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MACHINE LEARNING BASED SAFETY MONITORING FOR COVID-19

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***Abstract*—Corona virus is a large family of viruses that cause illness ranging from the common cold to more severe diseases.One of the effective methods against the virus is keeping ourselves and our surrounding safe. This paper introduces a face mask detection system and also makes sure of the person to follow proper medical protocols.m. In this paper, we propose a system that restricts the growth of COVID-19 by finding out people who are not wearing any facial mask in a hospital or institution or in any particular place where there is a need for proper hygiene.When a person without a mask is detected, the corresponding authority will be informed through mail.Face mask detection will helpthe authorities to make mitigation, evaluation, prevention, and action planning against COVID-19.The face mask recognition in this study is established with a machine learning algorithm through the image classification method: SSD MobileNet.It is hoped that our study would be useful in reducing the spread of this communicable disease all over the world.**

***Keywords*—COVID-19, face mask detection, machine learning,SSD MobileNet**

I. INTRODUCTION

A new strain which has not previously been identified in humans is novel corona virus (nCoV). Corona viruses (CoV) are a wide group of viruses which cause illness that range from colds to deadly infections like Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The first infected patient of corona virus has been found in December 2019. From that period, COVID-19 has become a pandemic all over the world. People all over the world are facing challenging situations due to this pandemic. Every day a large number of people are being infected and died. At the time of writing this paper, almost 16,207,130 infected cases have been confirmed where 648,513 are death. This number is increasing day by day. Fever, dry cough, tiredness, diarrhea, loss of taste, and smell are the major symptoms of corona virus which is declared by the World Health Organization (WHO). Many precautionary measures have been taken to fight against corona virus. Among them cleaning hands, maintaining a safe distance, wearing a mask, refraining from touching eyes, nose, and mouth are the main, where wearing a mask is the simplest one. COVID-19 is a disease that spread from human to human which can be controlled by ensuring proper use of a facial mask. The spread of COVID-19 can be limited if people strictly maintain social distancing and use a facial mask. Very sadly, people are not obeying these rules properly which is speeding the spread of this virus. Detecting the people not obeying the rules and informing the corresponding authorities can be a solution in reducing the spread of corona virus. A face mask detection is a technique to find out whether someone is wearing a mask or not. It is similar to detect any object from a scene. Many systems have been introduced for object detection. Deep learning techniques arehighly used in medical applications. Recently, deep learning architectures have shown a remarkable role in object detection. Recently, the growth of COVID-19 can be reduced by detecting the facial mask in their work places and in public places like hospitals, malls and in private and government sectors. This paper aims at designing a system to find out whether a person is using a mask or not and informing the corresponding authority. We have been using pi cameras to capture real-time video footage of people entering. From that video footage, facial images are extracted and these images are used to identify the mask on the face. The learning algorithm Convolutional Neural Network (CNN) is used for feature extraction from the images then these features are learned by multiple hidden layers. Whenever the architecture identifies people without facemask this information is transferred to the corresponding authority to take necessary actions. The proposed system appraised promising output on data collected from different sources. The remainder of the paper is arranged accordingly. The most recent works for facial mask detection is described in the upcoming chapters.

II. METHODOLOGY

A. proposed system

The proposed system consists of 2 modules. In module 1,the camera placed at the entry point monitors the people entering. If it spots people without mask, at that instant the image of the individual will be captured. The captured image will be sent to the higher officials through Gmail. Module 2 is an automatic hand sanitizing process. There is no risk of infection hence it is a touchless process. We use IR sensor and servo motor connected with raspberry pi in this module for making the process automatic.

