VOLTAGE STABILITY ANALYSIS USING SOLAR PANEL ON ARDUINO-BASED PUBLIC STREET LIGHTING

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Abstract

It is difficult to anticipate the future demand for energy sources, especially the need for electricity. The conversion of different forms of energy into electricity is necessary for the production of electrical energy. The process of transforming one kind of energy into other forms of energy is converted. As stated in the concept of the law of conservation of energy, "energy cannot be generated nor destroyed; it can only be changed from one form to another," energy may be converted into various forms of energy, including electricity. We should begin using generators that are less harmful to the environment or use less fuel oil. Solar panels are among the most eco-friendly energy sources since they do not need fossil fuels and emit zero percent pollution. Indonesia is one nation that makes efficient use of solar panels since its geographical position on the equator means that the sun shines on its land for a comparatively long period compared to countries that do not cross the equator. Indonesia should be able to make use of its advantageous geographical position by constructing additional PLTS (solar power plants) or by installing solar panels in public spaces. Lamp Street is one of the public locations that use solar panels as a source of power. Solar panels in public street lighting take the form of a solar panel device that is directly linked to street lights and functions to store solar energy during the day and utilize it to illuminate the street at night. In this study, solar panels used for public street lighting serve as the focus of the investigation. The author wishes to know the efficacy of the use of solar panels in public street lighting, given the context stated. Therefore, the author chose the title Work use of solar panels for street lighting for this study.

***Keywords**: Energy, Solar Panels, Sun, PJU*

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Introduction

Throughout history, humanity have need energy as a source of life.Currently, the need for energy is growing. Its simple and efficient use may encourage individuals to migrate from fossil fuels to renewable energy sources.to transition from fossil fuels to renewable energy sources. Now, it cannot be disputed that renewable energy sources are being utilised in power supply systems. The renewable energy sources that are employed the most often are solar energy sources. It provides optimal scheduling features to CRM in order to improve the service optimality based on task and enhance the computational processes such as service load management, heterogeneous service delivery, pricing, resource pools and elasticity. The proposed system leverages high performance when compared to the existing models(Kumar et al., 2022).

A solar panel system (PV system) is a system whose primary energy source is solar energy. PV systems may be applied in several industries, including automobiles, buildings, street lights, and commonplace electrical items.Electronic gadgets that are often used in daily life. The component responsible for energy conversion is the solar panel. The battery is the storage medium for the voltage charge. A DC/DC converter serves as a power utilization step in the system to be processed. This can happen from planning, constructing, using, and maintaining(Munawaroh et al., 2022).

General illumination with electrical power As a source of lighting power, solar is a cheap and inexpensive choice since it employs solar energy, a source of free and endless energy from the sun(Sarı, 2022). Solar Street Lights (Solar Powered PJU) can be used in a variety of locations, such as public roads, park lights, campus areas, residential areas, gas station areas, factory areas, tourist areas lighting lamps docks, parking area lights, street lights isolated highway, country street lamp, lamp sports field, mountain area, beach area, and bus stop, among others(Mankotia, 2022).

This system is meant to provide general illumination using renewable energy sources, with minimal maintenance costs and long economic life(Zhu, 2022). With a quick and simple installation mechanism, PJU Solar LEDs might be the ideal answer for swiftly addressing the requirement for road illumination(Guven, 2022).

Research methods

Public Street Lighting (PJU) refers to the block design shown in Figure 1 for device planning and production of hard battery charge and LED light as a light source for load demands(Sugiyono, 2012).

