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ACCESS CONTROL SYSTEM USING FACE MASK DETECTION USING ARTIFICIAL INTELLIGENCE

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Abstract - *The covid-19 pandemic, is causing a worldwide emergency in health protection. This virus mainly targets our lungs and spreads through respiratory droplets which come out from he/she infected with coronavirus and give risk others. The transmission gets huge risk in public places or in crowded places. The after-lockdown period has seen increase in cases day by day as people have now stepped out of their home to resume their work and recreational activities. The natural human tendency is to be complacent and take off the mask when talking, working or after using it for a long time, just use it to relax and breathe properly. And as per the reports in India, only 14 percent of the population correctly wears their mask. So, our project that falls in the combined domains of Artificial Intelligence and the Internet of things. In this project, we propose a method to detect face masks on people and consequently control a person's access to a facility/premise. Our system uses computer vision to analyzed and determine whether the person in question is wearing a face mask or not. Further, the output of the recognition module/system will be used to control access/entry to a facility/premise. This system will be implemented on a real-time basis, meaning that it will control the aforementioned access in real time without having to make a person wait. This will be made possible with the help of microcontrollers/microprocessors such as the Arduino Uno. The model that is trained and used for detection will be stored locally to ensure real-time processing. This will help prevent people from entering public places such as malls, cinema theatres, offices, hospitals, schools, colleges, etc. without a mask.*

***Keywords: COVID*-19, Face Mask, Image Processing, Computer Vision, Arduino Uno Artificial Intelligence, Micro controller.**

1. INTRODUCTION

The COVID19 pandemic has greatly affected people's lives, causing millions of people loss. Complacency tends to infiltrate people to adhere to restrictions/councils established for an extended time and subsequently, they manipulate their own diluted version of the instructions to better adapt to their comfort levels. Therefore, it sneaks into the trend to remove the mask according to their convenience and wear it again according to their comfort. Therefore, not only risk his own life, but also several people who might come into contact with this person knowingly/unknowingly. This module uses artificial intelligence to automatically detect a person with/without a mask and sets off an alarm when a person is detected without wearing a mask.

2. OBJECTIVES

- Face Mask Detection Model Training: A default OpenCV module was used for obtaining faces, followed by a Keras model for identifying face masks.

- Detecting persons who aren't wearing masks: Using the database, an open CV model was trained to recognize the names of people who aren't wearing masks. The system is designed to regulate the motor that connects the doors in public areas such as malls, theatres, schools, parks, and other public spaces. This motor will not be able to open doors and let that individual in because of the face-mask detecting system.

3. BRIEF DESCRIPTION

- Because the offices/establishment is now open to the public, a mask detection module is required. As a result, persons can currently walk freely in and out of establishment/office locations. According to ICMR norms, everyone (Mandatory) must wear a face mask. It is a natural human instinct to put on the mask prior to inspection (in/out gate controlled by sentries) and remove it thereafter (just to relax and breathe easily). This is clearly a breach of safety precautions and Social Distancing rules. Body temperature can be monitored with a thermal thermometer at entry/points, and the status of the Aarogya setu app can be checked, but this does not guarantee that the person is Covid positive/negative. As a result, the person cannot move freely without wearing Masks. Moreover Sentries/guards cannot be stationed at every corner of the establishment to keep an eye on persons who remove their mask and stroll around freely unnoticed, expecting that no one will be able to capture them once they have passed through a sentry-guarded gate. This module will detect if persons are entering the campus with or without a mask, and

admission to those without a mask may be prohibited. Inside campus, a properly placed gadget will be able to detect people who are not wearing their mask and remind them to do so. They can also be sufficiently cautioned so that they do not repeat this error, putting the lives of others and their own in jeopardy. This will also serve as a warning.

4. METHODOLOGY

The following is the process used to create this Artificial Intelligence-based module: - It uses artificial intelligence to distinguish the faces of people with and without masks.

•Face identification using artificial intelligence from live video or images.

•From the identified part of the face, relevant features are retrieved.

•To discriminate between mask-wearing and mask-free faces, use the trained model. Detect faces without masks and sound the alert.

