TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

Department of Computer Science & Engineering

HEAD OF THE DEPARTMENT

- Dr. CH.V.PHANI KRISHINA (Professor)

PROJECT COORDINATORS

- Dr. J. RAJARAM (Professor)
- Dr.VADIVALAN NATARAJAN (Professor)

SOCIAL DISTANCING DETECTION

OUR TEAM

INTERNAL GUIDE

DR.SARANGAM KODATI

-PROFESSOR

MD. SHARIQ

-18R91A05E2

V. SUSHMITHA REDDY

-18C21A0543

J. SHANMUKH GOUD

-18R91A05D1

OBJECTIVES

1. ABSTRACT
2. LITERATURE SURVEY
3. EXISTING SYSTEM
4. PROPOSED SYSTEM
5. HARDWARE & SOFTWARE REQUIREMENTS
6. MODULES
7. UML DIAGRAMS
8. CONCLUSION AND FUTURE WORKS

ABSTRACT

Social Distancing is one such terminology that has gained popularity over the past few months, thanks to COVID-19. People are forced to maintain a sufficient amount of distance between each other to prevent the spread of this deadly virus. Amidst this crisis, we decided to build a simple Social Distancing Detector that could monitor the practice of social distancing in a crowd. This project uses Deep Learning based YOLOv3 Pre trained model for object Detection, OpenCV python library for image processing and Centroid Tracking Algorithm For object tracking. The distance between people can be estimated and any noncompliant pair of people in the display will be indicated with a red frame and red line. The proposed method was validated on a pre-recorded video of pedestrians walking on the street. The result shows that the proposed method is able to determine the social distancing measures between multiple people in the video.

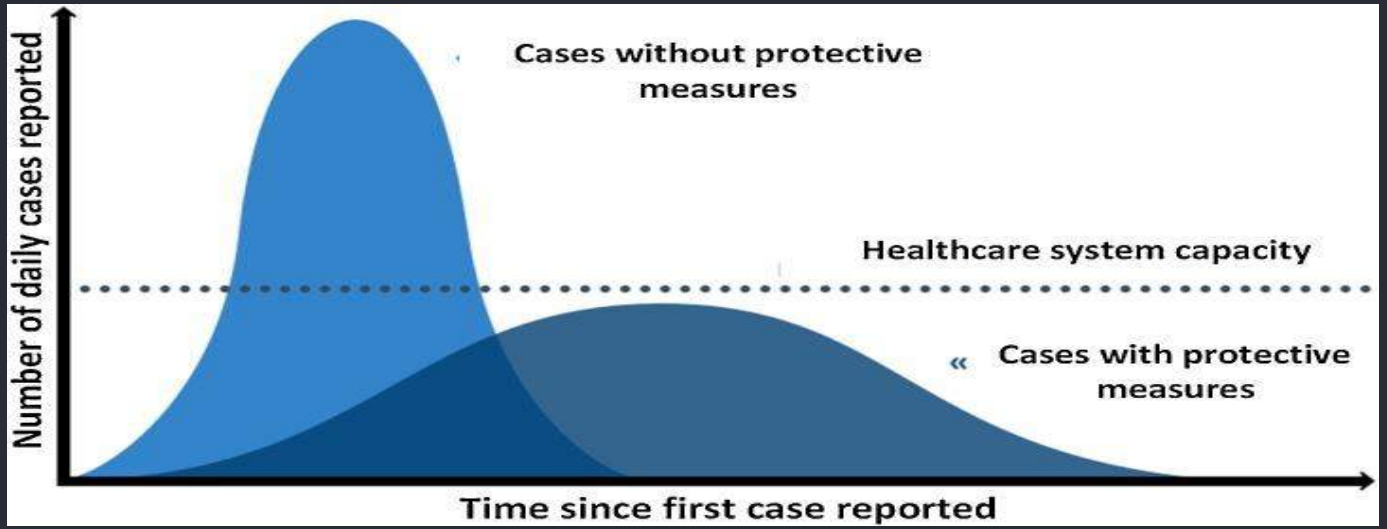


Fig: An outcome of social distancing as the reduced peak of the epidemic and matching with available healthcare capacity.

