Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF SMART ELECTRICAL FENCE POWERED BY PV SOLAR WITH IOT MONITORING

MUHAMMAD ASHRAF BIN MOHD HASBI

Bachelor of Electrical Engineering Technology (Industrial Power) with Honours

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DEVELOPMENT OF SMART ELECTRICAL FENCE POWERED BY PV SOLAR WITH IOT MONITORING

MUHAMMAD ASHRAF BIN MOHD HASBI

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PROJEK SARJANA MUDA II

Tajuk Projek : DEVELOPMENT OF SMART ELECTRICAL FENCE POWERED BY PV SOLAR WITH IOT MONITORING

Sesi Pengajian : 2022/2023

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Alamat Tetap:

Lot 10452 Lorong Cempedak 1,
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13310 Tasek Gelugor
Pulau Pinang SPU

(COP DAN TANDATANGAN PENYELIA)

Ts. ASRI BIN DIN
Pensyarah Kanan
Jabatan Teknologi Elektrik dan Elektronik
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
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I declare that this project report entitled "DEVELOPMENT OF SMART ELECTRICAL FENCE POWERED BY PV SOLAR WITH IOT MONITORING" is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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Student Name : MUHAMMAD ASHRAF BIN MOHD HASBI

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APPROVAL

I approve that this Bachelor Degree Project 2 (PSM2) report entitled "DEVELOPMENT OF SMART ELECTRICAL FENCE POWERED BY PV SOLAR WITH IOT MONITORING" is sufficient for submission.

Signature :

Supervisor Name : Ts. Asri Bin Din

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APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electrical Engineering Technology (Industrial Power) with Honours.

Signature : ....

Supervisor Name : Ts. Asri Bin Din

Date : 3/2/2023

Signature : ....

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Date : ....

DEDICATION

This project is devoted to me as an engineering technology student, and it is the first of my projects that I am studying and attempting to accomplish. It is also grateful to my mother and father, who taught me that even the most difficult activity can be accomplished if completed one step at a time and with patience. Last but not least, I would like to express my heartfelt gratitude to my supervisor, Ts. Asri Bin Din as well as all my friends, for being my pillars of support throughout this journey.

ABSTRACT

There are a lot of conventional electrical fence nowadays. Hence this project was based on study of existing conventional electrical fence and intruder or wild animal that easily trespassing without any notification. This project was based on renewable energy technologies that would be main power sources. There are various types of energy in this world and solar energy is one of energy that reliable to used. In addition, to power up electrical fence and televisions and several other gadgets and appliances in the home and garden this can be one alternative for obtaining electricity by use this method. Furthermore, a panel facing the sun can collect more solar energy and use it to power the electrical fence and lamp. Then, one of the crucial problems is the pattern of energy consumption at each equipment or process. Therefore, it relates to the difficulty in power analysis especially in system operational efficiency and proactive maintenance. Animals in the fields may cause trouble to garden or farms. Therefore, the owner can defend their fields, farmhouses, and farmlands from animals by employing electric fences. The electrical shock that produce can make animals runaway and teach them to keep away from the fence. Thus, electric fences are a cost-effective and practical way to increase field production because the output of electric fencing is discrete and safe. Project goals is to develop systematic system for gardeners by using Esp32 with sensor and to analyse the efficiency of the notification system and solar battery charging. To address this issue the system is equipped with Blynk apps as a monitoring application. The Esp32 is used in this project as a microcontroller that connects to the sensor and the battery. The operation of the smart electrical fence has met it functionality and requirements. Finally, the result of analysis has shown the positive results with relate to the efficiency of IoT response time and the charging process.

ABSTRAK

Terdapat banyak pagar elektrik konvensional pada masa kini. Oleh itu projek ini adalah berdasarkan kajian terhadap pagar elektrik konvensional sedia ada dan penceroboh atau haiwan liar yang mudah menceroboh tanpa sebarang pemberitahuan. Projek ini berdasarkan teknologi tenaga boleh diperbaharui yang akan menjadi sumber kuasa utama. Terdapat pelbagai jenis tenaga di dunia ini dan tenaga solar adalah salah satu tenaga yang boleh dipercayai untuk digunakan. Di samping itu, untuk menghidupkan pagar elektrik dan televisyen dan beberapa gajet dan perkakas lain di rumah dan taman ini boleh menjadi salah satu alternatif untuk mendapatkan tenaga elektrik dengan menggunakan kaedah ini. Tambahan pula, panel yang menghadap matahari boleh mengumpul lebih banyak tenaga suria dan menggunakannya untuk menghidupkan pagar elektrik dan lampu. Kemudian, salah satu masalah penting ialah corak penggunaan tenaga pada setiap peralatan atau proses. Oleh itu, ia berkaitan dengan kesukaran dalam analisis kuasa terutamanya dalam kecekapan operasi sistem dan penyelenggaraan proaktif. Haiwan di ladang boleh menyebabkan masalah kepada kebun atau ladang. Oleh itu, pemilik boleh mempertahankan ladang, rumah ladang, dan tanah ladang mereka daripada haiwan dengan menggunakan pagar elektrik. Renjatan elektrik yang terhasil boleh membuatkan haiwan lari dan mengajar mereka menjauhi pagar. Oleh itu, pagar elektrik adalah cara yang kos efektif dan praktikal untuk meningkatkan pengeluaran lapangan kerana output pagar elektrik adalah diskret dan selamat. Matlamat projek adalah untuk membangunkan sistem sistematik untuk tukang kebun dengan menggunakan Esp32 dengan sensor dan untuk menganalisis kecekapan sistem pemberitahuan dan pengecasan bateri solar. Untuk menangani isu ini sistem dilengkapi dengan aplikasi Blynk sebagai aplikasi pemantauan. Esp32 digunakan dalam projek ini sebagai mikropengawal yang menyambung kepada sensor dan bateri. Operasi pagar elektrik pintar telah memenuhi fungsi dan keperluannya. Akhir sekali, hasil analisis telah menunjukkan keputusan positif berkaitan dengan kecekapan masa tindak balas IoT dan proses pengecasan.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Ts. Asri Bin Din for their precious guidance, words of wisdom and patient throughout this project.

