Face Mask Detection Alert System using Raspberry Pi

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Abstract - *Coronavirus pandemic brought about by novel Covid is ceaselessly spreading up to this point everywhere in the world. The effect of COVID-19 has been fallen on practically all areas of advancement. The medical services are going through an emergency. Numerous prudent steps have been taken to diminish the spread of this sickness where wearing a mask is one of them. In this project we have used ML , OpenCV and TensorFlow to recognize face masks. This model can be utilized for security purposes since it is very resource efficient to deploy. In this approach MobilenetV2 architecture is used which has BN layer and is very lightweight and we have embedded this model with Raspberry pi to perform real-time mask detection, where, structure of SSD is used and backbone network is lite.The datasets used for this CNN based face mask detection are prepared by Prajna Bhandary and AIZOOTech which are available on Github. These datasets can be used by other researchers for further advanced models such as those of face recognition, facial landmarks, and facial part detection process.*

Key Words: SSD (Single Shot Detector), COVID-19 (Corona Virus disease), OpenCV (Open Source Computer Vision Library), CNN (Convolutional Neural Network), ML(Machine Learning), BN (bottleneck).

1. INTRODUCTION

As COVID-19 spread all across the planet , many folks became conscious of how important face masks are. While face masks may cause a small inconvenience, especially during the summer season, these tissues are the sole barrier between us and therefore the deadly SARS-CoV-2 (coronavirus). Healthcare officials from the planet Health Organization (WHO), Centers for Disease Control and Prevention (CDC), and native institutions from all round the world are urging people to wear face masks, as it's the only way to prevent the transmission of the virus as not wearing a face mask can increase the outbreak of coronavirus. in tworld. The main of this paper is to develop an efficient face mask detection to maintain the rules during these tough times of Covid-19 outbreak and to help people protect themselves from the virus.

2. PROPOSED SYSTEM

This paper explains a efficient system called as Face mask detection alert system using raspberry Pi which detects whether the person have worn a face mask or not. The proposed structure of the face mask detection and alert system performs following tasks:

A) Face Detection (using Pi camera input).

B) Mask Detection (if person has worn face mask or not).

C) Email alert with alert message and screenshot as proof (if face mask policy is violated).

D) Screenshots of all "no mask" instances are stored inside storage of device used.

We perform face detection using CNN i.e a structure of SSD (Single Shot Detector) and another model called as MobileNetV2 to detect people in a video frame. We perform this face mask detection system on a Raspberry Pi 4.The proposed algorithm for face mask detection system consists of :preprocessing, training the CNN, face mask detection. The dataset we are using consists of images with different sizes, colors and orientations. Therefore, the preprocessing step is to convert all the pictures into grayscale because we'd like to make certain that color shouldn't be a problem for detecting masks. After that, we need to have all the images in the same size before applying it to the neural network. Training the CNN: We used the structure of SSD.The backbone network is lite. The total model only has 1.01M parametes. Input size of the model is 260x260 and the backbone network(BN Network) only has 8 convolution layers. The total model has only 24 layers with the location and classification layers counted and we have also used another CNN architecture called MobileNetV2. We merge the Backbone network to Conv layers in order to accelerate the inference speed.

The last step is to recognize whether the person is wearing the mask or not using the model trained.

3. COMPONENTS

3.1 Raspberry Pi

The Raspberry Pi is a small sized computer, low cost that can be connected to a monitor or TV, and uses a typical keyboard and mouse. It is small device that permits people to explore computing, and to program in languages like Scratch and Python.

FIGURE 3.1 RASPBERRY PI

4.1 Pi Camera:

The Pi camera module is a light weight camera that can be connected to Raspberry Pi and is portable. It connects with Raspberry Pi using the MIPI camera serial interface protocol. It is normally utilized in image processing, machine learning or in surveillance projects. It is commonly utilized in surveillance drones since the payload of camera is extremely less.

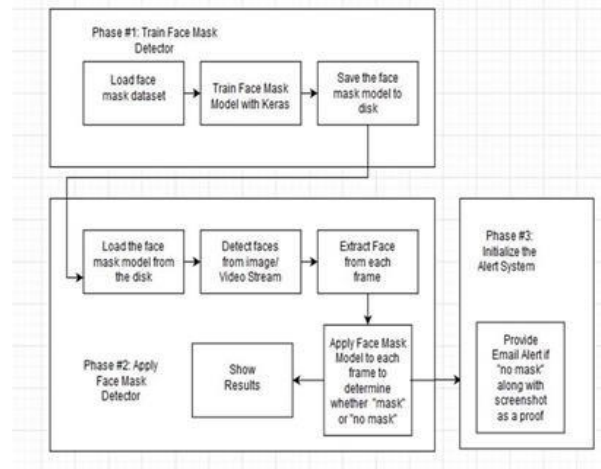
FIGURE 3.2 PI CAMERA

4. SYSTEM ARCHITECTURE

FIGURE 4.1 SYSTEM ARCHITECTURE

5. FLOWCHART

We use RGB Values to set the color of the bounding rectangle. We have give Green and Red for "mask" and "no mask" bounding rectangle respectively.

Inside an infinite loop, we are going to take input frame by frame from the Pi camera and convert each input frame from the pi camera to grayscale and the detect the faces. And the system will run through a for loop for each and every face extracted from a frame and the region of interest will be detected. We have used the most efficient model to get the best possible result. There are two probabilities for the result i.e "mask" or "no mask" which will be shown as green or red box respectively during the display of the result.
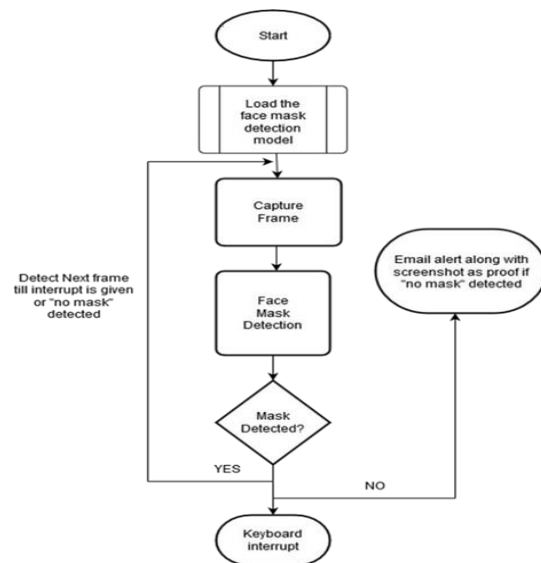

FIGURE 5.1 FLOWCHART

6. CONCLUSION

As the technology are blooming with emerging pandemic. So, we have created novel face mask detector which can possibly contribute to public health care department. The face mask detection is trained on CNN model and we have used OpenCV, Tensor Flow and python to detect whether person is wearing a mask or not. The model were tested with real time video as well as images and a promising accuracy is achieved and the optimization of the model is continuous process. In this project, MobileNetV2 model and a structure of SSD has been used for creating a efficient masked face recognition system. We have benchmarked this approach on a well known dataset. Our approach tested on those datasets shows better recognition rates. So, MobileNetV2 / structure of SSD model trained on masked and non-masked images gives better accuracy for simple masked face recognition.

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