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Switching Home Energy with IoT-Powered Solar

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Abstract: Technology has improved and continues to evolve. Various technologies have been created to make daily human life easier while maintaining comfort and almost all technologies have been developed requiring electrical power. With the new norm following Covid-19, many Malaysians now spend a lot of time at home. If someone is ever about to install solar panels in a home, now is the best time to do so. One can save on electricity bills while potentially earning a side income. Therefore, the installation of a solar system for a home is highly recommended. This solar system should be developed using IoT developments that are so popular nowadays. The development of IoT (Internet of Things) technology today will help solve this problem, not only making it easier for users to organize their solar systems, but also allowing them to track electricity consumption for electrical goods. house. One of the systems based on IoT principles is the introduction of home automation systems. Home automation allows you to access your home control system from anywhere in the world from a mobile device. The project presents the design and implementation of the Arduino Uno with the ESP8266 Wi-Fi module, and 5V relay and is based on the IoT concept. The system can be connected to a home electrical system so that users can control and monitor their system using their internet devices anywhere and anytime through the platform Blynk. The system is also equipped with several sensors for control unit input that allow users to operate the switch in a variety of ways, either online or by manual switches.

Keywords: Solar Technology, Smart Home Switching, IoT

1. Introduction

In recent times the most flexible, unsubstituted source of energy is electrical energy [1]. Electricity is one of the greatest gifts that science has bestowed on mankind. For all nation-building activities, it has been a critical resource that keeps the wheels of the countries in progress and economic prospers [1]. It has become part of modern life and without it, one cannot imagine how the world goes on.

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Electricity is generated at power plants and moves through a complex system, sometimes called the grid, of electricity substations, transformers, and power lines that connect electricity producers and consumers [2].

However, the whole world is leaping towards the use of renewable energy, as fossil fuels are slowly disappearing from the face of the earth. It projects to the scenario, 15 years from now, where the whole world could get easily drawn into an all-out conflict over the last remaining stains of non-renewable energy. The easiest way to solve this is, by the use of renewable energy. The best and most abundant renewable energy source is the ever-shining sun. Solar energy is considered to be the best source of renewable energy since the beginning of its use in 1876 [3]. Solar energy technologies are largely concerned with the practical application of solar radiation. Other than geothermal, all other renewable energies rely on solar energy for their energy. Depending on how they capture, process, and disperse sunlight, solar technologies are classified as either passive solar or active solar. Photovoltaic modules (also known as photovoltaic panels) and solar thermal collectors (with electrical or mechanical equipment) are two active solar systems that transform sunlight into useful outputs. Orienting a structure to the Sun, selecting materials with favorable thermal mass or light dispersion properties, and designing rooms that naturally circulate air are all examples of passive solar approaches. Passive solar technologies lessen the need for alternative resources and are generally regarded as demand-side technology. Active solar technologies improve the supply of energy and are considered supply-side technologies.

2. Materials and Methods

The process of finishing the IoT integration on this project is covered in this chapter. Before any action is done on the Switching Home Energy with IoT-Powered Solar project, a suitable strategy was established to guarantee that the project can be completed and executed successfully. Users may utilize IoT systems to switch energy between solar energy and local authority supply. This project's process included a breakdown of which step must be completed first and which would require more time to complete. Will go into further detail about the project's designation, workflow system, and testing of the project's components. The control system's flowchart is displayed in Figures 1 below.

