ABSTRACT

Steel is the most important material in the world of engineering and construction. Modern steelmaking relies on computer vision technologies, such as optical cameras to monitor production and manufacturing processes, which help companies improve product quality. Detection of steel surface damage is a challenging task in the detection of practical objects in the real world. Based on observations, there are two critical issues that create this challenge: the small size, and the vagueness of the damage.

The existing automatic steel surface damage detection system uses a deep learning approach to extract detailed information from steel defect drawings. The system used, namely YOLOv5, is a single-stage object detection method. This method can assess the position and type of objects in the image by performing CNN (Convolution Neural Network) architecture on the image, so that the recognition speed is increased.

In this study, we describe the detection of defects on the steel surface using several models from YOLOv5. Based on the results of the tests carried out, different mAP results were obtained. The Scratch-Low hyperparameter got the highest mAP value of 77.1% and the FPS value got 149 on the YOLOv5-GHOST model. The Scratch-Medium hyperparameter got the highest mAP value of 70% and the FPS value got 166 on the YOLOv5-PANetmodel. The Scratch-High hyperparameter got the highest MAP value of 71.3% and the FPS value got 163 on the YOLOv5-FPN model. The Scratch-Custom hyperparameter got the highest MAP value of 78.3% and the FPS value got 166 on the YOLOv5-PANetmodel. In this study, the highest yield of mAP and FPS is the YOLOv5-PANetmodel because it uses a bottom-up path where each image is used to help spread information at low levels and make lateral connections from low to top levels. However, in the YOLOv5-PANet model, there is also a shortage of very large negative object detection, where the sensor detects the background not the detected object.

Keywords : *Deep Learning*, Steel, YOLOv5