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SOCIAL DISTANCING USING COMPUTER VISION AND DEEP LEARNING

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ABSTRACT

Social distancing has proven to be an effective measure to hamper the spread of the disease. The system presented is for analyzing social distancing by calculating the distance between people in order to slow down the spread of the virus. This system utilizes input from video frames to figure out the distance between individuals to alleviate the effect of this pandemic. This is done by evaluating a video feed obtained by a surveillance camera. The video is calibrated into bird's view and fed as an input to the YOLOv3 model which is an already trained object detection model. The YOLOv3 model is trained using the Common Object in Context (COCO). The proposed system was corroborated on a pre-filmed video. The results and outcomes obtained by the system show that evaluation of the distance between multiple individuals and determining if rules are violated or not. If the distance is less than the minimum threshold value, the individuals are represented by a red bounding box, if not then it is represented by a green bounding box. This system can be further developed to detect social distancing in real-time applications.

I.INTRODUCTION

The World Health Organization has claimed the spread of coronavirus as a global pandemic because of the increment in the expansion of coronavirus patients detailed over the world. To hamper the pandemic, numerous nations have imposed strict curfews and lockdowns where the public authority authorized that the residents stay safe in their home during this pandemic. Various healthcare organizations needed to clarify that the best method to hinder the spread of the virus is by distancing themselves from others and by reducing close contact. To flatten the curve and to help the healthcare system on this pandemic.

To contemplate data-driven models and numerical models which are consistently the most favored decision. In the fight against the

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coronavirus, social distancing has proven to be an effective measure to hamper the spread of the disease. As the name suggests, it implies that people are suggested that they should maintain physical distance from one another, reduce close contact, and thereby reduce the spread of coronavirus.

The system to be developed aims to promote social distancing by providing an analyzer tool to monitor public areas, workplaces, schools, and colleges to analyze and detect any social distance violation and to generate warnings. This is done using a computer vision and deep learning model. Computer vision alongside image processing, machine learning, and deep learning provide effective solutions to measure social distancing among humans across the moving frames. Computer vision extracts information from the input images and videos to possess a correct understanding of them to predict the visual input just like the human brain. To achieve the above objective, objects are detected in real-time using YOLO (You only look once), an algorithm supported convolutional neural networks which are employed for the detection & determine the distancing between the human using clusters of pedestrians during a neighborhood by grabbing the feed from a video.

II.LITERATURE REVIEW

1. Social Distancing Detection Using Computer Vision,Juhi Shah; Mahavir Chandaliya; Harsh Bhuta; Pratik Kanani,Covid-19 is a highly contagious disease that is caused by a new coronavirus called the SARS-CoV-2. To control the spread of this disease it is imperative to maintain distance between people because it can’t be possible to know at all times if a person is infected or not. Social distancing while maintaining a minimum 6-ft distance is recommended by WHO. The project aims at using Artificial Intelligence enforcing this social distancing in public places by constantly monitoring the distance between people by a video feed and alerting the responsible person so as the required actions can be taken. This video feed can be very easily collected by pre-existing infrastructure across the public places such as CCTV Cameras. This would allow us to constantly check the distance between any two individuals in the public place. The scalability of this solution is very high, as cameras are installed at almost all public places.

2. Visual Social Distance Alert System Using Computer Vision & Deep Learning,Sheshang Degadwala; Dhairya Vyas; Harsh Dave; Arpana Mahajan,One of the principles and best measures to contain the ongoing viral episode is the support of the alleged social distancing (SD). To agree to

