UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ANDROID-BASED WHEELCHAIR CONTROLLER

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Electronics Engineering Technology (Industrial Electronics) (Hons.)

by

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I hereby, declared this report entitled “Android-based wheelchair controller” is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electronics Engineering Technology (Industrial Electronics) (Hons.). The member of the supervisory is as follow:

……

(Project Supervisor)

ABSTRAK

Projek ini adalah berkaitan dengan pengawal kerusi roda berasaskan sistem android. Sistem ini direka untuk mengawal kerusi roda menggunakan peranti android. Objektif projek ini adalah untuk memudahkan pergerakan orang kurang upaya atau orang-orang cacat dan orang tua yang tidak mampu untuk bergerak. Hasil reka bentuk ini akan membolehkan orang-orang tertentu untuk menjalani kehidupan tanpa bergantung pertolongan daripada orang lain. Teknologi Android adalah satu teknologi yang boleh memberikan cara baru untuk berinteraksi diantara manusia dengan mesin atau peralatan. Masalah dalam mengerakan kerusi roda dapat diselesaikan dengan mengunakan teknologi android. Ini boleh direalisasikan dengan menggunakan bluetooth sebagai peranti perantara. Dalam projek ini, antaramuka dibina mengunakan Basic4Android untuk membangunkan program untuk memasang pada peranti android yang akan mengawal pergerakan kerusi roda. Projek ini menggunakan papan IOIO dan Motor arus terus untuk mengerakkan kerusi roda. Keputusan dan analisis keatas inovasi ini akan menerangkan dalam laporan ini. Keputusan projek ini menunjukkan bahawa projek ini boleh digunakan untuk kerja-kerja kajian akan datang dan untuk mereka bentuk inovasi kecemerlangan yang memenuhi keperluan pasaran dan kepentingan awam.

ABSTRACT

This project is related to the android-based wheelchair controller. The system is designed to control a wheelchair using the android device. The objective of this project is to facilitate the movement of people who are disabling or handicapped and elderly people who are not able to move well. The result of this design will allow certain people to live a life with less dependence on others. Android technology is a key which may provide a new way of human interaction with machines or tools. Thus the problem that they are facing can be solved by using android technology to move the wheelchair. This can be achieved with used the Bluetooth as an intermediary. In this project, Basic4android interface is designed therefore to develop the program for installing to the android device that will controls the movement of wheelchairs. This project uses IOIO board and direct current motor to create the movement of wheelchair. The results and analysis of this innovation will describe in this report. The results of this project show that this project can be used for future research works and to design excellence innovation that meet the market needs and public interest.

DEDICATION

Alhamdulillah, praise to the Almighty Allah S.W.T

This thesis is dedicated to:

My beloved family,

My Parents,

My Supervisor,

My lecturers

And all my friends

Thanks for their encouragement and support

ACKNOWLEDGEMENT

Alhamdulillah, thank you Allah because of His blessing, I finally complete and finish my final year project successfully.

During the process to complete my project objective, I do a lot of research either by using internet, reading past year thesis, reference books and journal. With the guidance and support from peoples around me, I finally complete the project due to the time given. Here, I want to give credit to those who helped me to achieve what I had achieved in my final year project.

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Thank you to all lecturers, staffs, friends and all who has directly and indirectly involved on this project. Your helps and cooperation will never be forgotten. May Allah bless and reward them for their sincere, endeavour and contribution in the way of knowledge.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

SDK	-	Software Development Kit
VB	-	Visual Basic
GUI	-	Graphic User Interface
API	-	Application Programming Interface
RAM	-	Random Access Memory
ROM	-	Read Only Memory
UART	-	Universal Asynchronous Receiver/Transmitter
USART	-	Universal Synchronous Asynchronous Receiver/Transmitter
RF	-	Radio Frequency
DC	-	Direct Current
AC	-	Alternating current
AVD	-	Android virtual devices
B4A	-	Basic for android
EPWs	-	Electric power wheelchairs
A.D	-	Anno Domini
OS	-	Operating System
SMS	-	Short message service
MMS	-	Multimedia massage
NFS	-	Near field communication
VoIP	-	Voice over internet protocol
USB	-	Universal serial port
PC	-	Personal computer
UI	-	User interface
SSL	-	Secure socket layer
GPS	-	Global positioning system

PCB	-	Printed circuit board
MCU	-	Multipoint control unit
PWM	-	Pulse width modulation
SPI	-	Serial peripheral interface
LCD	-	Liquid crystal display
OTA	-	Over the air
GND	-	ground
PWR	-	Power
MEMS	-	Micro Electro Mechanical Systems

CHAPTER 1
INTRODUCTION

While the needs of many individuals with disabilities can be satisfied with electric wheelchairs, some members of the disabled community find it is difficult or impossible to operate a standard power wheelchair. This project could be part of an assistive technology. It is for more independent, productive and enjoyable living. The background, objectives, problem statement and scopes of the project will be discussed in this chapter.

1.1 Project Background

Android-based wheelchair controller is a system where the DC motor is used to move the wheelchair. Nowadays, handicapped people face problem to control wheelchair by themselves. Sometimes they need other people to help them. This project will provide a new way to control the movement of wheelchair such as turn to left, right, forward and reverse direction. The overall wheelchair operation uses DC motor and motor driver module combines with microcontroller system such as IOIO board.

Android-based wheelchair controller that consists of android device and a control box that can be attached to standard wheelchairs to control the movement by using a DC motor. Bluetooth communication protocol is used to communicate sensory and command information between the android device and the control box.

