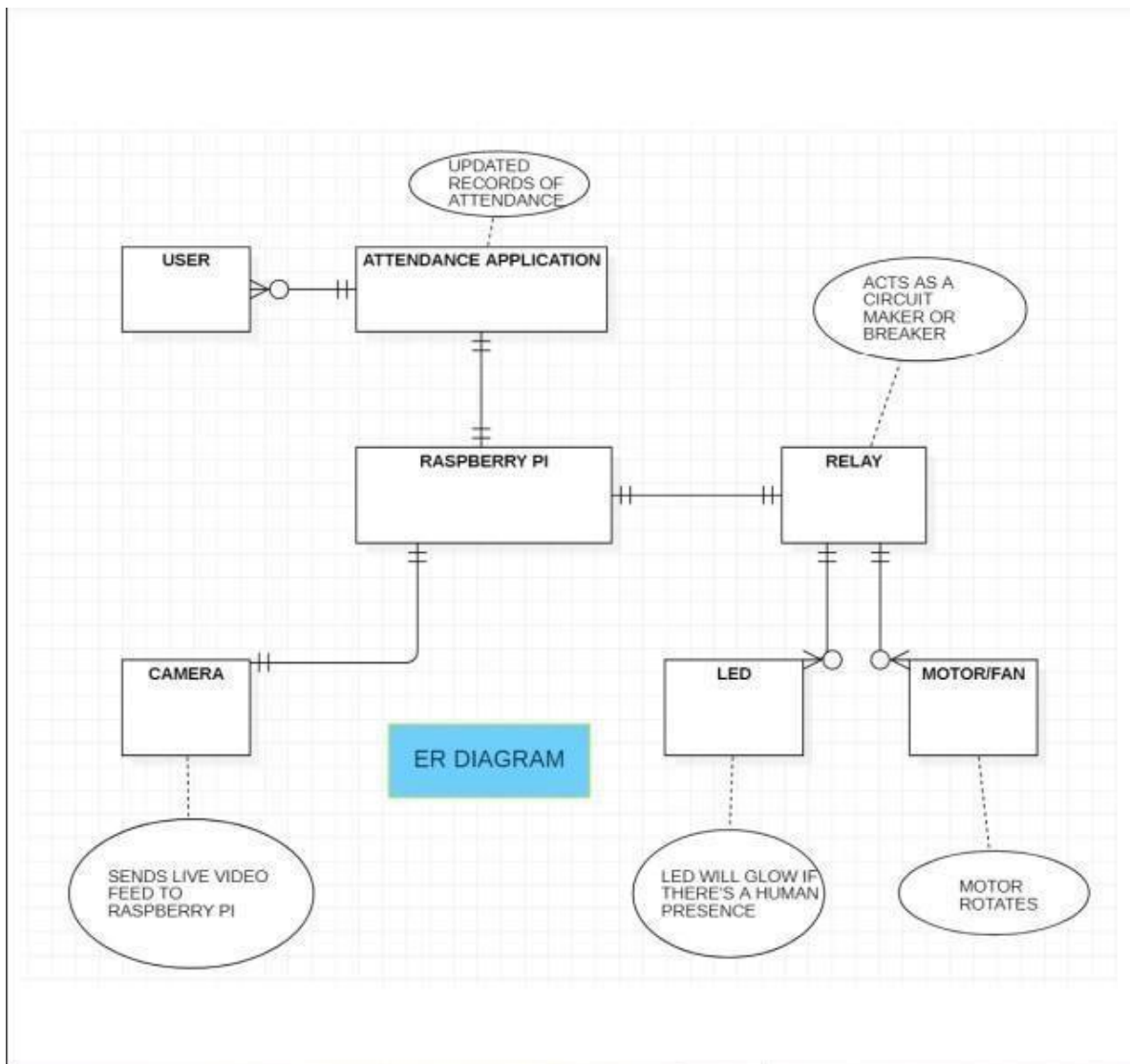
A resistor is used in order to prevent damage to the device by excess current.



