A PROJECT REPORT

ON

Vajra Kaksh

Submitted by
Ritick Sethi
1/18/FET/BEC/019
Sakshi Sharma
1/18/FET/BEC/022
Kuldeep Pandey
1/18/FET/BEC/015

Under the Guidance of
Ms. Prerna Kakkar
Assistant Professor
ECE, MRIIRS

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

Electronics and Communication Engineering

Faculty of Engineering & Technology
Manav Rachna International Institute of Research and Studies, Faridabad

December, 2021


V
Vajra Kaksh
stay safe from virus

Acknowledgement

I/We would like to express our sincere gratitude to our project guide **"Ms. Prerna Kakkar"** for giving us the opportunity to work on this topic. It would never be possible for us to take this project to this level without her innovative ideas and her relentless support and encouragement.

I/We take this opportunity to sincerely thank our Head of Department **"Dr. Abhiruchi Passi"** and our Project Coordinator "**Ms. Prerna Kakkar**", for their help and guidance given by them from time to time throughout the course of this project which shall carry us a long way in the journey of life on which we are about to embark.

Lastly, I/We are highly obliged to the faculty members of Department of Electronics & Communication Engineering, Faculty of Engineering & Technology, Manav Rachna International Institute of Research and Studies, for the valuable suggestions provided by them in their respective fields. We are grateful for their cooperation during the period of the project.

Ritick Sethi	1/18/FET/BEC/019
Sakshi Sharma	1/18/FET/BEC/022
Kuldeep Pandey	1/18/FET/BEC/015

Declaration

I/We hereby declare that this project report entitled "**Vajra Kaksh**" *by* **Ritick Sethi (1/18/FET/BEC/019), Sakshi Sharma(1/18/FET/BEC/022), Kuldeep Pandey (1/18/FET/ BEC/ 015),** being submitted in partial fulfillment of the requirements for the degree of Bachelor of Technology in **Electronics and Communication Engineering** under Faculty of Engineering & Technology of Manav Rachna International Institute of Research and Studies, Faridabad, during the academic year **2021-2022**, is a Bonafide record of our original work carried out under guidance and supervision of **Ms. Prerna Kakkar, Assistant Professor, Electronics and Communication** and has not been presented elsewhere.

1. Ritick Sethi, (1/18/FET/BEC/019)
2. Sakshi Sharma, (1/18/FET/BEC/022)
3. Kuldeep Pandey, (1/18/FET/BEC/015)

Manav Rachna International Institute of Research and Studies, Faridabad

Faculty of Engineering & Technology

Department of Electronics and Communication Engineering

December, 2021

Certificate

This is to certify that this project report entitled "**Vajra Kaksh**" *by* **Ritick Sethi (1/18/FET/BEC/019), Sakshi Sharma(1/18/FET/BEC/022), Kuldeep Pandey (1/18/FET/BEC/015),** submitted in partial fulfillment of the requirements for the degree of Bachelor of Technology in **Electronics and Communication Engineering** under Faculty of Engineering & Technology of Manav Rachna International Institute of Research and Studies, Faridabad, during the academic year 2021-22, is a Bonafide record of work carried out under my guidance and supervision.

(Signature)
Ms. Prerna Kakkar
Assistant Professor
Department. Of Electronics and Communication
Faculty of Engineering & Technology
Manav Rachna International Institute of Research and Studies, Faridabad

(Signature)
Dr. Abhiruchi Passi
Head Of Department –ECE
Department. Of Electronics and Communication
Faculty of Engineering & Technology
Manav Rachna International Institute of Research and Studies, Faridabad

TABLE OF CONTENTS

Acknowledgement i

Declaration ii

Certificate iii

Table of Contents iv

List of Tables vi

List of Figures vii

Abstract ix

Chapters: **Page No.**

I. Introduction

1.1 Overview and Literature Survey 1

1.2 Gap in Literature 4

1.3 Motivation 5

1.4 Problem formulation 5

1.5 Objectives 6

1.6 Organization of the report 6

II. Design and Implementation

2.1 Introduction 7

2.2 Different Design Options 10

2.3 Block Diagram 12

2.4 Circuit Design 16

2.5 Simulation Platform 19

2.6 Assembly of Hardware and Components 23

2.7 Flow chart for program coding 27

III. Conclusion and Future Enhancements

3.1 Conclusion 35

3.2 Applications 35

3.3 Scope of future enhancement 36

References/Bibliography 37

Appendices

- Economic Feasibility
- Program code
- Mechanical Schematics
- Component Listing with Specifications
- Interim Progress Report by Guide

LIST OF TABLES

Table **Page No.**

2.1 Dimension of Chamber 24

2.2 Dimension of Acrylic sheet 24

2.3 Dimensions of Ply Wood 25

2.4 Dimensions of Pipe 25

2.5 Dimension of ID Card Box 26

LIST OF FIGURES

Figure	Page No.
2.1 TADT design	10
2.2 Full body sanitizing chamber	10
2.3 DRDO design	11
2.4 Block Diagram of Chamber	13
2.5 Block Diagram of ID Card	14
2.6 Block Diagram of RFID tag	15
2.7 Circuit Diagram of Chamber	17
2.8 Circuit Diagram of ID Card	18
2.9 Arduino IDE	19
2.10 Python IDE	20
2.11 Fritzing simulation platform	21
2.12 Flowchart Designer platform	22
2.13 Architecture of chamber	23
2.14 Dimensions of chamber	23
2.15 Dimensions of Components	24
2.16 Architecture of ID Card	26
2.17 Flowchart of Chamber	27
2.18 Ultrasonic sensor	28
2.19 RFID Module	28
2.20 Thermal Sensor	29
2.21 Temperature reading 1	29
2.22 Temperature reading 2	29
2.23 Rpi camera	30
2.24 Person with mask	30
2.25 Person without mask	31
2.26 Conveyor Belt	31
2.27 Sanitizing	31
2.28 Flowchart of ID Card	32

2.29 Ultrasonic sensor 33
2.30 Arduino UNO 33
2.31 Distance less than 2 meter 33
2.32 Distance greater than 2 meter 34
2.33 Speaker 34

ABSTRACT

Today the world is suffering from various hazardous viruses that has degraded the quality of people's lives and these viruses has spread through physical contact and the covid-19 wave is disastrous one among them. Individuals can get tainted from this infection in numerous ways, fundamentally from one individual to another contact by means of the spread of debased beads beginning from the oral and nasal entries, or by touching a contaminated surface. The virus has driven its way to every part of the world, and individuals are fighting for their endurance yet the dread and spread of Covid does not let individuals go outside their homes and do their day-to-day routine work, which creates a huge financial loss to one's earning and corporate sector has given the facility to work from home but other sectors do not have the facility to work from home, which led them to go out into such places which are dangerous and has virus strains. The relaxation in the lockdown leads to a greater number of people coming out from their shelter and getting in contact with such surfaces where there is the presence of coronavirus. Although accidentally, but this has increased their chances of coming in contact with the covid-19 patients, which has led to a tremendous increase in the number of covid-19 patients. Insufficient cleanliness and unhygienic practices can prompt an expansion in the infection rate during this outbreak. The infection is dynamic for as long as three hours in sprayers, as long as 4 hours on copper surface, as long as 3 days on steel and plastic surfaces and active up to 24 hours duration on cardboard surface. It was need of the hour to make an IOT controlled smart chamber with a touchless system and precautionary measures which can eliminate the dread of covid-19 from individuals so they can go out to do their everyday work with insurances. This smart chamber offers many applications including ID Card checking through RFID reader, temperature checking of the individual coming into it, check whether the user is wearing a mask or not, providing mask and gloves through smart ways, sanitize the individual, and provide them smart ID card which will take care of social distancing norm.

Keywords- Covid-19 virus, IoT, smart chamber, touchless system, RFID reader, check mask, provide mask, sanitize, smart id card.

CHAPTER-1

INTRODUCTION

This chapter deals with the overview of the report, it consists of a Literature survey along with the gap in literature, motivation, problem formulation, and objective of the model.

1.1 OVERVIEW AND LITERATURE SURVEY

Due to the increase in cases of covid-19, a practical based solution should be proposed to save guard people against such diseases. The studies done till date reveal the following points.

Sharnil Pandya, Anirban Sur, and Ketan Kotecha suggested a model named Smart Epidemic Tunnel which is an IOT based sensor fusion assistive technology for covid-19 disinfection. The purpose of their proposed model is to safeguard people by designing an automatic sanitizer spray system that is equipped with a sanitizer sensing system based on human body detection. An ultrasonic sensor will detect a human from the range of 1.5 feet and disinfect the user by using the sanitizer spray. This tunnel operates using a solar cell during the day time and switched to a solar power bank mode during night timings. [1]

M. Biswal, R. Kanaujia, A. Angrup, and P. Ray proposed a Disinfection tunnel. These tunnels can be placed outside in crowded places. People can walk through the tunnel or even ride through them on two-wheelers. These compact portable structures are made of steel and polyvinyl chloride (PVC) with the distance fluctuating from 16 ft to 25 ft and can be of static and dynamic types. In the static tunnel, the person remains inside the tunnel for 10 to 15 minutes and the disinfectant is sprayed from nozzles present inside the tunnel. The dynamic type is a walk-through passage in which the individual moves for 16 to 25 ft and sprays the disinfectant throughout the path. [2]

Devdutt and Abhiruchi Passi has explained a system called Manav Rakshak. It is a wearable smart device that helps in maintaining social distancing. This is a kind of wearable id card that has different sensors like ultrasonic sensor, buzzer, battery, and ATMEGA 328P microcontroller. This system is designed

such that, whenever the system comes in close proximity of a person, which is less than 1.5 meters then the microcontroller will activate the buzzer and the buzzer will produce a sound to indicate that you have to maintain distance.[3]

Minh Long Hoang, Marco Carratu, Vincenzo Paciello, and Antonio Piertrosanto demonstrate an Indoor Condition Monitor and Activity Recognition by MEMS accelerometer based on IoT -alert system for people in quarantine due to covid-19. They have used thermal sensor in the form of smart gadgets to monitor the real-time temperature. They tried to form a wearable smart IoT solution using Arduino (ESP8266), Infrared Thermometer, Contact Thermometer, Ambient Sensor, LCD Screen, and using MQTT technology to access data any time anywhere. They are measuring the real-time temperature of the user wearing the specially designed watch and uploading the data on the cloud using ESP8266 (Wi-Fi module), which will alert the user through an application specially designed for the purpose to connect with the wearable gadget and keep a check on the real-time temperature reading being received from the gadget.[4]

Ashish Shrivastava suggested an IoT based Sanitization disinfection tunnel. It provides great exposure to Sanitizing chamber using Arduino Board, PIR/ Ultrasonic Microwave motion sensor, Relay, High-Speed Motor, Mono Block Motor, High psi DC Pump Motor, RO Pipe, T Connector, 0.1 mm BRASS NOZZLES, It is designed to give maximum protection to all the people passing through this chamber in 15 seconds. This tunnel tries to prevent the spread of the COVID-19 virus. They have used 1HP water pump, which is controlled by a PIR sensor using a Relay, whenever the PIR sensor detects a body, it will activate the combination of 5v + 12v relay, resulting in automatic turning on the Water pump which will pump the water out through 0.1 mm Brass Nozzles fitted on the chamber. [5]

Meghana Shinde, Tanvi Sukhadare, Soham Vaidya, and Meghali Kalyankar explained the Face Mask Detection Alert System using Raspberry Pi. They have used Machine learning, OpenCV, and TensorFlow to recognize face masks. This model can be used for security purposes. In the proposed system they have used a convolutional neural network for face detection and MobileNetV2 to detect people in a video frame. The face detection system is performed on

raspberry pi and the proposed algorithm for the face mask detection system consists of preprocessing and training the Convolutional neural network. [6]

F Ahmad, Anima Najam, and Z Ahmed of Beijing University of Aeronautics & Astronautics Beijing, China presented a paper on the topic “Image-based face detection and recognition: state of the art”. The main idea of the paper was to evaluate different face detection and recognition methods and compare those methods to know which has higher accuracy, as many public places have surveillance cameras and the human face is dynamic so it becomes difficult to detect the face in computer vision. [7]

Akshay Sharma, Department of ECE, from Vidyavardhaka College Mysore, India, published a review paper on the topic “Review on Automatic Sanitizer Dispensing Machine”. He reviewed how an automatic hand sanitization machine works when an ultrasonic sensor senses the hand placed near it, in this the microcontroller used is Arduino UNO. Whenever the sensor senses a hand, at a distance of less than 7cm, a 100ms pulse is given from Arduino digital output pin. The pump, pumps out a few drops of hand sanitizer, after pumping the distance is measured for every 1000ms for scanning purposes. Sanitization can be done in many ways including UV Sanitization, Soap Sanitization, The paper also stated that a concentration of greater than 70% alcohol can kill Coronavirus from hands and how sanitizers are better than liquid and solid soaps. [8]

Hurriyatul Fitriyah, Aditya Rachmadi, and Gembong Edhi Setyawan explained by their topic “Automatic measurement of human body temperature on thermal image using knowledge-based criteria”, that Instead of the thermometer, an infrared camera could be utilized to detect the body temperature instantly without any physical contact. This paper suggested an automatic algorithm that will measure the human body temperature with the help of a thermal camera. The camera will capture the infrared radiation that is emitted by the object using a microbolometer sensor. The infrared radiation gives the temperature of the object. [9]

Suthaghar S, Augustina Shaglin, Benit Banapriya, and Beulah explained a smart surveillance camera using RPi and OpenCV. They have used a low cost security system which has raspberry pi 2 operating at a speed of 900 MHz and a pi camera. The images are captured by the Rpi camera and then send to raspberry pi 2 for processing face and human detection using open cv, after that the detected face is compared with the database and then an audio message is produced and the message is sent to the user. The output of the audio message will depend on the result obtained by the database that whether the person's face is known or not. [10]

Naveen Kumar k, suryaS, Mohammed Nihaal, and Manoj Kumar suggested an automatic covid -19 face mask and body temperature detection. A RPi 4 Model B to detect face mask protocol violation through an integrated Rpi Camera and to monitor body temperature with MLX90614 sensor. A 5 MP raspberry pi camera module is used for this setup and MLX90614 is an infrared thermometer for a non-contact temperature machine. It has a range of -20 c to 120 c. They are smart enough to check temperature and face mask and alert the concerned authorities.[11]

1.2 GAP IN LITERATURE

After going through several research papers and surveying the design options currently available in the market, it was found that many innovative researches have been proposed in the market to sanitize people through sanitizer (each with a different type of configuration of the chemicals), or by increasing the temperature of the chamber to stop the spread of viruses. The models that are currently available in the market do not have all the necessary things embedded together. Either they only sanitize or they measure body temperature.