LITERATURE SURVEY

After the rise of the COVID-19 pandemic since late December 2019, Social distancing is deemed to be an utmost reliable practice to prevent the contagious virus transmission and opted as standard practice on January 23, 2020.During one month, the number of cases rises exceptionally, with two thousand to four thousand new confirmed cases reported per day in the first week of February 2020.

Later, there has been a sign of relief for the first time for five successive days up to March 23, 2020, with no new confirmed cases. This is because of the social distance practice initiated in China and, latterly, adopted by worldwide to control COVID-19. .

EXISTING SYSTEM

- It was difficult for the machine to determine who is maintaining social distancing and the real-world applications were limited.
- People are not detected from all angles by the current technology.
- A physical person should be there to observe whether or not the individuals are practicing social distancing.
- Sometimes human errors also occurs so results are not accurate.

PROPOSED SYSTEM

- Real-Time alert:

  If selected, we send an email alert in real-time.

  Use case:

  If the total number of violations (say 10 or 30) exceeded in a store/building, we simply alert the staff.
- Threading:
  - Multi-Threading is implemented in 'mylib/thread.py'. If you ever see a lag/delay in your real-time stream, consider using it.
  - Threading removes OpenCV's internal buffer (which basically stores the new frames yet to be processed until your system processes the old frames) and thus reduces the lag/increases fps.
- People counter:
  - If enabled, we simply count the total number of people: set People_Counter = True in the config.
- Desired violations limits:
  - You can also set your desired minimum and maximum violations limits. For example, MAX_DISTANCE = 80 implies the maximum distance 2 people can be closer together is 80 pixels. If they fell under 80, we treat it as an 'abnormal' violation (yellow).

HARDWARE & SOFTWARE REQUIREMENTS

Hardware

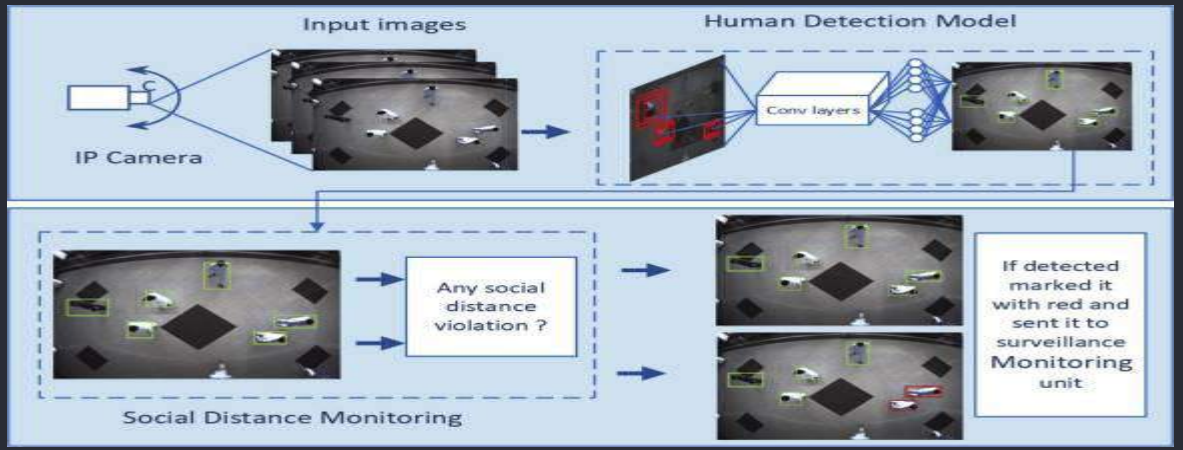
Processor: Intel Based Systems
Hard Disk: 40GB
RAM: 4GB(Minimum)
GPU: 2GB(Minimum)
Webcam

