AUTOMATIC COVID-19 FACE MASK AND BODY TEMPERATURE DETECTION USING RASPBERRY PI

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ABSTRACT

The first step in diagnosing COVID is checking for fever. Also, we need to check everyone's masks. Although manual temperature scanning has significant drawbacks, temperature checking technology exists to scan each entry. Employees who are not adequately trained in the use of temperature scanners. There is human error in reading the values. People are often allowed in despite high temperatures or not wearing masks. Staff will not scan if supervisors are not present. Manual scanning methods are not ideal for large groups. Here we propose an entry-level vendor and fully automated temperature scanner system to solve this problem. It is a flexible system with a wide range of applications. The technology uses a mask monitor and non-contact temperature measurement. If high temperature or mask absence is detected, an immediate human barrier is added to the scanner to prevent entry. No one will be allowed without temperature and mask scan. Immediate admission is granted only to those who meet both the criteria. The temperature sensor, camera and other components of the system are all controlled by the Raspberry Pi computer. A temperature sensor and camera are used to search for masks and measure forehead temperature. Raspberry evaluates the sensor data to determine whether the user is granted access. In this case, the system triggers a motor to open the barrier to allow the person to enter the building. The device flashes a red light and denies entry if it detects high temperature or the absence of a mask.
As a result, the technology provides a fully automated approach to stopping the spread of COVID.

Keywords: Face mask, Temperature,Raspberry pi
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1. INTRODUCTION

Since the COVID-19 epidemic, it has been very difficult to identify those who are sick since so many COVID-19 patients have no symptoms. A large percentage of false negative findings from the Covid-19 ICMR antibody kits suggested that a person was not infected. A prominent COVID-19 symptom is elevated body temperature. In order to find COVID-19, WHO advises body temperature screening. Numerous studies have shown the importance of wearing a face mask in public settings where the transmission of disease is likely to occur. There are several temperature guns available, but they lack the intelligence to concurrently monitor the temperature and the face mask and warn the relevant authorities to take the appropriate action if the protocol is broken. Many individuals have been stationed at public locations across the globe, including as stores, movie theatres, malls, schools, universities, train stations, etc., to enforce the wearing of face masks and temperature monitoring. As workers are required to wear face masks and have their body temperatures taken, this may be among the worst and most hazardous occupations someone could get. It might also result in laypeople in charge of face masks and body temperature monitoring infecting the infected individual with COVID-19. Use of an

automated face mask and body temperature measurement system driven by a Raspberry Pi microcontroller is the answer to this issue. In order to read the body temperature and enable the user to either remove the COVID-19 records or alert the appropriate authorities, the setup includes its own camera module to monitor the face mask.

2. LITERATURE REVIEW

BVarshini, HRYogesh Syed Danish Pasha, MaazSuhail, VMadhumitha, ArchanaSasi et.al: The COVID-19 pandemic was brought on by a worldwide health emergency. The best form of protection is to always wear a face mask in public. Lockdowns have been enacted by governments all around the globe in reaction to the COVID-19 outbreak in order to limit the virus's spread. The study's findings show that wearing a face mask in public areas dramatically lowers the risk of transmission. This paper presents a smart door with IoT capabilities that can recognise face masks and track body temperature. The suggested model may be used to any entry, including those to hotels, residential buildings, malls, etc. The end result is an efficient and cost-effective method for integrating AI and sensors to produce a healthy atmosphere. Utilizing the face mask detection approach and the TensorFlow software library, the suggested framework is assessed. The body temperature of a person may also be monitored with a non-contact temperature sensor. This suggested method may identify COVID 19 users by using Internet of Things (IoT) technologies.

NaveenKumar K, Surya.S, Mohammed Nihaal. S. S, Suranthar. S, 5Manoj Kumar. A et.al: The World Health Organization, Wikipedia, governmental health organisations, the New York Times, and other sources all provide information on the more than 127 million illnesses and 2 million fatalities caused by COVID-19. Face masks and safe social seclusion are two essential steps to take in public to stop the virus from spreading further. We suggest a dynamic computer vision-based automated system that employs a Raspberry Pi 4 Model B to identify face mask protocol breaches with an integrated Pi camera and monitor body temperature with an MLX90614 sensor, with a focus on real-time face monitoring. People are aware of face masks and body temperature in public areas. If the individual is wearing a face mask and their body temperature is within the authorised range as per WHO criteria, they are permitted to pass through the security screening system. Thus, the aforementioned process will aid society in time savings and the halting of coronavirus transmission. In public settings like malls, workplaces, and universities, it helps to tag individuals.

