

License Plate Extraction and Recognition of a Thai Vehicle Based on MSER and BPNN

Tao Hong

Faculty of Science and Technology
Assumption University
Bangkok, Thailand
htao.tony@gmail.com

Anilkumar Kothalil Gopalakrishnam

Faculty of Science and Technology
Assumption University
Bangkok, Thailand
anil@scitech.au.edu

Abstract—The extraction and recognition of a Thai vehicle license plate based on Maximally Stable Extremal Regions (MSER) and Back-Propagation Neural Network (BPNN) is presented. The license plate area is in a maximally stable extremal region of a car image. It can be effectively extracted from MSERs by multiple classifications. The feature extraction of characters from the license plate is based on Zernike moment. The feature is used as a training dataset for the BPNN to recognize the characters. The experimental results indicate that the proposed approach is an effective method for the extraction and recognition of a Thai license plate.

Keywords—Thai license plate recognition; MSER; Zernike moment; BPNN

I. INTRODUCTION

With rapid economic development and urban expansion, transportation volume increased year by year. The traffic management has also become more complex. In order to alleviate traffic pressure and improve vehicle management efficiency, Intelligent Transportation System (ITS) plays an important role in traffic management. The Vehicle License Plate Recognition (VLPR) is already widely applied in intelligent transportation system. For example, traffic surveillance system, highway management, vehicle location and navigation, parking management system [1], etc.

Vehicle license plate recognition is mainly divided into three parts: license plate location, character segmentation and character recognition. License plate location is the most important part of license plate recognition. The quality of the license plate location directly influences the outcome of the license plate recognition. In the natural light, the license plate location needs to overcome uneven illumination, license plate tilted angle, complex background conditions, etc. In this paper, the method which is used for the license plate location is mainly based on the MSER algorithm and multiple classifications. The character segmentation is based on the characteristics of MSER and priori knowledge of a license plate which is common in Thai private cars. It is due to the similarity of some Thai characters, the recognition of them are quite difficult with standard techniques. The application of Zernike moment is sensitive to the deformation of characters in the image. Hence the character recognition is based on the Back-Propagation Neural Network (BPNN) combines with Zernike moment.

The rest of the paper is organized as follows. Section II briefly describes literature review in the related work. The structure of VLPR system is introduced in section III. The detail of license plate location is presented in section IV. Section V explains the character segmentation and classification. The character recognition steps are presented in Section VI. Section VII explains the evaluation of the experimental results and performance of VLPR system. Finally, the conclusion and future works are in section VIII.

II. RELATED WORK

From the literature review, it is studied that a lot of license plate location methods based on MSER. The Maximally Stable Extremal Regions algorithm is proposed by J.Matas [2]. J.Matas also introduces an unconstrained license plate detection by Category-Specific Extremal Region (CSER) in [3]. A method of license plate detection is implemented by MSER+ and MSER-in [4]. In [5], the license plate is extracted from MSERs by the priori knowledge of license plate. A novel license plate location is based on the arrangement of MSERs in [1].

For Thai license plate recognition, the essential element of Thai characters is used for the Thai license plate recognition in [6]. The off-line Thai car license plate is recognized by the Hausdorff distance technique [7]. In [8], a position varied Thai license plate recognition is based on BPNN. The template matching technique is used to recognize the Thai license plate from a video stream [9]. In [10], an Extreme Learning Machine (ELM) is adopted for the Thai license plate recognition system. These methods have high requirements for the capturing position, camera angle, light, etc. The character recognition techniques are also difficult to overcome similarity of Thai characters.

III. SYSTEM OVERVIEW

The structure of the vehicle license plate recognition system is shown in Fig.1. The System is mainly divided into three parts: license plate location, character segmentation and character recognition. First of all, the High Resolution (HR) image of the vehicle is converted to Low Resolution (LR) image with a proportional value for license plate location. The part of license plate location consists of the image preprocessing, MSER detection and multiple classifications. After the license plate location, the coordinates of license plate in LR image are enlarged by same proportional value in first step. Then the