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Smart Checking System for Isolation of People during Covid-19

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ABSTRACT: COVID-19, a novel corona virus outbreak at the end of 2019, poses a serious threat to public health. Nowadays corona virus spread all over the world. The second stage of corona spread in India and Tamilnadu also. The people should follow the prevention techniques to control the spreading of Covid-19 further. Corona Virus Disease pandemic is causing a health crisis. One of the effective methods against the virus is wearing a face mask. This paper introduces face mask detection that can be used by the authorities to make mitigation, evaluation, prevention, and action planning against COVID-19. The face mask recognition developed with a Haar cascade algorithm can detect people not wearing mask at an accuracy of 96.85 percent. The Non contact IR temperature sensor checked the people in entrance to isolate the suspected one from other people. Finally the automatic sanitizer unit will dispense by ultrasonic and solenoid valve. The entire process is controlled by raspberry pi 4 model.

I. INTRODUCTION

In December 2019, the World Health Organization (WHO) China Country Office was informed of cases of pneumonia of unknown aetiology in Wuhan City, Hubei Province, China. So far, many confirmed cases have been confirmed in many countries, including medical staff. The Chinese government has taken timely public health measures including strengthening surveillance, conducting epidemiological surveys and limiting the inflow and outflow of population in Wuhan. This provides valuable experience for countries around the world to fight
the corona virus. Epidemiological investigations and genotyping have confirmed that COVID-19 is a highly infectious virus. To prevent the spread of the virus, scientists recommend that all people wear face masks in public.

Since the declaration of the COVID-19 virus as a pandemic by WHO in the study of stated that efforts have been made by various parties to reduce the spread of the virus. For now, there is no treatment or vaccine available. So that, Indonesia and other countries are depending on the implemented interventions by the authorities, for instance, physical distancing and wearing a face mask in the public place to impede COVID-19 transmission.

1.1.Existing System

The existing system, manual mask checking method and low performance mask detection algorithm used. In manual method errors occurs and also previous Methods are not suitable for performance wise. In mask detection the using microcontroller, it gives low performance and complicated process. System size and Assembling method also complicate.

Disadvantages

- Manual mask checking method.
- Not proper checking.
- Processing time more.
- High cost and size.
- Not strictly maintained

II. PROPOSED SYSTEM

Our goal is to provide Real time safe and Automatic Covid-19 Entry checking system. IT is used for presenting a lightweight backbone network for feature extraction, which based on SSD and spatial separable convolution, aiming to improve the detection speed and meet the requirements of real-time detection

Advantages

- Improve Real-time performance.
- Touch less temperature sensor gives high accuracy.

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- Compact size.
- Cost effective.
- No manual intervention needed.
- Safety is assured.
- Quick and easy method.

