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Floating Backup Supply Using Solar

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Abstract: Nowadays, floods often happen in Malaysia everywhere. Areas that are often affected by floods such as states on the east coast will flood once a year. The state is an area that is difficult to avoid this problem of flooding. If there is a flood in many areas, electricity will be cut off from the main electricity supply. Therefore, it will be difficult for flood victims to get help. Thus, this floating, solar-powered emergency power supply was created. This energy supply will receive energy supply through solar which is from the reflection of light. The received solar energy will store its energy in the battery and will be used for the phone to get help. In addition, this energy supply can also be used for lighting purposes. A lamp that uses a USB adapter can be used to provide light to users to protect themselves from darkness.

Keywords: Arduino Uno, Solar Panel, Boost Converter, Charging Station, Flood

1. Introduction

Solar energy is one of the renewable energy sources that is increasingly appealing to consumers today. It is a type of energy available to humans on this planet. Unfortunately, so many people aware about this but not too many uses it and implement in their life. However, as new technology emerges, people are becoming more high-tech as more solar technology designs are created. People are curious about the capabilities of this energy. This energy's most significant constraint is the cost of installing a solar system is most likely.

A floating solar power plant is an innovative approach to using photovoltaic modules on water surface to conserve the land along with an increase in efficiency of the module. Additionally, the water is also conserved due to reduction in evaporation of water from the water body. The plant can be installed on a pond, lake, reservoir, or on any other water body [1]. When this plant is installed on water, people get more space for the land and that can do for any other thing. Solar energy can be utilized for power generation in numerous ways. One of the barriers in harnessing solar energy is large land requirement. This problem can be addressed by using Floating Photovoltaic (FPV) system. FPV system is an innovative and new approach of installing PV modules on water surface. By installing FPV system, can maximize the usage of this solar energy and minimize the use of land [2].

The availability of solar resource and potential of it so enormous, besides just human need fully used of it and not making it in vain [3]. As a result, alternative energy sources that can create clean,

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green, and economical power are needed to fulfil the ever-increasing energy demand. To minimize greenhouse gas emissions and global warming, economically feasible measures must be implemented. [4].

2. Methodology

The part consists of a description of the methodology of this project in appropriate and systematic manners. The methodology proposed in this study is purposely done to achieve the objectives of the project. The work flow and detailed explanations of the model and system model used in this study are also included.

2.1 Operation of the System

This part explained all the requirements and procedures to complete the project. Secondly, the flow chart is displayed to provide a general understanding of the flow of the project. In addition, the simulation of MPPT controller photovoltaic system to be used in this study has also been stated in this section.

2.2 Flowchart

Figure 1 shows the proposed system of the project, to complete this project firstly, need to construct the circuit system to the simulation of Proteus. Make sure to get the output on in needed. Then, can design and construct the prototype to observe the output with 5 volts.

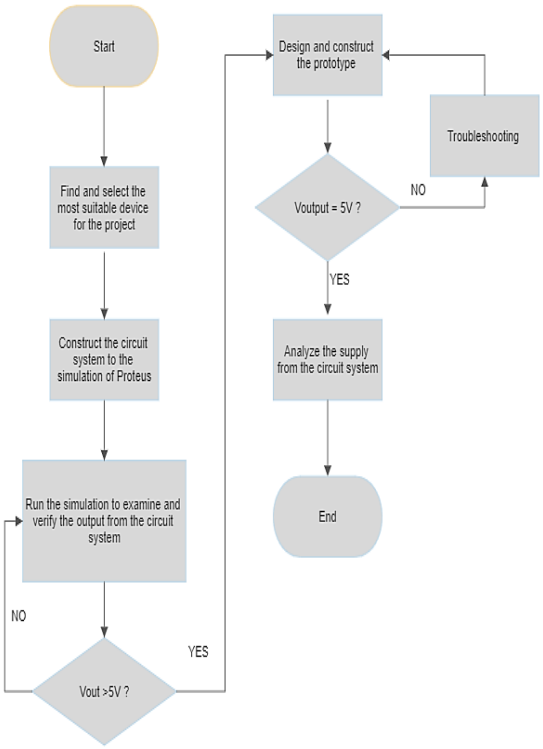

Figure 1: System Flowchart

2.3 System Block Diagram

The project hardware will be carried out according to the block diagram as shown in Figure 2. Literature review will be done and data information of voltage and current will be analyzed. Next, MPPT controller of photovoltaic system will be applied in the simulation system in Proteus Simulink.

