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Social Distancing Detection using Deep Learning Algorithm

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Abstract

To prevent the spreading of COVID, the only way is social distancing. Nowadays, AI teams create social distancing tools using computer vision concepts. This project proposed a methodology to find social distance with the help of deep learning to evaluate the distance between people for mitigating the impact of the coronavirus pandemic. The detection tool was developed to notify people to keep a safe safety distance from each other through the evaluation of a video input feed. The video frame from the 'mp4' file was given as input, and an object detection pre-trained model based on the YOLOv3 algorithm was applied for pedestrian detection. Then, the video frame was converted into a top-down view to measure the distance from the 2D plane. The distance among people was estimated and any non-compliant pair of people in the display is indicated with a red frame and red line. The proposed method was validated on pre-recorded video of pedestrians walking on the street. The output result verified that the proposed method can determine social distancing measures between people groups in the video. The developed technique may be further developed as a detection tool in real-time application. The project is designed using Python 3.5 with Open CV python 4.2.

Keywords: Social distance monitoring, Covid 19, human object detection.

1. Introduction

In Social Distancing Sensor, the weights of the YOLO v3 Object Discovery Algorithm and the COCO dataset are used which are fluently available online. Also, the main library being used will be the Open CV along with the Deep Neural Network (DNN) module. When the new coronavirus (Covid-19) epidemic emerges, the spread of the contagion has left public upkeep anxiety if they don't have an effective cure. The World Health Organization (WHO) has declared Covid-19 as an epidemic due to the increase in the number of cases reported around the world. To contain the epidemic, numerous countries have enforced a lockdown where the government executed that the citizens stay at home during this critical period. Public health bodies similar to the Centers for Disease Control and Prevention (CDC) had to make it clear that the most effective way to decelerate the spread of Covid-19 is by avoiding close contact with other people.

Citizens all throughout the world are practicing physical separation in order to calm the wind of the Covid-19 outbreak. During the counter blockade period, group conditioning and congregations such as travels, meetings, gatherings, shops, and begging were prohibited in order to apply social separation. People are encouraged to use phones and dispatch as much as possible to manage and conduct activities in order to reduce person-to-person contact. Persons are also being advised to practice hygienic measures such as frequently washing their hands, wearing a mask, and avoiding direct contact with sick people to help restrict the spread of the disease. Still, there's a difference between knowing what to do to minimize the spread of the disease and really doing it.

The globe has yet to fully recover from this epidemic, and a vaccine to adequately cure Covid-19 has yet to be developed. Nonetheless, in order to mitigate the epidemic's impact on the country's finances, various governments have permitted a limited number of profitable conditionings to proceed provided the number of new Covid-10 cases has decreased below a particular level. As these countries cautiously resume their profitable conditioning, enterprises have surfaced regarding plant safety in the new post-Covid-19 terrain. To reduce the possibility of infection, it's advised that people should avoid any person-to-person contact similar to shaking hands and they should maintain a distance of at least 1 cadence from each other. In Malaysia, the Ministry of Health Malaysia (MOHM) has recommended several complaint forestallment measures for workplaces, individualities, and families at home, seminaries, childcare centers, and elderly living installations.

These measures include enforcing social distancing measures, adding physical space between workers at the plant, stunning work schedules, dwindling social connections in the plant, limiting large work-related gatherings, limiting unnecessary work trips, performing regular health checks of staff and callers entering structures, reducing physical conditioning, especially for associations that have staff in the high- threat order, and conducting company events or conditioning online. Individualities, communities, businesses, and healthcare associations are all part of a community with their responsibility to alleviate the spread of the Covid-19 complaint. After restarting the lucrative conditioning, rehearsing social separation and tone-insulation have been suggested as the most successful approaches to break the chain of infections and reduce the effects of this coronavirus outbreak.

Many people have been witnessed neglecting public health standards, particularly when it comes to social distancing. It's understandable that, in their eagerness to get back to work, people sometimes overlook or overlook the perpetration of social alienation. Hence, this work aims to grease the enforcement of social distancing by furnishing automated discovery of social distance violations in workplaces and public areas using a deep literacy model. In the area of machine literacy and computer vision, there are different styles that can be used for object discovery. These styles can also be applied to descry the social distance between people.

