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Detecting Social Distancing By Using Detectron2 and OpenCV

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Abstract: Social Distancing is the phrase that has surprised the world and is switching the way we live. The best way to forestall the spread of COVID-19 is to keep up Social Distance. Keeping a sheltered good ways from one another is a definitive method to obstruct the spread of this infection. Restricting up close and personal contact with others is the most ideal approach to diminish the spread of Covid sickness (COVID-19).Social distancing, additionally called "physical separating" signifies keeping space among yourself and any other outsiders of your home. The fundamental of the undertaking is identifies where every individual is progressively, performs key point recognition and returns a bounding box that turns red if the separation between two individuals is extremely close.

1. Introduction

Covid illness (Corona virus) is an seductive contamination intiate about by a newfound Covid. Most of the people who fall sick due to COVID-19 will undergo mild to moderate indication and recuperate without having any special treatment. The disease that causes COVID-19 is radically sent through a small drop of a liquid made when a contaminated individual coughs, sniffles or inhales out. These beads are too considerable to even think deliberate evening contemplate drop observable in general, and speedily fall on floors or surfaces. You can be tainted by inhaling air in the virus that you are inside closeness of somebody who has COVID-19, or by contacting a polluted surface and afterwards your eyes, nose or mouth

The biggest cause of concern is that Covid -19 transmits from individual to individual when they are close to each other as well as through contact of an infected person. We realize that according to the world health organization (WHO), Covid-19 has so far contaminated very nearly 4 million individuals and guaranteed over 230k lives worldwide around 213 nations have been influenced so far by the savage infection [1][2]

The WHO Country Office for India (WCO India) has been working intimately with the Government of India (GoI) to venture up readiness and reaction measures for COVID-19, including reconnaissance and contact following, research facility testing, hazard correspondences and network commitment, emergency clinic readiness, disease counteraction and control, and usage of regulation arrangement at all three degrees of the wellbeing framework – public, state and region. The whole field presence, as well as the National Public Health Surveillance Project, comprising of in excess of 2000 work force has been completely reallocating to help the public authority to beat this test.

On January 31, the initial 2 novel Covid occurrences in the UK, the initial 2 occurrences in Russia and the main instance in Sweden and in Spain were accounted for. Canada announced its fourth instance .On Jan. 31, the United States gave 14 days disconnect regulation for US occupants go in for the US from China (required if entering from the Hubei province). Furnished a solicitation to contradict passage to outsiders who have gone to China inside the previous fourteen days.

On January 30, the novel Covid complete occurrence check outperformed that for SARS (which influenced 8,096 individuals worldwide).On January 30, the World Health Organization proclaimed the Covid episode a Global

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Public Health Emergency .On 30th of January CDC affirmed the primary US instances of individual to individual transmissions.

Germany, Japan, and other United States have revealed occurrences in patients who hasn't by and by visit China however gotten the infection from another person who had come upon Wuhan, China. These instances of individual to individual transferrable are the most troubling, as per the WHO.

2. Preventing measures of covid-19

- Wear a fabric mask except you are in a distinct risk group. This is extremely important when you can't put up physically distanced; especially in congested and poorly freshen indoor settings.
- Need to wear surgical or medical mask by the people who are over 60 years, having any medical issues, and looking after a person who is suffering due to some illness.
- Clean your hands frequently. Use sanitizers, soaps, or any alcohol-based hand sanitizers.
- Don't nudge your eyes, nose or mouth without cleaning your hands.
- We need to cover our nose or mouth with our bent elbow or any hand keen when we cough or sneeze.
- Clean and sterilize surfaces frequently. particularly those which are regularly insane, such as door handles , and mobile screens, and keyboards
- Stay home and self-isolate even if you have any small symptoms such as cough, headache, fever, until you take back.
- If you have a anything like fever, cough and difficulty in taking breath, seek medical attention immediately
- Maintain atleast one meter distance between yourself and others to reduce your risk of infection while communicating with each other.