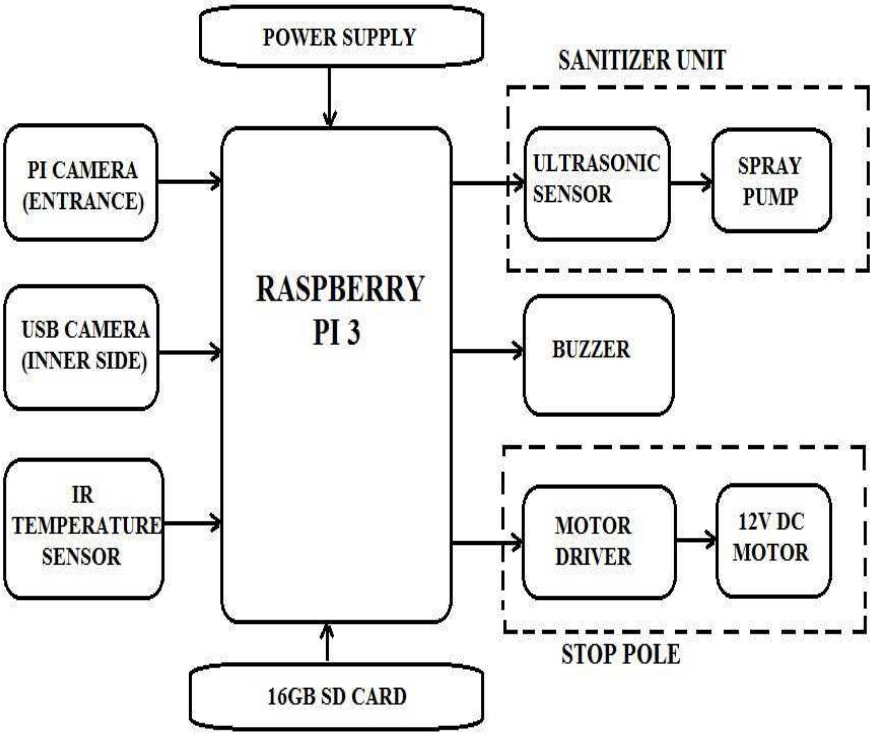

Figure 1. Block Diagram of Entry checking system

The Entry checking system consists of

- Touch less Temperature measurement technique with high accuracy and risk free operation.
- Entrance: pi Camera detect the people wearing mask or not.
- Inside room: USB cameras detect anyone without mask.
- Automatic sanitizer sprayer for hand washing.
- Raspberry pi 3 controls the entire process.
- Buzzer and LCD Display for commanding instruction

2.1. Temperature Measurement

Temperature is measured first at the entry of the person.Thermopile sensors are designed to measure temperature from a distance by detecting an object's infrared (IR) energy. It absorbs the energy and produces an output signal. The measuring distance is 0-3cm

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2.2. Mask detection using pi camera.

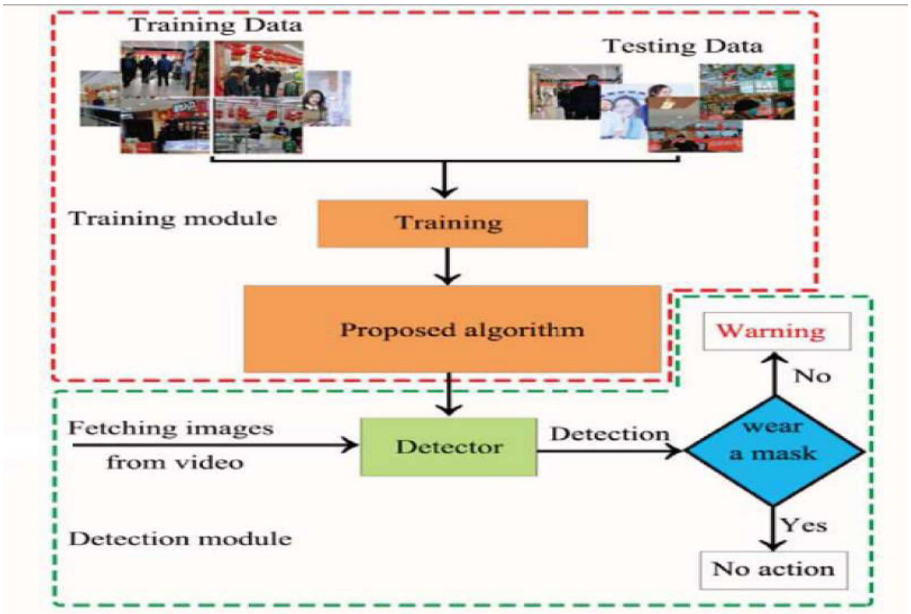

Figure 2: Mask Detection Module

The 5Mp camera module is capable of 1080p video and still images and connects directly to your Raspberry Pi. As for the face mask detector method; this work implemented the deep neural network known as Haar cascade. Haar cascade is able to run twice faster than the other deep neural network method which is used to detect the object. By reflecting these results, it is suitable to implement the method into the real-time face mask detector where high detection accuracy is needed. In this work, the object which needs to be detected is the face mask wearer. The Haar cascade which has been implemented in this work consists of two-stage detector. The first-stage detector consists of input, backbone, neck, and dense prediction. Moreover, the second stage of detector has sparse prediction to predict the object by understanding the bounding boxes and the classes on the object

To automatically detect whether shoppers are wearing masks in supermarket, we construct COVID-19-Mask, a new large-scale image dataset, by collecting images in two supermarkets. The new dataset is made up of the 2 types: wear a face mask, didn't wear a face mask. It should be noted that the images without masks were downloaded from the Internet.

Building The Face Detection Model

1. Data Collecting.

The development of the Face Mask Recognition model begins with collecting the data. The dataset train data on people who use masks and who do not. The model will differentiate between people wearing masks and not.

2. Split the Data.

After the pre-processing phase, the data is split into two batches, which are training data namely 75 percent, and the rest is testing data. Each batch is containing both of with-mask and without-mask images.

3. Building the Model.

The next phase is building the model. There are six steps in building the model which are constructing the training image generator for augmentation, the base model with algorithm, adding model parameters, compiling the model,training the model, and the last is saving the model for the future prediction process.

4. Testing the Model.

To make sure the model can predict well, there are steps in testing the model. The first step is making predictions on the testing set.

