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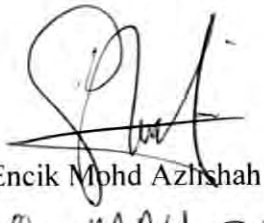
Signature : 

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Date : 8 MAY 2006

RADIO FREQUENCY LAWN MOVER

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This Report is Submitted In Partial Fulfillment Of Requirements For The Bachelor Degree Of Electronic Engineering (Computer Engineering)

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MAY 2006

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

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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.

ABSTRACT

The Radio Frequency (RF) Lawn Mover (Prototype) is machine to cutting grass and this lawn mover are control use remote control. The movement of machine like right, left, forward and backward will control with RF remote control. RF remote controls are chose in this project because RF is quite effective in long distance and the components are cheap and easy to get in market. RF remote control use to control the two operations of motor, H-Bridge motor circuit and stepper motor in this project. H-Bridge motor circuit is for controlling the movement of machine and the stepper motor are use to control the level of cutting fan. All this two motor are totally different in operation and circuit. Peripheral Interface Controller (PIC) is use for controlling stepper motor.

ABSTRAK

Radio Frequency (RF) Lawn Mover adalah sebuah mesin pemotong rumput dan kawalannya menggunakan alat kawalan jauh. Pergerakan mesin ini seperti ke depan, belakang, kanan dan kiri dikawal menggunakan alat kawalan RF. RF di pilih dalam projek ini kerana RF amat berkesan dalam jarak yang jauh dan komponennya mudah didapati di pasaran dan harganya murah.Alat kawalan RF dalam projek ini adalah untuk mengawal 2 operasi motor ialah H Bridge motor dan stepper motor.Litar motor H Bridge adalah untuk pergerakan mesin tersebut manakala stepper motor adalah untuk mengawal tahap ketinggian kipas pemotong. Operasi dan litar motor ini adalah berbeza sama sekali. Penggunaan Peripheral Interface Controller (PIC) dalam projek ini adalah untuk mengawal motor stepper.

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LIST OF ABBREVIATIONS

RF	Radio Frequency
PIC	Programmable Integrated Circuit
DC	Direct Current
FM	Frequency Modulation
AM	Amplitude Modulation
TX	Transmitter
RX	Receiver
SMPS	Switch-Mode Power Supply
FET	Field Effect Transistors
DSP	Digital Signal Processors
CPU	Central Processor Unit
ROM	Random Access Memory
RAM	Read Only Memory
IC	Integrated Circuit
MCU	Microcontroller Unit

CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

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 advantages of radio are the ability of the signal to pass through objects and walls. It range also impress 100 meters or more being typical. This project is to design Radio Frequency Lawn Mover which the machine control using RF remote control. By using this machine, people can save their energy because user just controls this machine using remote control. The fan or blade that use to cut grass can be adjusts the high of level, this give one optional to user to decide the high of grass that they want cut. This machine is user friendly because user only control the machine with remote control and all types' people can handle the machine includes disabilities physical people. These projects divide in two part, hard ware and software. PIC will use in software part and motor control in hardware part.

1.2 PROBLEM STATEMENTS

Currently, most lawn mover today operate in manually where human need involve directly in grass cutting activities, people use a lot energy if the area is to wide. Wireless lawn mover today only can operate in short range and the machine quiet expensive. The already lawn mover today also use petrol to operate and this can contribute to air pollution. If we look at the lawn mover use electrical energy, this machine need long cable or wire to operate outside, this machine is not effective because have limitation where this machine only can operate in small area. User also cannot choose the high level of grass that they want cut because the fan was fit.

1.3 PROJECT OBJECTIVE

To archive the goal of this project, there are some objectives that should archive. The objectives are:

a) To investigate a suitable wireless remote control to be used in this project.

b) To identify suitable motor and implement it on this project.

c) To develop a program to control the stepper motor using PIC.

d) To study a suitable material and design of lawn mover.

1.4 SCOPE PROJECT

The main scope in this project is to design and develop lawn mover machine control using remote control, Radio Frequency. All the operation will control using RF remote control. Beside that, this project only includes a basic electronic component that we have seen everyday in our life like remote control and dc motor. The mechanical movement of this machine like move to the left, right forward and backward will use motor control H-Bridge and stepper motor. H-Bridge is to control the wheel and stepper motor for control the level of fan.