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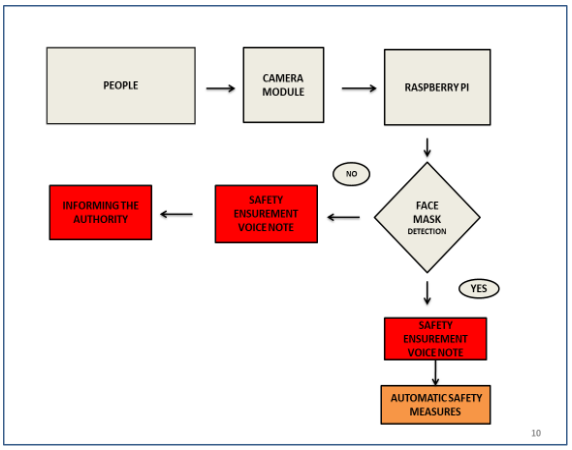

Fig. 1. Block diagram of module 1

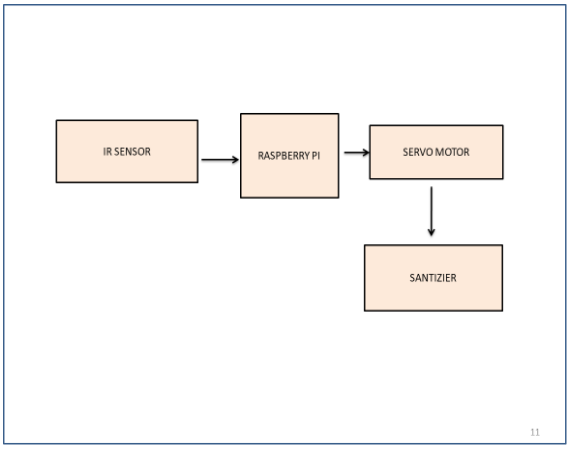

Fig. 2. Block diagram of module 2

B. Building a 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.

For building the model, this study uses 1.916 data with mask and 1.930 data without a mask. At this step, the image is cropped until the only visible object is the face of the object.

The next step is to label the data. The data which has been collected labeled into two groups; with and without a mask. After the data has been labeled, it is grouped into those two groups. The example of the data is as below

2. Pre-processing.

The pre-processing phase is a phase before the training and testing of the data. There are four steps in the pre-processing which are resizing image size, converting the image to the array, pre-processing input using SSD MobileNet, and the last is performing hot encoding on labels.

The resizing image is a critical pre-processing step in computer vision due to the effectiveness of training models. The smaller size of the image, the better the model will run. In this study, the resizing an image is making the image into 224 x 224 pixels.

The next step is to process all the images in the dataset into an array. The image is converted into the array for calling them by the loop function. After that, the image will be used to pre-process input using SSD MobileNet.

And the last step in this phase is performing hot encoding on labels because many machine learning algorithms cannot operate on data labeling directly. They require all input variables and output variables to be numeric, including this algorithm. The labeled data will be transformed into a numerical label, so the algorithm can understand and process the data

3. Split the data

After the preprocessing phase, the data is split into two batches, which are training data and testing data. Each batch contains both images of with mask and without mask pictures.

4. Building the model and testing

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 SSD MobileNet, adding model parameters, compiling the model, training the model, and the last is saving the model for the future prediction process.

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

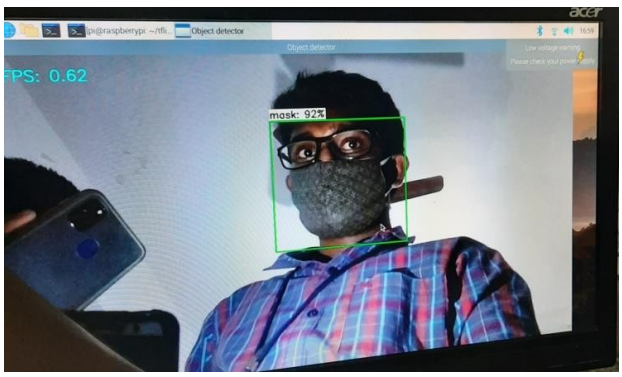

Fig. 3. Detected result

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 resizing the image size, converting to the array, pre-processing input using MobileNet.

The next step is predicting input data from the saved model. Predict the input image that has been processed using a previously built model. Besides, the video frame will also be labeled that the person is wearing a mask or not along with the predictive

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percentage. Figure 3 is an example of implementingthe model

III. Conclusion

This study presents a model using machine learning for face mask detection. After the training, validation, and testing phase, the model can provide the percentage of people using face mask in some cities with high accuracy. 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 Authors and Affiliations

IV. Future Work

In future, we can also identify the details of the person who is without mask by feeding and training their datas, hence it can be done specially for specific institution or office. The complexity differs in the amount of individual person's datail we train.

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