Social Distancing Detection, Monitoring and Management Using OpenCV

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Abstract - *The COVID-19 pandemic has unmistakably brought the planet to an end. The world we lived in only a few months ago is nothing like the world we live in now. The illness is rapidly spreading and poses a threat to humanity. Seeing the seriousness of the requirement, one should continually avoid the risk of being socially removed. Maintaining friendly removal during COVID-19 is an obvious prerequisite to ensure a halt in the rate of new case development. Our original draught focuses on determining whether or not the people in the area are interested in friendly removal. They are classified as protected or dangerous using our own self-developed model, SocialdistancingNet-19, for recognizing an individual's casing and displaying names. If the distance does not have a precise value This framework can be used to observe people using video surveillance in a CCTV system. Our model achieved a precision of 92.8 percent.*

Key Words*: *Social Distance Detector, OpenCV, tracking, monitoring, verification.

1. INTRODUCTION

Covid is an infectious disease caused by a crown infection that causes a severe respiratory illness. The infection was first discovered in Wuhan, China, in December, and has since spread around the globe. During people are in close proximity, the illness is conveyed mostly between them, especially through little beads shaped when sniffling or hacking. Beads that fall to the ground will travel through the air and into a human's body. The length of recovery for persons with severe side effects is determined by the severity as well as the person's resistance capabilities. The major demonstration technology is a constant switch record polymerase chain reaction from an anasopharyngeal swab (RRTPCR). In view of the increased chance of contamination, chest CT imaging is also useful for the evaluation of persons with a higher risk of contamination, Numerous warning indicators and risk factors Because of the disease's rapid spread, the World Health Organization (WHO) suggested that the term "social separating" be used instead. It is critical to maintain actual distance in order to slow the spread of the disease. Maintaining a two-meter barrier between two persons is essential for staying safe and returning to the world we left behind a few months ago. Following the COVID-19 pandemic, the CDC redefined social separation as staying out of gather settings, avoiding public gatherings, and protecting, when possible, a six-foot or two-meter hole from everyone. Beads from a wheeze or a full breath can travel more than six metres during exercise, according to later research. Furthermore, maintaining a high quality of social separation is both necessary and advantageous in order to live a more secure and better existence. Our project aims to determine whether or not a person adheres to the social separation

The findings are examined using both a live transfer and a video stream. We can determine whether an individual is looking after friendly separating by estimating the hole of two casings of individuals from the centroids. They're also labelled as protected and dangerous.

2. RELATED WORK

With the belief that social distance is the most reliable approach for preventing the spread of infectious disease, it was chosen as an unprecedented measure on January 23, 2020, against the backdrop of December 2019, when COVID-19 arose in Wuhan, China. The outbreak in China reached a climax in the first week of February, with 2,000 to 4,000 new confirmed cases each day, in less than a month. For the first time since the outbreak began, there was a sign of relief when no new confirmed cases were reported for five days in a row, from March 23 to March 23, 2020. This is seen in the use of social distancing tactics in China, which were eventually applied globally to regulate COVID-19.

Prem and colleagues researched how social distancing strategies affected the spread of the COVID-19 outbreak. Using susceptible-exposed-infected-removed (SEIR) models, the authors employed synthetic location-specific contact patterns to mimic the outbreak's continuous trajectory. It was also indicated that lifting social distancing too quickly could lead to an earlier secondary high, which could be levelled by gradually relaxing the interventions. As we all know, social separation is an important but financially costly measure to flatten the infection curve. Adolph et al. drew attention to the issue in the United States of America, where policy could not be adopted at an early stage due to a lack of consensus among policymakers, resulting in ongoing public health consequences.