There was the need to design a model in such a way that it has all the measures embedded together like a chamber, that can detect the temperature, detect that a person is wearing a mask or not, provide masks and gloves, check his id card, sanitize the person. Along with this a prototype that can help in maintaining social distancing.

1.3 MOTIVATION

After the ruination made by the Covid-19 virus, many people become jobless as according to the guidelines given by the government the companies workspace could not accommodate such a large number of people while maintaining social distancing. Many people got homeless. Although people are following the guidelines but still the condition is not under control. A huge number of cases are getting registered daily. It has been seen that many people do not follow those guidelines and they forget about social distancing. Social distancing has proven very beneficial to control the spread of the coronavirus. Sometimes people forgot to wear masks and gloves and to put sanitizers in their pockets while going to school and offices. To overcome the above said issue, there is a need to develop a smart gadget or prototype based on the concept of IoT powered, smart sanitizing chamber. That can take care of sanitization, masks, gloves, and social distancing in the workspace so that the working population of our country can work fearlessly in their offices and students can go to their schools.

1.4 PROBLEM FORMULATION

In the prevailing circumstances, Covid-19 has affected a lot of people in the world regardless of their age. Different models were proposed to control the spread of coronavirus. It was investigated that Sanitizing, wearing a mask, and maintaining social distancing can help reduce the extend of infection rate.

The problem statement is to design an embedded system that can integrate the internet of things with different sensors that can detect the presence of the human body and its temperature. The system can detect the mask and sanitize the person. The main aim is to design a chamber that can do all the above-mentioned things without any physical contact and to maintain social distance in the premises, between the employees so they can work fearlessly.

1.5 OBJECTIVE

- To do an extensive survey on the cause and effects of COVID-19.
- To design an automatic sanitization and face detection system.
- To develop an embedded system for providing masks and gloves to the concerned person.
- To design an embedded system to measure thermal temperature.
- To design and develop a complete model.

1.6 ORGANIZATION OF REPORT

The report consists of 3 chapters

Chapter 1 is the overview of the report, it consists of a literature survey along with the motivation, problem statement and, the objective of the model.

Chapter 2 has the introduction, different design options, basic block diagrams, circuit diagrams, and simulation platforms used for the project. Moreover it also has the assembly of hardware and components and flow charts of program coding.

Chapter 3 deals with the conclusion, application of the project, and future enhancement.

CHAPTER-2

DESIGN AND IMPLEMENTATION

This chapter comprises of the introduction of the idea, different design options already available, block diagram of the proposed model, related circuit diagrams and, simulation platforms used for the project. It also contains the assembly of hardware and components and flow charts for code.

2.1 INTRODUCTION

Today the world is suffering from the Coronavirus which is also known as covid-19. It is an acute respiratory illness. The first case of coronavirus was reported in Wuhan (China) on 31st December 2019, and then the virus spread rapidly and has driven its way to every part of the world by early 2020. On 30th January 2020, the World Health Organization (WHO) declared coronavirus outbreak as an international concern and pandemic, by march 2020 every country started taking precautions and started imposing complete or partial lockdown in their country, to cut down the human interaction and outspread of the virus.

The flare of the COVID-19 virus has impacted innumerable individuals all over the world. Controlling this real-time pandemic is currently a major priority of the scientific community. An individual can get the infection in numerous ways, primarily from one individual to another via the spread of contaminated droplets originating from the oral and nasal sections of the infected person, or by being in contact with a contaminated surface. Today, people are living a life, full of fear in their hearts of spreading the coronavirus amongst them and their loved ones. The hunger aspect of human beings has put them in the situation to come out of their homes and work to earn for the survival of their families. The relaxation in the lockdown leads to a greater number of people coming out from their shelter and getting in contact with such surfaces where there is the presence of coronavirus. Although accidentally, but this has increased their chances of coming in touch with the covid-19 patients, which has led to a tremendous increase in the number of covid-19 cases. Inadequate cleanliness and unhygienic practices can prompt an expansion in the infection rate during this outbreak. The virus is active as long as three hours in aerosols, as long as four hours on copper surfaces, and three days on steel and plastic surfaces, and as long as twenty-four hours on cardboard surfaces.

This has made the task of detecting and sanitizing the covid-19 patients amongst other people more tedious.

For precautionary measures, People are using sanitizer spraying machines and thermal guns to measure temperature, but it has led to other skin problems due to excessive amount of chemicals. So, to save guard one from such conditions, the solution is an IoT-powered smart chamber with preventive and required precautionary measures. Technologies used are interfacing with several sensors by using raspberry pi and Arduino for controlling these sensors and making them work systematically. OpenCV which stands for Open-Source Computer Vision is a cross-platform library that is available for development and use on all the major platforms like Linux, Windows, and MacOS in many programming languages like C++, Python, and Java.

Image Processing is one of the important features of OpenCV which provides many tools and built-in functions to enhance an image and apply various techniques like filtering, histograms, contours, or edge detection, etc, and modify the parameters of an image like color values, color spaces, brightness, and contrast or to apply geometric transformations like resizing, scaling, rotating, warping on the images.

In prevailing circumstances, the process that are gaining popularity in the technical world are mainly Face detection and recognition. These are based on different parameters like color segmentation, Image segmentation, Image matching, Gender recognition, which helps a computer to process images.

For real-time monitoring in the health care sector, internet of thing technologies are being used. Keeping a record of temperature is important, whether the employees are fit or are not. Irrespective of the outdoor temperature or weather, the typical human body temperature remains between 36.5 and 37 degrees Celsius. Each person's physiology is different, but the body's optimal core temperature falls within a particular range when muscles are primed and ready to go, it is just around 37.5 degrees Celsius.

A Hi-tech solution is needed that will complete every organization’s need during this corona pandemic. Three things taken in the measure are wearing a face mask, body temperature, and sanitization. Without a face mask and sanitization, the person can not enter the respective place as the door will not open, also if the temperature is not in the range then the door will not open and you cannot enter the place. Vajra Kaksh is an

IoT-powered device that performs the function of detection as well as sanitizing the people who enter inside it. It is a closed chamber that can be installed at the entry points of the workplaces, factories, organizations, or companies to study the body temperature of the workers as well as their staff members in addition to sanitizing them throughout. Before entering the vajra Kaksh chamber, there is an RFID reader present in the chamber on which the user needs to punch their RFID tags which will act as the unique login credentials of the user's unique database on the cloud and after a successful approval, there is a camera attached which keeps a check on mask. If the person is not wearing a mask then a mask along with gloves are passed to that person through a conveyer belt attached there. Coronavirus has majorly spread across the world and temperature testing and sanitization are some of the most effective ways to prevent the spread of this virus. Therefore, we are installing MLX sensors for temperature testing.

2.2 DIFFERENT DESIGN OPTIONS

There are various designs available in the market, some of them are listed below:

Figure 2.1: TADT Design

Mr. Deepak Maurya, and Mr. Mahindra Kumar Gholi proposed a model which is shown above. It consists of 2 chambers: The 1st chamber is the sterilization, which splashes a fog of sanitizer arrangement of chemical compounds frequently utilized as a sanitizer. The 2nd chamber is a hot air and far-bright C (far-UVC). The bright beams are known to obliterate the DNA of the infection. Hence it decreases the chances of virus spread.

Figure 2.2: Full body sanitizing chamber

UBA Participating Institute Government Polytechnic Jhajjar proposed a Full-body sanitization chamber. The design of the chamber is illustrated in figure 2.2. The stroll through the walled in area is intended for staff purification, each individual in turn. This versatile framework is furnished with isolated compartments of sanitizer and cleanser gadgets.

Figure 2.3: A DRDO Design

A unit of the Defense Research and Development Organization (DRDO) has planned a full-body sanitization chamber for medical services laborers who are in the front line of fight against Covid. The sterilization began by utilizing a foot pedal at the passage. On entering the chamber, an electrically worked siphon makes a sanitizer fog of hypo sodium chloride for cleaning. The design of chamber is shown in figure 2.3.

2.3 BLOCK DIAGRAM:

A block diagram is a chart of a framework wherein the chief parts or capacities are addressed by blocks associated with lines that show the connections of the squares. They are intensely utilized in designing equipment plans, electronic plans, programming plan, and interaction stream graphs.

2.3.1 Block of Chamber

- Ultrasonic sensor will detect the presence of a person inside the chamber.
- The person has to punch his Rfid tag on the RFID reader, if the tag is approved then the process will move forward.
- The thermal sensor will check the temperature of the user, if it is found above the normal limits i.e. greater than 99 degrees, then a message will be displayed that “you are not allowed to enter” and the person will get to know that his temperature is beyond normal, and the user is not allowed to enter in the premises.
- If the temperature of the user is found normal i.e., below 99 degrees, then the Rpi camera will detect whether the user has worn the mask or not.
- If the user has not worn the mask, then the camera will detect it and a safety message warning will be displayed, then a Conveyor belt will contain the masks and gloves for the users and the user has to wear a mask and gloves and the process will restart.
- If the user is wearing a mask, then he is safe to move forward.
- There will be a shower of sanitizer on the user through nozzles.

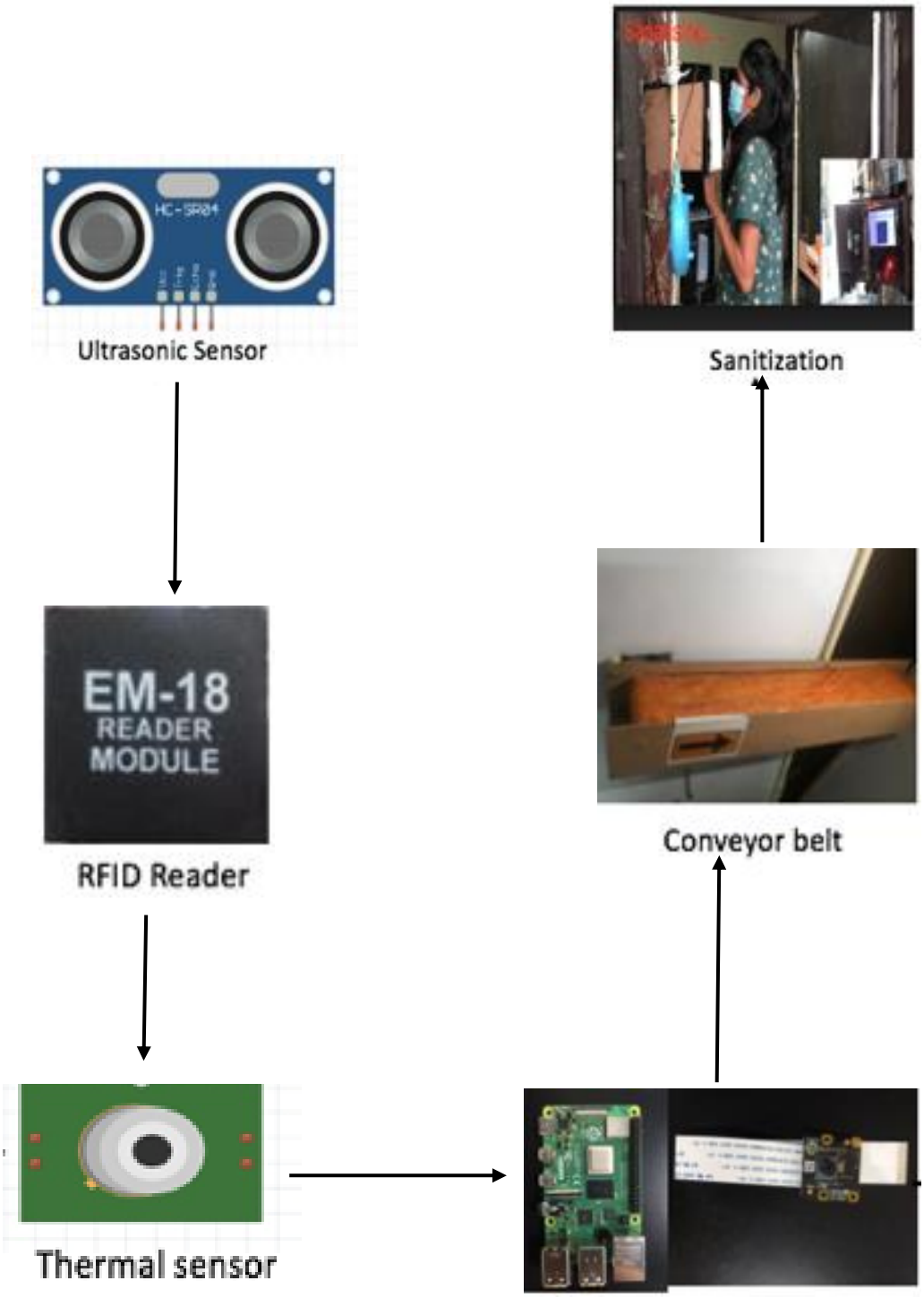

Figure 2.4: Block Diagram for chamber

2.3.2 BLOCK OF ID CARD

The Block diagram presented below explains the flow of the procedure followed by the ID Card.

- The user needs to wear an ID card that contains an ultrasonic sensor.
- The sensor relates to an Arduino and a speaker is connected to the output of Arduino.

The ultrasonic sensor will measure the distance, and the measured distance is sent to the Arduino microcontroller. If the detected distance is less than 2 meters then the green light will beep and an alarm will trigger and if the detected distance is greater than 2 meters then the process will trigger the sensor again and again to check the distance.

