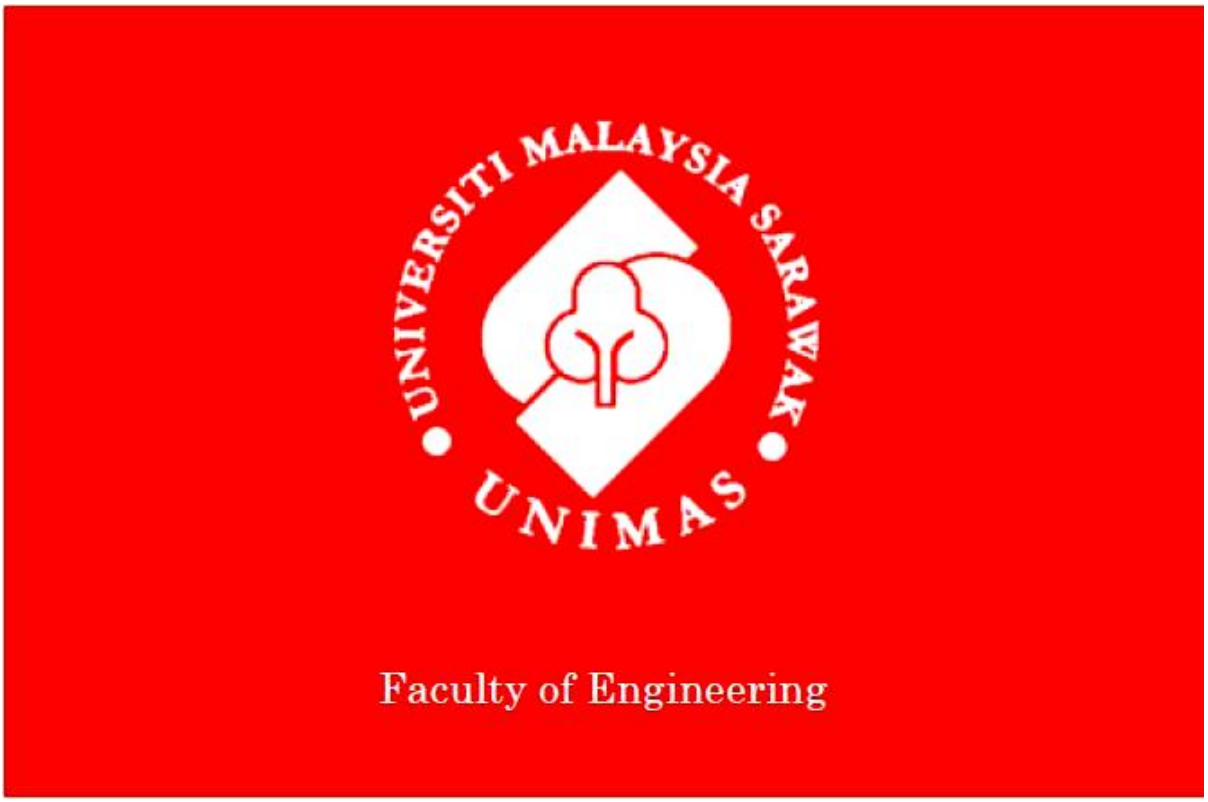

SOLAR TRACKER WITH WIRELESS CHARGING

PATRUS MAXSION ANAK TINGGAL

Bachelor of Engineering (Hons) in Electronics

(Telecommunications)

2017

UNIVERSITI MALAYSIA SARAWAK

Grade: _____

Please tick (√)

Final Year Project Report [√]

Masters [ ]

PhD [ ]

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This declaration is made on the 16th day of June 2017.

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I Ponta Mansion anak Tinggal, 43714, Faculty of Engineering

(PLEASE INDICATE STUDENT'S NAME, MATRIC NO. AND FACULTY) hereby declare that the work entitled Solar Tracker With Wireless Charging is my original work. I have not copied from any other students' work or from any other sources except where due reference or acknowledgement is made explicitly in the text, nor has any part been written for me by another person.

