LICENSE PLATE RECOGNITION OF MOVING VEHICLES

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Title: License Plate Recognition of Moving Vehicles

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LICENSE PLATE RECOGNITION OF MOVING VEHICLES

SITI RAHIMAH BINTI ABD RAHIM

Thesis is submitted to
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Dedicate this dissertation to my lovely parents, Abd Rahim Bin Mohd Ali and SitiSakniahBintiSarman and my siblings AbdRahiman Bin Abd Rahim and SitiRaihaniahBintiAbd Rahim for their love and being supportive family for me.

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ABSTRAK

Pengecaman corak telah diketahui oleh ramai penganalisis sebagai satu aplikasi dalam rangkaian neural. Ramai penyelidik memilih tajuk ini sebagai bahan penyelidikan samada pengecaman huruf dan lain-lain corak. Pengecaman huruf adalah satu aplikasi yang paling terkenal dalam pengecaman corak samada huruf tulisan tangan atau lain-lain seperti huruf Arab and China. Projek ini melibatkan pengecaman huruf dari pendaftaran kenderaan sewaktu kenderaan sedang bergerak di atas jalan raya. Pendaftaran kenderaan mempunyai dua jenis huruf iaitu abjad dan nombor. Huruf dari pendaftaran kenderaan dapat dikecam dengan mengunakan teknik pemprocessan gambar dan aplikasi rangkaian neural yang terdapat dalam perisian MATLAB. Projek ini mempunyai dua bahagian, dimana gambar kenderaan akan diproses mengunakan teknik pemprosesan gambar dan kemudian akan dikecam mengunakan rangkaian neural. Pengecaman huruf dari pendaftaran kenderaan akan dikecam mengikut sasaran yang telah ditentukan. Seterusnya, perbandingan diantara 50 dan 100 neurons lapisan tersembunyi dilaksanakan untuk mengenalpasti pengecaman huruf yang terbaik. Pada peringkat akhir projek, pengenalpastian huruf akan dibentang dan dibincangkan.

ABSTRACT

Pattern recognition has been identified by researchers as one of the neural network applications. There are many researches on this topic whether it character recognition or other pattern. The famous application in pattern recognition is the character recognition whether it handwritten recognition or others such as Arabic and Chinese character. In this project, the character recognition is for moving vehicles where character from license plate of moving vehicles will be recognized. License plate character consists of alphabet and number. Incorporated with image processing and neural network toolbox, this simulation will be design using the MATLAB toolbox. This project consists of two parts where the image will be process in image processing part while the character will be recognized using the backpropagation neural network. The character recognition will be recognizing according to the target output. In addition, performing recognition simulations compare between 50 and 100 neuron of hidden layer for the best character recognition. At the end of this project the recognized character from the license plate will be presented.

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LIST OF ABBREVIATIONS

ANN	Artificial Neural Network
BP	Back-propagation
DSLR	Digital Single-lens Reflex Camera
FYP	Final Year Project
MATLAB	Matrix Laboratory
NN	Neural Network
RGB	Red Green Blue
UNIMAS	University Malaysia Sarawak
GUI	Graphical User Interface

CHAPTER 1

INTRODUCTION

1.1 Background

Vehicles license plate recognition is one of the important techniques that can be used for identification of vehicles around the world. It useful in many applications such as entrance admission, security, parking control, road traffic control, speed control and so on [1]. This project entitled “License Plate Recognition of Moving Vehicles” is a system that will be developed to recognize the license plate characters in various speeds and conditions of moving vehicles. This project consists of simulation program to recognize license plate characters where a captured image of moving vehicles will be the input. The image will then be processed and analyzed using image processing and neural network techniques. Based on network performance error calculated from neural network output and target output will determined whether the neural network recognize the input as the target. Figure 1.1 shows the standard layout configurations of license plates for Malaysian private vehicles [1].

Figure 1.1: Standard Configuration of Malaysia License Plates

1.2 Project Objectives

The project objectives of designing the software for license plate recognition as has been discussed with the supervisor have been identified, as follows:-.

1. Develop the coding to loading image and neural network training to recognizing the character from license plate of moving vehicles.
2. Develop the coding that can extract the character from single line pattern with seven character of license plate in Malaysia particularly Sarawak state.
3. Develop the coding for image processing process and neural network training.

1.3 Statement of Expected Problems

The main expected problem that will be encountered in this project is blurred image that produce when capturing moving vehicles license plate image using normal camera. This problem occurs due to slow camera speed as compared to the moving vehicles. The blurred image capture also occurs when capturing image during the different conditions weather such as raining, sunshine, night and cloudy. Blurred image problem is basically causes by the hardware part of this project.

