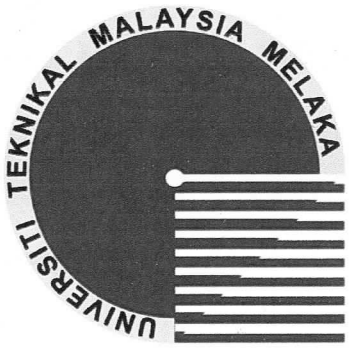

UNIVERSITI TEKNIKAL MALAYSIA MELAKA (UTeM)

Remote Control Lawn Mower

Thesis submitted in accordance with the partial requirements of the
Universiti Teknikal Malaysia Melaka for the
Bachelor of Manufacturing Engineering (Robotics and Automation) with Honours

By

Nur Nazatul Nura Mohamed Fouzy

Faculty *of* Manufacturing Engineering

May 2008

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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SESI PENGAJIAN: 2007-2008

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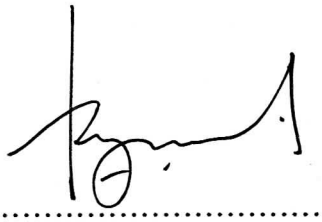
APPROVAL

This report submitted to the Senate of UTeM and has been accepted as partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Robotics and Automation). The member of the supervisory committee is as follow:



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Project Supervisor

May 2008

ABSTRACT

The Remote Control Lawnmower is a machine to make cutting grass process easier. The lawnmower's movement will be controlled using RF remote control, where the transmitter circuit will be placed at the remote control while the receiver circuit will be placed at the lawnmower. The signal will be transfer from the remote control to the lawnmower by the antenna (joystick) and the signal transfer is using radio frequency signal (RF). RF is quite effective in long distance and the components are cheap and easy to get in the market. In this project, transmitter and receiver circuit is build to control the movement of the lawn mower, motor and the rotation of the blade. H-Bridge connection is used in the circuit in order to control the lawnmower's movement whether to be slow or fast. There are two types of motor used in this project and both of it is dc motor. Two types of dc motor used in this project are power window motor and a regular dc motor.

ABSTRAK

Remote Control Lawnmower adalah sebuah mesin pemotong rumput yang dibina untuk menjadikan aktiviti memotong rumput lebih mudah. Pergerakkan mesin pemotong rumput akan dikawal mengunakan alat kawalan jauh RF dimana litar transmitter akan ditempatkan di alt kawalan jauh manakala litar receiver akan ditempatkan di mesin pemotong rumput. Signal akan di hantar dari alat kawalan jauh kepada mesin pemotong rumpur menggunakan antenna dan pemindahan signal ini menggunakan radio frequency signal (RF). Signal RF berkesan untuk jarak yang jauh dan komponen untuk litar RF adalah lebih murah dan senang untuk didapati di pasar. Untuk projek ini, litar transmitter dan receiver dibina bagi mengawal pergerakkan pemotong rumput, motor dan putaran mata bilah pisau. Sambungan H-Bridge digunakan dalam litar bagi mengawal pergerakan laju dan perlahan pemotong rumput. Terdapat 2 jenis motor yang digunakan dalam projek ini, kesemua motor yang digunakan adalah dc motor. Dua jenis dc motor yang digunakan adalah motor power window dan motor dc yang biasa.

ACKNOWLEDGEMENT

Firstly, I would like to say a prayer to Allah the Almighty for always being there for me.

Many thank and gratitude to Mr. Ruzaidi bin Zamri, my supervisor; for the guidance, the patience and help that he gave me through the commencement of this project.

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Not forgotten to my family members, my colleagues and for all who had involved directly or indirectly by giving inspiration and support throughout the year.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE

RF	-	Radio Frequency
RC	-	Remote Control
PIC	-	Programmable Input Controller
FM	-	Frequency Modulation
AM	-	Amplitude Modulation
DC	-	Direct Current
IC	-	Integrated Circuit
PIC	-	Programmable Input Controller

CHAPTER 1

INTRODUCTION

1.0 Introduction

Mowing can be a very dangerous job as it involves rotating blade. It also took a very long time to finish. This project produce a machine that is controlled by use of a radio control system that will allow the operator to stay a safe distance away from the machine so if anything happen, no one will get injured. This invention is also to make mowing activity to be more fun and easy. Remote control systems are increasing popular and the introduction of pre-tuned radio modules and their steadily falling prices has made radio a viable alternative to infra-red control. The remote control can cover area around 100 ft range. This machine is user friendly because user only controls the machine with remote control and people can handle this machine by only reading the instructions. This project is divided into two parts, mechanically and electronically.

