

IMPLEMENTATION OF OBJECT DETECTION WITH YOU ONLY LOOK ONCE ALGORITHM IN LIMITED FACE-TO-FACE TIMES IN PANDEMIC

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ABSTRACT

Covid-19 has hit many countries in the world, including Indonesia. The rapid and deadly spread of Covid-19 reached Indonesia in early 2020. This pandemic of course had a detrimental impact on the Indonesian people in terms of health, economy, education and others. The Indonesian government certainly does not remain silent, the government is aggressively making efforts to break the Covid-19 chain in various ways, one of the efforts made is to continuously inform about the health protocols recommended by the government to prevent transmission. The Indonesian Ministry of Health, Efforts that can be made in the prevention phase by each individual include: Wearing a mask, Wearing gloves, Using hand sanitizer/disinfectant, Washing hands with soap, Avoiding touching the face, Avoid shaking hands, Avoid gatherings or long queues, Avoid touching objects/object surfaces in public areas, Avoid taking public transportation, Maintain a distance of at least two meters from other people when outside the house, and If you show symptoms of illness, immediately notify the people around. Even though they have been informed about the prevention of Covid-19, the public tends to be negligent in implementing health protocols, one of which is the application of Social Distancing. Therefore, this study will create a distance detector using the YOLOv3 algorithm as one of the detection objects for the implementation of community activity restrictions

Keywords : *Social Distancing, Covid-19, YOLO Algorithm, Detector.*

1. Introduction

Based on data from JHU CSSE COVID19 Data, there are currently 13,737 new cases of COVID-19. This data is a fairly high increase compared to the previous month. This happens because people's behavior is increasingly ignoring health protocols. One of the health protocols is to avoid crowds by implementing social distancing. People tend to find it difficult to follow this one health protocol. The most important transmission factor is due to physical contact with each other. We are currently entering the era of the Industrial Revolution 4.0. In this era, digitization and efficiency are indispensable for technological development (Nugroho et al.) One way to find out the limits of crowds and social distancing is with a social distancing detector, which is an application to count the number of people and analyze the distance between people in a certain area by giving notifications if people in the area have exceeded the limit and do not apply social distancing health protocols. By enabling computers to detect social distance, it will facilitate human work by counting the number of people in a digital image consisting of many people, such as on a highway. This application development uses the Python programming language and the YOLOv3 library (Ge et al., 2020). The reason for using the YOLOv3 library is because YOLOv3 is able to detect objects with higher frame rates (Al Asyhar et al. 2020; Teng et al., 2022).

The YOLO (You Only Look Once) algorithm is a deep learning algorithm that utilizes a convolutional neural network (CNN) in detecting objects (Adibhatla et al., 2020; Al-masni et al., 2017). In the CNN process, there are 3 stages, namely pre-processing, processing, and classifying (Munadhif et al., 2020). The algorithm divides the image into grids of size $s \times s$, and then predicts the bounding grid and class map of each grid in each grid. If an object is predicted on a grid, then on that grid a bounding box will be predicted that surrounds the object. The confidence value will be calculated in each bounding box which will then be selected based on the value obtained. The detection system applied is to detect using a reuse classifier or locator. This study aims to develop a social distancing detector application using the Python programming language with the

YOLOv3 library (Gunawan et al., 2022). This application is used to detect the number and distance human object in order to minimize the spread of Covid-19. This application can be implemented by using loudspeaker alert system when there is excessive number of humans and humans which are close to each other.

2. Literature Review

You Only Look Once or YOLO is Intelligent neural network for real-time detection. YOLO applies a single neural network to the whole picture (Lin & Jhang, 2022; Dai et al., 2022). This network will be shared into regions, then will predict bounding boxes and probabilities. For each square in the bounding region, weigh probability to classify it as object or not. YOLO shared the image input into a grid measuring, where the value of S is 7 and the image size input is 448×448 . To get bounding box, we will scroll the image inputs. A bounding box has 5 values to save: coordinates, coordinates, width, height, confidence score (box The delimiter in question has a value of object probability). YOLOv3 has 53 convolutional layers, called Darknet 53, which consisted of convolutional and residual structures. In YOLOv3, the convolution layer is always followed by batch normalization and ReLU leaks (Bianchi et al., 2022). Residual block connection or shortcut in YOLOv3 solved by adding entry above the convolution layer residue block to the result 1×1 convolution layer filter, then do batch normalization and ReLU filtering, followed by a convolutional layer filter 3×3 with batch normalization, and at the end done leaky ReLU. Residual layer on YOLOv3 defined as 18 operation the sum of the initial input and the output the results after the convolutional layer on residual block (Xing et al., 2022).