Despite the fact that social distance has a negative influence on economic productivity, many academics are working hard to compensate for the loss. In light of this, Kylie et al. investigated the relationship between the degree of social separation and the region's economic level. According to the study, moderate amounts of activity could be tolerated while preventing a catastrophic outbreak. Since the breakout of the new corona virus, numerous countries have relied on technology-based solutions in various capacities to contain the outbreak. Many developed countries, such as India and South Korea, use GPS to follow the movements of suspected or sick people in order to monitor any risk of infection among healthy people. In India, the government uses the Arogya Setu App, which was created with the help of artificial intelligence.Using GPS and Bluetooth, we were able to detect COVID-19 patients in the neighbourhood. It also aids others in maintaining a safe distance from the infected individual. Some law enforcement agencies, on the other hand, have been employing drones and other surveillance cameras to identify large crowds and taking regulatory action to disperse them. Such physical intervention in these key moments may help to flatten the curve, but it also poses a unique set of risks to the public and is difficult for the workforce to implement.

Object identification algorithms based on deep models have made amazing development in computer vision in recent years, and they are potentially more capable than shallow models in tackling complicated problems. Person detection deep models emphasise feature learning, contextual information learning, and occlusion handling. Object detection models based on deep learning can now be separated into two groups:two-stage detectors such as R-CNN[9], Fast R-CNN and Faster R-CNN and their variants.

- One-stage detectors such as YOLO and SSD. In two-stage detectors detection is performed in stages, in the first stage, computed proposals and classified in the second stage into object categories.
- However, some methods, such as YOLO, SSD Multibox, consider detection as a regression issue and look at the image once for detection.

Item detection systems may be trained to recognize any object, although they are most commonly used for facial recognition since they are more accurate and faster. Supervised learning is exemplified by the Viola and Jones procedure. Another widely used facial detection technology that Zhu provided is a neural network-based detector. It's only effective on the front, upright face. A Multiview Face Detector with Surf Capabilities was proposed by Li et al. as another model for facial detection. On the GTX470, Oro et al. suggested a face detection approach based on a haar-like characteristic that enhanced the speed by 2.5 times. They did, however, just employ CUDA, a GPU programming tool for NVIDIA GPUs. In comparison to OpenCL, which is employed in a variety of applications. It is unable to tackle the imbalanced workload issue encountered during the implementation of the viola-jones face identification algorithm in GPUs due to computed components. Glass et al. (2006) discussed the importance of social differentiation and how, without the use of vaccinations or antiviral medications, the danger of pandemic spread can be slowly reduced by successfully maintaining social isolation. In order to demonstrate a drop in the growth rate, the authors conducted an extensive investigation in both rural and urban regions. Z., Luo investigates how people with full-face or partial occlusion might be identified.

This method divides people into two groups: those who have their hands over their faces and those who have their faces obstructed by items. This method is unsuitable for our case, which necessitates detecting faces with their lips hidden behind masks such as scarves, mufflers, handkerchiefs, and so on.

3. ANALYSIS / INTERPRETATION:

Machine Learning Algorithms:

Machine learning has become much more common in recent years as a result of increased demand and technological breakthroughs. Machine learning's ability to extract value from data has made it appealing to companies across a wide range of industries. The majority of machine learning solutions are created and implemented using off-the-shelf machine learning algorithms with small tweaks. There are three major categories of machine learning algorithms:

Given a series of observations, supervised learning algorithms simulate the relationship between features (independent variables) and a label (target). Using the features, the model is then used to predict the label of additional observations. It might be a classification (discrete target variable) or a regression (continuous target variable) task, depending on the features of the target variable.

•Unsupervised learning algorithms try to find the structure in unlabeled data.

•Reinforcement learning works based on an action-reward principle. An agent learns to reach a goal by iteratively calculating the reward of its actions.

4. PROBLEM STATEMENT:

With the assistance of computer vision and deep learning algorithms, this model focuses on identifying the person on an image/video stream and determining if social distance is maintained or not utilizing the OpenCV, Tensor flow library.

4.1 Approach:

1. Detect humans in the frame with yolov3.
2. Calculates the distance between every human who is detected in the frame.
3. Shows how many people are at High, Low and Not at risk.

