

SOCIAL DISTANCE DETECTOR

MINI PROJECT - 1

Abstract

In this COVID-19 period, Social distancing plays an important role in preventing the spread of the virus. After the first phase of unlocking roads are full of people in some of the metro cities, which results in the violation of social distancing which will increase the spread of the virus. In this paper we have studied 5 different Journal and Conference Papers and discussed how we can use different technologies like Artificial intelligence (AI), Machine learning (ML), python, Computer vision, etc, to build a social distancing detection device which will monitor the gathering and find the distance between different individual to check whether the social distancing is followed or not. We can use this in busy places like metro stations, offices and streets. After that, we will compare the different methods and try to find the best and economical method. Finally, we will talk about the problem that arises during this project and how we will solve them.

Introduction

Almost 22 million people are infected with corona virus, out of which 2.77 million is in India. In India initially the recovery rate was 66-68% which is increased and the new recovery rate is 73% which is a good news, but social gathering and opening of schools and crowded places will increase the spread of virus, Since march, more than 35 million people lost their job, global economy is in recession. GDP of china, Spain, France and Italy fell by 36.6, 19.2, 21.3 and 17.5 per cent respectively.

Best way to prevent this virus is reducing public gathering and closing all the college, malls and public transport but this will affect the economy

and increase unemployment, But we can open these services with precautions and by applying social distancing, maintaining social distancing with man power will only increase the risk of getting affected, so, we will use wireless technologies to maintain the social distancing.

