UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SMART SOLAR TRACKING SYSTEM WITH BLYNK AND THINGSPEAK

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for Bachelor of Engineering Technology of Telecommunication with Honours

By

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I hereby, declared this report entitled Development of Smart Solar Tracking System with Blynk and Thingspeak is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Electrical & Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronics Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

Signature: …….

Supervisor : GLORIA RAYMOND TANNY

ABSTRAK

Panel solar telah digunakan secara meluas dalam beberapa tahun kebelakangan ini untuk mengubah tenaga suria menjadi tenaga elektrik. Pada masa kini, orang ramai menggunakan lebih banyak tenaga daripada matahari menggunakan panel solar. Oleh itu untuk memaksimumkan penukaran dari solar ke tenaga elektrik, panel solar harus sentiasa kedudukan berserenjang dengan matahari. Matlamat utama projek ini adalah untuk mereka bentuk sistem penjejakan solar yang dapat menjejaki kedudukan matahari dan memantau prestasi panel solar. Kaedah yang digunakan dalam sistem telah dirancang dalam gambar rajah blok dan carta alir. Kaedah ini akan memastikan panel solar sentiasa mengesan pergerakan matahari untuk menghasilkan tenaga keluaran yang maksimum. Dalam projek ini, sistem dapat bergerak setiap 30 darjah dan pergerakan keseluruhan yang boleh dilakukan oleh sistem ini adalah 150 darjah. Sistem ini terdiri daripada Arduino Uno, modul Wi-Fi, motor servo, Resistor Bergantung Cahaya (LDR) sebagai sensor dan panel suria. Proses pemantauan akan memaparkan penggunaan harian tenaga boleh diperbaharui di Blynk dan Thinkspeak. Ini membantu pengguna untuk menganalisis penggunaan tenaga dari mana saja melalui internet. Analisis kesan ke atas penggunaan tenaga boleh diperbaharui dan isu-isu elektrik juga boleh diperhatikan melalui Thinkspeak. Sistem ini merupakan teknologi pendahuluan yang dapat memberi impak yang baik kepada setiap pengguna yang mengambil berat prestasi panel solar.

ABSTRACT

Solar panel have been widely used within the recent years in converting the solar energy into electrical energy. Nowadays, peoples are trying to utilize more energy from the sun using solar panel. So as to maximize the conversion from solar to electrical energy, the solar panel should always be position perpendicular to the sun. The main goal of this project is to design a solar tracking system which can track the position of the sun and monitor the performance of solar panel. The method used in the system was planned in a block diagram and flowchart. This method will ensure the solar panel always track the movement of the sun in order to produce the maximum energy output. In this project, the solar tracker is able to move 30 degrees each and total movement that this system can do is 150 degrees. The system consists of Arduino Uno, Wi-Fi module, servo motor, Light Dependent Resistor(LDR) as a sensor and a solar panel. The monitoring process will be display is reading of voltage, current and power in Blynk and ThingSpeak. This helps the user to analysis the energy usage from anywhere over the internet. Analysis impacts on the renewable energy usage and electricity issues also can be observe through ThingSpeak. This system is an advance technology which is able to give a good impact to every user that is concern about the performance of the solar panel.

DEDICATION

To my beloved parents

My supportive supervisor, Madam Gloria Raymond Tanny

My faithful panels, lecturer and staffs of FTK

My BEET Cohorts 5 classmates

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Thanks to Allah for giving me the strength to complete this project. First and foremost, I would like to thank my supervisor, Miss Gloria Raymond Tanny because for the guidance, advice and sharing the expertise regarding my project. I also want to express my gratitude to my parents because giving me encouragement and support me in order to complete this project. A special thanks also to my friends and others that involve directly and indirectly to helps me complete this project.

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LIST OF ABBREVIATIONS AND SYMBOLS

IoT	-	Internet of Things
API	-	Application Programming Interface
GPS	-	Global Positioning System
GSM	-	Global System for Mobile
GUI	-	Graphical User Interface
USB	-	Universal Serial Bus
LDR	-	Light Dependent Resistor
LED	-	Light Emitting Diode
VDC	-	Volts Direct Current
PV	-	Photovoltaic
STR	-	Solar Tracker Robot
ADC	-	Analog to Digital Converter
IP	-	Internet Protocol
AI	-	Artificial Intelligence
Wi-Fi	-	Wireless Fidelity

CHAPTER 1

INTRODUCTION

1.1 Project Background

Renewable energy is a trend in today's technology whereby solar energy or photovoltaic energy is the hottest topic among scientists and engineers to become an extremely popular alternative power. Commonly, utilization of solar energy is to produce and provide electricity for the usage of industrial or residential. Indirectly, solar energy may affect the alternative payment charges of electricity due to high demand of fossil fuel or gas which has higher value. Therefore, plenty of the researches had been carried out in order to develop alternative sources of energy that able to replace the fossil fuel or gas. Therefore, another alternative which can provide energy is photovoltaic energy that is one of the type of solar energy. As a result, of the solar panel is made up from the solar cells that enable to convert heat energy to electrical energy by absorbing the daylight.