TABLE1. Total Number of Cases

Months	Total cases
March	1,309
April	30,913
May	1,48,533
June	3,73,713
July	9,31,771
August	36,12,503
September	52,73,201
October	19,11,416
November	7,37,163

In march when the covid has started there are cases started with 1,309 and day by day covid cases are increasing to thousands, lakhs of cases by june it raised to 3,73,713 cases and by September no. of cases are increased up to 52,73,201 in September the cases raised a lot and there by October and November it comes to decrease little bit because of mainly following the social distance so,.

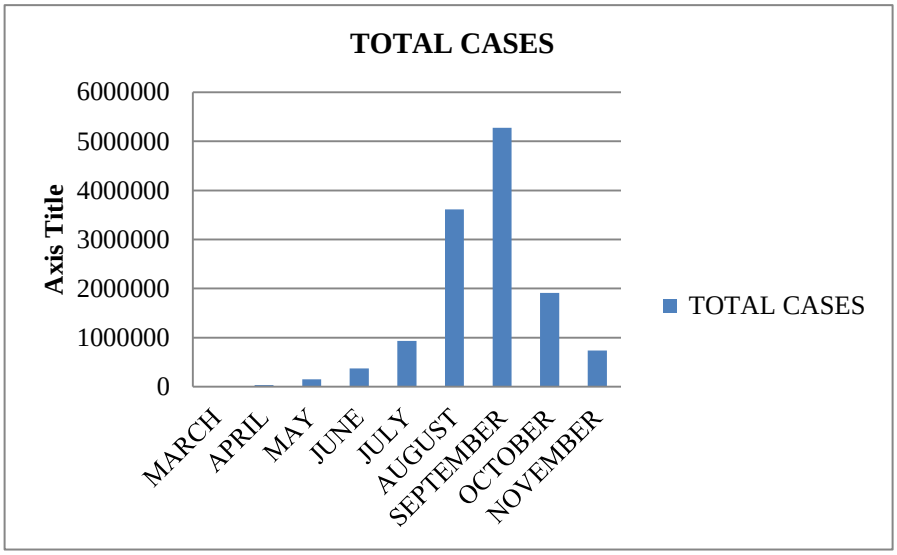

FIGURE.1 Total Number of Cases

TABLE 2. Total Number of Death Cases

Months	Number of deaths
March	33
April	980
May	3,892
June	8,959
July	17,431
August	26,905
September	31,874
October	24,624
November	9,681

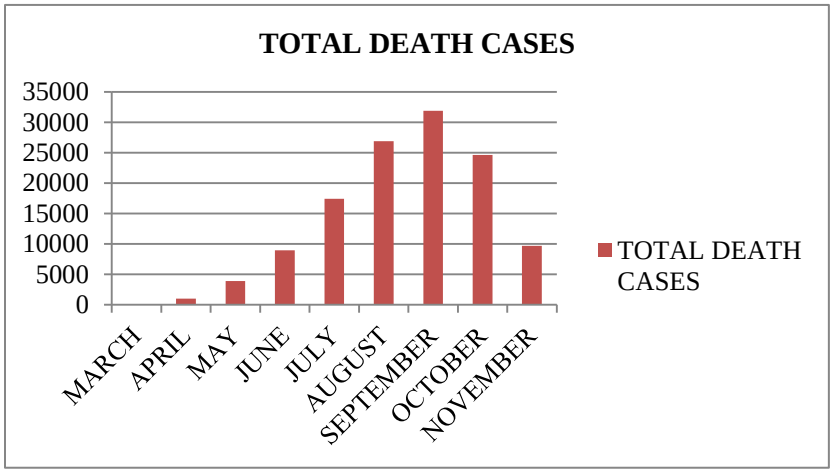

FIGURE.2 Total Number of Cases

The no of deaths are increased day by day as we seen the above bar chat and now that are becoming less due to this social distancing so.Everyone needs to know that the only way to overcome the spread of this covid-19 is social distancing **[2]**. keeping a minimum distance from each individual is the preferred way to overcome the spread of this infection so we thought to do the project that can probably helps to detect where each individual is maintaining minimum safe distance or not this can be helped to health organizations and also used to inspect the movement of people and aware them if any situation turns serious [2][5]

The main aim of the project is to detect the people who are not maintaining minimum safe distance by using bounding boxes [6] red and blue if implies that when the bounding box color is blue that the people are maintaining safe distance when the colour turns to red the people are not maintaining safe distance.