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this limitation, governments are receiving limitations over the base between close to home separation between individuals. Given this real situation, it is critical to enormously gauge the consistence to such physical requirement in our life, so as to make sense of the purposes behind the potential breaks of such separation impediments and comprehend if this suggests a likely danger. To this end, the proposed research work presents the Video Social Distancing issue, characterized as the programmed assessment of the between close to home good ways from a picture, and the portrayal of related individuals' conglomerations. Video Social Distancing is significant for a non-obtrusive investigation of whether individuals follow the Social Distancing limitation, and to give insights about the degree of security of explicit territories at whatever point this imperative is abused. It has been first viewed that, estimating Video Social Distancing isn't just a mathematical issue, however it additionally infers a more profound comprehension of the social conduct in the scene. The point is to genuinely identify possibly risky circumstances while keeping away from bogus alerts (e.g., a family with youngsters or family members, a senior with their guardians), the entirety of this by following current security strategies. At that point, the proposed research work will discuss about how video social distancing is related with past writing in social signal processing and show a way to investigate new computer vision techniques that can give an answer for such issue. This paper is concluded with future moves that are identified with the viability of video social distancing frameworks, moral ramifications and future application situations.

III.MOTIVATION

The motive for a social distancing project using computer vision and deep learning is to address the critical need for public health and safety during infectious disease outbreaks, such as the COVID19 pandemic or future similar situations. By leveraging advanced technologies like computer vision and deep learning, this project aims to help monitor and enforce social distancing measures in various public settings.

IV.PRIOR WORKS

The below mentioned works are unoptimized versions. Most of these works used open CV This section features and highlights some works related to object detection and person detection using deep learning. A heft of work recently focused on the classification of objects and detecting them involving deep learning are also discussed. Detection of humans done using computer vision is considered as a part of object detection. The detected objects are localized and classified based on their shape with the help of a predefined model.

The social distancing analyzer tool was developed using computer vision, deep learning, and python to detect the interval between people to maintain safety. The YOLOv3 model based on convolution neural networks, computer vision, and deep learning algorithms is employed in the development of this work. Initially, for detection of the people in the image or frame YOLOv3 is used, an object detection network based on the YOLOv3 algorithm was used.

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V.OUR APPROACH

1) Model used in our work is person-detection0202, This is a person detector that is based on MobileNetV2 backbone with two SSD heads from 1/16 and 1/8 scale feature maps and clustered prior boxes for 512x512 resolution. Downloaded from Intel OpenVINO toolkit pretrained models. 2)check the FPS of the video on the left top corner and the number of violations in the bottom, Social distance is measured between people who are close to each other and a red line is drawn in between these people, if the distance between the people is lessthan the threshold distance then number of violations would be increased and when two or more people detected at a time in a frame less than the threshold distance then each pair would be taken into count so, there might be an increase in repetitive count of number of violations only in this case .As OpenVINO toolkit is used the FPS of the video has increased 8 times when compared with the model that has not used OpenVINO.

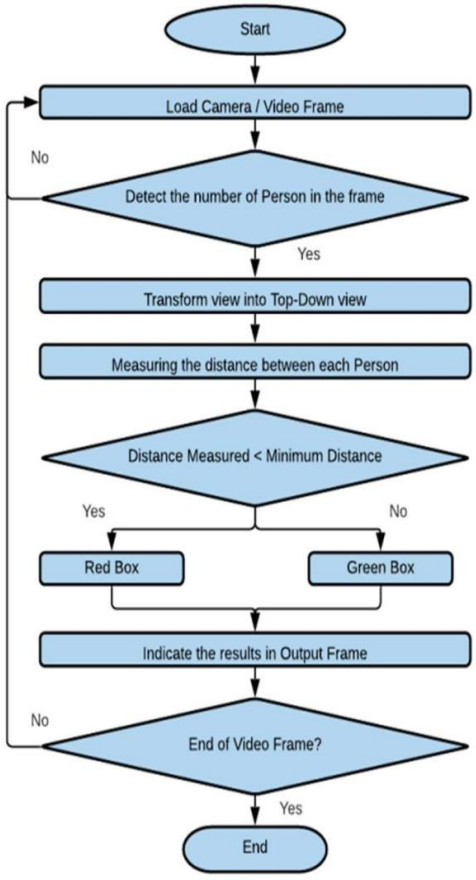

Fig-1.0 Flow Chart

VI.RESULTS :

