INFRARED FOLLOWING CAR

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PROJEK SARJANA MUDA II

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Signature : .....

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Date : 28 APR 2011.

ABSTRACT

The purpose of this report is to briefly describe the final year project with the title of “Infrared (IR) Following Car”. Objectives of this project are to make a simple product of controlling car movement by using IR pointer and enhance the control or ability by user. This report consists of introduction, literature review, procedures, result, discussion and conclusion of the project. The procedures start with circuit design, circuit simulation, circuit fabrication and testing. Basically, the car will move towards the IR light when the IR light was pointed on the floor and the car will continue follow the IR light if the IR light was point to others place.

ABSTRAK

Tujuan membuat laporan ini adalah untuk menerangkan secara ringkas tugasan projek sarjana muda (PSM) yang bertajuk "Infrared (IR) Following Car". Objektif projek ini adalah untuk menghasilkan produk yang ringkas dengan menggerakkan kereta kawalan jauh dengan hanya menggunakan *infrared pointer* dan mempelbagaikan cara kawalan atau kebolehan produk tersebut kepada pengguna. Laporan ini terdiri daripada pendahuluan, pengetahuan teori, langkah-langkah yang perlu diambil, keputusan, perbincangan dan kesimpulan projek ini. Langkah-langkahnya bermula dengan mereka bentuk litar, simulasi litar, fabrikasi litar dan menguji kefungsian produk kereta tersebut. Pada dasarnya, kereta ini akan bergerak menuju cahaya infrared setelah cahaya infrared tersebut ditujukan pada lantai dan kereta tersebut akan terus mengikuti cahaya infrared jika cahaya infrared tersebut ditujukan ke tempat lain.

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First of all, I would like to thank God for his blessing, and I would like to express my gratefulness to who had contributed in my final year project. I would like to begin my thanks giving with Mr. Amat Amir as my supervisor for support and guidance me throughout this project running and completing of this report.

Not forget also to thanks all those involved directly and indirectly helping me out during my PSM I & PSM II which I can't state out every one of them. A special expression of gratitude is extended to everyone for their tolerance and patience in doing all the things. I must admit that they had enriched me in many ways and words alone are not enough to express my gratitude.

Finally, I would also like to thank to my beloved family and friends who always given me support and useful advice during completing the project.

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INTRODUCTION

1.1 Project Introduction

Have you imagine a remote control car that can be control by using only an infrared light? In this situation, I replace the typical remote control device with an infrared light remote. When an infrared light point on the floor, the car suddenly move toward the infrared light and continue follow the infrared light if the infrared light was point at other place. Hardware that needs in produces the infrared following car are infrared emitter as the pointer and a car with two motors and has an infrared receiver. When an infrared receiver at the car receive the signal that produce by an infrared emitter, the car will move either forward or reverse.

1.2 Project Objectives

The objectives of this project are:

i. to design the schematic circuit diagram for the entire system
ii. to simulate the schematic circuit.
iii. to fabricate the schematic circuit into the PCB board.
iv. to test the effectiveness of the circuit on the PCB board.

From the above objective, the schematic circuit diagram for the system that must be designed are circuits for the pointer which is the emitter circuit, circuit for the receiver and circuit for the motor. Secondly, simulate the schematic circuit by using software is to make sure the circuit had been designed can work correctly. Thirdly, fabricate the schematic circuit into the PCB. Lastly, testing process is hold to make sure the product can work as planned.

1.3 Problem Statement

Typical remote control devices are worked based on the radio frequency (RF) to control the movement of the car. There are buttons on the remote control and those buttons are used to control the movement of the car. Therefore, skill is important and required in using the remote control. It is hard for children or beginner to use it as they do not have the skills in using the remote control.

1.4 Scope of the Project

Scopes of work of this project are:

i. study the theory of DC motor, IR transmitter and IR receiver.
ii. design the schematic circuit for DC motor, IR transmitter and IR receiver.
iii. simulate the circuit using Proteus software.
iv. fabricate the PCB circuit.
v. test the system.

1.5 Report Structure

Chapter I, will discuss the introduction of the project. The introduction include sub topic of project introduction, objective of the project, problem statement of the project, scope of the project and the structure of this thesis.

In Chapter II, discussion on the literature review will be done. This literature review include the theory of the project such as the theory of DC motor that need to be use in this project, the theory of infrared emitter and receiver and lastly the components that need to be used in this project.

In Chapter III, project methodology will be discussed. This project methodology includes the sequence of the whole process in completing this project. The process began from PSM I until PSM II.

