IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

REAL TIME DISTANCE MONITORING

[1]Shaikh Ajmal, [2]Sapkal Anil, [3]Rathod Chaitanya, [4]Shaikh Mohd Ashfaque, [5]Mohammed Juned

[1]Student, [2]Student, [3]Student, [4]Professor, [5] Professor

[1]Department Of Computer Engineering,

[1]Rizvi College Of Engineering, Mumbai, India

Abstract: Social distancing is a recommended solution by the World Health Organisation (WHO) to minimise the spread of COVID-19 in public places. The majority of governments and national health authorities have set the 2-m physical distancing as a mandatory safety measure in shopping centres, schools and other covered areas. In this research, we develop a hybrid Computer Vision and YOLOv4-based Deep Neural Network (DNN) model for automated people detection in the crowd in indoor and outdoor environments using common CCTV security cameras. The proposed DNN model in combination with an adapted inverse perspective mapping (IPM) technique and SORT tracking algorithm leads to a robust people detection and social distancing monitoring. The model has been trained against two most comprehensive datasets by the time of the research—the Microsoft Common Objects in Context (MS COCO) and Google Open Image datasets. The system has been evaluated against the Oxford Town Centre dataset (including 150,000 instances of people detection) with superior performance compared to three state-of-the-art methods. The evaluation has been conducted in challenging conditions, including occlusion, partial visibility, and under lighting variations with the mean average precision of 99.8% and the real-time speed of 24.1 fps. We also provide an online infection risk assessment scheme by statistical analysis of the spatio-temporal data from people's moving trajectories and the rate of social distancing violations. We identify high-risk zones with the highest possibility of virus spread and infection. This may help authorities to redesign the layout of a public place or to take precautionary actions to mitigate high-risk zones. The developed model is a generic and accurate people detection and tracking solution that can be applied in many other fields such as autonomous vehicles, human action recognition, anomaly detection, sports, crowd analysis, or any other research areas where thehuman detection is in the centre of attention.

Keywords: social distancing; COVID-19, human detection and tracking, distance estimation, deep convolutional neural networks, crowd monitoring, pedestrian detection, inverse perspective mapping