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Ponta Mansion anak Tinggal (43714)
Name of the student (Matric No.)

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SOLAR TRACKER WITH WIRELESS CHARGING

PATRUS MAXSION ANAK TINGGAL (43714)

A dissertation submitted in partial fulfilment

of the requirement for the degree of

Bachelor of Engineering (Hons) in Electronics

(Telecommunication)

Faculty of Engineering

Universiti Malaysia Sarawak

2017

To my beloved family and friends.

ACKNOWLEDGEMENT

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ABSTRACT

Sunlight is a renewable resources because everyday sun will rises and thus, produces sun light. Furthermore, sunlight can be harvested and it is eco-friendly and does not pollute the environment. Plus, by reducing the usage of cables is good for environmental and human's health. It is called as wireless in short. Do we know, by combining harvesting sunlight and wireless able to reduce large amount of money. Why? It is because materials needed to produce the cables can be cut and human able to avoid themselves from electric shock and by harvesting the sunlight, the electricity bill can be reduced. This project is to design, develop, investigate and analyze the efficiency of wireless charging solar tracker. This solar tracker able to rotate till 360^0 by using two servo motors and LDR as a sensor in order to harvest sunlight till maximum and combine with wireless charging by using magnetic resonance coupling method instead of using cable as medium to charge a battery.

ABSTRAK

Cahaya matahari adalah sumber yang boleh diperbaharui kerana matahari setiap hari akan terbit dan dengan itu akan menghasilkan cahaya matahari. Tambahan pula, cahaya matahari boleh dituai dan ia adalah mesra alam dan tidak mencemarkan alam sekitar. Seterusnya, dengan mengurangkan penggunaan kabel adalah baik untuk alam sekitar dan kesihatan manusia. Ia dipanggil sebagai *wireless* secara ringkasnya. Adakah kita tahu, dengan menggabungkan penggunaan solar dan *wireless* dapat mengurangkan perbelanjaan dengan mendadak. Mengapa? Ini kerana bahan-bahan yang diperlukan untuk menghasilkan kabel boleh dikurangkan dan manusia dapat mengelakkan diri mereka daripada kejutan elektrik dan penggunaan solar, bil elektrik dapat dikurangkan. Projek ini adalah untuk mereka bentuk, membina, menyiasat dan menganalisis kecekapan pengecasan tanpa wayar tracker solar. Penjejak solar ini dapat berputar hingga 360^0 dengan menggunakan dua motor servo dan LDR sebagai sensor untuk menuai cahaya matahari sehingga maksimum dan menggabungkan pengecasan tanpa wayar dengan menggunakan kaedah resonans gandingan magnet dan bukannya menggunakan kabel sebagai medium untuk mengecas bateri.

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LIST OF ABBREVIATIONS

A	-	Ampere
AC	-	Alternating Current
DC	-	Direct Current
EMF	-	Electromotive Force
FYP1	-	Final Year Project 1
FYP2	-	Final Year Project 2
LDR	-	Light Dependent Resistor
PIC	-	Peripheral Interface Controller
PV	-	Photovoltaic
PWM	-	Pulse Width Modulation
RF	-	Radio Frequency
RX	-	Receiver
TX	-	Transmitter
V	-	Volt
W	-	Watt
Ω	-	Ohm

CHAPTER 1

INTRODUCTION

1.1 Project Overview

Energy sources obtained from coal, oil and natural gas and very efficient for the progress of economic in this world. The cons using these sources are damaging to the environment and also human health. For an example, oil will be used in vehicles, thus, it will produce smoke or poisonous gas into the air and lead to greenhouse effect and affect the ozone layer. For human, it is dangerous for respiratory system especially children and who are sensitive to the surrounding. To solve the problems, developers and scientists nowadays try to reduce pollution by exploring more on renewable energy. Renewable energy can be found massively in the Earth and it will not finish such as petroleum. Examples of renewable energy are biomass, wind, solar, hydropower, and geothermal. The costs of wind and solar power are decreasing considerably in the past 30 years till today but oil and gas are increasing either usage or effect to the environment [1]. Therefore, to avoid this energy harm the earth, renewable energy is increasingly used.