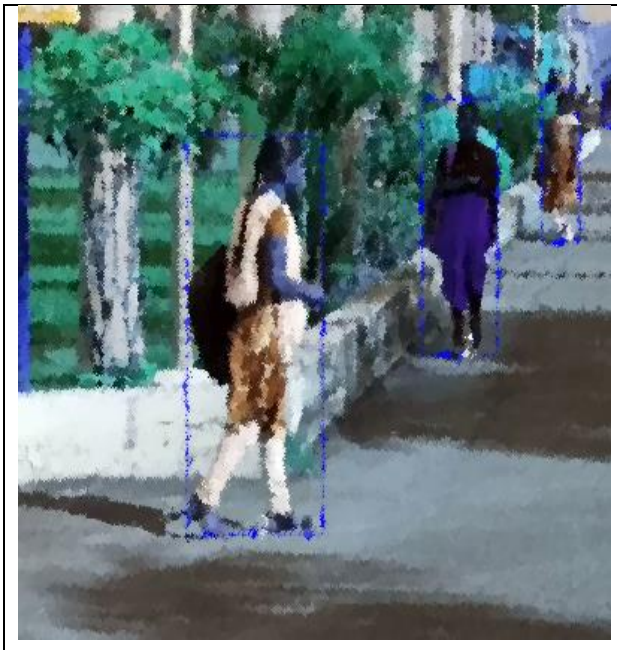

FIGURE.3 Representing Safe Distance with blue bound box

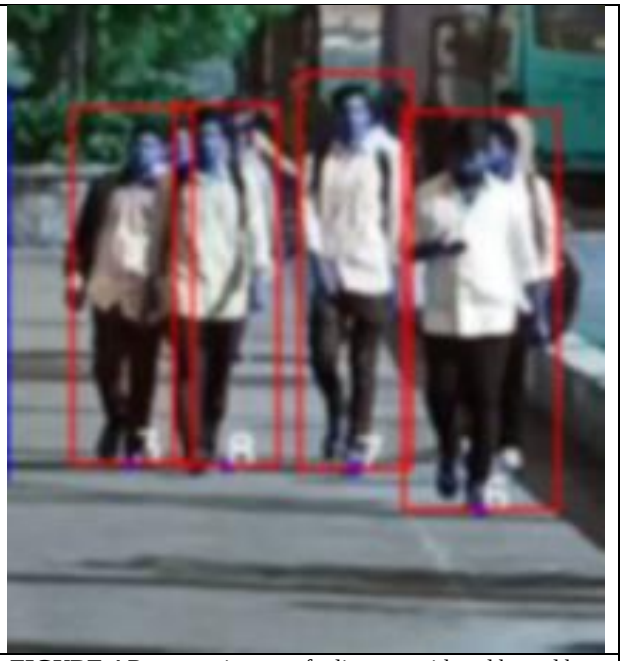

FIGURE.4 Representing unsafe distance with red bound box

3. Implementation

For developing this project we have used some of libraries and dependencies like numpy, random, matplotlib, open cv2 , detectron2

Numpy:

It is one of the python library which is used for working with arrays NumPy evince are put away at one constant spot in memory variant to records, so cycles can get to control them very efficiently. This conduct is called region of testimonial in PC science. This is the fundamental incentive behind why NumPy is speedy than records. Additionally it is enhanced to effort with most current CPU structures.

Random:

Almost all module capacities rely upon the fundamental capacity random() , which is utilized to produce a random float consistently in the semi-open reach. The capacities provided by this module are really bound strategies for a concealed case of the random.Random class. You can start up your own occasions of Random to get generators that don't share state.

Matplotlib:

Matplotlib is one of the plotting library for Python programming language. Furthermore, its mathematical science augmentation NumPy. It gives an article situated API to inserting plots into applications using universally valuable GUI toolboxes like Tkinter, wxPython, Qt, or GTK+.matplotlib.pyplot is a variety of request approach exertion that make Matplotlib effort like MATLAB. Each Pyplot duty reveals some development to a figure. For instance a limit makes a figure, a indicating region in a figure, plots a couple of lines in a laying region, decorates,etc.