•With the help of microcontroller and servo motor we can control a person's access to the premise.

5. WORKING

This project uses OpenCV, a caffe-based face detector, Keras, TensorFlow, and MobileNet V2 to detect face masks and consequently control access to the premise with the help of microcontroller and servo motor. The dataset used contains 3835 images, of which 1915 images include with masks and 1918 without masks. First the basic model is generated. This happens on Keras and MobileNet V2. The base model is generated first, then the head model. The head model consists of a 128-tier network, a "Relu" activation function and a 0.5 dropout, followed by another 2-tier network and a "Softmax" activation function. All three layers make up the trained model. The generated model will be trained on the labeled dataset by splitting it into two parts. The part contains 75% of the images and is used for training. The remaining parts contain the remaining 25% of the images and are used to test the accuracy of the model.

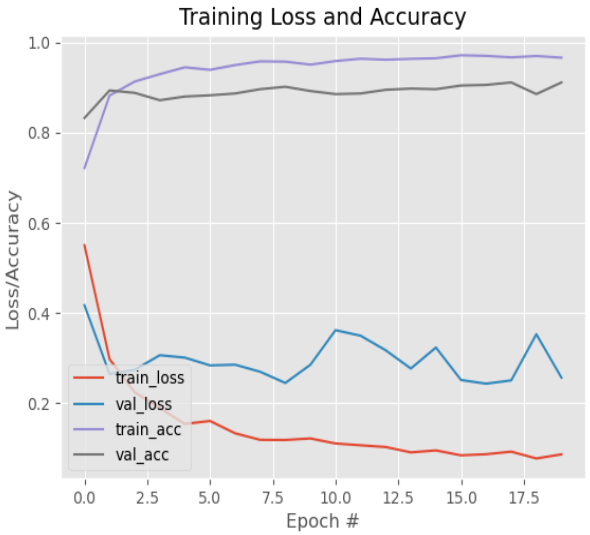


Chart -1: Training Loss and Accuracy

After the model is trained on, it can be used to detect face masks on the faces of people. A trained model is loaded and an image containing faces, with or without a mask, or a continuous video stream of people is provided as input. If the input is a video stream, the video image or frame is first sent to the standard face recognition engine for human face recognition. This is done by first resizing the image or video frame, then detecting the blobs in it. This detected blob is sent to the face detector model at. The face detector model outputs only a person's cropped face without a background. This aspect is given as an input to a previously trained model. It returns regardless of the presence of the mask.

