

## ABSTRAK

Pertumbuhan kendaraan yang terus meningkat berdampak terhadap padanya kendaraan di jalanan, yang juga mengakibatkan bertambahnya kasus pelanggaran peraturan lalulintas. Sampai saat ini pendeteksian dan penindakan kasus pelanggaran secara konvensional dirasa masih kurang optimal. Oleh karena itu deteksi dan penindakan pelanggaran secara otomatis dirasa penting, dengan adanya proses *automatic license plate recognition* (ALPR) atau pengenalan plat nomor kendaraan otomatis dapat membantu dalam proses penindakan pelanggaran. Pada sisi lain proses ALPR memiliki kekurangan, yaitu kemampuan CCTV Analog dalam menangkap citra masih memiliki kualitas yang rendah dikarenakan banyaknya noise. Dengan begitu peningkatan kualitas citra untuk meningkatkan akurasi proses pengenalan karakter dirasa penting.

Pada penelitian ini dilakukan peningkatan kualitas citra pada proses license plate recognition untuk pengenalan plat nomor kendaraan roda empat dengan menggunakan *super-resolution generative adversarial network* (SRGAN). SRGAN di implementasikan setelah proses lokalisasi plat nomor, dengan menghasilkan citra *super-resolution* memiliki 4x lebih banyak jumlah pixel daripada citra input, yang kemudian citra *super-resolution* dilakukan proses pengenalan karakter.

Pengujian dilakukan dengan melakukan pengukuran pada hasil akurasi, *recall* dan *F1 score* maupun nilai PSNR dan SSIM pada hasil pengenalan karakter pada plat nomor kendaraan roda empat. Perhitungan dilakukan pada citra hasil lokalisasi YOLOv4 sebelum dan setelah dikenai SRGAN, dengan menghasilkan peningkatan akurasi pada proses *license plate recognition* rata-rata sebesar 12%, 10%, dan 8% untuk nilai *recall*, akurasi, dan *F1 score* pada citra hasil lokalisasi YOLOv4. Dengan citra uji sintetis menghasilkan rata-rata peningkatan sebesar 98%, 94%, dan 0,63 untuk nilai *recall*, akurasi, dan *F1 score*, dengan rata-rata nilai PSNR dan SSIM sebesar 18,58 dB dan 0,83.

Kata kunci: plat nomor, pengenalan karakter, *super-resolution*, *generative adversarial network*.

## **ABSTRACT**

*The ever-increasing growth of vehicles has had an impact on vehicles on the streets, which has also increased cases of violation of traffic rules. Until now, conventional detection and prosecution of violation cases are still not optimal. Therefore automatic detection and enforcement of violations are considered important, with the process of automatic license plate recognition (ALPR) or automatic vehicle number plate recognition can assist in the process of prosecution of violations. On the other hand, the ALPR process has drawbacks, namely the ability of Analog CCTV to capture images that are still of low quality due to a large amount of noise. Thus improving image quality to improve the accuracy of the character recognition process is considered important.*

*In this study, image quality improvement was carried out in the license plate recognition process for recognizing four-wheeled vehicle license plates using a super-resolution generative adversarial network (SRGAN). SRGAN is implemented after the license plate localization process, by producing a super-resolution image having 4x the number of pixels than the input image, which then super-resolution image is subjected to a character recognition process.*

*The test is carried out by measuring the results of precision, recall, and F1 scores as well as PSNR and SSIM values on the results of character recognition on four-wheeled vehicle license plates. Calculations were performed on the images before and after being subjected to SRGAN, resulting in an average increase in accuracy in the license plate recognition process of 12%, 10%, and 8% for recall, accuracy, and F1 scores in YOLOv4 localized images. With synthetic test images, it produces an average increase of 98%, 94%, and 0.63 for recall, accuracy, and F1 score, with an average PSNR and SSIM value of 18.58 dB and 0.83.*

*Keywords: license plate, character recognition, super-resolution, generative adversarial network.*