AN AUTONOMOUS ENTRY SYSTEM WITH MASK AND TEMPERATURE DETECTION

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Abstract - *This paper presents detailed information about an entry system that contains a contactless temperature sensor and pi camera. We have implemented an engineering method that helps to prevent the link of the covid-19 virus. Here, we used a raspberry pi B+ and it is the main device of the entire system. It detects the temperature of the human body using a contactless temperature sensor mlx90614 and the Pi camera detects whether the person wears a mask and allows only those who have masks on their face. We used python software and OpenCV and with help of the haar cascade algorithm, we can detect facemask and also it sends a picture of the person who has a high temperature and without a mask in the mail.*

Key Words: **Raspberry Pi B+, mlx90614, DC motor, Pi camera, face recognition, haar cascade algorithm.**

1. INTRODUCTION

Since 2019 December the world is facing one of the deadliest viruses of all time that can be detected after 14 days of infection. It is the largest category for an RNA virus. This virus affects the sinuses, nose, and upper throat. Many people get infected with coronaviruses at one point in their lives, but symptoms are typically mild to moderate. In some cases, the viruses can cause lower-respiratory tract illnesses such as pneumonia and bronchitis [1]. The symptoms of this virus are cold and dry cough. The name of the virus comes from the crown-like spikes that it has on its surface. This virus has an effect around the globe and shaking the world and declaring a pandemic situation around the world. The virus can be spread from human to human using moisture content that comes out of the mouth of the person. The virus can be detected after 14 days of infection.

The economical and most easy method to end the virus spread is maintaining social distance and wearing masks in public places, biologically we can end the virus with vaccination. But the biological method does not prevent the virus that accurately. So, the best method is to wear a mask and check the body temperature regularly.

So, we came up with an idea of engineering technology that can prevent the spread of the virus. It can detect temperature and facemask and that can replace human efforts.

The main purpose of the project is to stop the spread of the virus by means of temperature scanning and facemask detection. It reduces human efforts and it can be implemented at public gatherings where people meet like halls, railway stations, etc.

2. SOFTWARE DESCRIPTION

The software we used in this project is

1) Python

Python is an open-source, portable, object-oriented programming language and can be used on any platform like UNIX, windows, etc., so we used this programing language to develop the logic behind facemask detection. It has inbuilt libraries and it is a major advantage for built project that's why we used this language.

2)OpenCV

OpenCV is specially designed for real-time optimized computer vision library, tool, and hardware. It also supports machine learning. It is a great tool for image processing and performing computer vision tasks by maintaining high accuracy. We used OpenCV Python because it provides standard libraries and does the work with high accuracy to detect face masks.

3)Linux

Linux is a UNIX-based operating system. It is used to manage hardware and software like CPU, Storage devices. It acts as a mediator between applications and hardware and connects software and physical devices. The Linux software is present in our raspberry pi 3 b+. This Linux is a platform in which we are going to write programs for facemask and temperature detection.

3. Implemented Methodology

As shown in fig 1 the raspberry pi takes input supply and when it is turned on the message will be displayed on the LCD screen as welcome. Then the temperature is detected by a contactless temperature sensor. Then the Pi camera gets activated and it detects whether the person wears a mask or

not. If the person's temperature is more than the normal temperature then the mlx9014 contactless temperature sensor detects the temperature and sends the image of the person to the linked mail ID. If the temperature of the person is normal then it proceeds to face mask detection and if the person with the absence of a face mask can be detected by the device and blinks redlight with alarm indication and it sends the photo to the linked email Id. If the conditions of the program is satisfied then the door will get opened and it will allow the person.