3.3 : Conceptual Diagrams

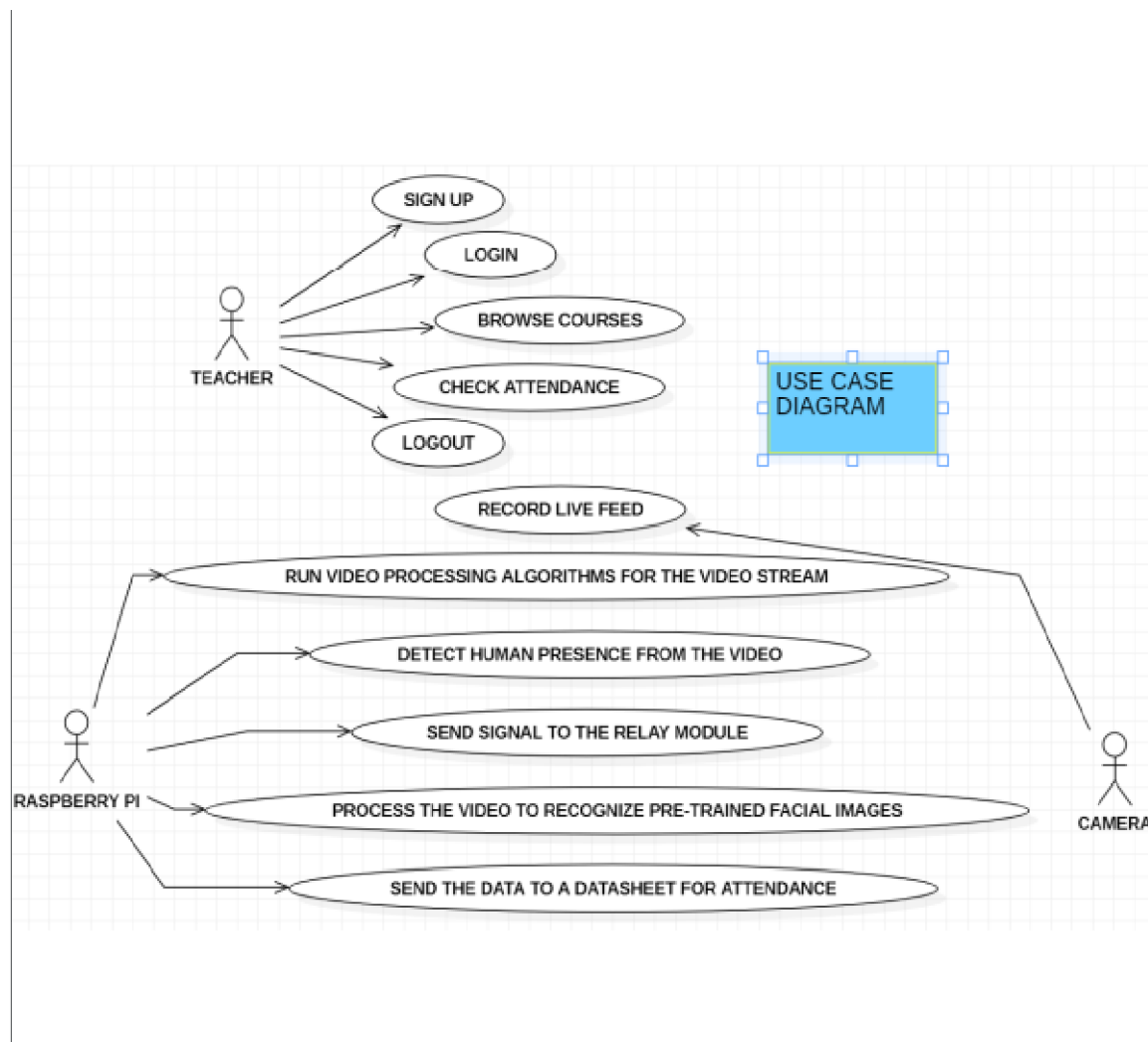
3.3.1 : ER Diagram

The ER model is a high-level data model diagram. ER diagrams are a visual tool which is helpful to represent the ER model. Entity relationship diagram displays the relationships of entity set stored in a database.



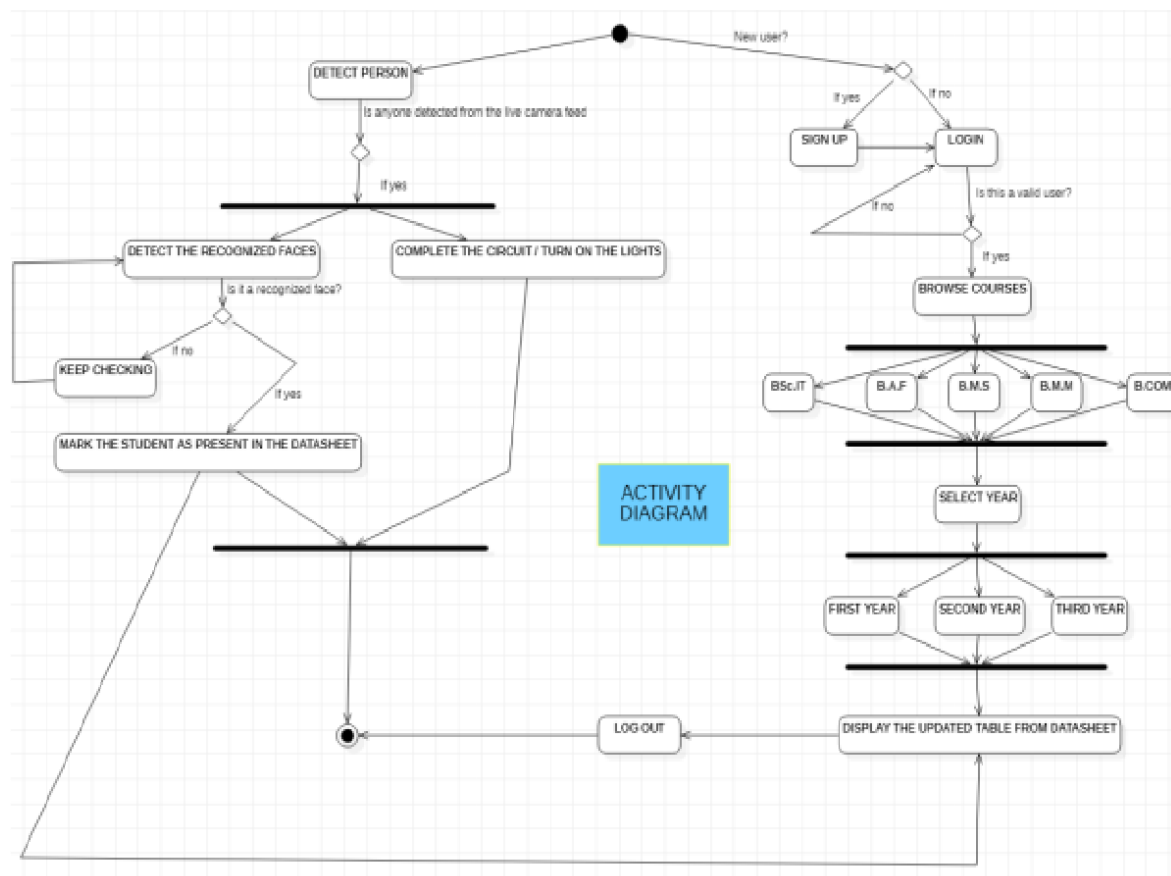
3.3.2 Use Case Diagram

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved.



