Smart Monitoring System For Physical Distancing using Deep Learning

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ABSTRACT

In the fight against COVID-19, physical distancing has proven to be the most effective way to reduce the speed of the spread of the contagious disease. People are being asked to prevent contact with each other, which reduces the chances of infection that are transmitted by physical or close contact. In the past too AI / Advanced Learning has shown promising results in a number of problems of daily life. In this project we had implemented a detailed description of how we can use Python, Computer Vision, Deep learning to monitor distancing at social places and places of work. Ensuring the process of physical distancing in public spaces and workplaces, a tool that can check if people keep a safe distance from each other by analyzing video streams from the camera, videos, CCTV footages, Monitoring people in the workplace, in factories, in stores we can include this tool in its security camera systems and can be careful if people keep a safe distance from each other otherwise or not.

Keywords **– COVID-19, Economy, vaccine, response**

I. Introduction

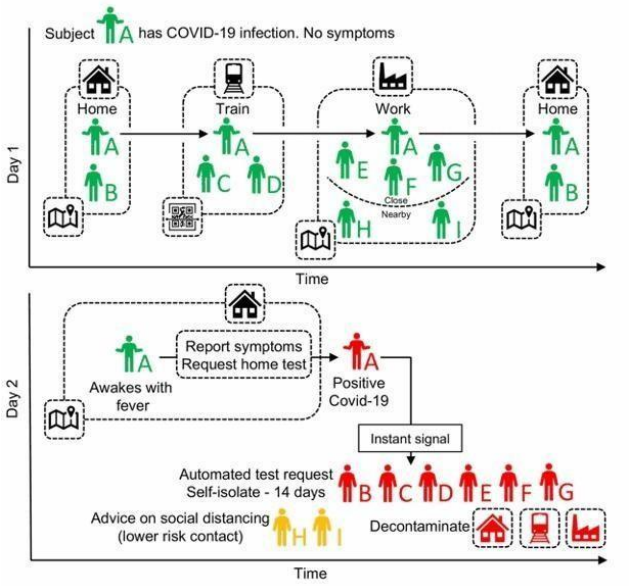
Physical Distancing - a term that took the world by storm and changed the way we live. Social segregation has become a global phenomenon, transcending languages, and cultures. This way of life has been forced on us by the fastest growing pandemic the world has ever seen - COVID-19. The World Health Organization (WHO) has declared Covid-19 as a pandemic due to an increase in the number of reported cases around the world [1]. According to the World Health Organization (WHO), COVID-19 has so far infected nearly 4 million people and claimed more than 230K lives worldwide. About 213 countries are affected by the deadly virus so far. A major cause for concern is that COVID-19 is transmitted from person to person through contact or close contact with an infected person. Given some densely populated areas, this has been a real challenge.

The only way to prevent the spread of COVID-19 is Social Distancing. Keeping a safe distance from each other it is the last way to prevent the spread of the disease[2]. . In Malaysia, the Malaysia Department of Health (MOHM), has recommended several ways to prevent sexually transmitted infections from places like workplaces, individuals, and families at home, in schools, child care centers, and high-rise accommodation [3]

So this made us think -We want to build a tool that can find out where each person is in real - time, and then return the bounding box that turns red if the distance between two people is too close and green at safe distance.

II. LITERATURE SURVEY

Following the outbreak of the COVID-19 epidemic in late December 2019, social isolation is considered a reliable practice to prevent the transmission of an infectious virus and was selected as a common practice on January 23, 2020 (B. News, 2020). In one month, the number of cases rises differently, with 2,000 to four new confirmed cases reported on the first week of February 2020. Later, there was a sign of release for the first time in five consecutive days until March 23, 2020, with no new confirmed cases of China, 2020). This is due to a social distance practice that started in China and, eventually, was universally accepted to control COVID-19. Ainslie et al. (2020) investigated the relationship between the economic situation in the region and the strength of social distancing. Studies have shown that moderate levels of exercise can be allowed to avoid major outbreaks. To date, many countries have used technology-based solutions to overcome the epidemic. Many developed countries use GPS technology to monitor the movements of infected and suspected individuals. Nguyen et al. (2020) provide research on a variety of emerging technologies, including Wi-fi, Bluetooth, smartphones, and GPS, location (localization), computer vision, and in-depth learning that can play an important role in some useful social media situations. Some researchers use drones and other surveillance cameras to detect masses.

