LINE FOLLOWER ROBOT WITH SOLAR APPLICATION

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DEDICATION

This dedication to my beloved mother and father that give moral support and money to finish the project, to my supervisor Puan Maniha Bt Abdul Ghani, special thank for help me and guide me on how to done this project by share the knowledge and experience with me. Also guide me to write thesis, last but not least to other lecture that give support to me like give advise and share knowledge that they have with me. To my friend thank you so much because support me either in moral support or material also help me done this project.

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ABSTRACT

The objectives of this thesis are to construct a line follower robot where it use energy from sun and controlled using solar charger, goes to battery. This robot is dynamic and durable where is modeling using three tires, one for in front and two at the back for free to move. Before building this solar robot several studies have been made and were divided into several stages. This Line-Following robot it follows the path of the white line in a suitable ground, it will be moved automatically forwards, backwards, left and right free from the black lined path by programming. Robot is operated using two DC Motor Planetary toothed wheels on left and right sides. Forward and backward movement, or left and right side motors are controlled by two motor driver circuits. The batteries can be charged by dc supply from an external source or by DC supply from a solar panel.

ABSTRAK

Tujuan dari penulisan ini adalah untuk membina sebuah robot pengikut garis yang mana penggunaan tenaga daripada matahari dan dikawal menggunakan charger matahari, kemudian pergi ke bateri. Robot ini bersifat dinamik dan tahan lama mana pemodelan menggunakan tiga tayar, satu untuk di depan dan dua di bahagian belakang untuk bebas bergerak. Sebelum memcipta robot suria, beberapa kajian telah dibuat dan dibagi menjadi beberapa tahap. Robot mengikut Line- itu menurut jalan garis putih di tanah yang sepadan, maka akan dipindahkan secara automatik ke depan, mundur, kiri dan kanan tidak dari jalan dipenuhi hitam oleh pengaturcaraan. Robot beroperasi menggunakan dua roda Motor DC Planetary bergigi di sebelah kiri dan kanan. Teruskan gerakan dan mundur, atau kiri dan motor kanan dikendalikan oleh dua rangkaian driver motor. Bateri boleh dicas oleh bekalan dc dari sumber luaran atau dengan bekalan DC dari panel surya.

TABLE OF CONTENTS

TITLE			PAGE
TITLE PAGE			i
DECLARATION			ii
DEDICATION			iii
ACKNOWLEDGEMENT			iv
ABSTACT			v
ABSTRAK			vi
TABLE OF CONTENTS			vii
LIST OF FIGURES			xi
LIST OF TABLES			xiv
LIST OF LIST OF SYMBOLS			xv
LIST OF APPENDIXES			xvii
CHAPTER 1	**INTRODUCTION**		
	1.1	Overview	1
	1.2	Objective	4
	1.3	Scope of the Project	4
	1.4	Problem statement	5
	1.5	Thesis overview	6