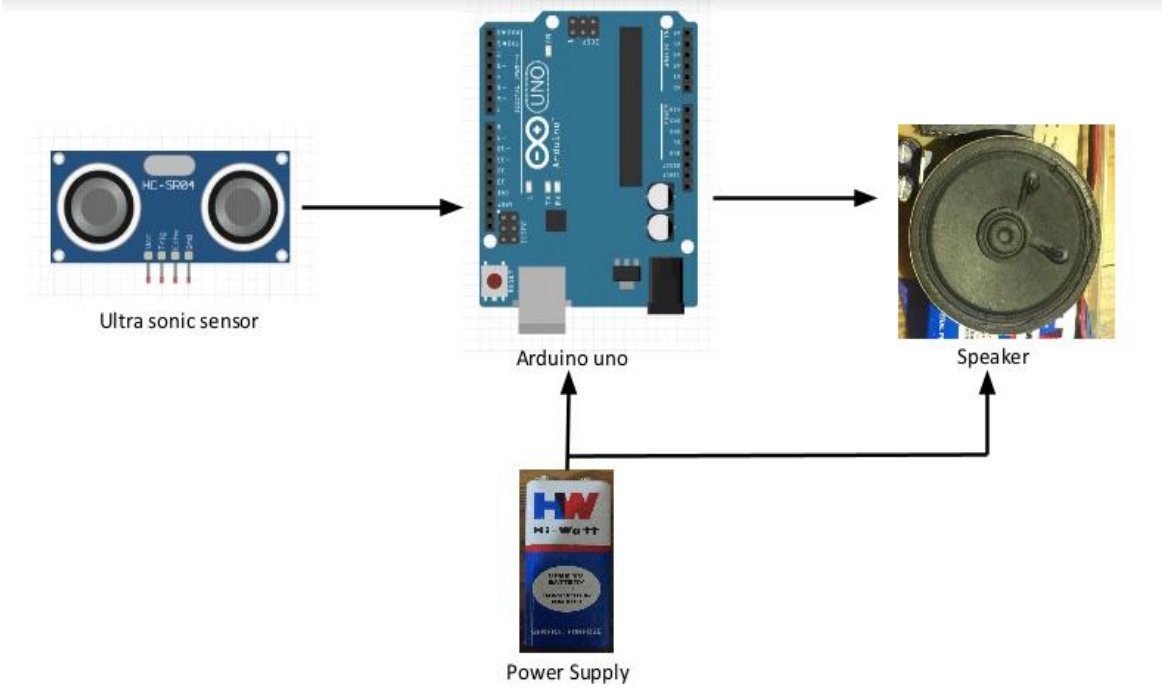

Figure 2.5: Block Diagram of ID card

2.3.3 BLOCK DIAGRAM OF RFID TAG & READER:

When a person enters the chamber then he has to punch his RFID Tag on the RFID reader present in the chamber, the tag will act as a unique login credential that indicates that this user is a member of the respective organization. The RFID reader will emit radio waves as shown in figure 2.6.

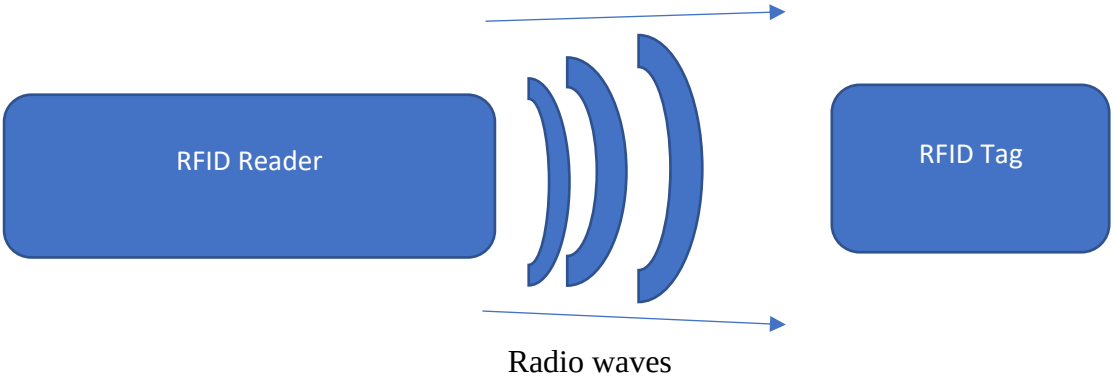

Figure 2.6: Block Diagram for RFID Tag

2.4 CIRCUIT DIAGRAM:

A circuit diagram is a graphical portrayal of an electrical circuit. A pictorial circuit chart utilizes basic pictures of parts, while a schematic outline shows the parts and interconnections of the circuit utilizing normalized emblematic portrayals.

2.4.1 CIRCUIT DIAGRAM OF CHAMBER:

The details for the circuit diagram are as follows:

- 12 v Power supply is directly connected to the motor driver L293D for the function of DC pump and DC motor.
- Raspberry Pi is given a 5-volt supply.
- The motor driver is interfaced with Rpi as output to take command and further proceed with the pump or motor.
- Ultrasonic sensor, Thermal sensor, Raspberry pi camera, an RFID reader are connected with the Raspberry pi for input.
- Raspberry pi 3-inch screen is connected with the GPIO pins of Raspberry pi to provide output as well as input.
- The process will start when the user will trigger the Ultrasonic sensor which is connected with Raspberry and getting a 5-v supply.
- L293D driver is connected to Supply as well as to GPIO pins of Raspberry Pi as an output.
- An RFID reader is connected to pin 7 of Raspberry Pi as an input to verify the tags.

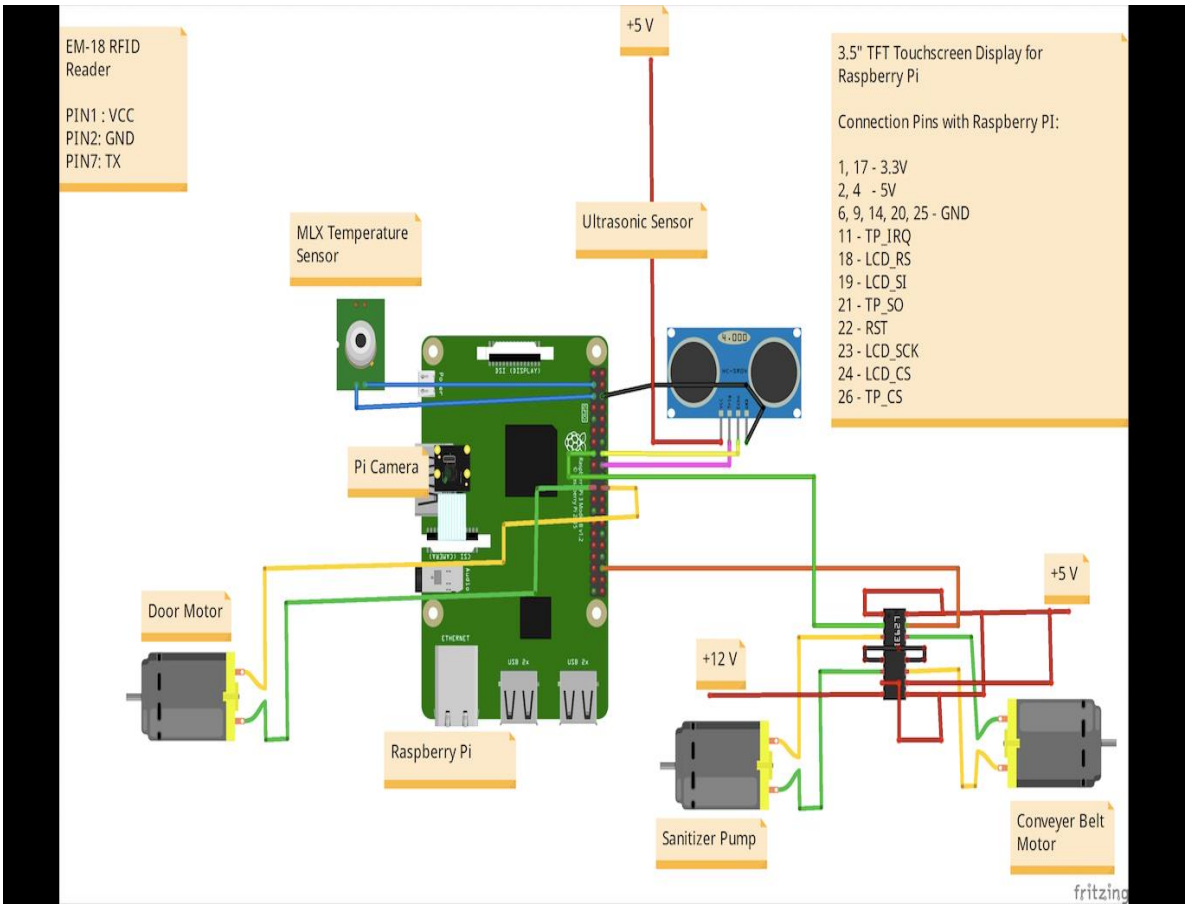

Figure 2.7: Circuit Diagram of Chamber

2.4.2 CIRCUIT DIAGRAM OF ID CARD:

The details for the circuit diagram are shown below in figure 2.8 are as follows:

- A battery of 9 volts is connected to the circuit in order to supply the required power.
- The speaker has 2 pins.
- HC-SR04 Ultrasonic sensor has 4 pins – Vcc, trigger, echo, and ground. The Sensor's operating frequency is 40Hz and the operating current is less than 15mA.

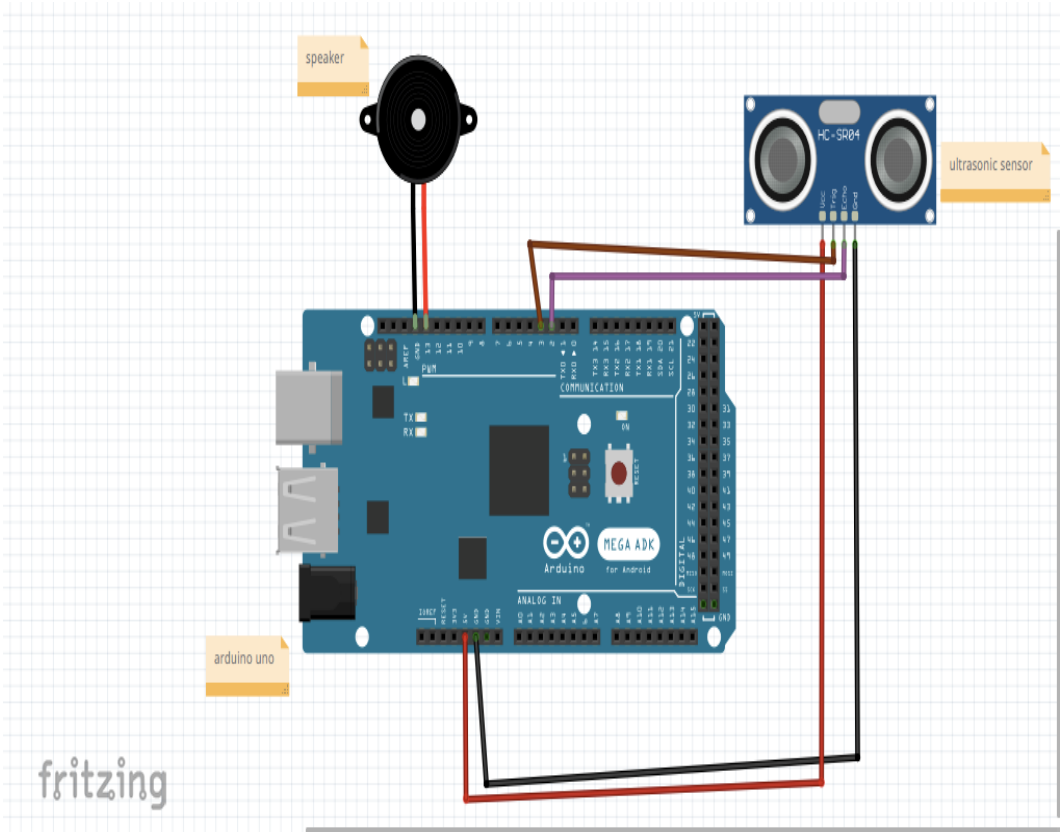

Figure 2.8: Circuit Diagram of ID Card

2.5 SIMULATION PLATFORM:

Simulation Platform permits you to assess, think about and advance elective plans, plans and arrangements. In that capacity, it gives an apparatus to disclose and guard choices to different partners.

2.5.1 ARDUINO IDE – The Arduino integrated development environment. It is free and open-source software. The IDE supports Windows, macOS, and Linux. c and c++ language are supported by IDE software, the programs written in Arduino software are known as sketches and are saved with. ino as a file extension. This software supports all kinds of Arduino boards and by using the software it becomes very easy to write and Upload code on boards. The integrated development environment contains a toolbar with common features, a message area, a text console area, and a text editor for code writing. The other commands like file, edit, sketch, tools, and help are found in the menu bar. The sketchbook concept is used by the Arduino software (IDE). There are a lot of libraries available in reference, one can view the examples which are already uploaded on the software. The user has to write the code under two basic functions which are void setup () and void loop ().

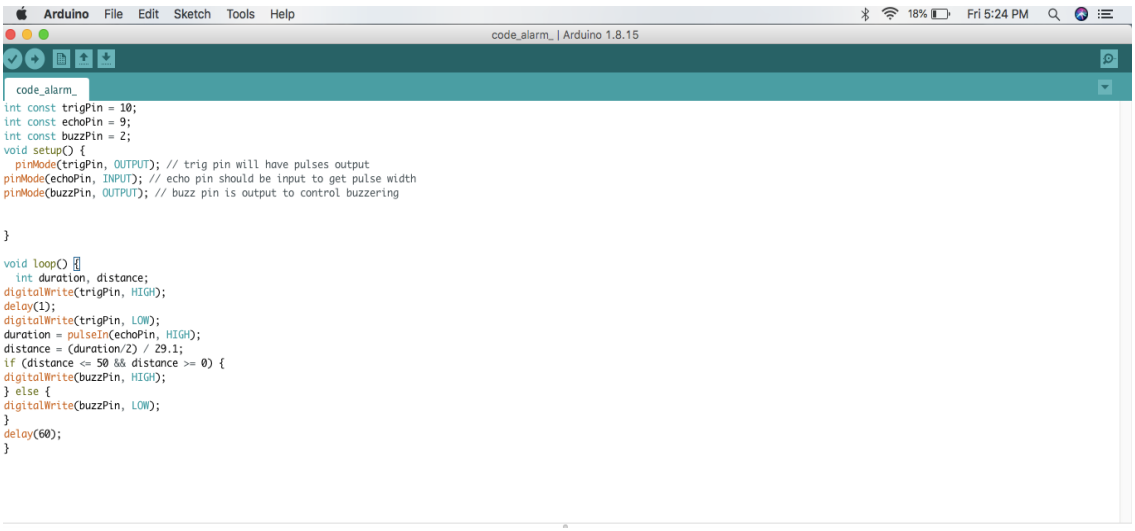

Figure 2.9: Arduino IDE

2.5.2 PYTHON IDE –INTEGRATED DEVELOPMENT ENVIRONMENT. IDE's integrate different tools which are specially designed for software development. There are many different python IDE's, some of them are available online and others can be downloaded on your system. Some of the popular ide's are IDLE, SUBLIME, PYCHARM, ATOM, JUPITER NOTEBOOK. PYTHON ide's help users to write the code in the python programming language. These ide's help us to save and code files, syntax highlighting, and to run code within the environment. Different python ide's have different features. The official programming language of raspberry pi is python. It is well known for web development and you can fabricate nearly anything like versatile applications, gaming, data science, AI, and so on. It is intended to be basic and simple like the English language. It's a lot simpler to perform Python programs in comparison with other programming languages like C++, Java and C#.