2. Connected Works

2.1 Implementation of Mitigation Strategies for Local Covid-19 Communities

The COVID-19 Strategic Preparedness and Response Plan (SPRP) for 2021, as well as accompanying documents, are being released by WHO as a package aimed at guiding the coordinated action that we must take in public, indigenous, and global settings to overcome the ongoing challenges in the response to COVID-19, address injuries, and chart a course out of the epidemic. With the help of WHO, philanthropists and friends, and unknown trouble from the scientific community and the commercial sector, governmental authorities, and communities have accomplished a great deal. What we learned about contagion and our coordinated response in 2020 is applied to strategic behavior in the Strategic Preparedness and Reaction Plan 2021 (SPRP2021). This strategy builds on prior achievements while also focusing on new issues, such as the pitfalls of new types. As part of overall measures, the strategy examined the path we needed to take to successfully combat the COVID-19 outbreak, which included the safe, impartial, and efficient delivery of diagnostics and vaccines. The coronavirus epidemic has affected millions of people and resulted in a number of deaths. COVID-19 vaccines are being developed to protect humans. Vaccination is a crucial intervention for protecting populations from COVID-19, especially when used in conjunction with other relevant therapies. The epidemic has brought to light various difficulties with vaccine uptake around the world. Dealing with adult immunization and the lack of experience in managing it is a critical issue. Moreover, vaccine apprehension has risen gradually in over 90 nations since 2014. Globally, all governments must take steps to assess the scope and nature of the hesitation before promoting the approved COVID-19 vaccines. Too Important conflicting vaccine information, misinformation, and innuendo have the potential to influence people's opinions, knowledge, and willingness to embrace vaccination. Rumors can be spread through digital channels, but they can also be spread through conventional media and communities, from one person to another. Community feedback consistently demonstrates that owing to the influence. As leader of the global incident operation support platoon (IMST) structure, the UN Crisis Management Team (UNCMT), and as an author of the Access to COVID-19 Tools (ACT) Accelerator, WHO harnesses the world’s specialized and functional moxie to restate knowledge into coordinated action.

2.2 Implementation of Mitigation Strategies for Communities with Local Covid-19 Transmission

This document describes the pretensions, guiding principles, and strategies for community mitigation to reduce or help original COVID-19 transmission. Community mitigation conditioning is conduct that people and communities can take to decelerate the spread of a new contagion with epidemic eventuality. COVID-19 is a contagious complaint caused by a new coronavirus. Community mitigation conduct is especially important before a vaccine or remedial medicine becomes extensively available.

Because COVID-19 is largely transmittable and can be spread by people who don't know they have the complaint, the threat of transmission within a community can be delicate to determine. Until broad-scale testing is extensively enforced or we have a further comprehensive and precise measure of complaint burden, countries and communities should assume some community transmission or spread is being. Individualities need to follow healthy hygiene practices, stay at home when sick, practice physical distancing to lower the threat of complaint spread, and use a cloth face covering (with some exceptions) in community settings when physical distancing cannot be maintained. These universal preventives are applicable anyhow of the extent of mitigation demanded. The public's health must be protected at all costs. In order to combat COVID-19's proliferation, communities are addressing its financial, social, and secondary health consequences. State, original, ethical, and territorial officials are best deposited to identify the position of mitigation required. Mitigation strategies should be feasible, practicable, and ethical; they should be customized to the needs of each community and implemented in a way that minimizes COVID-19 morbidity and mortality while causing or worsening no other health issues. The following data provides a framework for countries and points to consider as they consider how to limit COVID-19 community transmission in the US. These behaviors should be chosen and maintained based on their magnitude.

