UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF HAND GESTURE ROBOT USING Xbee COMMUNICATION

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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DECLARATION

I hereby, declared this report entitled "DEVELOPMENT OF HAND GESTURE MOBILE ROBOT USING Xbee COMMUNICATION" is the results of my own research except as cited in references.

Signature :……..

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Date :……

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the of Electrical Engineering Technology (Industrial Automation and Robotics) with Honours. The member of the supervisory is as follow:

(……..)

(Mr. Mohd Zaidi Bin Mohd Tumari)

DEDICATION

Dedicate in thankful appreciation for support, encouragement and understandings to my beloved mother, father, lecturers and brothers.

ACKNOWLEDGEMENT

First of all, I would like to express my deepest gratitude to my supervisor, Mr.Mohd Zaidi Bin Mohd Tumari, for accept and giving me this wonderful and yet interesting final year project. His supervision both aided me to channel and specify the discussed ideas and at the same time provided much appreciated freedom and support to explore new concepts. However, his endless drives for new and better results is highly appreciated, instead of willing to share his own experience and spend his free time to supervise me throughout the implementation of this project.

My appreciation also goes to my parents who bore immense difficulties to educate their children at the highest level. Their affection and love has brought happiness and joy to my life and therefore made this task becomes much easier to be implemented.

Nevertheless, I am grateful to my classmates and those whom involve directly or indirectly with this project. Finally, I hope that all the knowledge and experience gained through this project can be shared and bring benefit to all. Thank you.

ABSTRACT

In recent days the gesture controlled devices are getting more attention. In this work, gesture of the user controls the movement of the mobile robot. The developed system is classified into gesture unit and mobile robot unit. The gesture unit which consists of arduino read the movement of fingers and transmits the corresponding control signal to the mobile robot unit. The mobile robot unit also consists of arduino for controlling the movement of mobile robots. The mobile robot equipped in 2 DC motor in the gesture arduino unit is assisted by flex sensors and xbee for reading gestures. Both the units are powered up by separate battery source. This proposed system is developed at low cost with better efficiency. It can be implemented in many other applications such as holding the speakers to assist dumb people, toys etc. This project contributes to the field of robotics by intergrating the military departments, police, etc.

ABSTRAK

Pada hari-hari kebelakangan ini, robot kawalan jauh mendapat perhatian yang lebih. Dalam laporan ini, pengguna dapat mengawal pergerakan robot mudah alih. Sistem yang dibangunkan diklasifikasikan ke dalam unit isyarat dan unit robot mudah alih. Unit isyarat yang terdiri daripada Arduino membaca pergerakan jari dan menghantar isyarat kawalan yang sama dengan unit robot mudah alih. Unit robot mudah alih juga terdiri daripada Arduino untuk mengawal pergerakan robot mudah alih. Robot bergerak yang dilengkapi 2 motor DC dalam unit isyarat Arduino dikawal oleh flex sensor dan XBee untuk membaca gerak isyarat. Kedua-dua unit ini diberi tenaga dari sumber bateri yang berasingan. Sistem yang direka dibangunkan dari kos yang rendah untuk kecekapan yang lebih baik. Ia boleh dilaksanakan dalam pelbagai aplikasi lain seperti mengadakan speaker untuk membantu orang bisu, mainan dan lain-lain. projek ini menyumbang kepada bidang robotik dengan mengintegrasikan jabatan tentera, polis, dan lain-lain sebagai intipan.

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CHAPTER 1
INTRODUCTION

1.1 Project Background

Robot's are becoming one of the major development in field of technology and robotics are being used in many fields like defense, automobile, medical, construction etc. They are also being used to help people in form of fire fighting robots. Today, the good of project robotics on topic is "Hand gesture mobile robot using Xbee Communication". The main objective of this project work is to control a robot with gestures of our hand. This project is based on 2 major component Arduino microcontroller and Xbee which are discussed in this project report.