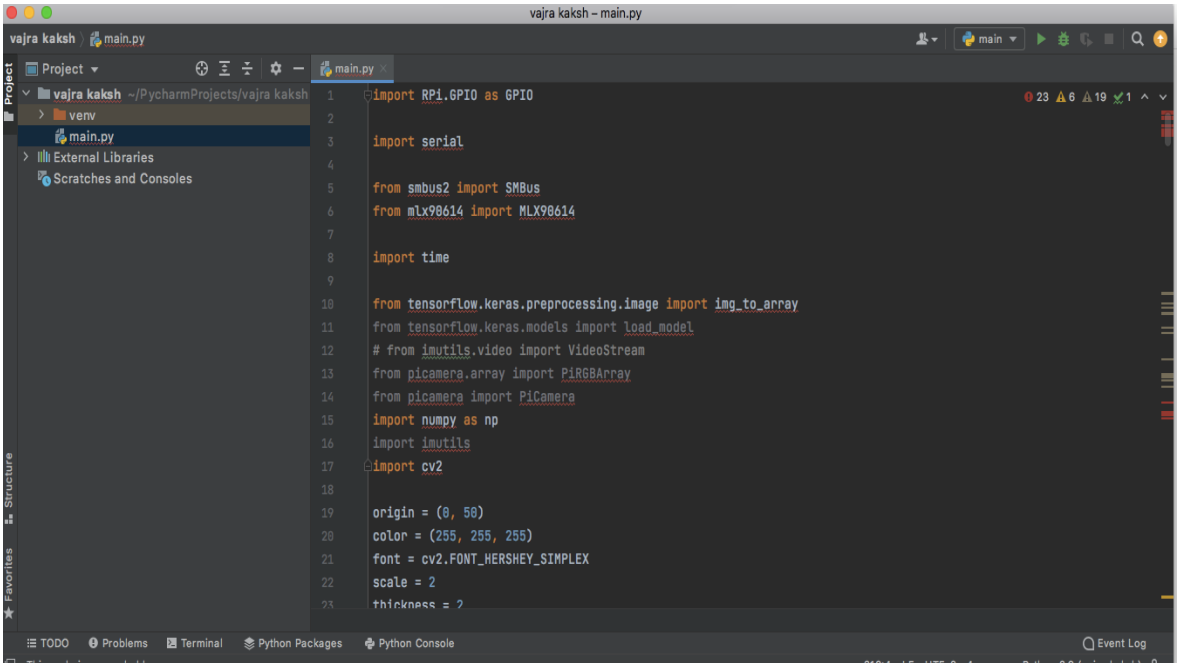

Figure 2.10: Python IDE

2.5.3 FRITZING

Fritzing is an open-source software that is used to develop the circuits of electronics hardware. It allows a designer to make their prototype and create a PCB layout. This software runs multiple simulations on the project to ensure that the developer achieves his objective with minimal effort. It allows you to use breadboard for making connections. The developer can make schematics and can even design PCB and have them fabricated from the files and can also upload the code on different platforms, boards and ports.

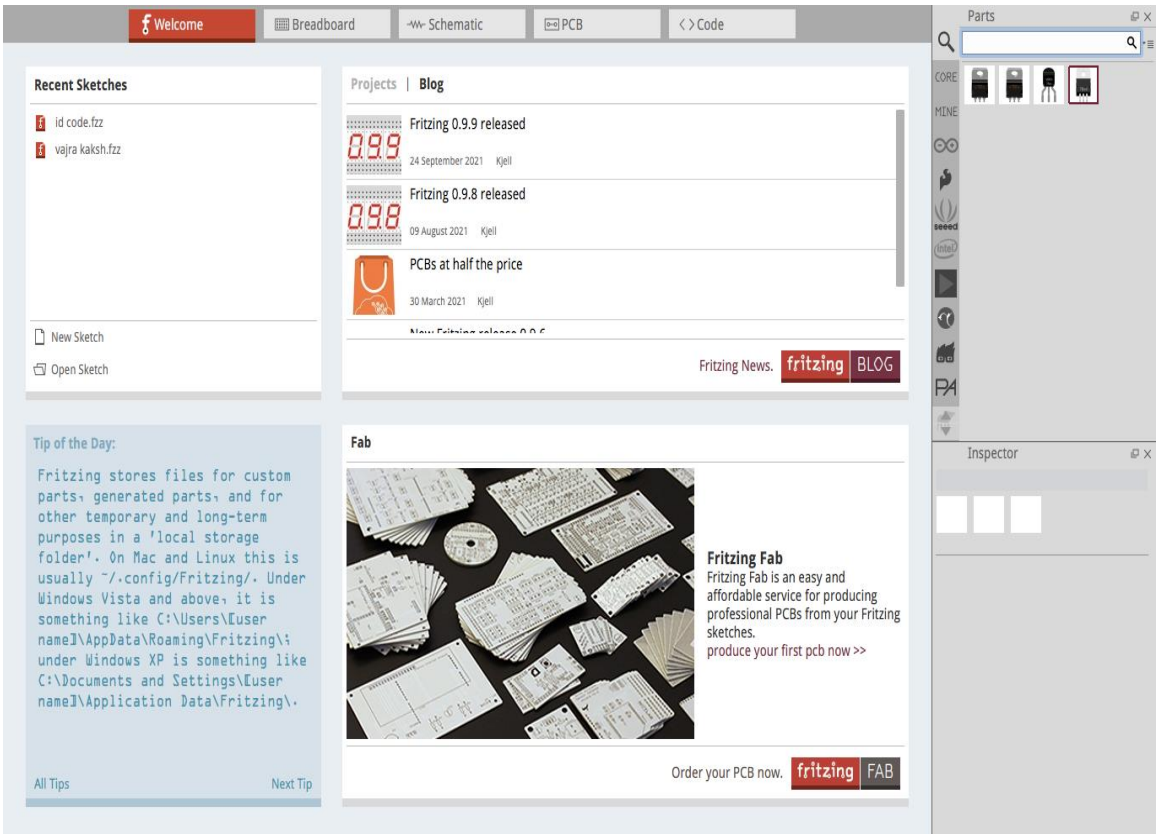

Figure 2.11: Fritzing Simulation Platform

2.5.4 FLOWCHART DESIGNER:

Flowchart Designer is a lightweight flowchart editorial manager with loads of preset shapes and the connector, one can make a flowchart without any problem. Flowcharts are used for drafting and pull off straightforward flow of project. There are different kind of flowcharts and each type has its own unique arrangement of boxes and documentations. Flowcharts give a brief explanation of the code. It deals with the decisions and choices the code will take in the if-else situation. Designing a flow chart is a basic step before writing any actual code.

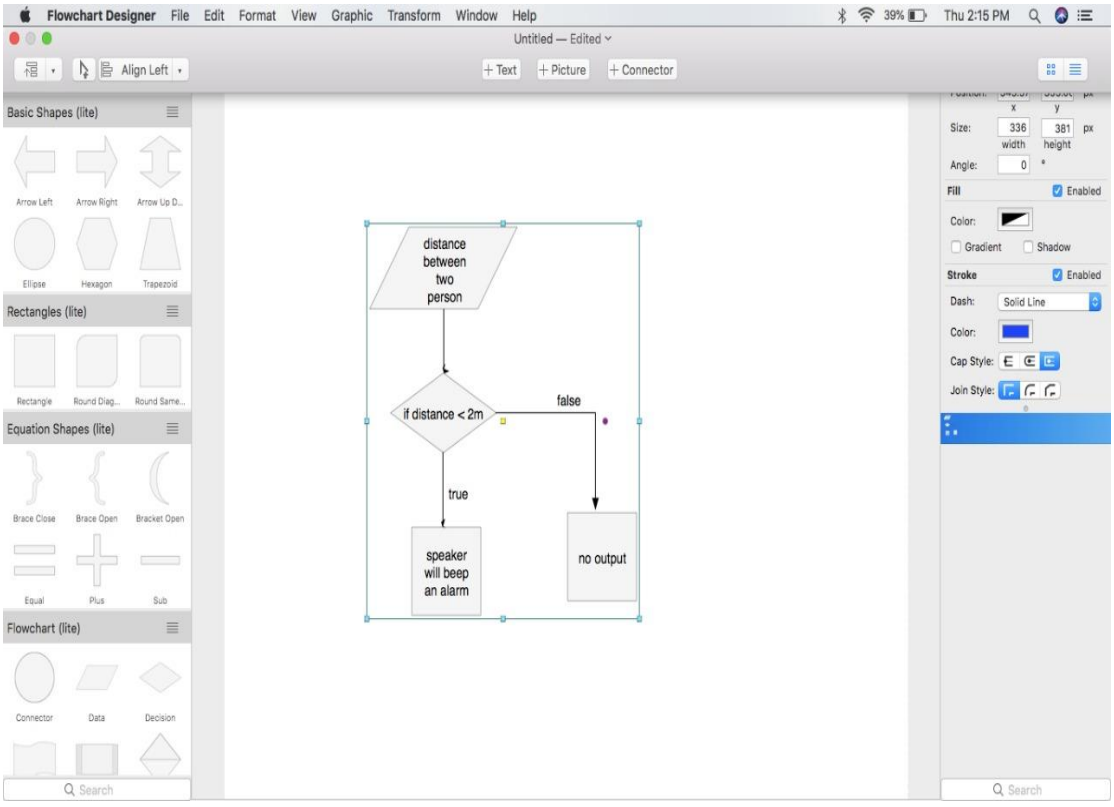

Figure 2.12: Flowchart Designer Platform

2.6 ASSEMBLY OF HARDWARE AND COMPONENTS

Hardware components assemble to form a product. Gathering parts can be individual parts or subassemblies that act as a solitary unit. For instance, a solitary part base plate and a multipart air chamber subassembly are the two parts when set in a gathering.

2.6.1 ARCHITECTURE:

The architecture of the chamber illustrated in figure 2.13 is designed in such a way that all the components are placed in correct and accurate positions and still spacious enough to complete the process by standing in the chamber comfortably.

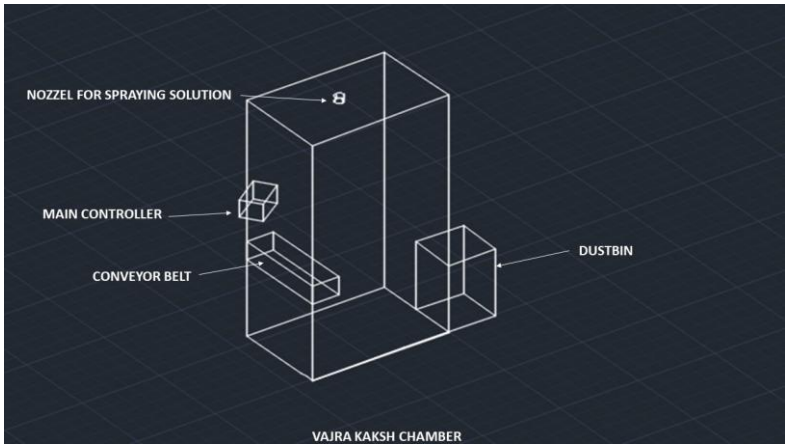

Figure 2.13: Architecture of Chamber

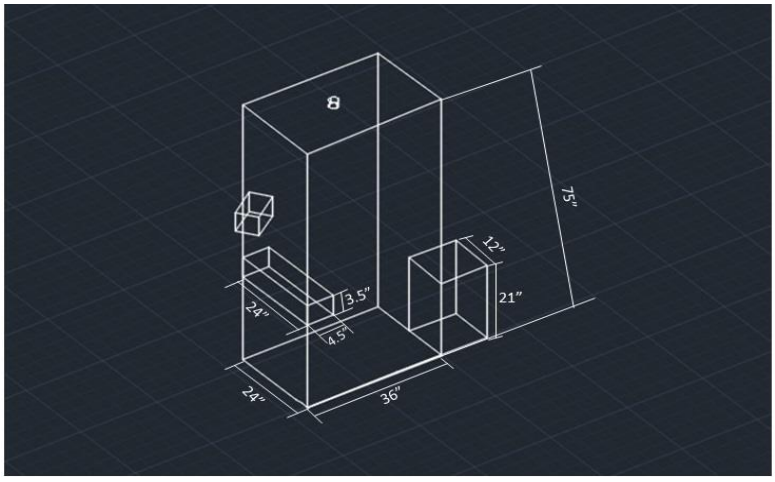

Figure 2.14: Dimensions of the Chamber

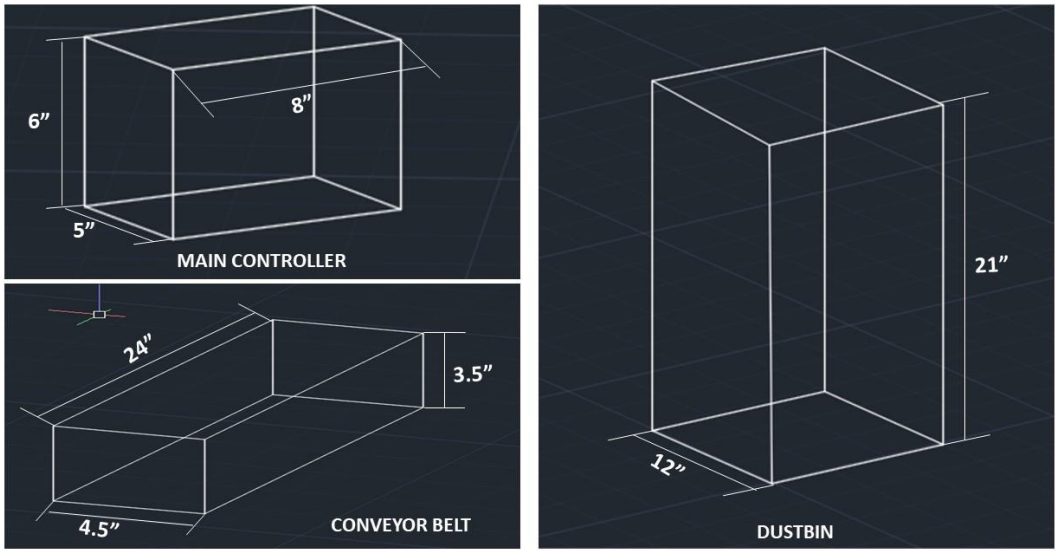

Figure 2.15: Dimensions of Components

The measurements of chamber in figure 2.14 are:

Table 2.1: Dimensions of Chamber

Height of chamber	72 inches
Length of chamber	36 inches
Width of chamber	24 inches

The material used to make the sides of the chamber is a transparent acrylic sheet of dimension:

Table 2.2: Dimensions of Acrylic Sheet

Length of acrylic sheet	72 inches
Breadth of acrylic sheet	24 inches
Thickness of acrylic sheet	2 inches

The upper and lower base of the chamber is made of ply wood.

