

Social Distance Detection and Alert

VenkateshJamdade, Ujala Pathak, Ganesh Tenkale, Shubham Shinde and Assistant Prof. Anjali Shejul, SCET, MITWPU

CSE, MIT World Peace University, Kothrud, Pune

Submitted: 10-09-2021

Revised: 19-09-2021

Accepted: 23-09-2021

ABSTRACT: Social distancing is an effective procedure in opposition the COVID-19 pandemic. Unfortunately, everyone are not maintaining the distance of 6 feet between themselves. To stop the spread of Corona Virus, there is a need of surveillance system to exhort people supporting the distance among them and steady the stretch of virus.

In this paper we arise with the solution with support of Machine learning and OpenCV. With the help of Euclidean Distance we can keep the track of the distance between two Detected persons image pixel and setting the threshold value for the distance between two peoples, and creating a red ALERT for the peoples who are violating it.

Key words: Machine Learning, OpenCV, Object Detection, Social Distancing

I. INTRODUCTION

Due to excessive increase of Covid-19 virus, every individual keeps worrying because of lack of antidote. The escalation of Corona Virus cases, World Health Organization (WHO) simulated to declare a pandemic throughout the world. Plenty of countries performed lockdown in which people were warned to stay at home by the government authorities to swallow back the critical duration of pandemic. Popular fitness agencies approved that the most successful method to detain the expansion of Corona Virus is dodging the physical connection among themselves. Every individuals are executing the bodily interval to tear down the extension on this virus. This situation concluded to breakdown the collaboration and joint action like get-together, seminars, and workrooms to support social distancing. The citizens utilized the mobiles and laptops to control and perform virtual occasions essentially feasible to decrease the one to one exposure. Each individuals are instructed to wash the hands, put on the mask and stay away from the person which are poorly sick which can slow down the growth of infection of Covid-19. Although, it is dissimilar in the middle of speaking how to decrease the emission and

placing it in real application.

Physical distancing which is also known as “social awareness” shows the protection among us and other people which are not family members. For the precaution of public and physical distance, keep minimum 6 feet away from the people around yourself.

Public awareness is a fulfill measure opposite to the Covid-19 disease. As a result, the basic population is not utilized to ripple unreal protection around them.

So the necessity of automated warning system to imprint the social distancing is essential which can help the perceptive capabilities of each individuals. The following point summarizes the important elements of this approach:

1. Deep learning has acquired additional awareness in Object Detection which was pre-owned for human recognition intends.
2. Enlarge a physical awareness recognition tool which can trace the interval among individuals to stay secure.
3. Estimation of categorization outcomes by investigating the instantaneous video stream from the Polaroid.

II. RELATED WORK

This module spotlights various related works regarding Human Detection using Deep Learning. A bunch of contemporary tasks on object classification and detection including deep learning are also reviewed. The futuristic analysis mainly throws some light on the ongoing exploration performs on Object Detection with the help of OpenCV, Yolo object Recognition, Machine Learning. Human detection can be contemplated as an Object Detection in the Computer Vision chore for localization and classification of its structure in video representation. Deep Learning has proclaimed the exploration craze in multi-class Object Detection and Recognition in Artificial Intelligence and has accomplished impressive representation on stimulating datasets. Nguyen et al. has introduced a

comprehensive exploration of highly developed on modern modifications and summons of human identification. The overview mostly well-defined on occlusion, human signifier, Machine Learning computations and real-time identification. For visual detection, methodology using deep CNN (Convolutional Neural Network) have been shown to bring off snobby accomplishment on various image detection conventions.

CNN (Deep Convolutional Neural Network) is a Deep Learning method with MLP (Multilayer Perceptron) neural networks that holds fully connected layers, various convolutional layers and sub-sampling layers. After some time, mass in all the layers in networks are learned for whole and every object identification depends according to its dataset. The object identification in image, the Convolutional Neural Network model is only one technique in deep learning which is effective feature for Grasping methods robust in detecting object in various categories. CNN (Convolutional Neural Network) obtained a good victory in enormous scale image identification role because of latest high performance system and also huge dataset like ImageNet. Various CNN models for

Object Recognition with its localization of objects had been preferred in the terms of network construction, computations and latest ideas. In frequent years, CNN models like VGG16, AlexNet [5], ResNet-50 and Inception V3 are trained to pull off impressive conclusions in object detection. The victory of Object Detection using Deep Learning is due to its neural network architecture which is capable of self-assessing the object signifier and learning the high-rise characteristics that are not straightly accommodated in the dataset.

