

# Intrusion Prevention for Covid-19 Using IOT Devices

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**Abstract-** This COVID-19 pandemic caused by novel corona virus is continuously spreading until now all over the world. Many precautionary measures have been taken to reduce the spread of this disease where wearing a mask is one of them. We propose a Raspberry Pi based system that restricts the growth of COVID-19 by finding out people who are not wearing any facial mask. While a person without a mask is detected. As we know fever is also a symptom of COVID-19, so our system will check body temperature of the person and also it will check if that person is maintaining proper social distancing or not. If the person follows all standard operating procedures then the automated door is opened he/she can enter. If the person is not following any one among three Standard Operating Procedures then the person will not be allowed to enter into the office / school / college. It alerts through buzzer.

**Keywords-** COVID-19, IOT, Mask detection, Temperature, Social distancing.

## I. INTRODUCTION

The main aim of the project is to build a Raspberry pi3 based safety device for covid-19 safety rules to reduce the disease spread. We focus on most common indoor measurement system to allow the people. This project makes a use of MLX90614 contact less temperature sensor to detect the body temperature and camera which detects whether the person is wearing a mask or not and also social distance checking. We introduce an affordable COVID-19 indoor safety system. All modules and sensor are interfaced to the raspberry pi processor.

The temperature sensor measures person's temperature using contact less IR sensor. The persons pass one by one. In case that person's temperature exceeds average human body, and then raspberry pi processor generates signal to lock the door and gives the audible alert through buzzer. Otherwise, the door is opened to let the person in.

For implementation of mask detection using an OpenCV and camera interfaced to the Raspberry Pi3. When the user switches on the kit then camera capture the images, In case that image does not contain mouth and nose, it means that person wears mask properly and corresponding door will be opened. However, if the person not wear a mask then raspberry pi processor generates signal to lock the door and also gives the audible alerts through buzzer.

When it comes to social distancing check algorithm, it leverages OpenCV's haarcascade\_fullbody classifier for human body detection within the captured image. If the distance between each two bodies is greater or equal to threshold, then social distancing is applied correctly in a given scenario. Otherwise, if this condition does not hold for at least one pair of bodies, then the system give the

alert through buzzer and displays the corresponding message on LCD module. The main controlling device of the project is Raspberry pi3 processor.

Here we are using DC motor as door. The SD card is a key part of the Raspberry Pi; it provides the initial storage for the Operating System and files. The status of the project will be displays on LCD module.

## II. DESIGN

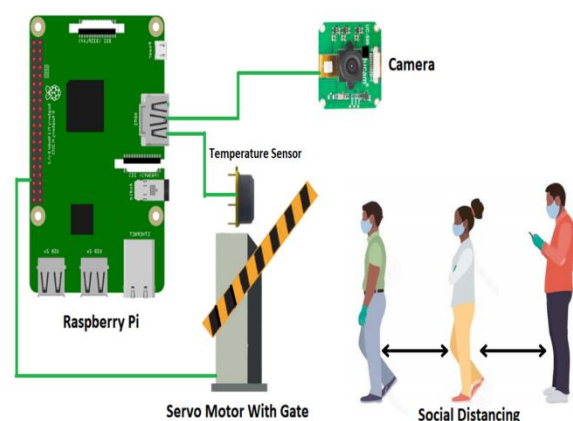


Fig 1. Design of the project.

### 1. The main blocks of this project are:

Raspberry pi3, Pi Camera, MLX90614 (IR based Temperature sensor), DC motor, Buzzer, LCD display, LED indicators. Raspberry Pi3 Featuring the ARM1176JZF-S Running at 1.2 GHz, with 1 GB of RAM The RASPBERRY Pi 3 is a credit card sized computer that plugs into your TV and a keyboard, its like a little PC which can be used for many of the things that your

desktop PC does, like spreadsheets, word processing and games. It also plays high definition video. The design is based around a Broadcom BCM2837 SoC, which includes an ARM1176JZF-S 1.2 Ghz processor, VideoCore IV GPU and 1 GB of RAM.

The design does not include a built in hard disk or solid state drive, instead relying on a microSD card for booting and long term storage. This board is intended to run Linux kernel based operating systems.

