UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CAR PLATE RECOGNITION SYSTEM USING MATLAB

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

by

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the Bachelor‟s Degree in Electronic Engineering Technology (Industrial Electronic) with Honors. The member of the supervisory is as follow:

……

(DR. ROSTAM AFFENDI BIN HAMZAH)

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ABSTRAK

Pada masa kini, peningkatan jumlah kenderaan menyukarkan penegakkan undang-undang jalan raya.. Untuk mengetasi masalah ini, sebuab system dibina iaitu sistem pengecaman nombor plat kenderaan menggunakkan MATLAB dengan kadar kejayaan yang tinggi dalam pengecamaan nombor plat kenderaan untuk pemantauan dan pengurusan aliran trafik yang cekap. MATLAB adalah bahasa pengaturcaraan tinggi yang terdiri daripada pakar seperti jurutera. Teknik yang dilaksanakan dalam sistem ini adalah pemprosesan imej digital dan rangkaian saraf tiruan (Neural Network). Lokasi sistem plat kereta berpusat pada pemprosesan imej digital. Apabila plat kereta terletak, digit akan dibahagikan untuk pengiktirafan menggunakan rangkaian saraf dan dipaparkan pada antara muka pengguna. Sistem ini akan mempunyai antara muka depan mesra untuk pengguna.

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ABSTRACT

Nowadays, The increasing number of vehicle in today word‟s, it is getting tough to physically uphold law and traffic rules for smooth traffic flow emerged the need of efficient monitoring and management of road traffic. In order to counter the problem, Car Plate Recognition System using MATLAB with high rate of success in identifying and extracting license plate from vehicle was developed. MATLAB is a high programming language composed for specialist such as engineer. The technique that implemented in this system is digital image processing and artificial neural network. The location of car plate system is centred on digital image processing. Once a car plate is located, it digit will be segmented for recognition using neural network and displayed on a user interface. The system will have a friendly front-end interface for user.

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DEDICATION

To my beloved father, mother, family and those people who have guided and inspired me throughout my journey of education here in UTeM.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Car Plate Recognition System is an intelligent Transport System that has a critical part in various certifiable application such motorway unattended parking lot and traffic law enforcement. Some of ALPR systems have restricted working condition due to different environment and the effect they have on the image.

Most Car Plate Recognition system is privately owned by government companies and is expensive to acquire. This project is to develop a Car Plate Recognition System using MATLAB with high rate of success in identifying and extracting license plate from vehicle. The technique that implemented in this system is digital image processing and artificial neural network. The recognition of car plate system is centred on digital image processing. Once a license plate is located, it digit will be segmented for recognition using neural network and displayed on a user interface. The system will have a friendly front-end interface for user. There are many processes before the license plate can be extracted in ASCII character.

1.2 Background of the study.

Nowadays, The increasing number of vehicle in today word‟s, it is getting tough to physically uphold law and traffic rules for smooth traffic flow emerged the need of efficient monitoring and management of road traffic. In order to counter the problem, car plate recognition was develop to identify the vehicle.

Number plates are used to identification of vehicle all over the nation. It has a unique license number that distinguishes one vehicle from other. In most cases,

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vehicle license plate numbers are easily readable by human but not machines. An Automatic Car Plate Recognition is an Intelligent Transport System that has an important part in numerous real word such a motorway toll, parking lots and traffic law enforcement. Car Plate Recognition is an image processing technique of identify vehicle by their number plate

The name “MATLAB” comes from the contraction of two words which is MATrix and LABoratory. It is a high-programming platform composed particular for specialist such as engineers‟. MATLAB language is the core of MATLAB, a matrix-based language permitting the most regular articulation of computational arithmetic. It integrates computing, visualization and programming environment.

1.3 Problem Statement

With many tenants living in close proximity and sharing any range of common spaces such as lobbies, hallways, parking garages, laundry facilities, workout rooms, swimming pools, etc. The security of an entire apartment complex can pose unique challenges. In order to ensure a safe and secure environment for all residents, a property manager must have a system in place that deters crime and flags suspicious activity of all kinds such trespassing to loitering, parking problems .

Thus by using this car plate recognition system monitoring and authorized vehicles at residential entrance can reduced the most of the problems happen in residential area. Next, avoid the unauthorized resident to trespassing the area. Furthermore, this system is advance than the previous security system because this system is an autonomous system that not required a security guard to control the entrance.

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1.4 Objective

The development of Car Plate Recognition System by using MATLAB was the main objective of this project. The system enables to recognize the car plate for surveillance. The objectives of this project are:

1. To develop a car plate recognition system based on neural network.
2. To create a graphical user interface (GUI) for the proposed system using a MATLAB.
3. To analyse the efficiency of the system using real car plate numbers.

