Physical Distance Detection Using Deep Learning: A Review

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Abstract: - In order to lessen the effects of this coronavirus, the research provides a mechanism for Physical distance identification using deep learning. Pandemic. By analyzing a video feed, the detecting tool was created to warn individuals to keep a safe distance from one another. The open-source object detection pretrained model based on the YOLOv3 method was used to detect pedestrians using the video frame from the camera as input. Later, a top-down perspective of the video frame was added to estimate distances from the 2D plane. It is possible to estimate the distance between individuals, and any non-compliant pair of individuals in the display will be denoted by a red frame and red line. A recorded video of people crossing the street was used to validate the proposed method. The outcome demonstrates that the suggested method is capable of identifying the physical distances between various characters in the video. The developed method can be improved and used as a real-time detection tool.

Key Words: - ***Pedestrian detection, Physical distance, Deep learning, Convolutional neural network.***

I. INTRODUCTION

The vaccine that can effectively treat Covid-19 has not yet been developed, and the globe has not yet fully recovered from this epidemic. However, numerous governments have permitted a restricted number of economic activities to resume once the number of new cases of Covid-10 has decreased below a particular level in an effort to lessen the pandemic's impact on the nation's economy. Concerns about workplace safety in the new post-Covid-19 climate have surfaced as these countries cautiously resume their economic operations. People are encouraged to keep a distance of at least 1 metre between each other and refrain from any personto-person contact, such as shaking hands, to lessen the risk of infection.

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A number of disease preventive strategies have been suggested by Malaysia's Ministry of Health (MOHM) for use in offices, homes, schools, child care centres, and senior living institutions [3]. Implementing social distancing strategies, increasing physical distance between coworkers at the workplace, staggering work schedules, reducing social interactions at the office, avoiding large work-related gatherings, avoiding unnecessary business travel, conducting routine health checks on staff and visitors entering buildings, reducing physical activity, especially for organisations with staff in the high-risk category, and conducting compa.

A community is made up of individuals, groups, businesses, and healthcare institutions, and it is up to them to control the spread of the Covid-19 disease. The most efficient techniques to stop the spread of illnesses after resuming economic activity have been determined to be social isolation and self-isolation in decreasing the effects of this coronavirus pandemic. In fact, it has been noted that a large number of people disobey public health regulations, particularly those pertaining to social isolation. It is understandable that people occasionally forget to put physical
distancing into practice due to their excitement about getting back to work.

II. LITERATURE SURVEY

A.Kaiming He, Xiangyu Zhang, Shaoqing Ren, Jian Sun: Training more complex neural networks is more challenging. We offer a residual learning framework to make it simpler to train networks that are much deeper than those previously employed. Instead of learning unreferenced functions, we deliberately reformulate the layers to learn residual functions with reference to the layer inputs. We offer in-depth empirical proof that these residual networks are simpler to optimize and can improve accuracy over far more depth. On the ImageNet dataset, we test residual nets up to 152 layers deep, which is 8 layers deeper than VGG nets [40] but still less complex. On the ImageNet test set, an ensemble of these residual nets produces an error of 3.57 percent. This outcome took first place in the 2015 ILSVRC classification task. We also discuss CIFAR-10 analysis with 100 and 1000 layers. For many visual recognition tasks, the depth of representations is crucial. On the COCO object detection dataset, we achieve a 28 percent relative improvement only as a result of our incredibly deep representations. Our submissions to the ILSVRC COCO 2015 competitions1 were built on deep residual nets, and we also placed first on the tasks of ImageNet detection, ImageNet localization, COCO detection, and COCO segmentation.

Mohd Ezanee Rusli, Salman Yussof, Mohammad Ali, Ahmed Abdullah Abobakr Hassan: Due to the COVID-19 epidemic, society must accept and adapt new norms, which include using social distance to stop the spread of the disease. People can be regularly watched and reminded to follow this habit with the aid of a smart physical distance application or tracker. Due to the high level of physical distance compliance, this application will directly result in a lesser or minimum number of COVID-19 instances. This paper will introduce a novel approach termed MySD, short for "My Safe Distance," which enables users or the general public to closely adhere to physical distance recommendations. In order to establish a safe distance and the required level of compliance, it makes use of the hardware capabilities of smartphones, which typically include a Bluetooth transceiver and GPS.

Sonja Georgievska, Philip Rutten, Jan Amoraal, Elena Ranguelova, Rena Bakhshi, Ben L. de Vries, Michael Lees, Sander Klous: We address the issue of spotting extremely high crowd densities in scenarios like indoor dance events. By anonymous, non-participatory indoor Wi-Fi localization of smart phones, we provide a novel approach to measuring crowd density. We address three issues using a statistical mechanics-inspired probabilistic model using only big data analytics: 1) The ambiguity of Wi-Fi-based indoor positioning, which manifests whether the latter is carried out using machine learning or with optimization, 2) The randomization of MAC addresses when a device is not connected, and 3) The instability of packet interarrival times. The main finding is that as the crowd size rises, our estimation becomes more—rather than less—accurate. The ability to detect dangerous crowd density depends on this characteristic.

Elizabeth B. Varghese, Sabu M. Thampi: In this paper, we offer a deep learning framework for combining data from several sensor modalities while accounting for the spatial features required to control illumination variation and occlusion of video data. By applying a pre-trained deep framework and linked components in graph theory to recognize the presence of social groups as graphs from the fused data, physical distance compliance breaches are alerted. Using the socio-psychological theory of Friends-formation, a cost function is developed for physical group graph clustering in order to find FCGs. The proposed method successfully analyses the potential risk of pandemic spread in an area by the calculation of violation scores and rate of violations, as demonstrated by experiment analysis on four benchmark datasets.