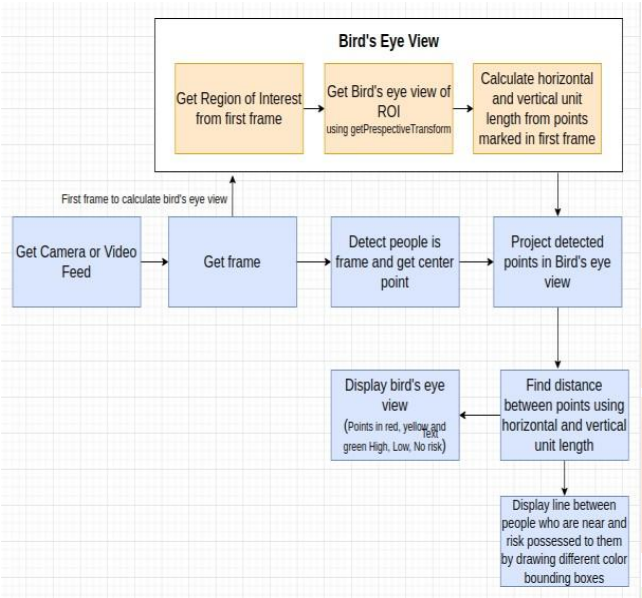


Social Distancing contact tracing

To date researchers have done a lot of diagnostic work (Yash Chaudhary & Mehta, 2020), and others are providing an intelligent health care program using the Internet of Things (Chakraborty, 2021; Chakraborty , 2021). studied the effects of social exclusion on the prevalence of COVID-19 outbreaks. Studies suggest that early and early social exclusion may slightly reduce the risk of infection. As we all know, while social segregation is important in curbing the curve of infection, it is an unfortunate step for the economy. In Adolph, Amano, Bang- Jensen, Fullman, and Wilkerson (2020), Adolph et al. highlighted the situation in the United States of America during the epidemic. Due to the lack of general support by decision makers, it was not used at first, it started to harm public health. However, social segregation has had an impact on economic productivity; however, many scholars sought other ways to overcome the loss.

III. METHODOLOGY

This smart monitoring tool is designed to determine the level of safety between people in public places. An in-depth approach to computer viewing techniques is used in this project. At first, an open-source object detection based on the OpenCV [13] and YOLO algorithm was used to find a person on video stand as shown in figure



Initially, an open-source discovery network was used based on the OpenCV [6]algorithm to locate a person on a video frames. From the findings, the only people category was used and other categories of items are not considered in this application. Therefore, the binding box that fits best with individual people can be found in the image, and the people information obtained will be used to measure distance.

With the camera setup, the camera [4] is held at a constant angle as a video frame, and the video frame is treated as a viewing angle converted into two-dimensional views at the top for a more accurate measurement of distance range. In this approach, it is thought that people in the video frame travel on the same flat plane. Four designated flight points are selected from the frame and converted into a vertical view. Each people's area can be estimated based on the top- down view. The distance between people can be measured. Depending on the pre-determined distance, any distance below the acceptable distance between any two persons shall be indicated by red lines that serve as warning signs. The work is done using the Python programming language.

