

WEARABLE HAND MOTION CONTROLLER

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
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BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : WERABLE HAND MOTION CONTROLLER

Sesi Pengajian :

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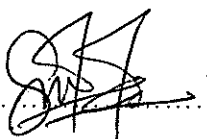
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Special dedicated to my beloved parents for their caring, understanding and encouragement

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ABSTRACT

Handheld controller has been utilized to control robot for the past half century. Although the design of handheld controller has been evolved since then, there are several shortcomings such as slipping problem and mechanical button issues. Therefore, this project is needed to improve the hand held controller that controls a robot from certain range. Thus, this project is design to be wearable and wireless controller to control mobile robot b using XBee Pro S1 module device as the transmission medium between transmitter and receiver. The implementation of flex sensor innovates the input generation whereby users only need to bend their finger in order to operate the corresponding robot either forward or reverse. As the sensors are embedded in a glove, the users can generate the input naturally using their fingers. This project has achieve its objectives in providing alternative to input control using hand motion which wearable and easy to use.

ABSTRAK

Pengawal pegangan tangan telah digunakan untuk mengawal robot pada setengah abad yang lalu. Walaupun reka bentuk pengawal pegangan tangan telah berkembang, terdapat beberapa kelemahan seperti masalah tergelincir ketika mengendalikan pengawal pegangan tangan dan isu-isu butang mekanikal yang sering rosak pada pengawal pegangan tangan. Oleh itu, projek ini diperlukan untuk meningkatkan pengawal tangan yang diwujudkan untuk mengawal dan mengendali robot dari jarak yang tertentu. Projek ini direka bentuk untuk menjadi pengawal boleh pakai dan tanpa wayar untuk mengawal robot mudah alih menggunakan XBee Pro S1 peranti modul sebagai medium pengantaraan antara pemancar dan penerima. Penggunaan penderia flex sebagai masukan kepada alat pengawal pegangan boleh pakai di mana pengguna hanya perlu membengkokkan jari mereka untuk mengendalikan robot pada arah yang ditentukan. Sebagai sistem yang terbenam, pengguna boleh menjana masukan ke alat pengawal secara semulajadi menggunakan jari mereka. Projek ini telah mencapai objektifnya dalam menyediakan alternatif lain kepada alat kawalan dengan kemasukannya menggunakan gerakan tangan yang boleh dipakai dan senang untuk digunakan.

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LIST OF SYMBOLS

PCB	-	printed Circuit Board
Mbps	-	Mega bit per second
GHz	-	Gigahertz
Wi-Fi	-	Wireless Fidelity
Kbps	-	Kilo bit per second
m	-	Meter
TTL	-	Transistor-Transistor Logic
UART	-	Universally asynchronous Receiver/Transmitter
AC	-	Alternate Current
DC	-	Direct Current
PWM	-	Pulse width modulation
PIC	-	Peripheral Interface Controller
TX	-	Transmitter
RX	-	Receiver
PC	-	Personal Computer

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CHAPTER 1

INTRODUCTION

In this chapter, it will cover the introduction part of this Final Year Project which is Wearable Hand Motion Controller. The subchapters that include in this chapter are objective, problem statements, scopes of project and methodology.

1.1 Introduction of Project

Controller is a gadget that is utilized from specific extents. The signal from remote control can be sent either through wired or wireless. Wired remote control provides more reliable connection and the rate of data transfer much faster compared to wireless. Due to lack of ranges that can wire remote control cover, wireless controller more popular compared to wired remote control. Depending on what type

utilization of wireless remote control such as XBEE, Bluetooth, and SKPS, wireless remote control can cover ranges more compared to wire remote control.

With the robot engineering creating progressively, versatile robot remote control framework has a wide application prospect, which can be broadly consideration. With the ceaseless improvement of embedded system, the system gives fabulous equipment stage for embedded mobile robot. The changes of remote control from wired to wireless brings a lot of benefits to human life but wire remote still reasonable to use depending on it application.

Due to the limitations of the existing wireless connection between transmitter and receiver such as cost and power consumption, XBee module is the answer of these problems. The limitations of the existing wireless connection can be improved by using this device. An XBee module has based on 802.15.4 and operates at frequency of 2.4GHz and has maximum data rate of 250kbps for the data transmission. Moreover, each XBee radio can directly gather sensor data and transmit them without the help of microcontroller. XBee provides some simple output function that can be found and perform at external microcontroller. For XBee Pro Series 1, it allows coordinator, routers or end devices to communicate with coordinator by default. This makes point to point communication so easy.

