UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF WIRELESS ROBOT CONTROLLER BY USING ARM GESTURE

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Industrial Electronics) 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 Electronic Engineering Technology (Industrial Electronics) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Projek ini adalah mengenai pembangunan pengawalan robot tanpa wayar dengan menggunakan isyarat tangan di mana ia dapat mengatasi masalah memilih dan memposisikan objek dari pengguna dengan cara yang paling mudah dan boleh mengawal kuasa cengkaman tangan robot untuk mengelakkan tekanan tambahan bagi tujuan keselamatan pada objek tersebut. Ideanya ialah menggunakan gerakan yang merupakan sensor giroskop dan sensor flex untuk mengesan pergerakan tangan. Ia akan menyampaikan maklumat pergerakan dari tangan orang sebenar ke tangan robot. Dua Arduino digunakan, iaitu Arduino Nano pada tangan orang sebenar dan Arduino Uno pada tangan robot sebagai mikropengawal. Reka bentuk projek adalah robot 4 DOF yang mempunyai empat servo motor mewakili 4 darjah kebebasan sehingga terdapat empat input untuk kawalan yang mana 2 input dari giroskop dan dua input lain dari dua sensor flex. Input-input ini kemudiannya dihantar secara tanpa wayar dari pemancar yang merupakan tangan pengguna kepada litar penerima tangan robot dengan menggunakan transceiver nRF24L01. Kemudian, pengesan daya akan membaca dan memaparkan daya tekanan tangan robot bagi memastikan daya yang sesuai untuk mengangkat dan meletakkan objek tersebut. Penyediaan sistem dan ujian juga dibentangkan dalam kertas ini. Jenis robot ini digunakan secara meluas dalam aplikasi tentera, industri robot, bidang pembinaan di mana robot ini dapat mengekalkan keselamatan manusia dan menggantikan tenaga manusia.

ABSTRACT

This project is about the development of wireless robot controller by using the hand gesture where it can overcome the problem of picking and positioning objects away from the user in the simplest way possible and can control the grip power of the robotic arm to prevent additional pressure for safety purposes on the object. The idea is to use motion which is the gyroscope sensor and bend sensors to detect the hand movements. It will convey movement information from a real person's hand to the robotic arm. Two Arduino are used, which is Arduino Nano on the real person's hand and Arduino Uno on the robotic arm as the microcontroller. The project design is a 4 DOF robot which it has four servo motors represent the 4 degree of freedom so there are four inputs for control which 2 input are from the gyroscope and another two input are from two flex sensors. These inputs are then wirelessly sent from transmitter which is user hand to the robotic arm receiver circuit using nRF24L01 transceiver. Then, force sensor will read and monitor the force of arm robot gripping to make sure suitable force to pick and place the object. The setup of the system and the testing are also presented in this report. This type of robot widely used in military application, industrial robotic, construction field where these robots can maintain human safety and replace human labor.

DEDICATION

For my beloved parents,

Wan Shafie bin Wan Daud and Che Azizah binti Mat Yajid

For my supervisor,

Mr. Khairul Anuar bin A Rahman

and my co-supervisor,

Mr. Wan Norhisyam bin Abd Rashid

And for my friends in UTeM,

Especially for BEEE students.

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LIST OF SYMBOLS

V	Volt
A	Ampere
mA	Miliampere
GHz	Gigahertz
°	Degree
mm	Milimeter
m	Meter
MHz	Megahertz
mw	Miliwatt
kw	Kilowatt
K	Kilo
g	Gram
Kg	Kilogram
DOF	Degree of Freedom
N	Newton

LIST OF ABBREVIATIONS

PWM	Pulse Width Modulation
IFR	International Federation of Robotics
PCB	Printed Circuit Board
IT	Information Technology
DOF	Degree of Freedom
IC	Integrated Circuit
DC	Direct Current
AC	Alternating Current
I/P	Input
O/P	Output
USB	Universal Serial Bus
IR	Infrared
LED	Light-Emitting Diode
LCD	Liquid-Crystal Display
PC	Personal Computer
LAN	Local Area Network
HTML	Hypertext Markup Language
GUI	Graphical User Interfacing
FSR	Force Sensitive Sensor
PLC	Programmable Logic Controller