Solar power is a renewable energy because solar energy is gained from the sun or harvesting energy from sun. Sun is one of the natural resources that naturally replenished. Actually, the energy is in the form of radiation that will creates electrical power or electricity. Electricity can be generated or produced from photovoltaic known as PV cells. Photovoltaic means “light” and “electric” literally. Solar cell is a device that harvest the solar energy and convert it directly into electricity, either from photovoltaic effect or change into heat energy first or chemical then into electricity. There are some factors that affect the output of the solar energy that is category and area of the material, sunlight’s intensity and the sunlight’s wavelength. Solar power is one of cleanest resources in earth. It is pollution-free and do not produced radiation.

Therefore, most people want to maximize the solar energy and maximize the efficiency of solar panel [7].

Wireless charging is the transmission of an energy from power source to a device that need to be charged without using wires or cables. Nikola Tesla is the "Father of Wireless" because he is the one who comprehended the idea of Wireless Power Transmission and also verified without using wires [2]. Wireless power transmission or wireless charging still new in this modern days although it has been discovered a long time ago because it is not practically widely and the technology still improving but will not end. Wireless charging will help and make the user's life easier because they need no wire to charge their phone and it is safe.

This project will focus on the construction of solar sun tracker with wireless charging using Arduino Uno microcontroller. As what as we know, solar tracker is not commercially implemented. Because of the solar tracker is not in the market, most of the people only use fixed solar panel. Figure 1 shows fixed solar panel.

Figure 1.1: Fixed Solar Panel.

To step up the effectiveness of harvesting sunlight, solar tracker is built to achieve maximum power and to reduce the usage of cables or wires, wireless charging is built. Solar tracker will track the movement of the sun every day in a year different with fixed solar panel that only fix in a certain angle and do not maximize the sunlight.

1.2 Problem Statements

Solar panel today mostly fixed solar panel and there is no solar panel that follow the sun from east to west. Fixed solar panel is designed for fixed angle or only one direction and cannot follow sun's movement. Therefore, it will produce low power than solar tracker panel and the efficiency is low compare to the solar tracker panel. For a family that needs more output than normal and wants to reduce electricity bill, they need to set up fixed solar panel at east and west where sun is rises and sun is sets. Therefore, needs a lot of money to install on the house. To overcome the problem, solar tracker panel is the solution because solar tracker panel can go to 180^{o} and 360^{o} by following the sun throughout a year and can generate more output power than fixed angle. Next, this system can reduce the time for the users to change the position of fixed solar panel.

Most of the users have a problem to charge their own phone if using ordinary charger (wired). Furthermore, the charger cable can be a mess if it is not placed in a suitable place. It is dangerous for children because the children can get electric shock if we forget to turn off the power supply because the cable is exposed. Without wire or cable, room become tidy and safe for the children. Figure 1.2 and 1.3 shows messy cables on the table and exposed wire.

Figure 1.2: Messy cables on the table.