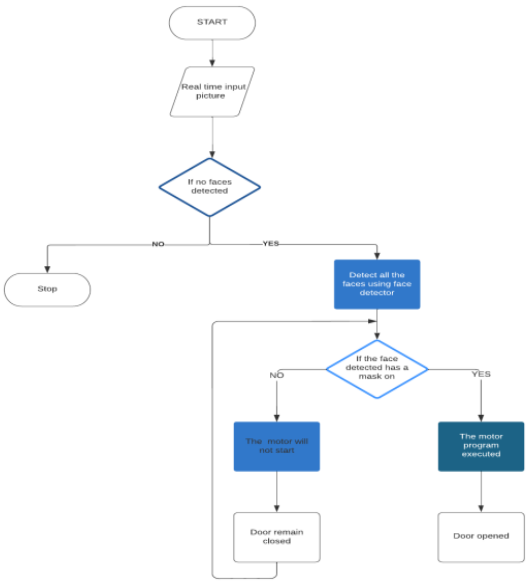
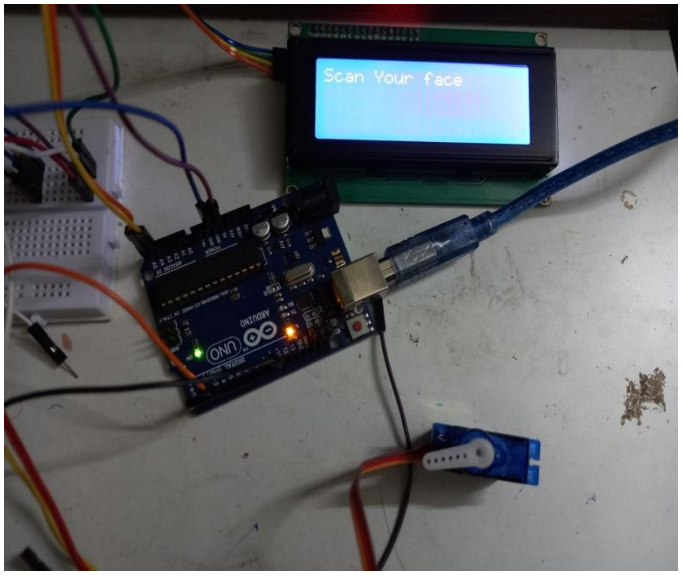
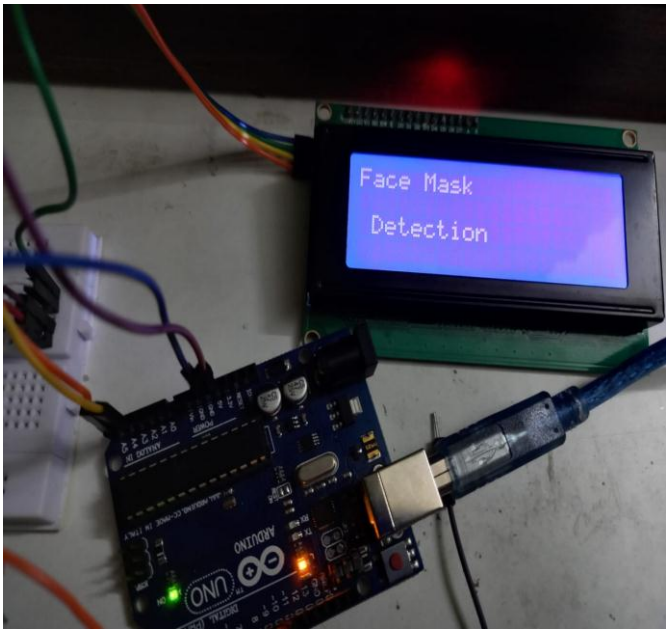


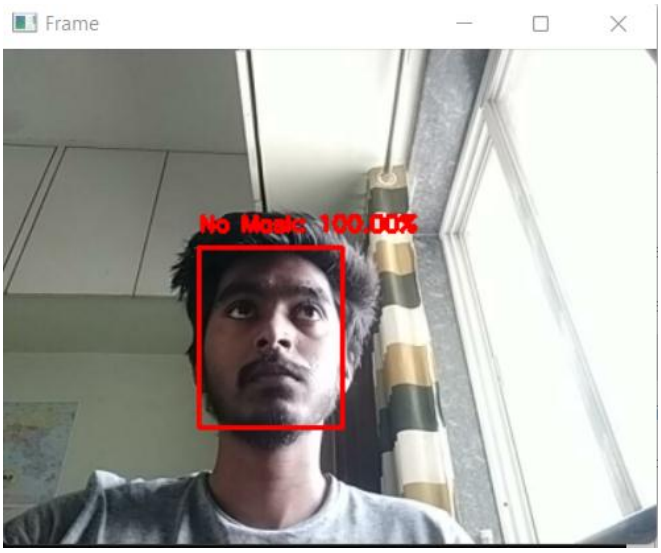
Fig-1: Flowchart Diagram

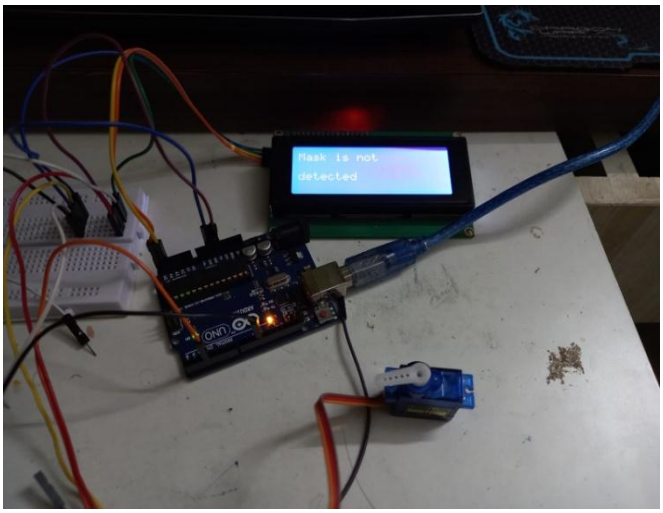
Then with the help of "serial" Library in python we can access the functioning of the Machine learning code in Arduino Uno (microcontroller) to control access of those people who are not wearing the masks with the help of servo motor.

