ABSTRAK

Penggunaan kereta api sebagai transportasi umum darat sangat diminati masyarakat. Hal itu menyebabkan frekuensi perjalanan kereta api meningkat setiap tahunnya. Hal tersebut juga berpengaruh terhadap bahaya resiko kecelakaan seperti *derailment* yang relatif bertambah. Salah satu faktor penyebab *derailment* adalah kerusakan pada rel, sehingga dibutuhkan inpeksi rutin untuk memastikan kondisi rel dalam keadaan normal, tidak terdapat *defect* atau kerusakan. Inspeksi yang telah lama digunakan adalah inspeksi manual yang memiliki kekurangan seperti efisiensinya yang rendah, adanya *human error*, bersifat objektif, dan berbahaya, sehingga mulai beralih ke inspeksi otomatis. Inspeksi otomatis dapat mempersingkat waktu inspeksi, mengurangi biaya pemeliharaan, data dapat bersifat *real time*, dan mengurangi keterlibatan manusia yang memungkinkan terjadinya kekeliruan. Penelitan ini akan membuat sistem inspeksi otomatis deteksi *defect* pada rel kereta api dengan teknologi *deep learning.* Metode yang digunakan adalah YOLOv3 dengan *framework Darknet-53* yang memiliki 53 *convolutional layer* dan *residual blocks.* Penggunaan algoritma YOLOv3 dapat memberikan nilai keakuratan yang tinggi dengan hasil deteksi yang relatif cepat dibanding metode lainnya. Model menggunakan dataset gambar rel *defect* yang sebelumnya telah dikumpulkan dan dilakukan proses pelatihan. Berdasarkan percobaan yang telah dilakukan, didapatkan hasil sistem pendeteksian menggunakan model YOLOv3 memiliki nilai mAP sebesar 86,71%, nilai *precision* 88%, nilai *recall* 86%, nilai *f1-score* 87%, nilai *average IoU* 69,22% dan nilai *accuracy* 84%.

Kata Kunci : *YOLOv3, Defect, Railway, Darknet*

ABSTRACT

The *use of trains as a means of public land transportation is highly popular among the community. This has led to an annual increase in train travel frequency. However, this also contributes to an increased risk of accidents, particularly derailments. One of the main causes of derailments is track damage, which necessitates manual inspections to ensure the tracks are in a normal state without any defects or damage. The traditional method of manual inspection, although long-standing, has several limitations, including low efficiency, human error, subjectivity, and potential safety hazards. As a result, there has been a shift towards automated inspections. Automated inspections offer numerous advantages, such as reducing inspection time, lowering maintenance costs, providing real-time data, and minimizing human involvement, which helps mitigate the possibility of errors. This research aims to develop an automated defect detection system for railway tracks using deep learning technology. The chosen method is YOLOv3, implemented with the Darknet-53 framework, which consists of 53 convolutional layers and residual blocks. By utilizing the YOLOv3 algorithm, the system can achieve high accuracy while maintaining relatively fast detection results compared to other approaches. To train the model, a dataset of railway track defect images was collected and used in the training process. Through extensive experimentation, the detection system using the YOLOv3 model yielded impressive results, including a mean Average Precision (mAP) of* 86,71%, *precision of* 88%, *recall of* 86%, *F1-score of* 87%, *an average Intersection over Union (IoU) of* 69,22%, *and accuracy of* 84%. *These metrics demonstrate the effectiveness and reliability of the developed automated defect detection system.*

***Keyword** : YOLOv3, Defect, Railway, Darknet*