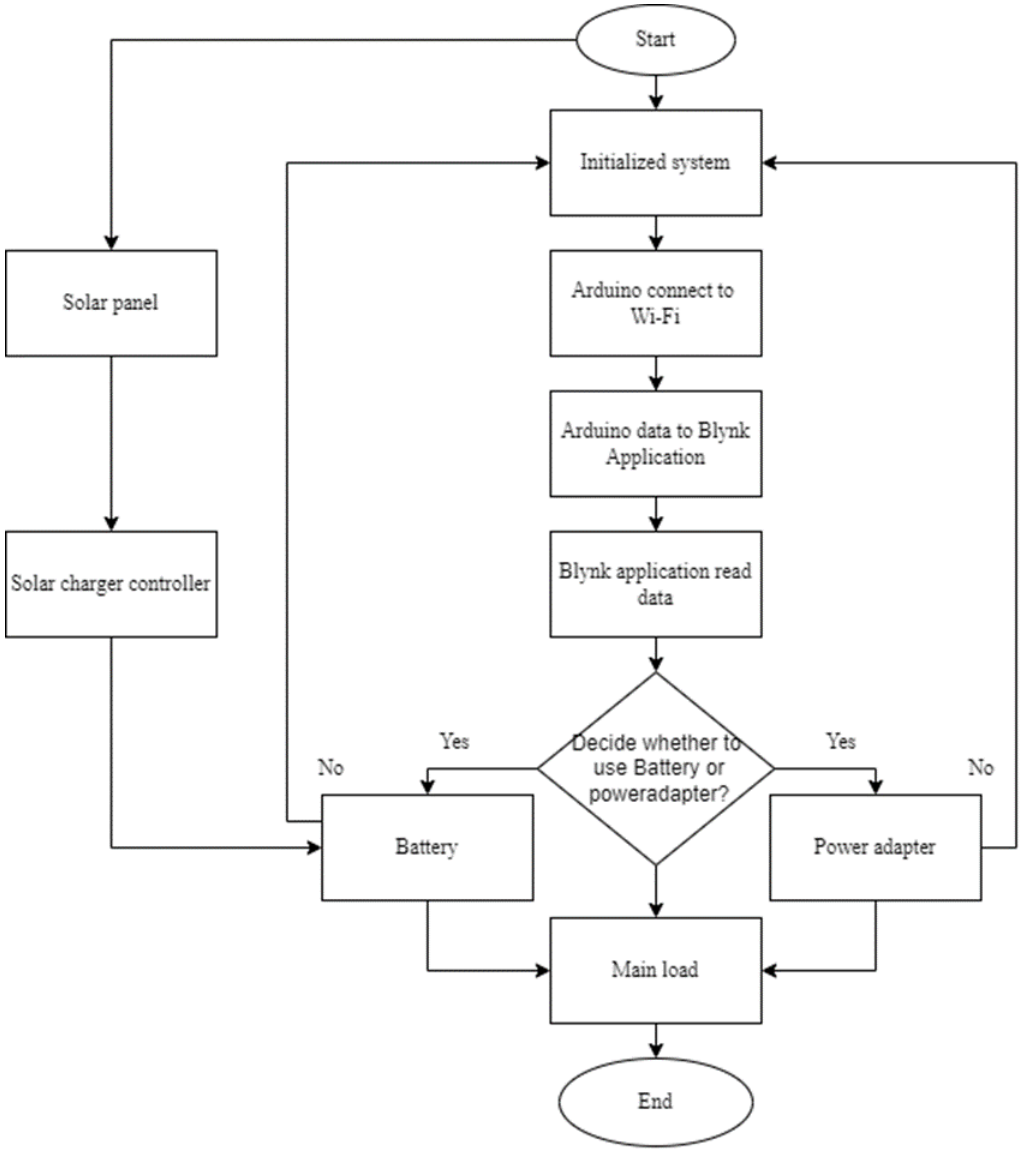

Figure 1: Flowchart of control system

The part which was the control system, began to operate when the IoT Nodemcu ESP8266 module connected to the Wi-Fi through the internet which allows the interface between the Blynk platform. The initiation of the system will go through the same flow as the power solar system since this project was based on the Internet of Things. In this flow, are possible to control the switch, by using a relay and also by the Blynk widget. Thus the scope of this project is:

1. This research paper proposes an IoT-based approach for solar power that allows the users to control solar energy by using a mobile phone. This project focused on the switching system and control system for the control of two energy.
2. This system is capable of the user switching whether to use energy from an electric supply from TNB or solar panel.
3. Polycrystalline type solar panel 5W is used in this project.
4. Nodemcu ESP8266 wifi module was used as the main part of the components which acts as a microcontroller to read the inputs for the control system as the implementation of IoT for the switch two energy.

5. A switch or the widget button in the Blynk program may be used to manually or electronically regulate the load switching.

2.1 Block Diagram of Project

This system can be divided into several parts which are input, controller, and output. The input part consists of a solar panel while the output part consists of a 1 channel 5 V relay and electrical load such as a lamp. There is one microcontroller used in this system, which is the Nodemcu ESP8266 Wi-Fi module as the main microcontroller and provides the system with network access and smartphone connectivity. The 1 channel 5 V relay module was placed between the load that is the lamp and the microcontroller(Nodemcu ESP8266 Wi-Fi module) used for controlling the electronic component. Blynk application is used as the platform of IoT to control hardware remotely.

