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An automated system to limit Covid-19 using facial mask, temperature and age detection

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ABSTRACT

COVID-19 pandemic caused by novel corona virus is spreading until now all over the world. The impact of COVID-19 has been fallen on all sectors of development. The healthcare system is going through a crisis. Many precautionary measures have been taken to reduce the spread of corona virus where wearing a mask is one of them. In this paper, we propose a system that restrict the spreading of COVID-19 by finding people who are not wearing facial mask in a smart city network where all the public places are monitored with cameras and also detecting the age and temperature of the persons who are entering in public places like malls, restaurants, etc. While a person without mask is detected, the corresponding authority is informed through the proposed system. This paper presents a simplified approach to achieve this purpose using some basic Machine Learning packages like TensorFlow, Keras, OpenCV and MobileNet. It is hoped that our study would be a useful tool to reduce the spreading of this disease for many countries in the world.

Keywords- *Coronavirus, Covid-19, Machine Learning, Face Mask Detection, MobileNet, TensorFlow, OpenCV*

1. INTRODUCTION

According to the World Health Organization (WHO)'s Report, coronavirus disease 2019 (COVID-19) has globally infected over 20 million people causing over 0.7million deaths. Individuals with COVID19 have had a wide scope of symptoms reported – going from mellow manifestations to serious illness. Respiratory problems like shortness of breath or difficulty in breathing is one of them. Those people having lung disease can possess serious condition from COVID-19 as they are at higher risk. Some common human coronaviruses that infect public around the world are 229E, HKU1, OC43, and NL63. Before debilitating individuals, viruses like 2019-nCoV, SARS-CoV, and MERS-CoV infect animals and evolve to human coronaviruses. Persons having respiratory problems can expose anyone (who is in close contact with them) to infective beads. Surroundings of a tainted individual can cause contact transmission as droplets carrying virus may withal arrive on his adjacent surfaces.

Face mask detection involves in detecting the face and then determining whether it has a mask on it or not. The issue is proximately cognate to general object detection to detect the classes of objects. Face detection is categorically deals with distinguishing a specific group of entities i.e. Face. It has various applications, such as autonomous driving, education, surveillance, and so on. This paper presents a simplified approach to serve the above purpose using the basic Machine Learning (ML) packages such as TensorFlow, Keras, OpenCV and MobileNet. The system also deal with age detection and temperature detection.

2. LITERATURE SURVEY

Early research on face detection focused on methods that used image processing techniques to match simple features describing the geometry of the faces. Even though these methods only worked under very constrained settings, they showed that it can be possible to use computers to automatically recognize faces. After that, statistical subspaces methods such as principal component analysis (PCA) and linear discriminant analysis (LDA) gained popularity. These methods are use the entire face region as an input. There are some other methods for face detection are deep learning, machine learning, RCNN.

Many researchers from different parts of globe studies on ways to improvise the face detection technique for real time. Kaihan Lin and Xiaoyong Liu are presented Improvement of RCNN Object Segmentation Algorithm [1]. this method used for face detection and segmentation based on improved mask R-CNN. System deals with only face detection.

Arti Mahore and Meenakshi Tripathi are presented Detection of 3D mask in 2D face recognition system by using DWT and LBP.[2] It follows the detection approaches categories such as hardware, software and user collaboration.

Abirami M , Saundariya K. , Senthil Kumaran R., Yamuna I. are presented Contactless Temperature Detection of Multiple People and Detection of Possible Corona Virus Affected Persons Using AI Enabled IR Sensor Camera[3]. In this system can detect real time temperature of people.

3. PROPOSED SYSTEM

We have proposed face mask detection, age detection, and temperature detection system using machine learning, deep learning, openCV and CNN. The system will automatically detect the face mask, age and temperature. After detecting face mask, age, and temperature it will shows on display.

3.1 System Requirements

(a) A standalone Computer (i3 5th Gen 8Gb ram or Higher) Webcam, Temperature Sensor.
(b) Intel Core I3 or Higher processor
(c) OS: Windows 7 or above
(d) Hard Disk: 20GB or higher.