The ongoing futuristic object detectors using Deep Learning had their opportunities and obstacles in terms of speed and accuracy. The object should have many relatable ratios and locations in the image. Hence, the real-time computations of object recognition using the CNN model like YOLO and R-CNN had further enlarged to recognize multiple classes in various regions in images had been developed. YOLO (You Only Look Once) is the crucial method for the Deep Convolution Neural Network oriented object recognition in terms of speed and accuracy. The illustration for the YOLO model is shown in below figure

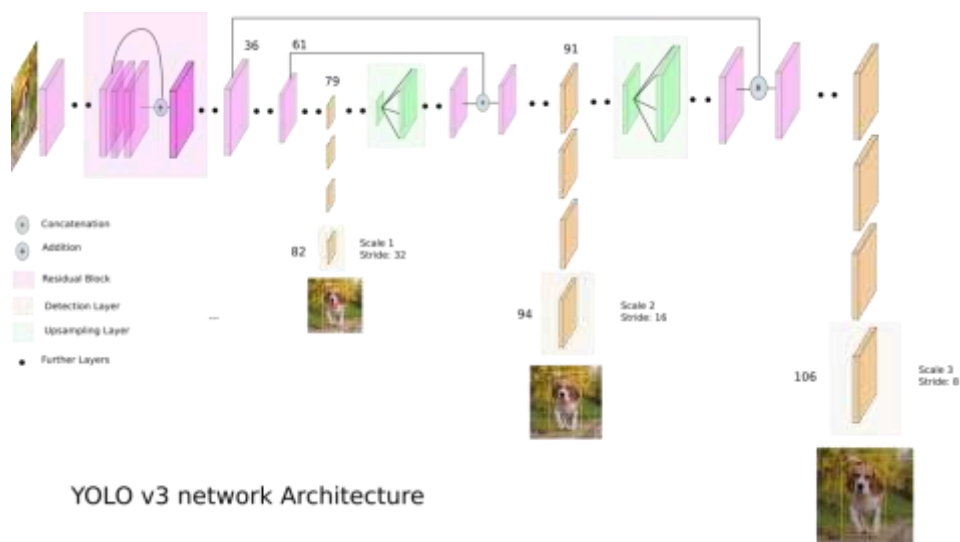


FIGURE 1:

YOLOv3 algorithm was used to detect the pedestrian in the video frame. From the detection result, only pedestrian class was used and other object classes are ignored in this application. Hence, the bounding box best fits for each detected pedestrian can be drawn in the image, and these data of detected pedestrians will be used for the distance measurement.

III. METHODOLOGY

This social distancing detection tool was developed to detect the safety distance between people in public spaces. The deep CNN method and computer vision techniques are employed in this work. Initially, an open-source object detection network based on the YOLOv3 algorithm was used to detect the pedestrian in the video frame. From the de- tecton result, only pedestrian class was

used and other object classes are ignored in this application. Hence, the bounding box best fits for each detected pedestrian can be drawn

in the image, and these data of detected pedestrians will be used for the distance measurement.

IV. EXPERIMENTAL WORK

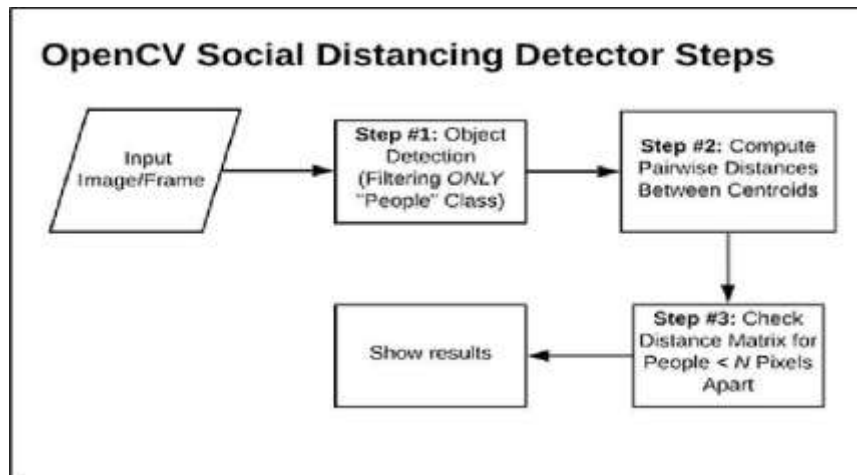


FIGURE 1:

We can use OpenCV, computer vision, and deep learning, CNN to implement social distancing detectors. The steps to build a social distancing detector include:

4. Apply object detection to detect all people (and only people) in a videostream
5. Compute the pairwise distances between all detected people
6. Based on these distances, check to see if any two people are less than N pixels apart if they are less distance apart then they are detected with red alert people.

So basically the network consists 53 CNN layers (Darknet53) stacked with 53 more layers producing 106 layers for YOLO.

CNN layer follows:

- Batch normalization
- Leaky ReLU

Essential Blocks: Residual block, Skip connections, Up Sampling, Down Sampling. YOLO other versions used the pooling concept for the filtration of the parameters and to reduce the dimensions of the feature map. Here we have not added the Pooling layer in network instead we added additional convolutional layer with stride 2 to down sample the feature maps. This will prevent the loss of the low level features. This is what excluded in the pooling layer. So capturing low level features helps to detect the small objects and improve the performance.

