"I / We admit that I / We have read this literature work through my/our observation which has fulfilled the scope and quality in order to be qualified for the conferment of Bachelor Degree in Electronic Engineering (Computer Engineering)."

Signature : .....

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# VOICE CONTROLLER VEHICLE

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"I admit that this is done by my self except the discussion and extracts taken from other sources that I explained each in detail."

Signature : .....

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This literature piece is dedicated to my beloved father and mother.

## ACKNOWLEDGEMENT

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# ABSTRACT

Nowadays speech recognition becomes the method of choice for controlling appliances, toys, tools, computers and robotics. There is a huge commercial market waiting for this technology to mature. Voice Controller Vehicle is a project about speech recognition where have been implemented in controlling a remote vehicle (radio control car). This project consists of 2 parts which is software and hardware. This program requires the computer to be equipped with a compatible sound card and of course a microphone which is used and required as the input of human voice.

# ABSTRAK

Pada masa kini, Pengenalan Bahasa (Speech Recognition) telah menjadi satu pilihan untuk mengawal peralatan, permainan, perkakasan, computer dan juga robot. Pasaran komersial yang sangat besar akan menanti bagi tekonologi ini sekiranya ianya berkembang lagi pada masa hadapan. Projek Pengawal Kenderaan Menggunakan Suara ini adalah merupakan sebuah projek yang menggunakan Pengenalan Suara (Speech Recognition) di mana ia telah diimplementasikan untuk mengawal sebuah kenderaan remote (kereta kawalan radio). Projek ini terdiri daripada bahagian perkakasan and juga perisian. Perisian yang dibangunkan ini memerlukan sebuah computer yang lengkap dengan kad suara yang sesuai dan juga mikrofon dimana ia digunakan sebagai masukan bagi suara manusia.

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| | |
|---|---|
| SDK | - Software Development Kit |
| GUI | - Graphical User Interface |
| PC | - Personal Computer |
| RF | - Radio Frequency |
| EM | - Electromagnetic |
| KHz | - Kilohertz |
| GHz | - Gigahertz |
| UV | - Ultraviolet |
| IR | - Infrared |
| AM | - Amplitude Modulation |
| FM | - Frequency Modulation |
| LAN | - Local Area Network |
| WLAN | - Wireless Local Area Network |
| PIC | - Peripheral Interface Controller |
| PCI | - Peripheral Component Interconnect |
| EPP | - Enhanced Parallel Port |
| ECP | - Extended Capability Port |
| SPP | - Standard Parallel Port |
| RLE | - Run-length Encoding |
| BASIC | - The Beginners' All-purpose Symbolic Instruction Code |
| IO | - Input Output |
| LPT | - Line Print terminal |
| TTS | - Text to Speech |
| SAPI | - Speech Application Programming Interface |
| API | - Application Programming Interface |
| COM | - Component Object Model |
| XML | - Extensible Markup Language |

| | |
|---|---|
| MDI | - Multiple-Document-Interface |
| CFG | - Context-Free Grammar |
| SR | - Speech Recognition |
| TTL | - Transistor Transistor Logic |
| DTL | - Diode Transistor Logic |
| DC | - Direct Current |
| I.C | - Integrated Circuit |
| IEEE | - Institute of Electrical and Electronics Engineers |
| VB | - Visual Basic |
| DLL | - Dynamic Link Library |
| OS | - Operating System |
| LED | - Light Emitting Diode |

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# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction of Project

There has been much progress in studies of the voice recognition in control system. The aim of this project is to design and built a device that will acquire user voice to control a remote vehicle. The remote vehicle that used in this project is actually a remote control car which existed in the market now. Normally, the remote control car is controlled by a hand remote but in this project, the car will be controlled by a desktop personal computer. Microsoft Speech SDK 5.1 @ speech recognition engine will be used as speech recognition engine. To achieve a friendly graphical user interface (GUI), Visual Basic programming will be used. The movement of the car (forward, reverse, left and, right) will be controlled through a voice command and also by the assigned key on the keyboard. User can choose to control the car either by voice or key pressed.

## 1.2 Objectives of Project

The objectives of this project are:

- To serve an alternate way in remote control vehicle system especially for those who have the disability of their hand.
- To built a device which acquire user voice to control a remote vehicle.

## 1.3 Scopes of Projects

The development of this project may include:

1. Development of vehicle:

- Study of remote control car may include its operation of the transmitter and receiver and the car movement control circuit.

2. Wireless communication between vehicle and PC:

- Selection of the most suitable cable is needed to send the signal from Pc to the transmitter.

3. Speech Recognition software:

-Program development begins after the 2 scopes of this project have been developed. This is to ensure that we do not have any problem with the hardware part.