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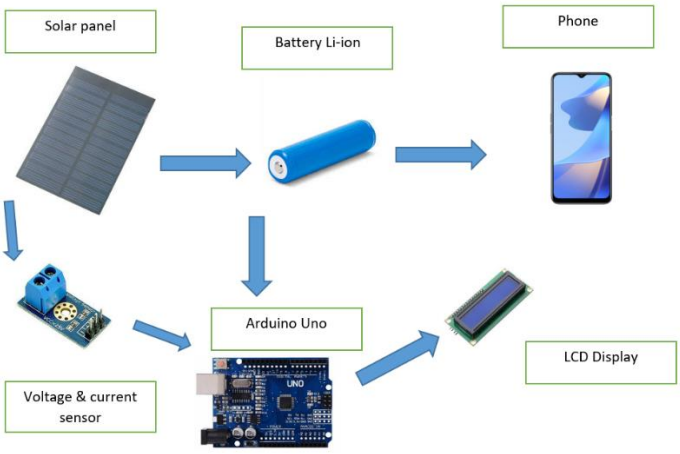

Figure 2: Block Diagram of Design Project

Figure 2 shows the block diagram of the design project. Firstly, solar panel will absorb the heat from the sun and produce the voltage and current to charge the battery. Besides, from solar panel also will flow to voltage and current sensor and go to Arduino, then will transmit the voltage and current to LCD display. From the battery then it will making an output to charging the phone.

2.4 Circuit Design

Proteus is a comprehensive development platform that takes the product concept to design completion. Intelligent principle layout, hybrid circuit simulation and accurate analysis, single-chip software debugging, single-chip and peripheral circuit co-simulation, and PCB automatic layout and wiring are some of its benefits. Figure 3 is simulation circuit of MPPT controller system by using the Proteus Simulink.

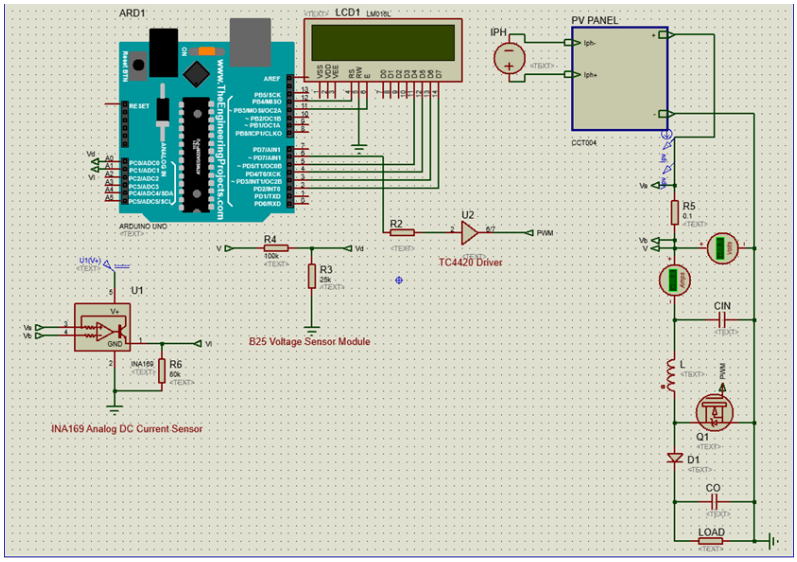

Figure 3: The Simulation Circuit of Backup Supply

Figure 3 shows the simulation of the project. From the simulation, circuit has been construct to make a charging system and power by solar. Then the voltage and current input will be monitor in the LCD Display.