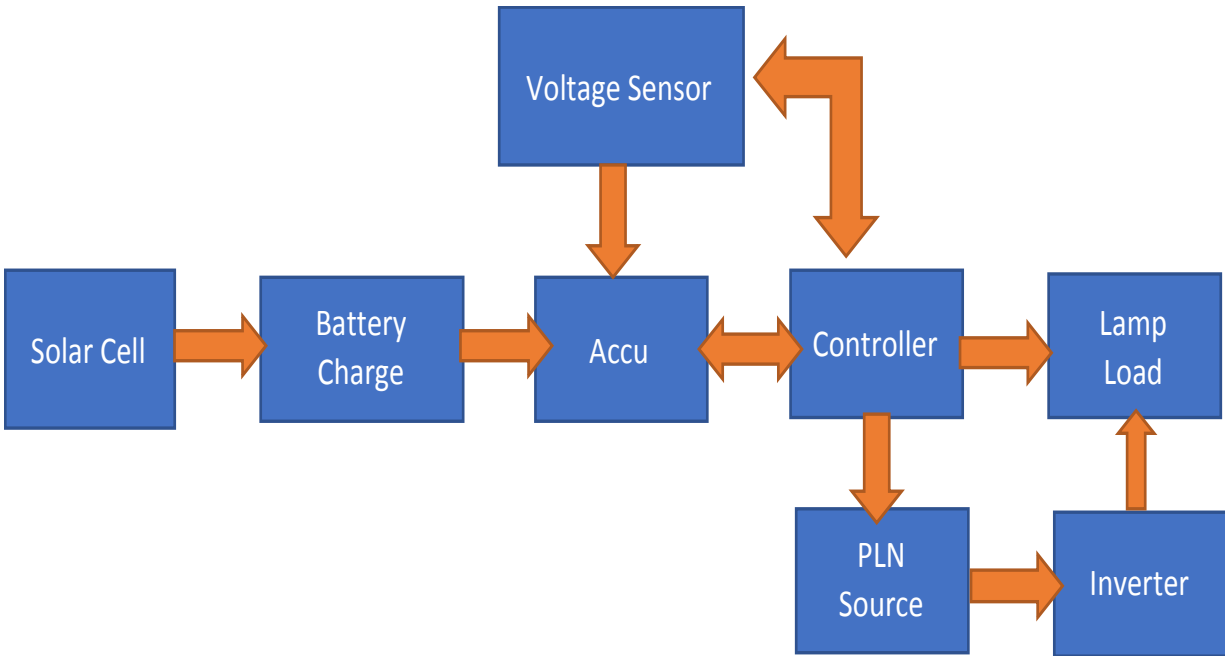

Figure 1. Block Diagram of the Solar Cell Lighting System

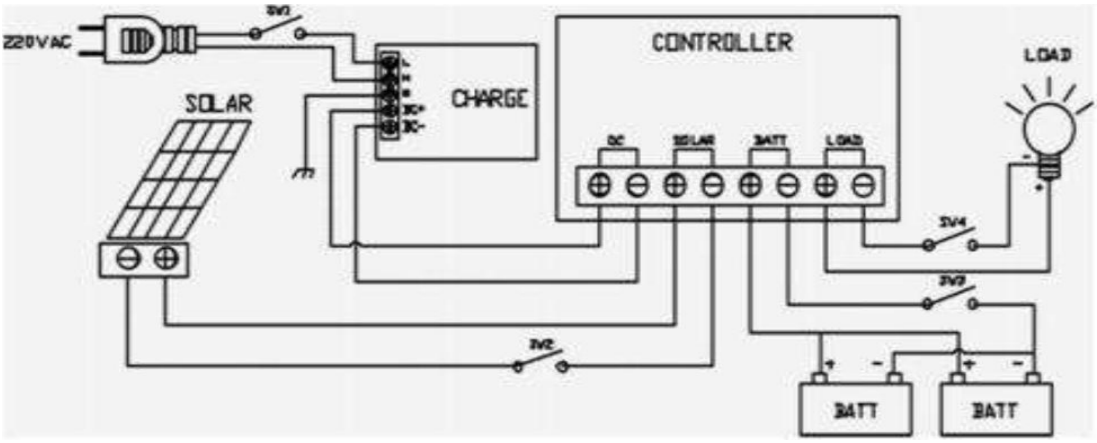

Figure 2.Installation circuit

Figure 2 depicts a solar cell-powered lighting installation circuit.