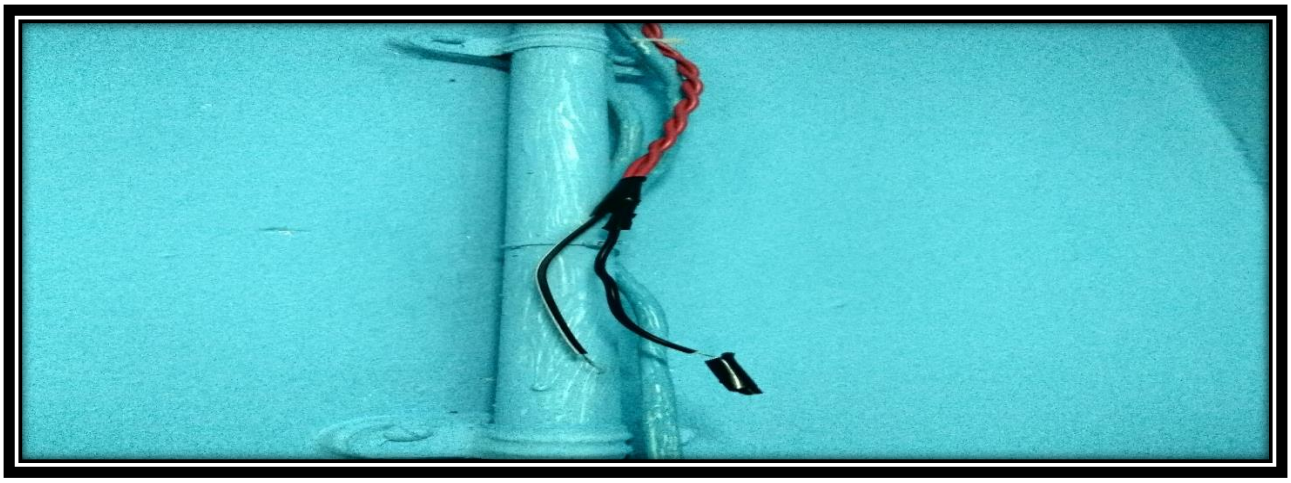

Figure 1.3: Exposed cables.

Today, many people want to charge their phone without wire because it is more safer but the efficiency of wireless charging still not able to compete with cable charging. The distance and the efficiency of charging is limited. Therefore, wireless charging solar will be developed and the efficiency is investigated and analyzed to see whether this eco-friendly device able to charge a battery efficiently. Wireless charging consists of many methods. Thus, to choose which methods have best efficiency will be discussed and able to produce better efficiency. Figure 1.4 shows existing product of wireless charging.

Figure 1.4: Existing product of wireless charging.

1.3 Objectives

The objectives of these project are:

- To design and develop a wireless charging solar tracker by using Arduino microcontroller.
- To investigate and analyze the efficiency of wireless charging solar panel by using Arduino microcontroller.
- To investigate the selected method of wireless charging.

1.4 Scope of Project

Figure 1.5 shows the flow chart of the activity. The main function of flowchart is to guide researchers on how to start, manage and completed a project.

According to the flow chart, the first step, a title of the project must be focused on. Once the title is confirmed, the objectives must be set based on the appropriate reasons and lacks. Problems that affect the project need to be discovered. Without problems that related to the objectives, the objectives that have been set will not be answered. Then, research must be conducted about the title of the project and previous works. This process helps the researcher to discover the weakness and solution for the project. Writing a report (introduction, literature review and methodology) is started once the data from research are completed. For the next step, focuses on software designing and hardware. For this part, it is very difficult because critical thinking is needed. There will be many circumstances and troubleshooting. Implementation process must be done after designing process has finished. Thus, in implementation process, just referring the design, implementing works will be easier. Lastly, the completed miniature will be tested. If it works perfectly, experiment must be conducted. This is to make sure that the results gain from the experiment is valid. When there is some glitches, troubleshooting process must be done to discover the reasons behind the problems. If the results are accurate, finalizing process will be done. This is the final touch up to makes the miniature and report are fully complete.