There are 4 options for basic motions of a wheelchair to be applied by the user. The four conditions of the wheelchair can be described as:

(a) Moving forward

(b) Moving backward

(c) Turning to the right

(d) Turning to the left

This project describes the design and development of the motion control using android device for a wheelchair application. Figure 1.1 shows the block diagram for overall of the project.

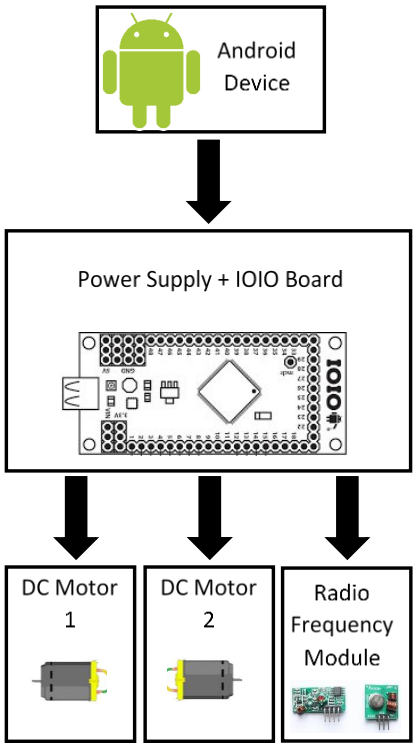

Figure 1.1: block diagram for overall of the project.

1.2 Problem Statement

Patients involved in physical injuries and disabilities with good mental strength struggle to get through places using the conventional hand powered wheelchair. A wheelchair is a chair with wheels, designed to be a replacement for walking. A wheelchair is a device used for mobility by people for whom walking is difficult or impossible, due to illness or disability. To face this problem, an android device that can control DC motor will be developed.

1.3 Project Objective

In order for the project to be implemented, the following objectives must be achieved for this project:

(a) Design Android system that can control the movement of a wheelchair.
(b) Design android system that can control electric appliances.

1.4 Scope of Project

The scope are listed to ensure the project is conducted within its intended boundary. Scope is useful to ensure the project is heading in the right direction to achieve the goal. The scopes of this project are to study the basic of android from several published papers and books and also study the code use to control the movement of the Android-based wheelchair controller.

The main focus of this project is to apply what already learned about the android application. The parameters for this project can be classified as:

1.4.1 The basic concept of android application

In this project, android application is use to control the movement of the wheelchair. Android is a software bunch comprising not only operating system but also middleware and key applications. Android applications are composed of one or more application components (activities, services, content providers, and broadcast receivers).

1.4.2 The basic movement of the wheelchair

The movement of the wheelchair is control by the android application. The wheelchair can move to the right, to the left and also move forward and move backward. All of this movement can be controlled by using android application.

1.4.3 The software used to program android device

This project use Basic4android (basic for android) software to program android application. Basic4android is a rapid application development tool for native Android applications, developed and marketed by Anywhere Software Ltd. Basic4android is an alternative withed to program with Java and the Android SDK. Basic4android includes a visual designer that simplifies the process of building user interfaces that target phones and tablets with different screen sizes. Compiled programs can be tested in AVD manager emulator or B4A Bridge, which enables testing within a real phone. The language itself is similar to Visual Basic and Visual Basic .Net though it is adapted to the native Android environment. Basic4android is an object oriented and event driven language.

1.4.4 The other technologies used to communicate sensory and command information.

This wireless technology enables communication between Bluetooth-compatible devices. It is used for short-range connections between desktop and laptop computers, digital cameras, scanners, cellular phones, and printers. Bluetooth takes care of all these limitations. Because the technology is based on radio waves, there can be objects or even walls placed between the communicating devices and the connection won't be disrupted. Also, Bluetooth uses a standard 2.4 GHz frequency so that all Bluetooth-enabled devices will be compatible with each other.

The project will be study and analyze so that during the testing and simulation, the good result achieve. Last but not least, to develop a prototype to implement it into real life.

1.5 Project Methodology

In order to achieve a good project, there are several procedure that must be follow. Initially, the first step is to find information about the wheelchair problem. Furthermore, get more information about the wheelchair problem from the journal, internet, book and also article. Besides that, the research continues with the search on the basic concept of android application and also search on coding for basic4android software to be programmed at the android device. Next, after finishing the research, the coding will be simulate in order to identify whether the coding can be simulate without any error. After that, the hardware for the android-based wheelchair controller will be design. Lastly, the hardware will combine with the coding to get the complete android-based wheelchair controller that will be controlled by android device.

1.6 Thesis Structure

Chapter 1:

The first chapter introduces brief idea of the project. It focused on the overview of the project, detailing the objectives, the problem statement, scope and outcome of the project.

Chapter 2:

Projects background is discussed in this chapter. The method concept, theory, and some characteristic of component of hardware that used in this project is discussed in this chapter. This chapter also contain a definition of term used in this project also discusses the concept of the research and how it related with the theory.

Chapter 3:

This section is methodology chapter. Methodology chapter is a schedule or steps that need to be complete, detailed reports of studies done to achieve aim objective. This chapter explains the procedure taken to complete the project. It consist the detail development of this project.

Chapter 4:

Chapter four is about the result and discussion that we obtain based on the methodology that we used. All the simulations, data collection and analysis obtained were discussed in detail. The results were compared with the outlined objectives in order to state some hypothesis and conclusion.

Chapter 5:

Chapter five is about the conclusion and future work. In this section, we will conclude what we have done and followed by some recommendation on how to improve the performance of the system based on the desired results.

1.7 Conclusion

At the end of this chapter, we know on how this project wants to develop. The problem statement in this chapter describe why this project must be develop and there is some technology that need to be learned to overcome the problem statement. In this project I will use android system to control the movement of the wheelchair.