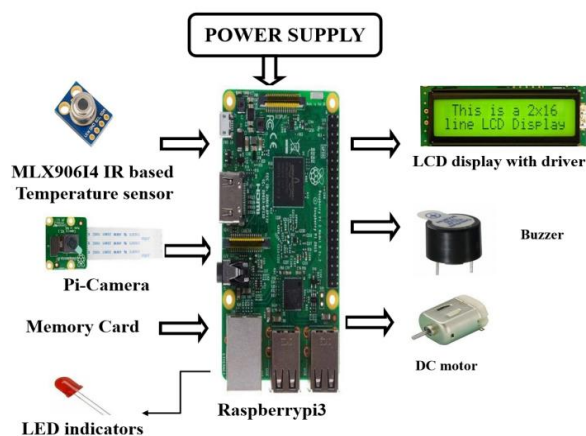


Fig 2. Implementation.

The AC adapter, AC/DC adapter or AC/DC converter is a type of external power supply, often enclosed in a case similar to an AC plug. Other names include plug pack, plug-in adapter, adapter block, domestic mains adapter, line power adapter, wall wart, or power adapter. AC adapters are used with electrical devices that require power but do not contain internal components to derive the required voltage and power from mains power.

The internal circuitry of an external power supply is very similar to the design that would be used for a built-in or internal supply. External power supplies are used both with equipment with no other source of power and with battery-powered equipment, where the supply, when plugged in, can sometimes charge the battery in addition to powering the equipment.

Use of an external power supply allows portability of battery-powered equipment without the added bulk of internal power components and makes it unnecessary to produce equipment for use only with a specified power source. A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting. Introduced as a practical electronic component in 1962, early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet and infrared wavelengths, with very high brightness.

The MLX90614 is a Contact less Infrared (IR) Digital Temperature Sensor that can be used to measure the

temperature of a particular object ranging from  $-70^{\circ}\text{C}$  to  $382.2^{\circ}\text{C}$ . The sensor uses IR rays to measure the temperature of the object without any physical contact and communicates to the microcontroller using the I2C protocol.

The key feature of MLX90614 is that it is a contact less IR temperature sensor with high accuracy. So it can be used in industries to measure the temperature of moving objects like a rotating motor shaft. Due to its high accuracy and precision, it is also used in a wide range of commercial, health care, and household applications like room temperature monitoring, body temperature measurement, etc.

As mentioned earlier, the MLX90614 sensor can measure the temperature of an object without any physical contact with it. This is made possible with a law called Stefan-Boltzmann Law, which states that all objects and living beings emit IR Energy and the intensity of this emitted IR energy will be directly proportional to the temperature of that object or living being. So the MLX90614 sensor calculates the temperature of an object by measuring the amount of IR energy emitted from it.

The Pi camera module is a portable light weight camera that supports Raspberry Pi. It communicates with Pi using the MIPI camera serial interface protocol. It is normally used in image processing, machine learning or in surveillance projects. It is commonly used in surveillance drones since the payload of camera is very less. Apart from these modules Pi can also use normal USB webcams that are used along with computer.

Basically, the sound source of a piezoelectric sound component is a piezoelectric diaphragm. A piezoelectric diaphragm consists of a piezoelectric ceramic plate which has electrodes on both sides and a metal plate (brass or stainless steel, etc.).

A piezoelectric ceramic plate is attached to a metal plate with adhesives. Applying D.C. voltage between electrodes of a piezoelectric diaphragm causes mechanical distortion due to the piezoelectric effect. For a misshaped piezoelectric element, the distortion of the piezoelectric element expands in a radial direction. And the piezoelectric diaphragm bends toward the direction. The metal plate bonded to the piezoelectric element does not expand. Conversely, when the piezoelectric element shrinks, the piezoelectric diaphragm bends in the direction. Thus, when AC voltage is applied across electrodes, the bending is repeated, producing sound waves in the air.

One of the most common devices attached to a micro controller is an LCD display. Some of the most common LCD's connected to the many microcontrollers are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

A dc motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors. The reverse process, producing electrical energy from mechanical energy, is accomplished by an alternator, generator or dynamo. Many types of electric motors can be run as generators, and vice versa. The input of a DC motor is current/voltage and its output is torque (speed).

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

All inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs are active and in phase with their inputs

## 2. This project is implemented using following software's and Linux Operating System:

Linux is a Unix-like and mostly POSIX-compliant computer operating system assembled under the model of free and open source software development and distribution. The defining component of Linux is the Linux kernel, an operating system kernel first released on 5 October 1991 by Linus Torvalds.