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction 7

2.2 Solar Robot 7

2.3 Solar charger controller 9

2.4 Solar Panel / Photovoltaic Module 11

CHAPTER 3 METHODOLOGY

3.1 Hardware development 18

3.2 Introduction to PIC 20

3.2.1 Power Circuit 24

3.2.2 Clock Circuit 25

3.2.3 Reset Circuit 25

3.3 Enhanced 40 pins PIC Start-up Kit 26

3.4 PD3046 Geared motor 27

3.4.1 Hardware interface 29

3.5 IR Sensor 30

3.6 Solar Charger Controller 33

3.6.1 Methodology Process Review for solar charger controller 34

3.6.1.2 Circuit design and Simulation 34

3.6.1.3 Hardware testing 35

3.6.2 Activation Circuit 37

3.6.2.1 Activation Circuit Test on Breadboard 38

3.6.3 Clock Oscillator 41

3.6.4 State latch 42

3.6.4.1 State Latch circuit testing on breadboard 43

3.7 Enhanced 30 Amp DC Motor Drivers 44

3.8 Software 46

3.8.1 Introduction to OrCAD Capture and Capture CIS 46

3.8.2 PicBasic Pro Compiler 49

3.8.3 Proteus 7 Professional 50

3.8.4 List of Component 52

CHAPTER 4 RESULT AND DISCUSSION

4.1 Introduction 53

4.2 Hardware design and fabrication 55

4.2.1 Robot Chassis Design 55

4.2.2 Motor mounting 56

4.2.3 Robot Chassis construction 57

4.2.4 Aluminum rod fabrication 58

4.3 Result for charging circuit 59

4.4 DC Motor Modeling 66

4.5 Line Follower Robot Coding 70

4.4.1 MicroCode Studio compiler 70

CHAPTER 5 **CONCLUSION**

5.1 Conclusion 71

5.2 Feature recommendation 72

5.3 Costing 72

REFERENCES 73

APPENDIX A-J 74-108

LIST OF FIGURES

FIGURE	TITLE	PAGE
2.0	Block diagram of the solar battery charger ASIC in its typical application	10
2.1	Battery voltage during the charging process	10
2.2	Basic PV cell structure	11
2.3	circuit equivalent for a single solar cell	12
2.4	A typical current- voltage I-V curve for a PV cell	13
2.5	solar modules	14
2.6	PV Arrays Hierarchy [M]	14
2.7	Three types of electrical array	15
2.8	Relationship between current and voltage of electrical array reconfiguratio	15
3.0	Block diagram of the system	18
3.1	PIC18F4550 Block Diagram	21
3.2	Pin Layout	22
3.3	Pin Description	23
3.4	Power Circuit	24
3.5	Clock Circuit	24
3.6	Reset Circuit	25
3.7	Enhanced 40 pins PIC Start-up Kit	26
3.8	Gear Motor Series 12 and 24V	27
3.9	Process of an ISCP Programmer	29
3.10	IR-Sensor Circuit Diagram	30

3.11	IR LED	31
3.12	Operational Amplifiers	32
3.13	Solar Charge Controller	33
3.14	Design of Solar charger controller using PROTEUS software	35
3.15	System flow chart	36
3.16	Design of Solar charger controller using PROTEUS software	37
3.17	Simulation output voltage of activation circuit (Pink line show 5 volt)	38
3.18(a)	Activation circuit	39
3.18(b)	Simulation connection setup	39
3.19(a)	Simulation input battery voltage (left) and PV voltage (right)	40
3.19(b)	Simulation Output voltage of Activation Circuit in Oscilloscope	40
3.20(a)	Design of Clock Oscillator	41
3.20(b)	Simulation Output pulse of clock oscillator circuit form oscilloscope	41
3.21	Design of state latch circuit	42
3.22(a)	Result of Condition A	43
3.22(b)	Result of condition B	43
3.23(a)	Enhanced 30 Amp DC Motor Driver	44
3.23(b)	Schematic diagram of motor driver	45
3.24	MicroCode Studio software	49
3.25	Proteus Virtual System Modeling (VSM)	50
4.0	flow chart for designing robot and charger	54
4.1	Motor Mounting	56
4.2	Robot Chassis	57
4.3	Aluminum rods as a crutch	58
4.4	testing for charging battery using solar radiation	59
4.5(a)	solar radiation in UMP Pekan 14 October 2010	60

4.5(b)	solar radiation in UMP Pekan 14 October 2010	61
4.6(a)	solar radiation in UMP Pekan 15 October 2010	62
4.6(b)	solar radiation in UMP Pekan 15 October 2010	62
4.7	Vantage summary for solar radiation, energy and wind energy	63
4.8(a)	graph voltage and current for charging 12volt lead acid battery	64
4.9(b)	graph voltage and current for charging 12volt lead acid battery	65
4.10	Circuit diagram of DC motor	66
4.11	Armature circuit of DC motor	67