1.1 Problem Statements

Most of lawnmower today operates manually where human needs to control the machine directly in grass cutting activities. This requires a lot of energy if the area was too wide. The available lawn mower today uses petrol to operate the engine; this can contribute air pollution. Automatic mower today requires a wire that surrounds the boundary of the yard. This wire was installed around the perimeter of the yard and the mower can sense this wire as the boundary. The mower will then turn a specified angle and then cut in a straight line until it hits either the boundary or an object, such as tree. It turns at the same angle again and will continue the same process. The mower will continue this process until the lawn is completely cut. There are a few drawbacks to this design. First, it requires a wire that needs to be implanted into the ground. Second, the lawn isn't cut in nice patterns that people wants. The mower constantly runs across the lawn in a different direction until it covers all of it, which will take hours to complete.

1.2 Objective

The objective of this project was to:

A. Identify the features that need to be modified or added for the Remote Control Lawn Mower :
   - wireless remote control
   - power window (dc motor)
   - transmitter and receiver circuit
   - lawnmower (body)

B. Fabricate the prototype of Remote Control Lawn Mower
   - material and design

C. Test and tune the lawnmower to working condition

1.3 Scope

The scope of this project was to design and develop lawn mower using remote control. All the operation will be controlled using radio frequency (RF) remote control. Basically, the project can be divided into two sections which are mechanically and electronically. From here it can be divided into 5 parts. The first part was the mower (body) and the second part was the transmitter and receiver circuit and next was the remote control. The fourth part is the motor and lastly, the fifth part was the power supply. This project was the result of the combination of these 5 parts.

This project will only include a basic electronic component that we have seen everyday, for example, remote control and DC motor. The mechanical movement of this machine from right to left and from back to front will be using the motor control H-Bridge.

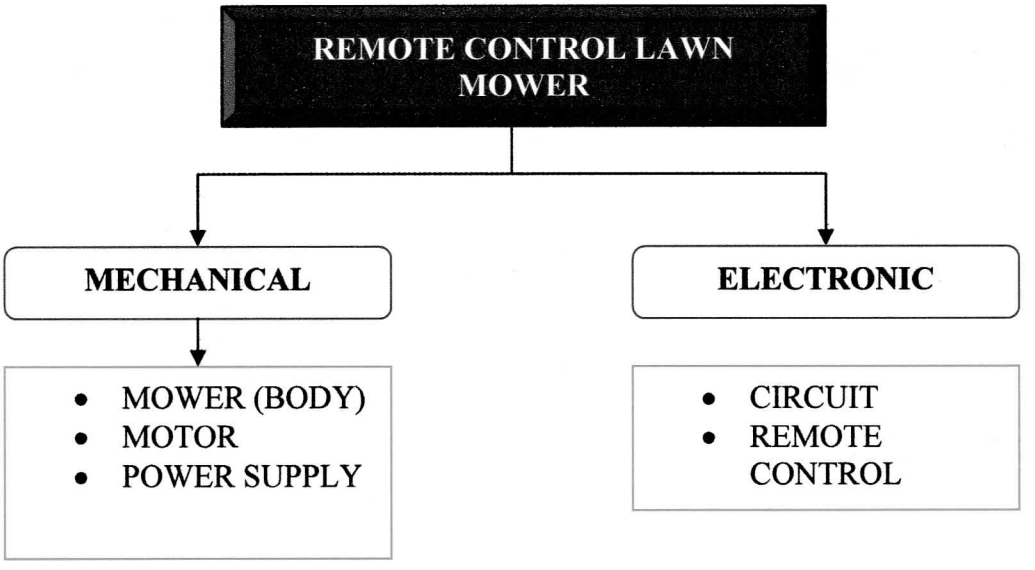

Figure 1.1: Section of the Project

CHAPTER 2

LITERITURE REVIEW

2.0 Introduction

In this study, previous researchers that were done by other researchers were reviewed. The study was related to the project. In this section those studies are reviewed, cited and credited. The information was found in reference book, magazines and electronics media such as in the internet.