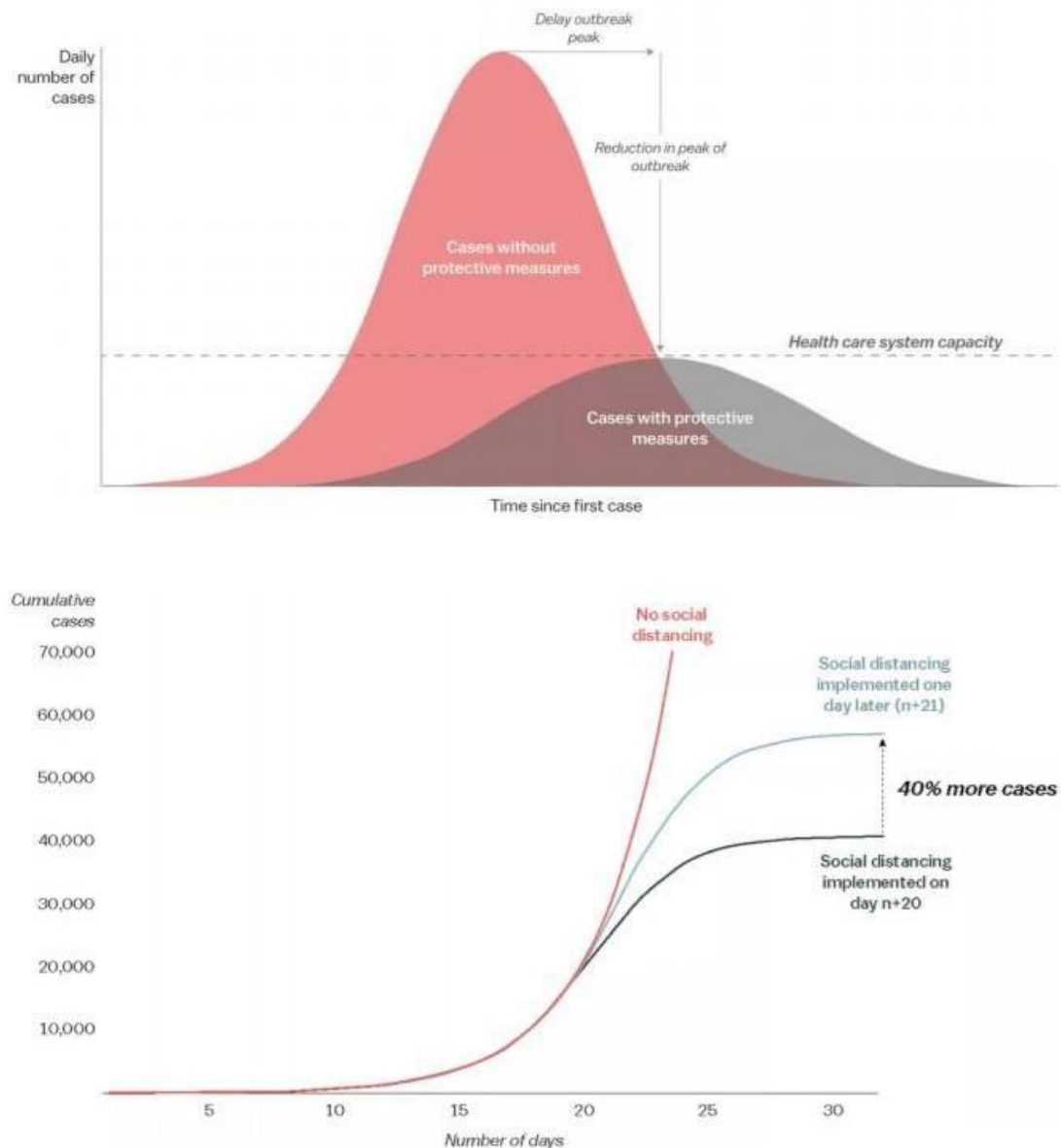


Fig showing the effect of social distancing

we will use neural network learning model and YOLO, R-CNN and DPM for object detection and compare which will give the accurate results. After detecting the image with the help of mathematical calculations we will find the distance between two individuals and compare that distance with the safe distance (6 feet), If the distance is more that the safe distance that means they are following social distancing.

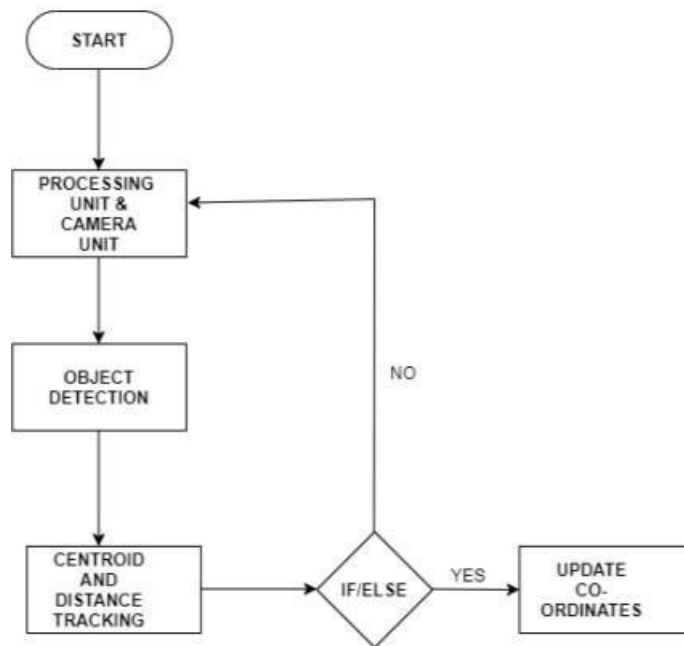


Fig shows the flow chart of social distance detector

To make sure that no individual will be recorded multiple times, we will use centroid tracking mechanism in which we will assign different ID's to each individual and monitor the distance between centroids. If we observe that the distance between two individuals is more than the safe distance then we will mark that area in map and if we find more than 6 individuals at the same place violating social distancing then we will report them.

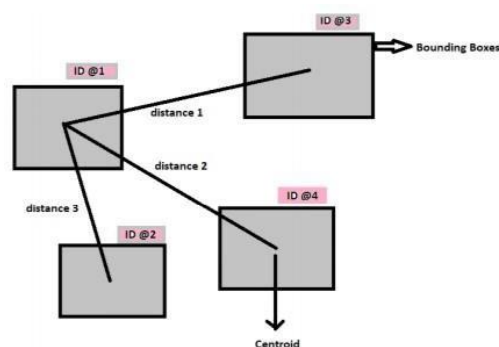


Fig showing distance detection using centroid tracking mechanism

Comparison between different object detectors (YOLO, R-CNN and DPM)

We get to know about an object detector by its mAP value, mAP stands for mean average precision, which tells that how accurate does a detector detect an object.

After training neural network with 3000 different images out of which 1000 images is used as weight for training, we came to know that the mAP of YOLO, R-CNN and DPM is 57.8, 45.4 and 51.9 respectively, and the time taken by YOLO is lesser than both R-CNN and DPM.



Fig MAp value of different detectors

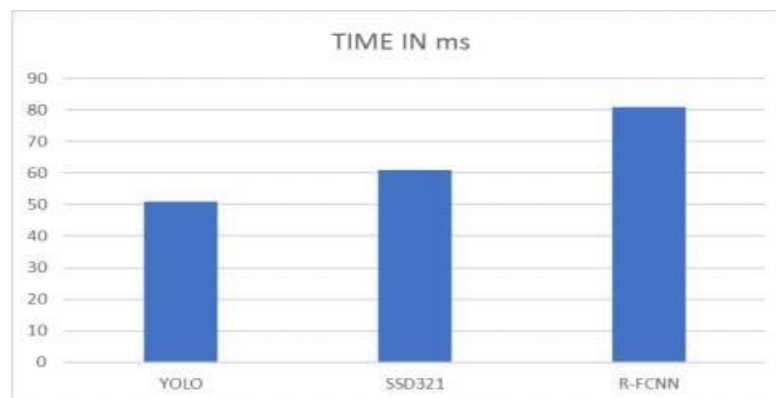


Fig time taken by different detectors

YOLO speed and accuracy is better than others also we don't have to worry about the size of different object, It converts the object size to a specific size, The size range varies from 320 X 320 to 608 X 608.