Nisha Rani, Rashi Jain, Saurav Patel, Tushar Ruhela et,al: Everyone is aware that coronavirus illnesses (COVID-19) are becoming more common. It is a distinct pandemic that is spreading quickly and creating a public health emergency. As a consequence, there have been a lot of fatalities lately. Wearing a face mask is one of the most common strategies to avoid such illnesses, and doctors and researchers are working to create a vaccine for it as well as other preventative measures. Using a Raspberry Pi and a live video streaming camera, we described an experiment to identify faces hidden behind masks in this article. Using the MobileNetV2 neural network-based CNN computer vision image classification approach, a face mask recognition model is developed. The following are the project's procedures: We initially gathered a data set of individuals wearing and not wearing face masks in order to train the MobileNetV2 neural network model. The data was preprocessed, segmented, trained, tested, and eventually the model was put into use. 95.85% of the training data for the model are accurate. For those who are wearing face masks, entrance is opened

instantly thanks to this technique. The facility owner or police will be informed if they are not covering their faces. It may be used in a range of areas, including schools, hospitals, clinics, houses of worship, and shops.

3. SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

A key area of biometric study is the identification of faces and images or videos. The goal of this research is to create a powerful facial recognition system. In this article, we provide a method for real-time picture capturing. The subject is identified using a user-created local database throughout the identification process using local binary pattern histograms (LBPH), which are used in conjunction with Haar cascade classifiers for face recognition. The core elements of this system are security, monitoring, and control via real-time automation. Numerous possible uses for such a face recognition technology include home security, airport monitoring, and more.

3.2 PROPOSED SYSTEM

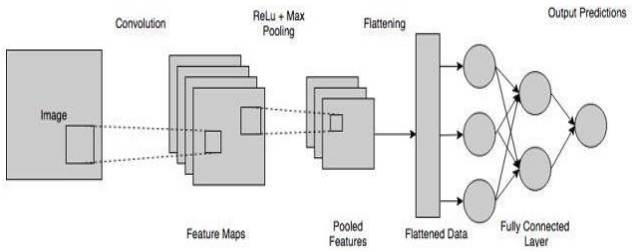


Fig 1. Proposed system

This system aids in the detection of persons wearing face masks in picture and video streams by using deep learning and computer vision techniques, as well as a variety of libraries such as OpenCV, Keras, and TensorFlow. Pictures may be found from a variety of free sources and are categorised as "masked" and "no masked." The images we downloaded came in a range of dimensions and quality.