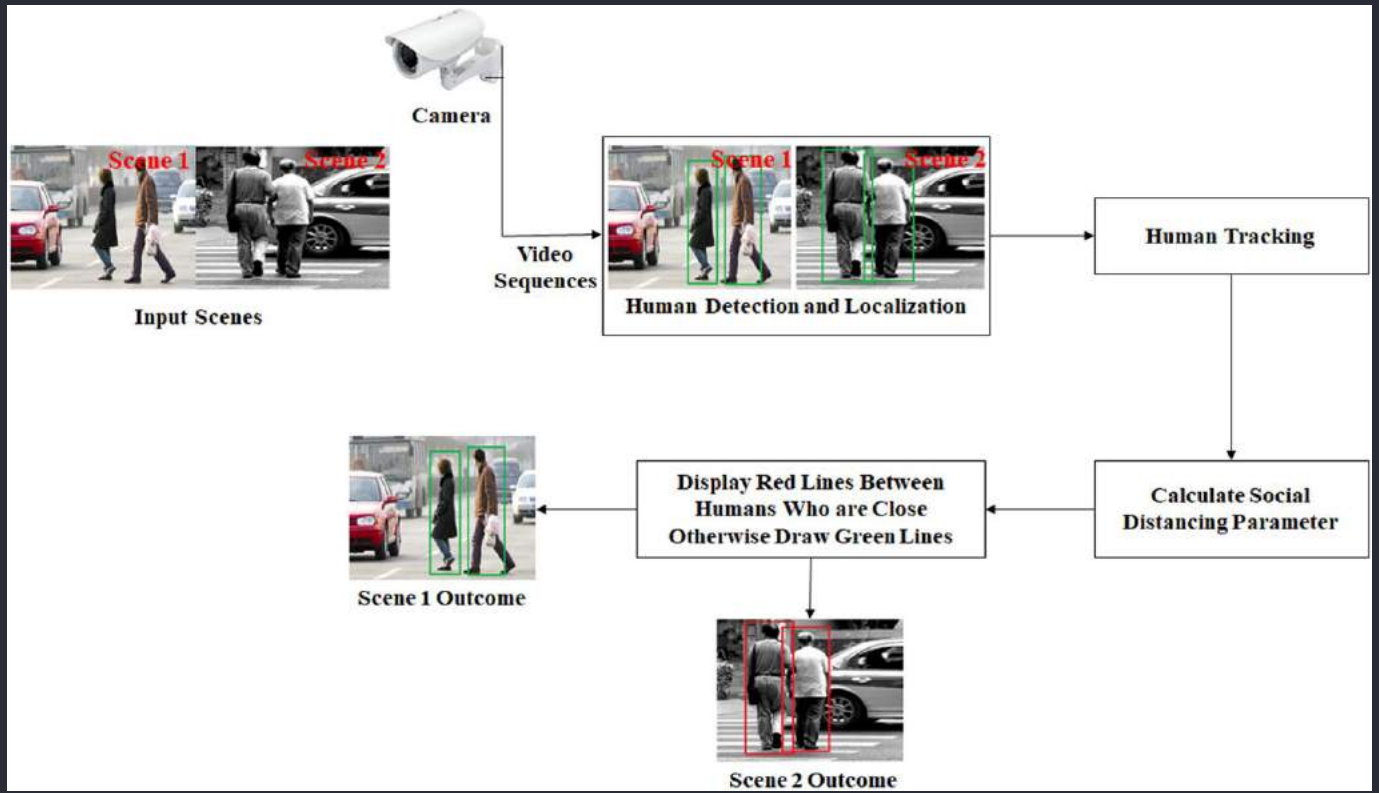
Software

Operating System: Windows 10
Language: Python
Library: OpenCV
YoloV3

MODULES

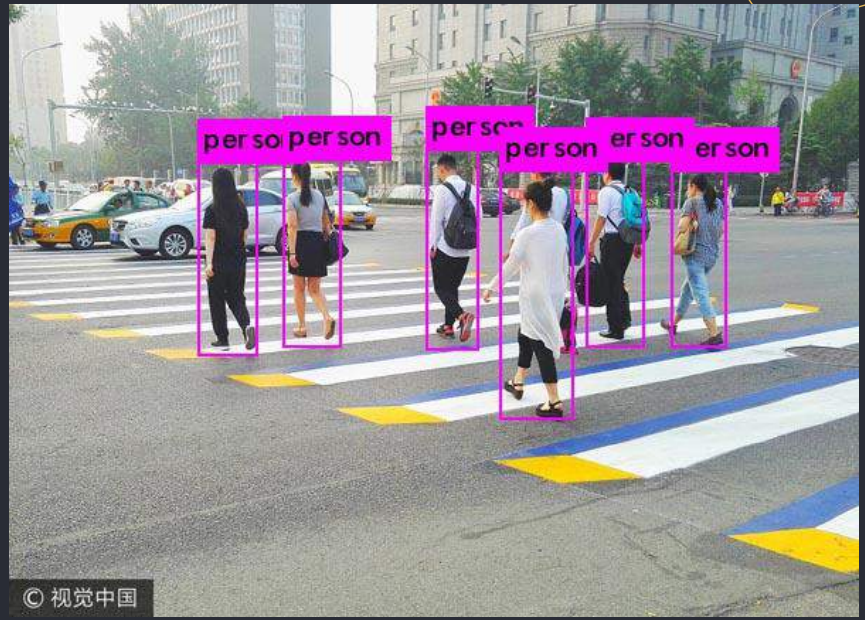
- Human Detection Model
- Social Distance Monitoring
- Bounding Box Detection
- Social Distance Violation Module.




Camera
Scene 1
Scene 2
Input Scenes
Video Sequences
Scene 1
Scene 2
Human Detection and Localization
Human Tracking
Calculate Social Distancing Parameter
Display Red Lines Between Humans Who are Close Otherwise Draw Green Lines
Scene 1 Outcome
Scene 2 Outcome