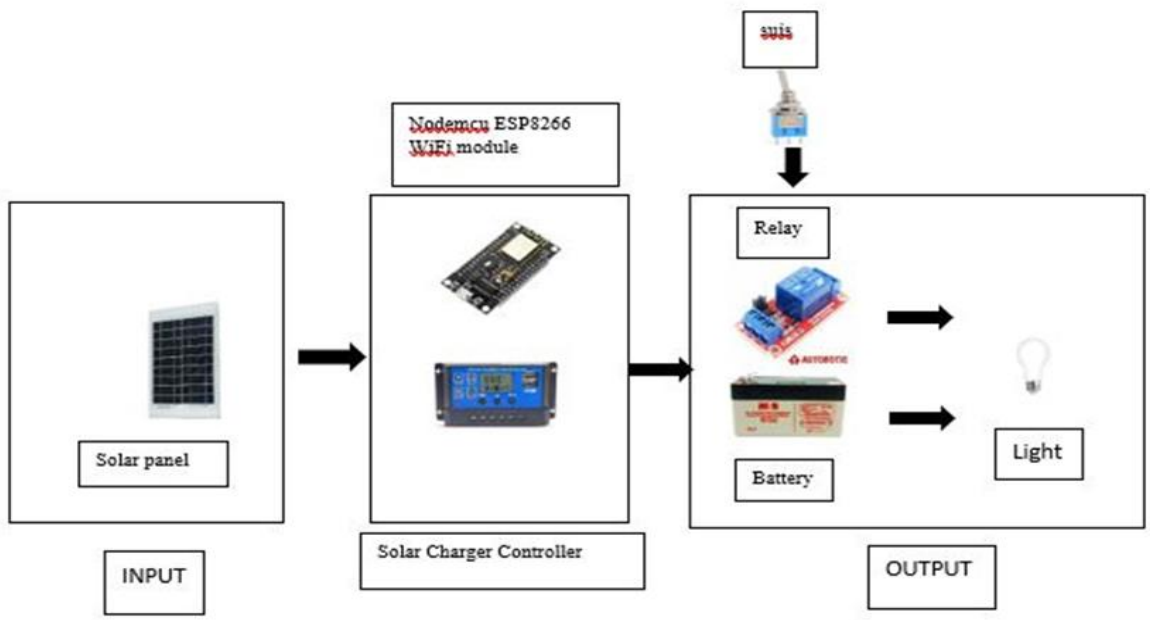

Figure 2: Block diagram of the project

2.3 Schematic Diagram

The schematic diagram, which shows all of the connections between electronic components, demonstrates the circuits' exact working and desired results. The circuit's essential components are shown in the block diagram, starting with the Nodemcu ESP8266 microcontroller. Nodemcu ESP8266 is to the 1 channel 5 V relay to control the circuit. The battery and a 5 W solar panel are connected to the solar charger controller. The schematic diagram of the project's system is shown in Figures 3 below.

