Face Mask Detection and Thermal Scanner for Covid Care

[1] Gerardine Immaculate Mary , [2]R.Sai sumanth , [3]Somalaraju Chenchu babu , [4] B.Bhargav reddy , [5] A. Varun Chowdary

[1]Associate professor grade2, [2]Student, [3]Student , [4]Student, [5]Student
SENSE,
Vellore Institute of Technology , Vellore , India

Abstract: Wearing a face mask in public places is the most efficient form of protection, according to the World Health Organization (WHO). Every single item is required to be contactless with everyone's safety in mind. The model is an automated system based on computer vision that concentrates on tracking people's faces in real-time to create a COVID-free environment. When a person is donning a face mask and their body temperature is within the threshold, automatic sanitization is carried out. Otherwise, a buzzer will sound and a warning message will be sent.

Key Words: Face Mask Detection, MobileNetV2, Keras, OpenCV, TensorFlow.

1. INTRODUCTION

The World Health Organization (WHO) recommends all countries to require its citizens to wear masks in public in order to stop the spread of corona virus (COVID-19). Scientists advise wearing a face mask in public locations to avoid illness transmission because the majority of positive cases are discovered in crowded and busy areas. Sanitizing hands on a regular basis is also vital to stop the transmission of viruses. The technique uses a combination of image classification and video analysis to determine whether a face mask is present in a video.

In less than six months, COVID-19 infected more than five million people in 188 different countries. The virus can spread through close physical contact and in crowded, confined spaces. We can prevent and treat new diseases with the help of cutting-edge technology like artificial intelligence, the Internet of Things, and machine learning. to better comprehend how our approach might be used to lower infection rates. Face masks must be worn in public according to laws in many countries. These regulations and laws were developed in reaction to the sharp rise in cases and fatalities in various places.

More than five million people in 188 different countries were infected with COVID-19 in less than six months. In busy, cramped areas and by direct physical touch, the virus can spread. With the use of cutting-edge technology like artificial intelligence, the Internet of Things, and machine learning, we can prevent and treat emerging diseases. to better understand how our method could be applied to reduce infection rates. There are regulations in many nations that require face masks to be worn in public. These rules and laws were created in response to the dramatic increase in incidents and fatalities around the country.

As this is currently not being archived despite taking care, we need a gadget that can help us attain social distance and sanitation in a single step. The sanitizer device will automatically pump out sanitizer when a mask-wearing face is recognised and if the temperature is within the recommended range, as indicated by an LED. If a model detects a person without a mask or when the temperature exceeds the acceptable level, a buzzer will be activated, and the message will be forwarded to the appropriate authorities.

2. PROBLEM STATEMENT

A device that can assist us in achieving social distance and sanitation simultaneously is required because, at the moment, neither goal has been met despite efforts. The challenge at hand is to determine whether or not they are wearing face masks while also using live streaming to check their body temperature.

3. PROPOSED SOLUTION

Utilizing a Raspberry Pi 3 Model B microprocessor to operate an automated facemask and body temperature sensing system, as well as an automatic sanitization system, is the solution to this issue. This setup has a built-in camera module that keeps an eye on the facemask and a non-contact temperature sensor that gauges body temperature. If the user complies with COVID-19 regulations, the sensor allows them to continue; otherwise, it warns the proper authorities.

- **DESIGN**

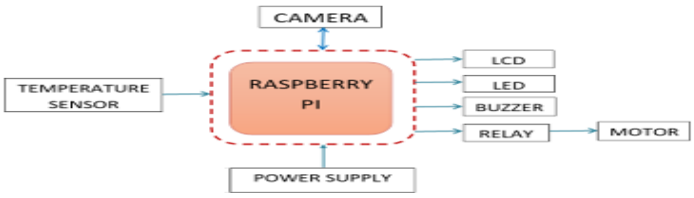


Fig1 : system block diagram

The block diagram of the system is displayed in Fig. 1. Similar techniques are used to make the connections. The Raspberry Pi receives input from the Pi Camera, which takes pictures of people and measures their body temperature using a temperature sensor. The Raspberry Pi's LCD will display the temperature measurements and the results of whether the mask is on or off. For alerting and sanitising purposes, external hardware is attached, such as an LED, buzzer, and relay.

