Automatic Detection of Temperature And Mask Scan Entry System For COVID Prevention

Dr.P.Kanakarajan[1], V.Karthick Raja[2], M.Ariharan[3], K.A.Arun Prakash[4], T.Monishvaran[5]
[1]Associate Professor, Dept of Mechanical Engineering
[2, 3, 4, 5]Dept of Mechanical Engineering
[1, 2, 3, 4, 5] K S R Institute For Engineering and Technology, Tiruchengode

Abstract- *To create a safe, COVID-19 free environment, we propose a dynamic Computer Vision based automated solution system focused on the real-time face monitoring of people to detect both face masks and body temperature in public places by using Host Computer to detect face mask protocol violations through an integrated camera and to monitor body temperature with the help of temperature sensor. In this project gate system fabricated and it will be used in entrance. One pneumatic cylinder is attached with gate. This cylinder has connected with 5/2 solenoid valve for automatic operation. The solenoid valve operated depends on ECU signal this system can operate depends upon the controller signal.*

Keywords- covid-19, nodemcu, pneumatic cylinder, ESP32camera

I. INTRODUCTION

The novel corona virus covid-19 had brought a new normal life. India is struggling to get out of this virus attack and the government implemented lockdown for the long way. Lockdown placed a pressure on the global economy. So the government gave relaxations in lockdown. Declared by the WHO that a potential speech by maintaining distance and wearing a mask is necessary. The biggest support that the government needs after relaxation is social distancing and wearing of masks by the people. But many people are getting out without a face mask this may increase the spread of covid-19. Hence we are using image processing techniques for identification of persons wearing and not wearing face masks. In real time images are collected from the camera and it is processed in Raspberry Pi embedded development kit. The real time images from the camera are compared with the trained dataset and detection of wearing or not wearing a mask is done. The trained dataset is made by using machine learning technique which is the deciding factor of the result. The algorithm created by means of using a trained dataset will find the persons with and without wearing face masks.

II. LITERATURE REVIEW

[1] Dr R Senthilkumar et al (2021): The novel Corona virus had brought a new normal life in which the social distance and wearing of face masks plays a vital role in controlling the spread of virus. But most of the people are not wearing face masks in public places which increase the spread of viruses. This may result in a serious problem of increased spreading. Hence to avoid such situations we have to scrutinize and make people aware of wearing face masks. Humans cannot be involved for this process, due to the chance of getting affected by corona. Hence here comes the need for artificial intelligence (AI), which is the main theme of our project. Our project involves the identification of persons wearing face masks and not wearing face masks in public places by means of using image processing and AI techniques and sending alert messages to authority persons. The object detection algorithms are used for identification of persons with and without wearing face masks which also gives the count of persons wearing mask and not wearing face mask and Internet of Things (IOT) is utilized for sending alert messages. The alert messages are sent to the authority persons through mobile notification and Email. Based on the count of persons wearing and not wearing face masks the status is obtained. Depending upon the status warning is done by means of using buzzer and LED's.

[2] Saman M. Almufti et al (2021): The rise of COVID-19 pandemic has had a lasting impact in many countries worldwide since 2019. Facemask detection had been significant progress in the Image processing and deep learning fields studies. Many face detection models have been designed using different algorithms and techniques. The proposed approach in this paper developed to avoid mask-less people from entering to a desired places (i.e. Mall, University, Office, …etc.) by detecting face mask using deep learning, Tensor Flow, Keras, and Open CV and sending a signal to Arduino device that connected to the gate to be open. it detect a face in a real-time and identifies whether the person wear mask or not. The method attains accuracy up to 97.80%. The dataset provided in this paper, was collected from various sources. Modern artificial intelligence systems and machine learning algorithms have revolutionized approaches to scientific and

technological challenges in a variety of fields. Nowadays Deep Learning (DL) and Machine Learning (ML) techniques has been a vary useful tools in solving problems. In the proposed real-time-face mask detection model Deep Learning libraries has been used to detect face and determine whether the person wear a mask or not. from the experimental result table, is seems that the real time face detection system has a high accuracy in detecting mask, this help control the spreading of COVID-19 in public places by preventing the people to enter it without wearing a face mask.