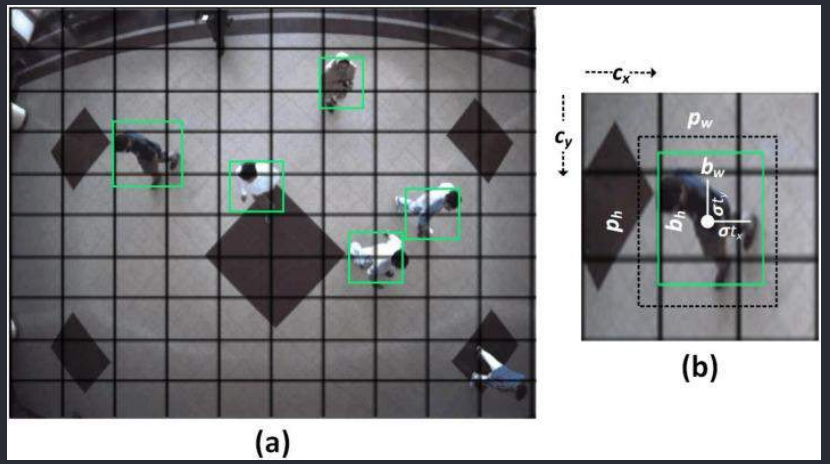
Human Detection Model

You Only Look Once version 3 (YOLOv3) on Google Colaboratory to process the images within a database and to accurately locate people within the images. YOLOv3 splits the image up into regions and predicts bounding boxes and predicts the probabilities for each region. These bounding boxes are weighted by the projected probabilities and finally, the model is able to make its detection based on the final weights. This model will be using a customised dataset from Google's Open Images with 500 high resolution images.