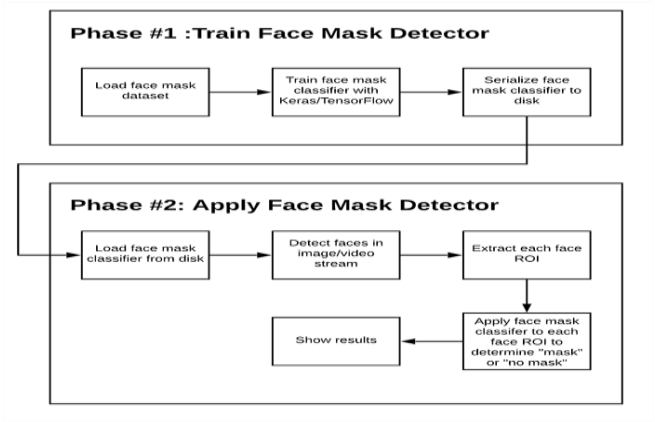


Fig 2.Steps for proposed system

4.SYSTEM ARCHITECTURE

4.1 Block diagram:

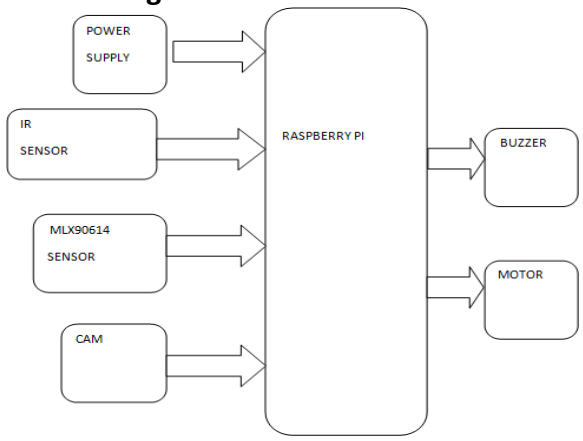


Fig 3.Block diagram

4.2 Power supply Block diagram

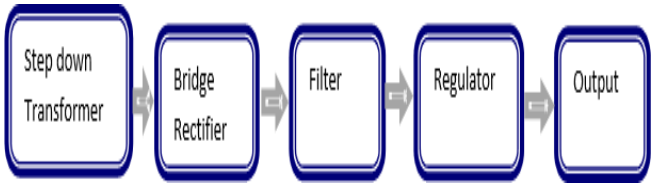


Fig 4. Power supply Block diagram

5.DESCRPTION OF COMPONENTS

5.1.Raspberry Pi Board

Fig 5.Raspberry pi

The BCM2837 controller included on the Raspberry Pi 3 board supports the ARM11 CPU. The Raspberry Pi 3 and later versions of the Raspberry Pi 2 both made use of this Broadcom chip. The BCM2837 and BCM2836 have a similar fundamental structure. The quad-core ARMv7 cluster is being swapped out with a quad-core ARM Cortex-A53 (ARMv8) cluster as the sole substantial modification.

5.2 WEB CAMERA

An essential component of automation is the camera. A camera is used to observe a space from a distance. The camera is a Life Cam VX-800 USB camera. The video from the associated room is streamed to the user whenever they click a video button on a loaded web page. We make use of MJPG Streamer for this. The room-monitoring camera is seen in the picture below.

Fig 6.Web cam

5.3 BUZZER

A buzzer or beeper is a mechanical, electromechanical, or piezoelectric sounder. Buzzers and beepers are often used as timers, alarm clocks, and confirmation devices for user input such mouse clicks and keystrokes. The same integrated structure is used by computers, printers, copiers, alarm systems, toys, automobile electronics, telephones, timers and other electronic audio devices, buzzers, electronic converters, and DC power sources.

Fig7.Buzzer

5.4 TEMPARATURE SENSOR

The MLX90614 is a digital infrared (IR) temperature sensor that is non-contact and can measure an object's temperature between -70°C and 382.2°C. The sensor monitors the object's temperature without making direct touch with it by connecting to the microcontroller via the I2C protocol.

Fig8.Temperature sensor

6.RESULTS

Fig 9. Hardware implementation

Output Cases :

CASE 1: Data Gathering

We establish a dataset to hold both masked and unmasked faces in the project's first stage. A simple Python script named collect image.py utilises OpenCV to gather pictures of faces. Here is a description of the picture capturing programme:

These two lines of code receive parameters from the system. The label name appears on the first line, and the quantity of photographs you wish to gather appears on the second line. For instance, you may run the command python3 collect images.py with mask 250 to collect 250 images with a mask, and python3 collect images.py without mask 250 to collect 250 photos without a mask, where with mask/without mask is the label for the image. Additionally, there are 250 photographs.

CASE 2 : Training the Model

After gathering face samples, we can feed them into the neural network and begin training it to recognise whether or not someone is wearing a mask. In order to paste the provided code, open the training.pi file in the mask detector directory. then use the command below to begin the training process: (training.py for Python 3.)

