Paper On Social Distancing Detection System

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Abstract WHO recommends social distancing as a preventive measure to minimize the spread of COVID-19 and other infectious diseases. All government and healthcare authorities recommend 2 meters as the optimal distance to practice social distancing in crowded areas like schools, markets, etc. The Project uses a Deep-Learning Based Neural Network model on common CCTV footage to automatically detect people, track them and estimate interpeople distances. We use YOLO object detection framework to accurately track people, even in situations of occlusion, partial visibility and variations in lighting. The output can be used to enforce social distancing in crowded public places to prevent the spread of infectious diseases and can have further applications like identifying areas to prioritize disinfecting and cleaning. Keywords- YOLO V3, OpenCV, WHO, & Social Distancing

I. Introduction

Social distancing refers to a precautionary action to prevent spread of infectious diseases, by minimizing the distance of people physical interactions in dense public places like schools, bus stations, etc. to reduce infection risk. Artificial Intelligence (AI)has a major role in monitoring social distancing. • Computer vision has become more important with various application like video surveillance, self-driving cars and more. It has been used in solving various health related problems which helps us to extract complicated features from the data.

As per WHO requirements, "the minimum distance between people must be at least 6 feet in order to effectively maintain social distancing". This study helps in reducing the spread of the coronavirus by providing an automated solution for monitoring and detecting social distancing violations among people using "Convolutional neural network (CNN) which is a neural network that has multiple convolutional layers which are used mainly for segmentation, image processing, classification".