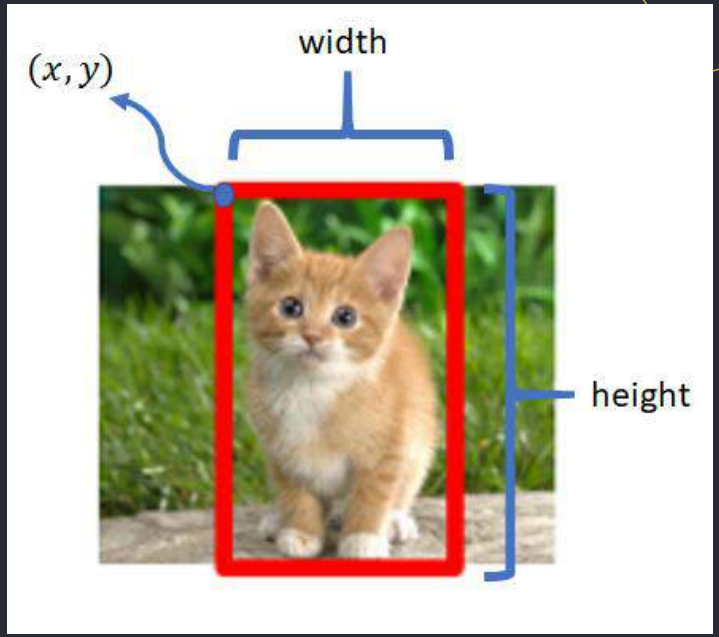
Social Distance Monitoring

The simulated model uses deep learning algorithms with OpenCV library to estimate distance between the people in the frame, and a YOLO model trained on COCO dataset to identify people in the frame. The system has to be configured according to the location it is being installed at. By implementing the algorithm, the number of violations are reported based on the distance and set threshold. Number of violations reported are one and two for two real time images respectively. The red box highlighting the violations are displayed along with distance. The distance is calculated by using Euclidean Distance formula. Reporting efficiency and correctness were validated for more number of samples.



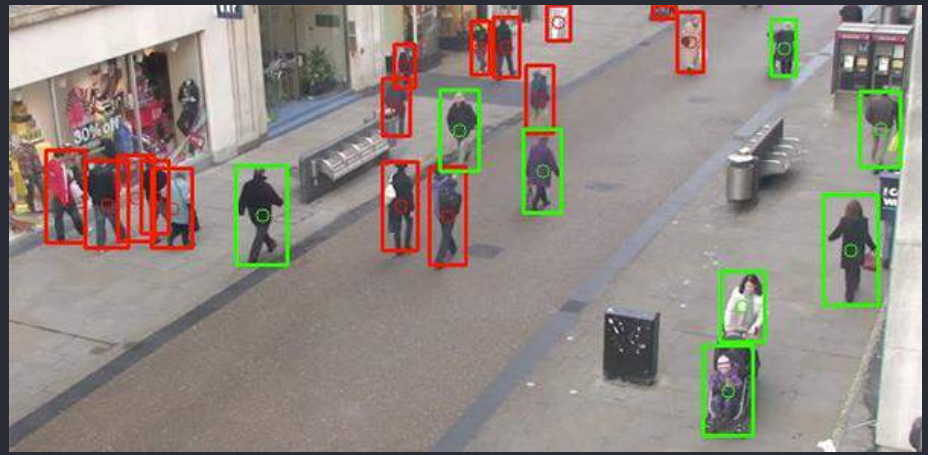
Bounding Box Detection

A bounding box is an abstract rectangle that acts as a reference point for object detection and produces a collision box for that object. These rectangles are drawn over images by data annotators, who identify the X and Y coordinates of the point of interest within each image. This helps machine learning algorithms find what they're looking for, evaluate collision paths, and saves precious computational power. In deep learning, bounding boxes are one of the most commonly used image annotation techniques. This approach will save resources and improve annotation performance as opposed to other image processing approaches.