Top Applications of Deep Learning

1. News Aggregation and Fraud News Detection
2. Virtual Assistants
3. Visual Recognition
4. Healthcare
5. Detecting Developmental Delay in Children
6. Colourisation of Black and White images
7. Adding sounds to silent movies
8. Automatic Handwriting Generation
9. Automatic Game Playing
10. Pixel Restoration
11. Photo Descriptions

Hardware Requirements

1. CCD Camera
2. PC/Laptops

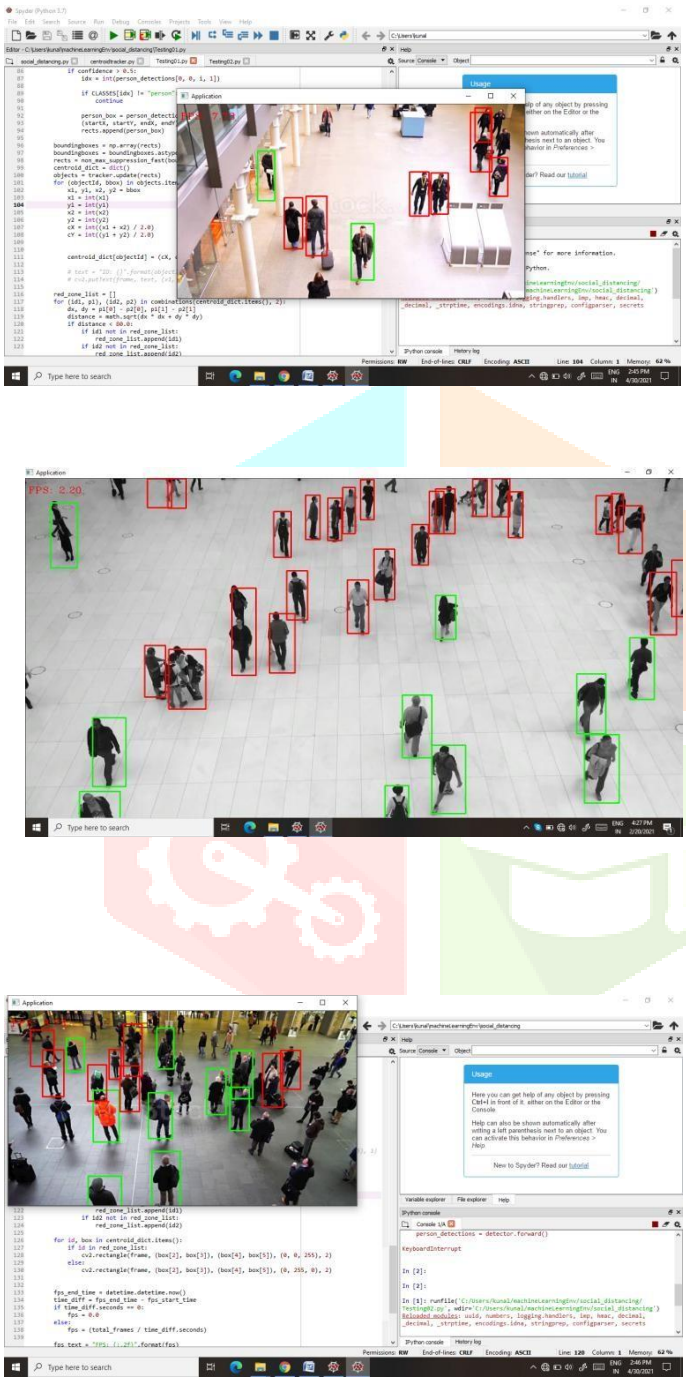
Software Requirements:

1. Anaconda3
2. Mp4 video of people
3. Python libraries.

IV. Implementation

After executing the program you will able to see the pedestrians and draw a binding box each pedestrian. Find people in the video and get the bounding box details. Now we have bounding box for person in the frame. We need to estimate person location in frame. i.e we can take bottom center point of bounding box as person location in frame. Then we estimate (x,y) location in top view by applying transformation to the bottom center point of each person's bounding box, resulting in their position in the top view. To calculate bottom center point for all bounding boxes and projecting those points in top view. Last step is to compute the top

view distance between every Two people (Point) and scale the distances by the scaling factor in horizontal and vertical direction estimated from Readings obtained.