5 Implementing the model.

The model implemented in the video. The video read from frame to frame, then the face detection algorithm works. If a face is detected, it proceeds to the next process. From detected frames containing faces, reprocessing will be carried out including re-sizing the image size, converting to the array, pre-processing input.

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2.3. Hand Sanitizer Sprayer

An ultrasonic sensor is an electronic device that measures the distance. A target object by emitting ultrasonic sound waves. It converts the reflected sound into an electrical signal. A solenoid valve is an electro-mechanically operated valve. The solenoid converts electrical energy into mechanical energy which, in turn, opens or closes the valve mechanically When the hand is held near the unit it sprays the sanitizer automatically.

2.4. BUZZER AND STOP POLE

Entry is denied or allowed based on the above three results by operating the stop pole .If the person satisfies the above three conditions such as Temperature range between 97 to 99oF, Weared the Face mask and Wash the Hand using Hand Sanitizer , then the stop pole will open the way to enter. otherwise ,I f any one of the conditions are not satisfied , Buzzer will make a sound and also displayed the status of the person in LCD display also.

2.5RASPBERRY PI 3

The Raspberry Pi Compute Module (CM1), Compute Module 3 (CM3) and Compute Module 3 Lite(CM3L) are DDR2-SODIMM-mechanically-compatible System on Modules (SoMs) containing processor, memory, eMMC Flash (for CM1 and CM3) and supporting power circuitry. These modules allow a designer to leverage the Raspberry Pi hardware and software stack in their own custom systems and form factors. In addition these module have extra IO interfaces over and above what is available on the Raspberry Pi model A/B boards opening up more options for the designer.

III. HARDWARE REQUIREMENTS

3.1 PI CAMERA

The Raspberry Pi Camera Module v2 replaced the original Camera Module in April 2016. The v2 Camera Module has a Sony IMX219 8-megapixel sensor (compared to the 5-megapixel OmniVision OV5647 sensor of the original camera). The Camera Module can be used to take high-definition video, as well as stills photographs. It's easy to use for beginners, but has plenty to offer advanced users if you're looking to expand your knowledge. There are lots of examples online of people using it for time-lapse, slow-motion, and other video cleverness.

3.2USB CAMERA

ZEB-Crystal Clear is a web camera with a 3P lens with a resolution of 640x480.The web camera also comes with a built-in microphone, and auto white balance, night vision feature, and a manual switch for LED.. Interface USB Image sensor CMOS Lens 3P quality lens

3.3. IR TEMPERATURE SENSOR

Thermopile sensors are designed to measure temperature from a distance by detecting an object's infrared (IR) energy. The thermopile sensing element, composed of small thermocouples on a silicon chip. Absorb the energy and produce an output signal.

3.4. ULTRASONIC SENSOR

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal.

IV. SOFTWARE REQUIREMENTS

Open CV PYTHON

Python is a general purpose programming language started by **Guido van Rossum**, which became very popular in short time mainly because of its simplicity and code readability. It enables the programmer to express his ideas in fewer lines of code without reducing any readability.

V. FACE DETECTION USING HAAR CASCADED

Object Detection using Haar feature-based cascade classifiers is an effective method proposed by Paul Viola and Michael Jones in the 2001 paper, "Rapid Object Detection using a Boosted Cascade of Simple Features". It is a machine learning based approach in which a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images. Here we will work with face detection. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. Then we need to extract features from it.

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For this, Haar features shown in below image are used. They are just like our convolutional kernel. Each feature is a single value obtained by subtracting the sum of pixels under the white rectangle from the sum of pixels under the black rectangle.

VI. RESULT

Figure 3 Without Mask, Process stopped, Next we do again for another person

Figure 4:All process done, person allowed

VII. CONCLUSION

In conclusion, this study presents a model using machine learning for face mask detection. After the training, validation, and testing phase, the Haar cascade image processing model can provide the percentage of people using face mask in some cities with high accuracy. In the name of the statistical organization that needs to move quickly to adopt and take advantage of machine learning and new digital data resources, this study can be an easy move for authorities to use more unstructured data resources for more data-based mitigation, evaluation, prevention, and action planning against COVID-19. The Infrared temperature sensor is touchless. so it is very useful and not spread corona from human to human.

VIII. FUTURE ENHANCEMENTS

In future, we improve high efficiency algorithm and execution also. We improve the system to found the color mask and face type masks. The overall system performance improves better than the current system; the number of peoples checking process will be increased. We will develop the insight the mall or class rooms, known person's names will be displayed. Add the mask vending machine for without mask wear person.

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