Social Distance Violation Module

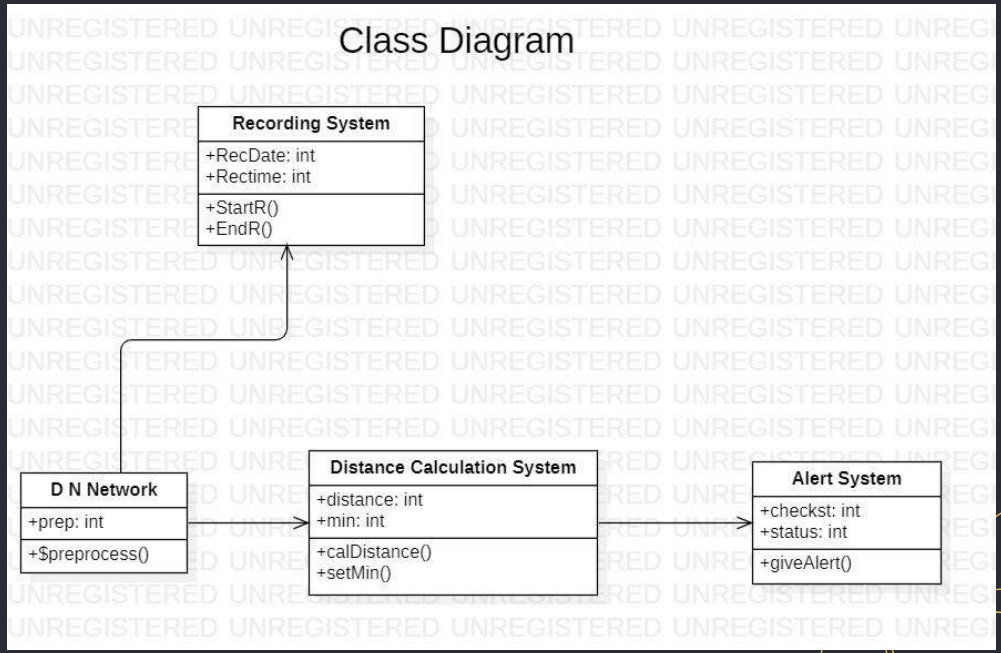
This program monitors and tracks crowd in real-time through CCTV footage, looking out for people or groups coming closer to each other by less than 5–6 feet. A red box is drawn on such groups to inform the monitoring authorities of the same. And it is integrated with a mailing feature with the program, which instantaneously informs the authority of any distancing violations as soon as it identifies one. The definition of violation can be set as per criteria set by local authorities, which may vary from 2 people walking together to a gathering of more than 20 people.



UML DIAGRAMS

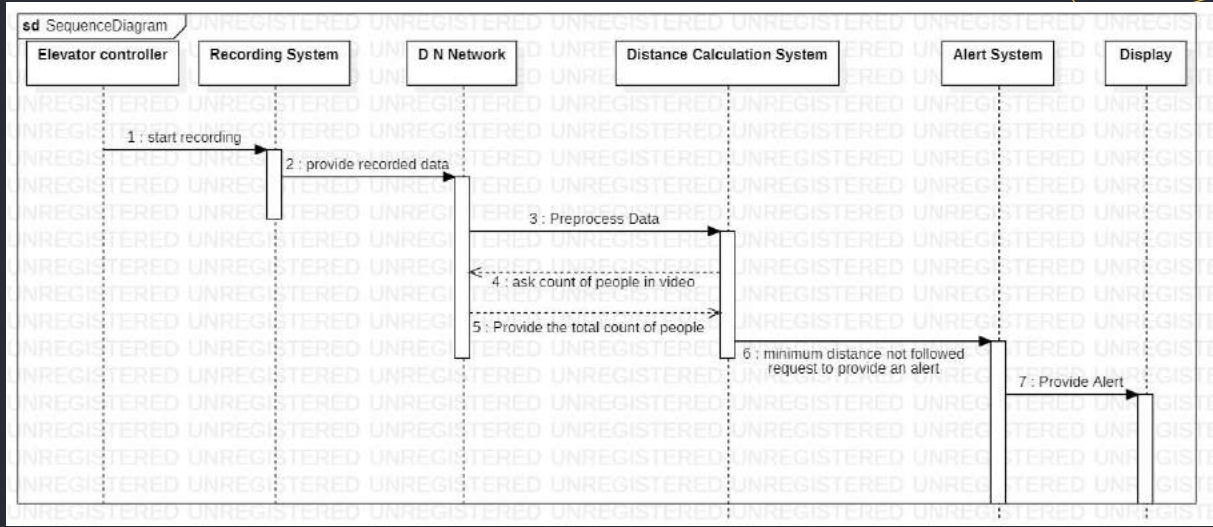
CLASS DIAGRAM FOR SOCIAL DISTANCING DETECTOR