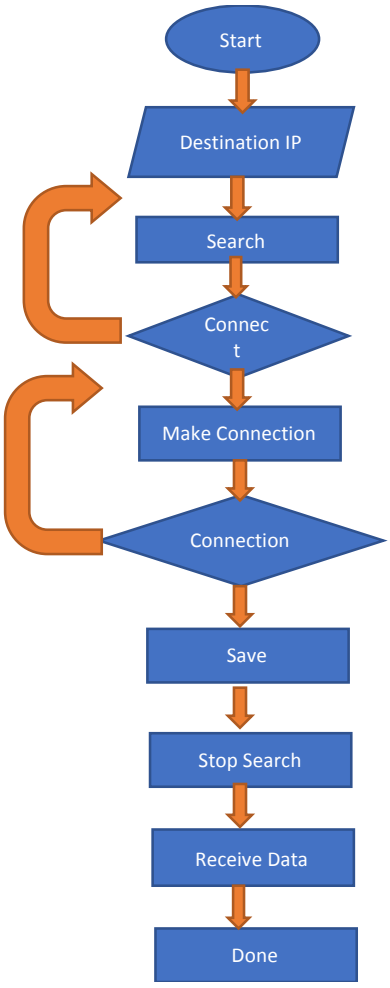

Figure 3. Circuit Flowchart

Results and Discussion

Mikrokontroler Arduino Uno

Arduino is an ATmega328-based microcontroller board. Figure 4 depicts the components of Arduino Uno(Essiane, 2022).

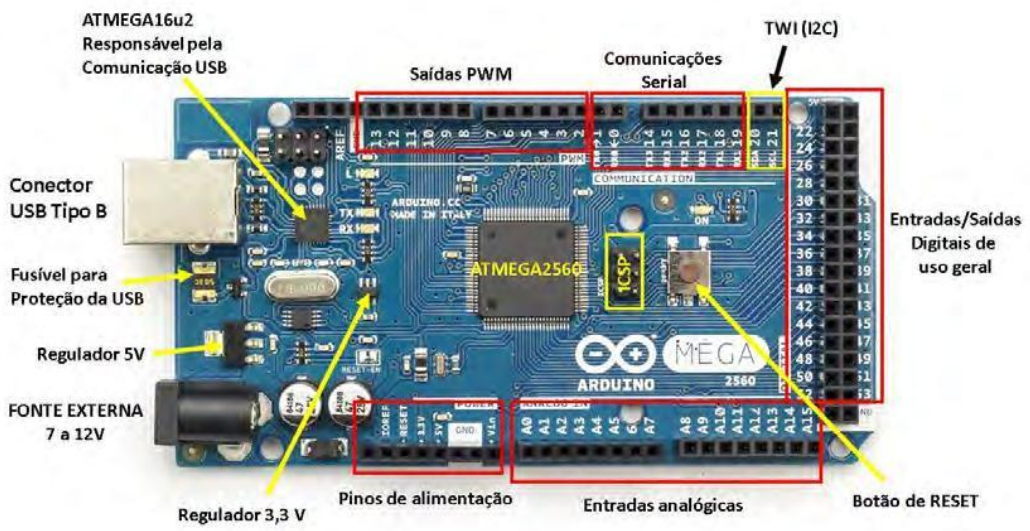

Figure 4.Depicts Arduino Uno and Its Components

Solar Cell

Solar Street Lighting is a low-cost and cost-effective alternative to conventional lighting since it employs solar energy, which is a renewable and free source of energy(Arulananth, 2022). The findings indicated that beach visitors' perceptions of parking problemsdid not match the actual parking availability(Andiyan & Cardiah, 2021).

Solar Street Lights (Solar Powered PJU) using Solar Modules/Panels with a 25-year lifespan receive the sun's light, which is then turned into power through the photovoltaic process(Guven, 2022). This light may automatically come on in the afternoon and turn out in the morning, requiring no maintenance and lasting for many years(Kaidi, 2022). Meanwhile, in minimizing and handling greenhouse gas emissions, the highest weight is found in the amount of fuel used in Fresh Fruit Bunch (FFB) shipments of 54.07%(Rosyidah, Khoirunnisa, et al., 2022).

Solar Street Lighting employs Very brilliant, energy-efficient, and long-lasting LED light(Mohammed, 2022). Photovoltaics is a kind of technology that converts solar radiation directly into electricity(Garcia, 2022). In addition, because the drilling process is carried out using generator power, it causes air pollution that can interfere with the respiratory system (respiratory inorganics)(Rosyidah, Andiyan, et al., 2022).

Figure 5. Solar LPJU

Advantages of Street Lighting Solar Power; (1) Bright and durable; (2) Energy saving; (3) Environmentally friendly; (4) Pollution-free; (5) Fast and easy to installation; (6) Save maintenance costs; (7) Long lifetime (LED light up to 11 years & solar panels up to 25 years); (8) Suitable for installation in any location; (9) Available with power from lamp with 15w (950Lm) -168w. power (14,558 Lm).

