UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AUTOMATIC VEHICLE PLATE RECOGNITION USING TEMPLATE MATCHING

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Telecommunication) with Honours.

by

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TECHNOLOGY

2019

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Tajuk: AUTOMATIC VEHICLE PLATE RECOGNITION USING TEMPLATE MATCHING

Sesi Pengajian: 2019

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Date:16/12/2019

APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

Signature: …….

Supervisor : TS DR ROSTAM AFFENDI BIN HAMZAH

ABSTRAK

Projek ini dapat memberi manfaat kepada Fakulti Teknologi Kejuteraan Elektrik dan Elektronik (FTKEE), UTeM. Tajuk bagi projek ini ialah mengenal pasti plat kenderaan automatik mengunakan padanan templat. Sistem ini diubah suai bagi memenuhi keperluan penguna. Sistem rangkaian yang digunakan dapat membaca nombor pendaftaran kenderaan dengan mengambil gambar mengunakan kamera. Kaedah ini dapat dikemaskini melalui projek ini dengan mengunakan padanaan templat tetapi ia hendaklah dihubungkan dengan mengunakan rangkaain Matlab. Dengan mengunakan rangkaian Matlab ini, ia dapat membantu penguna untuk memasuki rangkaian dengan sendirinya. Justeru ia dapat menjimatkan masa kerana penguna dapat memasuki sistem tanpa had masa. Selain itu, ia juga dapat memberi manfaat khususnya kepada pihak berkuasa melalui penjimatan kos dan ia dapat menjejaki kenderaan yang hilang dengan mengunakan rangkaian dipilih serta dapat menjimatkan tenaga manusia untuk menyelesaikan tugasan yang di berikan.

ABSTRACT

This project is useful for the Faculty of Technology in Electric and Electronic (FTKEE), UTeM. The project title is Automatic Vehicle Plate Recognition using Template Matching. The system is developed to meet the community needs. The system is a systematic software that can read the license plate when the images are taken using camera. The method used in completing this project is template matching but it is implemented using MATLAB software. By using this software, it helps people to access the software by themselves thus it can save their time because they can have an access to the system at any convenient time. It also can be very handy for the authorised party as they can save cost and energy because the vehicle can be tracked only by using the software and does not need man power to carry out the task.

DEDICATION

The biggest dedication would go to Allah who is the Almighty that gives me good health and open up my heart and mind to complete this report and project. Next one is to my supervisor who had helped me a lot during completing this report. Also to my beloved parents who gives me courage and full support to be able to perform this report successfully and lastly to my friends who had contributed direct and indirectly throughout the process of completing this report. The biggest thanks would go to all of them.

ACKNOWLEDGEMENTS

Firstly, I would like to thank Allah because I can complete all of the chapter of this final year project with success. I also want to express the biggest gratitude to my supervisor TS DR. Rostam Affendi bin Hamzah from University Teknikal Malaysia Melaka for giving me a clear guide line and advices throughout the process of completion of this report. Not forgotten, I want to express my special thanks to my family for providing everything that I need, support me and encourage me to complete this report successfully. Then, I also want to thank my friends, my special friends for keep on giving me help in terms of guidance regarding the report and project. I really have learned a lot during completing this assignment and report. All the tasks required are all managed to be completed with their help. Lastly, I also want to thank University Teknikal Malaysia Melaka and to everyone who has contributed their energy and time direct and indirectly in the whole journey of completing this project and report.

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LIST OF ABBREVIATIONS

ALPR – Automatic Vehicle License Recognition

CNN – Convolutionary Neural Network

LP – License Plate

HMMM – Hidden Markov Models

BRNN – Bidirectional Neural Network

HDRBM - Discriminative Restricted Boltzmann Machines

U.S – United States

CTD – Collaborative Tensor Decomposition

OCR – Optical Character Recognition

ELM – Extreme Learning Machine

SVM – Support Vector Machine

CHAPTER 1

INTRODUCTION

1.1 Background

Automated license plate recognition (ALPR) is a need for applications in roadway imaging. License plate recognition are equipped with sensors that comes with the implanted camera to observe the traffic of the road. The vehicle's license plate, the time and the location of the vehicles will be recorded when it moves near the sensor and that is how the process takes place. Automatic license plate recognition does not need the help of human thus this system can be found very handy in image processing field.

In real world applications like toll collection in highway, management systems in parking lot and traffic roads (S. Yu et al, 2015). Besides that, in in common cases like looking for stolen cars or in the embassies and factories, license plate recognition is system widely used (V. Tadi et al, 2016). In order to meet all the needs of the applications that used license plate recognition, the detection and the recognition rates must be very high.

Although license plate recognition has been used since the last two decades, there are still obstacles in accomplishing the detection and recognition rates (Tian, R. Wang et al, 2015). The major challenge in license plate recognition is the low quality that caused by the lighting and the conditions of where the images were taken.

The license plate itself also can affect the quality as the printed license plate sometimes are not in a good condition or the old one causing unclear images captured. In this case, noise can occur in the images and can cause the images fail to be detected so few approaches were implemented to ensure the quality of the license plate recognition will be in a high resolution (B. Epshtein et al, 2010).