1.5 REPORT STRUCTURE

This report starts with literature review about the radio frequency, transmitter and receiver, DC motor, motor controller, microcontroller, microcontroller programming and about the material that suitable to design the machine. In next chapter, will be discuses the project methodology on the process to build RF lawn mover machine. Chapter 4 shows all the result and algorithms. Project hypothesis will be done decide either the project archive the objective. Lastly in this report, some discussion and conclusion on this overall project.

CHAPTER II

LITERATURE REVIEW

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 communications 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 Islands. 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 discharged 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 transmitters, especially Alexanderson alternators, the only reliable long-distance wireless transmitters, 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 established 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 order word the required signal must be superimposed on the radio wave(carrier wave).With Amplitude modulation transmission, it the amplitude of the carrier wave that is made to change in accordance with the required signal. It is reasonable easy to generate but can suffer from interface .With Frequency Modulation transmission, it is the frequency of the carrier wave that is 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 are almost immune to interference, can carry higher data rate and have a longer range.

2.2.1 TRANSMITTER

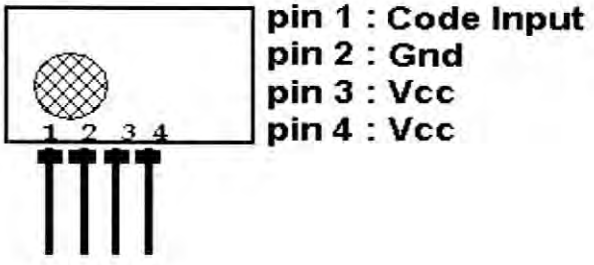


Figure 2.1: ZD TX module Pin Diagram

TX module 330MHz: The transmitter output is with a range of approximately 300 foot (open area) outdoors. Indoors, the range is approximately 150 foot, and will go through most walls.

The TX module 330MHz transmitter accepts both linear and digital inputs can operate from 1.5 to 12 Volts-DC, and makes building a miniature hand-held RF transmitter very easy.