I. INTRODUCTION

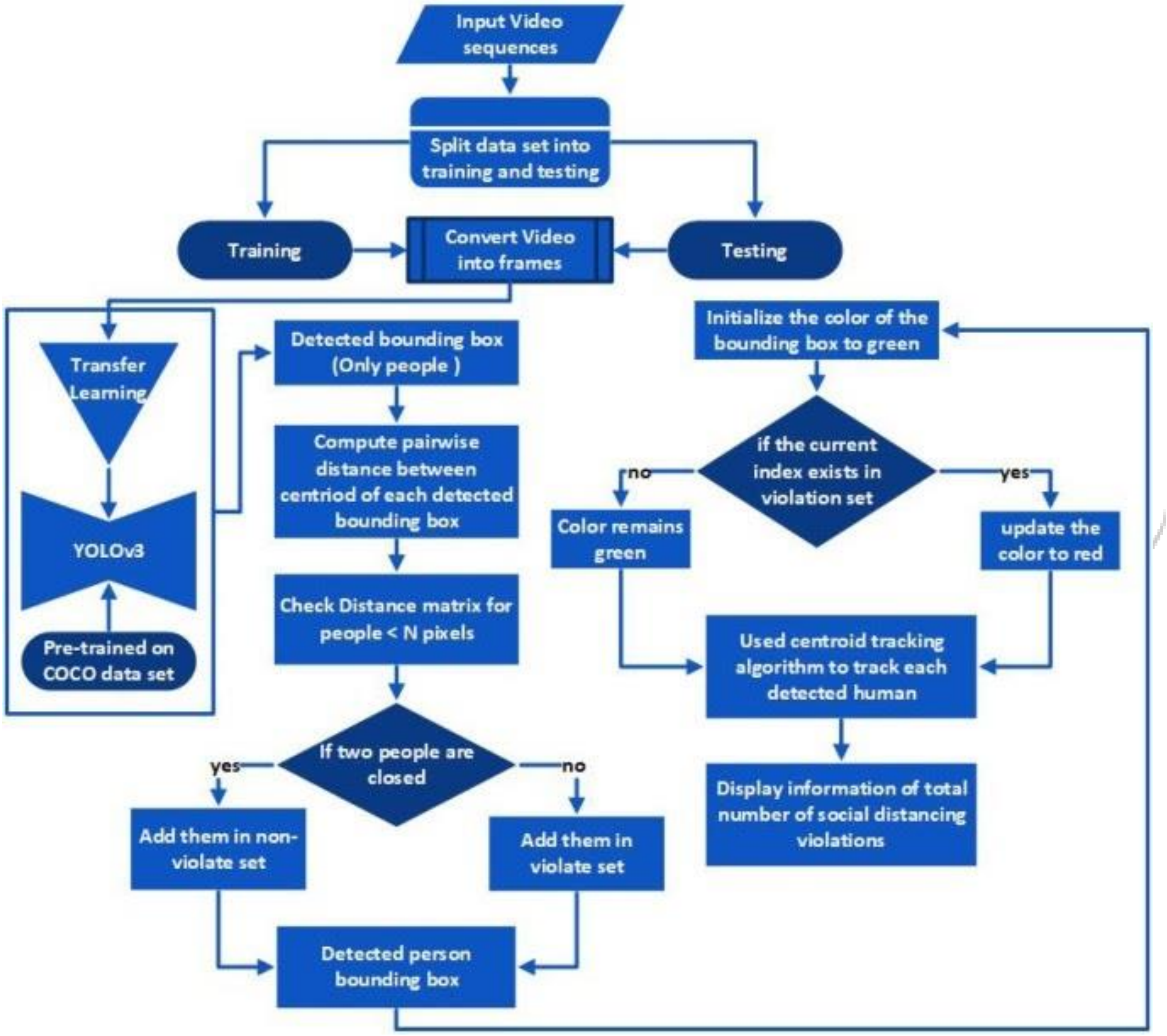
The novel generation of the coronavirus disease (COVID-19) was reported in late December 2019 in Wuhan, China. After only a few months, the virus became a global outbreak in 2020. In May 2020 The World Health Organisation (WHO) announced the situation as pandemic [1,2]. The statistics by WHO on 8th October 2020 confirm 36 million infected people and a scary number of 1,056,000 deaths in 200 countries. With the growing trend of patients, there is still no effective cure or available treatment for the virus. While scientists, healthcare organisations, and researchers are continuously working to produce appropriate medications or vaccines for the deadly virus, no definite success has been reported at the time of this research, and there is no certain treatment or recommendation to prevent or cure this new disease. Therefore, precautions are taken by the whole world to limit the spread of infection. These harsh conditions have forced the global communities to look for alternative ways to reduce the spread of the virus. *"There is emerging evidence that COVID-19 is an airborne disease that can be spread by tiny particles suspended in the air after people talk or breathe, especially in crowded, closed environments or poorly ventilated settings"* .The developed model can perform as a generic human detection and tracker system, not limited to social-distancing monitoring, and it can be applied for various real-world applications such as pedestrian detection in autonomous vehicles, human action recognition, anomaly detection, and security systems.

II. Review of Literature

Many researchers in the medical and pharmaceutical fields are aiming at treatment of COVID-19 infectious disease; however, no definite solution has yet been found. One the other hand, controlling the spread of the virus in public places is another issue, where the AI, computer vision, and technology can step-in to help.A variety of studies with different implementation strategies [5,6,20] have proven that controlling the prevalence is a contributing factor, and social distancing is an effective way to reduce the transmission and prevent the spread of the virus in society. Several researchers such as [20,21] use Susceptible, Infectious, or Recovered (SIR) model. SIR is an epidemiological modelling system to compute the theoretical number of people infected with a contagious disease in a given population, over time. One of the oldest yet common SIR models is Kermack and McKendrick models introduced in 1927 [22]. Eksin et al. [21], have recently introduced a modified model of SIR by including a social distancing parameter, which can be used to determine the number of infected and recovered individuals. Effectiveness of social distancing practices can be evaluated based on several standard approaches.

III. DESIGN

The architecture flowchart below describe the entire flow of system. Every user must need some input it may be in form of image or video or need camera in system which will help to capture live scenario. Input must contain atleast one human to detect and more than on human for accuracy of tracing