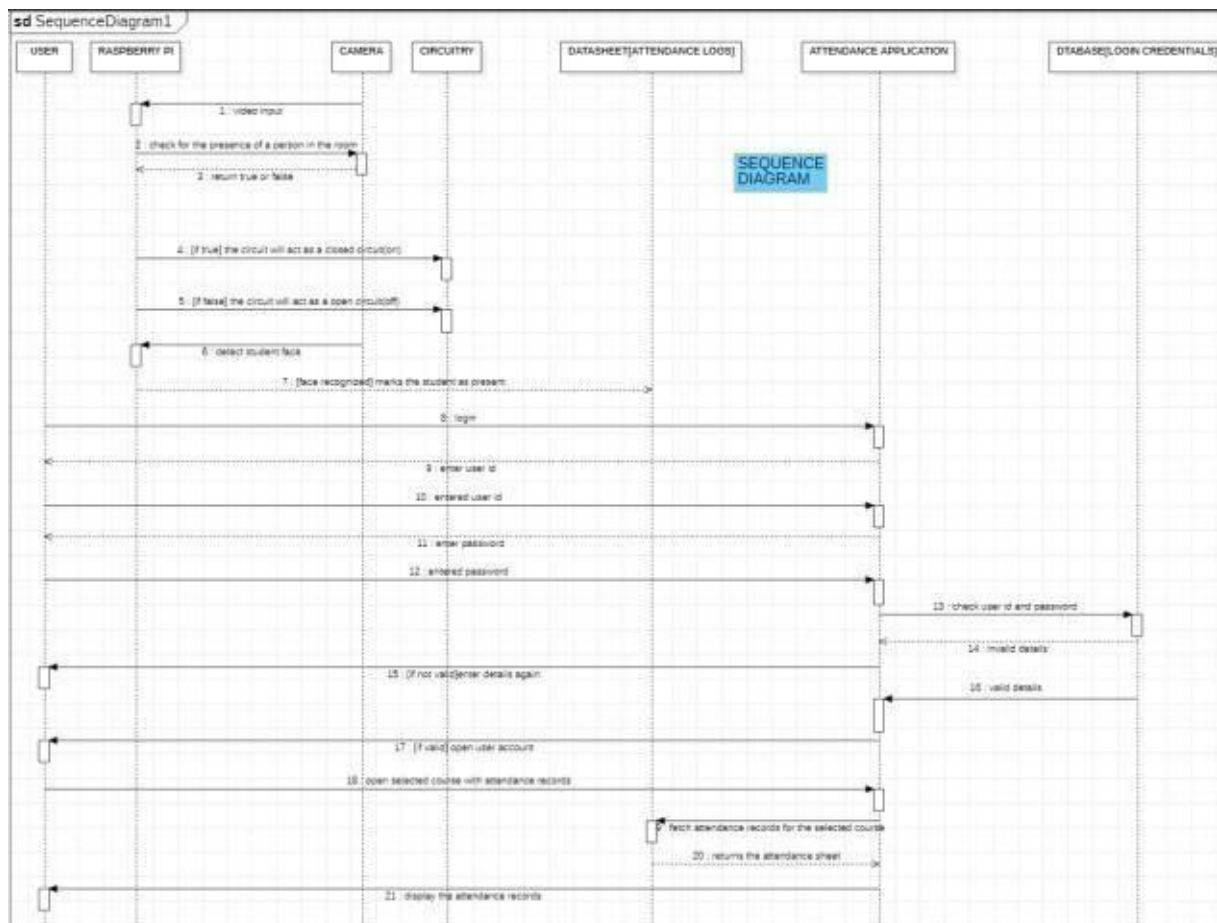
3.3.3 : Activity Diagram

Activity diagram is another important diagram in UML to describe the dynamic aspects of the system. Activity diagram is basically a flowchart to represent the flow from one activity to another activity.



3.3.4 Sequence Diagram

A sequence diagram simply depicts interaction between objects in a sequential order i.e. the order in which these interactions take place. We can also use the terms event diagrams or event scenarios to refer to a sequence diagram.

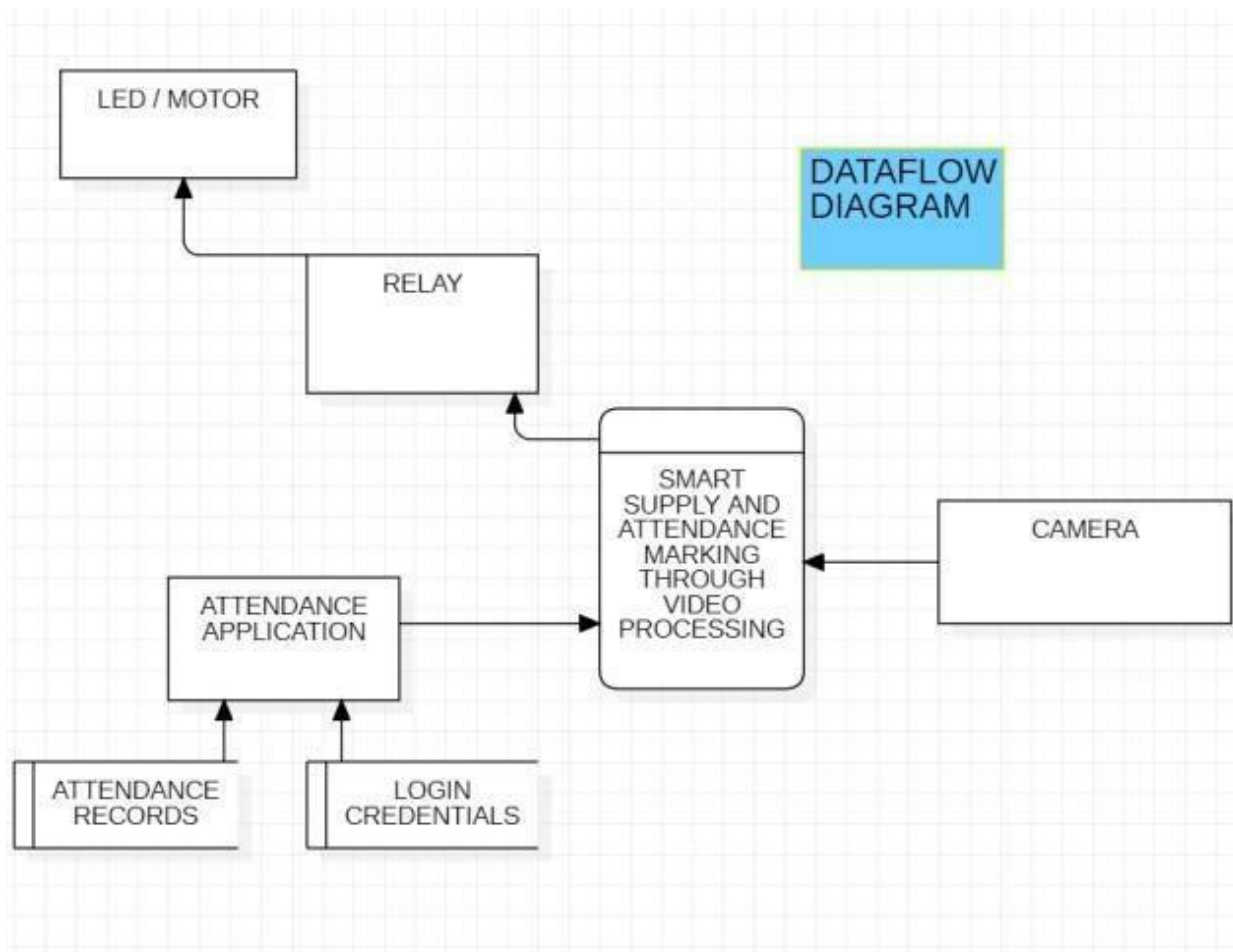


3.3.5 : Dataflow Diagram

A Dataflow Diagram is a type of diagram that represents a workflow or process. A Dataflow Diagram can also be defined as a