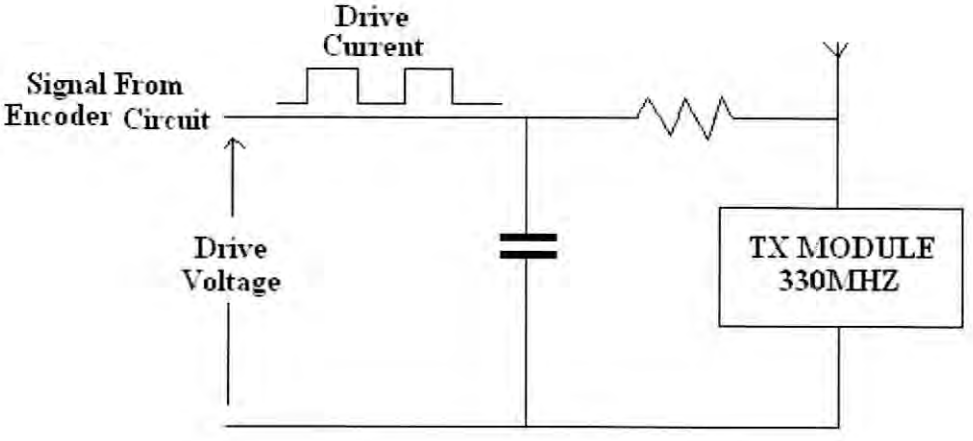


Figure 2.2: Transmitter driven positive supply

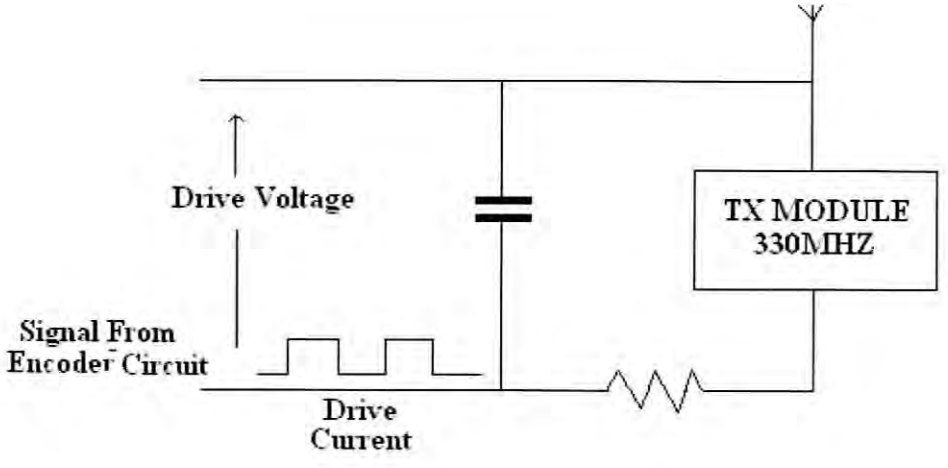
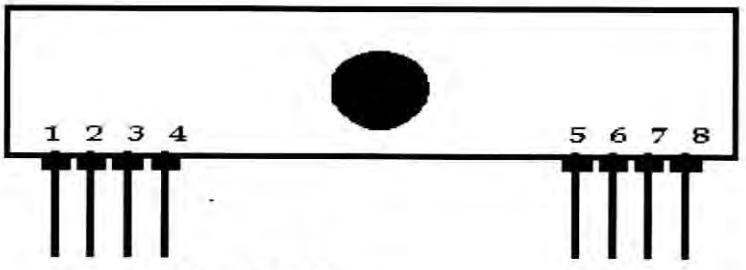


Figure 2.3: Transmitter driven negative supply

2.2.2 RECEIVER

ZD RX module: The receiver also operates at 330MHz, and has a sensitivity of 3uV. The ZD RX module receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs.



pin 1 : Gnd
pin 2 : Output
pin 3 : Linear Output
pin 4 : Vdd
pin 5 : Vdd
pin 6 : Gnd
pin 7 : Gnd
pin 8 :Ant

Figure 2.4: ZD RX module Pin Diagram

2.2.3 CODED TRANSMITTER

All remote control system is more reliable if a coded message is sent, and used of an encoder integrated circuit is suggested. Ax5326p-4 is the encoder is use in this project. It can operate at up to 12v and it does not produce a modulated output. In other word, the ic encodes the signals but modulation is 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 is only decoded if the setting on the d.i.p switch S1 is matching those of the transmitter.

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

2.3 H BRIDGE

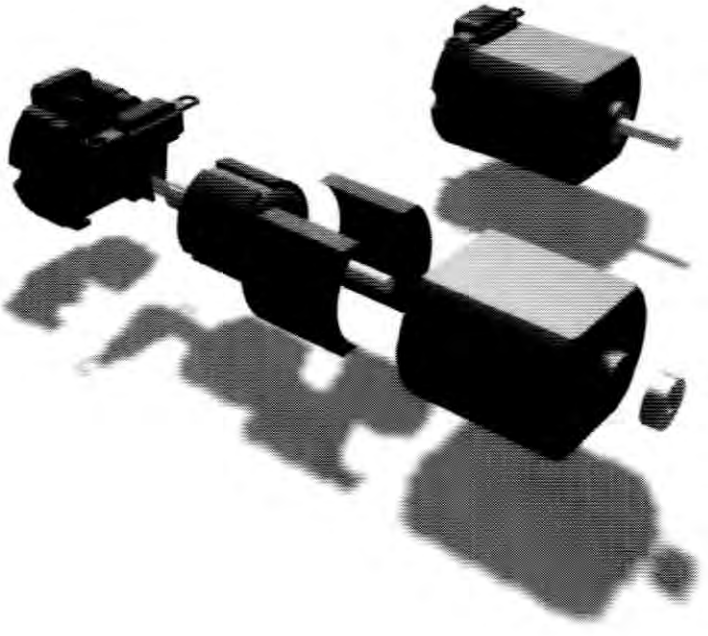


Figure 2.5: DC motor

Let's start with the name, H-bridge. Sometimes called a "full bridge" the H-bridge is so named because it has four switching elements at the "corners" of the H and the motor forms the cross bar. The basic bridge is shown in the figure to the right.