

Universiti Teknologi MARA

**License Plate Recognition Using Kohonen
Neural Network Algorithm**

Norfaeza binti Mat Noor

Thesis submitted in fulfillment of the requirements for
Bachelor of Science (Hons) Intelligent System
Faculty of Information Technology And
Quantitative Science

NOVEMBER 2006

DECLARATION

I certify that thesis and the research to which it refers are the product of my own work and that any ideas or quotation from the work of other people, published or otherwise are fully acknowledged in accordance with the standard referring practices of the discipline.

02 NOVEMBER 2006

.....

NORFAEZA BINTI MAT NOOR

2004107400

ABSTRACT

License plate recognition is one of important techniques that can be used for the identification vehicles. It is useful in many applications such as entrance admission, security, parking control, traffic enforcement, and toll gate automation. This paper focuses on the development of the character recognition for license plate number. In the development of this system, several stages have to be executed. The preprocessing is implemented by using MATLAB tool to preprocess the images to become as an input to the network in binary form. For the recognition of the license plate number, the Kohonen self-organizing map is used to recognize the license plate number with using Euclidean distance to determine best-matching unit and employed two dimensional Kohonen layer map. It is easily trained and has attractive properties such as topological ordering and good generalization. Experiments are performed to determine the network parameter beside to measure the performance of Kohonen neural network. The test result of the prototype was shown with 78.57% accuracy.

Keyword: License plate recognition, Kohonen self-organizing map, Euclidean distance

TABLE OF CONTENTS

CONTENTS	PAGE
DECLARATION	ii
ACKNOWLEDGEMENT	iii
ABSTRACT	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	viii
LIST OF TABLES	ix
LIST OF GRAPHS	x
LIST OF ABBREVIATIONS	xi
CHAPTER 1 : INTRODUCTION	
1.1 Introduction	1
1.2 Background	1
1.3 Problem Statement	2
1.4 Objectives of the Research	3
1.5 Project Scopes	4
1.6 Significances of the Research	4
1.7 Summary	5
CHAPTER 2 : LITERATURE REVIEW	
2.1 Introduction	6
2.2 License Plate Number	6
2.3 License Plate Recognition	8
2.3.1 Image Acquisition	8
2.3.2 Processing Approaches	9
2.3.3 Plate Location Detection Approaches	11

2.3.4	Character Localization and Segmentation Approaches	12
2.3.5	License Plate Recognition Approaches	16
2.4	Artificial Neural Network	17
2.4.1	What is Artificial Neural Network?	17
2.4.2	Application of Neural Network	19
2.4.3	The Learning Algorithm of Neural Network	19
2.4.3 [a]	Kohonen Self-organising Map	20
2.4.3 [a]. i.	Overview	20
2.4.3 [a]. ii.	Kohonen Architecture	20
2.4.3 [a]. iii.	Kohonen Algorithm	21
2.5	Summary	24

CHAPTER 3 : METHODOLOGY

3.1	Introduction	25
3.2	Research approach	25
3.2.1	Domain Determination	27
3.2.2	Knowledge Acquisition	27
3.2.2 [a]	Literature Search	27
3.2.2 [b]	Data Collection	28
3.2.3	Preprocessing	29
3.2.3 [a]	Image Normalization	30
3.2.3 [b]	Plate Segmentation	30
3.2.3 [c]	Image Enhancement	30
3.2.3 [d]	Binary Conversion	34
3.2.3 [e]	Character Segmentation	35
3.2.4	Kohonen Neural Network Architecture Determination	35
3.2.5	Kohonen Neural Network Algorithm Determination	37
3.2.6	Development	39
3.2.6 [a]	System Design	39
3.2.6 [b]	System Constructing	40