3. Results and Discussion

This particular chapter will portray the results of the analogue analysis of MPPT controller photovoltaic system in irradiance variation and stable irradiance. Besides, it is also portray the result of PV panel model sub circuit.

3.1 MPPT controller photovoltaic system in irradiance variation

Figure 4 is an analogue analysis that the panel photovoltaic when receiving the input from the irradiance variation. For this simulation, the irradiance is not stable, so, at the beginning, the input voltage is at 20 volt and the last at 10 volt.

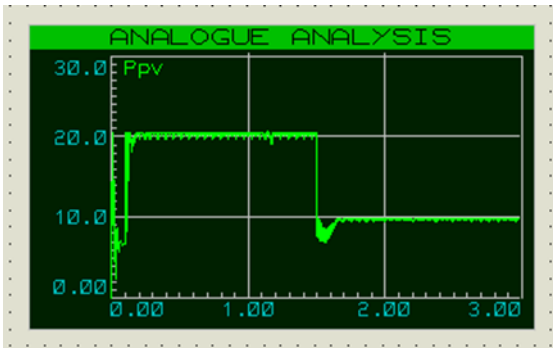

Figure 4: MPPT controller photovoltaic system in irradiance variation.

Figure 5 is an analogue analysis that the panel photovoltaic when receiving the input from the stable irradiance. For this simulation the irradiance is stable, so at the beginning to the last second, the input voltage is constant at 20 volt.

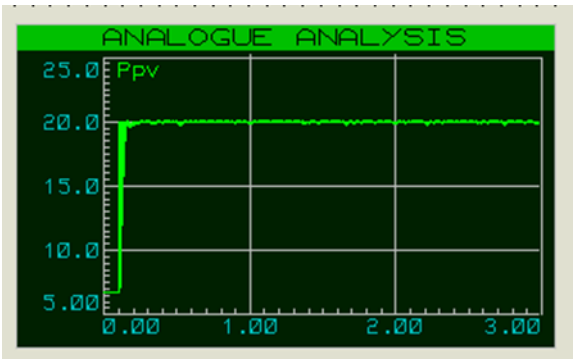

Figure 5: MPPT controller photovoltaic system in stable irradiance.

3.3 Result obtained from solar

In this section, voltage and current have been measured from 9 am to 5 pm every hour to observe the input from the photovoltaic that will supply to load. After that, from the load it will be making an output for 5V to charge the phone. Table 1 shows the voltage measured with time.

Table 1 shows the voltage input that comes from the solar panel. The peak hour at 2 pm get the highest voltage input because that when the sun rise. From 9 am to 1 pm the voltage slightly increases followed by the sun rise that start to rising. Starting 3 pm to 5 pm when the sun starts to goes down the voltage also slightly decreasing every hour.

Table 1: Average Voltage Measured During Every Hour

Time	Average Voltage (V)
9 am	2.89
10 am	3.33
11 am	3.96
12 am	4.01
1 pm	4.43
2 pm	4.87
3 pm	4.57
4 pm	3.99
5 pm	3.01

Figure 6 shows the voltage input that comes from the solar panel. The peak hour at 2 pm gets the highest voltage input because that is when the sun rises. From 9 am to 1 pm the voltage slightly increases followed by the sun rise that starts to rise. Starting from 3 pm to 5 pm when the sun starts to go down the voltage also slightly decreases every hour.