In Chapter IV, it describes the result and discussion of the project. In sub topic of result, the result that had been achieved in this project and in sub topic of discussion, will describe about the entire project.

In Chapter V, it describes the conclusion and suggestion of the project. In this chapter, the summary and others suggestion needed in improving this project will be discussed.

CHAPTER II

LITERATURE REVIEW

2.1 DC Motor

Whenever talk about making a robot, the first thing comes to our mind is making the robot move on the ground. And there are always two options in front of the designer whether to use a DC motor or a stepper motor. When it comes to speed, weight, size and cost, DC motors are always preferred over stepper motors. There are many things which can do with the DC motor when interfaced with a microcontroller. For example can control the speed of the motor and can control the direction of rotation.

In this project need to learn the interface and control of a DC motor with a microcontroller. Usually H-bridge is preferred way of interfacing a DC motor. These days many IC manufacturers have H-bridge motor driver available in the market like L293D is most used H-Bridge driver IC. H-bridge can also be made with the help of transistors and MOSFETs.

2.2 Differential Drive

By using two motors we can move our robot in any direction. This steering mechanism of robot is called as differential drive figure below shown the basic sketches, movement and the direction movement of the car.

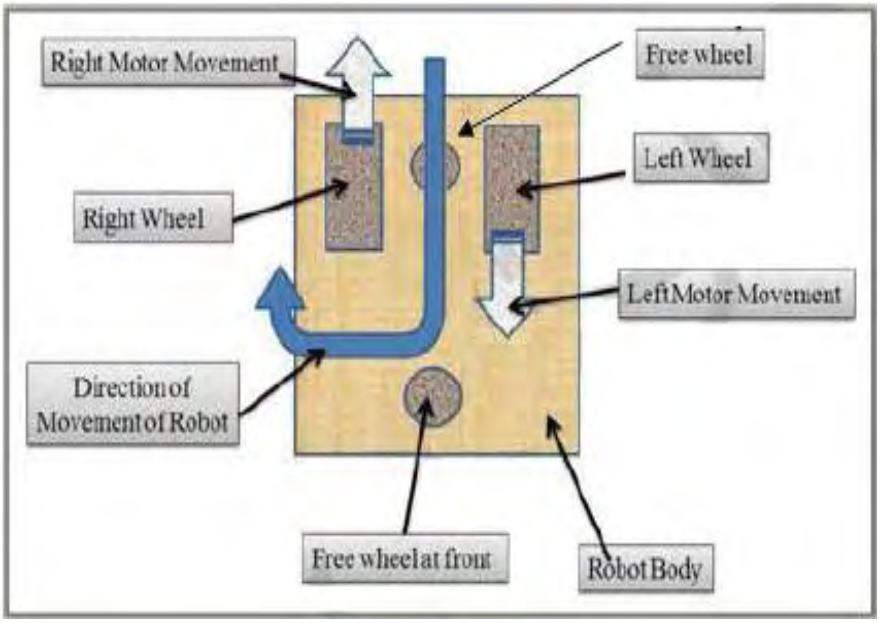

Figure 2.1: Basic sketch of the car

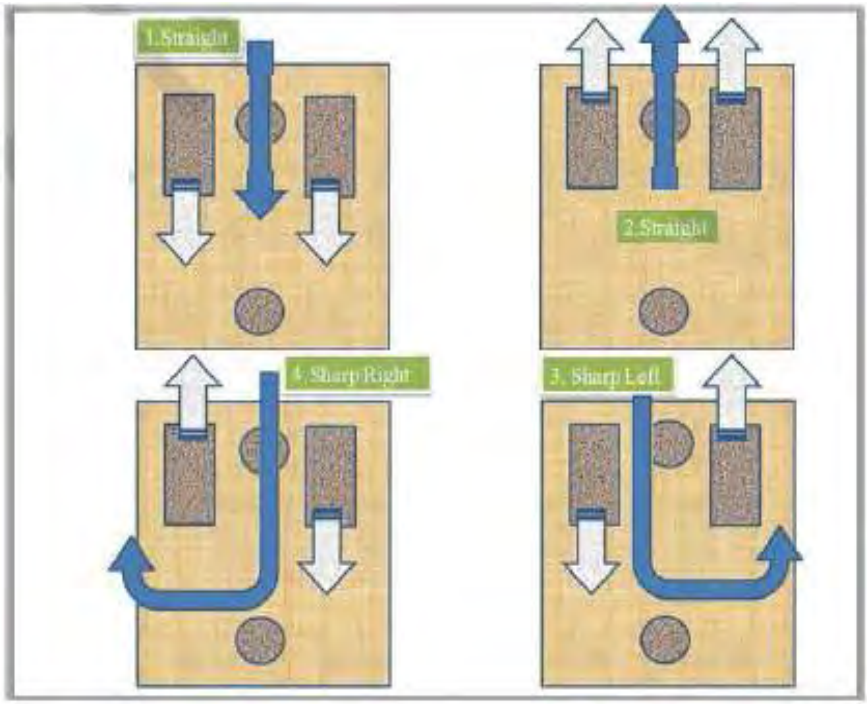

Figure 2.2: 4 types movement of the car.