-Visual Basic programming language was selected as to develop the Graphical User Interface (GUI) while as the voice control purpose; Microsoft Speech SDK 5.1 has been implemented.

## 1.4 Project Methodology

**Phase 1**: Development of vehicle

By using a remote conrol car which exists in the market now, some modification of the transmitter have to be done. This is because, in this project, PC-based control system will take place the function of the hand remote control.

**Phase 2**: Wireless communication between PC and vehicle.

To interface PC and the tranmitter of the remote control car, the parallel port is been used to establish the signal communication. The hand remote needs to be modified by connecting the four main inputs (forward, backward, left and right) to the suitable pin at the parallel port.

**Phase 3**: Software development

The main program to develop in this project is the voice recognition system. Microsoft Specech SDK 5.1 was implemented into the programming language of Visual Basic. The using of Visual Basic programming language is to develop the graphical user interface (GUI).

**Phase 4**: Testing and Debugging

The system was tested after all the development have been finished. This stage will identify whether this project is success or not. If any error occurs, so this system will be debug to make sure that it really works.

# CHAPTER 2

# CONCEPT AND LITERATURE REVIEW

## 2.1 Radio Frequency

Radio frequency (abbreviated RF, rf, or r.f.) is a term that refers to alternating current (AC) having characteristics such that, if the current is input to an antenna, an electromagnetic (EM) field is generated suitable for wireless broadcasting and/or communications. These frequencies cover a significant portion of the electromagnetic radiation spectrum, extending from nine kilohertz (9 kHz), the lowest allocated wireless communications frequency (it's within the range of human hearing), to thousands of gigahertz (GHz).[1]

When an RF current is supplied to an antenna, it gives rise to an electromagnetic field that propagates through space. This field is sometimes called an RF field; in less

[1] Joseph J. Carr *Secret of RF Circuit Design*

technical jargon it is a "radio wave." Any RF field has a wavelength that is inversely proportional to the frequency. In the atmosphere or in outer space, if $f$ is the frequency in megahertz and $s$ is the wavelength in meters, then

$$s = 300/f \qquad [2.1]$$

The frequency of an RF signal is inversely proportional to the wavelength of the EM field to which it corresponds. At 9 kHz, the free-space wavelength is approximately 33 kilometers (km) or 21 miles (mi). At the highest radio frequencies, the EM wavelengths measure approximately one millimeter (1 mm). As the frequency is increased beyond that of the RF spectrum, EM energy takes the form of infrared (IR), visible, ultraviolet (UV), X rays, and gamma rays.

Many types of wireless devices make use of RF fields. Cordless and cellular telephone, radio and television broadcast stations, satellite communications systems, and two-way radio services all operate in the RF spectrum. Some wireless devices operate at IR or visible-light frequencies, whose electromagnetic wavelengths are shorter than those of RF fields. Examples include most television-set remote-control boxes, some cordless computer keyboards and mice, and a few wireless hi-fi stereo headsets.

The RF spectrum is divided into several ranges, or bands. With the exception of the lowest-frequency segment, each band represents an increase of frequency corresponding to an order of magnitude (power of 10). The **Table 2.1** depicts the eleventh bands in the RF spectrum, showing frequency and bandwidth ranges. The SHF and EHF bands are often referred to as the microwave spectrum.

**Table 2.1: RF spectrum**

| Band name | Frequency<br>Wavelength | Example uses |
|---|---|---|
| Extremely low frequency | 3–30 Hz<br>100,000 km – 10,000 km | Communication with submarines |
| Super low frequency | 30–300 Hz<br>10,000 km – 1000 km | Communication with submarines |
| Ultra low frequency | 300–3000 Hz<br>1000 km – 100 km | Communication within mines |
| Very low frequency | 3–30 kHz<br>100 km – 10 km | Submarine communication, avalanche beacons, wireless heart rate monitors |
| Low frequency | 30–300 kHz<br>10 km – 1 km | Navigation, time signals, AM longwave broadcasting |
| Medium frequency | 300–3000 kHz<br>1 km – 100 m | AM (Medium-wave) broadcasts |
| High frequency | 3–30 MHz<br>100 m – 10 m | Shortwave broadcasts and amateur radio |
| Very high frequency | 30–300 MHz<br>10 m – 1 m | FM and television broadcasts |
| Ultra high frequency | 300–3000 MHz<br>1 m – 100 mm | television broadcasts, mobile phones, wireless LAN, ground-to-air and air-to-air communications |
| Super high frequency | 3–30 GHz<br>100 mm – 10 mm | microwave devices, mobile phones (W-CDMA), WLAN, most modern Radars |
| Extremely high frequency | 30–300 GHz<br>10 mm – 1 mm | Radio astronomy, high-speed microwave radio relay |
| | Above 300 GHz<br>< 1 mm | Night vision |