[3] Xinbei Jiang et al (2021): The rapid outbreak of COVID-19 has caused serious harm and infected tens of millions of people worldwide. Since there is no specific treatment, wearing masks has become an effective method to prevent the transmission of COVID-19 and is required in most public areas, which has also led to a growing demand for automatic real-time mask detection services to replace manual reminding. However, few studies on face mask detection are being conducted. It is urgent to improve the performance of mask detectors. In this paper, we proposed the Properly Wearing Masked Face Detection Dataset (PWMFD), which included 9205 images of mask wearing samples with three categories. Moreover, we proposed Squeeze and Excitation (SE)-YOLOv3, a mask detector with relatively balanced effectiveness and efficiency. We integrated the attention mechanism by introducing the SE block into Darknet53 to obtain the relationships among channels so that the network can focus more on the important feature. We adopted GIoUloss, which can better describe the spatial difference between predicted and ground truth boxes to improve the stability of bounding box regression. Focal loss was utilized for solving the extreme foreground-background class imbalance. Besides, we performed corresponding image augmentation techniques to further improve the robustness of the model on the specific task. Experimental results showed that SE-YOLOv3 outperformed YOLOv3 and other state-of-the-art detectors on PWMFD and achieved a higher 8.6% mAP compared to YOLOv3 while having a comparable detection speed.

[4] Jacob Boone (2021): In this presentation, we describe our face mask and body temperature detection system implemented using Raspberry Pi. This project aimed to develop portable face mask detection and temperature reading device that detected if a person was wearing a face mask and their temperature was within a specific range. An MLX90614 infrared (IR) sensor was interfaced with a raspberry pi and used to detect an object's temperature within its field of view. The operating distance of this specific IR sensor is 2cm-5cm. The detection software program utilizes the Python library smbus2 and the locally stored folder mlx90614 to read the object temperature from the IR sensor, convert the Celsius temperature to Fahrenheit. If the detected temperature is within the preset range and the MobileNetV2 model sees that the person is wearing a mask, then a green box is displayed around the person's head. If the detected temperature is out of the range and the model predicts the person is not wearing a mask, then there is a red box outlining the person's face.

[5] B Varshini **et al (2021):** COVID 19 pandemic is causing a global health epidemic. The most powerful safety tool is wearing a face mask in public places and everywhere else. The COVID 19 outbreak forced governments around the world to implement lockdowns to deter virus transmission. According to survey reports, wearing a face mask at public places reduces the risk of transmission significantly. In this paper, an IOT-enabled smart door that uses a machine learning model for monitoring body temperature and face mask detection. The proposed model can be used for any shopping mall, hotel, apartment entrance, etc. As an outcome a cost-effective and reliable method of using AI and sensors to build a healthy environment. Evaluation of the proposed framework is done by the Face Mask Detection algorithm using the Tensor Flow software library. Besides, the body temperature of the individual is monitored using a non-contact temperature sensor. This proposed system can detect the users from COVID 19 by enabling the Internet of Things (IOT) technology.

III. OBJECTIVES

In our project by using Host Computer to detect face mask protocol violations through an integrated camera and to monitor body temperature with the help of temperature sensor .The system uses a contactless temperature scanner and a camera to capture image. If a high temperature or the mask is observed, the scanner is connected to a gate like structure that prevents entry .to monitor the entire process the device uses a temperature sensor and camera connected to NODEmcu system.

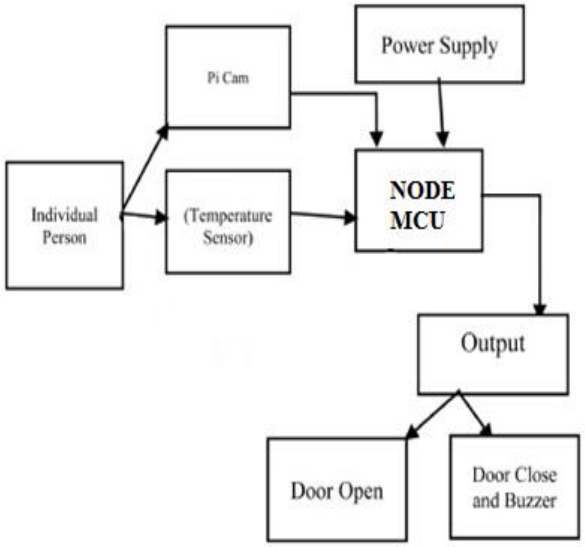
IV. EXISTING SYSTEM

The existing system deals with CNN (convolutional neural network) in the facemask detection models, they use clustering, classification, max pooling to train the machine. The CNN trains the machine with the help of dataset, around 20% of the images in dataset are used to train the machine and the remaining 80% is used for testing the results. The face mask detection model empathizes with the problems faced by people around the globe due to COVID-19. This system helps in a small way to stop the pandemic from spreading and festering into our lives further. The Person Identification

model or the face recognition model as it is popularly called uses the face recognition library of python to compare images by similarity detection technique. For temperature measurement, A temperature gun, also known as a laser or non- contact thermometer, is an infrared thermometer that measures the temperature of an object from a certain distance. Temperature guns are being utilized at airports to screen passengers, by shopkeepers to check incoming customers, in driveways, and every other possible area. In these existing systems it was impossible for the machine to know who is not wearing a mask and the real-world application for these existing systems were minimal.

