UNIVERSITI TEKNIKAL MALAYSIA MELAKA

THE DEVELOPMENT OF E-UNICYCLE BRAKING SYSTEM BY USING VOICE RECOGNITION COMMAND

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Automation and Robotics) with Honours.

by

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation and Robotics) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Sejak kebelakangan ini ramai penyelidik dari industri membangunkan satu sistem pengangkutan perseorangan seperti 'Segway PT', 'hoverboard' dan pengimbang diri satu tayar yang dikenali sebagai 'unicycle'. Projek ini adalah tentang pembangunan sistem brek untuk 'unicycle' elektrik yang dikenali sebagai prototaip sistem brek E-unicycle. Projek ini adalah untuk membangunkan sistem brek pintar dengan menggunakan arahan pengiktirafan suara. Sistem brek 'unicycle' elektrik yang terdapat kini dikendalikan oleh penunggang sendiri dimana mereka perlukan untuk mengawal sistem brek sendiri dengan meluruskan dan mengimbangi badan mereka untuk memberhentikan tayar 'unicycle' sehingga ia berhenti. Kenderaan satu tayar ini sukar untuk berhenti apabila penunggang berada dalam keadaan panik, oleh itu penunggang mungkin berlanggar dengan seseorang sehingga mengakibatkan kecederaan. Kecederaan boleh berlaku jika penunggang tidak dapat mengawal sistem brek. Sistem brek dengan menggunakan pengenalan suara dapat membantu meningkatkan keselamatan penunggang dengan menggunakan arahan suara. Arahan diberikan oleh penunggang melalui mikrofon dan isyarat dihantar ke modul pengenalan suara untuk diproses dan proses pengecaman suara berlaku. Data kemudiannya dihantar ke mikrokontroler dan mikrokontroler akan memproses data dan data akan dihantar terus ke motor umtuk mengaktifkan sistem brek. Sistem ini dibahagikan kepada dua bahagian utama iaitu bahagian elektrik dan bahagian elektronik. Untuk bahagian elektrik ia terdiri daripada satu motor untuk penggerak, satu roda, dan bekalan kuasa. Bahagian elektronik terdiri

daripada mikrokontroler, peranti pengecaman suara, dan pemandu motor yang disambung terus kepada sistem brek kecemasan. Mikrokontroler digunakan untuk melaksanakan semua arahan yang diterima daripada sistem pengenalan suara. Ujian untuk pengiktirafan suara telah menunjukkan bahawa peratusan pengiktirafan suara lebih tinggi apabila kawasan ini senyap berbanding dengan kawasan sesak dengan sebutan yang baik. Gabungan perisian dan perkakasan mencapai matlamat projek ini apabila pelaksanaan kedua-dua perisian dan perkakasan berfungsi dengan baik seperti yang diharapkan.

ABSTRACT

Recently many of researcher and inventor develop a single transportation system such as Segway PT, hoverboard and self-balancing unicycle. This project presents the development of electric unicycle braking system namely E-unicycle braking system prototype. This project is to develop the smart braking system by using voice recognition command. The current self-balancing unicycle braking system is control by the rider themselves which they need to control the braking system by straightening and balance their body to slow down the unicycle until it stop. It is hard to stop when the rider is in panic situation, thus the rider might have collided with something or bump into someone. Injury can have happened if the rider cannot control the braking system. The braking system by using voice recognition help to increase the safety of the braking system by using voice command. The command is given by the rider through microphone and the signal is send to the voice recognition module to process and recognize the voice. The data then is send to the microcontroller and the microcontroller process the data and send directly to the motor and activate the braking system. The system is divided into two main part which is electrical part and electronic part. For the electrical part it consists one motor for actuator, one wheel, and power supply. The electronic part is consisting of microcontroller, voice recognition device, motor and motor driver for the emergency braking system uses. A microcontroller is used to execute all command that received from the voice recognition system. The test for voice recognition has shown that the voice

recognition percentage of efficiency is higher when the area is silent compare to crowded area with good pronunciation. The combination of software and hardware achieve the objective of this project when the implementation of both software and hardware works well as expected.

DEDICATION

This study is wholeheartedly dedicated to my beloved parents, who have been my source of inspiration and give strength, provide their moral, spiritual, emotional and financial support.

I also dedicate this study to my family and friends who have supported me throughout the process. I will always appreciate all they have done especially to my supervisor Mrs. Siti Nur Suhaila Binti Mirin for helping me throughout my research and development of this project and all the advices.

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D, d	-	Diameter
F	-	Force
l	-	Length
m	-	Mass
N	-	Rotational velocity
P	-	Pressure
r	-	Radius
T	-	Torque
V	-	Velocity
w	-	Angular velocity
x	-	Displacement
z	-	Height
q	-	Angle

LIST OF ABBREVIATIONS

A	Ampere
V	Voltage
DC	Direct Current
Hz	Hertz
TX	Transmit
RX	Receive
AT	ATtention
W	Watt
GND	Ground
Vin	Voltage Input
ROM	Read-only Memory
RAM	Random-access Memory

CHAPTER 1

INTRODUCTION

1.1 Background

Transportation is a stage of human civilization for movement from one place to another. It makes humans works easier and smoother but nowadays our society suffer from traffic jam especially in urban area where most of the people use transportation for their daily uses. Even though transportation make our life easier, it has a negative impact to harm our environment. Combustion of petroleum from vehicles create the air pollution because it releases carbon monoxide (CO), carbon dioxide (CO2), methane (CH4), nitrogen oxides (NOx) and nitrous oxides (N2O) to harm us. Despite of these problem, electric vehicle was invented for reducing time consuming and to reduce air pollution that our society faces every day. Public transportations that uses electric power provided by the government such as commuter, ERL and MRT has help to reduce traffic jammed for a certain time and also help reduce the air pollution. Latest, the small personal vehicle is invented for a person for travelling short millage which can reduce their time during peak time rather than they take commuter with full of people. Though some people use the electric unicycle as a toy, but it can be a serious transportation alternative in future. This electric unicycle (EU) is more fun and challenging than a bicycle because the riders need to practice more to balance their self on the EU. To make a movement, the rider must lean their body forward, backward, left and right with freehand. Compare to the old unicycle and bicycle, it is less tired since riders does not have to cycle and it is an ability to have two hands free while riding. Riders can hold their groceries with two hand full or carry a

lot of stuff without worry. This EU can be ride on the sidewalk, bicycle lane, subway, shopping mall or other places since it is small and does not take much space. Although it helps a lot to ease user's daily routine, the safety of this vehicle has to be improve to reduce accident happened as a lot of cases has reported.

1.2 Introduction

In modern era, the technology continuous developed to make human works easier and faster. Along with that, transportation not being left behind to evolved with other technology. The latest technology for electric unicycle is known as self-balancing unicycle. Electric unicycle is a one-wheel vehicle for one person to move from one place to another by balancing their body without falling while riding the unicycle. The rider controls the movement of unicycle by leaning their body forward, backward, left and right in order to make a movement. There are many types of SBU in the market for example monowheel, micro unicycle, monster unicycle and dual wheel electric unicycle. This technology is invented to reduce time for a person to travel during a peak hour and to reduce air pollution in urban area but the safety of their braking system needs to be increase because the braking system has to control by the rider itself. The rider needs to control their self-straight in order to stop the unicycle or jump from the unicycle to stop it. This will lead to accident happened or injury occur.

1.3 Statement of the Purpose

The purpose of this project is to develop an E-unicycle smart braking system by using voice recognition. This project is to help user increase their safeness during riding the E-unicycle to avoid accident happened.