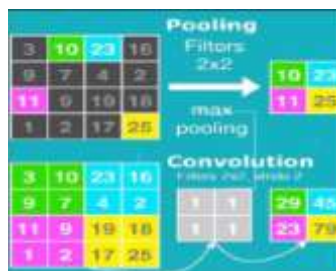


FIGURE 2:

Image Input: The input image can be any size. It will be automatically resized to network size. The detection occurs at the layer 82, 94, 106 these are scale 1, scale 2, scale 3 detection.

In yolo we consider the three network strides: 32, 16, 8 So for the image given if we consider the stride 32 then we get the output of 13*13, and for the stride 16 we get 26*26, and for stride 8 we get 52*52. Here 13*13 is respo

nsible for detecting large object, 26*26 is responsible for detecting medium object, and 52*52 is responsible for detection of smaller objects.

The probability is calculated for the all BB using K means algorithm. So the BB with maximum probability is taken for class detection. The Class detection is done using objectness score which is calculated using formula

$$P_{object} * IoU = \sigma(t_o) = P_o$$

FIGURE 3:

Then based on the objectness score we determine the class of the object.

4.1 Object Tracking

Object Tracking and Object Detection are similar in terms of functionality. These two tasks involve identifying the object and its location. But, the only

difference between them is the type of data that you are using. Object Detection deals with images whereas Object Tracking deals with videos. Object Detection applied on each and every frame of a video turns into an Object Tracking problem. As a video is a collection of fast-moving

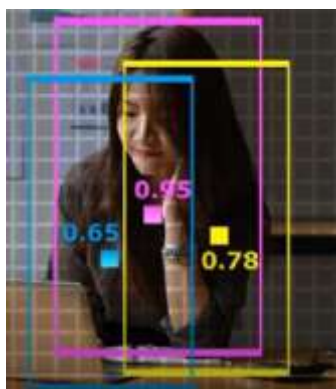


FIGURE 4:

frames, Object Tracking identifies an object and its location from each and every frame of a video.

4.2 Compute Distance

Computing the distance between objects is very similar to computing the size of ob-

jects in an image. The Euclidean distance between two points is the length of a line segment between the two points. If p and q are two points, then distance is $d(p, q) = |p - q|$. We use centroid method for calculating the distance between two objects

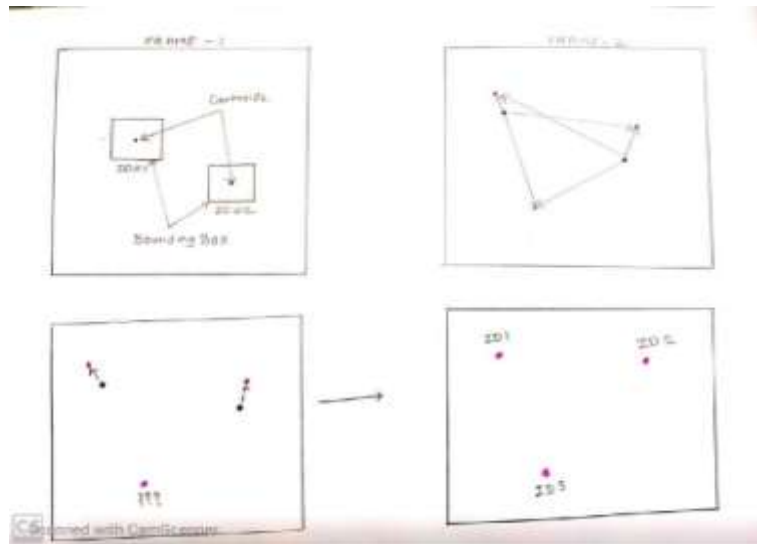


FIGURE 5:

V. RESULTS

For YOLO implementation : class Accuracy was 85.18% Obj Accuracy: 64.022%
 The final social distance detection output:



VI. CONCLUSIONS

So to completely get rid of the deadly disease all should follow the social distancing rule. To maintain the rule the technology is helping us by giving an alert message to the people to maintain the distance from each other. So the aim of this project is to build a system which will help the people to maintain the Social distance and keep them safe from Covid19.

ACKNOWLEDGEMENTS

We would like to express our gratitude toward all those who motivated and helped us in process of making of this project. We are grateful to School of Computer Engineering & Technology for giving us this opportunity to read, study and learn about the trends in the world. We would like to express our gratitude towards our internal guide **Prof. Anjali Shejul** for her invaluable guidance, constant encouragement and suggestions throughout the course of the trimester. We are

grateful to the authors of the references and other literatures referred to for this project. We would also like to appreciate all those who have indirectly guided and helped us in many ways.

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