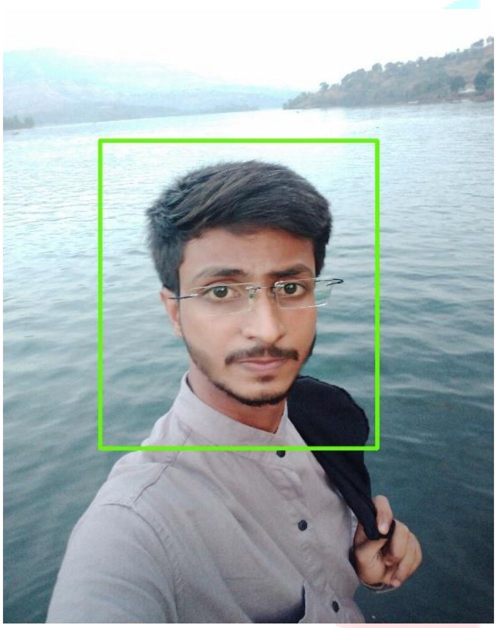
IV. IMPLEMENTATION

The utilisation of Artificial Intelligence, Computer Vision, and Machine Learning, can help to discover the correlation of high-level features. recent advances in Computer Vision, Deep Learning, and pattern recognition, as the sub-categories of the AI, enable the computers to understand and interpret the visual data from digital images or videos. It also allows computers to identify and classify different types of objects. Such capabilities can play an important role in empowering, encouraging, and performing social distancing surveillance and measurements as well. For example, Computer Vision could turn CCTV cameras in the current infrastructure capacity into “smart” cameras that not only monitor people but can also determine whether people follow the social distancing guidelines or not. Convolutional Neural Networks (CNNs) have played a very important role in feature extraction and complex object classification, including human detection. With the development of faster CPUs and extended memory capacities, CNNs allow the researchers to make accurate and fast detectors compared to conventional models.

Deep neural network (DNN) based detector, along with Deep sort algorithm as an object tracker for

people detection to
assess the distance violation index—the ratio of number of people who violated the social distancing measure to the total number of the assessed group. There are two types of model belongs to DNN are YOLO and RCNN , but we use mostly YOLO.
CNN is subset of DNN.
This is depend on mainly 3 steps
I] Object Detection
II]Object Tracing
III] Distance Calculation By mathematical implementation

I] Object Detection
YOLO ("You Only Look Once") is an effective real-time object recognition algorithm, first described in the seminal 2015 paper by Joseph Redmon. In this article we introduce the concept of object detection the YOLO algorithm itself, and one of the algorithm's open source implementation .
Image classification is one of the many exciting applications of convolutional neural networks. Aside from simple image classification, there are plenty of fascinating problems in computer vision, with object detection being one of the most interesting. It is commonly associated with self-driving cars where systems blend computer vision



ii]Object Tracking
Computers are getting better everyday at thinking, analyzing situations and making decisions like humans do. Understanding vision is an integral part of this progress in the area of machine intelligence. One of the things that has baffled scientists and engineers is how to get our algorithms to see things not pixel to pixel but capture the overarching patterns in a picture or a video. Object Detection and object tracking technology have come far in that regard and the boundaries are being challenged and pushed as we talk. While detecting objects in an image has been getting a lot of attention from the scientific community, a lesser known and yet an area with widespread applications is tracking objects in a video, something that requires us to merge our knowledge of Detecting Object in Static Image with analysing temporal information and using it to best predict trajectories. Think tracking sports events, catching burglars, automating speeding tickets or if your life is a little more miserable, alert yourself when your three year old kid runs out the door without assistance.
An object tracker on the other hand needs to track a particular object across the entire video. If the detector detects 3 cars in the frame, the object tracker has to identify the 3 separate detections and needs to track it across the subsequent frames (with the help of a unique ID).

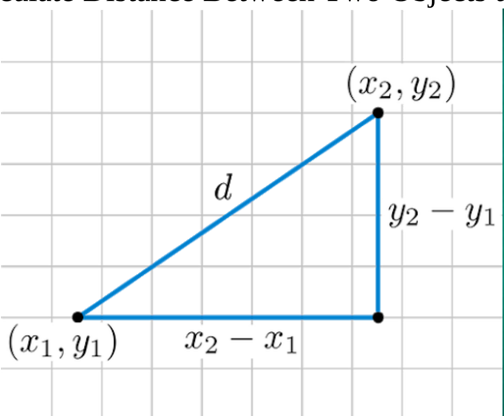
FRAME 1

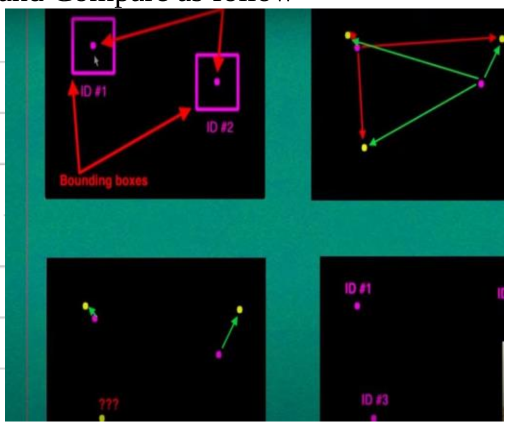
FRAME 2

iii] Distace Calculation

In this step obeject eill fixed in a rectangle. With help of height and bredth of rectangle we will calculate centroid of object. System will take centroid point of other objects and calculate distance between them with help of euclidiens distance formula.

calculate Distance Between Two Objects and Compare as follow





V. TESTING

The System is tested with various test cases as shown in table below. And purpose of Testing to make sure the System work excepted. We excepted following output should true before deploying system.