V. PROPOSED SYSTEM

The proposed system will focus on enhancing the prediction by increasing its accuracy and detection probability. This setup has its own camera module through which it monitors facemask and it has a non-contact temperature sensor to read the body temperature and allows the person if they clear the COVID-19 protocols. A hybrid system model using classical and deep learning for facial mask recognition and detection will be implemented. The system utilises face mask detection dataset which will be consisting of images with mask and images without mask, Open CV to detect faces from a live stream through the Webcam in real-time. The image dataset will be using to build the face mask detection system. The system will be implemented with deep learning using python, Open CV, Keras and Tensor flow. Net and Open CV. A square box is been displayed on every person's face with the color of red and green where red indicates the person is not wearing a mask and green indicates a person is wearing a mask. The developed system model will be tested on the real time video streaming and with a set of images. The result of the person from the video displays a person with a square bound box. This system monitors continuously, and whenever a person is identified without a mask then the audible buzzer activates. For implementation of mask detection using an Open CV and pi camera interfaced to the NODEmcu. When the user switches on the kit then web camera capture the images. The persons pass one by one. In case the temperature exceeds average value or mask not detected or correctly aligned, the NODEmcu processor generates signal to lock the door and gives the audible alert through buzzer. Otherwise, the door is opened to enter. The main controlling device of the project is NODEmcu processor. Here we are using DC motor as door. The status of the project will be displayed on LCD module. The system will be used in offices, hospital, airports, banks, sports venues, entertainment industries, hospitality places and densely populated places. The system shall support the society through offering lower spread of COVID-19 and time saving. The system will be effectively implemented during this current condition where lockdowns has been eased to allow public gatherings, mall shopping, church gathering and reopening of schools. This automation of checks will minimize the manpower for inspections at public gatherings hence can be used at any situation and period oftime.



Double Acting Cylinder:

In a double acting cylinder, air pressure is applied alternately to the relative surface of the piston, producing a propelling force and a retracting force. As the effective area of the piston is small, the thrust produced during retraction is relatively weak. The impeccable tubes of double acting cylinders are usually made of steel

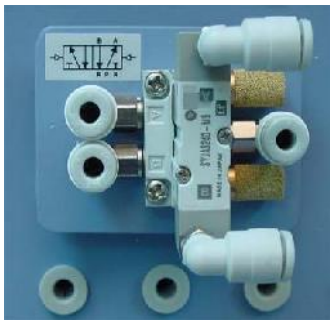
DIRECTIONAL CONTROL VALVE:

Directional control valves ensure the flow of air between air ports by opening, closing and switching their internal connections. Their classification is determined by the number of ports, the number of switching positions, the normal position of the valve and its method of operation. Common types of directional control valves include 2/2, 3/2, 5/2, etc.

The first number represents the number of ports; the second number represents the number of positions. A directional control valve that has two ports and five positions can be represented by the drawing, as well as its own unique pneumatic symbol.This project consists of two major platform one is automation and another one is mechanical setups.
The automation setup has electronic control unit, camera, and relay unit.Mechanical setup has gate model, pneumatic cylinder

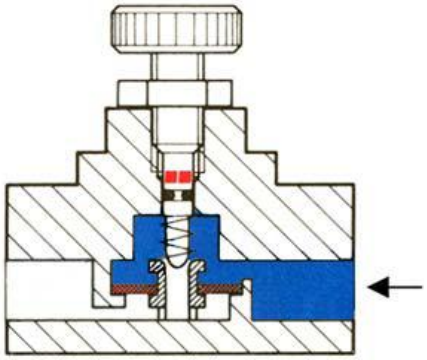
5/2 Directional Control Valve:

When a pressure pulse is input into the pressure control port 'P', the spool will move to the left, connecting inlet 'P' and work passage 'B'. Work passage 'A' will then make a release of air through 'R1' and 'R2'. The directional valves will remain in this operational position until signals of the contrary are received. Therefore, this type of directional control valves is said to have the function of 'memory'



.**FLOW CONTROL VALVE**:

A flow control valve is formed by a non-return valve and a variable throttle.



CAMERA

This 5 megapixels sensor with OV5647 camera module is capable of 1080p video and still images that connect directly to your NODEmcu. This is the plug-and-play-compatible latest version of the NODE operating system, making it perfect for time-lapse photography, recording video, motion detection and security applications. Connect the included ribbon cable to the CSI (Camera Serial Interface) port on your NODEmcu, and you are good to go!

