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RILP: Robust Iranian License Plate Recognition Designed for Complex Conditions

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Abstract

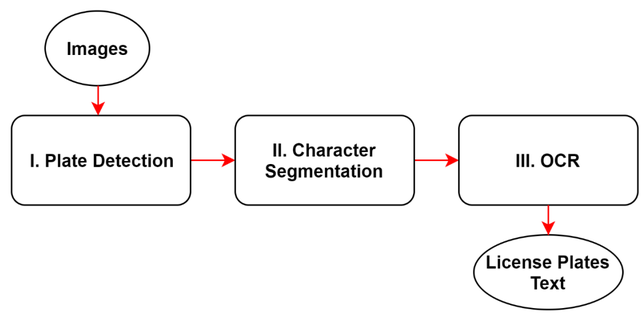
This study introduces RILP, a novel approach to create a modular platform for autonomous license plate recognition (LPR). The proposed method consists of three stages of neural networks connected in a modular fashion. The first stage is the detection of license plates (LP); after that, RILP proceeds to detect text regions and performs character segmentations. Finally, to get to the LP number, optical character recognition (OCR) is done via a neural network previously trained for recognition of Persian characters. A robust LPR platform is a vital tool in modern cities for a variety of applications such as autonomous terrific management, surveillance, gateway control and etc. In order to be deployed in real-world conditions, LPR platforms should be practical and adaptive; in other words, easily trainable. RILP has paid attention to this matter as it can be effortlessly trained for any national LP. Only the final module of this approach requires training, which can be done with a simple dataset of the characters used in the LP of the desired country. This gives RILP tremendous portability to be deployed in any country for a wide variety of applications. The proposed platform was designed specifically for complex conditions. Therefore, a very complex and challenging dataset of Iranian LPs was created for a comprehensive evaluation of RILP, consisting of over 350 images of challenging natural conditions. RILP was evaluated with another publicly available dataset, as well as real footage of a local security camera. Evaluations yielded satisfying recognition accuracy up to 95% with a response time of 66 ms/LP. RILP proved to be robust and reliable enough, yielding satisfactory results in a reasonable time, while used in challenging conditions.

Keywords— License plate recognition, License plate segmentation, Character recognition, Convolutional neural network

Introduction

LPR Applications
- Security surveillance
- Digital monitoring
- Vehicle identification
- Autonomous parking management
- Automatic payments at toll
- Automatic entrance/exit management

Key Features
- Modular design
- Extreme portability
- High recognition accuracy
- Trainable for LPs of any nationality
- Efficient training procedure
  - LP dataset is not necessary



Results

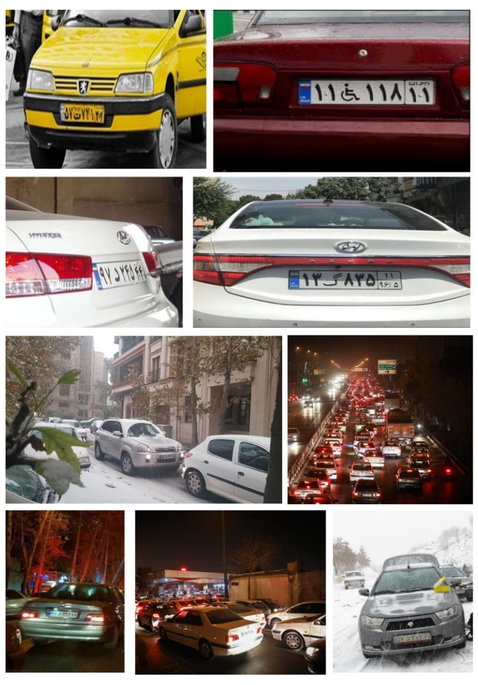


TABLE 1. Confusion matrix of the LP detection stage performed on IRCP dataset (200 images)

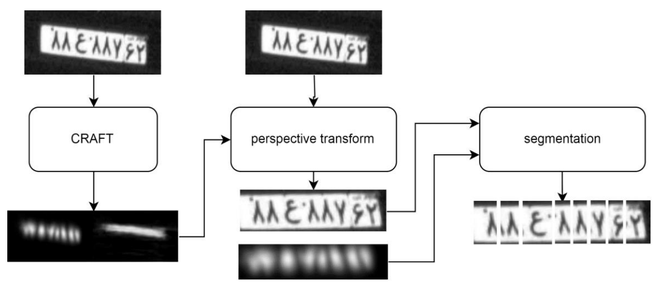
Plates	96%	4%
No Plates	0%	100%

TABLE 2. Confusion matrix of the LP detection stage performed on our own dataset (350 images)

Plates	84.25%	15.75%
No Plates	9%	91%

TABLE 3. Recognition accuracy

IRCP dataset (200 images)	95%
Our dataset (350 images)	81%



Notable Networks
- SSD
- CRAFT
- ResNet

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