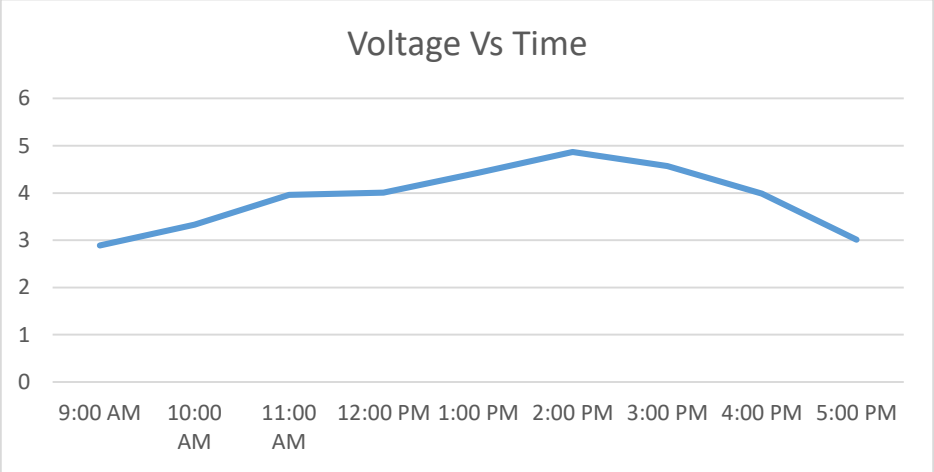

Figure 6: Voltage taken every hour vs time.

3.4 Output Result

In the section shows the output result of 5V that required to charge the phone. The output is coming from the battery after being boost to 5V. The battery that will get charge from the solar panel will make an output to the load with is to charge phone.

Figure 7 shows that the voltage output gets to 5V. This voltage is very reliable to charge the phone and small appliances.

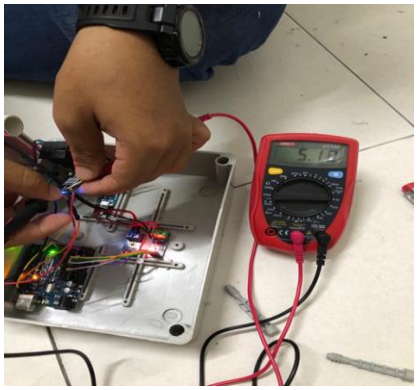

Figure 7: Voltage output

3.5 Phone Charge

In this section shows that output 5V is very reliable to charge the phone as shown in Figure 8. After the system running smoothly and the output get to 5V it can operate the circuit to supply the power to charge the phone and power on the small appliances.

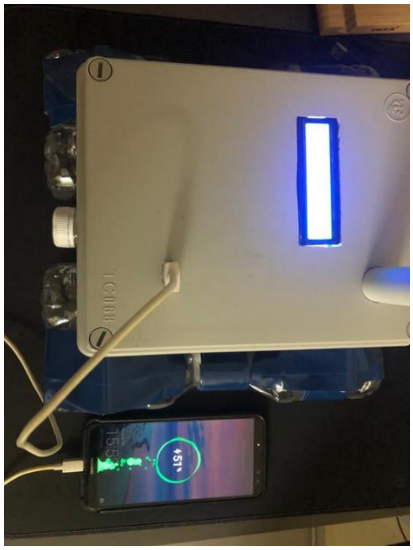

Figure 8: Phone charge

3.6 Floating Backup Supply Using Solar Prototype

In this section shows the prototype that will floating on the water. When the flood comes this prototype also can be floated on the flood as proven in Figure 9.

Figure 9: Floating backup supply using solar.

4. Conclusion

Overall, in this research, the target of the research as well as the actual outcomes and discoveries are discussed and analyzed. It is to analyses the output voltage from the solar panel to give supply and charging the battery. The objective of this project to construct and simulate the solar panel power plant, to develop a prototype of a floating backup supply, to analyses the system for the user to supply power for phone charging and emergency lamp. In view of this, construct and simulate the simulation has been carried out. Then, develop the prototype of a floating backup supply and make sure the prototype can be float on water. Lastly, analyses the output of the system to make sure the output will reach 5 volt to charge the phone.

Acknowledgement

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