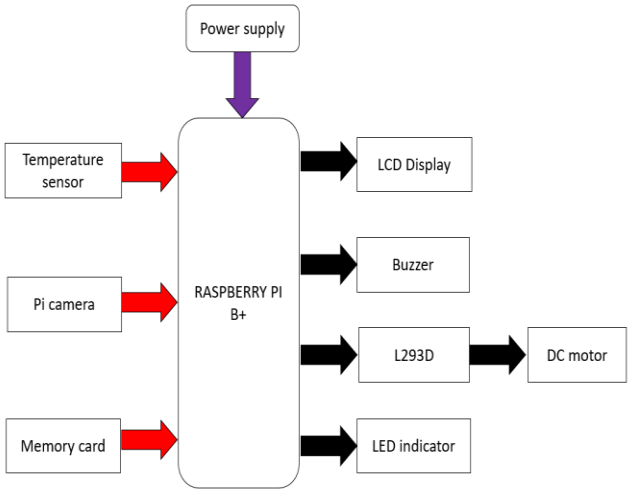


Fig -3: block diagram

4. HARDWARE REQUIREMENTS

Raspberry Pi B+:

In this project, the raspberry pi acts as the brain of the system and it does all its functions. The raspberry pi 3 B+ is a member of the raspberry pi 3 family and can be used for many tasks that a typical desktop PC can do, including image processing, HD video, programming, and project creation. It is a mini-computer with built-in peripherals. Includes a 64-bit quad-core processor running at 1.4 GHz or faster, Ethernet, Bluetooth 4.2/BLE.

Fig -4.1: Raspberry Pi B+

LCD Display:

LCD stands for liquid crystal display it is a flat panel display it uses liquid crystals in its primary form of operations. The LCD we use here is (16x2). Here the use of the LCD display in our project is the raspberry pi that sends messages based on the temperature sensor and pi camera.

Fig -4.2: 16x2 LCD Display

MLX90614:

The mlx90614 is the contactless temperature sensor that can sense temperature from a 5 cm distance. So in this project, we use this sensor that has an operating voltage of 3.6 to 5volts max and the supply current is 1.5mA.it is so accurate that it can sense value correctly up to 0.02°C so the position of this sensor is downwards and the very first procedure of our project starts by sensing temperature.

Fig -4.3: MLX90614

Pi camera:

The Pi camera is a module that supports raspberry pi and has lighter in weight and it is portable.it is the 5MP color camera module that supports both raspberry pi model A and model B. The resolution of this camera is 2592*1994. In this project, the use of this camera is to send images to the raspberry pi. Later, the raspberry pi detects faces with masks and without masks and does the next work.

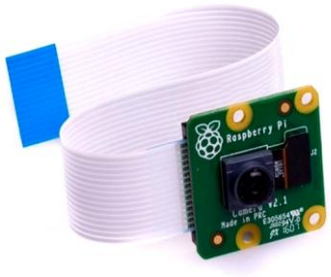


Fig -4.4: Pi camera

L293D:

L293D is a motor driver that contains 14 pins and is designed to provide bidirectional drive currents of up to 600 mA and the voltage range is from 4.5 to 36v. The driver receives signals from the raspberry pi and transmits the signal to the motor. Here the use of this motor driver to control the position of the gate from 0° to 90°.

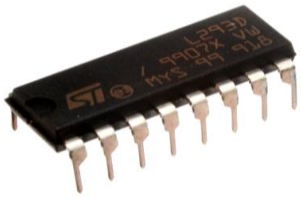


Fig -4.5: L293D

DC MOTOR:

The DC motor here we use with gear arrangement. The actual speed of the DC motor is 1000RPM but we control the speed of the motor using the pulse width magnitude method. The torque ranges to 0.5 kg-cm. The operating voltage is up to 12 volts. The raspberry pi cannot satisfy the supply needs of the motor so we use a Li-ion battery of 9v supply additionally. The gear arrangement is used to lift the gate or door smoothly.

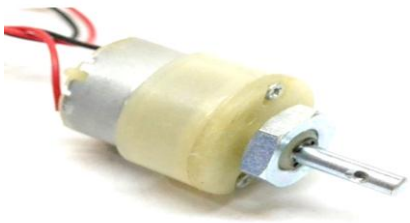


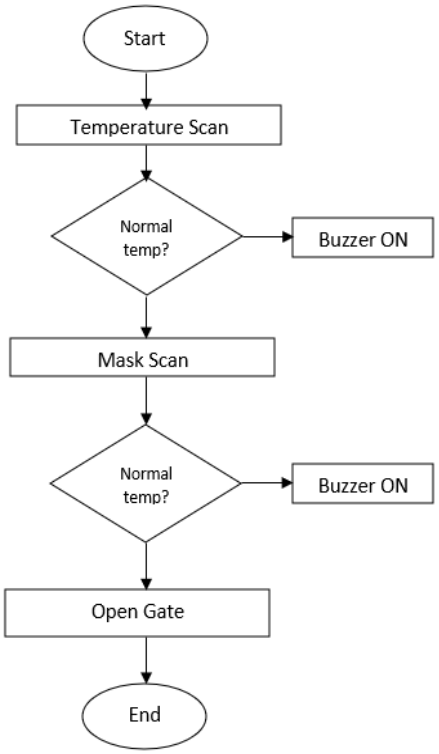
Fig -4.6: DC MOTOR

BUZZER:

The buzzer or beeper is a sound-making device that converts audio signals (electrical signals) into sound signals. It contains conductive electrodes sandwiching a piezoelectric material that is used for signal indication purposes which are in the form of sound. When a voltage is applied across the two electrodes of the buzzer, the piezoelectric material deforms due to the voltage applied across the electrodes. This movement of the disc creates a sound same as a magnetic buzzer or speaker. So here we use this buzzer as an indication that tells us the person is not wearing a mask or has a high temperature.

Fig -4.7: BUZZER

5. flow chart



6. PRACTICAL KIT

So this is what our practical kit looks like. This kit is divided into two parts for a simple explanation. Fig 3.1 is the head and it contains an LCD display, Pi camera, and LED indication. Inside the head, the raspberry pi and buzzer is well placed, and to avoid short circuits we made a special arrangement inside the head.

Fig -6.1: Head part of the kit

Fig -6.2: Practical kit

The bottom of the kit contains a dc motor fixed with a gate to allow persons and it.

7. OUTPUT

The output we get from LCD display and through Gmail. In Gmail, we get a photo shot of the person who has a high temperature or no face mask or with both.

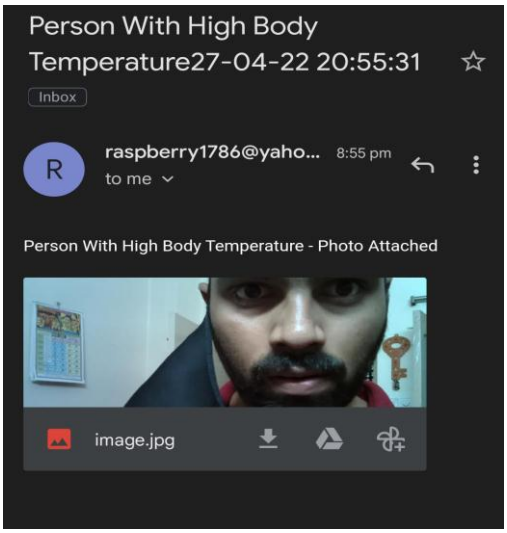


Fig -7.1: Person with high temperature

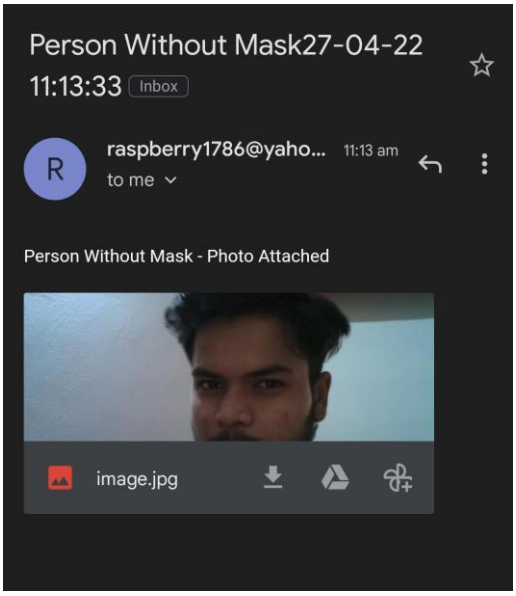


Fig -7.2: Person with no face mask

8. Conclusion

Hence this project helps to prevent the spread of coronavirus and reduces human efforts. A smart door is developed to monitor body temperature and face mask detection that enhance public safety. Taking as an engineering problem we made this project to stop the virus using engineering methods. So this is one of the best methods to break the link of covid-19. This project is best and suitable where a crowd or group of people gather in a place for something like meetings, traveling, etc.

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BIOGRAPHIES

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