LIST OF TABLES

TABLE NO.	TITLE	PAGE
3.0	Photovoltaic Specification	19
3.1	T truth table in normal operating condition	44
3.2	Pin configuration between motor driver and PIC	45
3.3	List of Component	52
4.0	List cost of project part 1	103
4.1	List cost of project part 2	104

LIST OF SYMBOLS

SYMBOL		DESCRIPTION
θ	-	Angle
$\dot{\theta}$	-	Angular velocity
$\ddot{\theta}$	-	Angular acceleration
H	-	Measurement matrix
W	-	Process noise
τ_m	-	Motor torque (Nm)
τ_e	-	Applied torque (Nm)
R	-	Nominal terminal resistance (ohms)
L	-	Rotor inductance (H)
k_f	-	Fractional constant (Nms/rad)
k_m	-	Torque constant (Nm/A)
k_e	-	Back emf constant (Vs/rad)
r	-	Radius of the wheel
ω	-	Angular velocity of shaft (rad/s)
α	-	Angular acceleration of shaft (rad/s^2)
V_a	-	Applied terminal voltage (V)
V_e	-	Back emf voltage (V)
i	-	Current through armature (A)

LIST OF ABBREVIATIONS

PV	-	Photovoltaic
DC	-	Direct Current
CW	-	Clock Wise
CCW	-	Counter Clock Wise
PWM	-	Pulse Width Modulation
GND	-	Ground

LIST OF APPENDIXES

APPENDIX NUMBER	TITLE	PAGE
A	Datasheet for Motor	75
B	Datasheet for LM 324 (Comparator)	76
C	Datasheet for LM741N	81
D	Datasheet for TLC222CP	85
E	Datasheet for CD4013BE	90
F	Datasheet for 2N3904	93
G	Coding For Line Follower Robot	97
H	Cost for line follower robot and solar charger	103
I	Battery Charger	105
J	Datasheet for solar panel	107

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

A robot is a self controlled device that is built using electronic, electrical and mechanical units. The robot is designed to carry out a specific set of instructions that it is programmed for regularly. Robots can do the same task several times without getting bored with it and getting tired of it. Robots were initially used in industries to handle radioactive material because they were harmful to people. Since the beginnings of civilization man has had a fascination for a human-like creation that would assist him. Societies in the early part of the first millennium engaged in slavery and used those slaves to perform the tasks which were either dirty or menial labors. Having slaves freed the enslavers to carry on their society and concentrate on what they perceived as more important tasks such as business and politics. Man had discovered mechanics and the means of creating complex mechanisms which would perform repetitive functions such as waterwheels and pumps. Technological advances were slow but there were more complex machines, generally limited to a very small number, which performed more grandiose functions such as those invented by Hero of Alexandria.

A space age energy source now being considered by some and used by others to power the robotic is photovoltaic (PV). Solar energy is the most non-conventional energy source gaining interest throughout the world which has no harmful environmental impact. There are a number of devices in the modern car that are electrically powered. PV is the direct conversion of sunlight to electricity **[1].** Most people never heard what PV is, there has been a great deal of research in PV among energy experts. The merging of these two technologies will benefit mankind and without damaging the environment.

The renewable energy is a vital part of all available energy, which is capable to fulfill our entire energy requirement. Among all available forms of renewable energy the solar energy is clean, green, free and widely available. From over the past century, we have seen a relentless approach toward the procurement of world of automation and ease. The industrial revolution have significantly introduces up various electronic and mechanical devices. In present scenario, we have become dependent over the functioning of these devices for our continued growth and development. More recently the exploitation of the oil, natural gases and other fossil fuels has empowered the wheels of industry and automation. **[2]** We accept that the automation requires less human input effort but it surely requires a vital part of the energy. Thus, we have enslaved ourselves to non renewable energy sources and created a world whose possibility diminishes inabsence of these non-renewable sources. The human beings propensity to push the boundary of the Universe by exploring the deep uncharted realms of space would get mollify by a proper delineation of non renewable energy flow cycle.

