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SOCIAL DISTANCING DETECTOR

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Abstract -*This article is about Social Distancing – the term that has taken the world by storm and is transforming the way we live. Social distancing has become a mantra around the world, transcending languages and cultures. Social distancing is crucial to avoid the spread of COVID-19 virus. Humanly, it is very difficult to monitor if people are following social distancing or not in crowded places. This can be done easily with the help of computers, a camera and some advanced object detection techniques. All these things, gave us the idea to build our project.*

1.INTRODUCTION

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. So this got us thinking – we want to build a tool that can potentially detect where each person is in real-time, and return a bounding box that turns red if the distance between two people is dangerously close. This can be used by governments to analyze the movement of people and alert them if the situation turns serious. This project uses Yolov4 object detection technique combined with method to measure Euclidian distance between two points to fulfil the objective of checking if people are socially distanced or not.

2. ARCHITECTURE:

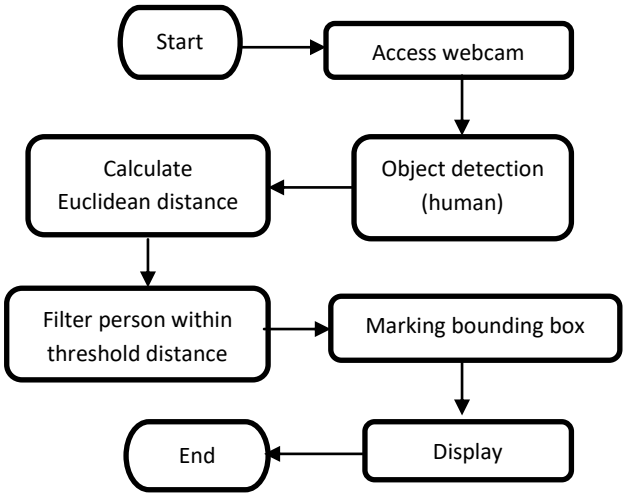


Fig -1: ARCHITECTURE

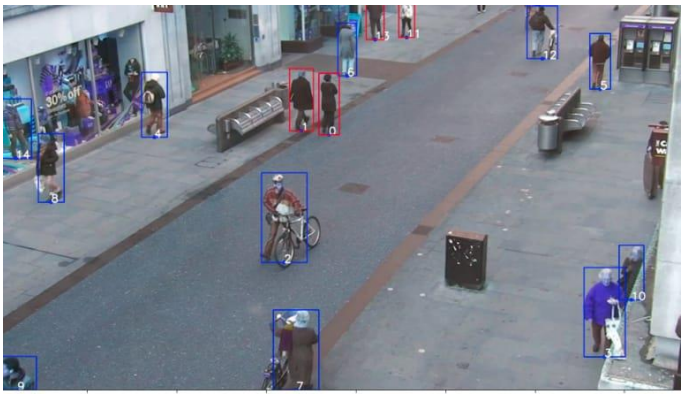


Fig2 : Social distancing detection

3.Social distancing detection:

Above figure shows that is social distancing is being maintained or not. The colour of the bounding boxes around the people shows the status of social distancing. If ,for some person, the colour is red then such person is in close contact(less than set threshold value) with some other person. People with blue/green bounding boxes are following social distancing.To check if the two or more persons are closer than the set threshold, the Euclidian distance between the center of botttom line of bounding boxes for each person is measured and comapre with the threshold(can be varied as per need) set by ourselves. The bounding boxes around the people are drawned with the help of Yolov4 object detection algorithm. This is a state-of-the-art algorithm and is able to detect objects at real time. Pre-trained Yolov4 has been used for detection of persons in this project.