Rosario Fedele, Massimo Merenda: This study's goal is to present an IoT system that uses an IoT-WSN and algorithms (Neural Network, NN, and Shortest Path Finding) that can identify alarms, accessible exits, assembly points, the safest and shortest paths, and overcrowding from real-time data collected by sensors and cameras utilizing computer vision. A web platform and Near Field Communication (NFC) technology are then used to transmit this information to mobile devices. The findings, which are based on two distinct case studies (emergency and monitoring), demonstrate that the system can offer tailored solutions and deal with various situations, and that this is true even in the event of a connectivity outage.

Sergio Saponara, Abdussalam Elhanash, Alessio Gagliardi: In support of this idea, this research suggests a synthetic intelligence system for classifying people according to their physical distance using thermal images. A novel deep learning detection technique is created for detecting and tracking people in both indoor and outdoor scenarios by utilizing the YOLOv2 ,(you look at once) approach. Additionally, an algorithm is used to measure and categories distances between people as well as to automatically determine whether or not physical distance rules are being followed. Therefore, the purpose of this study is

to determine whether and how individuals adhere to physical distance rules in order to reduce the spread of the COVID-19 virus. The suggested method is used to create a comprehensive AI system for people tracking, physical distance classification, and body temperature monitoring using images captured by thermal cameras.

G. Ji-hun Won, Dong-hyun Lee, Kyung-min Lee, Chi-ho Lin: We suggested a better YOLOv3-based neural network for de-identification technology in this paper. The current YOLOv3 network has a high speed. and recent performance. The majority of CCD surveillance systems store images from cameras deployed in several locations simultaneously. The application of deep learning in such a setting necessitates a technique for object detection in multiple images using a single inference engine. The price of constructing a surveillance system rises noticeably if the inference engine hardware is utilised for each camera channel. Therefore, even though the detection performance is slightly reduced, a network topology with a fast detection speed is needed in the field of surveillance systems.

H. Liquan Zhao, Shuaiyang Li: One of the most popular deep learning-based object detection techniques is called "You Only Look Once" (YOLOv3). The anticipated bounding boxes' initial width and height are estimated using the k-means clustering technique. This method is time-consuming to process large-scale datasets because the estimated width and height are sensitive to the initial cluster centers. A novel cluster method has been developed to estimate the initial width and height of the predicted bounding boxes in order to solve these issues. First, it separates the width and height of the ground truth boxes into a single initial cluster center by randomly choosing a few width and height values. Second, it builds Markov chains depending on the chosen beginning cluster, using each Markov chain's final points as the other initial centers. The distance between the chosen initial clusters and each candidate point is calculated during the construction of Markov chains using the intersection-over union method rather than the square root method. The cluster center can be continuously updated using this method with each new set of width and height values, which represent only a subset of the data taken from the datasets. In terms of recall, mean average precision, and F1-score, our suggested method outperforms the YOLOv3 method.

Vinay Chamola, Vikas Hassija, Vatsal Gupta, Mohsen Guizani: Worldwide, the number of laboratory-confirmed coronavirus cases has been rising alarmingly, with over 2.2 million cases officially verified as of April 20, 2020. Since the COVID19 outbreak, there have been several false claims, inaccurate information, and unwarranted concerns about coronavirus that have only served to exacerbate these problems. In response to such actions, we give a thorough overview of all the key elements related to the COVID-19
pandemic, drawing on numerous trustworthy sources. This report emphasizes the COVID-19 outbreak's effects on the global economy in addition to the immediate health consequences. As we come to a close, we consider how the COVID-19 outbreak might be impacted by technologies like the Internet of Things (IoT), Unmanned Aerial Vehicles (UAVs), blockchain, Artificial Intelligence (AI), and 5G, among others.

J. Rodrigo Amaral, Artur Ventura, Saulo Carvalho: Through the use of electronic, control, and software, the Advanced Driver Assistance System (ADAS) features found in modern vehicles improve traffic, provide comfort for drivers, and protect pedestrians and the environment. One of the technologies used in ADAS features that can be mounted in front of the vehicle is a digital camera. In order to calculate the distance between the car and an object or point in front, the camera captures video and images in real time. Some systems based on video processing need to know how far away the ego car is from the target vehicle, as well as how far away pedestrians and traffic signs are. This desire is provided by the Inverse Perspective Mapping (IPM) technique, which creates new picture coordinates in real-time while correcting perspective-related image distortions. The IPM and implementation of a function to determine the distance from an object while eliminating the perspective effect in the HSV colormap are presented in this paper. The IPM method has been tested in a vehicle that is parked underneath a road to ensure that it is applicable.

III. EXISTING SYSTEM

3.1 Existing System and issues

The study proposes a way for measuring social distance between individuals using deep learning in order to lessen the effects of the coronavirus epidemic. By analyzing a video feed, the detecting tool is being created and will warn individuals to keep a safe distance from one another. The open-source object detection pre-trained model based on the YOLOv3 method is use to detect pedestrians using the video frame from the camera as input. Negative comments: There are a few detection errors as well, which may be the result of one pedestrian walking too

close to another until they are overlaid on the camera view. The pedestrian detection algorithm also has an impact on how precisely pedestrian distances are measured.

IV. CONCLUSION

A deep learning model-based methodology for physical distance identification is suggested. The distance between people can be calculated using computer vision, and any noncompliant pair of persons will be marked with a red frame and a red line. A video of people walking down a street was used to validate the suggested strategy. The visualization findings demonstrated that the suggested method can identify social distances between individuals and that it has potential for use in different environments, including offices, restaurants, and schools. Additionally, by enhancing the pedestrian detection algorithm.

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