1.5 Scope

The scope of this project is to monitoring and surveillance of car entrance at the gate using car plate recognition. It helps to reduce the time taken for the authorized residence during entrance and exit at the entrance gate and reduce the workload of security guard. Furthermore, improve the safety and security system in the resident area especially for monitoring the vehicles at the parking area.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Car Plate Recognition System (CPR) using neural network will be discuss in this chapter. It will cover about the study and theory about Image Processing and Neural network used to develop the project. In order to gain the knowledge and idea about the project a few of research paper are referred as reference. It is a good way to produce a better and more effective product.

2.2 Research on Previous Project

2.2.1 License Plate Recognition using Multi- cluster and Multilayer Neural Network

From the journal of Siti Norul Huda Sheikh Abdullah,Marzuki Khalid and Rubiyah Yusof , Malaysia vehicle license plate recognition with typical license plate based on image processing, feature extraction and neural network was develop. Multi- Cluster was used to detect the license plate at the correct spot. For neural network classifier source Kirsh Edge feature extraction technique was used to abstract information from license plate character. A standard multilayer perception was used as neural network model that have been trained using back-propagation algorithm.(Abdullah and Khalid, 2006)

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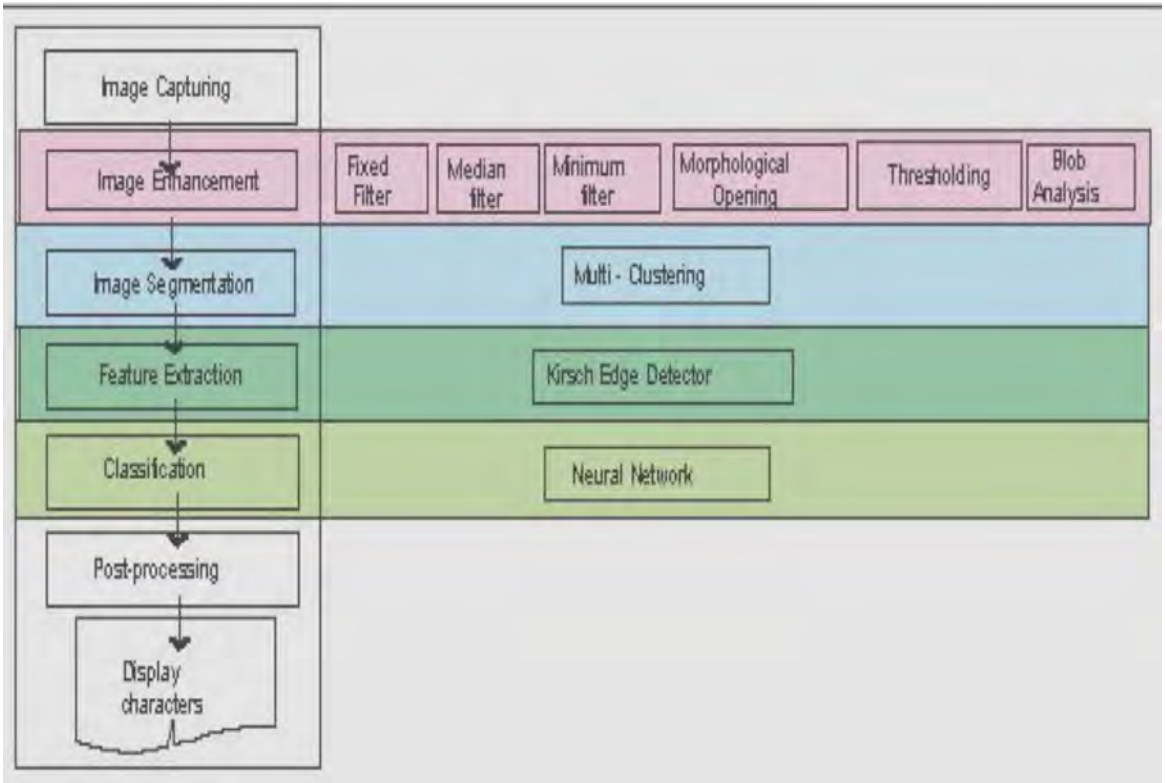

Figure 2.2.1.1: Process in Image processing

Clustering technique is to analyse and find the best blob object and necessary data such as location, height and dimension. The blobs are clustered when distinction among blob and cluster heights and difference between maximum Y value of the cluster and blob are less than a constant time to cluster's height as expressed in multi-clustering formula.