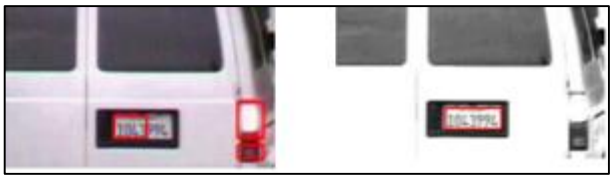

Figure 1.0: The figure shows the text detection method before (on the left side) and the improvement of the license plate image (on the right side).

Figure 1.0.1: The figure shows the extracted images from the first figure

Figure 1.0.2: The figure shows the binarization of the plate number using Howe's method.

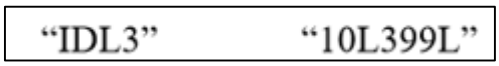

Figure 1.0.3: The figure shows the recognition of the binarized results using Tesseract OCR

1.2 Objective

Due to the development of this project which is Automatic Vehicle Plate Recognition, the objectives were created. The main purposes are:

1. To develop a vehicle plate recognition using template matching.
2. To generate an interface using MATLAB software.
3. To analyse the effectiveness of the result based on the proposed method.

1.3 Problem Statement

Nowadays, the residents in big cities and even in rural area has increased a lot so as the number of residents rise, definitely the number of vehicles will also surge because having a vehicle is a need for everyone. When most of the residents will have more than one

vehicles, it would be very hard to control and observe the incoming and outgoing each of the vehicles and it may lead to the growth of crime cases especially stolen cars because in a place like car parks, basement and lobbies, people tend to share the spot to park their vehicles there. Moreover, in the car parks, the access of the vehicles there can also be tough to be controlled because in such condition at a housing area where the parking space is limited, people might have difficulties on dealing with a problem of a people taking over someone else parking. If the problem is related to the security problems, the case could be referred to the authorised party like police but when it comes to the neighbourhood problems or residential area problems, an initiative to solve the problem needs to be thought.

Having a license plate recognition can be the best way to solve the problem because it is a device where the public users can also have. If there are numerous number of a stolen cars in a day, police or the authorised party might take quite a long time to find the car so here where license plate recognition can be an option because it saves time besides can reduce the crime cases related to the vehicles so all the movements of vehicles can be tinged by reading the plate number of the vehicles. The system can be very handy because it no longer needs security guard or man power to move around to observe the condition. Hence, it can also save cost from hiring more people.

1.4 Scope

License plate recognition method emphases on large community of people as it includes vehicles usage since most of people in the world have their own vehicles so it can be considered as a prior need. License plate recognition scopes are to display the same car plate that has been captured as an input image accurately.

1.5 Structure of report

There are three chapters in this report where all of them are the important elements of the project. All the processes and the sequence of the project will be discussed clearly in the chapter.

The report starts with chapter 1. In chapter 1, it will cover about the introduction of the proposed method. The basic stage of the project is clearly reviewed. This chapter gives a clear picture of how does the idea of the chapter are generated and what does a problem occur that lead to the project development. Besides that, the measured goals are discussed in objectives and the scope of the project will explain about what the project really does.

After chapter 1, it is followed by chapter 2. Chapter 2 is about the literature review of the related previous projects. The literature review is learning and understanding the method used by other party and the research can be in the forms of journals, paper, news, internet source and others.

The next chapter of the project is chapter 3. If in the chapter 2, other method used by other party is explained and learned, in chapter 3, the proposed method used in the project is discussed. The method used of the project is briefly describe in flowcharts and block diagram of each of the process that takes place would be stated in chapter 3.

Last but not least is about result and discussion. All the results obtained whether they are success or fail and result analysis are in this chapter. The purpose of having a discussion part is to discuss about what lead to the result failure and the root causes of it.

The last chapter is about conclusion and future work.

CHAPTER 2

LITERATURE REVIEW

2.1 What is plate recognition?

In today's world where technology advancement has becoming a significance in our daily life, a system named License Plate Recognition is an intelligent approach to read and capture vehicle registration plates to trace the location of the vehicles and to obtain the vehicles data.

This system is usually owned by a government that has restricted access and it is hard for the public users to get them because of the expensive price. License Vehicle Plate Recognition has many ways to recognize plates such as digital image processing and neural network. There are four phases in the system which starts with is acquisition of image, extraction, segmentation and recognition but all the methods have the same goal which is to reduce the crime rate among vehicles such as stolen cars, car parks access, ease the process of gathering traffic statistics and monitor highway toll fee collection.

Number plates are the important element of a vehicle all around the world. In order to differentiate from one vehicles to another, unique license is used. Normally the plate numbers are clear and can be read by human directly without the help of machines or any device. An automatic License Car Plate Recognition can be so important in the daily life and acts as a technique to recognize vehicles plate number.

2.2 Previous Related Past Project

During the process of completing this chapter, the literature reviews are discussed and presented in the forms of summarizing the journal. The chapter will cover about the idea of the project that leads to the development of this project. The method used by other projects will be explained in details in the summary of the journals.