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Social Distancing Detection By Using Deep Neural Network

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ABSTRACT

This article helps in presenting a clear view of detecting social distance inorder to evaluate the distance covered by the people from eachother. It helps in providing alarming notification to the people in making safety during this pandemic period by the use of video feed. The frame of the video clipping is used as an input and is implemented based on the hybrid computer vision. The Deep neural network dependent algorithm named YOLOv3 has been used in alarming the detection of distance between the people. It is used along with the mapping technique known as Inverse Perspective Mapping (IPM) which is one of the tracking mechanisms that helps in monitoring the social distance. It is tested against MS COCO and image datasets that has been obtained from Google. The precision was found to be 97% that helps to design the outlook of the place where the public involvement is too high. It could help in controlling the violations of trespassers who does not obey the rules of social distancing and also servers to be precaution to control the disease prone zones.

INTRODUCTION

Covid 19 is deadly disease that ruined many of the human live since 2019. In order to cope up with the disease and also to get rid of this virus provocation, some of the precautionary measures have been encountered. One of them is exhibiting social distancing between individuals. This type of disease usually transmitted when the individuals are in close contact with one another. And hence it is important to stay away from each other inorder to end this virus transmission. The recent trends in machine learning could easily reduce the human interventions in maintaining the social distance. Therefore, a deep neural network model has been developed that can assess and track whether or not a person is maintaining their social distance. The computer vision mainly concerns with the object detection that mainly includes classifying each object that come in the common field[11-15]. The convolution neural network mainly the variant specified helps in splitting the input into separate grid of individual cells. The input image when it is of same size, the model constructed using YOLO v3 helps in predicting more than one bounding boxes than the previous version v2. The model used here helps in recognizing nearly 80 variant objects that could be easily analysed from the videos and images concerned.

LITERATURE REVIEW

Syed Ameer Abbas et al. [1] used an open CV and raspberry pi in detecting and managing the crowd. The video was captured with high crowd using camera that uses ARMv8 in processing the video frame by frame. The head count measuring is done that could manage the threshold value in detecting positions that could serve as a precautionary tool in overcoming the impact of the virus spread. Joel Joesph et al.[2] done an identification of traffic system that has been done on image processing technique. First, the video input was applied to the fuzzy logic in handling the partial truth. It ranges from false to true range completely. In an article Adrian et al. [3] published a view about the deep learning concept that works during pandemic period in analysing how the distance are between the individuals. It was obtained from the CCTV camera that has been used in the streets

for focusing what happens around the surroundings. The pixels were compared along with the standard measurements in analysing the social distance between the people. Neel Bhave et al. [4] proposed a working prototype that could go with the implementation of Object detecting algorithms and techniques. Reinforcement learning which comes under the deep learning strategies serves in providing the right way in analysing the state of traffic behaviour enlighten from the induced action supplemented.

BACKGROUND STUDY AND RELATED WORK

When it comes to dealing with this pandemic condition, social distancing is the most important method to use. Because of this pandemic period that has been resulted by the spread of COVID 19, this proposed work is very much important in overcoming the effects. It evidently shows that how it manages the various effects caused due to this deadly virus. The aim of Prem et al. [5] is to have a look at the major supplementary issues that has been listed and also the measures resulted due to the social distance followed. The special patterns were recognized based on the trajectory that was indicating the on-going trend of the virus growth. The model that was introduced to be the preliminary model named Susceptible Exposed Infected and Removed (SIER) helps in determining the premature effects of social distancing. It is said to be flattening the gradual interventions as it covers the economical stress in implanting it globally.