Open CV2 :

It is one of the library of python bindings draw to solve computer vision.OpenCV utilizes Numpy, which is an exceptionally upgraded library for mathematical activities with a MATLAB-style punctuation. All the OpenCV[7][9] group structures are substituted over to and from Numpy betray problems.cv2.imread() technique stacks a picture from the predefined life..

Detectron2 :

It is an object detection & segmentation platform released by FAIR i.e., Facebook AI research's cutting edge programming framework that executes best in class object detection[5][6] calculations. And also we import some common utilities from detectron 2 like model zoo **[6]**defaultpredicto,get_cfg,visualizeand metadatacatlog.

Detectron2 is constructed utilizing PyTorch which has considerably more dynamic network now to the degree of contending with TensorFlow itself. Likewise the arrangement guidelines are a lot simpler in addition to an exceptionally simple to utilize API to remove scoring results.

3.1 Object Detection:

Object detection mechanization has seen a rapid assumption rate in various and multiple industries. It encourages self-driving vehicles securely haggle through traffic, spots vicious conduct in a blocked spot, helps sports groups examine and fabricate exploring reports, guarantees legitimate quality intensity of parts in assembling, in addition to other things. And these are just roughen the area of what object detection can do.

Item discovery is one of the famous errand in PC vision [5]. They have a wide scope of utilization here article recognition distinguishes the item just as its area in an image [6]

For the most part we came to here about object tracking .In usefulness wise both the article following and item location are comparative. These two undertakings include recognizing the item and its area yet the main contrast between them is the kind of information that you are utilizing. Article discovery manages pictures though object following arrangements with video for this we have utilized faster R-CNN [6][10] which burns-through almost 25 seconds for every content picture and is throughout multiple times faster than R-CNN.

Faster R-CNN restore the exterior region proposal algorithm by the region proposal network for object detection.

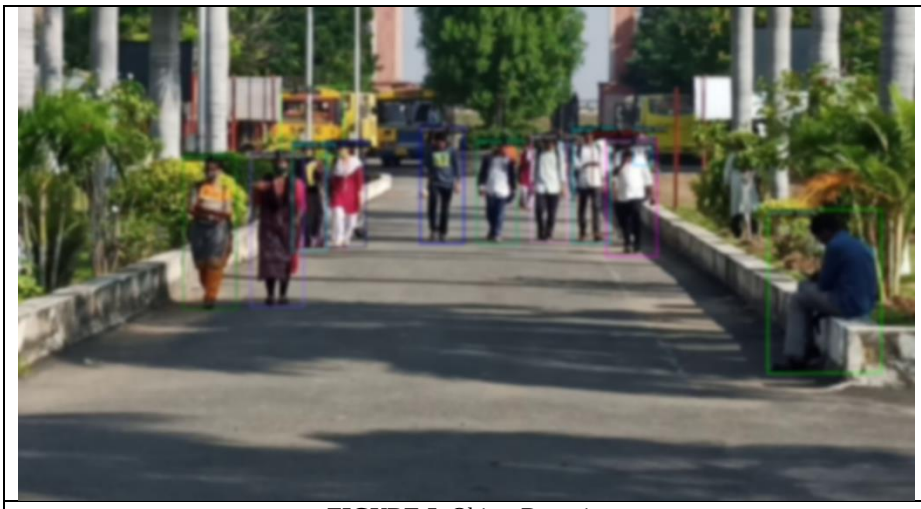

FIGURE 5. Object Detection

3.2 Instance segmentation:

There are various procedures that are utilized in pc vision tasks. Where some of them included with classification, semantic segmentation, object detection, and instance segmentation. Portrayal uncovers to us that the picture has a place with a specific class. It doesn't consider the itemized pixel level structure of the picture. It comprises of making a forecast for entire information. Semantic segmentation makes thick forecasts gathering marks for every pixel so every pixel in the concept is named with the class of its encaging object. **Object detection** gives the classes as well as show the spatial area of those classes. It considers the covering of items. **Instance segmentation** assimilates ID of limits of the articles at the point by point pixel level.