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In Figure 2.1, there are three of wheel was used for the car. The three wheels are right wheel, left wheel and free wheel at front of the car. In Figure 2.2, is shown four types movement of the car. Firstly, both motor are running forward. This situation will cause the car move straight forward. Secondly, both motor are running reverse. This situation will cause the car move straight reverse. Thirdly, right motor was running forward and left motor was running reverse. This situation will cause the car turn sharply to the left. Lastly, left motor was running forward and right motor was running reverse. This situation will cause the car turn sharply to the right. Table below shows a summary of the movement of the car.

Table 2.1: A summary for the movement of the car.

Right Motor	Left Motor	Car Movement
Forward	Forward	Straight forward
Reverse	Reverse	Straight reverse
Forward	Reverse	Turn sharp to left
Reverse	Forward	Turn sharp to right

2.3 Working Theory of H-Bridge

The name "H-Bridge" is derived from the actual shape of the switching circuit which controls the motion of the motor. It is also known as "Full Bridge". Basically there are four switching elements in the H-Bridge as shown in the figure below.

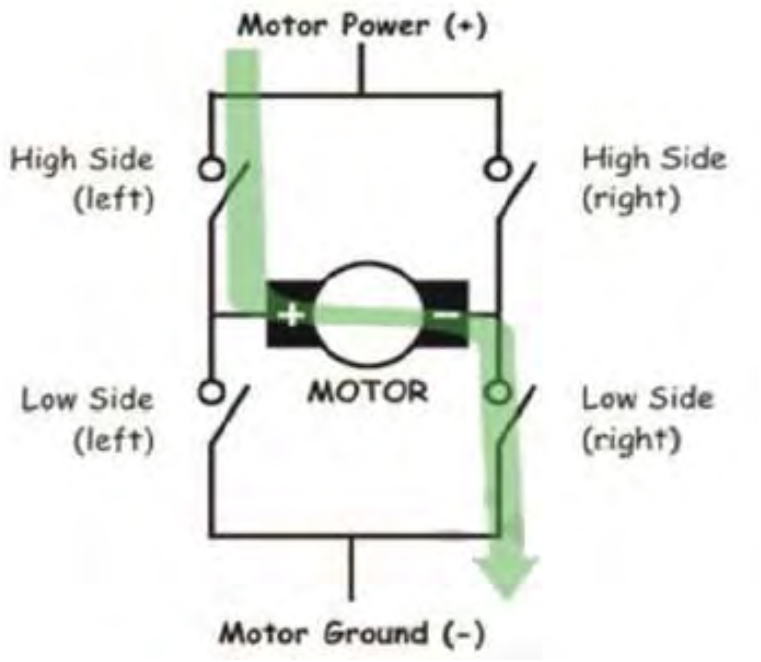

Figure 2.3: H-Bridge circuit flow.

As you can see in the figure above, there are four switching elements named as "High side left", "High side right", "Low side right", "Low side left". When these switches are turned on in pairs motor changes its direction accordingly. Like, if we switch on High side left and Low side right then motor rotate in forward direction, as current flows from power supply through the motor coil goes to ground.

Similarly, when you switch on low side left and high side right, the current flows in opposite direction and motor rotates in backward direction. This is the basic working of H-Bridge. We can also make a small truth table according to the switching of H-Bridge explained above.

Table 2.2: Truth table of the switching H-Bridge.

Hight left	**Hight Right**	**Low Left**	**Low right**	**Description**
On	Off	Off	On	Motor runs clockwise
Off	On	On	Off	Motor runs anti-clockwise
On	On	Off	Off	Motor stop
Off	Off	On	On	Motor stop

2.4 L298N Dual H-Bridge Motor Driver

The L298 is an integrated monolithic circuit in a 15-lead Multiwatt. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing

resistor. An additional supply input is provided so that the logic works at a lower voltage.