I am also indebted to Universiti Teknikal Malaysia Melaka (UTeM) and my parents for the financial support throughout my four years of studies which enables me to accomplish the project. Not forgetting my fellow colleague for the willingness of sharing their thoughts and ideas regarding the project.

My highest appreciation goes to my parents and family members for their love and prayer during the period of my study. An honourable mention also goes to Ts. Asri Bin Din for all the motivation and understanding.

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G	-	Irradiance
C	-	Celcius
n	-	Solar Efficiency

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CHAPTER 1

INTRODUCTION

1.1 Background

Solar energy is an infinite source of energy that, if properly harnessed, will allow humanity to reduce its reliance on traditional energy sources. The goal of this project was to improve the efficiency of solar energy harvesting. A smart electrical fence is built using solar and Arduino. This project is powered by an Esp32 as a microcontroller, which manages the various functions of the project. A Solar Panel is used to collect solar energy. Furthermore, a panel facing the sun can collect more solar energy and use it to power the electrical fence and microcontroller.

1.2 Problem Statement

The pattern of energy consumption at each equipment or process is critical for power analysis for operational efficiency and proactive maintenance. In order to do so, some gardeners are unaware of renewable energy, and solar energy is one of the most efficient renewable energy sources. Second, this invention makes it easier for people to monitor and keep wild animals out of gardens, and gardeners who work away from home won't have to worry about their gardens because the voltage sensor would trigger it and and the advantage of IoT embedded in the system could send an indicator to informed the system owner.

1.3 Project Objective

This project's main goal is to propose a systematic and effective methodology for estimating this invention system with high security. The following are the specific objectives are as follows:

a) To generate solar renewable energy from pv solar.

b) To develop a systematic system for gardeners by using Esp32 as a microcontroller with sensor.

c) To analyze the efficiency of the monitoring system and solar battery charging.

1.4 Scope of Project

The scope of this project are as follows:

1. The target audience for this project is the gardener because of the viability and ease of gathering data, decided to limit the scope to the average place like garden and residential area.
2. This project was started with the intention of assisting and easing the consumer in determining which security level to increase. This typical project for any garden consists primarily of an electrical fence that runs nonstop for 24 hours. Therefore this project will duplicate the same method.
3. This project does not use conventional electricity because it uses solar energy, which is a renewable resource that can save money in the future. Furthermore, the electric fence can be monitored from a mobile phone using the Blynk app.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Everyone in today's modern society requires renewable energy efficiency. This invention makes it easier to monitor and keep wild animals out of gardens, and gardeners who work away from home won't have to worry about their gardens because our voltage sensor will trigger it and send us a warning message. Then, using Esp32 and Sensor, this project is aim want to generate solar renewable energy, develop a systematic system for gardeners, and use the energy consumed by solar to charge a battery.

The industries will benefit more if a smart electrical fence with a combination of solar and voltage sensor is designed. It has the potential to reduce the amount of electricity used by the machines and equipment in this project. It can also lead to financial gain for the gardeners. Three things are extremely important in this project: Solar panels provide renewable energy, while Esp32 provides voltage sensors and IoT, as well as an electric fence to keep wild animals at bay.

The solar panel will energize the solar charger controller, which will store current in the battery, as expected. The battery's current will then be used to power the electric fence. Finally, we had use an electric fence to keep wild animals out of the garden, which we had detect with a voltage sensor and can be monitored from Blynk apps.