Table 2.3: Dimensions of Ply Wood

Length of ply wood	36 inches
Breadth of ply wood	24 inches
Thickness of ply wood	2 inches

The walls, upper base and lower base are supported and fixed together with the help of PVC pipes structure. The dimensions of PVC pipes are:

Table 2.4: Dimensions of Pipe

Length of pipe	72 inches
Diameter of pipe	1.5 inches

The conveyor belt is placed on one side of the chamber and the microcontroller is placed on another side to manage the flow and space between the chamber.

The nozzles are placed on both the side of the chamber and the upper base of the chamber at different angles to give complete coverage.

2.6.2 ARCHITECTURE OF SOCIAL DISTANCING ID CARD

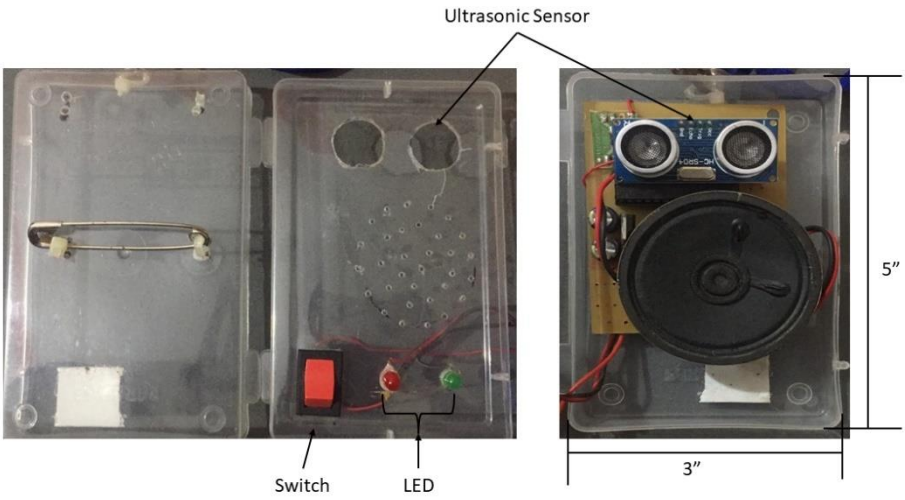

Figure 2.16: Architecture of ID Card

ID Card has one ON-OFF switch and 2 LEDs, one is red and the other is green. The red light indicates that the ID card system is getting proper supply and is working. The green light indicates that the distance is less than 2 meters and now you have to maintain distance.

The speaker, Arduino and power supply are embedded together in such a way that they can be placed in a small plastic box that is light weighted and easy to carry or hang like an ID card.

The Dimension of the box used for the ID card is:

Table 2.5: Dimensions of ID Card Box

Length	5 inches
Breath	3 inches
Thickness	1 inch

2.7 FLOWCHART

The Flowchart explains the flow of procedure followed by the code. It demonstrates the decisions and conditions

FLOW CHART OF CHAMBER:

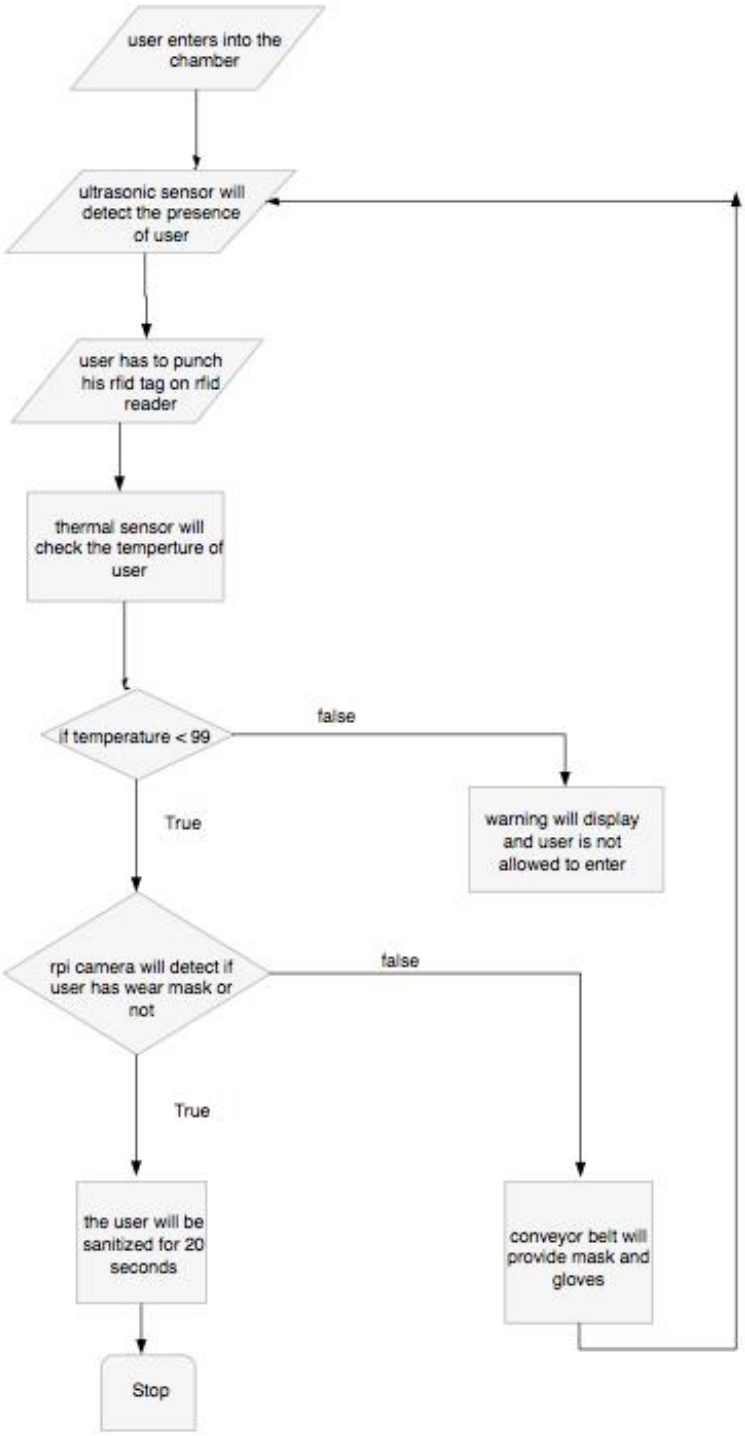

Figure 2.17: Flowchart of Chamber

Ultrasonic sensor will detect the presence of a human body in the chamber and trigger the application to start the process.

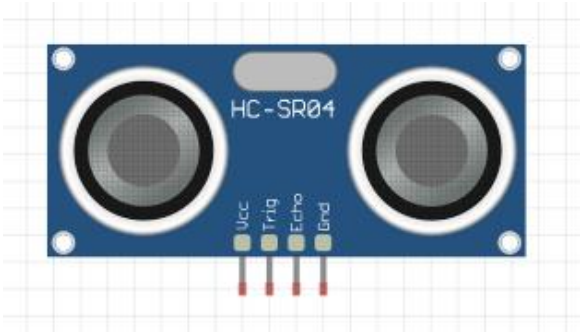

Figure 2.18: Ultrasonic Sensor

The process will start and the RFID reader will ask the user to punch his/her RFID tag on the reader, if the reader recognizes the tag, then after successful punching, the process will move to its next step but if the tag is not valid then the process will not move forward.

Figure 2.19: RFID Module

Further, the user needs to face the thermal sensor, which will detect the temperature. If the recorded temperature reading is normal i.e., below 99 degrees then the process will move further with step 3.1. or else if the recorded temperature reading is above the normal limit i.e., above 99 degrees then the process will follow step 3.2.

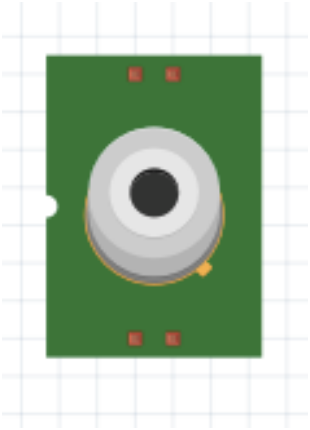

Figure 2.20: Thermal Sensor

The body temperature is normal and the process will move forward with step 4.

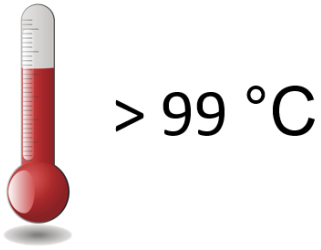

Figure 2.21: Temperature Reading

The body temperature is high then the process will not proceed and will display the warning on Rpi screen that “user not allowed to enter” and the process will jump directly to step 6 for sanitization.

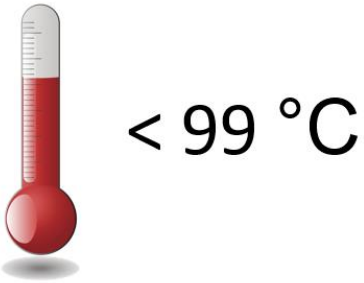

Figure 2.22: Temperature Reading

The process will ask the user to face the Raspberry pi camera, in order to detect that wheather the user is wearing a mask or not, depending on that the process will proceed further:

Figure 2.23: Rpi Camera

If the user is wearing a mask, then the process will jump to step no. 6 i.e., the sanitization part.

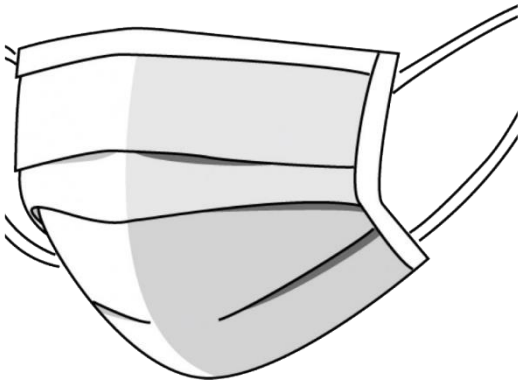

Figure 2.24: Person with Mask

If the user is not wearing a mask, then the process will move forward with step no. 5 i.e., the conveyor belt stage.

Figure 2.25: Person without Mask

The process will trigger the conveyor motor which carries mask and gloves that needs to be worn by user.

Figure 2.26: Conveyor Belt

The final step before entering the premises is the sanitization. The dc pump will generate a pressure which will let the sanitizer out from the nozzles, placed at different angles of the chamber to provide complete sanitization to the user as shown in figure 2.27.

Figure 2.27: Sanitizing

2.7.2 FLOWCHART OF ID CARD

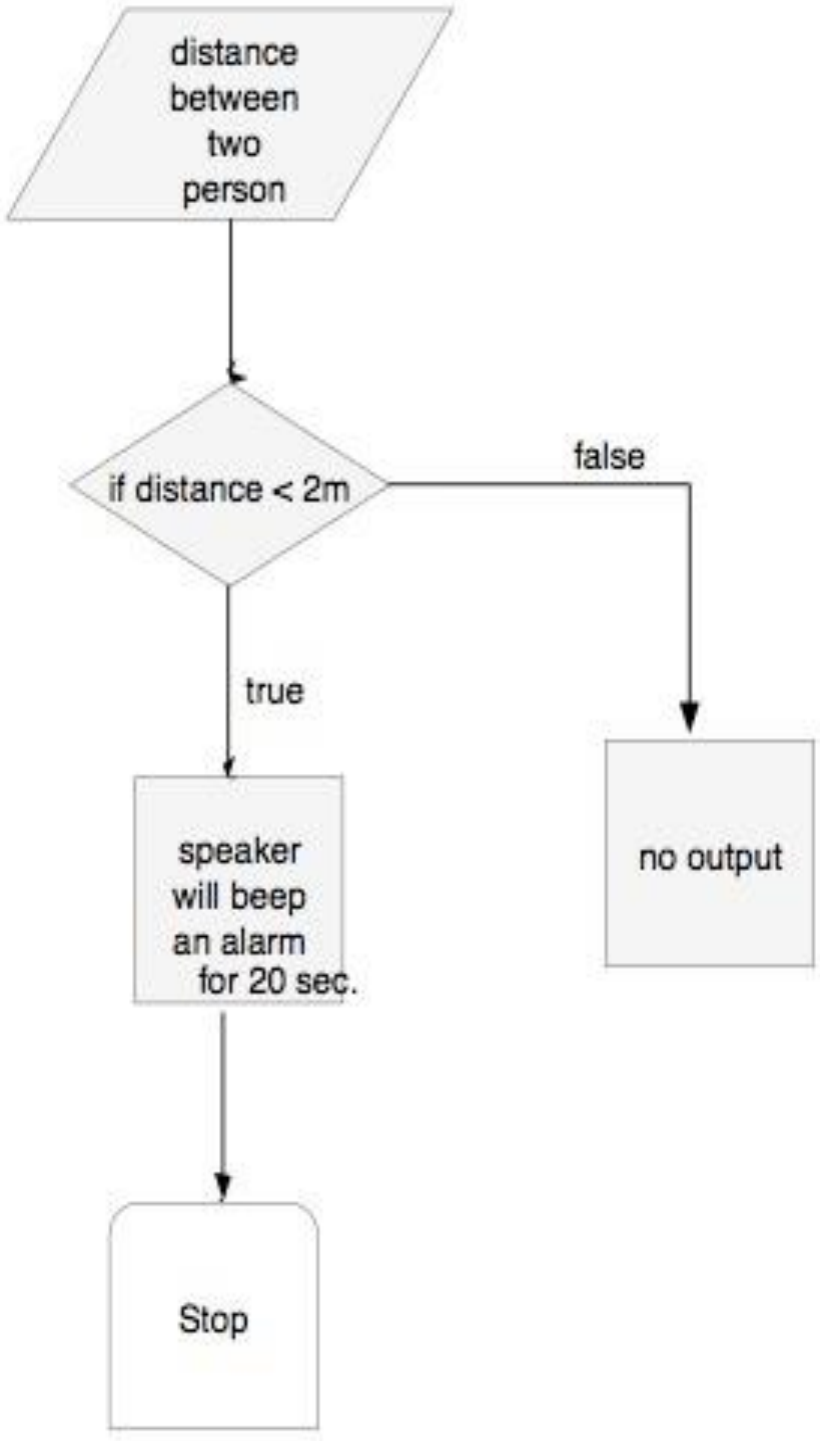

Figure 2.28: Flowchart of ID Card

The ultrasonic sensor will measure the distance between the user and other person and the measured signal is sent to microcontroller.