2.3 Image net Classification with Deep Convolutional Neural Networks

In this paper [3] the authors use a deep convolutional neural network for classifying 1.1 million high-resolution images in the Image Net LSVRC-2010 contest into 900 different classes. Here in this test data, they tried to achieve a) top-1 and b) top-5 error rates with 37.5 and17.0, independently, which are better than the previous state-of-the-art methods. The given neural network, which has 50 million parameters with neurons, consists of 5 convolutional layers, some of which are also followed by maximum-pooling layers, also three completely connected layers with a final 1000- way of softmax. To make training brisk, we used on-saturating neurons and a veritably effective GPU perpetration of the complication operation. To reduce over fitting in the completely connected layers they employed a lately developed regularization system called " powerhouse" that proved to be veritably effective. They also gave a variant of this proposed model in the ILSVRC-2012 competition and tried to achieve a top-5 test error rate of 15.2, compared to 26.1 achieved by alternate entry. Research by Yann LeCun and colleagues was rejected by the leading computer vision conference four years ago because it used neural networks and hence provided no insight into how to create a vision system. At the time, leading computer vision researchers believed that a vision system needed to be meticulously hand-crafted utilizing a thorough grasp of the task. They anticipated that just presenting exemplifications of photos and the names of the objects they contained to a neural network that gained the whole knowledge based on this training data would not solve the problem of categorizing objects in real photographs.

What numerous in the visual exploration community failed to appreciate was that styles that bear careful hand-engineering by a programmer who understands the sphere don't gauge as well as styles that replace the programmer with an important general-purpose literacy procedure. With enough calculation and enough data, learning beats programming for complicated tasks that bear the integration of numerous different, noisy cues. Four times agone, while they were at the University of Toronto, our deep neural network called Supervision nearly halved the error rate for feting objects in natural images and started an overdue paradigm shift in computer vision. Figure 4 shows some exemplifications of what Super Vision can do.

2.4 *Very Deep Convolutional Networks for Large-Scale Image Recognition*

In this paper [4] the authors delved into the effect of convolutional network depth on its delicacy in large-scale image recognition settings. Their main donation is a thorough evaluation of the networks of adding depth using an armature with veritably small (3×3) complication pollutants, which shows a significant enhancement on previous-art configurations that could be achieved by pushing depth to 16–19 weight layers. These findings were based on their Image Net Challenge 2014 submission, where their platoon secured first and the alternate places in the localization and bracket track independently. They also showed that their representations generalize well to other datasets, where they achieved state-of-the-art results. They have made their two best-performing Conv Net models intimately available to grease further exploration of the use of deep visual representations in computer vision. During training, input to their Conv Nets is a fixed-size224×224 RGB image. The only pre-processing they did is abating the mean RGB value, reckoned on a training set, from each pixel. The image is passed through a mound of convolutional (Conv) layers, where they used pollutants with veritably small open field3x 3 (which is the lowest size for capturing the notion of leftism/ right, up/ down, center). In one of the configurations, they also employed 1×1 convolution pollutants, which can be seen as the direct metamorphosis of the input channels (followed by non-linearity).

3. Methodology

3.1 Image Selection

The image is named from the operation brochure itself. Any color image can be taken as input.

3.2 Setup for Neural Network

Then set up lines are set to load the yolov3 configuration and weights data along with coco names data set data so that mortal object presence discovery in the given image frame.

This data is loaded for training purposes to fete the mortal object in the frames recaptured from the videotape. This data preserves as a training object.

3.3 Image Extraction from Videotape

Then, the videotape train is taken from the vids brochure and using the cv2 module, the frames are resolved from the train taken. However, it's resized into 480 pixels, If the train confines are above 480. In machine literacy, pattern recognition, and image processing, point birth starts from an original set of measured data and builds deduced values (features) intended to be instructional and non-redundant, easing the posterior literacy and conception way, in some cases leading to better mortal interpretations. Point birth is related to dimensionality reduction.

3.4 Mortal Object Discovery on with Distance between Two Objects

Then, image processing is carried out similarly the “person" classifier score is calculated, and also if the confidence value is above0.5 also, it's honored as mortal and a bounding box is drawn for each mortal object inside the frame.