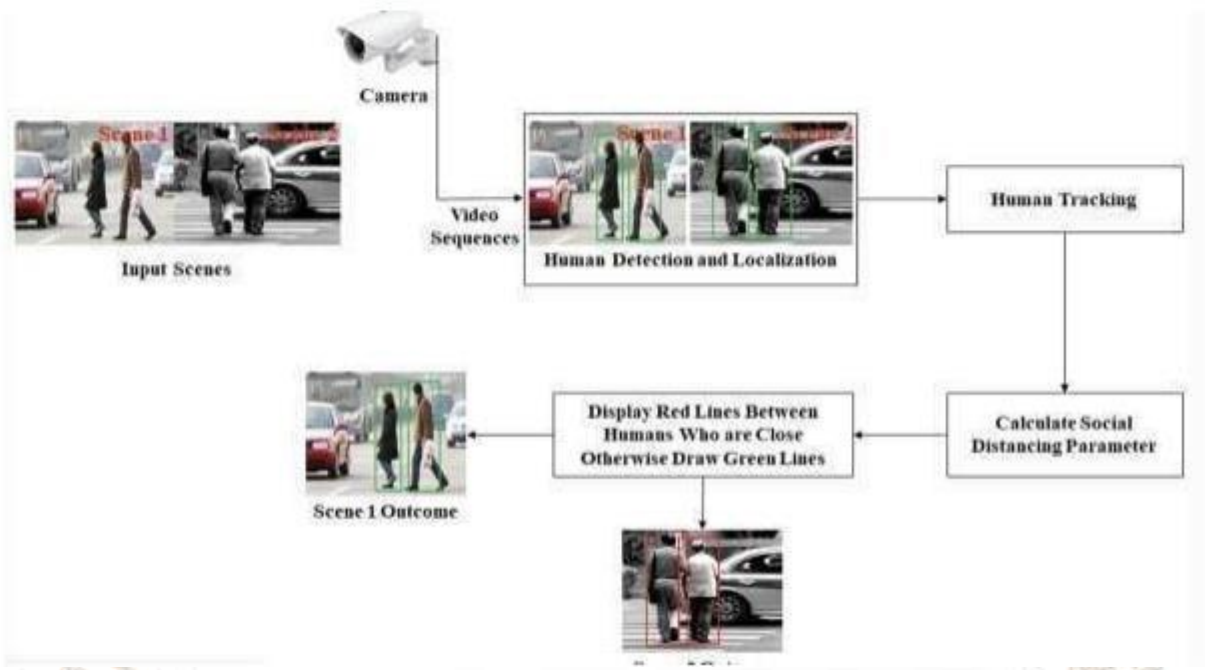
II. Literature Survey

EXISTING SYSTEM

Since the COVID-19 pandemic began, many countries are seeking for technology- oriented solutions. Asian countries have used a range of technologies to fight against COVID-19. The most used technology is tracking location by phones where the data of COVID- 19 positive people are saved, based on this data their near about healthy peopleare monitored. Germany and Italy are using anonymized location data to monitor lockdown. UK has launched an application (app) named C9 corona symptom tracker that helps people to report their symptoms. Similarly, South Korea launched an app named Corona 100m that has stored the location of infected people and generate alert to healthy people when they came near to corona patients at a distance of100m. India has developed an app that helps people to maintain a specific distance from a person who has tested corona positive. Besides this, India, South Korea, and Singapore are taking benefit from CCTV footage to monitor the recently visited places of COVID-19 patients to track down the infected people. China is utilizing AI- powered thermal cameras to identify those people in the crowd having the temperature. Such inventions in this drastic situation might help to flatten the curve but at the same time, it results in a threat to the personal information.

PROPOSED SYSTEM

Our proposed system uses single stage object detector (YOLO stands for You Only Look Once) which is often considered a competitor of other existing models. It can detect object fastest rate, and can run at more than 170 FPS on a modern GPU.YOLO struggles with smaller objects. But the architecture is constantly evolving from its earlier variants (YOLO v2) while training represents the process of learning the weights of the model from the training dataset. Due to its simpler architecture, YOLO runs a lot faster than faster R-CNN..



The proposed system, social distancing analyzer tool was developed using computer vision, deep learning, and python to detect the interval between people to maintain safety for detection of the people in the image or frame YOLOv3 is used in object detection network.

Figure 3 – Detecting People in the frame and calculating inter-people distance

III METHODOLOGY DETECT PEDESTRIANS:

The first step is to detect pedestrians from the real time video stream and draw bounding boxes around each pedestrian detected in the footage. YOLO draws bounding boxes around each person based on the predictions made by the trained model.

Input Module:

In our project, we use numpy, argparse, openCV libraries to work on the videos. The argparse module makes it easy to write user-friendly command-line interfaces. The program defines what arguments it requires, using which we can give source and destination paths for input and output videos.

We import video using openCV‟svideoCapture() method which takes video path as an input. We calculate the height, width and framerate of the current video and then we use the object to iterate over the object to get each frame.

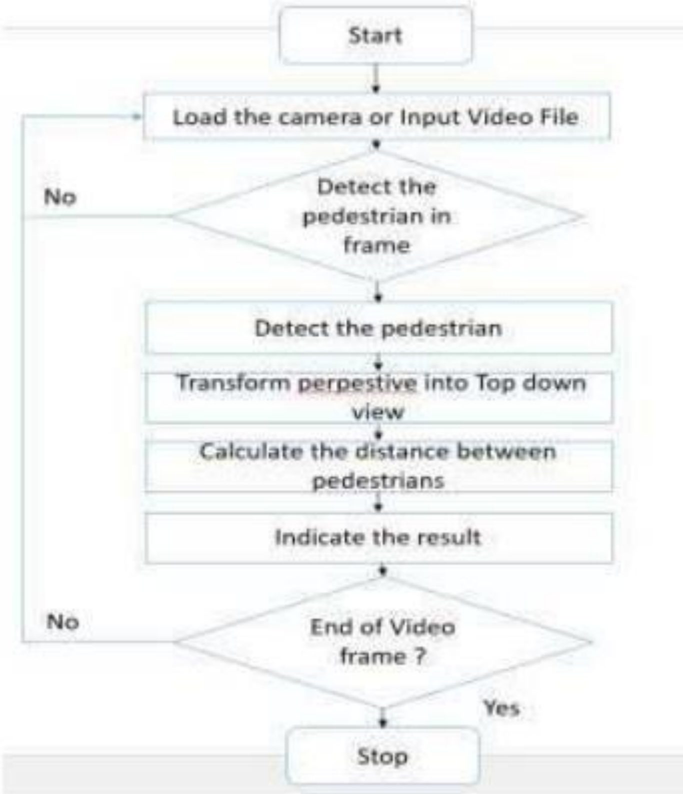
The individual frames are processed for bird‟s eye view transformation and people detection.

Birds Eye View Transformation Module: Get Region of Interest from first frame. First the user has to select 4 points in the frame representing the region of interest. This is done using OpenCV‟s mouse event listener setMouseCallBack(). Similarly, we take 3 more points to mark 6 feet distance horizontally and vertically. Get Bird's eye view of ROI using getPerspectiveTransform().