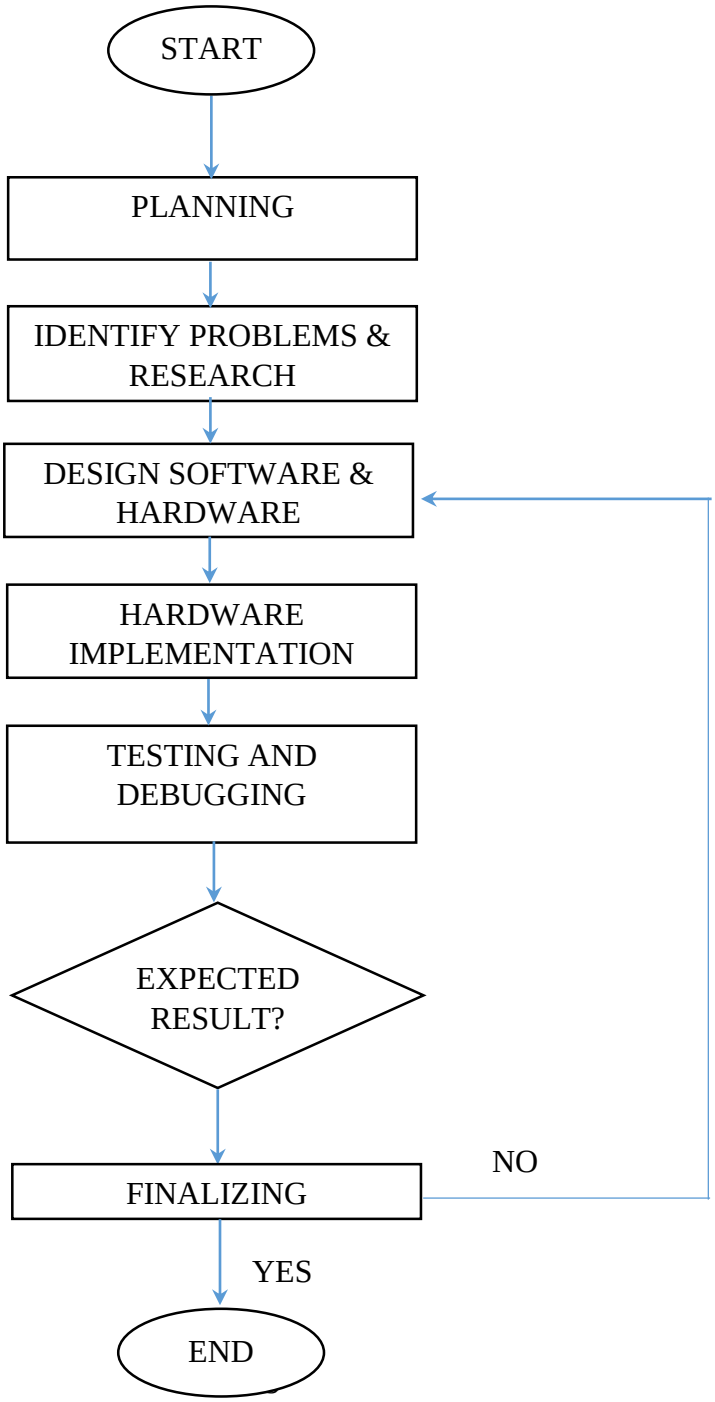

Figure 1.5: Flowchart of activity.

1.5 Expected Outcome

Solar tracker with wireless charging can help the users to get more output power than fixed panel solar. This is because Solar Tracker With Wireless Charging is able to harvest the sunlight more than static panel with high efficiency. User is also able to charge their phone without using wire or cable and it is safer because this is a combination between solar and wireless charging.

1.6 Report Structure Overview

Project Outline

This report consists of six chapters. (Introduction, Literature Review, Methodology, Project Development and Analysis, Discussion and Conclusions and Recommendations). For FYP 1, three chapters that need to be done that is Introduction, Literature Review and Methodology. For FYP 2, in the next semester, the remaining chapters will be done. Below tells the short detail about each chapter.

Chapter 1: Introduction

In this chapter will explain what is Solar Tracker With Wireless Charging, project overview, statement of the problems, objectives of the project, work planning and expected outcomes.

Chapter 2: Literature Reviews

Literature review discuss the information that related to the project. All the research and studies that obtained from the journals is summarized so that it will correspond to the title. This chapter also discuss the components needed for the project and the full design of Solar Tracker With Wireless Charging.