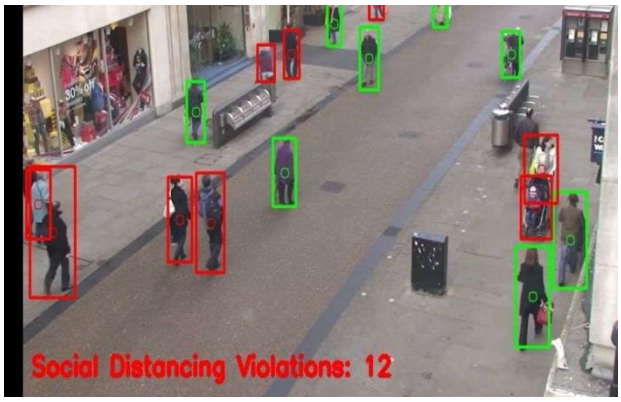

Fig-2.0 Unoptimized Version(without OpenVINO)

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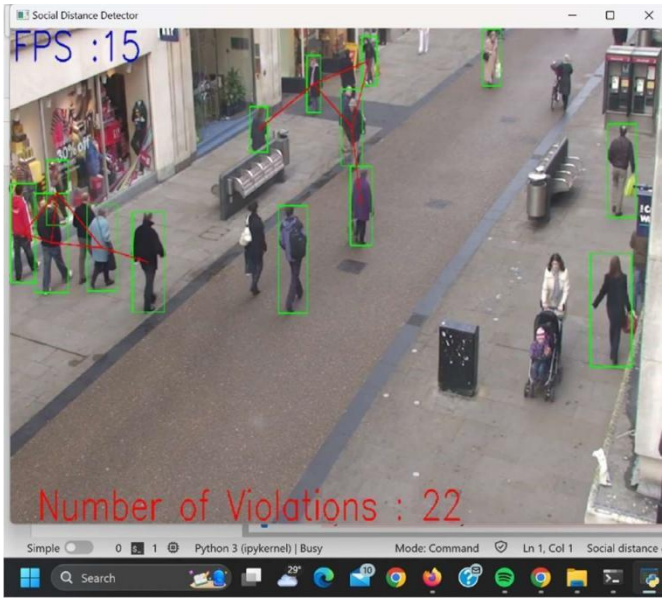

Fig-3.0
Optimized Version(using openVINO)

VII.CONCLUSION

In conclusion, the implementation of social distancing using computer vision and deep learning represents a significant step towards mitigating the spread of infectious diseases in crowded environments. By leveraging advanced technologies to monitor and enforce social distancing measures, this project offers a proactive approach to public health and safety. Through real-time analysis of video feeds and intelligent algorithms, the system can accurately detect and alert individuals who are not adhering to recommended social distancing guidelines, thereby reducing the risk of virus transmission.

Moreover, the successful development and deployment of this project demonstrate the potential of technology to address pressing societal challenges, particularly in times of crisis. By harnessing the power of computer vision and deep learning, governments, businesses, and communities can enhance their capacity to respond effectively to public health emergencies and safeguard the well-being of their constituents.

VIII.FUTURE SCOPE

Looking ahead, there are several avenues for further research and development in the field of social distancing using computer vision and deep learning. One potential area of expansion is the integration of additional sensors and data sources to enhance the accuracy and reliability of the system. Incorporating data from wearable devices or IoT sensors, for example, could provide complementary information for monitoring social distancing in various settings.

Furthermore, there is room for refinement and optimization of algorithms to improve detection capabilities and reduce false positives. Fine-tuning the models through continued training on diverse datasets and incorporating feedback mechanisms could lead to more robust and adaptable solutions.

Additionally, exploring the application of this technology beyond the context of infectious disease control is another promising avenue for

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future research. For instance, the same principles could be applied to monitor and manage crowd density in public spaces or optimize traffic flow in urban environments.

Overall, the project lays a foundation for ongoing innovation and collaboration in leveraging computer vision and deep learning for public health and safety applications, with potential implications for diverse domains beyond social distancing.

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