No.	Test Case	Expected Result	Actual Result	Test Passed
1	Taking Input in video format from given path	It should access video from given path	Access input from provided path	True
2	Reading Input	It should read video	Successfully read video	True
3	Access Camera	It should access camera of system	Camera Turned On successfully	True
4	Detect object	It should Detect human	Human detected Successfully	True
5	Trace Object	It should tack movement	Perfectly trace movement in given frame	True
6	Showing Non violated person	Non violated human should show in green rectangle	Green rectangle visible for non violation	True
7	Showing Violated person	Violated human should show in Red Rectangle	Red rectangle visible for violation	True
8	Total Count Of Violation	Show number of Distance Violation in given frame	Getting count of violation on screen	True

VI. CONCLUSION

The article proposes an efficient real-time deep learning based framework to automate the process of monitoring the social distancing via object detection and tracking approaches, where each individual is identified in the real-time with the help of bounding boxes. The generated bounding boxes aid in identifying the clusters or groups of people satisfying the closeness property computed with the help of pair wise vector approach. The number of violations are confirmed by computing the number of groups formed and violation index term computed as the ratio of the number of people to the number of groups. The extensive trials were conducted with popular state-of-the-art object detection models: Faster RCNN, SSD, and YOLO v3, where YOLO v3 illustrated the efficient performance with balanced FPS and MAP score. Since this approach is highly sensitive to the spatial location of the camera, the same approach can be fine tuned to better adjust with the corresponding field of view.

The emerging trends and the availability of intelligent technologies make us to develop new models that help to satisfy the needs of emerging world. So we have developed a novel social distancing detector which can possibly contribute to public healthcare. The model proposes an efficient real-time deep learning based framework to automate the process of monitoring the social distancing via object detection and tracking approaches, where each individual is identified in the real-time with the help of bounding boxes. Identifying the clusters or groups of people satisfying the closeness property computed with the help of Bird's eye view approach. The number of violations is confirmed by computing the number of groups formed and violation index term computed as the ratio of the number of people to the number of groups. The extensive trials were conducted with popular state-of-the-art object detection models Faster RCNN, SSD, and YOLO v3, since this approach is highly sensitive to the spatial location of the camera, the same approach can be fine tuned to better adjust with the corresponding field of view.

This system works very effectively and efficiently in identifying the social distancing between the people and generating the alert that can be handled and monitored.This solution can be used in places like temples, shopping complex, metro stations, airports, etc..

VII. ACKNOWLEDGMENT

We are gratefully to our college RIZVI COLLEGE OF ENGINEERING for guiding us and supporting at project and we are thankfull helping us at all stages during our work for gathering information regarding the project. I am profoundly grateful to Prof. SHAIKH MOHD. ASHFAQUE for his expert guidance and continuous encouragement throughout to see that this project rights its target.

VIII. REFRENCES

1]P. Dollar, V. Rabaud, G. Cottrell, and S. Belongie, "Behavior recognition ´ via sparse spatio-temporal features," in 2005 IEEE International Workshop on Visual Surveillance and Performance Evaluation of Tracking and Surveillance. IEEE, 2005, pp. 65–72.

2]M. Piccardi,"Background subtraction techniques: a review," in 2004 IEEE International Conference on Systems, Man and Cybernetics (IEEE Cat. No. 04CH37583), vol. 4. IEEE, 2004, pp. 3099–3104.

3]Y. Xu, J. Dong, B. Zhang, and D. Xu, "Background modeling methods in video analysis: A review and comparative evaluation," CAAI Transactions on Intelligence Technology, vol. 1, no. 1, pp. 43–60, 2016.

4]Pias, "Object detection and distance measurement," https://github.com/ paul-pias/Object-Detectionand-Distance-Measurement, 2020.

5]"Social Distance Detection", International Journal of Emerging Technologies and Innovative Research (www.jetir.org), ISSN:2349-5162, Vol.8, Issue 1, page no.21-46.

AUTHORS

1. Shaikh Ajmal
2. Sapkal Anil
3. Rathod Chaitanya
4. Shaikh Mohd Ashfaque