L298N is a dual H-Bridge motor driver, so with one IC we can interface two DC motors which can be controlled in both clockwise and counter clockwise direction and if you have motor with fix direction of motion. It can make use of all the four I/Os to connect to DC motors. L298N has operating supply voltage up to 46V, total DC current up to 4A and also had an over temperature protection.

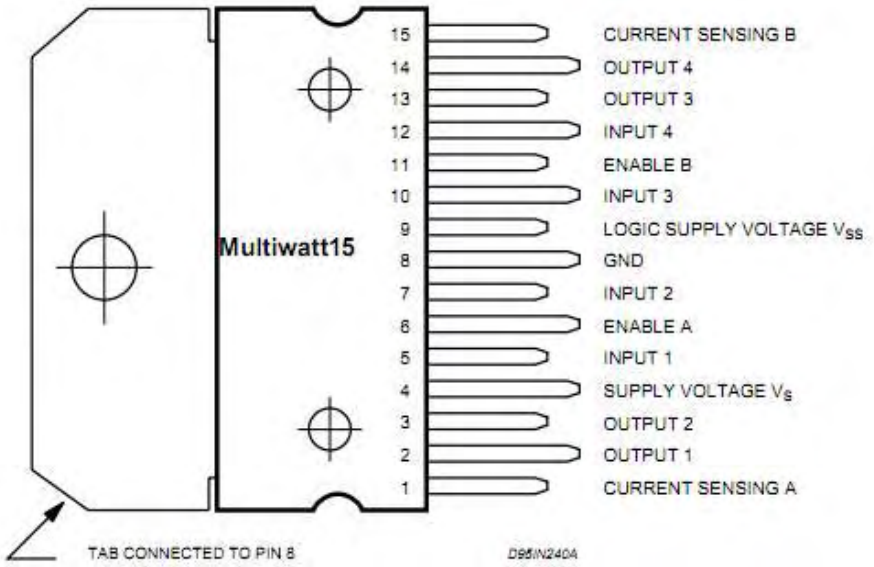

Figure 2.3: L298N

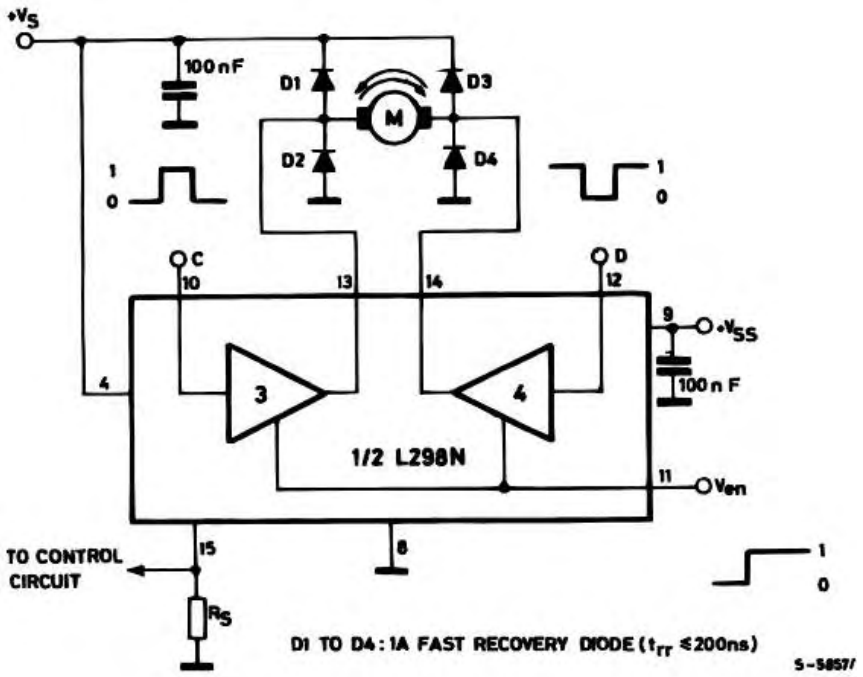

Figure 2.4: Bidirectional DC Motor Control of L298N.

Figure 2.5 shows a bidirectional DC motor control schematic diagram for which only one bridge is needed. The external bridge of diodes D1 to D4 is made by four fast recovery elements (trr $\leq$ 200 nsec) that must be chosen of a VF as low as possible at the worst case of the load current. The sense output voltage can be used to control the current amplitude by chopping the inputs, or to provide over current protection by switching low the enable input. The brake function (Fast motor stop) requires that the Absolute Maximum Rating of 2 Amps must never be overcome.