All material that created by human have some advantages and its disadvantage to be consider. Here are some advantages and disadvantages about the solar power system **[3].** For the advantages, the sunlight reaching the earth's surface is plentiful compared to the average power consumed by humans. Another advantage is solar

power is pollution free during use. That means production end wastes and emissions are manageable using existing pollution controls. No bills to pay, means customer buy solar powered equipment and after that the electricity is free. Another advantage using this PV are minimal or no maintenance because Solar panels are guaranteed for 15 years and the Deep Cycle Batteries for 5 years. Advantage for the standalone systems is streetlights can be easily relocated and any occurrence of accidents or failure will not affect the others. Cost effective. In areas where the National Grid is not available, solar powered products have a clear advantage. There will be no cabling costs, no need for substations, which are very costly to put up. Another advantage of PV is the system operation quiet, benign, and compatible with almost all environments. Solar cell converts the solar radiation directly into electricity using photovoltaic effect without going through a thermal process. For the disadvantages using the photovoltaic PV are, solar electricity is almost always more expensive than electricity generated by other sources. Secondly, solar electricity is not available at night and is less available in cloudy weather conditions. Therefore, a storage or complementary power system is required. Limited power density and solar cells produce DC which must be converted to AC (using a grid tie inverter) when used in currently existing distribution grids. This incurs an energy loss of 4-12%.

In this final year project, I will construct a number of autonomous robots that acquire the strategies to survive in real world outdoor environments through a learning mechanism. The survival ability mentioned throughout this paper refers to the ability of the robots to autonomously maintain their energy amount to a certain level that ensures their ability for executing their strategies. The robots are equipped with solar panels, and a model of neural network ensemble that enables the robots to execute different strategies to cope with dynamic environments. Solar panel will put on top of vehicle because it will operate in maximum also that place incur to sun. The main purpose of this project are to design and develop the hardware model of the line follower robot using solar power and program with a use of a PIC microcontroller for robot brain. The research work is undertaken into a few stages. Fist state is to develop

the line follower robot and second state is to design and built solar controller charger. PIC 18F4550 is select because it easy to used and more durable than other microcontroller like Motorola or Atmel.

1.2 OBJECTIVE

The objectives of this project are:

i. To design and develop a line follower robot using solar energy.
ii. Design solar charger controller to charge the battery.

1.3 SCOPE OF THE PROJECT

The works undertaken in this project are limited to the following aspects:

i. Line follower robot hardware design and development using solar application.
ii. This solar robot will move forward with the distance more than 500m using battery that charge using solar energy.
iii. Design solar charger controller that will be use to protect the battery from damage.

1.4 PROBLEM STATEMENT

Robot is designed to make the daily work of men easier. For example, ASIMO robot created by the Honda. It can do human job like cook your dinner, do homework, clean the house, or get the groceries. . But many problems occur, for an example of the energy used to move the robot, the use of batteries as the power to move the robot. It will quickly run out and slowly to get fill. Depending on the type of batteries used, so the use of solar energy as the energy for the robot is the best solution. Solar energy used during the day and night use batteries.

To protect battery from damage during charging solar charging circuit is use where it will cut the charging process when voltage at battery is enough. Also it protects power circuit and control circuit.

1.5 THESIS OVERVIEW

This Implementation of a Solar Charger controller in Solar Line Follower Robot final thesis is arranged into following chapter:

Chapter 1: Basically is an introduction of the project. In this chapter, provides the background of the project, objectives, scope of the project, problem statement, and also the thesis outline.

Chapter 2: Focuses on literature reviews of this project based on journals and other references either on book or website.

Chapter 3: Mainly focused on methodologies for the development of Implementation of a Solar Charger controller in Solar Line Follower Robot. Details on the progress of the project are explained in this chapter.

Chapter 4: Focuses more on result and discussion of the project. All information must be explained in detail in this chapter with the problem specification.

Chapter 5: Conclusion and discussion of the project. Where expected result, feature recommendation and all cost that involve to the project.