OpenCV (Open Source Computer Vision Library) is a software library for dynamic real-time image processing, created by Intel, and now supported by Willow Garage and Itseez. OpenCV is released under a more liberal BSD license than the GPL, and provides complete freedom for commercial use without disclosing the source code. It also has an interface that supports C++, C, Python, and Java programming languages, including Windows, Linux, Mac OS, iOS, and Android operating systems. OpenCV is designed for computational efficiency, with a focus on real-time applications (Khan et al., 2019; Chandan et al., 2018).

Object Detection or object detection is part of Computer Vision. Object Detection refers to the ability of the computer to detect a number of objects in a picture (Liu et al., 2020). This can be done by: retrieve image features such as lines, angles, contours and colors of an image. Detection object is part of Object Recognition or object identification. Therefore can be concluded that for definite object detection must first identify the object. Meanwhile, in this research, it will be object detection is carried out and then distance detection and calculation is implemented number of objects.

3. Research Methods

In performing object detection, an algorithm is needed that can read the features of the image in order to recognize the object in the image. The algorithm that has been tested to be fast and accurate in previous research is Faster R-CNN (Faster Region-based Convolutional Neural Network) (Qiao et al., 2021; Benjdira et al., 2019). Although it is quite accurate, the accuracy produced by Faster RCNN is not maximized because the region generated by the RPN (Region Proposal Network) is sometimes detected as a background when in fact it contains objects. Another method developed for Real Time Object Detection is Yolo. Where Yolo detects faster than Faster R-CNN. This study uses the YOLO algorithm because it has many advantages over Faster R-CNN. First, YOLO is very fast because it makes object detection a regression problem so it doesn't require complex flows. Second, YOLO considers image globally when making predictions. Third, YOLO can study the generalization of object representation (Jiang et al., 2022).

The development of the social distancing detector application using the Python programming language with the YOLOv3 library is used to process and analyze digital images and detect distances and count the number of people in the inputted digital images. This application will be implemented in the form of a personal computer application system that is integrated with a camera or CCTV, which will provide a warning system output when there are excessive numbers of humans and humans who are close to each other (Kumar & Goel, 2021).

4. Results and Discussions

After the preprocessing stage, the next step is to conduct data training for the You Only Look Once model. The total training data for this process is 2003 data consisting of various positions.

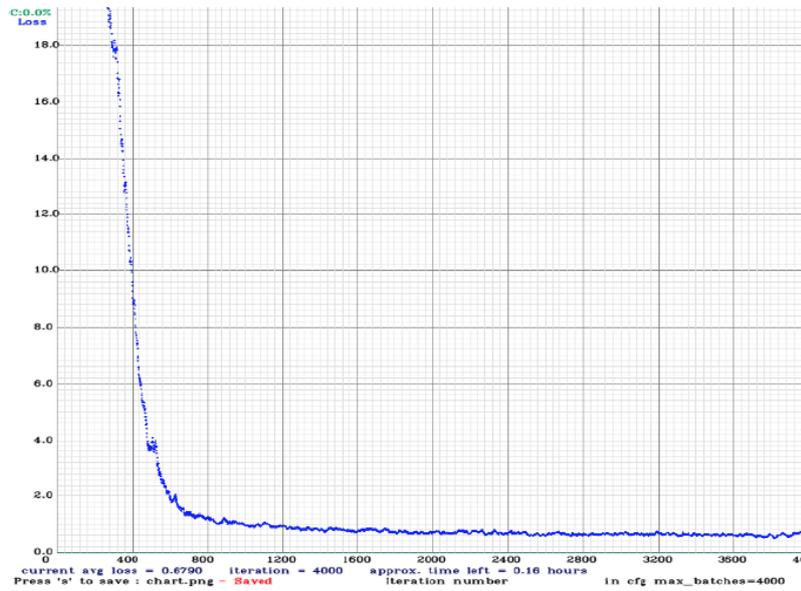


Fig. 1. Graph of losses at the YOLO Tiny V3 Training stage

In Figure 1 is the graphic result of the training process with a total of 4000 liters of literacy, resulting in an average loss of 0.6790. Where the loss value is sufficient for testing.

4.1 Testing with Image

Testing with images is carried out to test the model without being affected by motion first in order to determine the level of distance accuracy. The images tested were 22 images. In the test image, the distance between the webcam camera and the human object is set with various distances, namely 1m, 2m, 3m, 4m and 5m. While the distance between human objects is set at a distance of 0.5 m, 1 m and 1.5 m. The following shows 2 sample images that have been tested with an ecludian distance value of 100 pixels for 1 meter of actual distance. The test is carried out indoors (Fu et al., 2021).