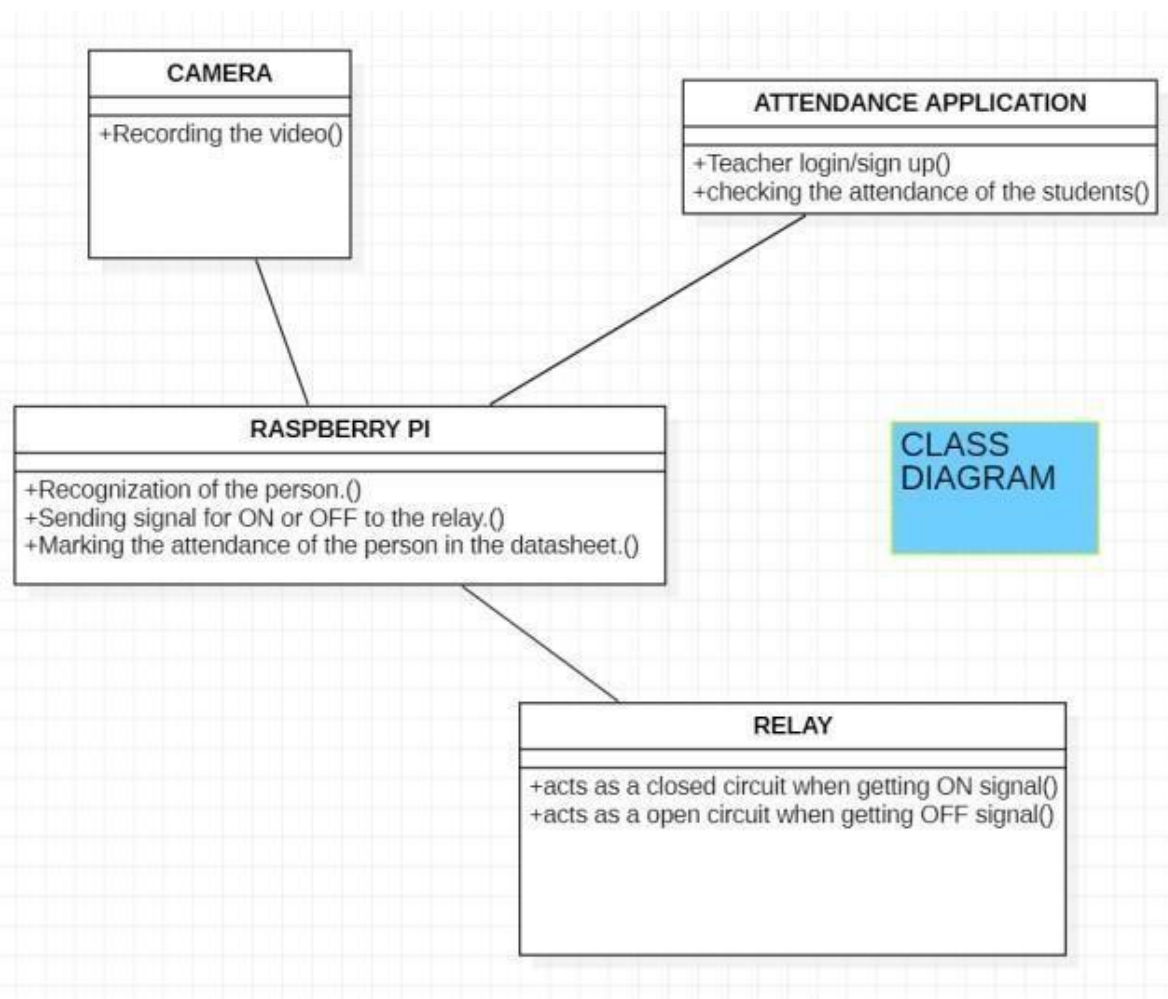
:

diagrammatic representation of an algorithm, a step-by-step approach to solving a task.



3.3.6 Class Diagram

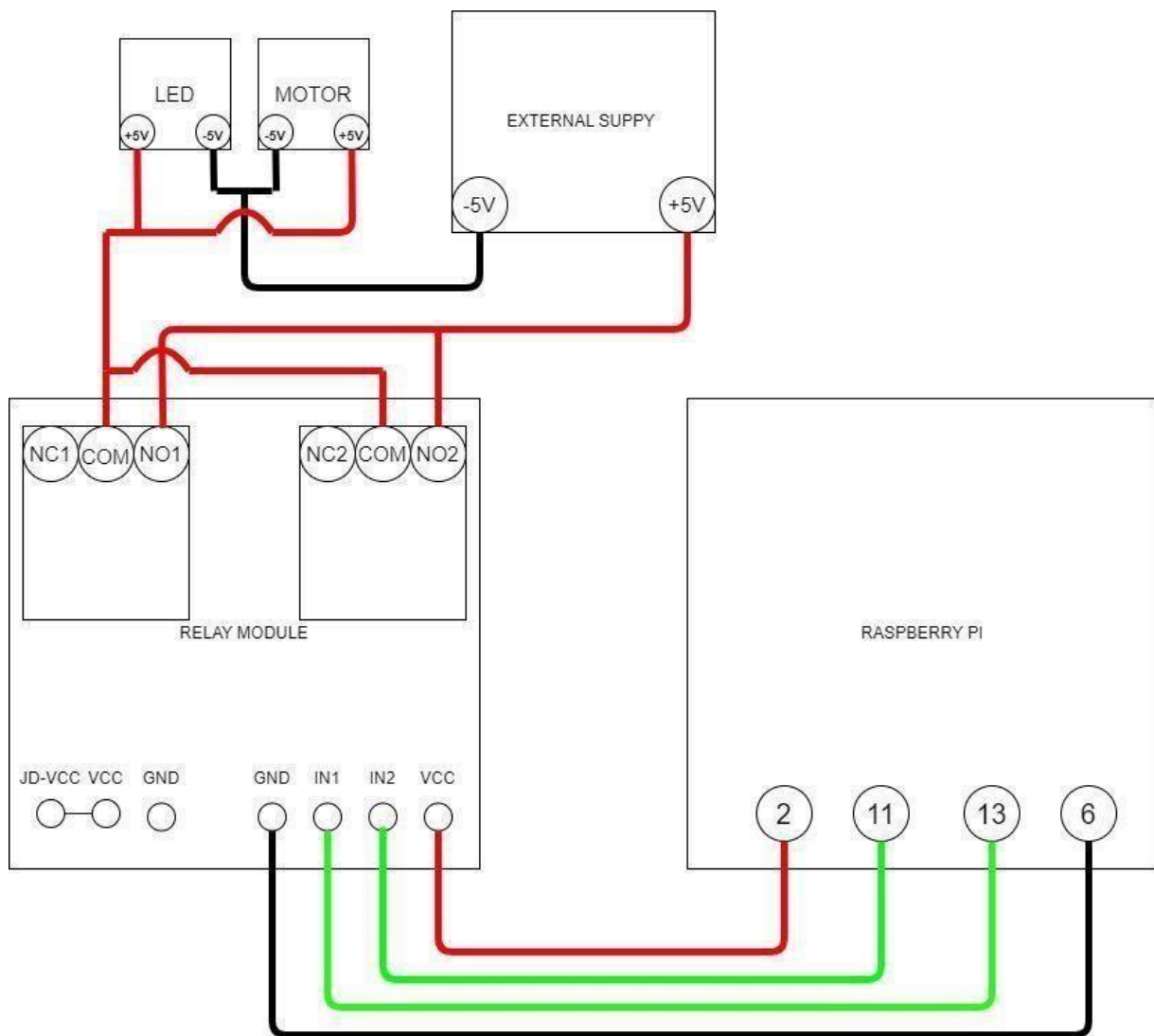
The class diagram depicts a static view of an application. It represents the types of objects residing in the system and the relationships between them. A class consists of its objects, and also it may inherit from other classes. A class diagram is used to visualize, describe, document various different aspects of the system, and also construct executable software code.