(Source from: Secrets of RF Circuit Design)

## 2.2 Transmitter Design

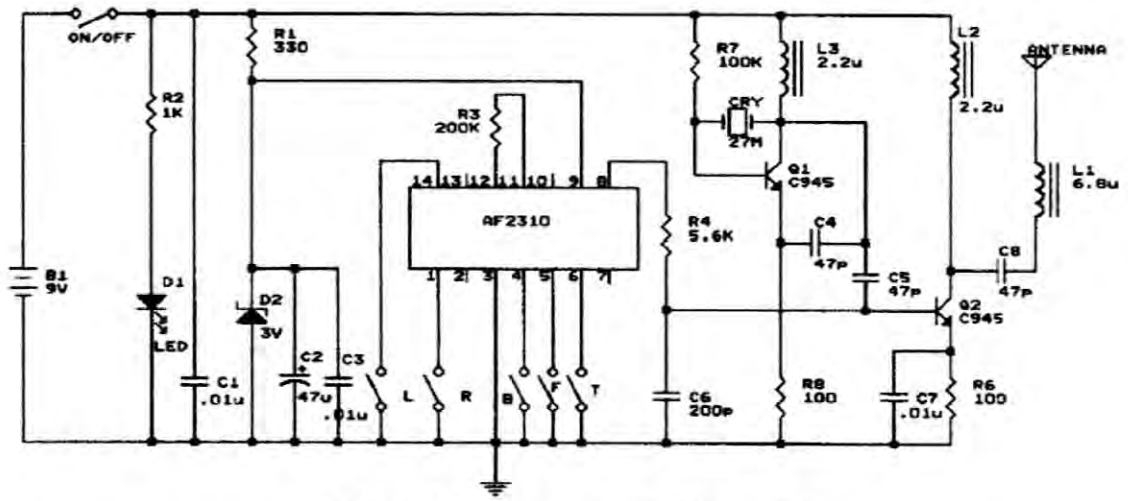


**Figure 2.1: Transmitter Schematic**

In this project, modification was needed on the transmitter. This is because we are going connect the transmitter with the computer via the parallel port. When the levers in the Remote Control Unit were pushed electrical contacts are made connecting the 9V battery power to the transmitter and indicating which commands the user wants sent to the car. Forwards/Backwards and Left/Right commands are controlled by different levers and use different sets of electrical contacts that are used to encode a sequence of electrical pulses; the number of pulses depends on which command is being sent. In some models Left/Right commands are only sent if Forwards/Backwards commands are also being sent, since there is too much friction to turn the wheels unless the car is moving. An electrical circuit that is tuned to a frequency of 27.9 MHz creates a signal that is sent to the antenna when the pulses are active. The antenna converts this electrical energy into radio energy, creating a stream of radio energy bursts, which travel through the air and are picked up by and understood by the radio receiver in the car.

## 2.3 Parallel Port

### 2.3.1 Introduction

Parallel port is a simple and inexpensive tool for building computer controlled devices and projects. The simplicity and ease of programming makes parallel port popular in electronics hobbyist world. The parallel port is often used in Computer controlled robots, PIC programmers, home automation, etc.

Everybody knows what parallel port is, where it can be found, and for what it being used. The primary use of parallel port is to connect printers to computer and is specifically designed for this purpose. Thus it is often called as printer Port or Centronics port (this name came from a popular printer manufacturing company 'Centronics' who devised some standards for parallel port). We can see the parallel port connector in the rear panel of our PC. It is a 25 pin female (DB25) connector (to which printer is connected). On almost all the PCs only one parallel port is present, but it can be added more by buying and inserting PCI parallel port cards into the PCI slots.

### 2.3.2 Parallel port modes

The IEEE 1284 Standard which has been published in 1994 defines five modes of data transfer for parallel port. They are:

i. Compatibility Mode

ii. Nibble Mode

iii. Byte Mode

iv. EPP (Enhanced Parallel Port)

v. ECP (Extended Capability Port)

Compatibility Mode, also known as Centronics, standard parallel port or SPP, is a uni-directional implementation with only a few differences from the original Centronics design. Nibble Mode is a uni-directional interface that allows the device to transmit data four bits at a time using status lines for data. This is the Bi-tronics mode introduced by HP and is generally used for enhanced printer status. Byte Mode allows the device to transmit eight bits at a time using data lines. Enhanced Parallel Port (EPP) is a half-duplex bi-directional interface designed to allow non-printer devices to transmit large amounts of data to the host. Extended Capability Port (ECP) is a half-duplex bi-directional interface designed that allows RLE (Run-length encoding) compression.