Module Ethernet Shield

Ethernet Shield is a Wiznet W5100-based connection between an Arduino board and a computer(Nayak, 2022).The ethernet library is used to develop programs that link the Arduino board to a network. There is a micro-SD slot on the ethernet shield for storing files that can be accessed via the network. The microSD card reader is available via the SD library(Taleb, 2022).

Ethernet Shield functions to allow Arduino and PC to connect to the internet through IP service. Connect the Arduino Ethernet Shield to the Arduino board, and it will then be linked to the internet network(Chen, 2022). Simply plug this module into the Arduino board and connect it to the network using an RJ-45 connection, and the Arduino will be linked straight to the internet. And to utilize it, we must naturally configure the IP address on the internet module and computer so that they may communicate. The module of the Ethernet Shield is seen in Figure 5(Bouzguenda, 2022).

Figure 5.Ethernet Shield Module.

Battery Charger

The function of the Battery Charger is to charge the battery with a steady current up to the set voltage(Kurniawan, 2022). When the required voltage is attained, the charging current will automatically decrease. The objective of this study was to determine the determinants between Community-

to the exact safe level that has been selected and maintains the charging current until it slows down, so that the indicator light illuminates, signaling the battery is completely charged(Singh, 2022).regulator of voltage in the battery circuit This charger is an LM350 Regulator.

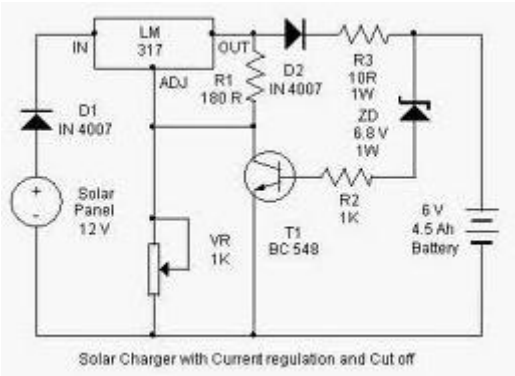

Figure 6. Battery Regulator Circuit

Software Arduino

Arduino IDE (Integrated Development Environment) is the software used to program Arduino boards; in other words, Arduino IDE serves as a programming environment for Arduino boards(Samuda, 2022).

Arduino IDE is a handy text editor for creating, editing, and validating computer code. It is also capable of uploading to the Arduino board. Arduino "sketch" or source code Arduino, with theno source code file extension refers to the program code that is utilized with the platform.

The programming language JAVA is used to create the Arduino IDE. Wiring, a C/C++ package included with the Arduino IDE, makes input and output operations moresimple. Arduino IDE is derived from processing software that has been redesigned particularly for Arduino programming.

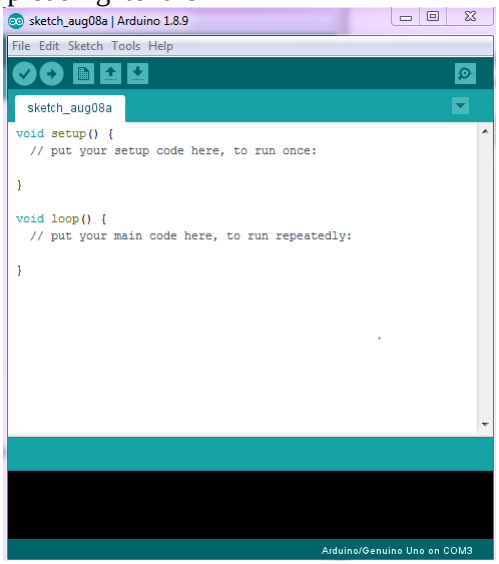

Figure 7. Arduino software initial screen

Conclusion

Solar panels in public street lighting take the form of a solar panel device that is directly linked to street lights and functions to store solar energy during the day and utilize it to illuminate the street at night. In this study, solar panels used for public street lighting serve as the focus of the investigation. The author wishes to know the efficacy of the use of solar panels in public street lighting, given the context stated.Therefore, the author chose the title work use of solar panels for street lighting for this study.

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