1.2 Objectives of Project

1. To develop a controller that control using Hand Motion
2. To create wearable wireless remote control system by using XBEE

1.3 Problem Statement

The existing controller needs to be handheld but this project gives more natural feeling and less button are use. The handheld controller needs to hold and carry while using it. Sometimes this controller would slip from user hand that needs a good grip to handle it. Wearable Hand Motion Controller gives user more freedom because they no need to handheld the controller anymore but just wear the glove to control mobile robots. It also sticks to user hand that could solve the slippery of the controller.

1.4 Scope of Project

The Wireless Wearable Hand Motion Controller uses XBEE Pro. The main reasons using XBEE Pro is this device can covers range to 750m for outdoor line of sight and the frequency band of this device is 2.4 GHz. This is very suitable for outdoor usage especially for mobile robot application because it can provide a reliable connection. Besides that, this controller uses four flex sensors indicate four different direction movement of mobile robot. The figure 1 above shows the whole system of wearable Hand Motion controller that consist two parts, transmitter and receiver. This controller used Arduino Uno and then to create the communication protocol between the microcontroller of the transmitter and microcontroller of the receiver, Arduino software will be used.

1.5 Project Significant

The Wireless Wearable Hand Motion Controller is using XBEE Pro Series 1. By using this device, it can provide high range and secure network. XBEE can reach up to 750 meter lines of sight with 2.4GHz frequency. This is very suitable for

outdoor usage as it can provide a reliable connection. The network connection also can be locked to prevent from any unauthorized users controlling the robot.

Besides that, Wireless Wearable Hand Motion Controller is user friendly because it reduces the complexity to use this controller or in other word, this controller is ergonomic. User no need to handheld the controller anymore but just wears the controller. By wear the controller also can help to avoid slippery of the controller. With the texture of skin of the glove, user can feel comfortable while controlling the robot.

1.6 Report Structure

The report consists of five chapters. Chapter 1 discusses the introduction of the project which includes the objectives of the project, problem statements, and scope of the project, project significance and report structure.

Chapter 2 discuss about the Literature review. This chapter included literature review on control of Omni-direction robot using accelerometer sensor on android smartphone, utilization of mobile technology for mobile robot controller, hand gestures controlled speed and direction of mobile robot, SKPS in PS2 controller starter kit, utilization of mobile technology for mobile robot controller and Arduino Uno microcontroller.

The next chapter, chapter 3 discusses about Project Methodology of the project. The methodology involved system analysis, system design, system development and system testing.

Then, chapter 4 discusses about Result and Discussion of the project. It is about result full decision after the completion of this project.

The final chapter is chapter 5 that explains about conclusion and recommendation for future work related to this project which is controller.

CHAPTER II

LITERATURE REVIEW

In completing this project, some background researches have been done on several resources. The theory and description plus detail about the project have taken as guidance in completing this project.

2.1 Control of Omni-Directional robot using Accelerometer sensor on Android Smartphone [11]

By referring to this project, it using accelerometer sensor on Android smart phone with helps of Wi-Fi as medium to transmit and receive information data. The control of robot the robot movement is done by sending the accelerometer sensor value changes to the robot via a wireless network. Figure 2.1 show the communication process for android smartphone with robot.

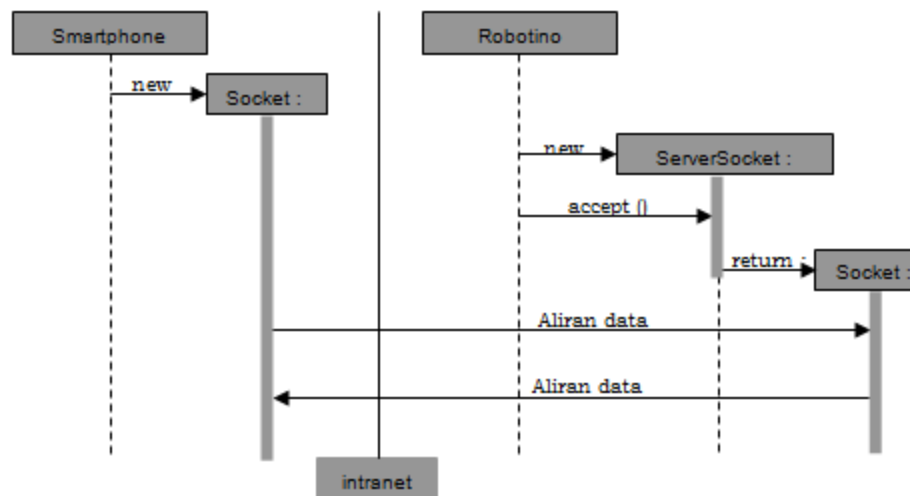


Figure 2.1: communication process of android smartphones with robot.