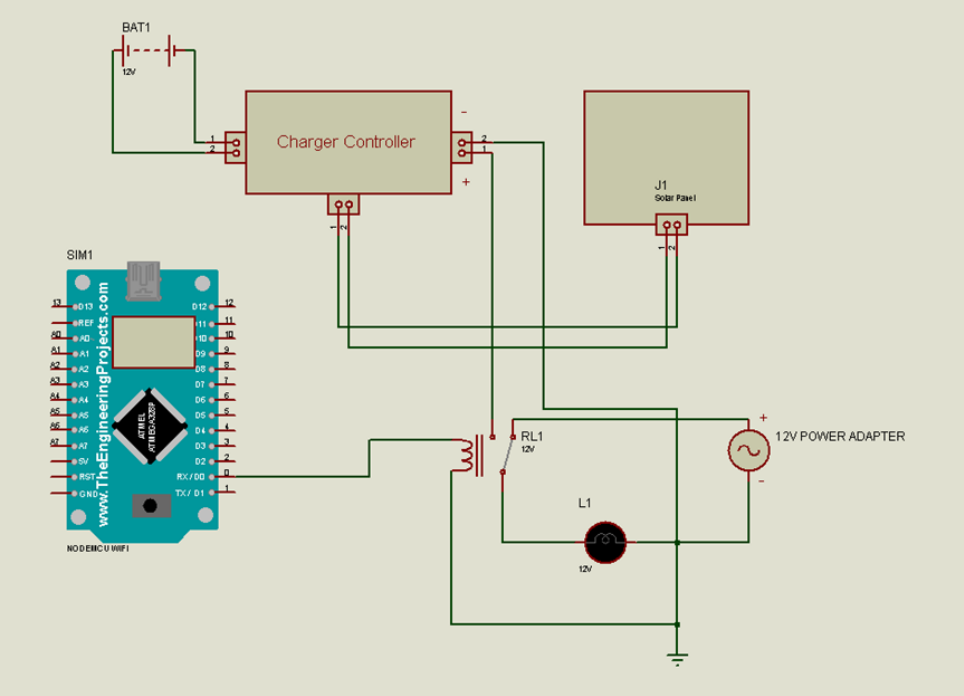

Figure 3: Schematic Diagram of The Project's System

3. Results and Discussion

3.1 Hardware/Prototype Implementation

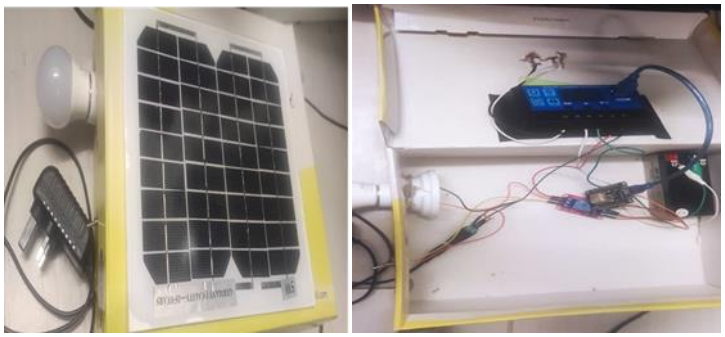

Figure 4: Exterior and interior for the hardware implementation

After the process of system designation, testing functionality for each component used, and troubleshooting successfully, the project continued with the development of a complete prototype to see how the whole system functions. The development of this hardware began with the installation of the component that we use, a manual load control switch, and also a wire connection that completes this circuit. After that, the implementation continues with the installation of electronic components such as ESP8266 Nodemcu v3, 1channel 5 V relay, and so on. Figure 4 shows the project's hardware execution for the exterior and interior of the hardware.

3.2 Results of control system

Figure 5: The electrical load in plug mode before 'on' the switch

The following results demonstrated the implementation of the control system in this project. As stated previously, housing electrical load can be performed in two different ways which are manual and online. The following Figure 5 indicates that the power load was manually operated.

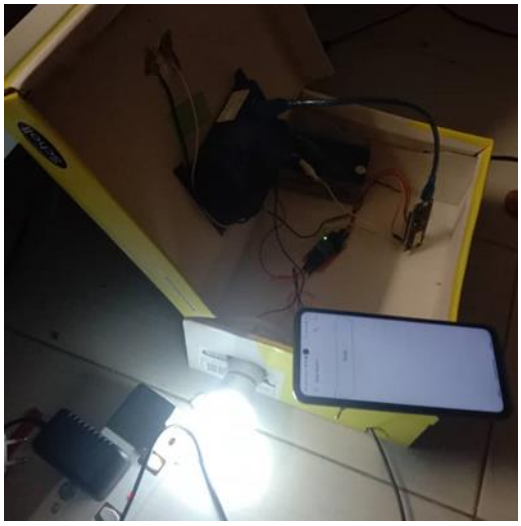

Figure 6: The electrical load in plug mode after the switch

When the device is in plug mode it can use manual and online to 'on' the light. Figure 6 shows plug mode after 'on' the switch.

Figure 7: Battery mode in 'on' condition

While when want to exchange mode to the battery mode, just click the plug display and control the device by clicking the display on the Blynk. Figures 7 show the load was 'on' in the battery mode.

4. Conclusion

In conclusion, the Switching Home Energy With IoT-Powered Solar project has been completed successfully through PSM1 and PSM 2. This project can be a solution to the energy consumption crisis nowadays. Knowing the amount of energy used every day makes consumers more aware and more interested in solar energy and becomes one of the ways to decrease the consumption of electricity. In other words, the project will indirectly decrease electricity bills.

Acknowledgment

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