Below is a description of the Python script used to train the recognizer:

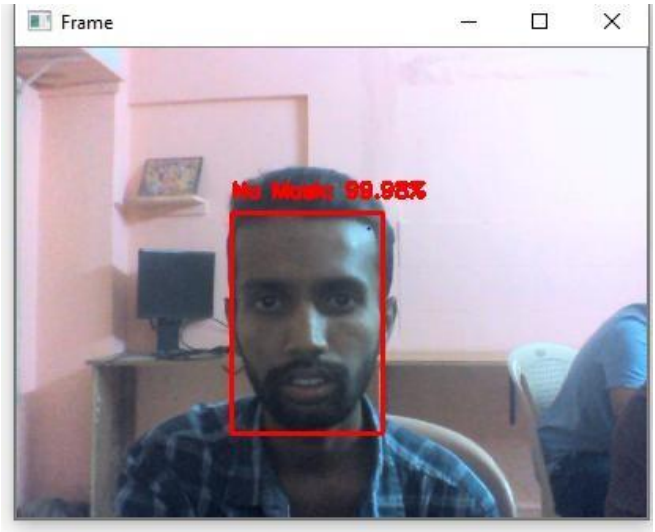
The necessary packages are imported by the Training.py script. The initial learning rate, the number of training epochs, and the batch size are initialised in the few lines that follow the import of the packets.

CASE 3: Testing the Face Mask Detection:

Connect the Raspberry Pi camera module to the Pi as per the example below to see the COVID-19 face mask detector in real-time: Start the detect mask.py programme. You will see the camera view pop-up window after a little delay. You will notice a green box that reads "Mask Detected" if a mask is identified, and a red box that reads "No Mask Detected" otherwise.

Case A:

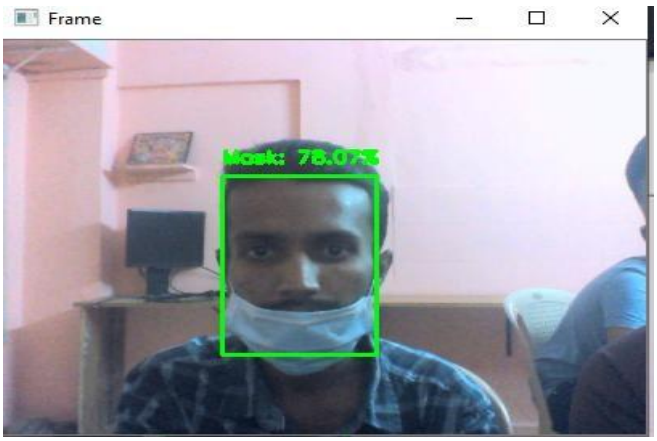
Face detection without Mask:



Using open cv library we are observing without face mask detection with 99.98% highlighted with ROI red colour.

Case B:

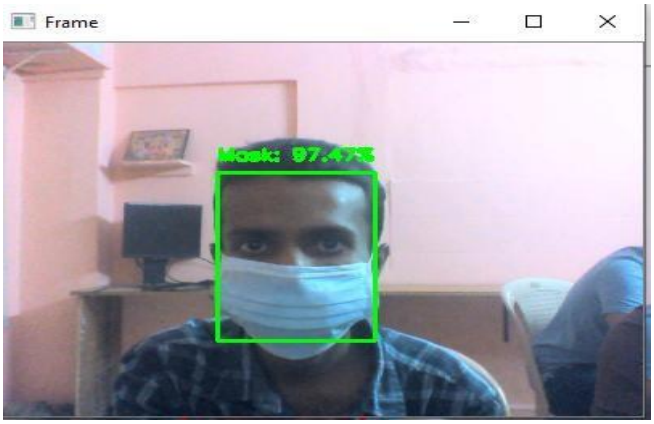
Face detection Partial mask:



Using open cv library we are observing with partial face mask detection with 78.07% highlighted with ROI green colour.

Case C:

Face detection with mask:



Using open cv library we are observing with fully face mask detection with 97.47% highlighted with ROI green colour.

7.CONCLUSION

Nobody will be let in without having their temperature and mask scanned. Anyone who satisfies both conditions will be accepted right temperature, a temperature sensor and camera are employed. The system evaluates the sensor data and determines whether or not to let the individual inside. The barrier is opened by the system in this instance, enabling the individual to away. The system's full functionality is powered by a Raspberry Pi computer, a camera, and a temperature sensor.