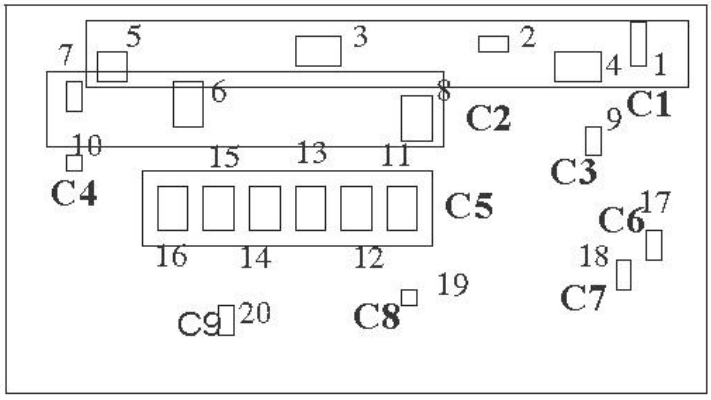

Figure 2.2.1.2 : Image Segmentation using clustering approach

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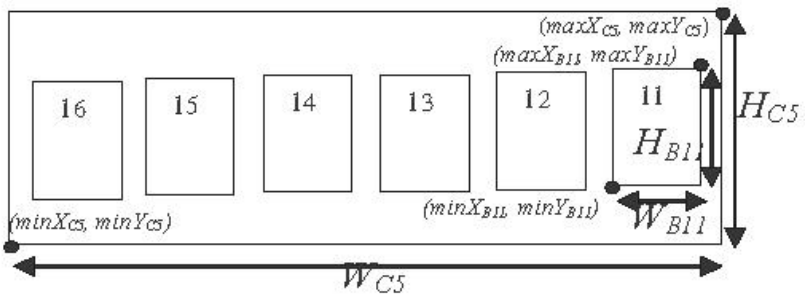

Figure 2.2.1.3 : Important information for clustering approach.

Kirsch Edge Detection has 8 different kernels to detect 8 different of edge. The right vertical, top horizontal, top left diagonal and top right diagonal have been used to symbolize character image and input to neural network.

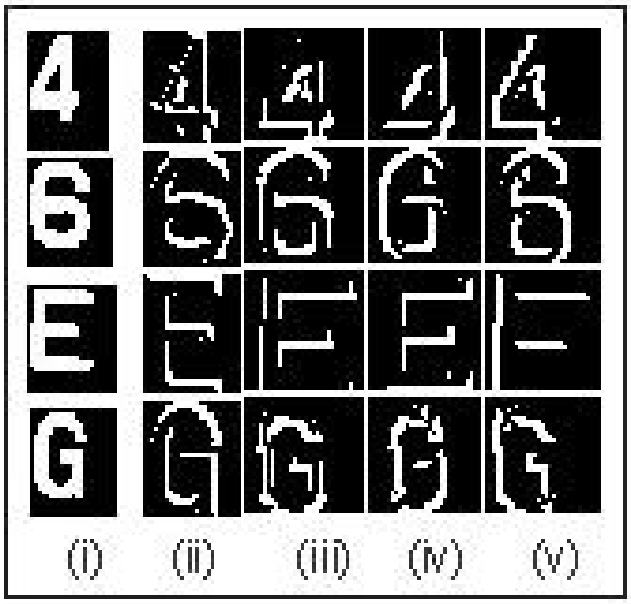

Figure 2.2.1.4 : (i) Character Original Image. Feature extracted of (ii)vertical, (iii)horizontal, (iv)left diagonal and (v)right diagonal for letter '4', '6', E' and 'G' images that use Kirsch Edge Detection.

Neural network were apply to classify the image and recognize the character. There are two important characteristic of neural network which is learning and generalization. The output values were depending on the activation functions which were chosen Binary-Sigmoid. The system has an accuracy of more than 91%.

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2.2.2 Development Of Automatic Vehicle Plate Detection System.

This project was designed by Norizam Sulaiman to help the authorities in recognizing the stolen vehicle. Image Processing and Optical Character Recognition (OCR) approach was applied in this project to overcome the limitation which is the incapability to convert text or information precisely in the difference of character, background and the size of the vehicle plate ,(Sulaiman *et al.*, 2013).