3.2 System Architecture

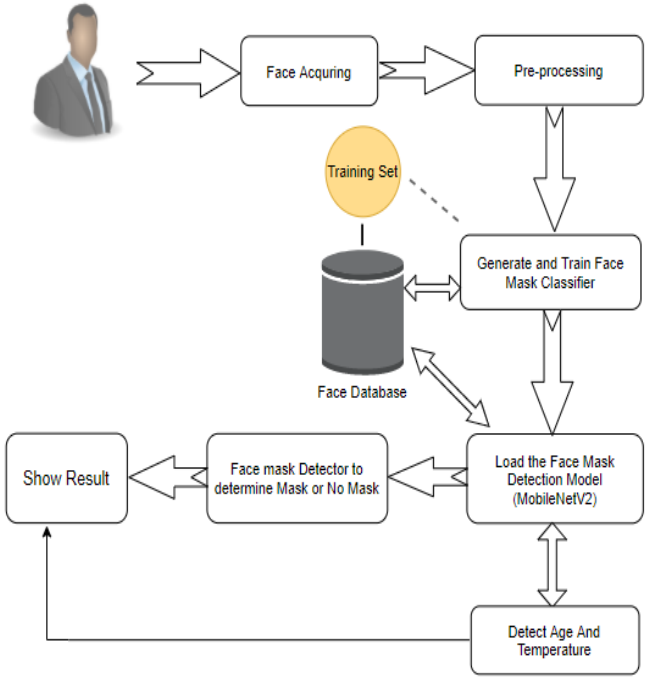

Fig: System Architecture

In this architecture Face Mask Detection is the first Module in that if a person enters in the area where system placed, it checks whether the person wearing mask or not if the face mask detected then the system checks the age and gender of the person with the help of our second Module which is Age and Gender Detection and if the age is matched with the set parameter. In the last Temperature Detection Module detects the temperature, if it is matched with set parameter then person is allowed otherwise not allowed.

Module 1: Face Mask Detection

In this module, system acquire the face of the person then do the pre-processing of the acquired face then the next step is that generating and train the face mask classifier with the help of the images stored in the dataset. we are using the Keras dataset as well as some images from the Google Images to train the Module.

With the help of OpenCV, Keras/TensorFlow, Deep Learning and Convolutional Neural Networks (CNN) we are able to detect that person is wearing mask or not. We are going to follow the Convolution Neural Network (CNN), but there is small change in it. So, our idea to implement here is we are going to neglect this particular convolution that we usually do for image processing and introduce MobileNet here. So, what we are do here is, after the input image processed we will send it to MobileNet and then we do Max-Pooling and then Flatten it and then create Fully Connected Layer and get the Output.

In order to train a custom face mask detector, we need to break our module into two distinct phases, each with its own respective sub-steps.

- Training: Here we will focus on loading face mask detection dataset from disk, training a model (using Keras/TensorFlow) on this dataset we serializing the face mask detector to disk.
- Deployment: Once the face mask detector is trained, then we can move on to loading the mask detector, performing face detection, and then classifying each face as with_mask or without_mask.

Module 2: Age and Gender Detection

In this Module, we are detecting the age and the gender of the person who entering in room with the help of the OpenCV, Keras/TensorFlow, Deep Learning and Convolutional Neural Networks (CNN).

Module 3: Temperature detection

In this module, we are detecting the temperature with the help of some hardware. here we are using the Non-contact temperature sensor mlx90614 and Arduino.

4. CONCLUSION

To mitigate the spread of COVID-19 pandemic, measures must be taken. We have modelled a face mask detector using CNN architecture. To train, validate and test the model, we are using the dataset that consist masked faces images and unmasked faces images. These images were taken from various resources like Kaggle and Google Images. The model was inferred on images and live video streams. To select a base model, we evaluated the metrics like accuracy, precision and recall and selected MobileNetV2 architecture with the best performance having 100% precision and 99% recall. It is also computationally efficient using MobileNetV2 which makes it easier to install the model to embedded systems. This face mask detector can be deployed in many areas like shopping malls, airports and other heavy traffic places to monitor the public and to avoid the spreading of the disease by checking who is follows the rules and who is not.

5. REFERENCES

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