

Universiti Teknologi MARA

**Facial Expression Type Recognition using
K-Nearest Neighbor Algorithm**

Norhafizah Saffian

**Thesis submitted in fulfilment of the requirements for
Bachelor Of Computer Science (Hons.)
Faculty of Computer and Mathematical Sciences**

JANUARY 2017

ACKNOWLEDGEMENT

Alhamdulillah, praises and thanks to Allah for bestowing us the strength and knowledge to be shared all, I was able to finish this project within the time duration given.

Firstly, my special thanks goes to my beloved supervisor, Dr. Rajeswari Raju. Without her ideas and opinions, I may not be able to complete this project. Therefore, all her kindness for helping me in many ways during this research will not be forgotten. My appreciation also goes to Dr. Hamidah Jantan, my thesis coordinators for all the knowledge, guidance and opinion.

Special appreciation also goes to my beloved parents and siblings for their patience and supportive words that give the strength to carry out this project. Thank you for understanding all my needs. Last but not least, I would like to give my gratitude to my dearest classmates. Thanks you for all your support, cooperation and motivation

ABSTRACT

Customer satisfaction measurement is one of the most crucial ways to identify and improve the business strategy of the organization and the department that involved is in the customer service management. One of the methods to measure the customer satisfaction is by trying to measure the customer emotional aspect. Therefore, it is important to identify customer expression about the services provided and this can be solved using the facial expression recognition to get an accurate measurement of the customer satisfaction. The facial expression consists of three steps that are face detection, facial feature extraction, and classification of feature extraction. The main problem that occurs in measurement the customer satisfaction is the problems with the survey content and the way of the customer respond with the services that lead to an inaccurate customer satisfaction measurement. In this proposed project, the classification step is being focused on and become the main objective. The k-Nearest Neighbor classifier is applied as the classification algorithm. The confusion matrix calculation is used to measure the accuracy of k-NN classifier. Based on this calculation, the accuracy of this algorithm is 93% using the k values of 5. The future work that continue based on this project proposed is by study and applied other type of algorithm that can produce the high performance and accuracy of classification of facial feature for facial expression recognition.

TABLE OF CONTENTS

CONTENT	PAGE
SUPERVISOR APPROVAL	ii
STUDENT DECLARATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	ix
LIST OF TABLES	xi
LIST OF ABBREVIATIONS	xii
CHAPTER ONE: INTRODUCTION	
1.1 Background of Study	1
1.1.1 Facial Expression Recognition	1
1.1.2 Customer Satisfaction Measurement	4
1.2 Problem Statement	5
1.3 Project Objectives	6
1.4 Project Scope	6
1.5 Project Significance	7
1.6 Research Methodology Framework	8
1.7 Summary	9
1.8 Project Outline	9
1.8.1 Research Chapter Organization	10
CHAPTER TWO: LITERATURE REVIEW	
2.1 Pattern Recognition	11
2.1.1 Approaches of The Pattern Recognition	12
2.1.2 Pattern recognition process	14
2.2 Classification technique	16
2.2.1 Proposed Technique To Be Used	16

2.2.2 Another Technique That Has Been Used	19
2.3 Customer Service Management (CMS)	21
2.3.1 Customer Service Management System	21
2.3.2 Customer Satisfaction Measurement	22
2.3.3 Proposed Application	24
2.3.4 The Other Similar Type Related To The Proposed Application	25
2.4 Development of Customer Satisfaction Measurement Using Facial Expression Recognition	29

CHAPTER THREE: METHODOLOGY

3.1 Introduction	30
3.2 Project Methodology Framework	31
3.3 Preliminary Study Phase	34
3.3.1 Image Acquisition and Data Preparation	34
3.4 Design Phase	35
3.4.1 Project Requirement	35
3.5 Project Design Phase	35
3.5.1 Data Representation	35
3.5.2 Algorithm / Engine	36
3.5.3 Design Interface	41
3.5.4 Implementation	42
3.6 Project Evaluation Phase	42
3.6.1 Statistical Analysis	42
3.6.2 Documentation	43
3.7 Summary	43

CHAPTER FOUR: RESULTS AND FINDINGS

4.1 Introduction	44
4.2 Overview of FER_KNN Prototype	44
4.3 Input / Data Description for Representation	46
4.3.1 Analysis Image Pre-Processing	46
4.3.2 Data Pre-Processing of Feature Vector	48