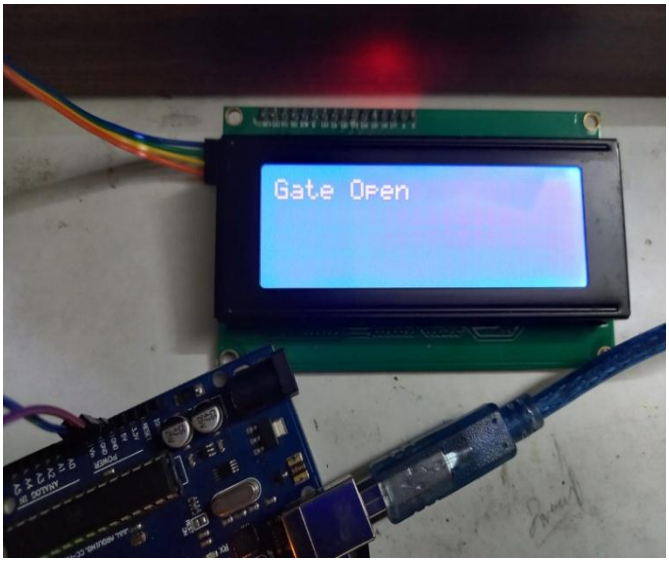


6. RESULTS

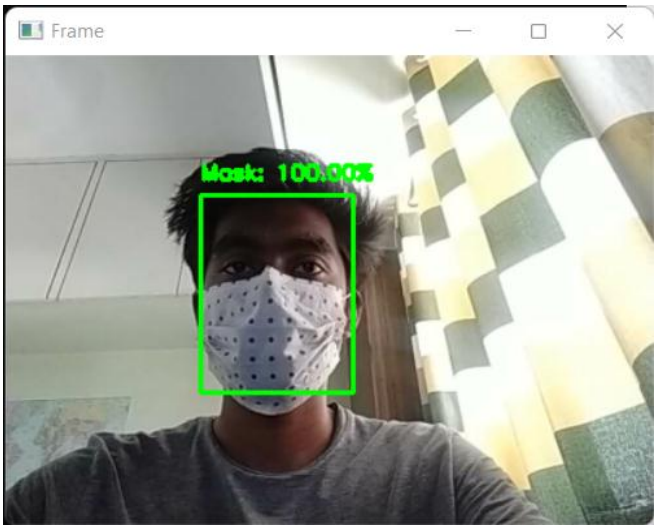








As the results are shown in above pictures, we have created this prototype to show how the Gate will open when the person is wearing mask and if the person is not wearing the mask, then LCD Module shows “Mask in not detected”.



7. CONCLUSIONS

As the technology are blooming with emerging trends the availability so we have novel face mask detector which can possibly contribute to public healthcare. The architecture includes MobileNetv2 as the backbone, it can be used for both high and low compute scenarios. To extract more powerful features, we use transfer learning to apply weights from similar task face detection, trained on a very large data set.

We used OpenCV, TensorFlow, and Neural Network to detect if people were wearing masks. The models have been tested with real-time video and image feeds. Model accuracy is achieved and model optimization is a continuous process and we build a very precise solution by tuning hyper parameters.

This particular model can be used as a use case for edge analysis. Furthermore, the proposed method achieves the most advanced results on the dataset of public masks. Through the development of mask detection, we can detect whether the person is wearing a mask or not, and allowing them in and out will be of great help to society.

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