

Monitoring Social Distancing for Covid-19 Using OpenCV and Deep Learning

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Abstract - Recently, the outbreak of Coronavirus Disease (COVID-19) has spread rapidly across the world and thus social distancing has become one of mandatory preventive measures to avoid physical contact. This survey paper emphasizes on a surveillance method which uses Open-CV, Computer vision and Deep learning to keep a track on the pedestrians and avoid overcrowding. The implementation can be done using closed circuit television (CCTV) and Drones where the camera will detect the crowd with the help of object detection and compute the distance between them. The Euclidean distance between two people will be calculated in pixels and is compared with given standard distance and if it is observed to be less than the standard distance the local authorities or local police authorities will be notified.

Key Words: COVID-19, OpenCV, Social distancing, Deep learning, Computer vision, CCTV, Drones.

MOTIVATION: As the pandemic situation has taken over the world, social distancing is one of the major precautions which needs to be taken. As people come together in crowds, they are more likely to come into close contact with someone that has COVID-19 and hence World Health Organization has proposed a strict law for maintaining physical distance of 1 meter (3 feet) in every pair. Thus, to keep a track of the social distancing among the public this idea of social distancing detector emerged.

1. INTRODUCTION

The pandemic situation has taken over the world and has made the conditions worst, as of now there is no vaccination developed for the contagious disease and hence social distancing has emerged as one of the best methods to prevent the spread of COVID-19. As the name suggests, social distancing implies that people should physically distance themselves from one another. The cases have been escalating at a very fast rate all over the world and thus social distancing is important.

To monitor social distancing at public places, this survey paper provides a pinpointing solution. In this pandemic period using CCTV and drones we can keep a track on human

activities at public places and henceforth we can compute and summarize distances between people and monitor the social distancing violations across the city. This proposed survey will also there and then restrict people from coming together and prevent social gatherings. People who gather in massive amounts at religious places can make conditions worse. Recently all countries in the world were and mostly are in the lockdown period and this has imposed the citizens to be at home but as time passes people will tend to visit more and more public places, religious places and tourist destinations, so in those circumstances this system of monitoring social distancing will be beneficial all around the world.

With the help of computer vision and deep learning and the installed CCTV we can keep a track on humans and compute the distance between them in pixels by using computer distance algorithms and set the standard maintained distance to be followed and get an overview of people violating the law and concerned authorities can take the actions accordingly [6].

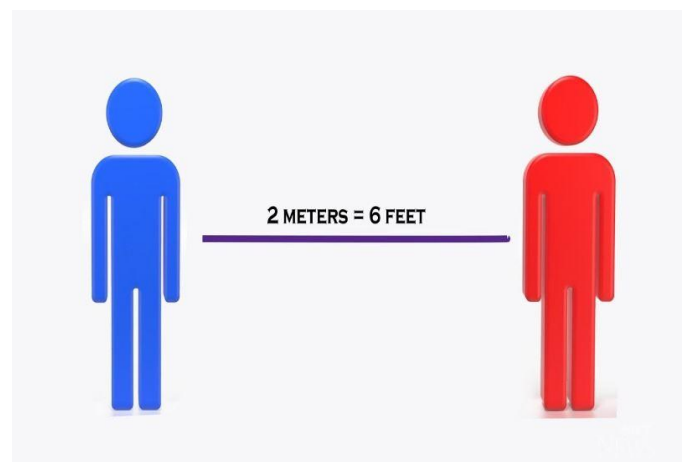


Figure 1

2. LITERATURE SURVEY

In 2017, Dr. S Syed Ameer Abbas and his co-authors proposed a system for human tracking and crowd

management using raspberry pi and Open-CV. A cascade classifier was trained for head detection from the scene is trained using Haar features through OpenCV. The whole concept of their idea was to record the crowded scene using a camera and Raspberry pi3 that has a quad core ARMv8 central processing unit which processes the video frame by frame. The head count is measured and the crowd is managed by comparing the value with the threshold and if it surpasses the threshold the prevention can be done accordingly [4].

In 2018, Joel Joseph Joy and his co-authors proposed a system of traffic density identification which was based on image processing. The queue length and the traffic densities were recorded from the images taken from the camera. The video input was taken and fuzzy logic was applied to handle the concept of partial truth. The outcome of partial truth concept could range anywhere between completely true and completely false [2].

In 2020, Adrian Rosebrock published an article on social distancing detector which is based on OpenCV, Computer Vision and Deep Learning concept. The article throws a light on social distancing during the pandemic period and it focuses on social distance monitoring through CCTV cameras installed across streets. The camera records the distance between people in pixels and compares it with the standard measurement and thus behave as a social distancing detector. This social distance detector application logic resides in the file.py script and this file is responsible for looping over frame of a video stream and ensuring that people are maintaining a healthy distance from one another. It is compatible with both video files and webcam streams [6].