This enormous study indicated that some of these activities should be followed that mainly done with the help of technology conservations in maintain the global health. Also, the study has undergone to govern the various use and implementation of applications in dealing with this pandemic situation. The Arogya set up application helps in detecting the social distance by the Indian government. It is working with the help of Bluetooth and Global Positioning System (GPS) in order to track the Covid patients in the crowded area. The study that has been done by Afiq Harith Ahamad et al. [5] helps in analysing the technologies embedded in tracking model of social distancing based on SSD using MobileNet for Image processing. Narinder Singh Punn et al. [6] analyses the vulnerability that resulted due to the Covid increase in various countries and gave an approach that is very much feasible to overcome this pandemic which is nothing but ensuring social distancing. Adina Rahim et al. [6] provided an effective solution that helps to tackle this pandemic situation that has been brought a higher level crisis across the world.

Rinkal Keniya et al. [7] used a development model that helps in detecting the persons' movement in which the frames are considered to be separate labels. It could be marked and coated as safe or unsafe. Mahdi Rezaei and Mohsen Azarmi [8] made an assessment that has be done through online in analysing the spatial data from the movement of object and violation rate. Savyasachi Gupta et al. [9] proposed a framework that has been done based on R CNN neural network in detecting the movement of the people in a videp footage captured. IshaShete [10] implemented a facial recognition that could detect objects' movement in the video captured. The Res Net classifer is used as a training model[16-19].

SYSTEM IMPLEMENTATION

EXPERIMENTAL SETUP

1. Determine person localization – The ROI range is compared by using the plane point from each segment in determining the position of an individual. The cameras are positioned at so

that it will be helpful in comparing the plane level from the ground instead of using the center point.

2. Pass each involved framed into the model – Each frame is first processed by using run() function. It is followed by bounding that helps in finding the coordinates. The confidence level of the prediction is grouped from 0 to 1.

FILTER WEAK AND IRRELAVANT PREDICTIONS

The model helps in identifying the persons' movement and the associated class gives the value 1 which indicates the involvement of an individual. If the values obtained from further computation said to be 0, it means no movement. But, this type of trained model will not helpful to detect the object movement because only a certain class is taken into consideration. It also takes more time since it involves analysing more than 90 objects in the video frame.

TRANSFORMATION OF BIRD EYE VIEW

The top view is governed by implementing bird eye transformation. It is done by using OpenCV that could transform the image capturedin each frame.

Step 1: Select the 4 points from the corner points that is going to be transformed. The proportions will not be the same in case of transformations, which uses call back function to get those coordinates.

Step 2: Transformation matrix is calculated in knowing the dimensions along with property of the image state.

Step 3: The matrix helps in knowing the coordinates of the detected individuals. The results are then cross verified using the GPS in the frame.

Step 4: The calculated value is far more relatively accurate, the distance might not be the same when they are in different planes. And hence, the comparison is finally tested with the original framein improving the measurement of the distance calculated between the individuals.

RESULT AND DISCUSSIONS

The 2 points in building the bounding boxes is returned when each individual is detected. The centroid is obtained from the middle position between them. Using the result obtained from the above transformations to obtain the best representation of the ground plane location, the coordinated for the bottom point is calculated. The coordinated for the bottom point is calculated in order to find the best presentation of the ground plane position. The red line indicates that the objects violate the rules of social distancing and the green mark here helps in indicating the proper distancing between the people. The table given below helps to validate this model and also measures computed evidently shows the training time along with the total loss and number of iterations used.

Model	**TT(in sec.)**	**Nol**	**mAP**	**TL**	**FPS**
Faster RCNN	9435	12318	0.981	0.01	4
SSD	2212	1321	0.678	0.28	11
YOLO v3	**5655**	**7689**	**0.874**	**0.83**	**24**

Fig.1 Performance Comparison of Object Detection Models Screenshots

CONCLUSION

The proposed framework described helps in the automation of monitoring he distance that has been followed between the individuals. Each person is identified with the help of the bounding boxes along with the real time computations. The clusters or groups of individuals will be very well classified using these bounding boxes from the video frame used as an input. The extensive test were implemented analysing the performance of the trained model. Thus it efficiently gives balanced FPS and MAP score. It could be finally then adjusted when it is to be better tuned in the corresponding view of detecting movement of the objects.

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