Class diagram is a type of static structure diagram that describes the structure of a system by showing system classes, attributes, operations and the relationship among objects.



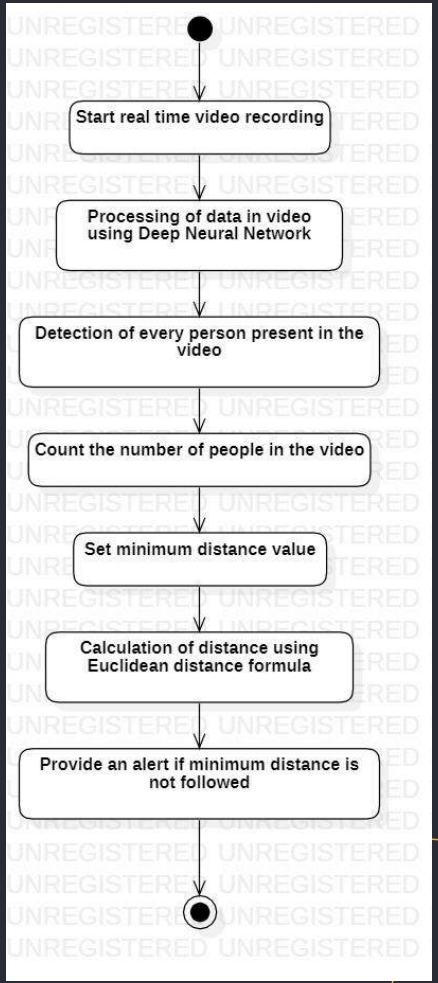
SEQUENCE DIAGRAM FOR SOCIAL DISTANCING DETECTOR:

A sequence diagram in Unified Modeling Language (UML)is a kind of interaction diagram that shows how processes operate with one another and in what order.