:

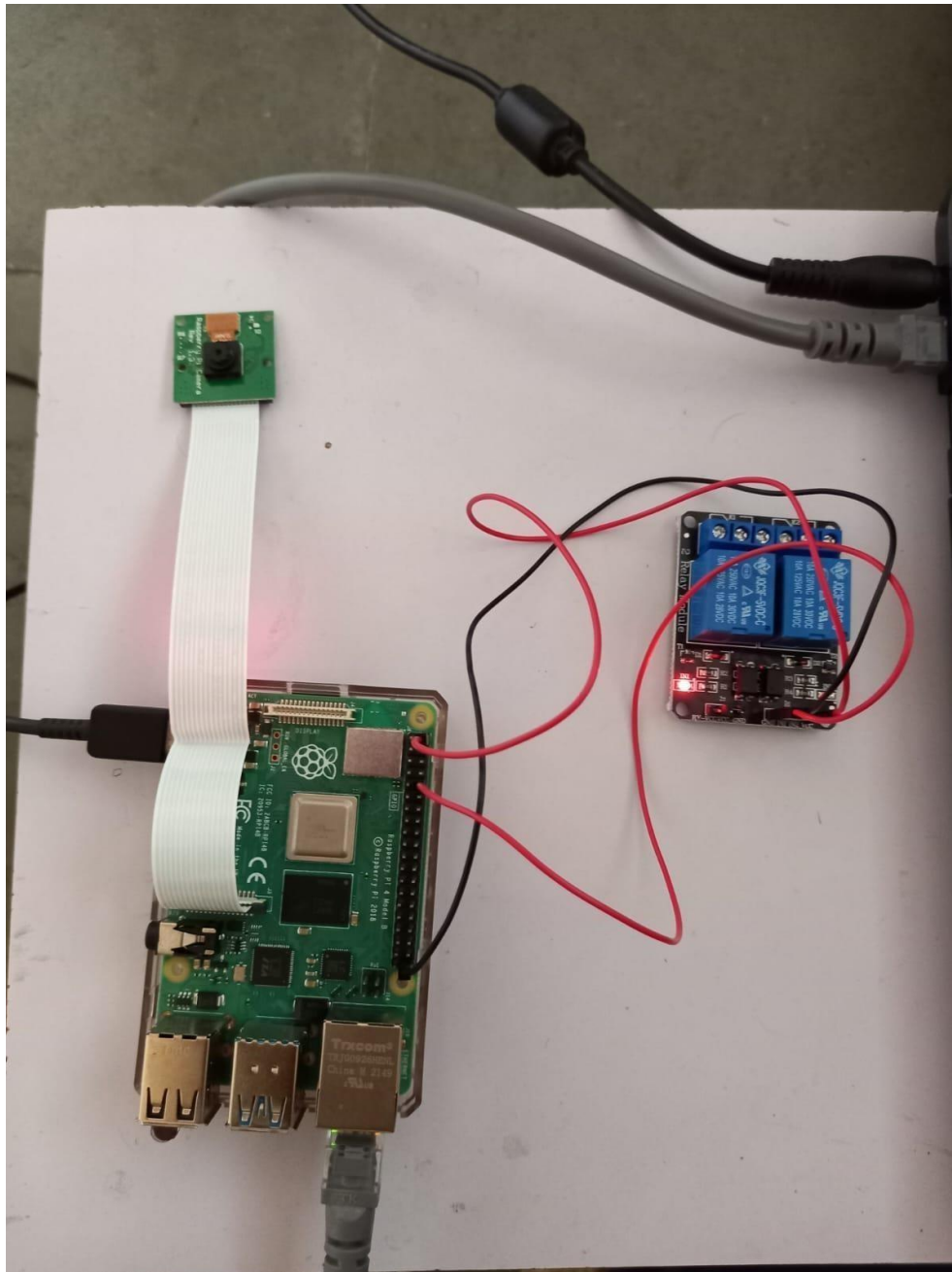
3.3.7 Block Diagram

A block diagram is a diagram of a system in which the principal parts or functions are represented by blocks connected by lines that show the relationships of the blocks. They are heavily used in engineering in hardware design, electronic design, software design, and process flow diagrams.



3.3.8 Circuit Diagram

A circuit diagram (also known as an electrical diagram, elementary diagram, or electronic schematic) is a simplified conventional graphical representation of an electrical circuit.



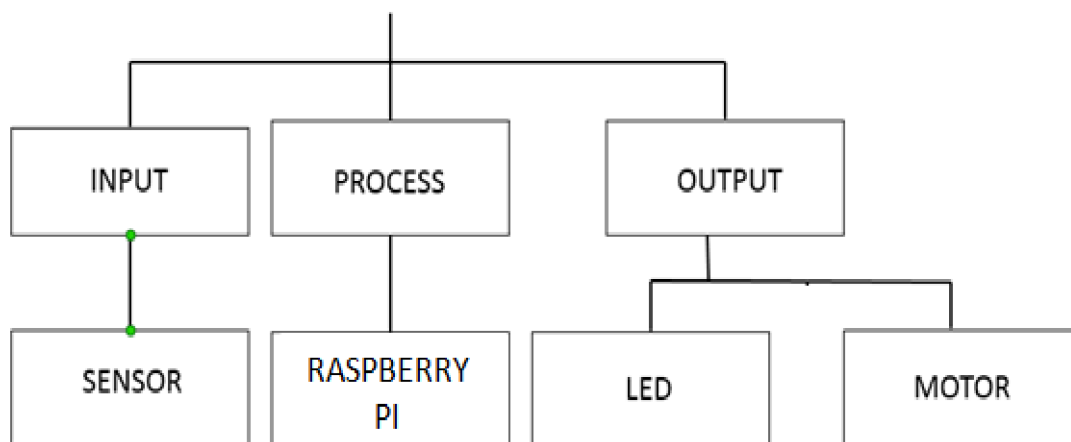
Chapter 4

SYSTEM DESIGN

4.1 : Work Breakdown Structure

A work-breakdown structure (WBS) in project management and systems engineering, is a deliverable-oriented breakdown of a project into smaller components. A work breakdown structure is a key project deliverable that organizes the team's work into manageable sections. The Project Management Body of Knowledge (PMBOK 5) defines the work-breakdown structure "A hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables". A work-breakdown structure element may be a product, data, service, or any combination thereof. A WBS also provides the necessary framework for detailed cost estimating and control along with providing guidance for schedule development and control.

