Universiti Teknologi MARA

Parkinson Disease Detection Using Backpropagation Neural Network

Nereus Nixon Nicholas

Thesis submitted in fulfilment of the requirements
for Bachelor of Information Technology (Hons.)
Intelligent Systems Engineering
Faculty of Computer and Mathematical Sciences

February 2017

ACKNOWLEDGEMENT

First of all, I would like to gratefully thank to the Almighty God for blessing me to fulfil my task during my learning periods and successfully completed it within the given time period.

All the success will not be easily achieved without the support from several individuals. Firstly, I would like to express my deepest gratitude to my supervisor, Shamimi binti A. Halim for her supervision, guidance, suggestions, criticism and correction that she provided throughout the progress of this project proposal. Without her full cooperation, I may not be able to carry out this research. Therefore, all her kindness for helping me in many ways during this research will not be forgotten.

Not forgetting, also dedicated thankfulness to Sara Lew Lai Heong who is my domain expert domain and committee members of Malaysian Parkinson Disease Association (MPDA) for all the data she provided for this research.

My appreciation also goes to Azlin binti Ahmad (Dr.) for her guidance in the development of the backpropagation neural network.

Besides that, special appreciation to my family for their patience and supportive words that give me the strength to carry out this research. Thank you for understanding all my needs. Last but not least, I would like to give my gratitude to my fellow classmates. Thank you for all your supports, cooperation and motivations.

ABSTRACT

Parkinson Disease (PD) is a chronic disease that affect the body movement. People who suffered this symptom usually tend to have a massive body tremor especially the patient's hands which they barely able to do any simple activities such as picking up items, pressing electronic buttons, holding things etc. People usually start to have this symptom in their old ages approximately between the ages of 50 to 60. But bear in mind that as early as the age of 30 years old could also shows a minimal sign of PD. So, this project is developed to detect PD in their early ages whether they have positive or negative signs of PD. Since there is no standard PD diagnosis procedure and most of it are expensive, a small portable device called Leap Motion Controller (LMC) is used in this project which focused at the PD patient's hand tremor. It is a small/handheld tool which simply hovering/moving their hands 5cm distance on top of the tool will capture the hand movements in 3D. Basically, each finger (thumb, index, middle, ring, and pinky) is pinpointed and exported their x, y and z axis positions after the recordings is done. All the readings are then processed by Backpropagation Neural Network (BPNN) engine to detect positive or negative PD. The training and testing dataset of the BPNN engine is 90% and 10% respectively. The BPNN inference engine is programmed using C# programming language on Unity3D multiplatform software. The system was tested for its accuracy and showed acceptable results with an accuracy of 80% for PD detection.

TABLE OF CONTENT

CONTENT	PAGE
SUPERVISOR APPROVAL	ii
STUDENT DECLARATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	ix
LIST OF TABLES	x
LIST OF ABBREVIATIONS	xi
CHAPTER ONE: INTRODUCTION	
1.1 Project Background	1
1.2 Problem Statement	2
1.3 Research Questions	3
1.4 Project Objective	3
1.5 Project Scope	3
1.6 Project Significance	4
1.7 Summary	5
CHAPTER TWO: LITERATURE REVIEW	
2.1 Introduction to Parkinson Disease	6
2.1.1 Parkinson Disease Symptoms	7
2.1.2 Diagnose Parkinson Disease	11
2.1.3 Commonly Used Methods	12
2.2 Leap Motion	13
2.2.1 Leap Motion Controller	14

CHAPTER 1

INTRODUCTION

Currently the numbers of Parkinson Disease patient in Malaysia are keep increasing over time. We should monitor our health so that we could maintain our healthy lifestyle which in turn, gave us advantages where we can do any work without health irritation. Therefore, it is very important that each individual have to identify whether they have Parkinson Disease in their early age so that they could prevent it from getting it worst.

1.1 Project Background

Parkinson's Disease (PD) is a progressive movement disorder and chronic disease, which means that the symptoms are gradually worsen from time to time. Symptoms of Parkinson's develop slowly and continue progress over time. Each person is affected differently and the rate of progression varies greatly between individuals. Parkinson's doesn't directly cause people to die and it is possible to live with Parkinson's for a long time, although symptoms do get worse over time.

The causes of Parkinson Disease are unknown, and although there is presently no cure, there are treatment options such as medication and surgery to manage its symptoms. There are many theories as to the causes and it is generally thought that multiple factors are responsible. The average age of diagnosis is 65 years, however younger people proximately 30 years or older can be diagnosed with Parkinson's too.

According to Malaysian Parkinson Disease Association (MPDA), it is estimated that about 15,000 to 20,000 patients suffered from Parkinson Disease (PD) in Malaysia. Since there is no cure for PD, it is expected that the number