The tilt angle of solar panel facing the sunlight may affect its performance in order to produce electricity. The most efficient method is to direct the solar panel to perpendicular with sunlight. However, the solar panel that is available in the market is in fixed position that cannot be adjusted. In the other hand, to extend the efficiency of the solar panel while generate electricity, the intervals time should be moveable. Thus,

the goal of proposing this project is to develop a simple solar tracker system to enhance its efficiency. There have several parts in this project which consists of software and hardware implementation. Each of the parts are designed by considering the performance, cost, capability and maintainability.

1.2 Problem Statements of the Project

The performance of solar system is depended on the amount of the electricity it can generate. According to the nature phenomena on Earth, sunlight will not fix in a certain direction. Instead, position of sun may have related to the direction of sunlight. Unfortunately, existed solar panels these days are installed in static position and failed to follow the position of the sun in order to absorb more heat energy. Perhaps, this technology is less impressive due to its low performance that can only produce low output power as the output power only will increase if only if the solar panel is in perpendicular position with the sun all the time during the daytime. Therefore, the solar panel is improvised with a solar tracker with the help of sensor.

Besides that, the second problem for the existed solar panel is user do not have the output information produce from the solar panel. So this system resolves the problem because user can monitor the performance of solar panel through internet at anywhere. Thus, user can detect whether the system have problem or require maintenance.

1.3 Objectives of the project

The objectives of this project are:

- To design monitoring solar tracker system which provide accurate value data of measurement parameter in IoT.
- To develop solar tracker system that can track the sun movement to improve its efficiency and monitor the output of solar panel.
- To analyze the performance of solar tracker system using Blynk and Thingspeak.

1.4 Project Scopes

This project is focused to design and build the prototype of solar tracking system. The scope for this project are:

- System move 30 degrees each and total movement that this system can do is 150 degrees.
- The system will ensure the solar panel always follow the movement of sun to get maximum power.
- Using IoT based solar power monitoring system that allows for automated solar power monitoring from anywhere over the internet.
- The output show from Blynk and ThingSpeak is reading of voltage, current and power with date and time.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will be discussion of literature review based on the journals or articles that written by engineers. List of references based on the articles and journal will be also explant in this report.

2.2 Solar Panel

Nowadays, renewable energy such as solar energy currently been used to provide electricity to electronic device. To obtain the maximum efficient solar energy, solar tracker was design to concentrate a sun-oriented reflector. The solar powered equipment works as soon as they are set in the sun. Before this fixed solar panel is being widely used. However, we know that the position of sun will move across the sky according to time which will not give enough solar energy to fixed panel. Therefore, solar tracker was invented to increase the efficiency to the solar powered equipment.

The development of sun oriented cells is from the extraction of power that happen at solar panel. The solar cell is a semiconductor that can convert energy from sunlight to direct current. The connection of solar cells is in series to electronic devices which will convert directly into electrical DC output. The efficiency of high output will make the greater use of

solar generation. Besides that, solar cells can be non-mechanical devices that made of silicon alloys(Ramadan, Yehia, & Rashad, 2015).

Figure 2.1: Solar Panel

Solar cells are the basic parts of the photovoltaic framework building. Individual cells will move from 0.5 to 4 inches upwards(Johnson-hoyte, 2012). One cell cannot produce enough power for electrical device that require high power. The efficiency of various photovoltaics is depending on daylight. The weather situation such as daylight and cloudy influence the amount of solar energy that solar panel can captured.

The solar energy required to be monitor in order to get optimum power output. This recovers proficient power output from control plants while monitoring for flawed sun based boards, connections, clean collected on boards bringing down output and other such issues influencing sunlight based execution. So here student propose a robotized IoT based sun based power checking framework that considers mechanized sun based power monitoring from anyplace finished the web(P.R. Naregalkar, Krishna Kishore Thanvi & Assistant, 2017). The Arduino based framework is use to screen a 10Watt sun oriented board parameters. The framework continually screens the sun based board and transmits the power

output to IoT framework over the web. By utilizing IoT Gecko to transmit sun oriented power parameters over the web to IoT Gecko server(Patil, Vijayalashmi, & Tapaskar, 2017). It now shows these parameters to the client utilizing a viable GUI and furthermore cautions client when the output falls beneath particular points of confinement. This makes remotely monitoring of sun oriented plants simple and guarantee best power output.

2.2.1 Process of solar system

The solar system is the process of converting sunlight energy to electrical energy. The solar panel received and collecting the energy from sunlight and convert it into DC output from electrical device used. Normally, most solar panels have thickness about 3cm to 6cm which is designed in square shape. This is because it will ease the installation to electrical device. Figure 2.2 below shows system processes from solar panel to output devices used.

