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FACEMASK DETECTION USING RASPBERRY PI

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ABSTRACT

Paper proposed how a face masks detection system can be simply to access and control a system the highly infectious diseases. A Raspberry Pi implementation of COVID-19 face mask detection is proposed in this paper. The Raspberry Pi-based implementation outperforms GPU-based desktop alternatives that require excellent real-time cloud enabled connections. We'll use a Python script to train a face mask detector and examine the results. If the person is wearing a face mask and their body temperature is under World Health Organization (WHO) norms, a security screening system will allow them to enter. As a result, this will benefit society by saving time and controlling the spread of the Corona virus.

Keywords: COVID-19, Face mask detection, Deep learning

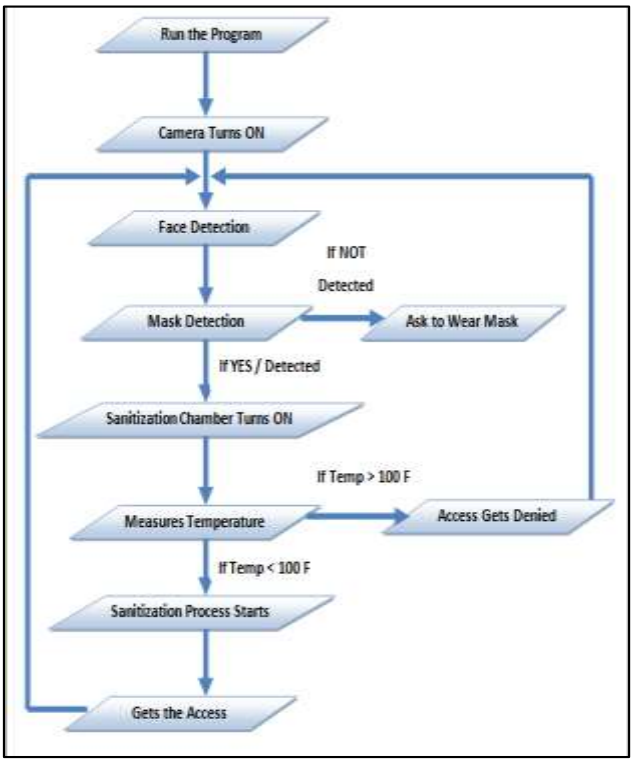
1. INTRODUCTION

Covid-19 is very infectious disease and is spreading with the minimum ratio of 1:3. To decrease risk of the disease one has to be safe by taking very simple precautions, such as washing your hands frequently, keeping physical distance, rooms should be kept ventilated, avoid crowds, coughing into a bent elbow and the very important is wearing mask.As a result, everyone should put on a Face Mask to conceal their face.

According to studies, wearing a face mask is critical in preventing the transmission of the infection. According to research, N95 and surgical masks are 91% and 68 percent efficient at preventing virus transmission, respectively. Wearing these masks successfully disrupts airborne viruses, preventing them from reaching a human's respiratory system, and it is a cost-effective strategy to reduce mortality and respiratory infection problems. (Qin et al., 2020) has used image super-resolution with classification network for identification of facemask. (Li et al., 2020) YOLOv3 improved the speed on the detection layer by modifying the smaller faces. (Sayem et. al., 2018) integrated IoT based system for face recognition. (Islam et al., 2020) used CNN for detecting the face. (Punn et al., 2020) used deep learning for analysis of Covid-19 pandemic. Deshmukh et al., used Raspberry Pi for face detection. (Wang, et al., 2020) created a dataset of face masked people for various applications.

Face mask detection systems are undergoing research to meet the various needs of industrial applications. The successful detection of face masks and other variations in operator bio signal passports that can be used as a basis for access and egress as well as the continuation of certain manufacturing processes is a common theme. Computer vision systems allied with Deep Learning networks are required for the successful detection of face masks and other variations in operator bio signal passports that can be used as a basis for access and egress as well as the continuation of certain manufacturing processes. Face mask detection algorithm is developed using Python, openCV, Keras and tensor flow. The circuit consist of Raspberry Pi on which camera is mounted which monitors the facemask and it also measure the temperature. An alert signal is given to the appropriate authorities if the Covid-19 protocols are not followed.

2. FLOWCHART



3. METHODOLOGY

3.1 Face Recognition

Before facial recognition, a database of diverse people was created, which includes their faces, unique characteristics, and other personal details. These are extracted from the database and stored in a pre-configured folder.We'll use the features from these images to improve our classification systems. We'll also compare these features to the ones that were already stored in a database.

3. 2 Mask Detection

This system can identify people wearing a facemask on a video stream by using various deep learning and computer vision techniques such as Opencv, Keras, TensorFlow, etc.

3. 3 Temperature Check

The MLX90614 is s non-contact infrared thermometer which is used to determine the temperature of a person's body. Then into a Raspberry Pi data is been feeded through the thermometer and which then displayed on an LCD screen.