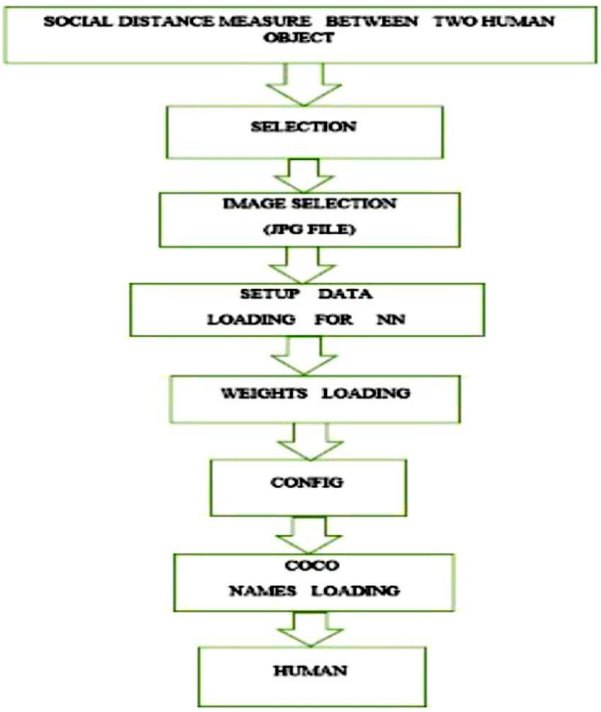

Figure 1 Flow diagram

Also, if the Euclidian distance between the center points of two bounding boxes is less than the imbrication threshold, red boxes are painted over the green bounding boxes, indicating that those two mortals are breaching Covid social distance. Every object class has unique characteristics that aid in classification - for example, all circles are circular. These traits are used in object class discovery. When looking for circles, for example, items that are

at a specific distance from a point (i.e. the center) are searched. When looking for a location, items with vertical corners and equal side lengths are also desired. Face recognition uses a similar approach, where the eyes, nose, and lips can be identified.

4. Results and Discussions

This project solved the problem of social distance measure in the given image frames between two human objects to alert/avoid the Covid problem. This design introduces the methodology of a social distancing discovery tool using a deep literacy model. By using computer vision, the distance between people is estimated and any non-compliant brace of people is indicated with a red frame and a red line. The proposed system is validated using a videotape showing climbers walking on a road. In the being system, image accession is carried out by first opting for the videotape train and resolving them into frames. Also, the images are taken for rambler discovery. For better results, images can be resized here. However, will be indicated with red lines that serve as preventative warnings, If the distance is lower than the respectable distance between any two individualities.

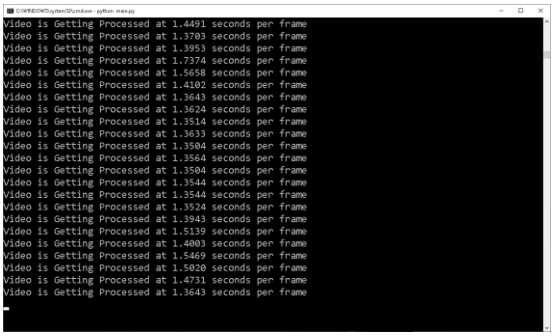

Figure 2 Program window

The YOLO was trained using the COCO dataset, which contains 80 markers such as people, animals, and ramblers. The only box equals, object confidence, and pedestrian object class from the YOLO model discovery result were used for rambler discovery in this study. The dereliction value is set to 0.5, and the confidence value for marker "person" is acclimated.

Figure 3 Image identification

The visualization findings revealed that the new system can determine social separation measures between people and that it may be further developed for usage in different environments such as offices, cafes, and academies. Furthermore, if computational resources allow, the work can be improved by optimizing the rambler discovery process and incorporating other discovery techniques like mask discovery and mortal body temperature discovery.

5. Conclusions

This design answered the problem of social distance measure in the given image frames between two mortal objects to warn/ avoid the covid problem. This design introduces the methodology of a social distancing discovery tool using a deep literacy model. By using computer vision, the distance between people is estimated and any non-compliant brace of people is indicated with a red frame and a red line. The proposed system is validated using a videotape showing climbers walking on a road. The visualization results showed that the new system can determine the social distancing measures between people which can be further developed for use in other terrains similar as offices, eateries, and academies. In addition, the work can be further bettered by optimizing the rambler discovery algorithm, integrating other discovery algorithms similar to mask discovery and mortal body temperature discovery, if the computing power of the tackle is bettered, and calibrating the camera perspective view. The system is veritably flexible and stoner-friendly, so the conservation grounded on the changing terrain and conditions can be incorporated fluently. Any changes that are likely to beget failures are averted with security and preventative measures could be taken. The coding is done in an accessible and flexible system program that helps easy changing. Since Python is a veritably flexible programming language, stoner can fluently incorporate any modular program in the operation.

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