4. SYSTEM REQUIREMENTS

- **Raspberry Pi 3**

Our access to the vast array of libraries is made possible by the Raspberry Pi 3 model B. It has a new Video Processor VI 3D graphics core and a quad-core CPU with 1.2GHz clock rates. 1GB RAM is the on-board memory. It has 40 GPIO pins for signal transmission and reception. We can connect to the internet via the Ethernet connector on the Raspberry Pi. Python programming is used in the system's design.

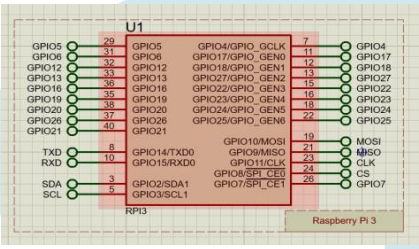


Fig2 : Raspberry Pi 3 model B

- **LM35 Temperature Sensor**

Sensor is a non-contact infrared thermometer. In this instance, it's being utilised to gauge body temperature. It is capable of withstanding temperatures between -20 and 120 °C. It takes an individual's body temperature and transmits it to a Raspberry Pi.

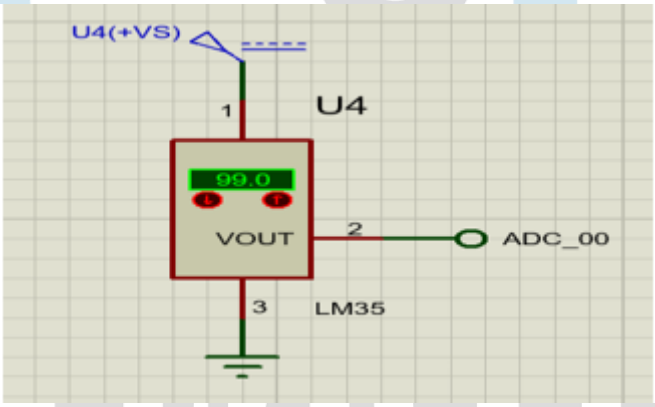


Fig3 : Temperature sensor

5. METHODOLOGY

- **Face Detection**

Classifiers are employed in the face detection process.To train a classifier, thousands of pictures with and without faces must be used. The learning algorithm is based on Haar cascade and AdaBoost. From a big amount of features, it picks out a few crucial ones and creates classifiers that are incredibly efficient. Any non-face portions of a picture are removed using a "cascade" of progressively more complex classifiers, allowing more computation to be focused on potential object-like regions. After extensive training, data (in the form of photographs) is supplied into the system. The classifier extracts the Haar features of each image before storing them in a database for subsequent processing.

- **Mask Detection**

With the use of Deep Learning and Computer Vision methods and libraries like OpenCV, Keras, TensorFlow, and others, this system will be able to identify individuals wearing facemasks in an image or video stream. In this section, we'll focus on loading our face mask detection dataset from disc. The images we downloaded come in a range of dimensions and resolutions. Therefore, crop and resize the 256 x 256 source image before using RGB colour filtering.

Fig4 : With mask data set

- **Temperature Check**

The MLX90614 ESF is a non-contact infrared thermometer used to measure body temperature. The Raspberry Pi receives data from the thermometer, which is then shown on an LCD.

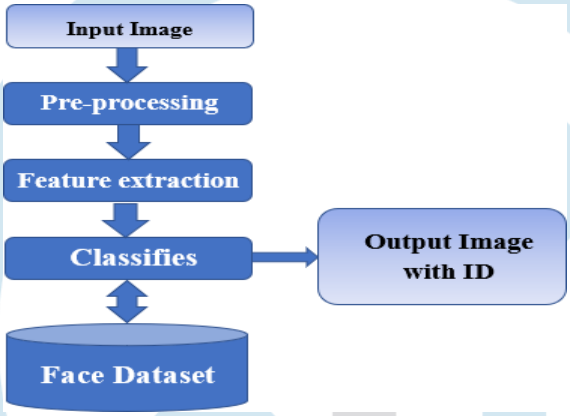


Fig 5 : Flowchart of face recognization

Prior to facial recognition, a database of various persons is created by taking pictures of their faces from various angles. The person's name or ID number serves as the folder name, and the important facial features are then extracted and saved in a database. A person's image is pre-processed by the Pi camera when it captures it, including cropping, resizing, rotating, and other operations. The pre-processed image features are used to enhance the precision of our classifiers. We'll then contrast these qualities with those we've recorded in a database. If there is a match, the name of the person will be sent by email to the relevant authorities.

