Project Report : COVID Protocol violations detection

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1. Abstract

The past 2.5 years have changed the world in a way that no one has ever seen before. We've learnt that the virus is spreading at a rapid pace and monitoring physical human interaction is of paramount importance and the need of the hour. Maintaining social distancing during COVID-19 is a must to ensure a slowdown in the growth rate of new cases. Physical monitoring of social distancing on a large scale would require a huge number of manforce and actively engaged personnels which would be both unnecessary and unfeasible. We propose a system to automate the process and monitor social distancing at a public space remotely. This system can be used for monitoring people via video surveillance in CCTV.

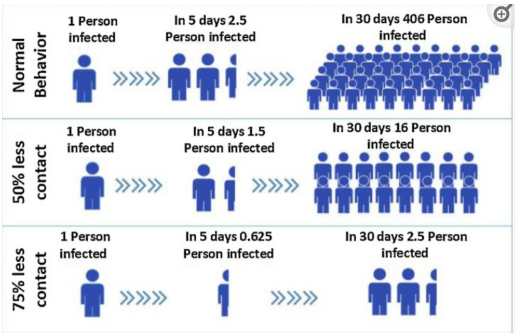


Figure 1. importance of social distancing.

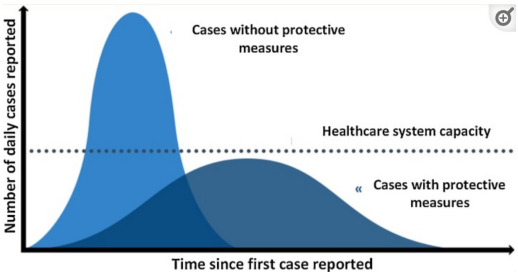


Figure 2. the effects of social distancing.

2. Introduction

The corona virus-2 causes extreme acute respiratory syndrome, which is an infectious disease. The disease was first discovered in Wuhan, China, in December, and has since spread throughout the world. When two people are in close proximity, the virus spreads primarily between them, including through tiny droplets produced by sneezing or coughing. Droplets falling to the ground will travel through the air and through a human's body. The infection is most infectious during the first three days. Nausea, a dry cough, and fatigue are all common symptoms. Human consequences have been severe and harmful, resulting in a worldwide halt. Sore throat and headache are two examples of such symptoms. A person with mild symptoms takes a fortnight to recover. The length of recovery for people with severe symptoms is determined by the severity of their symptoms as well as their immune system's ability. The most common method of diagnosis is a real-time reverse transcription-polymerase chain reaction on a nasopharyngeal swab (RT-PCR). Chest CT imaging can also be used to diagnose people who have a high risk of infection based on symptoms and risk factors. The World Health Organization (WHO) suggested using the term "social distancing" to describe the disease's devastating spread. It is necessary to keep a physical distance from the disease to slow its spread. To stay safe and return to the world we left behind a few months ago, keep a distance of two meters between two people. Following the COVID-19 pandemic, the CDC redefined social distancing as staying out of congested areas, avoiding public gatherings, and maintaining, when possible, a six-foot or two-meter gap between everyone. Droplets from a sneeze or a deep breath can fly more than six meters during exercise, according to new research. As a result, maintaining the social distancing norm is both necessary and beneficial to living a safer and healthier life. Our research aims to determine whether or not a person follows the social distancing rule. Our focus is mainly to implement a model that is faster than others, which uses basic tools and requires less hardwares. We aim to introduce more advanced technologies in the system. Both a live stream and a video feed are used to verify the findings. We can deter-

mine whether or not a person maintains social distance by measuring the distance between two frames of people from the centroids. This way we can try to make an effort to control the global outbreak of Covid. They're also labeled as safe and unsafe. Our main idea towards this approach is to increase efficiency; police men/ security men can be wisely deployed in areas where their need is more.

3. Related Works

Existing solutions bifurcate between 2 different covid protocol violations, namely social distancing and covering of face using a mask. That is, they require two different sets of inputs. And generate two different outputs. We propose an integrated system which would show us both the verdicts, that is, if social distancing, as well as violation of not wearing a face mask, has been followed or not. There is another issue of high latency in the processing of real time streams or even pre recorded videos, that is, there is a significant amount of lag between the input received and the output generated.