Instance segmentation is a group of image segmentation which recognizes each instance of each object within the image at picture [5]. This instance segmentation is acquired by using mask-R-CNN which means in each frame for each object or a person it will be masked with different colors [7]

FIGURE 6. Instant Segmentation

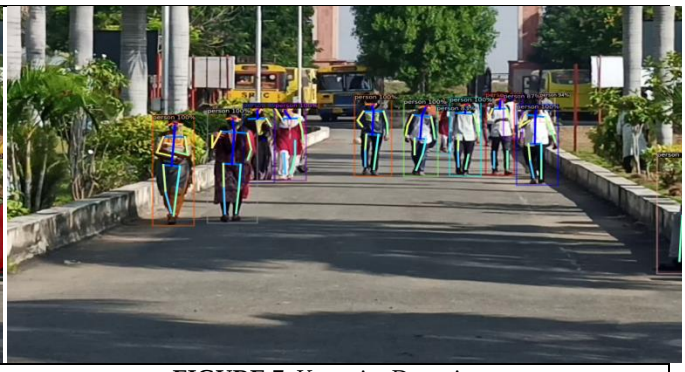

FIGURE 7. Keypoint Detection

3.3 Key point detection:

Key point detection includes all the while identifying individuals and restricting their key points by utilizing key point R-CNN .key points are they same thing as interest focuses. They are spatial areas, or focuses in the picture that characterize what is fascinating or what hang out in the picture. They are invariant to picture pivot, shrinkage, interpretation, contortion, thus on. This key point identification is utilized to show the stance of an individual.

4. Experimental Results

In this we have used different number of frames in each frame bounding box will be tracked. Once the bounding box is created we need to find the distance between the people for that case we are importing distance by using the Euclidian distance [8] between the people by using their midpoints.

Once we have the distance then we need to find the closest people i.e., who are close to each other. The people whose distance is less than the minimum distance are considered as the closest people, once the closest people are detected then it will be changing this bounding box color to red saying that they are not maintaining the safe distance. By using list directory we need to retrieve the frames and the frames are going to get would be in unordered list, Hence we need to sort the frames to get the frames in an sorted order.

FIGURE 8. Original Input Video

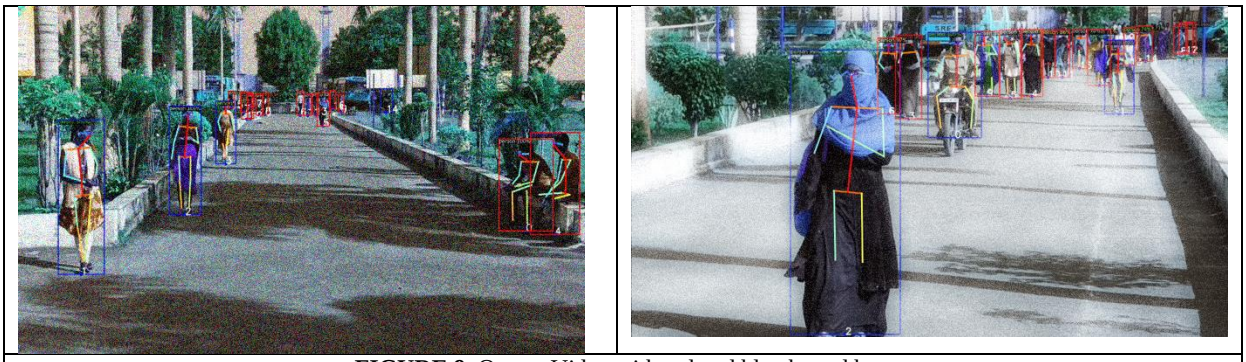

FIGURE 9. Output Video with red and blue bound box

5. Conclusion

Finally we need to conclude by saying that how we can object the closet people. That is object detection will be applied on each and every frame of a video that will be turned into an object tracking problem.

As a video is a group of a fast operating frames object tracking recognized an object and its location on each and every frames of a video. And finally we hope this might be helpful to examine the gesture of people and aware them before the situation turns into serious.

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