UNIVERSITI TEKNOLOGI MARA

PARKINSON DISEASE GAIT CLASSIFICATION BASED ON MACHINE LEARNING APPROACH

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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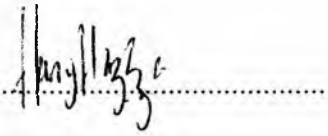
Signature of Student	:	
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ABSTRACT

The aim of this thesis is to develop a Parkinson gait recognition technique that is able to evaluate and distinguish gait deviations experienced by Parkinson Disease (PD) patients from normal pattern. The research can be divided into two phase namely gait analysis of PD as compared to normal subjects, followed by gait classification using machine learning approach. Firstly, two types of statistical test are conducted which are independent t-test and Pearson's correlation test. Raw gait database which consist of four basic gait features, five kinetic gait features and also twelve kinematic gait features are acquired from prior walking experiments of both PD and normal subjects. Based on statistical analysis conducted, significant different between PD and normal gait pattern are observed for four features, which are the step length and walking speed from basic features, maximum extension of hip from kinematic feature and maximum horizontal push-off force from kinetic feature. Hence these significant features are appropriate to be utilized for recognition of PD gait. Next, Principal Component Analysis (PCA) is used as feature extraction for each gait features from basic, kinetic and kinematic parameter followed by normalization based on intra-group as well as inter-group. To evaluate the effectiveness of each gait features category, Artificial Neural Network (ANN), Support Vector Machine (SVM) and Naive Bayes classifier (NBC) are chosen as classifier. Results obtained demonstrated that for ANN classifier, fusion of basic and kinematic gait features due to intra-group normalization attained performance with 100% of accuracy outperformed others. As for SVM with polynomial kernel function, the finest performance specifically 100% accuracy is attained based on basic gait features from intra-group normalization whilst NBC achieved the best accuracy of 93.75% due to fusion of kinetic and kinematic gait features with intra-group normalization. Overall, the results obtained proven the ability of the machine classifiers in classifying gait pattern of PD from normal gait pattern with basic spatiotemporal seems to be the most reliable feature for this purpose due to its superb performance that achieved during classification by the three classifiers.

TABLE OF CONTENTS

CHAPTER THREE: THEORETICAL BACKGROUND

CHAPTER FOUR: METHODOLOGY