To look for masks and gauge forehead enter the building. If the system detects a high temperature or the absence of a mask, it flashes a red light and refuses the user admission.

REFERENCES

[1] NaveenKumar K, Surya.S, Mohammed Nihaal. S. S, Suranthar. S, 5Manoj Kumar. A et.al: "Automatic Covid-19 Face Mask and Body Temperature Detection with Deep Learning and Computer Vision"International Journal of Creative Research Thought(IJCRT)Volume 9, Issue 4 April 2021 | ISSN: 2320-2882.

[2] BVarshini, HRYogesh Syed Danish Pasha, MaazSuhail,VMadhumitha, ArchanaSasi et.al, "IoT-Enabled smart doors for monitoring body temperature and face mask detection"Dept. of CSE, Presidency University, Bengaluru, Karnataka, IndiaICCSA- 2021.

[3] Rani, N., Jain, R., Patel, S., Ruhela, T., Kumari, P., Kumawat, R. (2022). Real-Time Face Mask Detection Using Raspberry Pi and Camera. In: Chen, J.IZ., Tavares, J.M.R.S., Iliyasu, A.M., Du, KL. (eds) Second International Conference on Image Processing and Capsule Networks. ICIPCN 2021, vol-300.

[4] https://books.google.co.in/books?id=achqDwAAQBAJ book for Neural network and Deep learning.

[5] https://ietresearch.onlinelibrary.wiley.com/doi/epdf/10.1049/iet-ipr.2020.1119 face mask detection in covid-19

[6] Katravath Ravi, M.Rajunaik, S.V.S Prasad, **Arulananth T S,** Fire Alarm Robot and Authentication System Using Raspberry Pi and Cloud, "International Journal of Innovative Technology and Exploring Engineering, ISSN 2868-3075, Volume-8,Issue 4S2,March-2019, PP-256 259.

[7]A. Das, M. W. Ansari, and R. Basak, ''COVID-19 face mask detection using TensorFlow, keras and OpenCV,'' in Proc. IEEE 17th India Council Int. Conf. (INDICON), Dec. 2020, pp. 1–5.

[8] **Arulananth T S,** Baskar M**,** P. Haribabu**,** **R**.DivyaSree **,** R.Sanjana, S.Bhavana "IR sensor based obstacle detection and avoiding robot" in the journal of Palarch's Journal Of Archaeology Of Egypt/Egyptology 17(9). ISSN 1567-214x.

[9] **Arulananth T S,** T. Om SaiKiran,S. ManidharSai, ShaikAlthaf, S.SaiSrinivas "Image processing-based traffic control for autonomous vehicle" 6th International Conference on Microelectronics, Computing & Communication Systems MCCS-**2021**.

[10] Venkat G, **Arulananth T S**, Baskar M, Density Based Traffic Controller with Emergency Override using CCTV Camera, International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8, Issue-2S3, July 2019.

[11] R.Pandimeena, A.Kavitha ,S.Bhuvaneshwari , P.Pavanvignesh ,P.Prudhviganesh, **Arulananth TS**, Forgery signature detection works on convolutional neural network and deep learning, in ICAAMM-2021 organized by MLRIT, Hyderabad during August 26-27,2021

[12] M. J. Pramila, P. S. Shewta, "Wireless Temperature detector System using ARDUINO and IOT", International Journal of Computer Trends and Technology (IJCTT) vol. 67 issue 11, pp.8283,2019.https://doi.org/10.14445/22312803/IJCTT-V67I11P113

[13] P. Viola, M. Jones, "Rapid Object Detection using a Boosted Cascade of Simple Features", 2001 IEEE Computer Society Conference on Computer Vision and Pattern Recognition, pp. 511-518, 2001

[14] https://patents.google.com/patent/US9639740B2/en face detection and recognition.

[15] Coronavirus Update (Live) [online]. Availableon:https://www.worldometers.info/coronavirus/, last accessed: 11/07/2020.

[16] https://www.leewayhertz.com/face-mask-detection-system/ webpage for mask detection.

[17] https://www.okazakimfg.com/Tech_info/TemperatureSensorMANUAL2016b.pdf