2.1 Historic of Wireless Communication

Wireless signals proved effective in communication for rescue work when a sea disaster occurred. Effective communication was able to exist between ships and ship to shore points. A number of ocean liners installed wireless equipment. In 1899 the United States Army established wireless communication with a lightship off Fire Island, New York. Two years later the Navy adopted a wireless system. Up to then, the Navy had been using visual signaling and homing pigeons for communication.

In 1901, radiotelegraph service was instituted between five Hawaiian Island. By 1903, a Marconi station located in Wellfleet, Massachusetts, carried an exchange or greetings between President Theodore Roosevelt and King Edward VII. In 1905 the naval battle of Port Arthur in the Russo-Japanese war was reported by wireless, and in 1906 the U.S Weather Bureau experimented with radiotelegraphy to speed notice of weather conditions.

In 1909, Robert E. Peary, arctic explorer, radio telegraphed "I found the pole". In 1910, Marconi opened regular American-European radiotelegraph service, which several months later enabled an escaped British murderer to be apprehended on the high seas. In 1912, the first transpacific radiotelegraph service linked San Francisco with Hawaii.

Overseas radiotelegraph service developed slowly, primarily because the initial radiotelegraph set discharge electricity within the circuit and between the electrodes was unstable causing a high amount of interference. The Alexanderson high frequency alternator and the De Forest tube resolved many of these early technical problems. The Navy made major use of radio transmitter, especially Alexanderson alternators the only reliable long-distance wireless transmitter, for the duration.

During World War I, governments began using radiotelegraph to be alert of events and to instruct the movement of troops and supplies. World War II demonstrated the value of radio and spurred its development and later utilization for peacetime

purposes. Radiotelegraph circuits to other countries enabled persons almost anywhere in the United States to communicate with practically any place on earth.

Since 1923, pictures have been transmitted by wire, when a photograph was sent from Washington to Baltimore in a test. The first transatlantic radiophoto relay came in 1924 when the Radio Corporation of America beamed a picture of Charles Evans Hughes from London to New York. RCA inaugurated regular radiophoto service in 1926.

Two radio communication companies once had domestic networks connecting certain large cities, but these were closed in World War II. However, microwave and other developments have made it possible for domestic telegraph communication to be carried largely in part over radio circuits. In 1945, Western Union establishes the first microwave beam system, connecting New York and Philadelphia. This has since been extended and is being developed into a coast-to-coast system. By 1988 Western Union could transmit about 2,000 telegrams simultaneously in each direction.

2.2 Radio Frequency (Transmitter and Receiver)

In order to carry useful information, radio waves must be modulated, in other word; the required signal must be superimposed on the radio wave (carrier wave). With amplitude modulation transmission, it is the amplitude of the carrier wave that is made to change in accordance with the required signal. It is reasonable to generate but can suffer from interface. With Frequency Modulation transmission, it was the frequency of the carrier wave that was made to change in accordance with the required signal. The F.M modules described here tend to be more expensive than the A.M modules, but they were almost immune to interference, can carry higher data rate and have longer range.

