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DEVELOPMENT OF INTERACTIVE SCENARIO USING HUMANOID ROBOT TO ASSIST REHABILITATION FOR CHILDREN WITH CEREBRAL PALSY

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AUTHOR'S DECLARATION

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

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Human-robot interaction (HRI) has widened their wing to help people with disabilities to improve their quality of life. The use of Socially Assistive Robotics has created a potential approach in Cerebral Palsy (CP) rehabilitation. CP is a common neurological disorder among children that impairs motor function and may involve cognitive function. The objective of the study is to investigate the potential application of humanoid robot NAO as a tool in augmenting rehabilitation therapy for children with CP. Four interactive scenarios were designed to augment rehabilitation therapy for children with CP. Data for Joint Values of the robot NAO for Interactive Scenario 2, 3 and 4 have been recorded. The selected children have been undergone repetitive exposure with the robot for a period of 8 weeks. The experiment indicates that the robot had successfully acted as an adjunct tool in order to motivate the children during the process of robotic rehabilitation. Attention Measurement Checklist has been developed to measure the HRI effectiveness. The children were engaged in the interactions and showed positive responses to the robot. Next is the analysis and comparison of the result of clinical assessment between pre- and post- interaction. The other part of the study is to survey the parents' perception towards HRI. Overall, this parent strongly agreed with this robotic therapy for their child. With the presence of humanoid robot NAO, there is a good potential to make the therapy more effective since the robotic elements have a potential attraction to the children's interest.

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CHAPTER ONE
INTRODUCTION

This chapter presents the introduction of this thesis. Background of study, objectives, and problem statements of this research are presented. The chapter also explains the scope and limitation, significant and also the originality of the study.

1.1 RESEARCH BACKGROUND

Up until now, the number of registered people with disabilities in Malaysia is keep increasing. The statistic stated by the World Health Organization (WHO) in 2011 that people with disabilities (PWDs) in Malaysia is considered as one of the most vulnerable of the minority group in the Malaysian population (Islam, 2015). The number is expected to be increase due to the population ageing and improvements in methodologies used to measure disability. One of the most common physical disabilities that occur among children is Cerebral Palsy (CP).

CP is an umbrella term encompassing a group of non-progressive, non-contagious motor conditions that cause physical disability in human development, primarily in the various areas of body movement (Peter Rosenbaum, 2006). There are four types of CP which are spastic, ataxic, dyskinetic and mixed (Konstantinos P.Michmizos, 2012). It is noted that the awareness on CP had started since the 1860s. Early studies by William John Little (1810-1894) related CP to perinatal anoxia, injury to the head and neck at birth and difficulty in deliveries (Schifrin BS, 2000) which findings were agreed by Sigmund Freud. The biggest challenges faced by children with CP are limitations in the fundamental areas of humanity: mobility, communication, manipulation, orientation and cognition (Konstantinos P.Michmizos, 2012). Since CP has no cure, management for CP focuses on how best to help individual maximize his or her potential to improve their quality of life (Marjolijn Ketelaar, 2001).