The board itself is tiny, at around 25mm x 23mm x 9mm and weighing in at just over 3g, making it perfect for mobile or other applications where size and weight are important. The sensor has a native resolution of 5 megapixels, and has a fixed focus lens on board. In terms of still images, the camera is capable of 2592 x 1944 pixel static images, and also supports 1080p30, 720p60 and 640x480p90 video.

RELAY

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several

circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

The traditional form of a relay uses an electromagnet to close or open the contacts, but other operating principles have been invented, such as in solid-state relays which use semiconductor properties for control without relying on moving parts. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called protective relays.

Latching relays require only a single pulse of control power to operate the switch persistently. Another pulse applied to a second set of control terminals, or a pulse with opposite polarity, resets the switch, while repeated pulses of the same kind have no effects. Magnetic latching relays are useful in applications when interrupted power should not affect the circuits that the relay is controlling.

ALARM

A town for better sound coverage. Most fire alarm are single tone and mechanically driven by electric motors with a rotor attached to the shaft. Some newer alarm is electronically driven an alarm is a loud noise-making device. Civil defense alarm are mounted in fixed locations and used to warn of natural disasters or attacks. Alarm is used on emergency service vehicles such as ambulances, police cars, and fire trucks. There are two general types: mechanical and electronic.

Many fire alarms (used for calling the volunteer fire fighters) serve double duty as tornado or civil defense alarm, alerting an entire community of impending danger. Most fire alarm are either mounted on the roof of a fire station or on a pole next to the fire station. Fire alarm can also be mounted on or near government buildings, on tall structures such as water towers, as well as in systems where several alarm are distributed around speakers.

Fire alarm is often called "fire whistles", "fire alarms", or "fire horns". Although there is no standard signaling of fire alarm, some utilize codes to inform firefighters of the location of the fire. Civil defense alarm also used as fire alarm often can produce an alternating "hi-lo" signal (similar to emergency vehicles in many European countries) as the fire signal, or attack (slow wail), typically 3x, as to not confuse the public with the standard civil defense signals of alert (steady tone) and fast wail (fast wavering tone). Fire alarm is often tested once a day at noon and are also called "noon alarm" or "noon whistles".

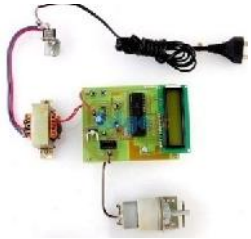
POWER SUPPLY

A power supply is an electrical device that supplies electric power to an electrical load. The main purpose of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power. Examples of the latter include power supplies found in desktop computers and consumer electronics devices. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power (uninterruptible power supply).

All power supplies have a power input connection, which receives energy in the form of electric current from a source, and one or more power output or rail connections that deliver current to the load. The source power may come from the electric power grid, such as an electrical outlet, energy storage devices such as batteries or fuel cells, generators or alternators, solar power converters, or another power supply.
The input and output are usually hardwired circuit connections, though some power supplies employ wireless energy transfer to power their loads without wired connections. Some power supplies have other types of inputs and outputs as well, for functions such as external monitoring and control.

ECU

An electronic control unit (ECU), also known as an electronic control module (ECM), is an embedded system in automotive electronics that controls one or more of the electrical systems or subsystems in a car or other motor vehicle.



Modern vehicles have many ECUs, and these can include some or all of the following: engine control module (ECM), power train control module (PCM), transmission control module (TCM), brake control module (BCM or EBCM), central control module (CCM), central timing module (CTM), general electronic module (GEM), body control module (BCM), and suspension control module (SCM). These ECUs together are sometimes referred to collectively as the car's computer though technically they are all separate computers, not a single one. Sometimes an assembly incorporates several individual control modules (a PCM often controls both the engine and the transmission).

NODEmcu

Nodemcu is a low-cost open source IoT platform. It initially included firm ware which run on the ESP8266 Wi-Fi SoC from Espressf Systems and hardware which was based on the ESP-12module. Later, support for the ESP32 32-bit mcu was added. Nodemcu is an open source firmware for which open source prototyping board designs are available. The name "NODEmcu" combines "node" and "mcu" (micro-controller unit). The term "Nodemcu" strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source.

The firmware uses the Lua scripting language. The firmware is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS. Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.