3. 4 Hand Sanitization

The green LED will be turned on if the person is wearing a face mask and their temperature is below the threshold. The red LED will be activated if the mask is not worn. If the temperature is above the threshold, the buzzer will be turned on and the individual's face will be identified. If the temperature is below the person's hand will be sanitized.

4. WORKING

We used a dataset that covered all potential test cases to build this system. Selenium and numerous other extensions were used to scrape photographs from the internet of people wearing masks and people who were not wearing masks in order to construct a dataset. This data collection was split into two parts.

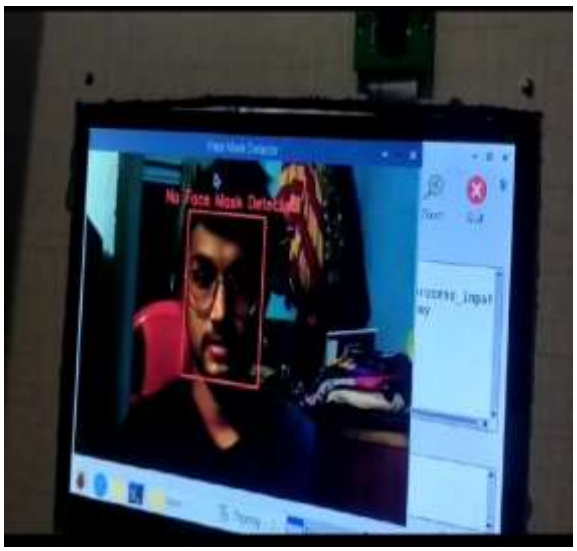


Fig. 1 Images showing people with mask and no mask

4.1 Web Scrapped data set

There are two sections, namely the Training set and the Validation set, which contain 80 percent and 20 percent photos, respectively.

Using Deep Learning and Computer Vision techniques and libraries such as OpenCV, this system will identify people wearing a facemask on an image/video stream.

Others include Keras and Tensor Flow. Our focus will be on to load our face mask detection dataset from discpart. The images we downloaded are in a variety of formats. Sizes and resolutions are available in a variety of formats. Consequently, crop and resize the image, RGB color transformation of the source image (256 x 256) filtering.

The MLX90614 ESF is a non-contact infrared thermometer that is used to determine a person's body temperature. The data from the thermometer is sent to a Raspberry Pi, which displays it on screen. The green LED will glow, and the relay will activate the motor. Inject the hand sanitizer into the person's palm.

4.2 ALGORITHM FOR FACE MASK DETECTION

It is divided into two phases:

i) TRAINING PHASE: In this phase we will generate a face detection model using classification algorithm. This phase is further divided into two stages:

a)Data Pre-processing

b) Data Training

The training includes the following process –

- Loading Image Data
- Pre-processing
- Loading the MobileNetV2 classifier
- Building a new fully connected (FC) head

a) Data Pre-processing:-

This stage works on image data available in dataset. In this face mask detection project, dataset is a classified collection on image data of peoples wearing mask and not wearing mask generated via facial land marking artificially.

The Pre-processing process includes:-

- Loading image dataset.
- Resizing dataset images to 224 x 224 pixels.
- Conversion to array format using numpy array.
- Scaling the pixel intensities in the input image.
- Ensuring training data is in numpy array format.
- Segmentation image data for training and testing.
- Data augmentation.

b) Data Training:-

This stage will work on training the preprocessed image data using classification algorithm. Algorithm used in this is MobileNetV2 to generate a base model for testing purpose.

The Data Training process includes:-

- Fine tuning of the data.
- Loading of MobileNet with pre-trained image Net weights.
- Construction of new FC head.
- Adam optimizer for model compilation.
- Model generation.

ii) DEPLOYMENT PHASE:This phase will do the rural time detection of face mask using the trained model from the training phase using classification algorithm:

- Load the trained models.
- Get the real-time image data.
- Compare real time data with trained data.
- Show the results using OpenCV.

5. RESULTS

The given system is built on the idea to reduce the physical workforce, it can be used in an entrance of a building or high crowded area like a stadium, malls, etc. The system can efficiently work on an airport for entrance flow management and monitoring. The system can be added to any entrance to make sure that all passengers follow the safety rules while boarding the plane.It can also be used in a hospital as the person detected with a high temperature can be rush to the treatment without spreading it any further.

The system described in the paper helps to ensure the safety of the people in public places by detecting whether or not an individual is wearing a face mask.

Fig.2 Circuit connection of Facemask detection

Fig. 3 Output of Circuit

6. CONCLUSION

The system in the paper is presented due spread of the coronavirus and a face mask is essential to control the pandemic. The system is trained to detect whether the person is wearing a mask or not and can also detect temperature without any human involvement. This process requires relatively less time and provides better accuracy compared to any other method. The system deals with the problem efficiently and will only improve after the required time. After the initial phase, there is some further improvement that needs to be done in the

system as Coughing and Sneezing Detection and a door prototype.

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