WORK BREAKDOWN STRUCTURE



4.2 : Algorithm

```
import cv2
import RPi.GPIO as GPIO
import time
import glob
import face_recognition
import numpy as np
from datetime import datetime
from datetime import date
import mysql.connector
import os

GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False) #
Set up the relay module
relay_pin=21,26
GPIO.setup(relay_pin, GPIO.OUT)

FONT=cv2.FONT_HERSHEY_COMPLEX
images=[]
names=[]
today = date.today()
now = datetime.now()
dtString = now.strftime("%H:%M:%P")
path = "/home/sahil/projectend/image/*.*)"
for file in glob.glob(path):
    image = cv2.imread(file)
    a=os.path.basename(file)
    b=os.path.splitext(a)[0]
    names.append(b)
    images.append(image)

def encoding1(images):
    encode=[]

    for img in images:
        unk_encoding = face_recognition.face_encodings(img)[0]
        encode.append(unk_encoding)
```

```

return encode

encodelist=encoding1(images) def
mysqladddata(names):      mydb =
mysql.connector.connect(
    host= "192.168.1.106",
    user="Finalc",
    password="madangle@7788",
    database="attendance"

)

    a = mydb.cursor()
    sql = ("INSERT IGNORE INTO detected(SNAME,TIMING,RDATE)
VALUE(%s,%s,%s)")
    data=(names,dtString,today)

    a.execute(sql,data)

    mydb.commit()
    mydb.close()

cap =cv2.VideoCapture(0)
#width  = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
#height = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT)) while
True:
    ret,frame=cap.read()
    frame1=cv2.resize(frame,(0,0),None,0.25,0.25)
    face_locations = face_recognition.face_locations(frame1)
    curframe_encoding =
    face_recognition.face_encodings(frame1,face_locations)
    face_detected = False      for encodeface,facelocation in
zip(curframe_encoding,face_locations):          face_detected = True

```

```

        results = face_recognition.compare_faces(encodelist, encodeface)
distance= face_recognition.face_distance(encodelist, encodeface)
match_index=np.argmin(distance)      name=names[match_index]
mysqladddata(name)      x1,y1,x2,y2=facelocation
x1,y1,x2,y2=x1*4,y1*4,x2*4,y2*4
        cv2.rectangle(frame,(y1,x1),(y2,x2),(0,0,255),3)
cv2.putText(frame,name,(y2+6,x2-
6),cv2.FONT_HERSHEY_COMPLEX,1,(255,0,255),2)
        # Turn on the relay module when a face is detected
        GPIO.output(relay_pin, GPIO.HIGH)
        print("Relay on")
if not face_detected:
        # Turn off the relay module when no face is detected
        GPIO.output(relay_pin, GPIO.LOW)
print("Relay off")

        cv2.imshow("FRAME",frame)
if cv2.waitKey(1)&0xFF==27:
        break cap.release()
GPIO.cleanup() cv2.destroyAllWindows()

```


4.3 : Data Dictionary

A data dictionary is a file or a set of files that contains a database's metadata. The data dictionary contains records about other objects in the database, such as data ownership, data relationships to other objects, and other data. The data dictionary is a crucial component of any relational database.

Attribute Name	Data Type	Max Field Size	Description	Format
ROLLNO	INT	11	Roll Number of the individual students	Integers , E.g. : 2021505,20215014 etc.
SNAME	VARCHAR	100	Name of the student	Variable length String , E.g. : "Max"
TIMING	TIME	Not Defined	Timing recorded of the student entering the room	Time : hh:mm:ss, E.g. : 12:50:00
RDATE	DATE	Not Defined	Date for which the attendance is recorded	Date : YY-MMDD, E.g. : 23-04-12
EMAIL	VARCHAR	100	Email entered during the registration for the application	Variable length String , E.g. : "xyz@gmail.com"
USERNAME	VARCHAR	100	Username entered during the registration for the application	Variable length String , E.g. : "xyz"
PASSWORD	VARCHAR	100	Password entered during the registration for the application	Variable length String , E.g. : "max123"
CONF_PASSWORD	VARCHAR	100	Conformation password entered during the registration of the application	Variable length String , E.g. : "max123"
DEPARTMENT	VARCHAR	45	Department in which the student is currently studying in	Variable length String , E.g. : "BSCIT", "BAF" etc.

ACADEMIC YEAR	VARCHAR	45	Academic year of the student	Variable length String , E.g. : "FY", "SY", "TY"
------------------	---------	----	------------------------------	--

4.4 :Security Issues

In this section, we analyze the security of the System against different threat, and how it can counter these threat.

4.4.1 : Software Security Issue

Man-in-the-Middle (MITM) Attack:

A man-in-the-middle (MITM) attack is a common type of cyber security attack that allows a malicious element to insert itself into a conversation between two parties, impersonate both parties, and gain access to information that the two parties are trying to send to each other. To block and prevent the risk of MITM, we rely on TLS to exchange messages over a secure channel.

Broker Hijack:

For whatever reasons, some people and small towns may prefer to use a free public broker; however, using a free public broker comes with a price. It increases the risk of being compromised by malicious hackers. For security, we should use private broker.

4.4.2 :Hardware Security Issue

Network Down:-The network can become offline due to server down or some component that has stopped working.

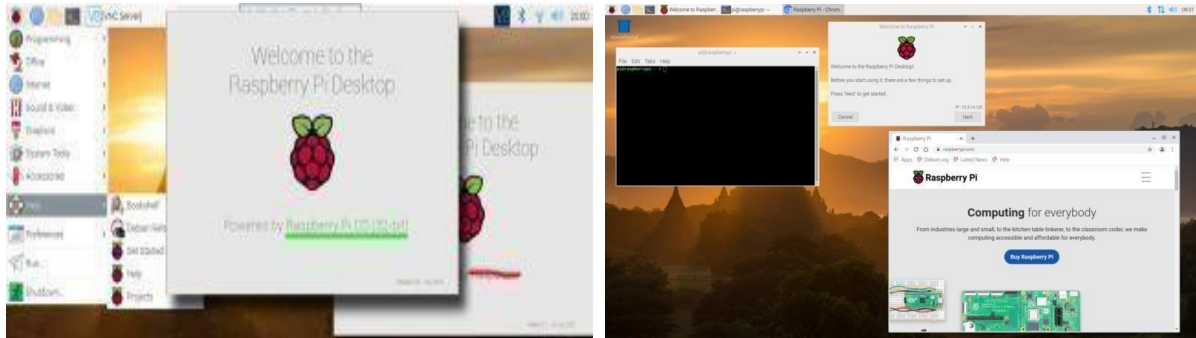
Stolen:-The sensor can be stolen as it is expensive. Even one of the component is stolen, the whole system goes offline.