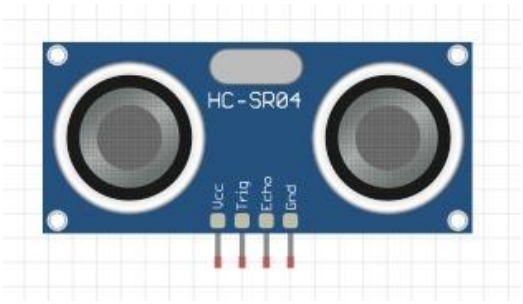

Figure 2.29: Ultrasonic Sensor

The Arduino will check the reading and depending on the distance, it will move to one of the below mentioned steps:

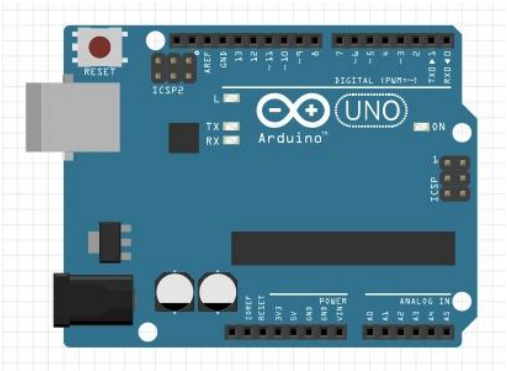

Figure 2.30: Arduino UNO

If the measured distance is less than 2 meters then step 3 is followed.

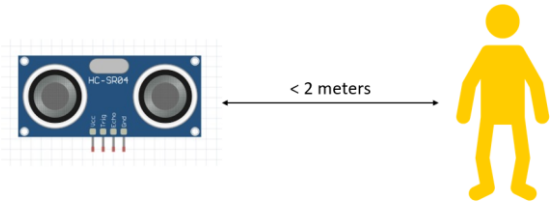

Figure 2.31: Distance less than 2 meters

If the measured distance is equal to 2 or greater than 2 meters then it won't trigger the alarm.

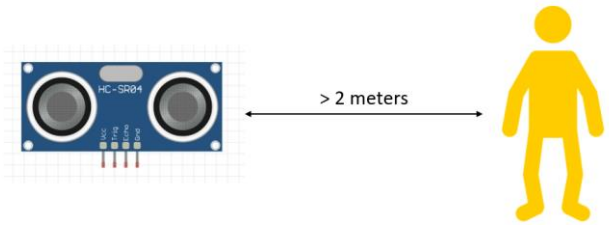

Figure 2.32: Distance greater than 2 meters

The speaker will activate and play a sound "please maintain social distancing" in English as well as in Hindi Language.

Figure 2.33: Speaker

CHAPTER-3

CONCLUSION AND FUTURE ENHAMCEMENTS

Chapter 3 deals with the conclusion, application of the project, and future enhancement.

3.1 CONCLUSION

After doing through research on all the above-mentioned papers and solutions available in the market we came to know that the solutions which are currently available in the market for helping people taking precautionary measures and disinfecting them are doing good, but the need for the current scenario is social distancing and a device that can detect the temperature and ensure that the person is wearing a mask and the staff is following the norms, maintaining proper sanitization and maintaining social distancing or not. The technology is growing with the current situation of pandemic. keeping in mind, the future scope of viruses, we have created a complete solution which is an IOT powered smart chamber that can contribute in taking precautionary measures against different types of air spread and contagious viruses. It will help in sanitization, checking body temperature, maintaining social distance, and providing masks and gloves to the user entering into it. This system can be installed in offices, schools, colleges, and other workplaces. It is taking care of two main preventive measures which are sanitization and social distancing. It will contribute to the health care department and in fighting against novel coronavirus.

3.2 APPLICATION

- These smart chambers can be installed at the entry points of universities/ schools, students as well as the faculty member can access it through their ID cards.
- The Corporate as well as the industry sector's can be the major part of this project as because of this, as many small- or large-scale industries are being affected because of the fear of spreading coronavirus and not allowing full staff all together.

- supermarkets and malls can also install such types of chambers without the feature RFID reader as they are counted in public areas where anyone can come, but keeping in mind the safety.
- In the medical field, as doctors are the major phase of this pandemic and patients coming up for routine checkup can be a major risk factors for the doctor as well as visitors coming to meet any patients.
- In public places, where people should take care of the norms asked by the govt to follow.
- Many party places, restaurants as well as hotels using pass for entry, where people from different areas visit most frequently.

3.3 FUTURE SCOPE

In this current situation, many offices, schools and colleges are planning for a reopening but because of coronavirus, employees and students can’t get back to work properly. The benefit of solving this challenge is that people will able to work by keeping sanitization and other safety measures into consideration. This chamber has the potential to attract most of the offices, organizations, workplaces, schools, colleges, etc. that are in the seek of getting reopen but are grasped by the issues of maintaining sanitization and social distancing among the staff, with the features of human body temperature study, providing face mask and glove as well as 360-degree sanitization, and id cards for maintaining proper distance.

REFERENCES

1. Sharnil pandya, Anirban sur and ketan kotecha, smart edidemic tunnel: IOT- based sensor-fusion assistive technology for covid-19 disinfection.

2. M.Biswal, R.Kanaujia, S.Mohan, Disinfection tunnels, public health.

3. Abhiruchi passi, Dev Dutt,2020:Manav Rakshak: Device to Help Maintain Social Distancing. International Journal of Engineering and Advanced Technology(IJEAT).

4. Chu, D.K., Akl, E.A., Duda, S., Solo, K., Yaacoub, S., Schünemann, H.J., El-harakeh, A., Bognanni, A., Lotfi, T., Loeb, M. and Hajizadeh, A., 2020. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. The lancet, 395(10242), pp.1973-1987.

5. Ashish Shrivastava, IOT Based Sanitation Disinfection tunnel, Journal of Information and Computer Science, ISSN: 1548-7741

6. Singhal, T., 2020. A review of coronavirus disease-2019 (COVID-19). The indian journal of pediatrics, 87(4), pp.281-286.

7. Faizan Ahmad, Aaima Najam, Zeeshan Ahmed, 2013. Image-based Face Detection and recognition: “State of the Art”. arXiv.org>cs>arXiv:1302.6379

8. Akshay Sharma AS , 2020. Review on Automatic Sanitizer Dispensing Machine, International Journal Of Engineering Research and Technology,IJERTV91S070307.

9. Hurriyatul Fitriyah, Aditya Rachmadi and Gembong Edhi Setyawan, 2017, Automatic Measurement of Human Body Temperature on thermal Imahe Using Knowledge Based Criteria, Research gate, Journal of Information Technology and Computer Science.

10. Suthagar S, Augustina Shaglin Ponmalar, Benita, Banupriya, Beulah, 2016, International Journal of Advaned Research Trends in Engineering and Technology, Smart Surveillance Camera Using Raspberry Pi 2 and OpenCV.

11. Naveen Kumar, surya s, M nihaal, 2021, Automatic Covid-19 Face Mask And Body Temperature Detection With Deep Learning, International Journal Of Creative Research and Computer Vision.

APPENDICES-A

- **ECONOMIC FEASIBILITY**

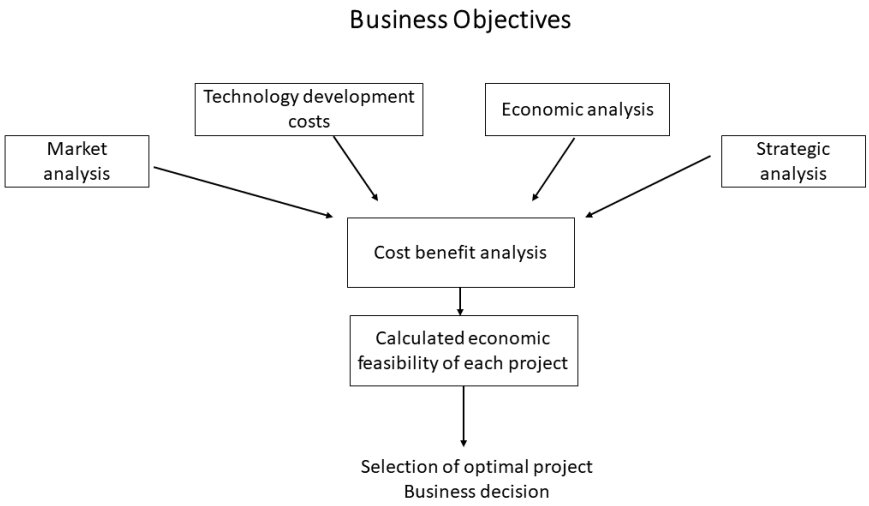

Figure a: Economic Feasibility

The Product will be available at a reasonable price as compared to other products in the market.

The product that we are planning for, has many features as compared to other products already available in the market and will cost around INR 25000.

There is still no product that is providing the attendance, Touchless mask and gloves which is a smatter way for maintaining social distancing.

We are adding the conveyor which will provide the masks and gloves to that individual whose temp is below the set limit.

- The cost of our product will cost around 30,000 INR - 35,000 INR.
- Service centre will be placed in every state for user convenience and 24/7 online support will be provided.
- The target audience will be schools, collages, institutes, companies, malls etc. and we will help our world to be safe from the grasp of corona virus.

Table a: Projected profit or loss statement for next 3 years (Figures in INR) for 1 models

Figures in INR Lakhs	**2021-2022**	**2022-2023**	**2023-2024**
	Revenue for 1 pieces each		
Sales	35,000	70,000	1,40,000
Rentals	1,20,000	2,40,000	3,60,000
Total Revenue			
	Expenses for 1 piece		
Material costs	15,000	30,000	60,000
Maintenance cost	8,000	16,000	32,000
Current Expenses	25,000	50,000	1,00,000
Total Expenses	48,000	96,000	192,000
Net Profit	**72,000**	**144,0000**	**168,000**

APPENDICES-B

- **PROGRAM CODE**
  - **CODE OF ID CARD:**

```
int const trigPin = 10;
int const echoPin = 9;
int const buzzPin = 2;
void setup()
{
pinMode(trigPin, OUTPUT); // trig pin will have pulses output
pinMode(echoPin, INPUT); // echo pin should be input to get pulse width
pinMode(buzzPin, OUTPUT); // buzz pin is output to control buzzering
}
void loop()
{
int duration, distance;
digitalWrite(trigPin, HIGH);
delay(1);
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance = (duration/2) / 29.1;
if (distance <= 50 && distance >= 0) {
digitalWrite(buzzPin, HIGH);
} else {
digitalWrite(buzzPin, LOW);
}
delay(60);
        }
```