This robot is designed to use the discarded equipment such as aluminum, Perspex and others. While use of materials in use, the robot is durable even when used in a variety of circumstances. This robot is also dependent on batteries that are used to move it. The robot control distance depends on the XBee used either far or near. The robot movement distance is approximately 70 meters outside the area without hindrance. This robot is designed more to military resistance due to body movement of the robot and the robot can move in a variety of surfaces. This robot is not too heavy because the components used are not too many, so it can be taken anywhere without feeling the burden.

1.2 Problem statement

This project is designed to have a stable shape to move on various surfaces. Hand Gesture robot (Chain wheel motion) helps to overcome difficult terrain like bumpy, slope, stony etc very easily. This type of vehicle can traverse places which are not in reach of regular wheel mechanisms. Here a simple tanker like vehicle motion. This model is remote controlled thru a set of hand gesture.

1.3 Scope

In this project there will be 3 work scopes. For the first scope, it is the mechanical design. In this scope it will be the base of the robot, and wheel of robot. The second scope is the electronics design. For this scope, the arduino uno, dc motor, flex sensor, Xbee and motor driver has been use. Lastly is the software design. In this scope, the project uses the Arduino IDE and use the XBee program.

1.4 Objectives

- To develop a mobile robot that able to move according to hand gesture robot
- To design the physical structure, electronic circuit and control of the robot
- To implement a Xbee module as a communication between hand gesture and mobile robot .

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, base on previous study work that have been done in different field of research. There are different research such as artificial Xbee Module , data glove based, flex sensor, programming and etc. These review also emphasizes on research project in order to understand clearly regarding with develop of hand gesture robot. In this chapter, detail summaries of the hand gesture robot from previous research.

According to Rajkanna, Mathankumar et al. (2014) presently a day's signal based controlling of the procedure is begin to execute in normal items like TV, cell telephones and so forth. In a glove procedure, sensors are set in gloves or in diverse parts of finger to identify the motion. In this work, flex sensors are utilized to recognize the motion of the client which is set on the top side of the gloves. Every sensor is interfaced in ADC module of the Arduino with suitable circuit. At whatever point the flex sensor experiences pressure change, yield voltage is accomplished.

2.2 Previous Project Work

2.2.1 Hand Gesture Robot Movement

According to Rajkanna, Mathankumar (2014) the mobile robot unit gets the code signal from the module kit unit through XBee-S1. This code is a standard code. Then, the codes are getting coordinated and related to control activity is performed on DC motor driver. Table 2.1 demonstrates the different operations of the motor driver.

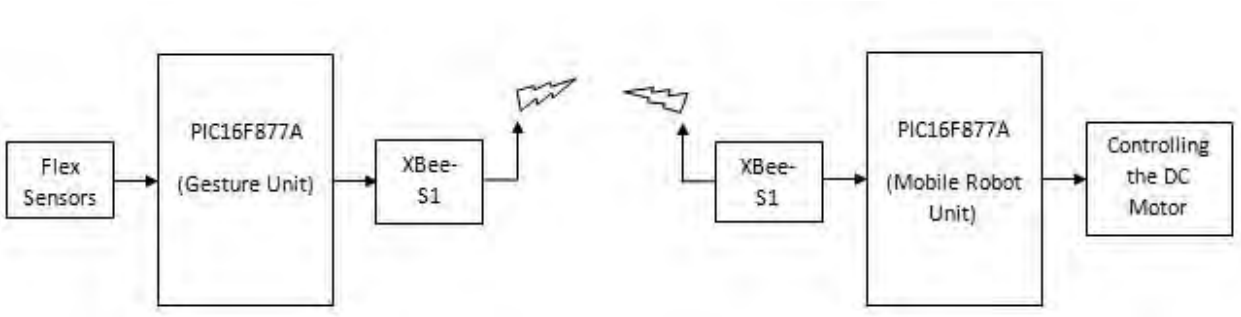
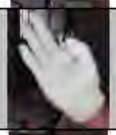
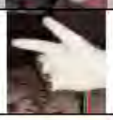


Figure 2.1: Block diagram for the proposed system

Table 2.1: Code Generation For Corresponding Gestures

Hand Gesture	Generated Code at Gesture Unit	Actions of Mobile Robot Unit	Values Passed to PORTD
	0	Stop	0X00
	1	Forward	0X03
	2	Reverse	0X0C
	3	Forward right	0X02
	4	Forward left	0x01
	5	Reverse Right	0x04
	6	Reverse Left	0x08

2.2.2 Algorithm

According to Rajkanna, Mathankumar (2014) the finger developments can be made smoother by utilizing great quality flex sensors or by utilizing more carbon containing plastics. The XBee utilized as a part of this undertaking has been confined to 100m in open air environment. By utilizing repeaters and extenders the scope of radio wire can be expanded.