4.5 : Screen Designing

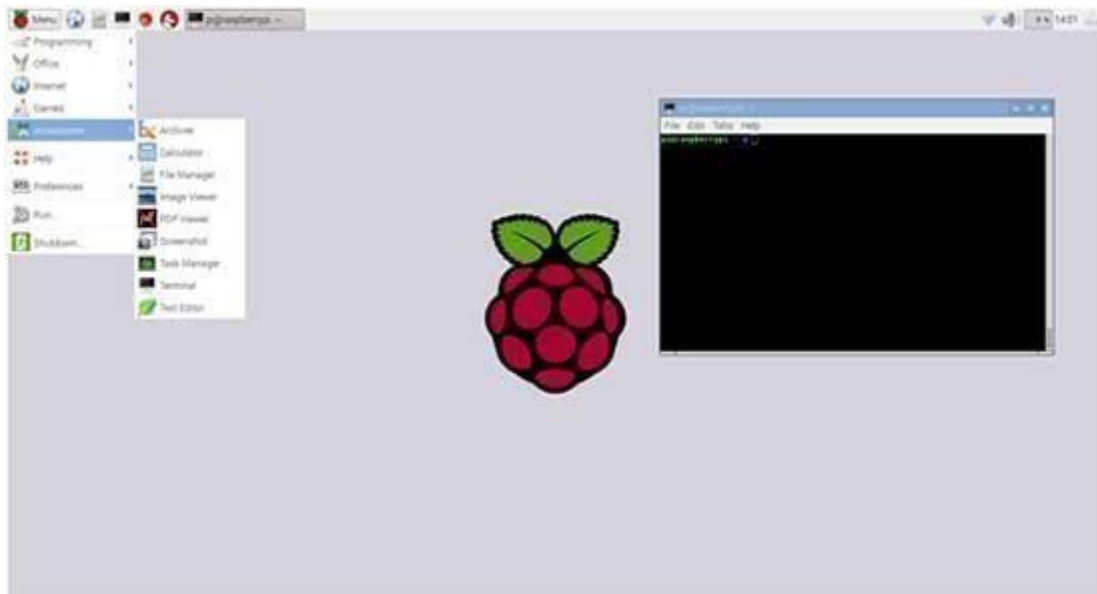
4.5.1 : Raspbian Os/ Raspberry Pi OS

Raspberry Pi OS (formerly Raspbian) is a Debian-based operating system for Raspberry Pi. Since 2013, it has been officially provided

by the Raspberry Pi Foundation as the primary operating system for the Raspberry Pi family of compact single-board computers.



Raspberry Pi OS



Parts of the Raspberry Pi OS

Chapter 5

Testing and Implementation

5.1 : Testing Result

Sr. No.	INPUT	OUTPUT	ACTUAL OUTPUT	TEST PASS/FAIL	RESULTS ACCEPTED?
01	LABELED IMAGE – “maaz.png”	1] DETECTS FACE WITHIN A FRAME LABELED WITH NAME OF THE STUDENT. 2] LED TURNS ON 3] UPDATES THE ATTENDANCE IN THE DATABASE	1] DETECTS FACE WITHIN A FRAME LABELED WITH NAME OF THE STUDENT. 2] LED TURNS ON 3] UPDATES THE ATTENDANCE IN THE DATABASE	PASS	YES
02	LABELED IMAGE – “farzan.png”	1] DETECTS FACE WITHIN A FRAME LABELED WITH NAME OF THE STUDENT. 2] LED TURNS ON 3] UPDATES THE ATTENDANCE IN THE DATABASE	1] DETECTS FACE WITHIN A FRAME LABELED WITH NAME OF THE STUDENT. 2] LED TURNS ON 3] UPDATES THE ATTENDANCE IN THE DATABASE	PASS	YES
03	LABELED IMAGE – “ayaan.png”	1] DETECTS FACE WITHIN A FRAME LABELED WITH NAME OF THE STUDENT. 2] LED TURNS ON 3] UPDATES THE ATTENDANCE IN THE DATABASE	1] DETECTS FACE WITHIN A FRAME LABELED WITH NAME OF THE STUDENT. 2] LED TURNS ON 3] UPDATES THE ATTENDANCE IN THE DATABASE	PASS	YES
04	LABELED IMAGE – “sail.png”	1] DETECTS FACE WITHIN A FRAME LABELED WITH NAME OF THE STUDENT. 2] LED TURNS ON 3] UPDATES THE ATTENDANCE IN THE DATABASE	1] DETECTS FACE WITHIN A FRAME LABELED WITH NAME OF THE STUDENT. 2] LED TURNS ON 3] UPDATES THE ATTENDANCE IN THE DATABASE	PASS	YES

05	GENERATE ATTENDANCE REPORT IN THE APPLICATION THROUGH A BUTTON CLICK	1] DISPLAYS THE ATTENDANCE FOR THE SPECIFIED YEAR AND DEPARTMENT	1] DISPLAYS THE ATTENDANCE FOR THE SPECIFIED YEAR AND DEPARTMENT	PASS	YES
06	DOWNLOAD THE ATTENDANCE REPORT IN EXCEL FORMAT THROUGH A BUTTON CLICK	1] CREATES A .XLSX FILE AND NAMES IT ACCORDING TO THE DEPARTMENT SELECTED AND SAVES IT IN THE CURRENT FOLDER	1] CREATES A .XLSX FILE AND NAMES IT ACCORDING TO THE DEPARTMENT SELECTED AND SAVES IT IN THE CURRENT FOLDER	PASS	YES

5.2: Implementation Approaches:

In the approach towards the implementation of our subsidiary elements of the project we took over the thought of proceeding step by step of definition of our project i.e. planning and standards used to implement.

Step 1: Implementation of Targeted System

Standards used –

- i) Define Goals/Objectives
- ii) Schedule Milestones

Step 2: Implementing the Sketch

Standards used –

- i) Selection of platform for coding ii)
- Defining what to adapt

Step 3: Schematizing the circuitry

Standards used –

- i) study of connection and conversion

Step 4: Assembling of the units

Standards used –

- i) Allocate resources
- ii) Requisite knowledge

Step 5: System Implementation

5.3 Coding Details and Code Efficiency:

5.3.1 Coding Details:

- For establishing connection between the peripheral devices and the Raspberry Pi Microcontroller.
- Sending input to the Raspberry Pi Microcontroller.
- Microcontroller will sense the input and produce the desired output in the form of Student Attendance sheet and also importantly control the electricity supply in a room.

5.3.2 Code Efficiency:

Code efficiency is a broad term used to depict the reliability, speed and programming methodology used in developing codes for an application. Code efficiency is directly linked with algorithmic efficiency and the speed of runtime execution for software. It is the key element in ensuring high performance. The goal of code efficiency is to reduce resource consumption and completion time as much as possible with minimum risk to the business or operating environment. The software product quality can be accessed and evaluated with the help of the efficiency of the code used.