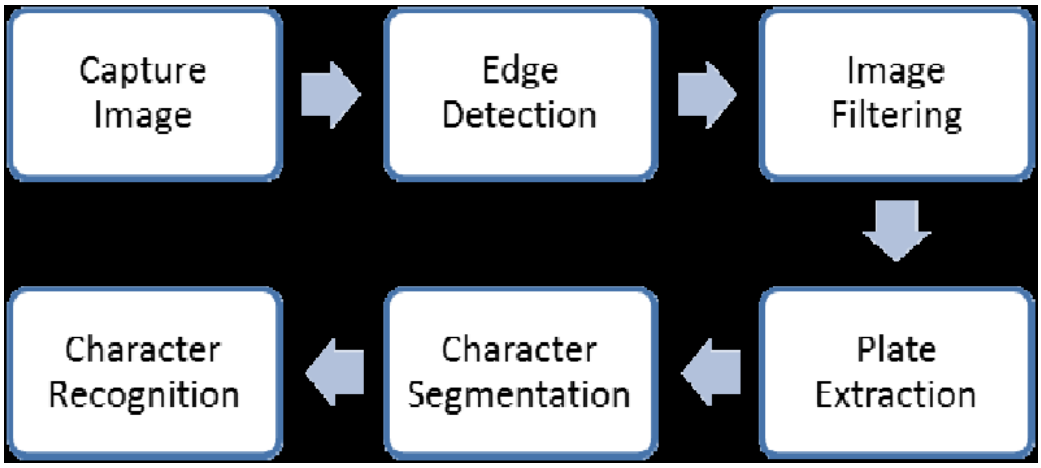

Figure 2.2.2.1 : The block diagram for the system.

In the pre-processing stage, the original colour in RGB format was converted to black and white format. The reason of applying colour conversion was to reduce the scale and range number of colour (RGB) from (0-255) to (0-1) which is black and white. The pixel size of digital image is 640 x 480 pixels.

Figure 2.2.2.2 Colour conversion from RGB to BW for black background.

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Figure 2.2.2.3 Colour conversion from RGB to BW for white background.

Mexican Hat filtering was chosen to filter and eliminate noise and distortion on the images. It is an ideal tool to enhance spots, like spherical particles in noisy images. This module is easy to tune, only by selecting the standard deviations in X, Y and Z directions.

0	0	0	-1	-1	-1	0	0	0
0	-1	-1	-3	-3	-3	-1	-1	0
0	-1	-3	-3	1	-3	-3	-1	0
-1	-3	-3	6	13	6	-3	-3	-1
-1	-3	-1	13	24	13	-1	-1	-1
-1	-3	-3	-6	13	6	-3	-3	-1
0	-1	-3	-3	1	-3	-3	-1	0
0	-1	-1	-3	-3	-3	-1	-1	0
0	0	0	-1	-1	-1	0	0	0

Table Mexican Filtering of 9x9 since the dimension of sample was 640 x 480.

After filtering process, to improve the quality of image, the Morphology operation was applied. Two processes were involved in this operation which is opening and closing. Opening process was used to eliminate the small objects while closing process was used to eliminate small holes. The important features will be extracting from the image plate in this process by using the inverse technique.

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Figure 2.2.2.4 : After applying feature extraction

Figure 2.2.2.5 : After applying inversing technique

In character segmentation, each character and number will be separate using the boundary boxes. Only black pixel in the boundaries box can be identify for character segmentation. The maximum black pixel will be considered in the boundary box for segmentation.

Figure 2.2.2.6 : Character segmentation by applying boundary box

Figure 2.2.2.7 : The results after applying segmentation process

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Lastly, OCR was applied after the result after character segmentation. The evaluation among the character segmentation and typical letter using template matching which consist A to Z letter and number from 0 to 9. The final result was displayed in the text.

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2.2.3 Study Of Edge Detection Techniques In Automatic License Plate Recognition (ALPR).

In this paper by S.Mahalakshmi Edge detection is a procedure of distinguish and finding sharp discontinuities in an image. The discontinuities are unexpected modification in pixel intensity scene. Edge detectors form a collection of very important local image processing technique to trace sharp changes in the intensity function. Edge detection significantly lessens the measurement of information and removes pointless data, while conserving the vital structural properties in an image. With the assistance of edge detection one can easily identify the features of an image which shows the end of one region in the image and beginning of another indicating the transformation in grey level (Mahalakshmi and Karani, 2017).

Sobel edge detection was created by Irwin Sobel and Gary Feldman. This system acts as a discrete differentiation operator, while computing an approximation of the gradient of the image intensity. Hence, this operator will build a gradient vector or a norm of the same in each point of the image as an output. In license plate, Sobel edge detection was applied to find vertical edges and then eliminate unwanted edge and finally, the extract the plate region.

Canny edge detection was utilized to distinguish wide range of edge in an image with the assistance of multi stage algorithm. The detected edge point should be precisely localized at the focal point of the edge by the administrator and an edge should be checked just once whilst preventing false edges being made to meet the criteria of capturing edge with minimum error rate.

Harris corner edge detection technique is a technique which is robust in light. It manages the corner focuses and diverse brightening condition that not influence the corner of image. In license plate, the character is clearly character that have numerous corner then any region on the vehicle.

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