- **CODE OF CHAMBER:**

```
import RPi.GPIO as GPIO

import serial

from smbus2 import SMBus
from mlx90614 import MLX90614

import time

from tensorflow.keras.preprocessing.image import img_to_array
from tensorflow.keras.models import load_model
#from imutils.video import VideoStream
from picamera.array import PiRGBArray
from picamera import PiCamera
import numpy as np
import imutils
import cv2

origin = (0,50)
color = (255,255,255)
font = cv2.FONT_HERSHEY_SIMPLEX
scale = 2
thickness = 2

#empty display of black color
black = np.zeros((720,720,3), dtype=np.uint8)

#display for scanning the card
scan_card = cv2.putText(black,"Scan RFID
Card",origin,font,scale,color,thickness,cv2.LINE_AA)
black = np.zeros((720,720,3), dtype=np.uint8)
```

```
#display for after scanning the card
allowed = cv2.putText(black,"Door
Open!!",origin,font,scale,color,thickness,cv2.LINE_AA)
allowed = cv2.putText(allowed,"You can now
enter!!",(origin[0],origin[1]+100),font,scale,color,thickness,cv2.LINE_
AA)
black = np.zeros((720,720,3), dtype=np.uint8)

#display for hand sanitization
hand_ultrasonic = cv2.putText(black,"Place hand in front
of",origin,font,scale,color,thickness,cv2.LINE_AA)
hand_ultrasonic = cv2.putText(hand_ultrasonic, "ultrasonic
sensor",(origin[0],origin[1]+100),font,scale,color,thickness,cv2.LINE_
AA)
black = np.zeros((720,720,3), dtype=np.uint8)

#display for temperature sensor
temp = cv2.putText(black,"Place hand in front
of",origin,font,scale,color,thickness,cv2.LINE_AA)
temp = cv2.putText(temp, "Temperature
sensor",(origin[0],origin[1]+100),font,scale,color,thickness,cv2.LINE_
AA)
black = np.zeros((720,720,3), dtype=np.uint8)

#display for normal body temperature
normal_temp = cv2.putText(black,"Normal
body",origin,font,scale,color,thickness,cv2.LINE_AA)
normal_temp =
cv2.putText(normal_temp,"temperature",(origin[0],origin[1]+100),font
,scale,color,thickness,cv2.LINE_AA)
black = np.zeros((720,720,3), dtype=np.uint8)

#display for high temperature
```

```
high_temp = cv2.putText(black,"High body
temperature!!",origin,font,scale,color,thickness,cv2.LINE_AA)
high_temp = cv2.putText(high_temp,"Can not
enter",(origin[0],origin[1]+100),font,scale,color,thickness,cv2.LINE_A
A)
black = np.zeros((720,720,3), dtype=np.uint8)

#display for sanitization
sanit =
cv2.putText(black,"Sanitizing!!!",origin,font,scale,color,thickness,cv2.
LINE_AA)
black = np.zeros((720,720,3), dtype=np.uint8)

#display for mask detection by facing in the camera
face_camera = cv2.putText(black,"Please face
into",origin,font,scale,color,thickness,cv2.LINE_AA)
face_camera = cv2.putText(face_camera,"the
camera",(origin[0],origin[1]+100),font,scale,color,thickness,cv2.LINE
_AA)
black = np.zeros((720,720,3), dtype=np.uint8)

#dispaly for door open
#door_open = cv2.putText(black,"Door
Open!!",origin,font,scale,color,thickness,cv2.LINE_AA)
#door_open = cv2.putText(door_open,"You can now
enter",(origin[0],origin[1]+100),font,scale,color,thickness,cv2.LINE_A
A)

#dispaly for door close
close_door = cv2.putText(black,"Door
Close!!",origin,font,scale,color,thickness,cv2.LINE_AA)
black = np.zeros((720,720,3), dtype=np.uint8)

#dispaly for without mask no entry
```

```
#not_allowed = cv2.putText(black,"Not allowed to
enter",origin,font,scale,color,thickness,cv2.LINE_AA)
#not_allowed = cv2.putText(not_allowed,"without wearing
MASK!",(origin[0],origin[1]+100),font,scale,color,thickness,cv2.LINE
_AA)

#display for tain mask from the conveyer belt
conveyer = cv2.putText(black,"Take your mask
from",origin,font,scale,color,thickness,cv2.LINE_AA)
conveyer = cv2.putText(conveyer,"Conveyer
Belt",(origin[0],origin[1]+100),font,scale,color,thickness,cv2.LINE_A
A)
black = np.zeros((720,720,3), dtype=np.uint8)

conv_belt= 15
sanitizer = 32
pulse_start= 0
pulse_end = 0
TRIG = 37
ECHO = 36
sanitize_delay = 2
door_open = 31
door_close = 33

details = []

rfid_list = ["0B0023E7CA05", "0B0023F10ED7", "0B0023EA9153",
"0B0023F769B6"]

GPIO.setmode(GPIO.BOARD)
GPIO.setup(TRIG,GPIO.OUT)
GPIO.setup(ECHO,GPIO.IN)
GPIO.setup(conv_belt,GPIO.OUT)
GPIO.setup(sanitizer,GPIO.OUT)
```

```
GPIO.setup(door_open, GPIO.OUT)
GPIO.setup(door_close, GPIO.OUT)

GPIO.output(door_open,True)
GPIO.output(door_close,True)
GPIO.output(sanitizer,True)
GPIO.output(conv_belt,True)



def check_dist():
    pulse_start= 0
    pulse_end = 0
    GPIO.output(TRIG, True)
    time.sleep(0.00001)
    GPIO.output(TRIG, False)

    while GPIO.input(ECHO)==0:
        pulse_start = time.time()

    while GPIO.input(ECHO)==1:
        pulse_end = time.time()

    pulse_duration = pulse_end - pulse_start
    distance = pulse_duration * 17150
    distance = round(distance+1.15,2)
    #print(distance)
    return distance

def check_temp():
    bus = SMBus(1)
    sensor = MLX90614(bus, address=0x5A)
    #print ("Ambient Temperature :", sensor.get_ambient())
    temp = sensor.get_object_1()
    #print ("Object Temperature :", temp)
```

```
    bus.close()
    temp= int((9/5 * temp)+32)
    return temp

def sanitize():
    time.sleep(2)
    GPIO.output(sanitizer,False)
    time.sleep(sanitize_delay)
    GPIO.output(sanitizer,True)

def start_conveyer():
    GPIO.output(conv_belt,False)
    time.sleep(5)
    GPIO.output(conv_belt,True)



def detect_and_predict_mask(frame, faceNet, maskNet):
    print("checking mask")
    (h, w) = frame.shape[:2]
    blob = cv2.dnn.blobFromImage(frame, 1.0, (224, 224),
        (104.0, 177.0, 123.0))

    faceNet.setInput(blob)
    detections = faceNet.forward()
    #print(detections.shape)

    faces = []
    locs = []
    preds = []

    for i in range(0, detections.shape[2]):
        confidence = detections[0, 0, i, 2]
```

```
        if confidence > 0.5:
            box = detections[0, 0, i, 3:7] * np.array([w, h, w, h])
            (startX, startY, endX, endY) = box.astype("int")

            (startX, startY) = (max(0, startX), max(0, startY))
            (endX, endY) = (min(w - 1, endX), min(h - 1, endY))

            face = frame[startY:endY, startX:endX]
            face = cv2.cvtColor(face, cv2.COLOR_BGR2RGB)
            face = cv2.resize(face, (224, 224))
            face = img_to_array(face)
            face = preprocess_input(face)

            faces.append(face)
            locs.append((startX, startY, endX, endY))
if len(faces) > 0:
        faces = np.array(faces, dtype="float32")
        preds = maskNet.predict(faces, batch_size=32)

    return (locs, preds)

def read_rfid():
    print("rfid tag")
    ser = serial.Serial(port='/dev/ttyS0', baudrate = 9600,
parity=serial.PARITY_NONE, stopbits=serial.STOPBITS_ONE,
bytesize=serial.EIGHTBITS)
    data = ser.read(12)
    ser.close ()
    read = str(data)
    read = read.replace("'","").replace('b','')
    return read

while True:
```

```
    cv2.imshow("Text",hand_ultrasonic)
    cv2.waitKey(1000)

    distance = check_dist()

    if distance <= 8:
        #Scan RFID Card
        cv2.imshow("Text", scan_card)
        cv2.waitKey(1000)
        rfid = read_rfid()
        if rfid in rfid_list:  #if RFID matched then check temperature
            cv2.imshow("Text",temp)
            cv2.waitKey(3000)
            temperature = check_temp()

            if temperature >= 99.00:         #if temperature greater than
threshold do nothing
                cv2.imshow("Text", high_temp)
                cv2.waitKey(2000)
                #No need to sanitize

            elif temperature < 99.00:          #if temperature in normal range
check for mask
                cv2.imshow("Text", normal_temp)
                cv2.waitKey(2000)

                cv2.imshow("Text",face_camera)
                cv2.waitKey(3000)

                camera = PiCamera()
                camera.resolution = (480,320)  #(640, 480)
                rawCapture = PiRGBArray(camera,size=(480,320)) #(640,
480))
                time.sleep(0.3)
```

```
            camera.capture(rawCapture, format="bgr")
            frame = rawCapture.array
            cv2.imshow("Text",frame)
            cv2.waitKey(1000)
            cv2.imwrite("image.jpg",frame)
            (locs, preds) = detect_and_predict_mask(frame, faceNet,
maskNet)
            for (box, pred) in zip(locs, preds):

                (mask, withoutMask) = pred
                label = "Mask" if mask > withoutMask else "No Mask"
                #label = "{}: {:.2f}%".format(label, max(mask,
withoutMask) * 100)
                pred = max(mask,withoutMask)*100

                print(pred,"  ",label)

                if label == "Mask":
                    cv2.imshow("Text", sanit)    #first sanitize and then
enter
                    cv2.waitKey(3000)
                    sanitize()
                    welcome = cv2.putText(frame,"Welcome
user",origin,font,1,(0,0,255),thickness,cv2.LINE_AA)
                    cv2.imshow("Text", welcome)
                    cv2.waitKey(3000)
                    GPIO.output(door_open,False)
                    GPIO.output(door_close,True)
                    time.sleep(5)
                    GPIO.output(door_open,True)
                    GPIO.output(door_close, True)

                    cv2.imshow("Text",allowed)
```

```
                cv2.waitKey(3000)

                GPIO.output(door_open,True)
                GPIO.output(door_close,False)
                time.sleep(5)
                GPIO.output(door_open,True)
                GPIO.output(door_close,True)
                cv2.imshow("Text",close_door)
                cv2.waitKey(3000)

                #here send email of rfid, time, and temperature
                send_email(rfid, temperature)



            else:
                print("No Mask")
                not_allowed = cv2.putText(frame,"Not allowed to
enter",origin,font,1,(0,0,255),thickness,cv2.LINE_AA)
                not_allowed = cv2.putText(not_allowed,"without
wearing
MASK!",(origin[0],origin[1]+100),font,1,(0,0,255),thickness,cv2.LIN
E_AA)
                cv2.imshow("Text",not_allowed)
                cv2.waitKey(3000)
                cv2.imshow("Text",conveyer)
                cv2.waitKey(3000)
                start_conveyer()



        camera.close()
        i=1
```

```
            else:
                print("Card not authorized")

        else:
            cv2.imshow("Text",black)
            cv2.waitKey(1000)



"""except KeyboardInterrupt:
    GPIO.cleanup()
            """
```

APPENDICES-C

- **MECHANICAL SCHEMATICS:**

Step 1: The user needs to activate the tunnel by placing hand in front of the ultrasonic sensor, which will detect the presence and start with the process.

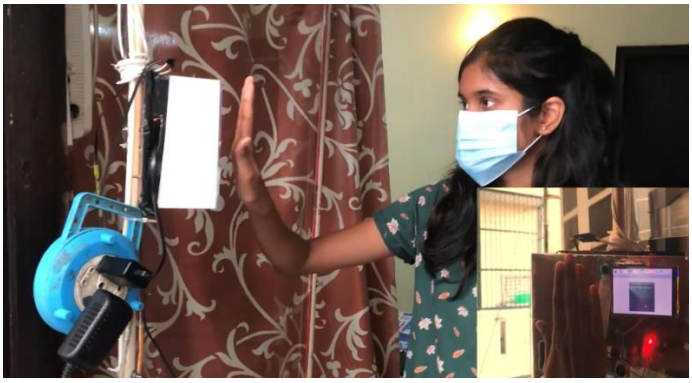

Figure b: Interaction with Ultrasonic sensor

Step 2: The user needs to tag his/her ID card which is a special designed RFID card which will be provided by the organization for confirming employees/staff/student existence.

Figure c: Tagging RFID Tag

Step 3: The user needs to place hands in front of Thermal sensor present at the box, which will detect the temperature and will decide further process on the basis of temperature as follows:

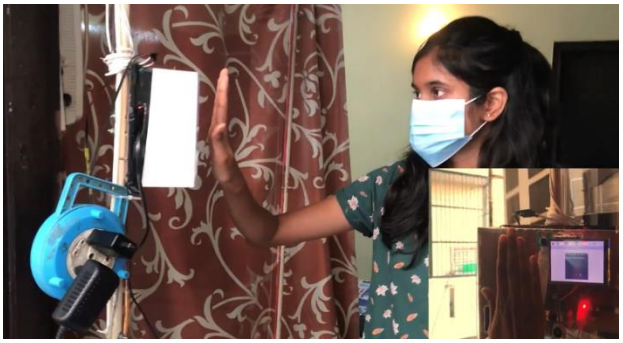

Figure d: Detecting Body Temperature

Step 3.1: If the user is having a normal temperature, then he/ she will continue with step 4 and the normal process.

Step 3.2: If the user is having a high temperature i.e., above the set limit, then the process will display warning and not allow the user to move further and directly jump to step 6 for sanitizing.

Step 4: The user needs to face the Rpi camera which will detect wheather the user is wearing a mask or not, the steps are as follows for the same:

Figure e: Detecting Mask

Step 4.1: If the user is wearing a mask, then the process will directly jump to step 6 sanitizing.

Figure f: Wearing Mask

Step 4.2: If the user is not wearing a mask, then the process will proceed with the step 5.

Figure g: Not-wearing Mask

Step 5: If the user is not wearing a mask, then process will trigger the conveyor belt carrying a pair of gloves and a mask and user needs to wear the same and then after the completion of step 5, the process will restart from step 1 and then proceed further.

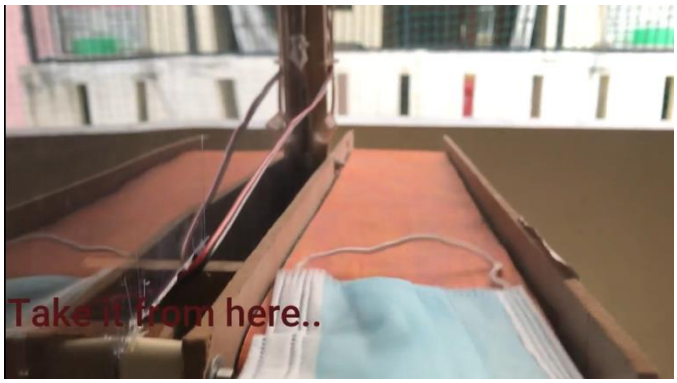

Figure h: Conveyor Belt

Step 6: The final step before exiting the chamber, Sanitization. The nozzles are placed in such an angle that it will sanitize user completely, only user needs to rotate at an 360 degree angle and the nozzles will sanitize completely the top, middle, even the lower portion as well as the shoes also.

Figure i: Sanitizing

Step 7: Before entering the premises, the user needs to wear a special designed social distancing ID card which will detect the presence of any other person under a distance of 2 meter and will play a warning to maintain social distance in Hindi as well as in English.

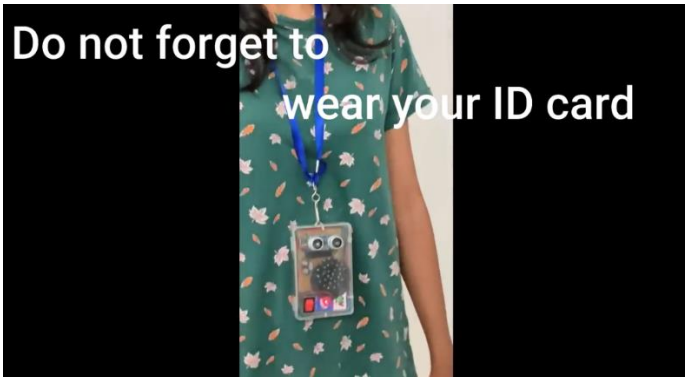

Figure j: Social Distancing ID Card

APPENDICES-D

- ## Component listing:

  - **RFID Reader:** A radio frequency identification reader (RFID reader) is a device, used to gather information from an RFID tag that is used to track individual objects. Radio waves are utilized to move information from the tag to a peruse. The RFID tag should be inside the scope of a RFID peruse, which goes from 3 to 300 feet. Recurrence goes change from low frequencies of 125 to 134 kHz and 140 to 148.5 kHz, and high frequencies of 850 to 950 MHz and 2.4 to 2.5 GHz. Frequencies in the 2.4 GHz.

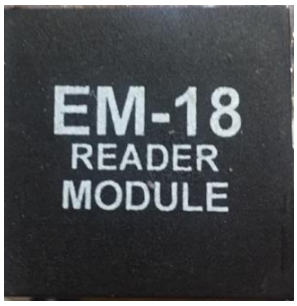

Figure k: RFID Reader

  - **Thermal Sensor:** A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record and monitor the temperature. The sensor is made up of two metals, which generate electrical voltage or resistance once it notices a temperature change**.** There might be a effect of room temperature on thermal sensor, but the result are almost near to the accuracy. It is a small chip-based sensor, which works on 5v power supply.

