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SOCIAL DISTANCING DETECTION

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ABSTRACT -*This paper has discussed about the monitoring and assurance of proper following of the social distancing in the public places. During this pandemic situation the spread of corona virus has increased rapidly the major reason for the spread of the virus is due to the gathering of the crowd at public places. The proposed application software will help the user/authorities to maintain the social distancing in the surrounding areas and the places where there are possibilities of appearance of crowd. This project will help in minimizing the spread of corona virus and other diseases that may affect people's health. This application will be helpful for the govt. departments, malls, markets, and other public places where the crowd management is hard. this project consists of the three main algorithms that are used in this that are object detection, object tracking, and distance measurement that are applied together so that the distances between the objects can be found.*

Keywords: *social distancing, software, corona virus, Object tracking, object detection, application.*

1. INTRODUCTION

As we all are aware of the situation around us that is a small and dangerous virus is affecting our daily lifestyle. Talking about this virus it had affected us since November 2019 and thus called covid-19.
Due to this virus over 120 countries face a mortality rate of 8000000 and current cases of 119000000 and more. Today we are getting vaccinated and having lockdowns in different parts of the country but the situation around us getting worsening day by day. So the prime objective we need to give is how to get maximum precaution and for this two things are possible that is to cover the face with the mask and to maintain the social distancing.
So, moving towards our prime motto that is social distancing. It is the method or we can say a precautionary measure that ensures the spread of contagious diseases.
And as this name itself describes that people should physically maintain some distance from one another, and by reducing the close contact, we can stop the spread of this deadly virus (i.e., coronavirus) to some extent. In this, we are getting a detection for social distancing to differentiate a non-infected with an infected person. So, we are devising a system that could detect the object and thus we can together mitigate this problem easily. The prime focus of this project is to make an application-based software to make sure that during this pandemic situation the people are maintaining a proper social distancing in a public area.
By making an easily controllable device and also to make user friendly by reducing the human efforts. It will help customers/users to monitor and maintain the social distance between people in public places or around the house or anywhere where a crowd could appear.

2. STEPS TO CREATE A SOCIAL DISTANCING DETECTOR

1. Using object detection algorithms to detect everyone in the video frame.
2. Calculate the pairwise distances between all detected people.
3. According to these distances, examine that two people are less than N pixels apart.

2.1 OBJECT DETECTION

Object detection is a technique which comes under the computer technology. This technique helps in Identify and track objects in images and videos.

Object recognition has a wide range of uses, such as facial recognition, vehicle recognition, pedestrian counting, self-driving cars, security systems, etc.

The object detection technique helps in easily filter out the objects from the images and videos.

Centroid tracking algorithm

2.2 OBJECT TRACKING

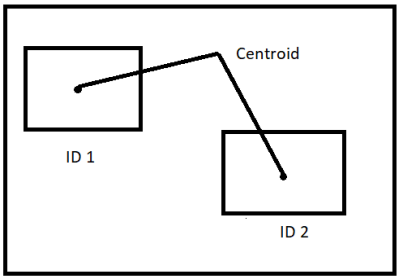
The purpose of object tracking is to map the target to a continuous video image. When the object is moving fast relative to the frame rate, matching can be particularly difficult.

Another condition that makes tracking an object difficult is to change the direction of the tracked object.

Under these conditions, object tracking systems usually use motion models to describe how the target image changes with the various possible motions of the object

Pace #1: Accept the bounding box coordinates and calculate the centre of gravity

Here the centroid tracking algorithm will assume that a set of bounding box (x, y)-coordinates are passed for each detected image/object in each and every frame of video. The bounding boxes can be generated by using different types of object detector like Haar cascades, SSDs, etc., provided that the bounding boxes are computed for each and every frame in the video. Once the bounding boxes are obtained their centroids are computed. The figure below shows the accepted sets of bounding box coordinates and their computed centroids.



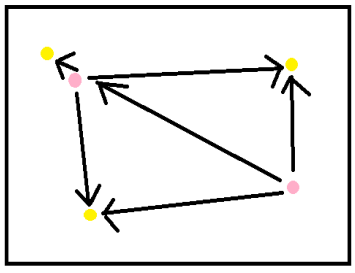
Pace #2: Compute Euclidean distance among new bounding packing containers and present objects

For every and each body in a video we should compute item centroids. Instead of assigning a completely unique ID to every and each new item detected within side the video so we should decide if we will update new item centroid (yellow) with the vintage item centroid (pink).

So that it will accomplish this technique the Euclidean distance is calculated between each and every pair of centroids of existing objects and centroids of input objects.