4. Methodology

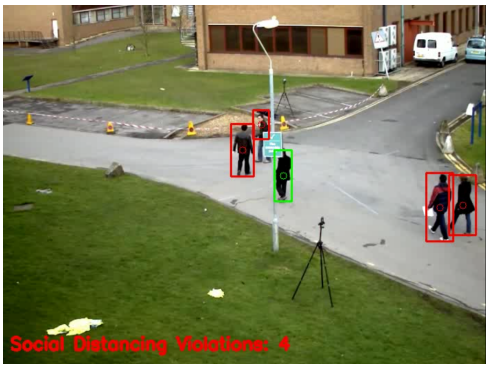
Computer vision is a method for understanding how images and videos are stored, as well as manipulating and retrieving data from them. We are using YOLO library for object detection in our case the object being the different people in the video stream. Object detection is faster than other methods by miles as this applies a single neural network to the full image.This network divides the image into regions and predicts bounding boxes and probabilities for each region. These bounding boxes are weighted by the predicted probabilities also known as probability weights. The output is in a video format with bounding boxes around each of the detected persons. In addition to that the boxes/people which are within a threshold distance decided are coloured red and the ones which are safe distance apart appear to be in green. We also worked to detect the mask on a person's face. But this was majorly only effective when a person was at a distance from where his/her face could be detected as the mask detection works with good accuracy as a modification to the face detection using opencv.We expect video input from a higher angle so as to overcome the problem of 3D-distance. But choosing a camera angle too high will get us problems in detecting the person using the YOLO library.

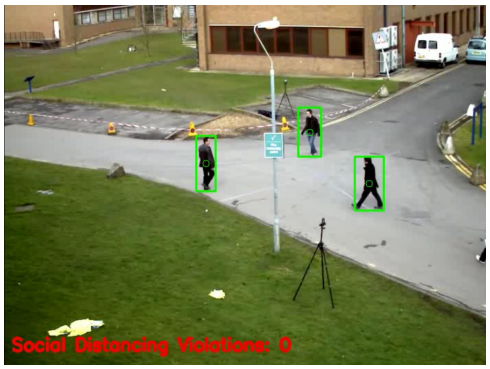
5. Experiments

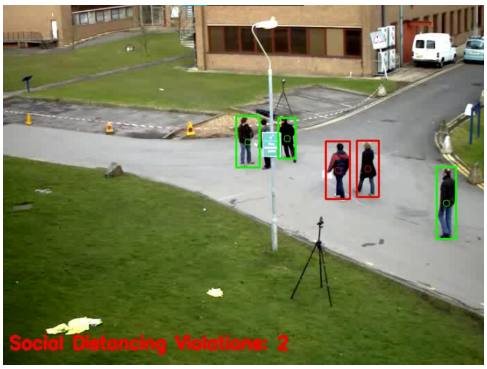
The detailed description of various experiments carried out in this work are presented in this section. To monitor social distancing the following videos were used:

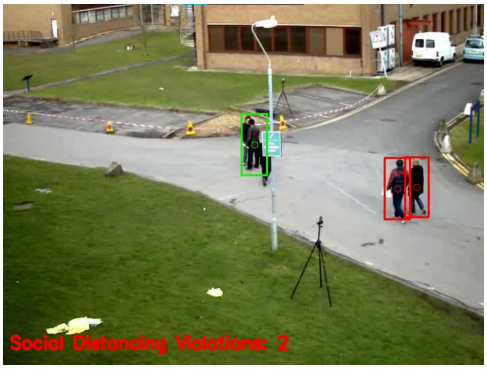
https://vimeo.com/530909999?embedded=true&source=vimeo_logo&owner=136871050

To monitor the social distancing a range of videos have been used the links for the same can be found above. The videos are so chosen that the camera was positioned at an overhead height high enough to overcome the issue of 3D distances and low enough so that YOLO library is able to detect the person. There is no restriction on the movement of the people through out the video. There visual appearance might be affected by the radial distance and camera position varying in different video inputs. For the implementation opencv as well as the YOLO library was used.As the model only considers the human class the pre-trained model can only detect an object that looks like a human. The pre-trained model delivers near perfect results and detects various sized persons bounding boxes as shown with red and green rectangles. People closer to each others than the set threshold have been shown bounded with red rectangles while those at a safer distance (greater than the set threshold) are shown bounded by a green rectangle.as shown in the sample frames people with various characteristics are effectively identified and the social distance between them is computed and processed.if people are too close to each other the model effectively detects the breach of social distancing between them and appropriately marks the bounding boxes as red or green rectangles.









6. Conclusion

This system, as a whole, takes inputs from public spaces (like videos); on processing the input, the generated output serves the purpose of detecting covid protocol violators, that is, people not maintaining social distancing or not wearing face masks. This integrated system is cheaper as everything's computerized. The output video highlights people using red (for people who violate covid protocols) and green (for people who are at safe distance from others) rectangular boxes. There can be few challenges in this system. Sometimes, input from the camera from public spaces does not capture the best view (people overlap in the video). This could create problems in detecting social distances. But switching to the concept of 3D distances can help in this case. Cameras should be positioned in such a way that it doesn't fully capture the top view or the side view. Both of them should have a balance.

7. References

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