The Free Software Foundation uses the name GNU/Linux, which has led to some controversy. The Linux Standard Base (LSB) is a joint project by several Linux distributions under the organizational structure of the Linux Foundation to standardize the software system structure, including the file system hierarchy used in the GNU/Linux operating system. The LSB is based on the POSIX specification, the Single UNIX Specification, and several other open standards, but extends them in certain areas

The main controlling device of the project is Raspberry pi3. pi camera, temperature sensor, DC motor, LCD display and buzzer is interfaced to the raspberry pi processor.

The processor continuously read the data from sensor and pi camera. In case that person's temperature exceeds average human body, and then raspberry pi processor generates signal to lock the door and gives the audible alert through buzzer. Otherwise, the door is opened to let the person in.

If the person wears mask properly and corresponding door will be opened otherwise the system lock the door. If the distance between each two bodies is greater or equal to threshold, then the system give the alert through buzzer and displays the corresponding message on LCD module.

Here we are using DC motor as door. The status of the project will be displays on LCD module.

## 3. Setting up the Raspberry Pi and camera interface:

To get started, we will need a Raspberry Pi board already loaded with Raspbian OS and a Raspberry Pi camera board module.

- Step 1. Connect the camera module with the Raspberry Pi.
- Step 2. Enable the camera module  
Open the terminal and run "sudo raspi-config".  
Go to the "Interfacing Options" and select "Camera".  
Enable the camera module

Bingo, now the camera interface is enabled. To test this, open the terminal and execute "raspistill -o image.jpg". This will activate the camera module, displays a preview of the image, and then it captures the image and saves it in the current working directory as "image.jpg".

## 4. Installing the dependencies:

Now, we will be installing opencv for image processing and tf-lite\_runtime to load our face\_mask\_detection model. The remaining dependencies can be installed directly via pip or pip3.

### Step 1. Installing tf-lite\_runtime.

- Go to <https://www.tensorflow.org/lite/guide/python>
- Select the appropriate package for installed python version on your Raspberry Pi ( In case you don't know then open the terminal and execute "python3 --version"
- cCopy the URL and install the package using pip3. For example, if you have Raspberry Pi that's running Raspbian Buster (which has Python 3.7), install the Python wheel by executing: pip3 install [https://dl.google.com/coral/python/tflite\\_runtime-2.1.0.post1-cp37-cp37m-linux\\_armv7l.whl](https://dl.google.com/coral/python/tflite_runtime-2.1.0.post1-cp37-cp37m-linux_armv7l.whl)

### Step 2. Installing OpenCV:

- sudo apt-get update && sudo apt-get upgrade
- sudo apt-get install build-essential cmake unzip pkg-config sudo apt-get install libjpeg-dev libpng-dev libtiff-dev
- sudo apt-get install libavcodec-dev libavformat-dev libswscale-dev libv4l-dev
- sudo apt-get install libxvidcore-dev libx264-dev
- sudo apt-get install libgtk-3-dev
- sudo apt-get install libcanberra-gtk\*
- sudo apt-get install libatlas-base-dev gfortran
- sudo apt-get install python3-dev

Now, you have successfully installed OpenCV 4.0 on your Raspberry Pi.

### III. RESULT

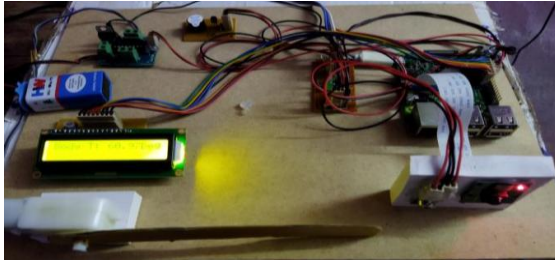


Fig 3. Actual Implementation.

#### Case 1:

If the person is not wearing mask, It will Display “No Mask Detected” message on LCD Display along with Buzzer beep And Gate will remain close with Buzzer beep.

#### Case 2:

If the person is wearing a mask, A message is displayed On the LED display ie. “Mask Detected” with Buzzer beep.

#### Case 3:

If the body temperature of the person is high Message will be Displayed ie. “High Temperature” And the gate will remain close with a beep sound of the Buzzer.

#### Case 4:

If the person is not maintaining social distancing It will display XYZ person is near to you with a Buzzer beep.

### IV. CONCLUSIONS

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested.

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