Chapter 9
Vehicle License Plate Recognition With Deep Learning

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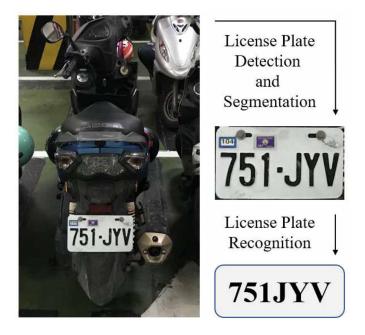
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ABSTRACT

In this chapter, an AI (artificial intelligence) solution for LPR (license plate recognition) on moving vehicles is proposed. The license plates in images captured with cameras on moving vehicles have unpredictable distortion and various illumination which make traditional machine vision algorithms unable to recognize the numbers correctly. Therefore, deep learning is leveraged to recognize license plate in such challenging conditions for better recognition accuracy. Additionally, lightweight neural networks are chosen since the power supply of scooter is quite limited. A two-stage method is presented to recognize license plate. First, the license plates in captured images are detected using CNN (convolutional neural network) model and the rotation of the detected license plates are corrected. Subsequently, the characters are recognized as upper-case format (A-Z) and digits (0-9) with second CNN model. Experimental results show that the system achieves 95.7% precision and 95% recall at high speed during the daytime.

Figure 1. The illustration of a typical LPR system

1. INTRODUCTION

1.1. Overview

The objective of LPR is to recognize the vehicle registration numbers from images and identify the owner or the origin of the vehicle. The acquired information can be used for stolen vehicle tracking and traffic management, such as ETC (Electronic Toll Collection), access control, traffic law enforcement, and parking lot management. A typical LPR system consists of license plate detection, segmentation, and recognition as shown in Fig. 1-1.

With the growth of surveillance cameras in Taiwan, there has been a steady decline in theft rate, e.g., 82.94% and 77.22% in motorcycle and car theft rate, respectively (Peng 2015). However, the video tracking of theft vehicles is one of, if not the most labor-intensive and time-consuming task, which turns LPR system into an indispensable part in the whole process, various LPR systems were invented consequently.

Due to the variations in luminance, contrast, noise, and geometry of the license plates captured in natural scene, traditional machine vision methods are unable to solve the problem completely. In recent years, many computer vision tasks achieved state-of-the-art results leveraging deep learning, particularly, CNN (Convolutional

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