Social distancing detector using Block-chain

As we know that initially block chain is use as financial tool but now days we can use it in health care system, The idea is to create an app which is linked with user mobile number and will use GPS for tracking the activity, every user will get some coins ,tokens and passes which they can use for visiting public places, For example every user will get N

tokens each week and every token will carry T amount of time which they can spent for their movement.

For places like school, malls, college and metro, we can restrict a certain number of users and allow only limited number of users which will reduce the rush and helps in maintaining proper social distancing.

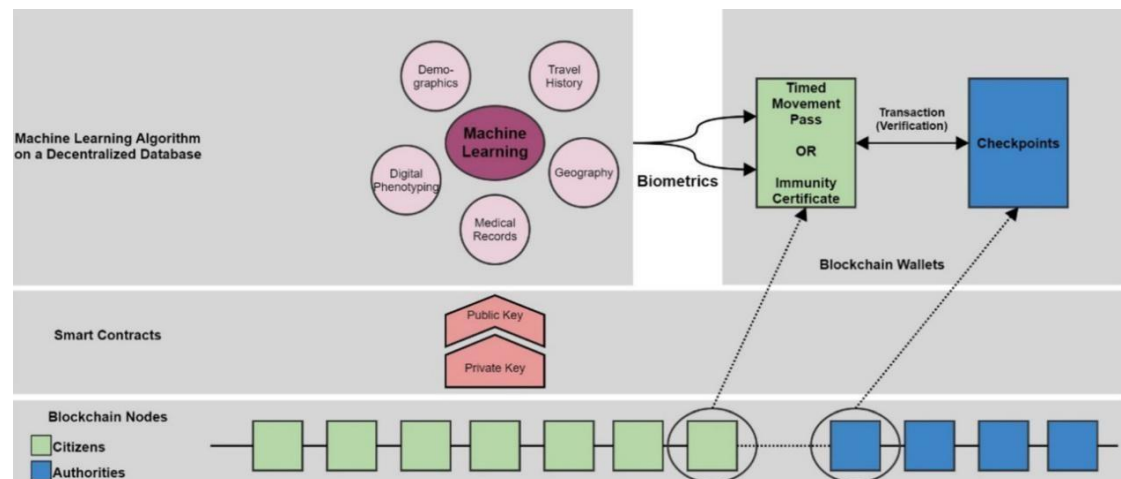


Fig flow chart of social distancing using block chain

With the help of this we can even track the activity of infected patient, If a user will get affected then we can easily track the places they visited and other users they meet and interact.

The major drawback of this solution is, we can't track someone who don't use mobile phone, although these days majority of people carry smart phone but in village majority of family have one or two smart phone which makes it harder to track every individual but this project will work effectively if we try it on small scale like in office, stores and banks.

Normal V/S Bird eye view

If the input video is taken from some angle then for proper calculation and working we have to convert that video into bird view, in bird view we are seeing a video from the top, which make it way easier to calculate the distance between centroids and convert that pixel distance into other units (meter, feet, etc). For converting a normal video into bird view we have to pick four points in perspective view and then convert that four square points into bird view. Another thing we can do is by applying unitary method we can calculate how many pixels are there in safe distance (6 feet), then convert the end result.

Comparison between different methods

Ref. No	Methodology	Method	Result
1	Python and YOLO object detector.	Detection of people using YOLO object detection and calculating the distance between the centroids using python.	Used in large scale if implemented properly and provide employment to those who will monitor the device for maintaining social distancing
2	Block chain	With the help of app giving token and movement pass every week for accessing small but important place like bank and post office.	Highly effective and economical easy to use but user need to have smart phone.
3	Neural network and bounding boxes	Detecting object using YOLO and generating virtual perceptive views with the help of omnidirectional image. Training model on ImageNet and COCO data set.	Virtual perceptive view is highly overlapped and minimizing over sized boxes are necessary.
4	Wi-Fi	Transmitting radio signals with wireless access point (AP) to communicate with other devices in the range.	Economical and can be used in small areas, accuracy range up to 5-6 meters. High privacy risk.
5	Bluetooth	Wireless communication with rang of 2.4 to 2.485 GHz. Automatically find and connect to the nearby devices, other devices in range means violation of social distancing.	Unless like Wi-Fi can be used both indoor and outdoor, low cost and able track the movement of infected people

Conclusion

Social distancing is one of the most effective way to prevent the spread of virus and with the help of technology like python, block chain, AI, Wi-Fi, etc, we can stop the violation of social distancing.

In this survey we have seen that how we can maintain social distancing with the help of technologies. We discussed about different type of object detectors and their advantages over others then we try to understand why bird view is more convenient and how we can track the infected and maintain social distancing with the help of commonly used technologies like Wi-Fi and Bluetooth. We compared 5 different journals and try to understand what is best for indoor and outdoor conditions considering the fact that it is economical and easy to use.

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