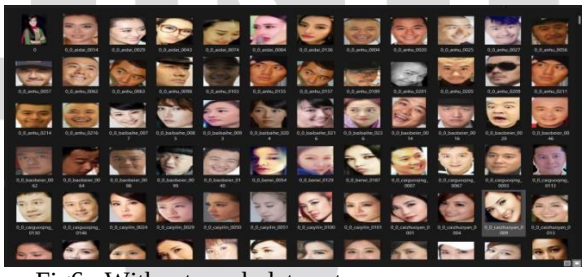
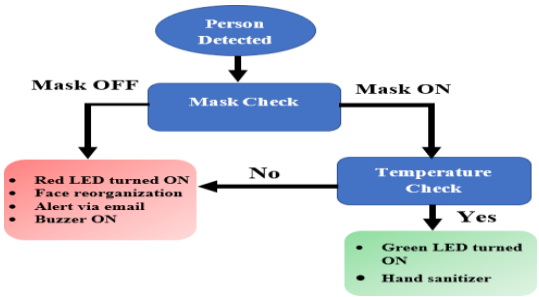


Fig6 : Without mask data set

6. ALERT SYSTEM AND HAND SANITIZATION

If someone is wearing the face mask and their body temperature is below the protocol value, the green LED will turn on, and the relay will activate the motor to pump the hand sanitizer into the person's hand. If not, a buzzer will sound, a red LED will light up,



a face will be recognised, and the person's name or ID will be sent via email to the relevant authorities.

Fig 7 : Flowchart of alert and hand sanitization

7. RESULTS

The suggested method checks to see if the person is wearing a facemask and informs the microcontroller accordingly. When both conditions are satisfied—as determined by the non-contact temperature sensor—automatic sanitization begins. Buzzers will be activated and the person's name or ID will be emailed to the appropriate authorities if that doesn't happen.

- When mask-on and Temperature with inthreshold

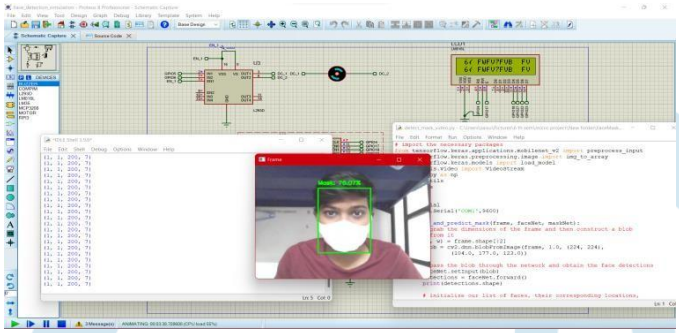


Fig 8 : Facemask Detected

The person in Fig. 8 above is wearing a mask, and since his body temperature is below the threshold, the relay engages the motor to disinfect the person's hands and the green LED illuminates.

- When Person found with no mask ORtemperature above threshold:

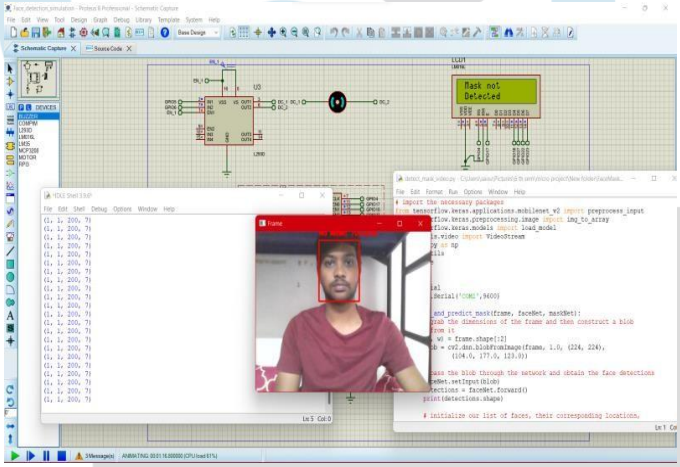


Fig 9 : No mask detected

8. CONCLUSION AND FURTHER ENHANCEMENTS

With the help of this model, an automated solution is achieved and COVID -19 procedures can be monitored without the need for human interaction. By giving the module more training data, it is possible to increase the module's facemask detection accuracy. As a result, our suggested approach will benefit society by saving time and lowering the spread of the Corona virus. This model can be used to monitor people in settings with large gatherings, such as colleges, schools, and other organisations. Additional research will concentrate on identifying the faces from various angles and detecting other types of masks, such as face shields and transparent masks.

9. REFERENCES

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