In normal mode, the result of the flex sensor is zero, at what point it suffered any pressure is the result of several created from the sensor. Voltage outputs are easily turned into a flag developed by the internal ADC module PIC microcontroller. After changing over the quality of the computerized check the controller experience any new

signs achieved positions or older. On the off chance the new signals identified later the controller sends a code related to their versatility robot unit via XBee-S1. Figure 2.2 show the operation was examined under the algorithms structure.

Table 2.2: Operation In Algorithmic Form

Step 1: start the ADC and UART modules
Step 2: Change the flex sensor output into a computerized signs
Step 3: Compare the change in static movement
Step4: Compare the value changes with effective change If they hop along with step 2
Step 5: If another value has changed more in line with that laid down value
Step6: Repeat the process from step 2

2.2.3 Glove Controller

According to Flores, Siloy (2014) the glove controller was made utilizing flex sensors and a computerized accelerometer joined with a gizDuino microcontroller and a Bluetooth shield for remote usage. Two sorts of glove controller was made, one utilizing business flex sensors and one utilizing alternative flex sensors. Commercial flex sensors can be promptly purchased in the business and cost around Php600.00 each. With a specific end goal to diminish the expense for the formation of the glove controller, business flex sensors were reproduced utilizing minimal effort materials. Figure 2.2 demonstrates the strides taken for the formation of the improvised flex sensors.