In 2019, Neel Bhawe and his co-authors proposed a system which is a complete working model which comprised of Reinforcement model and Object detection algorithms. In this they used YOLO (You Only Look Once) Real Time Object Detection which has less shortcomings, is much faster, provides accurate results and can be trained for more than 200 classes. Reinforcement learning is an area of machine learning which is responsible for providing the green phase timing according to the current state of traffic and learn from the actions taken [3].



Figure 2

3. LIVE SURVEY

WHO Officials in a press conference held in march 2020, stated that "Since people can spread the virus before they know they are sick, it is important to stay away from others when possible, even if you—or they—have no symptoms. "Since social distancing is essential to prevent the spread of Covid-19, but it was observed that social distancing was being violated at public places and hence the concept of "social distancing detector" is introduced. In this research we are using object detection to monitor safe distance between people [3].

CCTVs and Drones can be used for human detection. Closed Circuit television (CCTV) are being used as a means of surveillance from a long time but due to its limitations it is not completely reliable. The drone thus has a better communication with the rest of the swarm in a particular area to follow the human while also dividing the areas between the drones dynamically so as to not lose track of the human. OpenCV, computer vision and deep learning are used to monitor social distancing across the region. Initially, object detection is applied to detect pedestrians in a video stream. In the next step, the pairwise distances between all detected people are calculated and finally these distances are compared with the standard distance that should be maintained (6 feet or 2 meters) and are represented by red frame if they are violated and green frame otherwise. So, if 5-6 people gather around in a particular area, the local authorities or the local police stations will be immediately notified. Recently, after the outbreak of this virus, the police Authorities need to patrol across the city and are bound to invest time unnecessarily. Using this concept of social distancing detection, the police will be able to monitor and reach the exact location and control the scenario immediately. Thus, social distancing can be controlled and indirectly the spread of COVID-19 be prevented [5]. The below figure shows the steps for implementation of a social distancing detector.

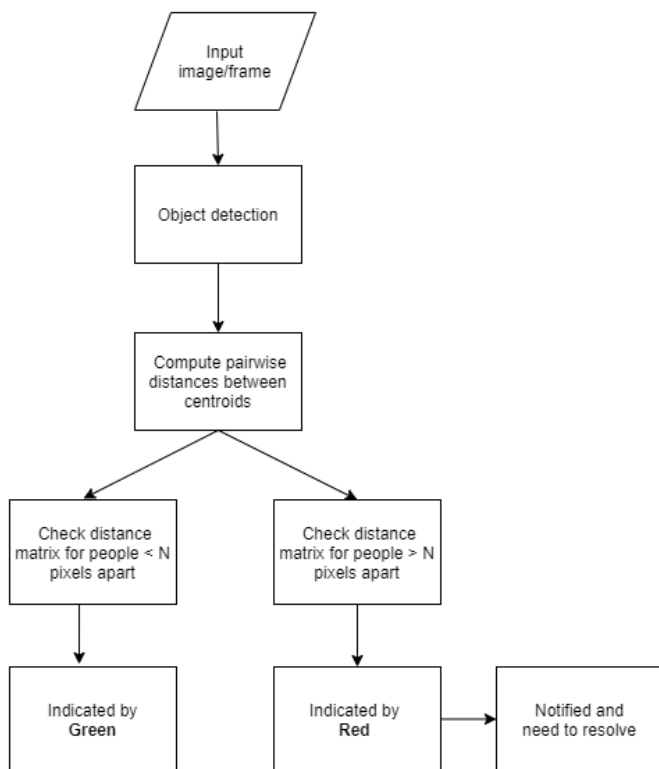


Figure 3

4. CONCLUSIONS

As we envision the world post COVID-19 pandemic the need of self-responsibility emerges irrefutably. The scenario would mostly focus on accepting and obeying the precautions and rules that WHO has imposed more precisely as responsibility of one will totally embark on themselves and not government. Social Distancing would undoubtedly be the most important factor as COVID 19 spreads through close contact with infected ones. In order to supervise large mobs, an effective solution is important and this survey paper focuses on that. Using installed CCTV and drones, authorities can keep a track of human activities and control large crowd to come together and prevent violating the law [2]. As far as people are maintaining a safe distance they would be indicated with green light, and as the CCTV captures more and more crowd gathering, red light would pop-up and the allocated police of that area will be notified and the situation can come under control immediately [6]. As controlling large mob is not an easy task, using this survey, conditions can be managed before situation goes out of control. Thus, implementing this idea can reduce the on-ground efforts of the police and they can entirely focus on supervising conditions exclusively on those areas where conditions are unfavorable and thus, they can utilize time wisely and save energy for equitable situations.

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