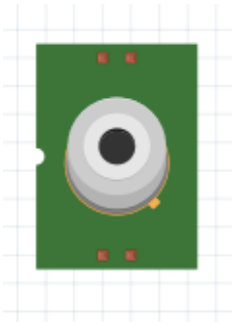

Fig l: Thermal Sensor

- **Raspberry pi:** The raspberry pi range, boasting a 64-bit quad core processor running at 1.4GHz, dual-band 2.4GHz. and 5GHz wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and PoE capability. via a separate PoE HAT & pi camera module are official products from the raspberry pi foundation. The original 5- megapixel model was released in 2013.
  Given below are some of the examples where Raspberry Pi is selected over various microcontrollers:

  - RPi has a huge system processing speed while Arduino board has less than 100Mhz clock speed, so they can perform limited functions. They are not capable of performing high end programs like weather station, cloud server, gaming console etc. on the other hand RPi can perform all those functions as it has 1.2 GHz of clock speed and 1GB of RAM.
  - Wireless connectivity is also one of the main advantages of Raspberry Pi as it has wireless LAN Bluetooth connectivity by which HOTSPOT can be setup for internet connectivity. For IOT this is the best feature of microcontroller.
  - It has special in build port for connecting the LCD display which pass over the need of monitor.
  - Another feature of this board is that it has a special camera port too so that camera can be attached to board easily.
  - It also has PWM output for application use.

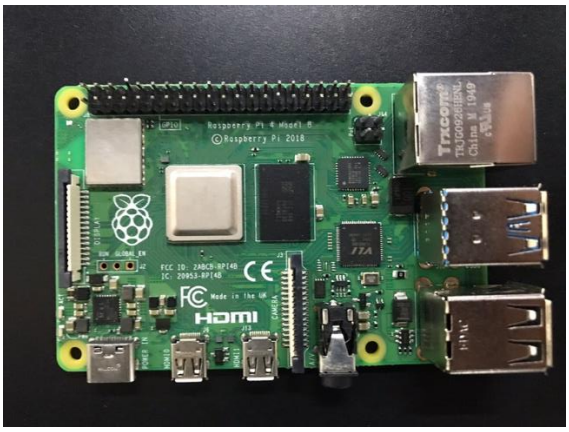

Figure m: Raspberry pi

- **Raspberry Pi camera**: It is a high-quality 8MP image sensor added on raspberry pi with the feature of a fixed focus lens. Its pixel frame rate is 3280 x 2464 and supports 1080p30 and below video quality [7]. The use of this in our project is to scan the QR code which is obtained on the mail of the customer so that the order is verified. Camera Module are of two types: Standard Version: in this picture can be captured in the normal light. NOIR Version: it doesn't contain infrared filter, so to take pictures in dark one can use infrared light with camera. The project use standard version camera module. The library pi camera in python is used for controlling camera module in Raspberry Pi.

  The default image resolution of the camera is set according to the monitor.

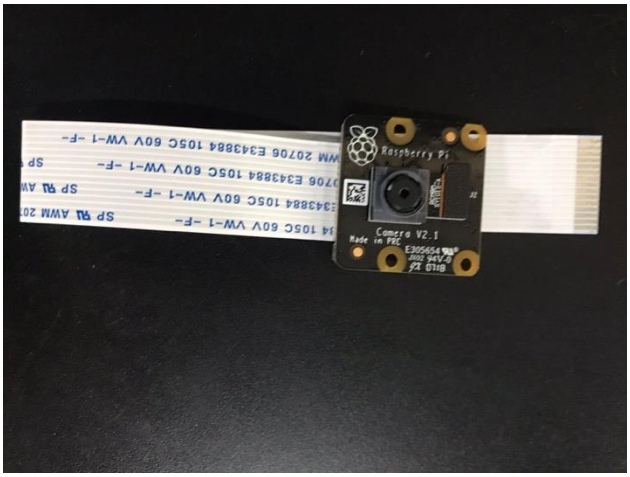

Figure n: Rpi Camera

- **DC Induction motor-** An induction motor or asynchronous motor is an AC electric motor in which the electric current in the rotor is needed to produce torque is obtained by electromagnetic induction from the magnetic field of the stator winding Rotatory motion is developed when the inductor inside the motor creates a magnetic field on applying DC voltage. The shaft of the motor is wrapped with a coil of wires and contains two fixed magnets on both sides producing repulsive and attractive force and creating torque. DC gear motor is also used in the project for reducing the speed while increasing the torque

Geared motor is a component whose mechanism adjusts the speed of the motor A gear motor is a combination of both motor and the gearbox. The gear head which is installed at the motor helps to reduce the speed of motor and increase the torque at the output. The major parameters of the gear motor include speed (rpm), torque (lb.-in) and efficiency (%). For selecting the best gear motor for the project, one must calculate the load, speed and torque requirement of the project.

Key points which can help in selection of an appropriate motor or gear motor for the project are:

- **Design Requirements**: deciding phase in which the design parameters, functionality and product optimization are discussed.
- **Design Calculations**: Calculations are made according to the project that tells which motor is appropriate for the project. It consists of ratio, torque, rotating mass, service factor, overhung load and testing analysis.

Fig o: dc Induction motor

- **Belt for conveyor-** Conveyors are durable and reliable components. It is the carrying medium. The very essential tool of the project is the conveyor belt commonly used in the material handling sector. Conveyors are durable and reliable components. Belt conveyors are the most utilized fuelled transports since they are the most adaptable and the most affordable. It is the carrying medium. A belt conveyor framework comprises of at least two pulleys with a shut circle of conveying medium that turns about them. It is made up of stripes that are constantly moving and carrying stuff to transfer from one place to another.

Figure p: Belt for conveyor

- **Nozzles for spray:** The Nozzles uses pressurized fluid generated by the motor energy. The kinetic energy is utilized to break the liquid into little particles and to disperse them evenly according to the desired pattern. Now and again, the active energy is utilized to give higher infiltration power to the Jet. The capacity depends on the internal flow area and the working pressure. It is available with a wide range of nozzles suitable to solve every kind of spray problem. These Nozzles are specially designed to produce mist which can help disinfecting a surface by spreading a special liquid designed by taking care of various aspects and human body tendencies. These Nozzles are of different type, but mainly 0.5 mm brass nozzles are used for sanitizing purpose.

Figure q: Nozzles for spray

- **Arduino Uno:** It is microcontroller based on a Microchip ATmega328P microcontroller. Arduino uno is easy to use into a variety of electronics

projects. The board contains 14 digital input/output pins in which 6 are analog input pins, USB connector one reset button, ICSP header, and other components

The AT mega 28 provides UART TTL (5V) Serial communication, which is available on digital pins 0 (RX) and 1(TX). The operating voltage of microcontroller Arduino uno is 5 v. The Input voltage may vary from 7-20 v. It has 1 I2C, SPPI. The DC current per I/O pins is 20 mA. It has a 32 KB flash memory, 2 KB SRAM, 1 KB EEPROM, 16 MHZ clock speed. The length and width of this microcontroller is 68.6 mm & 53.4 mm.

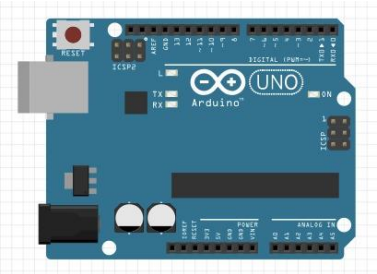

Figure r: Arduino Uno

- **Ultrasonic sensor:** It is an electronic device that measures the distance of a target object by emitting ultrasonic waves and converts the reflected wave into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound. It measures the distance of the target by measuring the time between the emission and reception for ultrasonic sensing, the most widely used range is 40 to 70 kHz.

  ultra-sonic sensor has two main components:

  Transmitter which discharges the sound utilizing Crystal and receiver which experiences the sound after it has made a trip to and from the objective

  They can be found in a self-parking technology also used in robotic detection systems, as well as manufacturing technology

  APPLICATION OF ULTRA SONIC SENSOR

1. Detecting obstacles
2. Data sheet control
3. Height and weight measurement
4. Presence detection
5. Robotic sensing

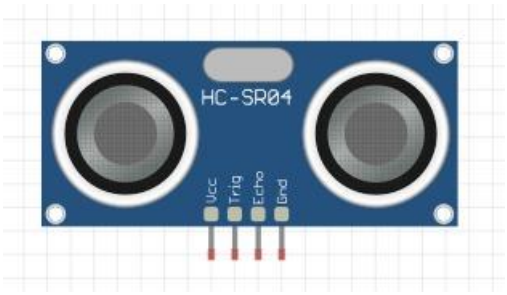

Figure s: Ultrasonic sensor

- **Speaker & sound chip:** Speakers are the device that take help of electric energy and convert signals into sound energy. These speakers came up of different type of configurations for diff types of purposes. They contain a magnate attach along with it, which help catch the signal and convert into the sound energy for user to listen. They are attaching to particular chip. These chips mainly contain a message or a particular song that will be use as output for someone or something. They will play the data already available in that chip whenever they will get trigger from the microcontroller.

Figure t: Speaker

- **Rpi screen:** A 3-inch Raspberry pi screen take use of GPIO pin to get connected with the Raspberry pi. It is a complete resistive touch screen. It has 320 x 480 resolutions. It is compatible with any Raspberry pi revision. It is of same size of Raspberry pi. It has a high-quality immersion gold surface plating. It can support Raspbian system, Ubuntu, Kali Linux system.

Figure u: Rpi screen

- **Transistors, Capacitors and Resistors:** A semiconductor with three or more terminals fixed with electrode region, current which is flowing between the electrodes is managed by voltage or current to specified electrodes. It can amplify and can replace in most circuits as it is small in size and can work on low voltage as well.

  A capacitor is a gadget that stores electrical energy in an electric field. It is a uninvolved electronic part with two terminals. While some capacitance exists between any two electrical conduits in closeness in a circuit, a capacitor is a part intended to add capacitance to a circuit.

  A resistor is a passive two-terminal electrical part that executes electrical opposition as a circuit component. In electronic circuits, resistors are utilized to lessen current stream, change signal levels, to partition voltages, inclination dynamic components, and end transmission lines, among different employments.

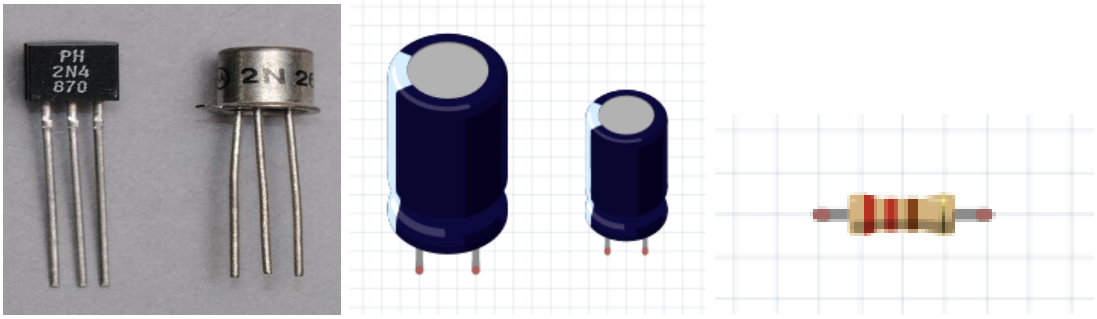

Figure v: Transistor

- **L293D Motor Driver:** This motor driver is utilized for building new robots. The most straightforward method of figuring out how to chip away at a DC motor is interfacing the L293D motor driver with the Arduino. It can handle the turning and speed of two DC motor alongside that it can likewise control unipolar or bipolar stepper motor. GPIO pins in RPi is used and keyboard is used to enter the commands for the action performed by the motor. The main point in this procedure is that the DC motor must be Powered by the external power supply and also do not connect the module directly with the RPi. As motor require at least 400mA of current to start and this much power cannot be generated by the Pi and can cause damage to controller.

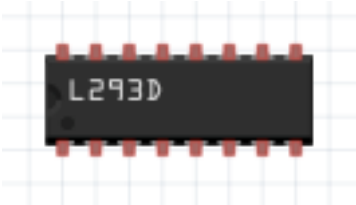

Figure w: L293D Motor Driver

- **7805 Voltage Regulator IC:** 7805 Voltage Regulator, an individual from 78xx series of fixed direct voltage controllers used to keep up with such vacillations, is a famous voltage controller coordinated circuit (IC). The input voltage range lies between 7-35 v. And current rating for the same is 1A. Output voltage range lies from 4.8v to 5.2v. It consists of 3 pin input, output and ground.

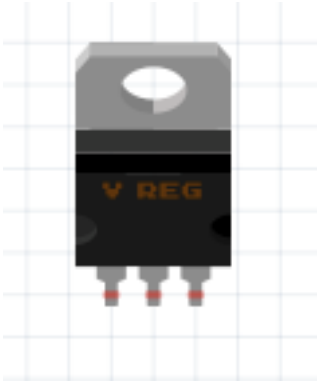

Figure x: 7805 Voltage Regulator IC

- **DC pump:** It is 3-6v submersible water pump, works on operating voltage 2.5 ~ 6 v. And the operating current for the same is 130 ~ 220 mA. The flow rate for the pump is 80 ~ 120 L/H, it can lift from 40 ~110 mm. The diameter of outlet is 7.5 mm, and inside diameter is 5 mm. It generates pressure and send fluid to nozzles for out through pipes.

Figure y: DC Pump

- **2 Pin Switch and LED:** A switch is an electrical part that can detach or interface the leading way in an electrical circuit, interfering with the electric flow or redirecting it starting with one channel then onto the next. The most widely recognized sort of switch is an electromechanical gadget comprising of at least one arrangements of versatile electrical contacts associated with outside circuits. At the point when a couple of contacts is contacting current can pass between them, while when the contacts are isolated, no current can stream.

A light-radiating diode (LED) is a semiconductor light source that produces light when current courses through it. Electrons in the semiconductor recombine with electron openings, delivering energy as photons. The shade of the light (relating to the energy of the photons) is controlled by the energy needed for electrons to cross the band hole of the semiconductor. White light is acquired by utilizing different semiconductors or a layer of light-discharging phosphor on the semiconductor gadget.

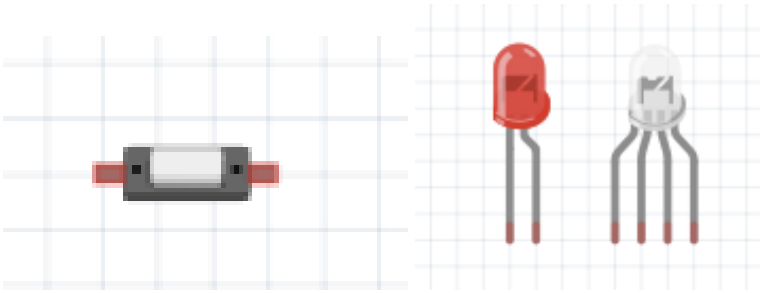

Figure z: 2 Pin Switch and LED