3.1 YoloV4:

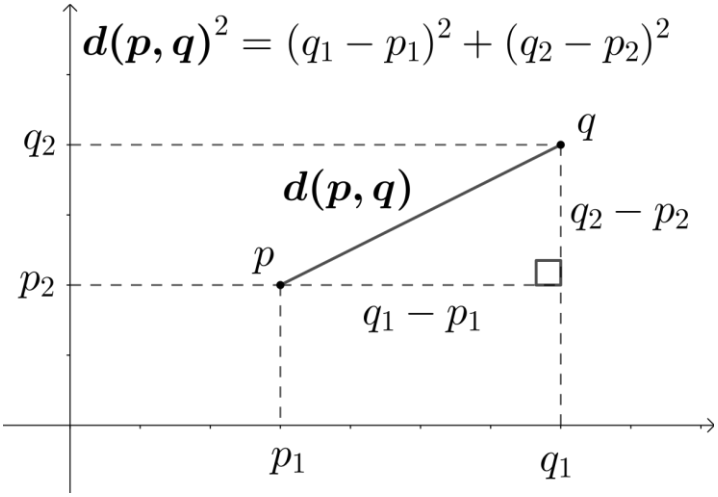
YoloV4 is an important improvement of YoloV3, the implementation of a new architecture in the **Backbone** and the modifications in the **Neck** have improved the **mAP**(mean Average Precision) by **10%** and the number of **FPS**(Frame per Second) by **12%**. In addition, it has become easier to train this neural network on a single GPU.It predicts several boxes, since it is difficult for a convolution network to predict directly a set of boxes associated with objects of different ratio, it uses anchors that divide the image space according to different strategies.From the features map created by the convolution layers, it creates many anchor boxes of different ratios in order to be able to represent objects of any size.

3.2 EUCLIDEAN DISTANCE:

The **Euclidean distance** between two points in Euclidean space is the length of a line segment between the two points. It can be calculated from the Cartesian coordinates of the points using the Pythagorean theorem, therefore occasionally being called the **Pythagorean distance**

In the Euclidean plane, let point p have Cartesian coordinates (p1, p2) and let point q have coordinates (q1, q1). Then the distance between p and q is given by:

$$d(p,q) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2}.$$



4. TESTING

4.1 SOFTWARE TESTING types

1. **System Testing**
2. **Unit Testing**
3. **Integration Testing**
4. **Functional test**
5. **System Test**
6. **White Box Testing**
7. **Black Box Testing**
8. **GUI Testing**

4.2 Test Objectives:

- All field entries must work properly.
- Pages must be activated from the identified link.
- The entry screen, messages and responses must not be delayed.

4.3Features To Be Tested:

- Verify that the entries are of the correct format
- No duplicate entries should be allowed
- All links should take the user to the correct page.

5. INTEGRATION TESTING

Software integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures caused by interface defects. The task of the integration test is to check that components or software applications, e.g. components in a software system or – one step up – software applications at the company level – interact without error.

- **Test Results:** All the test cases mentioned above passed successfully. No defects encountered.
- **Test Results:** All the test cases mentioned above passed successfully. No defects encountered.
- **Test Cases:** Set of inputs, execution conditions and expected results carried out for some objectives:

6. TEST CASE:

sr no	test_Id	test objective	input data	expected result	Actual result	status
1	TC01	To test whether the software detects all the persons in the given input	Frame/video with humans	The software detects all the humans inside a frame and draws bounding boxes around them.	As Expected	PASS
2	TC02	To test whether the software classifies the persons not following social distancing	Frame/video with humans	The software detects the persons not following social distancing and changes the colour of their bounding boxes.	As Expected	PASS
3	TC03	To test whether the software classifies the persons following social distancing	Frame/video with humans	The software detects the persons not following social distancing and changes the colour of their bounding boxes.	As Expected	PASS

Fig -7: overall test cases

7. APPLICATIONS:

This system will help in increasing the robustness and speed of the scanning systems. It will also increase efficiency in procedure when people don't use masks..

8. Future scope:

This application is meant to be used in a real-time environment so, precision and accuracy are highly required to serve the motive. The proposed model shows efficient results during the evaluation of the YOLO v4 model in low light conditions. To evaluate the performance of the social distance monitoring strategy few Tests are performed. The proposed deep learning and social distance monitoring technique shows a good speed-accuracy tradeoff in monitoring social distancing during the night. The technique is limited to a few scenarios, social distance among people can be only monitored at fixed threshold values. Secondly, in

order to initialize the monitoring process, we have to place two temporary target objects in an environment.

People who are not following social distancing may be alerted by an alarm signal on that location, and displaying the violators image in a LED screen to maintain a safe distance from the person would be a further study.

9. CONCLUSIONS:

Thus we conclude that, if this application is used properly, it can be very useful in reducing the spread of corona virus and many other viral diseases.

Social distancing monitoring system enables to check if people are following social distancing or not. These systems can work with existing surveillance systems to monitor social distancing in public places.

By the development of this system we can easily monitor social distancing protocol. In this way, we can prevent peoples from Virus Transmission through this System.

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