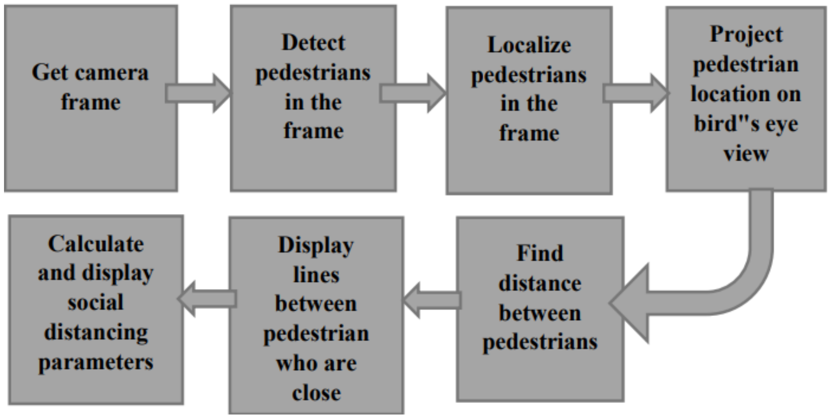


Fig-1: Working Process

5. PROPOSED SOLUTION:

With the help of computer vision and deep learning algorithms and the OpenCV, Tensor flow library, the suggested system focuses on identifying the person on an image/video stream and determining if social distance is maintained or not. Method 1: Use yolov3 to detect humans in the frame. 2. Calculates the distance between every people in the picture that has been detected. 3. Indicates the number of people who are at high, low, or no risk.

Because the input video might be shot from any perspective, the first step is to transform the perspective of view to a bird's-eye (top-down) view. The simplest transformation approach entails selecting four points in the perspective view that define ROI where we want to monitor social distancing and mapping the corners of a rectangle in the bird's-eye view because the input frames are monocular (collected from a single camera).

In the real world, these points should create parallel lines when viewed from above (bird's eye view). This presupposes that everyone is standing on the same level ground. The points are scattered uniformly horizontally and vertically in this top view or bird's eye view (scale for horizontal and vertical direction will be different). We may extract a transformation that can be applied to the full perspective image from this mapping.

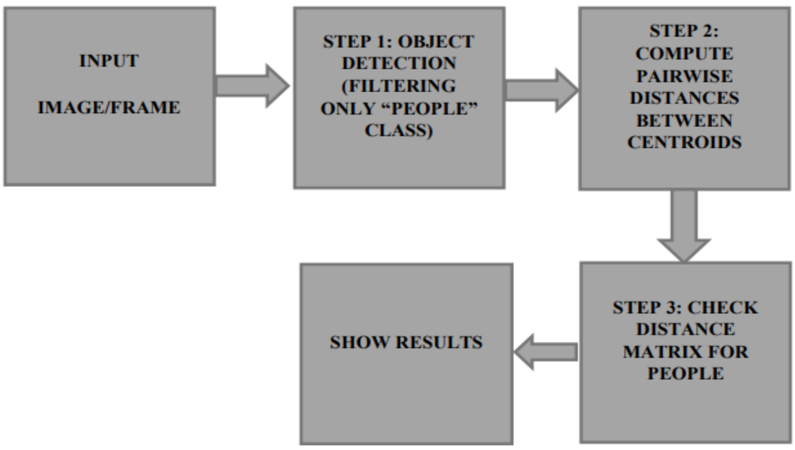


Fig-2: Working of app

5.1 Detection

The next stage is to identify pedestrians and draw a bounding box around each one. To reduce the risk of overfitting, we use minimum post-processing techniques including non-max suppression (NMS) and several rule-based heuristics to clean up the output bounding boxes.