The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core

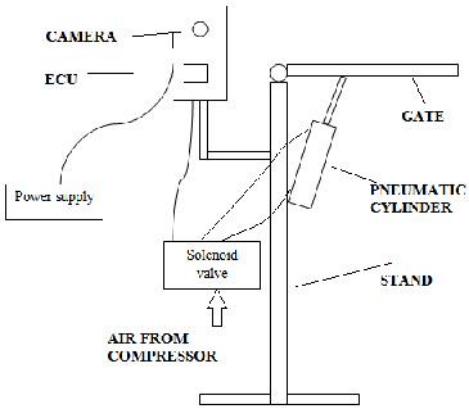
VI. WORKING PRINCIPLE

This project consists of two major platform one is automation and another one is mechanical setups.

The automation setup has electronic control unit, camera, and relay unit.Mechanical setup has gate model, pneumatic cylinder and solinoid valve.This pneumatic cylinder connected with gate mechanism. Whenever the cylinder rod extend the gate gets open. Where as cylider rod moves backward its pulls the gate Solinoid valve controls the direction of piston by changing its ports direction with respect to signal of the ECU.

The ECU found the mask on humans face its gives signal to the controller then the controller provides power supply to operte the solinoid valve so the cylinder actuated.

If the person wear mask the gate gets open. If not wear mask the gate gets close.



VII. RESULT AND DISCUSSION

This project consists of two major platform one is automation and another one is mechanical setups.

- The automation setup has electronic control unit, camera, and relay unit.
- Mechanical setup has gate model, pneumatic cylinder and solinoid valve.
- This pneumatic cylinder connected with gate mechanism. Whenever the cylinder rod extend the

gate gets open. Where as cylider rod moves backward its pulls the gate so gate gets closed.

- Solinoid valve controls the direction of piston by changing its ports direction with respect to signal of the ECU.
- The ECU found the mask on humans face its gives signal to the controller then the controller provides power supply to operte the solinoid valve so the cylinder actuated.
- If the person wear mask the gate gets open. If not wear mask the gate gets close. This operations all defined by ECU.

ADVANTAGES

- Reduce human power for this work
- High accuracy
- Reduce the covid spreading level
- Easy installation and operation

APPLICATIONS

- Schools
- Colleges
- Malls
- Theaters
- Bus
- Government offices etc…

VIII. CONCLUSION

The Corona Mask provides a real-time safety measure for human beings by detecting whether a person is wearing the mask or not as wearing a mask is an essential need of the hour in this COVID-19 pandemic. This project has been developed to come up with an efficient way for detecting and notifying officials when a person does not follow the COVID 19 safety protocols in a workplace, business establishments etc.

REFERENCES

[1] Z. Q. Zhao, P. Zheng, S. T. Xu, and X. Wu, "Object Detection with Deep Learning: A Review," IEEE Trans. Neural Networks Learn. Syst., vol. 30, no. 11, pp. 3212–3232, 2019 doi: 10.1109/TNNLS.2018.2876865.

[2] D. Meena and R. Sharan, "An approach to face detection and recognition," 2016 Int. Conf. Recent Adv. Innov. Eng. ICRAIE 2016, pp. 0–5, 2016 doi: 10.1109/ICRAIE.2016.7939462.

[3] D.-H. Lee, K.-L. Chen, K.-H. Liou, C.-L. Liu, and J.-L. Liu, "Deep Learning and Control Algorithms of Direct Perception for Autonomous Driving," pp. 2–7, 2019, [Online]. Available: http://arxiv.org/abs/1910.12031.

[4] K. S. Savita, N. A. Hasbullah, S. M. Taib, A. I. Z. Abidin, and M. Muniandy, "How's the Turnout to the Class? A Face Detection System for Universities," 2018 IEEE Conf. e-Learning, e-Management e-Services, IC3e 2018, pp. 179–184, 2019, doi: 10.1109/IC3e.2018.8632630.

[5] J. Redmon et al., "2008 Dpm," Proc. IEEE Comput. Soc. Conf. Comput. Vis. Pattern Recognit., vol. 330, no. 6, pp. 1299–1305, 2014, doi: 10.1109/CVPR.2018.00889.

[6] K. Lin et al., "Face Detection and Segmentation Based on Improved Mask R-CNN," Discret. Dyn. Nat. Soc., vol. 2020, pp. 1–11, 2020, doi: 10.1155/2020/9242917.

[7] Z. Zou, Z. Shi, Y. Guo, and J. Ye, "Object Detection in 20 Years: A Survey," pp. 1–39, 2019, [Online]. Available: http://arxiv.org/abs/1905.05055.

[8] P. Viola and M. Jones, "Rapid object detection using a boosted cascade of simple features," Proc. IEEE Comput. Soc. Conf. Comput. Vis. Pattern Recognit., vol. 1, no. July 2014, 2001, doi: 10.1109/cvpr.2001.990517.