An alternate approach to detect masks on face

- Vinayak Iyer
2017120019
BE IT
RV Batch C

Problem Statement

- In these unprecedented times, it is imperative for everyone to wear face masks to break the chain of community transmission of COVID-19.
- This project aims to provide an alert system by detecting faces that do not wear masks in real time
- While keeping the problem in mind, the aim is to construct a system that is quick and non CPU intensive, and provides sufficient accuracy.

Introduction to generic solutions

There are many techniques prevalent that detect masks on the face, and most of them follow the following approach:

- Detect faces
- Detect masks on the face (with SSD, YOLO ...)
- According to the face input, then display bounding box accordingly.

The advantage is the other accuracy is high, but **the downside is the heavy reliance on face mask data to train.**

The alternate approach

The approach followed:

- Detect faces & then use landmark to detect mouth area.
- Calculate the average saturation and compare with a threshold I set to check whether or not the face has a mask.

This method has the **advantage of not needing data to train**, the **speed is higher** than that of method 1 but sometimes due to changing lighting conditions, it may not be able to detect correctly.

The Process

1. First, the face is detected and then its landmark features.
2. The mouth area is detected, converted to HSV and then the average saturation is computed.
3. The saturation is then compared with the threshold set. If the value < 100, it is a mask (much white) and vice versa.

Technologies used: OpenCV, dlib, Haar Cascade

The Process

Detecting facial landmarks is therefore a two step process:

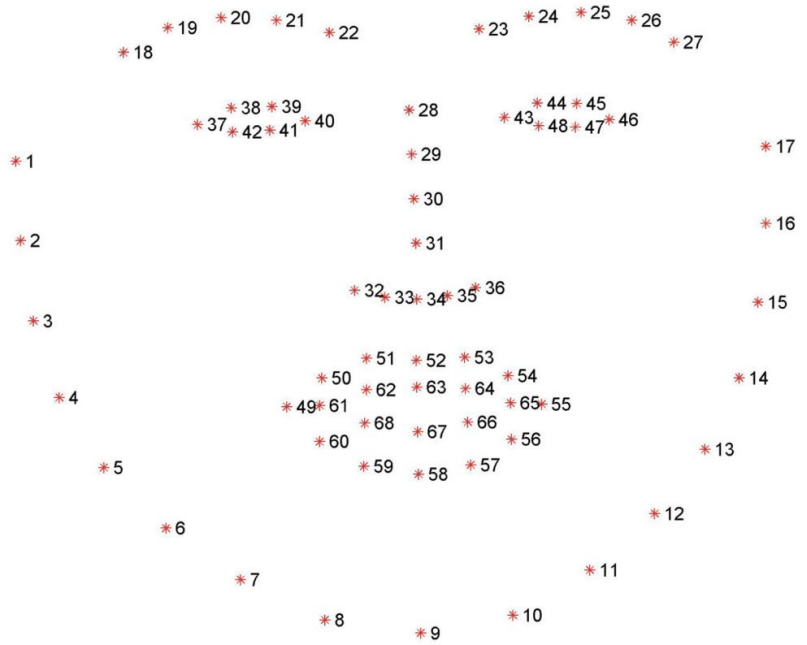
Step #1: Localize the face in the image. Done using Haar Cascades.

Step #2: Detect the key facial structures on the face ROI.

The Process

The pre-trained facial landmark detector inside the dlib library is used to estimate the location of 68 (x, y)-coordinates that map to facial structures on the face.

The indexes of the 68 coordinates can be visualized on the image alongside:



Video Links

Demo Link -
https://drive.google.com/file/d/1Z1_IMntPgNIqNDhOx_0y8x6MW06e20Za/view?usp=sharing

Recorded PPT Link -

https://drive.google.com/file/d/1SDXxtyR6m-twCy0D2jiafZI2EqgZh0gR/view?usp=sharing

Summary

- Face mask detection has been done using an alternate approach that does not require training data images of faces with and without masks.
- It provides a quick and an easy way to detect masks on face, and is less intensive.
- The accuracy of the model suffers in low light conditions.