i) Conditional Statement

- Remove unnecessary code or code that goes to redundant processing

ii) Variable Declaration/Notation

- To use the best keywords, data types and variables, and other available programming concepts to implement the related algorithm

iii) Make use of optimal memory and non-volatile storage

- To ensure the best speed or run time for completing the algorithm
- To make use of reusable components wherever possible

iv) Develop programming code that's compliant with the design logic and flow

- To make use of coding practices applicable to the related software

5.3.3 Code: Main.py

```
import cv2 import RPi.GPIO
as GPIO import time import
glob import face_recognition
import numpy as np from
datetime import datetime from
datetime import date import
mysql.connector import os
```

```
GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False) #
Set up the relay module
relay_pin=21,26
GPIO.setup(relay_pin, GPIO.OUT)
```

```
FONT=cv2.FONT_HERSHEY_COMPLEX
images=[] names=[] today = date.today()
now = datetime.now() dtString =
now.strftime("%H:%M:%P") path =
"/home/sahil/projectend/image/*.*" for
file in glob.glob(path): image =
cv2.imread(file)
a=os.path.basename(file)
b=os.path.splitext(a)[0]
names.append(b)
images.append(image)
```

```
def encoding1(images):
    encode=[]

    for img in images:
        unk_encoding = face_recognition.face_encodings(img)[0]
    encode.append(unk_encoding)
    return encode
```

```

encodelist=encoding1(images) def
mysqladddata(names):      mydb =
mysql.connector.connect(
    host= "192.168.1.106",
    user="Finalc",
    password="madangle@7788",
    database="attendance"

)

    a = mydb.cursor()
    sql = ("INSERT IGNORE INTO detected(SNAME,TIMING,RDATE)
VALUE(%s,%s,%s)")
    data=(names,dtString,today)

    a.execute(sql,data)

    mydb.commit()
    mydb.close()

cap =cv2.VideoCapture(0)
#width = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
#height = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT)) while
True:
    ret,frame=cap.read()
    frame1=cv2.resize(frame,(0,0),None,0.25,0.25)
    face_locations = face_recognition.face_locations(frame1)
    curframe_encoding =
    face_recognition.face_encodings(frame1,face_locations)
    face_detected = False    for encodeface,facelocation in
    zip(curframe_encoding,face_locations):
        face_detected = True

```



```

        results = face_recognition.compare_faces(encodelist, encodeface)
distance= face_recognition.face_distance(encodelist, encodeface)
match_index=np.argmin(distance)      name=names[match_index]
mysqladddata(name)      x1,y1,x2,y2=facelocation
x1,y1,x2,y2=x1*4,y1*4,x2*4,y2*4
        cv2.rectangle(frame,(y1,x1),(y2,x2),(0,0,255),3)
cv2.putText(frame,name,(y2+6,x2-
6),cv2.FONT_HERSHEY_COMPLEX,1,(255,0,255),2)
        # Turn on the relay module when a face is detected
        GPIO.output(relay_pin, GPIO.HIGH)
        print("Relay on")
if not face_detected:
        # Turn off the relay module when no face is detected
        GPIO.output(relay_pin, GPIO.LOW)
print("Relay off")

        cv2.imshow("FRAME",frame)
if cv2.waitKey(1)&0xFF==27:
        break
cap.release()
GPIO.cleanup() cv2.destroyAllWindows()

```

createdatabase.py

```

import mysql.connector

mydb = mysql.connector.connect(
host= "192.168.1.106",
user="Finalc",
        password="madangle@7788",
database="attendance"

)
a = mydb.cursor()
#a.execute("CREATE DATABASE source")
#a.execute("CREATE TABLE sample (Date
VARCHAR(30),Student_NAME VARCHAR(255),DateTime

```

```
VARCHAR(255),Roll_No VARCHAR(255), PRIMARY KEY  
(Date,Student_NAME))")
```

```
#sql = "DROP DATABASE source"
```

```
#a.execute(sql) mydb.commit()
```

```
mydb.close()
```

finalsearch.py

```
import mysql.connector
```

```
def mysqlsearch(name):    mydb =
```

```
mysql.connector.connect(
```

```
    host= "192.168.1.106",
```

```
    user="Finalc",
```

```
    password="madangle@7788",
```

```
    database="attendance"
```

```
)
```

```
    a = mydb.cursor()
```

```
    sql1=a.execute("SELECT * from Students WHERE Student_NAME =  
%(name)s", {'name': name})
```

```
    a.execute(sql1)
```

```
checkUsername = a.fetchall()
```

```
    print(*checkUsername, sep = "\n")
```

```
    mydb.commit()
```

```
    mydb.close()
```

```
name=input("Enter Student_Name:-") mysqlsearch(name)
```

Chapter 6

Cost Analysis

6.1. Cost Benefit Analysis:

The main objective behind cost and benefit analysis is to assess the feasibility to determine whether the developed project has a reasonable chance of success.

A requirement of the economic feasibility of the project always requires a through cost/ benefit analysis.

Developing a cost/benefit analysis is a three-step process:-

Step 1: The first step in the process is to estimate the anticipated development and operational costs

- a. Development costs are those that are incurred during the development of the new system. It includes: System Analyst Time, Programmer Time, User Time, Possible hardware cost, possible software purchase cost and Possible outside service cost.
- b. Operational costs are those that will be incurred after the system is put into production. It includes: Computer cost, Communication cost, Operation staff cost, Incremental user cost, Maintenance costs and Server-side applications cost.

Step 2: The second step is to estimate the anticipated financial benefits.

- a. Financial benefits are the expected annual savings or increases in revenue derived from the installation of the new system.

Step 3: In third step, the cost/benefit analysis is calculated based on detailed estimated costs and benefits. The most frequent error in cost/benefit analysis is lack of thorough definition of cost and benefits.

6.2. Cost Evaluation Component Cost :

Bill of Cost

COMPONENTS	PRICE(RS)
Raspberry Pi 4 Model B	10,000
Pi Camera	300
Relay	100
LED	20
Resistor	10
Jumper(M2M)	50
Jumper(M2F)	50
Total	10,530

6.4

Analysis,

Designing And Coding Cost

Number of people working on the project = 4

Number of days worked = 90 Days

Cost per person for per day = 15

Total manpower cost = Number of people * Number of days * Cost per day
 $= 4 * 90 * 15$
 $= 5,400$

Chapter 7

Conclusion

7.1 Conclusion:

7.1.1 Significance Of The System :

- It is easier to understand.
- It performs the same task all the time so there is no need of any hardware changing such as extra memory or space for storage.
- It performs only one task at one time mean it purposed the dedicated task.
- Hardware cost of embedded c systems are usually so much low.
- Automates the hectic task of taking attendance
- Embedded applications are very suitable for industrial purposes.

7.1.2 Limitation:

- Requires a huge database and storage space in order to save data of every student.

7.1.3 Future Scope:

-
- LiDar cameras can be used in order to increase the efficiency of the system.
 - Many more applications can be built using this same technology, like a Door Locking System.

Chapter 8

References

- <https://www.youtube.com/watch?v=-ZyFYniGUsw>
- <https://iotdesignpro.com/projects/raspberry-pi-object-detection-usingtensorflow-and-opencv>
- <https://youtu.be/AO3Z7dBbwRE>
- <https://iotdesignpro.com/projects/raspberry-pi-object-detection-usingtensorflow-and-opencv>
- <https://circuitdigest.com/microcontroller-projects/cctv-motion-detectionwith-alarm-using-opencv-on-raspberry-pi>
- <https://youtu.be/AO3Z7dBbwRE>
- <https://www.kincony.com/download/SMART-Main-Distribution-Boardusing-KC868-H32BS.pdf>