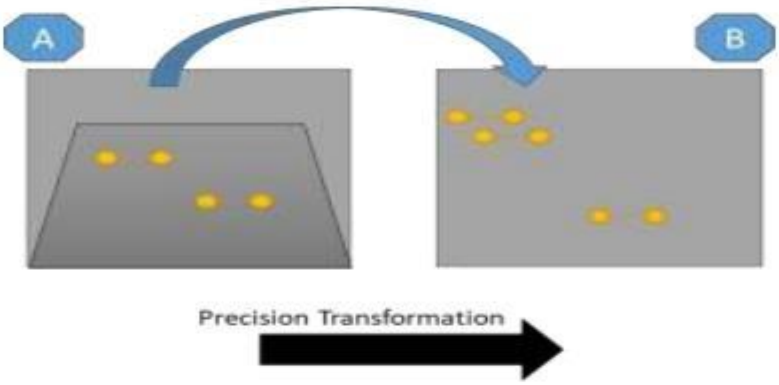
Calculate horizontal and vertical unit length from points marked in first frame.

People Detection Module: Configure the network from the yolo model weights and configuration. Take each frame and preprocess it to feed it into the network. Feed the preprocessed frame as input to the deep neural network and the output. Compare the confidence scores against threshold to detect people in frame and get center point of each people‟s bounding box. Project detected points to Bird's eye view.

Classification and Output Module: Find distance between points using horizontal and vertical unit length. Classify the risk based on distance.



BIRD EYE VIEW TRANSFORMATION:
The second transformation method involves selecting seven points. First four define ROI where we want to monitor social distancing and mapping them to the corners of a rectangle in the bird's-eye view. This assumes that each person is standing on an equivalent flat ground plane.
The birds-eye view transformation would involve installing overhead cameras at strategic locations within the monitored area. These cameras would capture the scene from a top-down perspective, allowing for a wider field of view and a more holistic understanding of the environment. Additionally, advanced image processing algorithms would be applied to the captured footage to correct for perspective distortions and provide a more accurate representation of the scene.



DISTANCE CALCULATION:
To estimate the person's location in frame, we can take the bottom center point of the bounding box as a person's location in frame. Then we estimate (x,y) location within the bird eye view (perspective view) by applying transformation to rock bottom center point of every person's bounding box, leading to their position within the bird's eye view. Last step is to compute the bird's eye view distance between every pair of people and scale the distances by the scaling in horizontal and vertical direction estimated from calibration This distance calculation is done by using centroid tracking algorithm. CompCuting the Euclidean distance between the centroids of the input bounding boxes and the centroids of existing objects that already have calculated.
$F = (P \times D)/W$ $D' = (W \times F)/P$

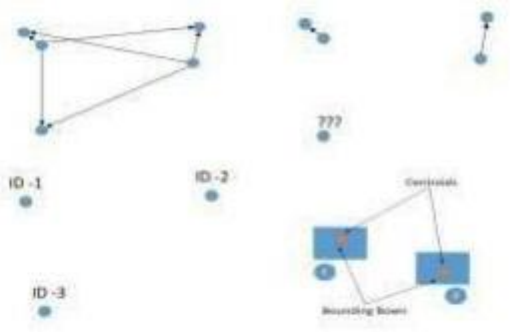


Fig 5: Distance Calculation

IV. CONCLUSION AND FUTURE WORK

In this project, a social distance monitoring system which uses deep learning technique such as deep learning is presented. This work is the first attempt that makes use of transfer learning for a deep learning-based detection paradigm, used for overhead perspective social distance monitoring. Using the Euclidean distance, the centroid distances between two bounding boxes is measured. Based on the distance between the centroids, the system determines whether the social distance is being violated or Furthermore, this tracking algorithm is used for tracking humans in the video. These results indicated that the framework continuously identifies people walking too close and violates social distancing. The Deep learning methodology increases the detection model's overall efficiency and accuracy. For a pre-trained model without transfer learning, the model achieves detection accuracy of 92% and 95% with transfer learning. Different detection and tracking algorithms might be used to help track the person or people who are violating or breaches the social distancing. Privacy-Preserving Solutions: Developing privacy-preserving techniques, such as anonymization or data encryption, to address privacy concerns while still maintaining the effectiveness of the system. This can help build trust and encourage broader adoption. Integration with Contact Tracing: Integrating social distancing detection systems with contact tracing technologies can provide a holistic approach to public health management. It can help identify potential exposure risks and support targeted interventions in case of outbreaks or contact tracing needs

V.REFERENCES

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