Output image of Project

A. People Detection

The deep CNN model was a proposed object detection method that reduced complex computer complexity by creating detection with

a single retrospective problem [11]. When it comes to in-depth learning-based acquisitions, the YOLO model is regarded as one of the state- of-the-art technology that can be shown to offer great speed benefits that will suit a real- time application.. The YOLO algorithm was considered as an objection detection taking the given input image and simultaneously reads the links of the interlocking box . YOLO trained in the COCO database with 80 labels including classes for people or pedestrians. In this function, only the linking box, object confidence and pedestrian item category from finding the result in the YOLO model was used for pedestrian detection.

B. Camera view ratings

Image region (ROI) of the image is focused on the footpath was turned upside down 2D view containing 480 × 480 pixels .Camera view measurement works working to apply the view finder modification to looking up. In OpenCV, a change of view is an easy way to measure an inclusive camera selecting four points in view view and map them in the rectangular corners in 2D image view.Therefore, everyone is thought to be standing the same flat plane Real distance between pedestrians corresponds to the number of pixels in the top to bottom view estimated.

C. Distance measurement

At this point of the pipe, the end point individual box (x, y, w, h) in view view is approx found and converted into a superficial view. For one thing pedestrians, position in top and bottom views is limited based on the center point of the binding box. The the distance between all pedestrians can be calculated from top views and distances are rated a limited feature from the camera view rating. Given position of two pedestrians in the image as (x_1, y_2) and (x_1, y_2) respectively, the distance between two pedestrians, d, can be computed as:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad (1)$$

Pedestrians have a minimum distance acceptable range, t, is marked in red, and the rest is marked green. The red line also draws between pairs of people whose distance is less than previously described the limit. Operation of

the binding box threshold, c, can be defined as:

$$c = \begin{cases} red & d<t \\ green & d \geq t \end{cases} \quad (2)$$

Requirements

OpenCV-python 3.4.2

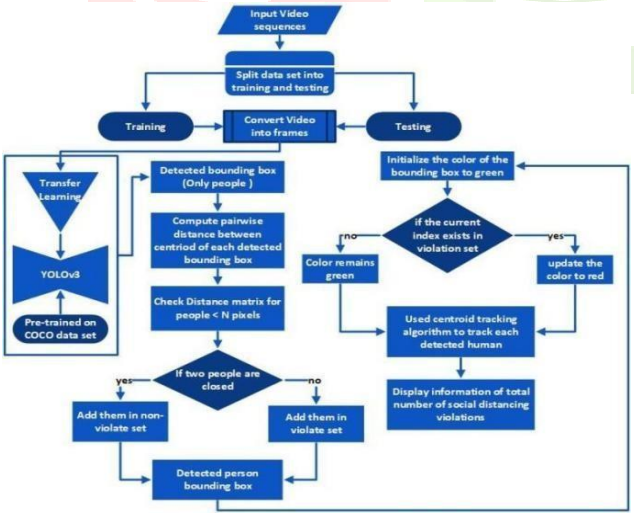
imutils 0.5.3

To install the above modules type the command below in the terminal.

install pip moudle_name

RESULTS AND DISCUSSION

This video shows people walking on a public street. In this function, the video frame is set in the specified corner of the file the road. Views of video frame ideas are we have turned it upside down to be more precise distance measurement. The figure shows the file for social deployment discovery and video effects and results in top view. Sequences are shown from top to bottom below.



The points represent each social distancing fraud detection. Red points represent people whose distance from other people's is less than the acceptable limit and green points represented people who keep a safe distance from other people. However, there are many detection errors shown in Figure. These errors may be due to people who walk very close to one another who walk until they see attached to the camera view.

V. CONCLUSION AND FUTURE ACTIVITIES

A tool for detecting social deviations using a deep learning model is proposed. Using computer vision, the distance between people can be measured and any people who do not obey the law will be shown in red Frames and red lines. The proposed approach was confirmed using a video showing peoples walking down the street. The visual results showed that the proposed approach is It can determine how society divides people who can be further developed for use else where environments such as office, restaurant, and school. Also, the work can be improved by progress algorithm for finding peoples, includes other acquisitions techniques such as the discovery of a mask with the human body finding the temperature, improves the computer's power of the hardware, and measuring camera view views.

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