The similarity of some alphabet and number patterns are also foreseen to the problems occur in this project. The alphabet and number that might be similar are misinterpreted by developed software are “1” with “7”, “2” with “Z” and “8” with “B”. This may causes error where incorrect results are displayed by the simulation software developed

1.4 Proposed Solutions

The solution on blurred image can be solved by using the appropriate camera that suitable for capture the moving image such as high speed camera. Although this camera speed can capture the freeze moving image, it is still incapable of solving the blurred image. The images will still certain same blurred edges. Therefore, the image must undergo some image processing technique using MATLAB software to remove the blur edges. After this process, the image obtain will be used to undergo the next part for character recognition.

The neural network approach will recognize each character that has been extract from image, where it will solve the misinterpreted character problem. The solution on recognizing the similar character will be also solved using neural network approach where the best chosen learning pattern identified will be used for this problem. There are a lot of neural network types can be chosen for better accuracy on recognizing the character. Large amount of neural network training in MATLAB software toolbox will give more understanding on this approach and increases the ability of this project to recognize the character correctly.

1.5 Expected Outcomes

This FYP project is based on simulation program develop using MATLAB. However, this project still employs hardware system on the image acquisition part. This project consist the hardware used to capture the moving vehicles image and the simulation program used to do the image preprocessing and recognize the license plate character based on target output given in neural network training process. This simulation program will be developed using MATLAB software. Image preprocessing consist the process of image enhancement, filtering the noise and extracts the character from license plate where neural network part consists of process to recognize each license plate character based on error calculation between network output and target output. Video camera is used to capture the moving image and convert it into image frame.

1.6 Report Outlines

The report outline contains the undergoing chapter of the final year project report. Chapter 1 starts with introduction of the project, benefits and also the aims and objective of the project. This chapter also gives explanation on the statement of problem together with the proposed solution on each problem and project outline that has been followed while undergoing the final year project.

Chapter 2 is the literature review where it summarizes the recent research and scholarly sources relevant on the particular issue and theory in this project. This chapter also summarizes the particular of theory on simulation approach that connected with this project. In this context, the research on license plate recognition using another approach and the explanation on simulation approach such as image processing part will be discusses.

Chapter 3 is methodology which summarize about the method that will be used in this project to obtain the result. In this project the method that will be used in recognizing the license plate character is image processing approach and neural network simulation using MATLAB.

Chapter 4 explains the result and discussion from this project. The result represent in from of network performance graph, the network simulation result from the network training and the discussion on recognition result.

Chapter 5 concludes the report summary of the finding obtain though out the whole FYP project. The conclusion on work experience and work effort done to meet the requirement on this project development has been told here. The future work on improve this project and recommendation on new title research that similar with the project also been suggest here.

CHAPTER 2

LITERATURE REVIEW

2.1 License Plate Recognition System

License Plate Recognition of Moving Vehicles is based on image processing and neural network where image processing techniques such as edge detection, thresholding and re-sampling has been used to locate and isolate the license plate and the characters. The neural network was used for successful recognition the license plate number [2]. There are many researches on this project title where they using a different method for license plate character recognition [1, 2, 3].

Among the thesis on license plate recognition system titles Vehicles license plate character recognition by neural network by M. Khalid et. al. [1], Smart License Plate Recognition System based on Image Processing using neural network by V. Koval et. al. [2] and car license plate recognition with neural network and fuzzy logic by J.A.G Nijhuis et. al. [3]. Some of the method that they used is almost same especially on the image preprocessing, image segmentation and also use the grayscale image.

2.2 Image Preprocessing

Image preprocessing is an important process which it used to manipulate the images for character recognition operation. The image preprocessing applies some standard image processing technique such as contrast stretching and noise filtering to enhance the quality of the image [3]. Capturing image of moving object will produce the blurred image, using the computer algorithm; image will be preprocessing to improve the quality to allow the character in the images to be recognized. In image preprocessing, color image (RGB) acquired by a digital camera is converted to gray-scale image based on the RGB to gray-scale conversion technique. The basic idea of this conversion is performed by eliminating the hue and saturation information while retaining the luminance. Equation (2.1) shows an optimal method for RGB to gray-scale conversion [4].

$$Lu = (0.2999 \times R) + (0.587 \times G) + (0.114 \times B) \tag{2.1}$$

where

Lu is luminance

R refers to red components

G refers to green components

B refers to blue components