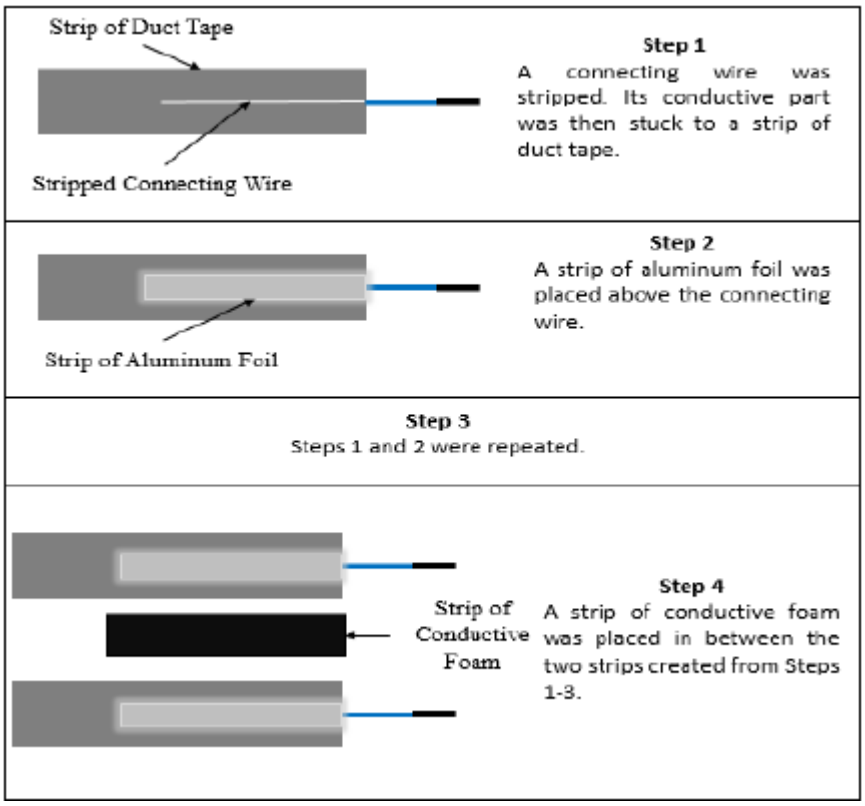


Figure 2.2: Creation of Makeshift Flex Sensors

2.2.4 Finger Binary System

According to Rajkanna, Mathankumar et al. (2014) binary System Finger ideas that have been used for the movement of a finger. Since there are two requirements finger, flexible and casual, every state has given little value, 0 to 1 for loose and flexible. Therefore, with a slight thumb the most noteworthy and progressive acceleration rather large bit, a Binary Coded Decimal (BCD) can be used to describe comparable to each signal. Through the use of a microcontroller gizDuino adjusted by Arduino IDE, information from the acceleration sensor and an advanced flex has read and interpreted. This information is then sent to the customerand program definition virtual environments.

2.2.5 Hand Gesture recognition, Wireless vision, Mobile robot, Color spaces, Skin Detection

According to Manigandan and Jackin (2010) vision-based hand gesture recognition has programmedis a very dynamic checkpoint lately with Lively application, for example, human PC connection (HCI), robot control, and communication through gestures of understanding. That the general issue is really difficult because of the wide range of issues calculate how chaotic static element and hand signal, the basics of the complex, and barriers. Assaults simplification of the issues in which require complex calculations PC asset requires concentrated. What inspires for this work is, the issue of robot path, where the occupied by controlling the posture of the robot with signals given by man. Due to the ongoing operational requirements.

2.2.6 XBee, Arduino, Wireless Sensor Networks

According to Sung, Chen et al. (2014) before the wireless transmission not commonplace, rely on the signal wire is passed to the microprocessor for analysis, as long as the number of over one signal cable, layout is very likely to cause problems.

This is a long time down the problem cannot be resolved. In recent years, the rapid development of wireless sensor networks, is today an indispensable technique used in smart home and environmental monitoring, health care, situational awareness, security, real-time reporting system so a variety of measures, the use of a variety of environmental sensors to monitor changes in the environment, the integration of hardware, software and wireless communication capabilities. Figure 2.4 show the sensor value exceeds the threshold value.

Figure 2.3: Experimental Sensor Network

2.3 Hand Gesture Recognition System For Traffic Light Control (TLC)

2.3.1 TLC System

There are two first strategy is based on the vision and the second is based sensor. Within this framework, the acceleration sensor is used for hand gesture recognition. Graf Piece proposed framework is given in Figure 2.5.