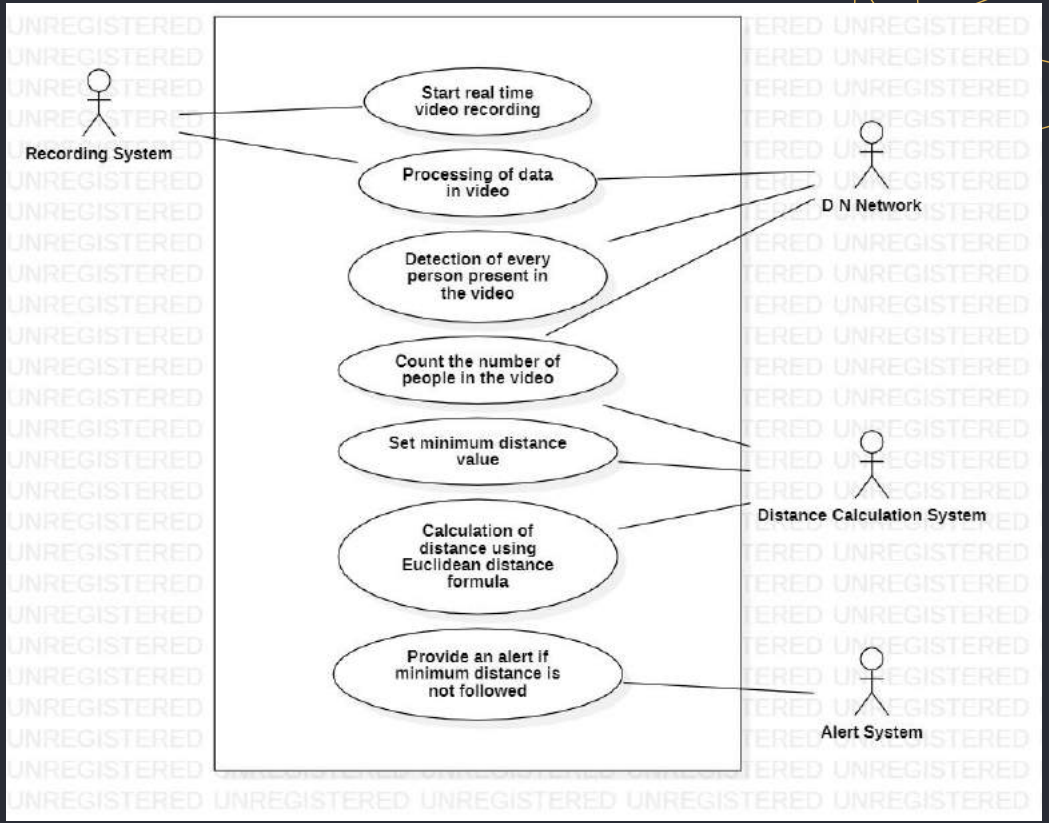
ACTVITY DIAGRAM FOR SOCIAL DISTANCING DETECTOR:

An activity diagrams type of diagram that represent a work flow or a process . A flowchart can also be defined as a diagrammatic representation of an algorithm.



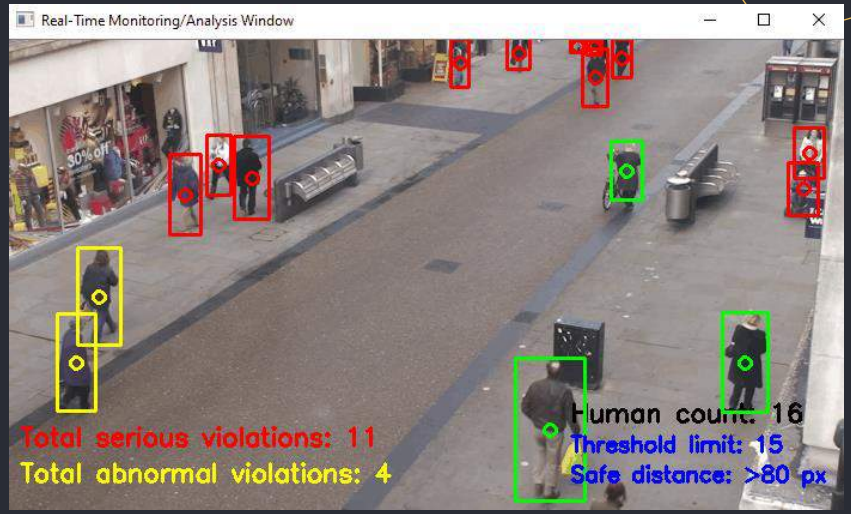
USE CASE DIAGRAM FOR SOCIAL DISTANCING DETECTOR:

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a use case analysis. The main purpose of a use case diagram is to show what system functions are performed for which actor.



Input

Output



CONCLUSION AND FUTURE WORKS

Using Machine learning & Al it is possible to estimate social distancing accurately. The system can control death rate & Spread of corona by ensuring social distancing in public places.

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THANKS!

DO YOU HAVE ANY QUESTION?

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