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SPECIAL ISSUE

Real-time automatic license plate recognition for CCTV forensic applications

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Abstract We propose an efficient real-time automatic license plate recognition (ALPR) framework, particularly designed to work on CCTV video footage obtained from cameras that are not dedicated to the use in ALPR. At present, in license plate detection, tracking and recognition are reasonably well-tackled problems with many successful commercial solutions being available. However, the existing ALPR algorithms are based on the assumption that the input video will be obtained via a dedicated, high-resolution, high-speed camera and is/or supported by a controlled capture environment, with appropriate camera height, focus, exposure/shutter speed and lighting settings. However, typical video forensic applications may require searching for a vehicle having a particular number plate on noisy CCTV video footage obtained via non-dedicated, medium-to-low resolution cameras, working under poor illumination conditions. ALPR in such video content faces severe challenges in license plate localization, tracking and recognition stages. This paper proposes a novel approach for efficient localization of license plates in video sequence and the use of a revised version of an existing technique for tracking and recognition. A special feature of the proposed approach is that it is intelligent enough to automatically adjust for varying camera distances and diverse lighting conditions, a requirement for a video forensic tool that may operate on videos obtained by a diverse set of unspecified, distributed CCTV cameras.

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1 Introduction

The number of on-road motor vehicles has increased with the rapid growth of world's economy and with this augmentation the need for security and monitoring of vehicles has also increased. It is necessary for officials to continuously examine the traffic to avoid/control congestion, overspeeding and unlawful activities that involves a vehicle. Many successful commercial systems that employ dedicated camera systems, providing video input captured under control environments to ALPR algorithms, exist at present [1, 3, 6, 9–11, 19, 24, 25]. However, application scenarios in video surveillance and forensics such as tracking down a stolen vehicle or searching for a vehicle involved in a crime, as identified by a bystander to be of a particular registration number, requires the painstaking task of manual search, because the existing ALPR systems are not capable of efficiently working on video footage obtained via non-dedicated (for ALPR) CCTV systems The non-deterministic camera positioning (height and angle), specifications (speed, focus, aperture), lighting conditions, presence of compression artifacts, high levels of noise etc. in CCTV systems pose a significant challenge to computer vision and pattern recognition algorithms used in existing ALPR systems.

This paper presents an efficient and robust framework that can perform localization, tracking and recognition of multiple vehicle license plates in a real-time scenario (i.e., incoming video stream from low-resolution surveillance cameras). The major aim of carrying out this work is to make significant contribution to the efficacy improvement