2.2 Solar energy

There are many ways to use solar energy: heating, chemical processes, and electricity production are all examples. "Solar energy" relates to the energy released by the sun. With the brilliance of the sun, our present and future energy needs are dwarfed by it. If this widely spread resource is properly used, all future energy demands may be fulfilled. With its unlimited supply and low environmental effect, solar power is likely to become a prominent renewable source in the next century. Renewable energy sources like wind and solar power are more environmentally friendly than fossil fuels like oil and gas. In spite of the low amounts of light at Earth's surface, sunlight is the most abundant energy source for the planet. It is not uncommon for radiation emitted by the Sun to spread out across a broad area. Solar radiation is absorbed and diffused by the environment by clouds, resulting in just a little amount of extra losses. There are little quantities of uv and other types of electromagnetic radiation in sunlight that reaches the Earth's surface, but the visible light spectrum makes up the majority of the energy that hits our planet.

Solar energy has the most potential of all renewable energy sources because it has many advantages over other sources and it is also the most reliable energy in malaysia. Hence ,Solar energy is a free source of energy from the sun. It is a non-polluting, naturally accessible source that emits no GHGs or air pollutants. Solar energy is either directly harvested from the sun for heating or converted into electricity using a solar panel with solar cells mounted on it. Due to its proximity to the equator, Malaysia has a lot of potential for solar energy resources in comparison to other countries. As a result, Malaysia receives an abundance of natural solar radiation throughout the year [1].

2.2.1 Photovoltaic solar energy

Direct conversion of solar radiation to electricity is how photovoltaic energy from the sun is generated. Solar cells are most typically made with silicon owing to the availability of this material on our planet, its low contamination rate, its long-term durability, and the wealth of knowledge it has gained in the microelectronics sector. Despite the fact that a variety of methods have been developed and implemented, the most often used silicone panels are monocrystalline and polycrystalline. The cylinder monocrystalline silicon bars used to make crystalline silicon cell are roasted in a special furnace before being used to make monocrystalline silicon cells. Using a sharp knife, slice the bars into long, thin strips (300 mm thick). However, despite their high manufacturing costs, they have a conversion efficiency of 15% when converting solar light to energy. Using molds, silicon blocks are melted in order to create polycrystalline silicon cells. This process does not result in the formation of a single crystal. This solar panel's conversion efficiency when exposed to the sun is 13%. Solar radiation and cell temperature are the two most essential elements that affect the results of a photovoltaic panel. As the amount of cell insulation increases, so does the temperature within the cell, reducing module efficiency [2]. As shown in Figures 2.1 and 2.2, the intensity of solar radiation and the temperature differential impact the performance of photovoltaic panels.

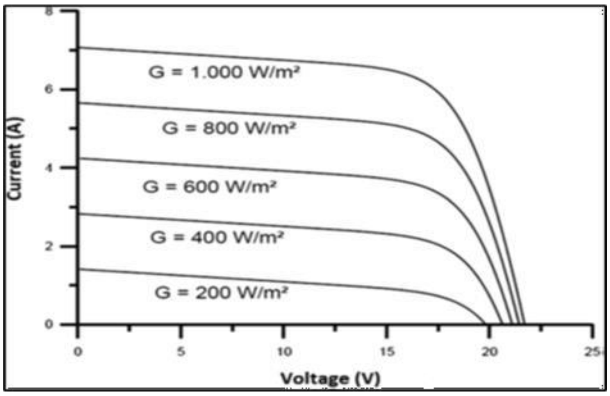

Figure 2.1 Variation in a PV system's characteristic curve due to changes in solar radiation has this effect.

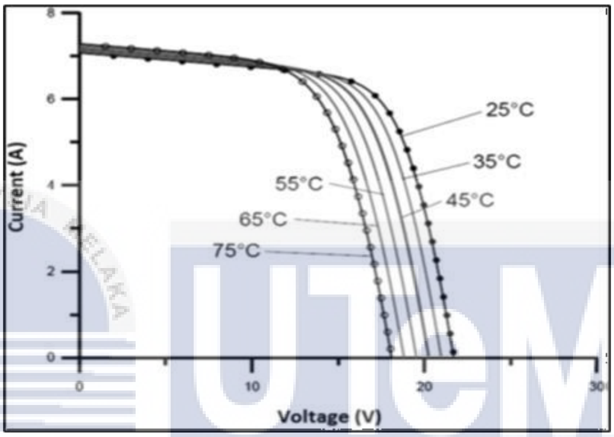

Figure 2.2 The curve of a Photovoltaic exhibits an effect induced by temperature.

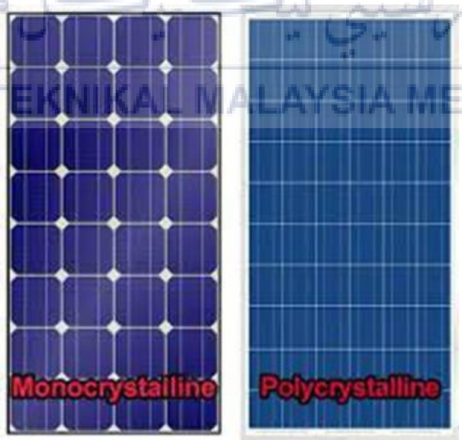

Figure 2.3 Example of Monocrystalline and polycrystalline photovoltaic panels.