The advantage of using this technology is the cost for developing the controller is more cheap compared to Wireless Wearable Hand Motion Controller because it only using accelerometer in an android smart phone. Nowadays, people can affordable to buy this Android smart phone because the price much cheaper. By using the phone that someone already has to control movement of robot can save and reduce the cost for developing the robot controller.

The disadvantages of using this technology are the accelerometer is too sensitive for controlling robot movement. It need accuracy while turning the phone left, right, backward and forward for controlling the robot. This is due to that controller or the android mobile phone need to handheld while using it. Besides that, this controller technology use Wi-Fi as transmission medium between transmitter and receiver to transport signal to each other. By using Wi-Fi, the possibility of signal loss is higher compare to XBEE technology. XBEE technology can reach up to 750 meter line of sight compared to Wi-Fi technology that only can achieve about 5 meter in a closed room and 15 meter in open space. Furthermore, the further the distance between smart phones to the robot, the slower the response time of Omni-directional robot in motion.

2.2 Utilization of mobile technology for mobile robot controller [12]

These papers present the utilization of different mobile technology for mobile robot controller such as Bluetooth and Wi-Fi or Wireless LAN. In this paper also discussed the comparison of the frequency, data rate and range for each types of mobile technology used in this application which is Bluetooth and Wi-Fi. Figure 2.2 and figure 2.3 show the Bluetooth technology system and wireless technology system.

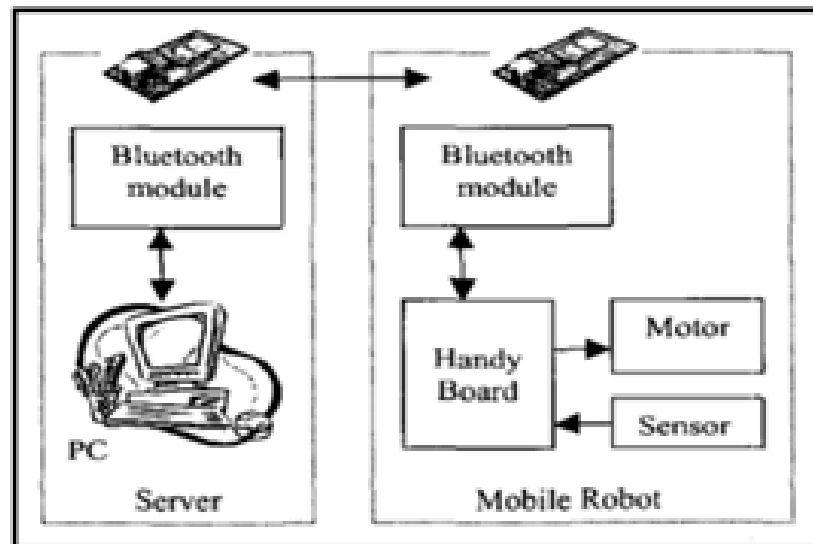


Figure 2.2: Bluetooth technology system.

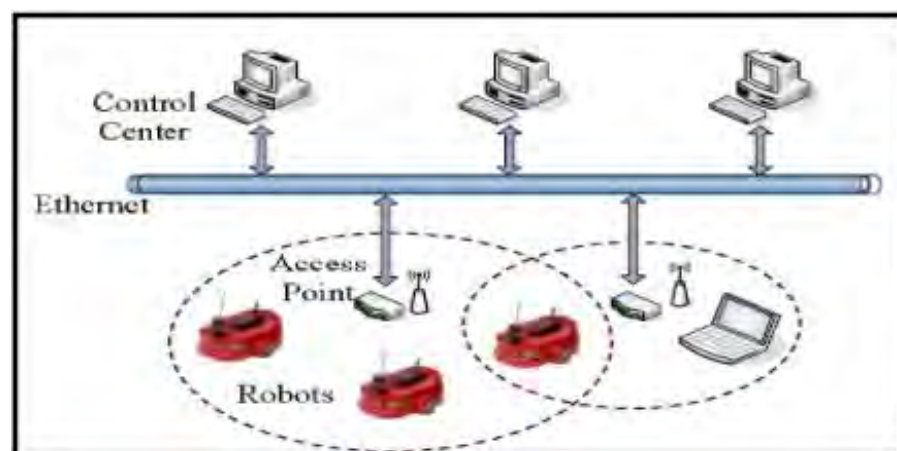


Figure 2.3: Wireless technology system.