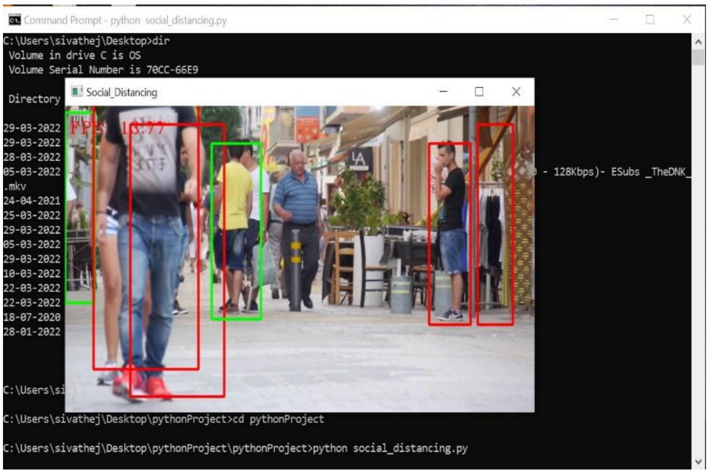
5.2 Calculation of Distance

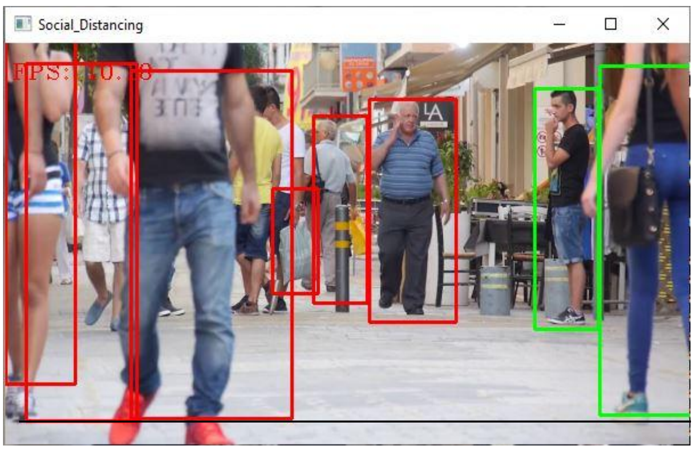
Each individual in the frame now has a bounding box. We need to figure out where people are in the frame. i.e., we can use the bottom center point of the bounding box as the location of the person in the frame. Then, by applying transformation to the bottom center point of each person's bounding box, we estimate (x,y) location in bird's eye view, resulting in their position in the bird's eye view. The final step is to calculate the bird's eye view distance between each pair of persons and scale the distances in both horizontal and vertical directions using the scaling factor calculated via calibration.

5.3 Working

When you run the application, you will be given a frame (the first frame) where you must draw the ROI and distance scale. From the first frame, obtain the ROI and distance scale points. In Bird's eye view ROI and Scale points selection for first frame, code to convert perspective to Bird's eye view (Top view) and compute horizontal and vertical 180 cm distance in Bird's eye view ROI. The next stage is to identify pedestrians and draw a bounding box around each one. In order to detect humans in video and obtain bounding-boxing-formation.

Each individual in the frame now has a bounding box. We need to figure out where people are in the frame. i.e., we can use the bottom center point of the bounding box as the location of the person in the frame. Then, by applying transformation to the bottom center point of each person's bounding box, we estimate (x,y) location in bird's eye view, resulting in their position in the bird's eye view. To determine the lowest center point for all bounding boxes and project those points in a bird's eye view. The next step is to calculate the bird's eye view distance between each pair of persons (Point) and scale the distances in both horizontal and vertical directions using the scaling factor calculated via calibration.





6. CONCLUSION:

We are only attempting to assist society in combating COVID-19 in our study. In the absence of a COVID-19 vaccination, social distance is the only option available to humans. When we consider the world after the COVID-19 epidemic, the need for self-responsibility becomes undeniable. The scenario would primarily focus on embracing and following the safeguards and rules that the WHO has enforced, with the individual taking full responsibility for himself rather than the government. Because COVID 19 spreads by close contact with infected people, social distancing would surely be the most significant aspect. An effective method for supervising huge crowds is critical, and this survey study focuses on that. Authorities can keep check of things using mounted CCTV and drones. Human activities and crowd control to bring people together and avoid breaking the law. As long when individuals keep a safe distance, they will be indicated with a green light; but, as the CCTV captures more and more crowd gatherings, a red light will appear, alerting the local police and allowing the situation to be brought under control quickly. Because controlling a large mob is difficult, this poll can help manage the problem before it spirals out of control. As a result of applying this proposal, the police's on-the-ground efforts will be reduced, and they will be able to focus solely on supervising conditions in places where conditions are bad, allowing them to spend their time wisely and save energy for equal outcomes.

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