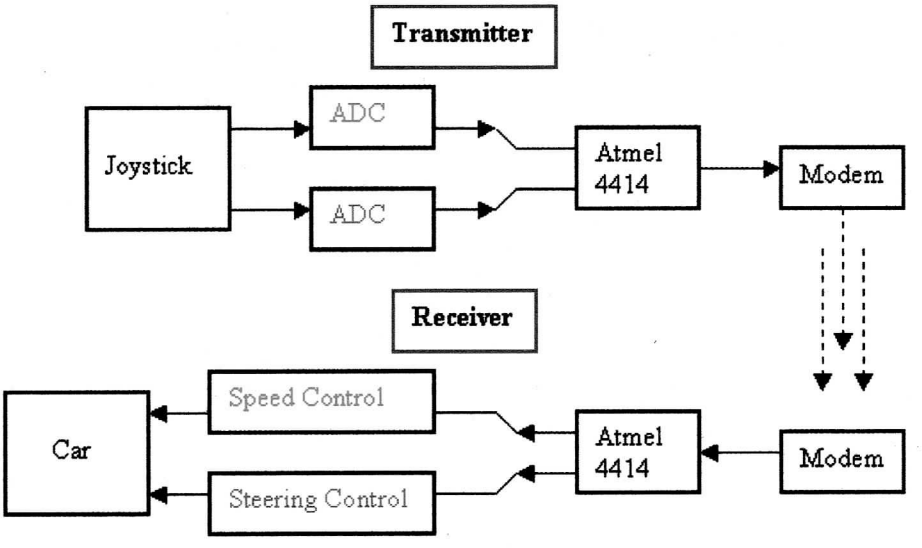

Figure 2.1: Transmitter and receiver modules

2.2.3 Coded Transmitter

All remote control system was more reliable if a coded message was sent, and used of an encoder integrated circuit is suggested. AX5326p-4 is use in this project. It can operate up to 12V and it does not produce a modulated output. In other word, the IC encodes the signals but modulation was performed inside the radio module.

2.2.4 Decoding Receiver

Details how the receiver module may be used with an AX decoder. Signals detected by the receiver module IC are output to the decoding device. The signal was only decoded if the setting on the dip switch S1 was matching those of the transmitter.

When a correctly coded signal was received the pin on IC2 switched to positive. The only pin remains positive for the duration of the decoded signal.

2.3 TIG Welding

2.3.1 TIG Basics

Gas Tungsten Arc Welding (GTAW) was frequently referred to as TIG welding. TIG welding was a commonly used high welding process. TIG welding has become a popular choice of welding processes when high quality, precision welding was required.

In TIG welding an arc was formed between a nonconsumable tungsten electrode and the metal being worked. Gas was fed through the torch to shield the electrode and molten weld pool. If filler wire was used, it was added to the weld pool separately.

Although TIG welding was a relatively slow process, it provides high quality welds. Typical applications are for aluminum irrigation pipes, stainless steel sprayer tanks and aluminum engine parts.

TIG was the perfect welding method for materials such as stainless steel, titanium alloy, aluminum alloy and high-temperature alloy steel. It was most often used for general repairs and sometimes for assembly. For example, conventional TIG would be used for welding or laminating multiple tooling parts.

Conventional TIG would also be a choice to repair damage caused by knockout pin breakage, or to repair parting line flash and to weld gate areas. Dimensional corrections can be made to get a mold back into tolerance, and can be used to apply a permanent shim on the back or bottom of an insert or cavity and core.

2.3.2 Advantages of TIG Welders

While using a TIG welder requires that separate filler material be used when additional material is needed, TIG welding has a number of advantages over other welding processes.

- The sharp and rigid tungsten allows for high precision welding.
- The small arc produced by TIG welding was ideal for welding thin materials.
- No material was added to the weld unless it is required.
- The inert gas shielding the weld creates no slag or splatter, making TIG welding a much cleaner and time-efficient process.

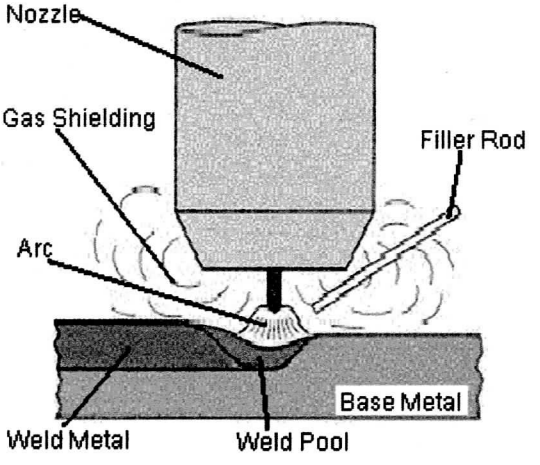

Figure 2.2: TIG Illustration

2.3.3 Shielding Gases

- Argon
- Argon + Hydrogen
- Argon/Helium

Helium was generally added to increase heat input (increase welding speed or weld penetration). Hydrogen will result in cleaner looking welds and also increase heat input; however, Hydrogen may promote porosity or hydrogen cracking.

2.3.4 TIG Welding Problems

- Erratic arc
- Excessive electrode consumption
- Oxidized weld deposit
- Arc wandering
- Porosity
- Difficult arc starting