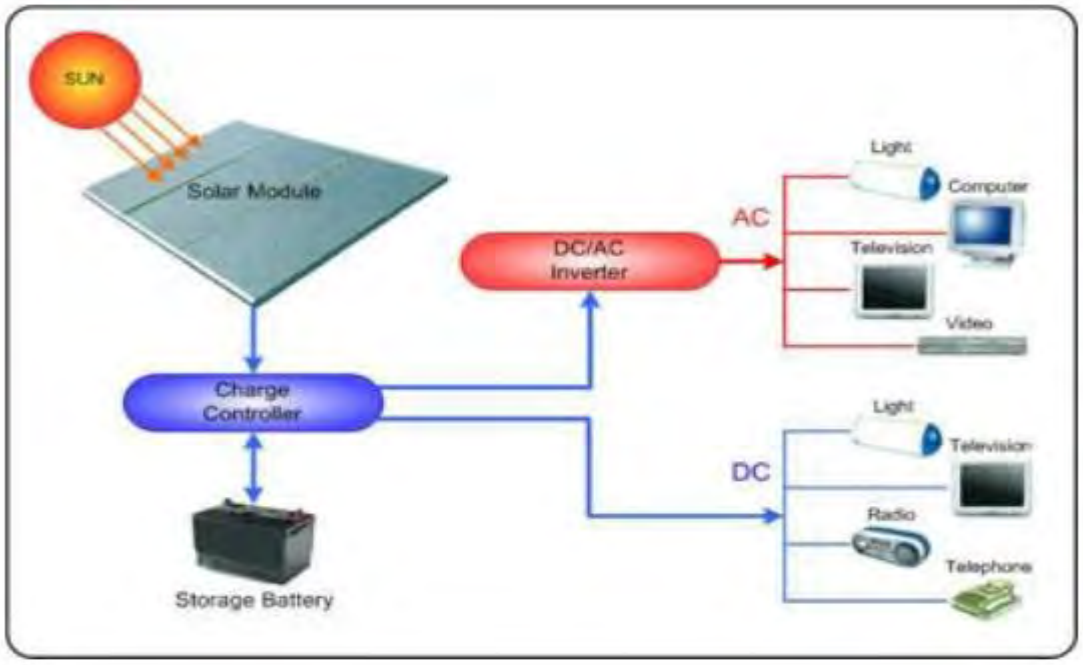

Figure 2.2: Process of solar tracker system

2.2.2 Renewable Solar Energy

The energy gained from the sun is called solar energy. It is considered as essential to living things because it gives the world almost all energy through directly or indirectly. To produce sustainable energy to the world, solar energy stores fossil fuels and biomass, and also responsible for enabling the cycle of water and producing wind(Akram, Khalid, & Shafiq, 2018). The Sun radiates every day, and sends a large amount of energy. The Sun radiates a great deal of vitality at a time compared to people who have been used since the beginning. Sunlight comes from the sun itself.

Solar energy is a type of renewable energy source. A renewable energy source is a source that is naturally renewed, and therefore it will never run out. Solar power is considering to be renewable due to the nuclear reaction that the sun is expected to continue to produce sunlight for billions of years(Quadri, Rastogi, & Dwivedi, 2016).

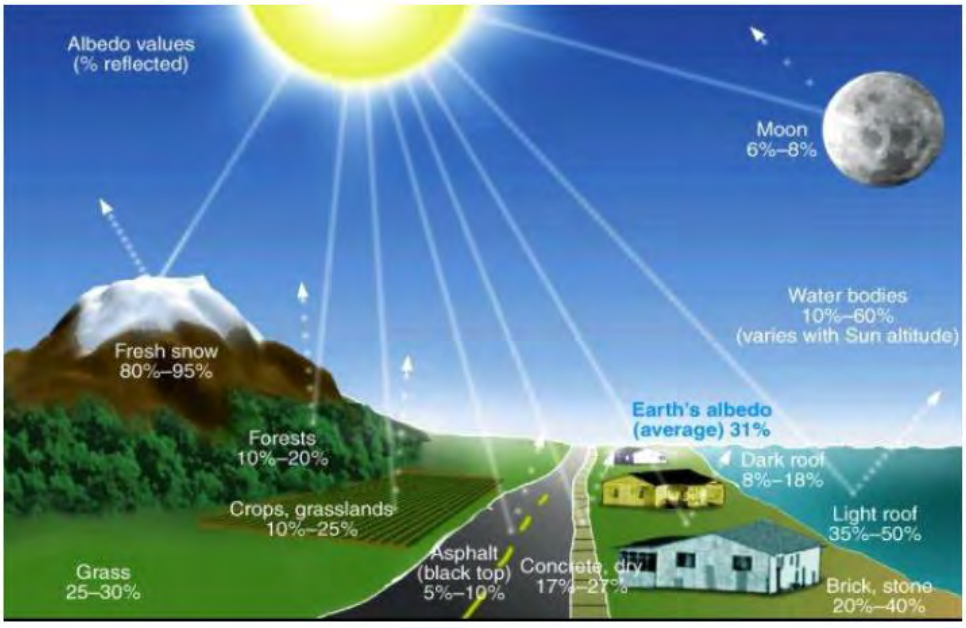

Figure 2.3: Energy from sunlight reflected on earth's surface