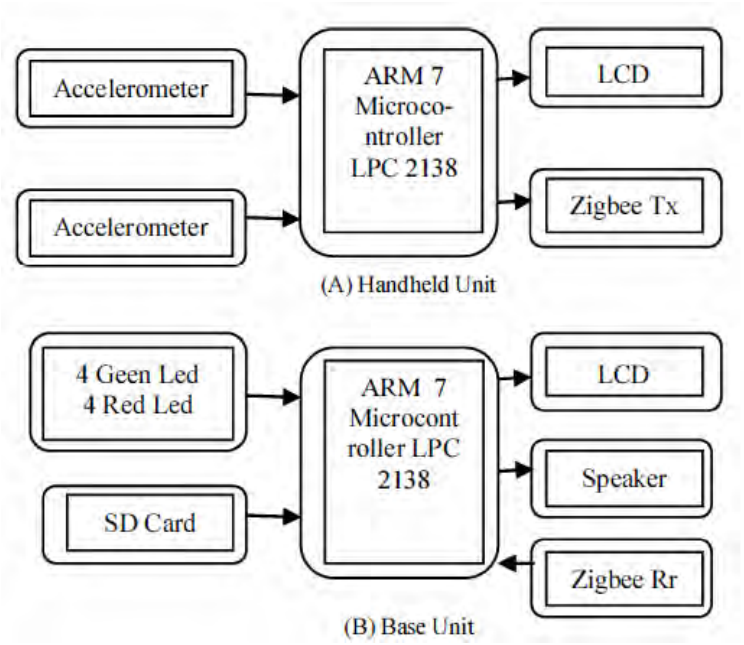


Figure 2.4: Diagram Of Hand Gesture Recognition System For TLC

According to Swapnali and Chilveri (2014)his framework has two units, base units and handheld units. Here using a handheld sensor unit which coordinated the triaxesacceleration chips as handheld device info in this regard framework of the association. At the time when mankind's present a proposal, which The sensor will collect the results of the flow of information by the acceleration chip, moreover, send to the remote PC through a convention. Here consider this crude the flow of information from the sensor can be "design data". As shown by the day-by-day meeting, the examples are made the development of the human hand when performing the same signal meet certain standards of fact to some degree, by on it, the proposed "standard model". "Standard for example "is the class predefined example, each compared with a remarkable "semantic information".

2.4 SIMULATIONS

According to Swapnali and Chilveri (2014) in order to test the performance of the proposed hand-gesture-based interface for navigating a car-robot, it should be generate a comprehensive data base to test the interface There are several elements to make the issue hand gesture recognition became very difficult. In the beginning of the all, the diversity of the human causes the same type of hand gestures towards its own each time.

Notwithstanding to the same individuals, councils of different varieties of the same hand movements may be indistinguishable. Furthermore, the same hand movement can implemented in a variety and / or the size of its own. Third, the same hand signals can be performed in a separate speed. Along these lines, the 8 basic information was create.

Each subject was asked to draw 6 types of hand signals as shown in figure 2.6. Each subject was asked to draw the same type of hand gestures with 3 different size than those small size, medium size and large size. All sizes hand signals interest to 5 times. Along these lines, each hand signal has 120 information. In the end, the basic information consisting of 720 information.

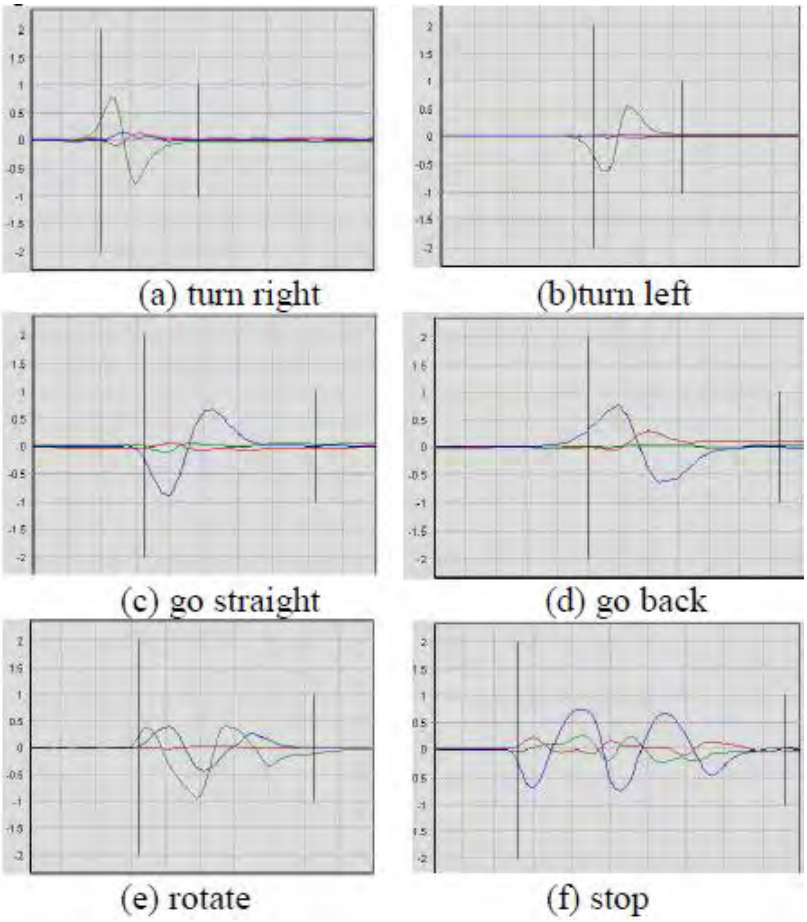


Figure 2.5: The resulting test template sequence for each hand gesture