From the figure below we can conclude that this time we have three objects detected in the image where the two pair together are the pre-existing objects.

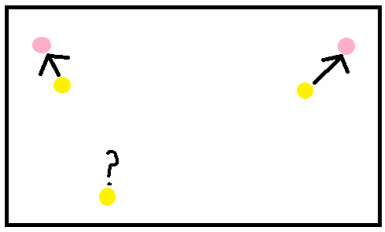
Now the Euclidean distance is computed among every pair of latest centroids and the unique centroids



Pace #3: Update the (x, y) coordinates of the current object

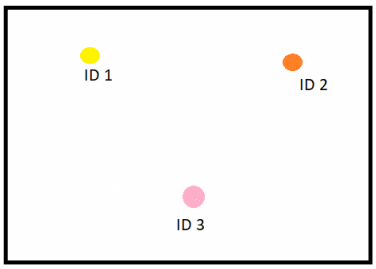
The first assumption of the centroid monitoring set of rules is that an item will doubtlessly flow below a few constant frames, however the distance among the frames will smaller than all of the distances among the objects. So if we need to attach the centroids having minimal distances in among the following frames we are able to be capable of construct our personal item

tracker. Therefore, on the definition page below, we can see how to select a set of centroid tracking rules for other centroids, which can minimize their respective Euclidean distances.



Pace #4: Register new objects

If there are more recognizable input objects in the event or video in addition to the existing objects being tracked, the newly recognized objects should be recorded. Save the center of gravity of the bounding box coordinates of this newly discovered object. The figure below shows the calculation of the minimum Euclidean distance used to link existing object IDs and then register new objects. ID.



2.3 DISTANCE MEASUREMENT

The triangulation method is used to determine the distance from the camera to a known object or marker.

The similarity of triangles is as follows: Suppose we have an object of width W. The distance between this mark and the camera is D. Take a picture with the camera, and then measure the apparent width P in pixels. This helps us calculate the perceptible focal length F of the camera:

F= (P x D) / W

For example, take a piece of paper with width W=10 and distance D= 20 inches and then capture a photo. Then the pixel P is found out to be P= 200px.

F = (200px X 20) / 10

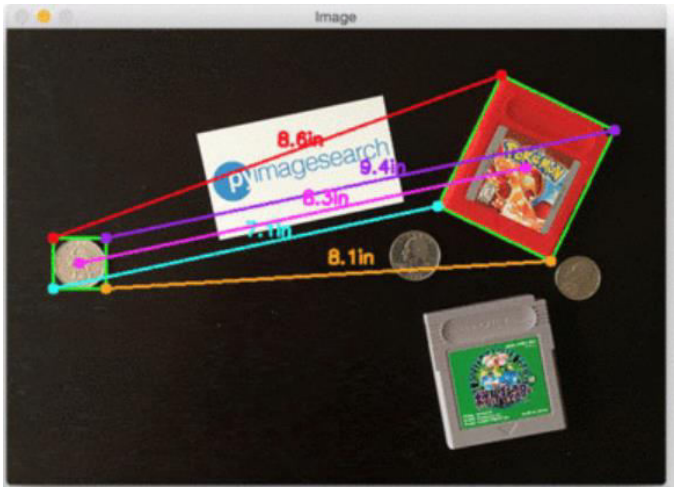
=2000

When the camera moves closer or close to the subject, the triangular similarity method can be used to determine the distance between the subject and the camera.

D' = (F X W) / P

Let us take another example, camera is moved 5ft away from the object and the picture is clicked. With the help of automatic image processing, perceived width of object is 200px. Now the value of D' is calculated as:

D' = (10 X 2000) / 200 = 200inch



Distance measurement

3. RESULT

This project mainly focuses on the problem of social distancing that is people that are not following the guidelines of social distancing in the public places where the threat of spreading the disease is very severe. In this difficult pandemic situation people must maintain the social distancing in the public places so that the spread of the COVID could decrease to some extent. Apart from this this project can also be used by the police department to ease their work of maintaining the social distancing in public

4. DISCUSSIONS AND CONCLUSION

This article gives a brief explanation of how we can prevent the spreading of perilous virus by the method of social distancing. It provides a way to monitor the Social distance to fixed cameras to monitor people in the crowd at different public places from a fixed camera distance and thus it shows the resultant distance in the real world and thus it shows the person who violated the social distancing rule.

In this, the YOLO v4 which is based on a Solutions for real-time monitoring of social distance evaluated with the help of COCO detection metrics.

this proposed device has a low error rate as well as it is proficient in high precision

It is highly used in crowded places such as banks, shops, railway stations, and many more areas to detect and track the person who violates the same.

5. REFERENCES

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