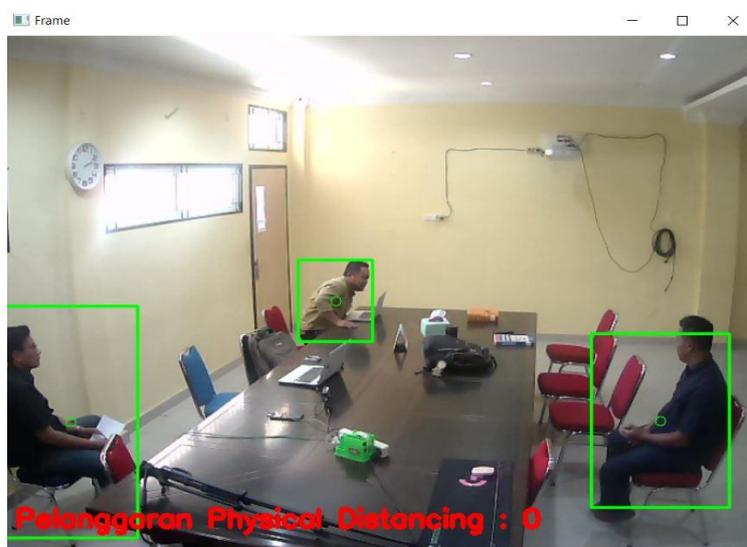


Fig. 2. Indoor detection results

Figure 2 is a real result of object detection, there is no physical distance violation in the room. In the experiments that have been carried out, it shows that the program that is run does not have a failure rate in operating the webcam.

4.2 Testing with Camera Video

In the direct video camera testing process, it will be deployed using NVIDIA Jetson Nano. The test is carried out in a closed room. The following shows a sample image that has been tested using the YOLO Tiny V3 method with a set Euclidean distance value of 100 pixels in Figure 3. This test aims to determine the processing speed of object detection (Huang et al., 2018).

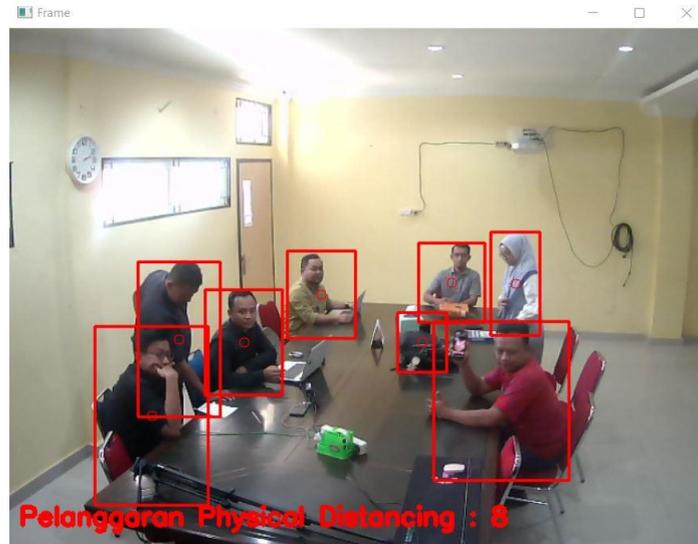


Fig. 3. The results of the detection in the room detected by the violator

In real-time video testing, it is almost the same as testing using images. However, in video testing there is a frame transfer value in one second or what is commonly called FPS. The average FPS value in this study, for the YOLO Tiny v3 method is 1.39. With this FPS value, it is less fast in processing in real time. It takes simplification of the model or use other models to get a larger FPS on a low processor like the NVIDIA Jetson.

5. Conclusion

In this study, it was concluded that the system can monitor physical distance using the YOLO Tiny V3 approach by detecting human objects. The system can detect human objects and the distance between human objects with the Decision Support System (DSS), which issues a warning sound in real time to humans caught on the system camera. In testing the method for detecting human objects using YOLO Tiny V3 and the distance between humans using Euclidean distance using 100 pixels as the distance value on the system and having an average FPS (Frame Per Second) of 1.39. Produces an accuracy value of 76.316% for detecting human objects and 94.444% accuracy in detecting a warning (unsafe) distance between humans. Both of these accuracy shows that the YOLO Tiny V3 method can be used to monitor and supervise the implementation of physical distance, but the accuracy needs to be increased for the purposes of calculating the number of violators.

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