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APPLICATION SOLAR CELLS ON HELMES AS A HANDPHONE BATTERY CHARGER

Muhammad Amin[1*], Ricki Ananda[1]
[1]Sistem Komputer, Sekolah Tinggi Manajemen Informatika Dan Komputer Royal, Indonesia

Corresponding author:
stmikroyal13@gmail.com

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ABSTRACT

To simplify cell phone charging. This solar panel-based cellphone charger is an electric energy charger for cellphone batteries that use solar panels as a tool to produce electrical energy. Solar panel-based cellphone chargers enable cellphone users to always carry cellphones when traveling in places where the availability of electricity is limited so that users can comfortably carry cellphones. The absence of an automatic circuit breaker while charging the mobile phone can cause overcharging on the mobile battery. Overcharging causes changes in energy from electrical energy to heat energy. The heat that occurs in the handphone battery causes the cell performance in the battery to be disrupted, so the battery can be easily damaged, then in this tool is given a button for charging per the time specified by the charger using the solar panel, so that the electrical energy stored in handphone battery can be maximal.

INTRODUCTION

Solar energy is one of the energies that is being actively developed at this time. This energy is one of the alternative electricity generations that is very good for the present and the future. The tool for converting solar energy into electrical energy is solar panels. Solar panels are collections of solar cells that are electrically connected and collected in a structured device. Solar cells can convert light energy into electrical energy. Solar cells are made of very small pieces of silicon coated with special chemicals to form the basis of solar cells. Solar cells generally have a minimum thickness of 0.3 mm made from sliced semiconductor material with positive and negative poles. Each solar cell usually produces a voltage of 0.5 V. Solar cells are active elements (semiconductors) that utilize the photovoltaic effect to convert solar energy into electricity. Solar panels have been widely applied to replace the electricity supply from PLN, such as installation at the roof of the house, street lights, up to the driving of electricity [1].

In this study will apply a 1-watt solar panel to a helmet that is often used by online motorcycle taxi, so that the solar panel can help the performance of online motorcycle taxi users to charge their cellphones without having to recharge the

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cellphone supplied by PLN or use power bank which sometimes runs out and must be filled by using power from PLN.

METHODE

Pushbutton

By the name of the function, the push-button switch is used to disconnect and connect the flow of electricity by pressing the button. At the top there is a knob that functions as a pressure area (red), then beside the left and right terminals, normally open (NO) and normally close (NC) contacts function as wiring terminals to be connected to other electrical devices, then have a load capacity around 5 A [2].

Battery

The 3rd generation battery from a rechargeable battery has a lightweight and size. In the design of this thesis used a Lithium-Ion 3.7 battery type [1].

Solar Module

A photovoltaic cell is a semiconductor device that has a wide surface, consisting of a series of diodes P and N. Sunlight (light) that hits the solar cell produces electrons with positive charges and negatively charged holes, then electrons and holes flow to form direct current, electrons will leave the solar cell and flow in the outer circuit so that this principle of electrical current arises called photoelectric [3].

USB Bost 5V

USB is designed to standardize computer peripheral connections (including keyboards, mice, digital cameras, printers, portable media players, disk drives, and network adapters) to computers, both for communication and for supplying electrical power. USB has become a standard for other devices such as smartphones, PDAs, and video games. USB has proven to be effective in replacing old interfaces, such as parallel ports, as well as chargers for portable devices [4].

Relay

Relay an electronic switch that can open or close a circuit by using controls from another electronic circuit. A relay is composed of coils, springs, switches (connected to springs), and 2 electronic contacts (normally close dan normally open) [5].

Arduino

Arduino is known as a hardware project based on "open source" that allows anyone, including those with no electrical educational background to make prototypes of electronic systems easily and without even involving solder. One of the most popular products from this project is Arduino Uno or Genuino Uno. This credit card-sized board is equipped with some digital and analog pins that allow it to be used to read sensors such as temperature and humidity sensors or to control actuators such as LCD or servo motors [6].

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RESEARCH RESULT

Arduino and Relay Analysis

Explanation of the Arduino R3 Design Circuit with 1 Channel Relay Module:

a. PIN 5V Arduino connected to the feet VCC module relay 1 channel.
b. PIN GND Arduino connected to the feet GND module relay 1 channel.
c. PIN 7 Arduino connected to the feet IN module relay 1 channel.

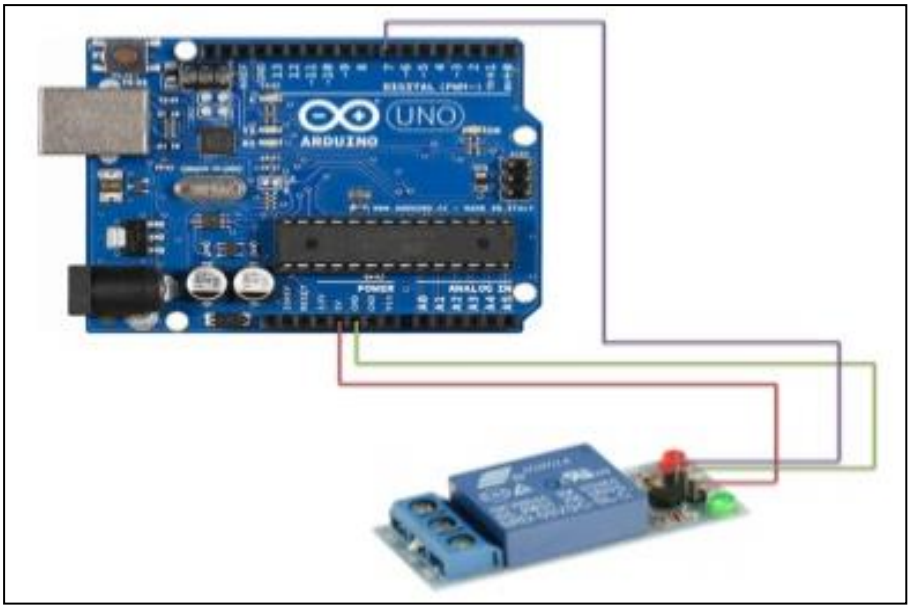

Image 1. Arduino dan Relay

Image 2. Relay and Arduino Testing

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Table 1. Arduino R3 Test Results With 1 Channel Relay

No	Voltage	Posisi NO/NC	LED	Magnet Relay	Suhu Relay	Sumber Tegangan	Objek Penelitian
1	3,5VDC	Not Active	Dull	Not Active	Cold	Arduino	Relay 1 Channel
2	4,5VDC	Not Active	Light	Not Active	Cold	Arduino	
3	6VDC	Active	Light	Active	Medium	Arduino	
4	9VDC	Active	High Light	Active	Medium	Power Supply	
5	12VDC	Active	High Light	Active	Thermal	Power Supply	

Analysis Arduino and Pushbutton

Explanation of the Design Circuit Arduino R3 with Button 4x4:

a. PIN 5V Arduino connected to the feet 1 button 1 dan button 2.
b. PIN GND Arduino connected to the feet 1 resistor 1 dan resistor 2.
c. PIN 4 Arduino connected to the feet 2 resistor 1and the feet 2 buttons 1.
d. PIN 5 Arduino connected to the feet 2 resistor 2 and the feet 2 buttons 2.

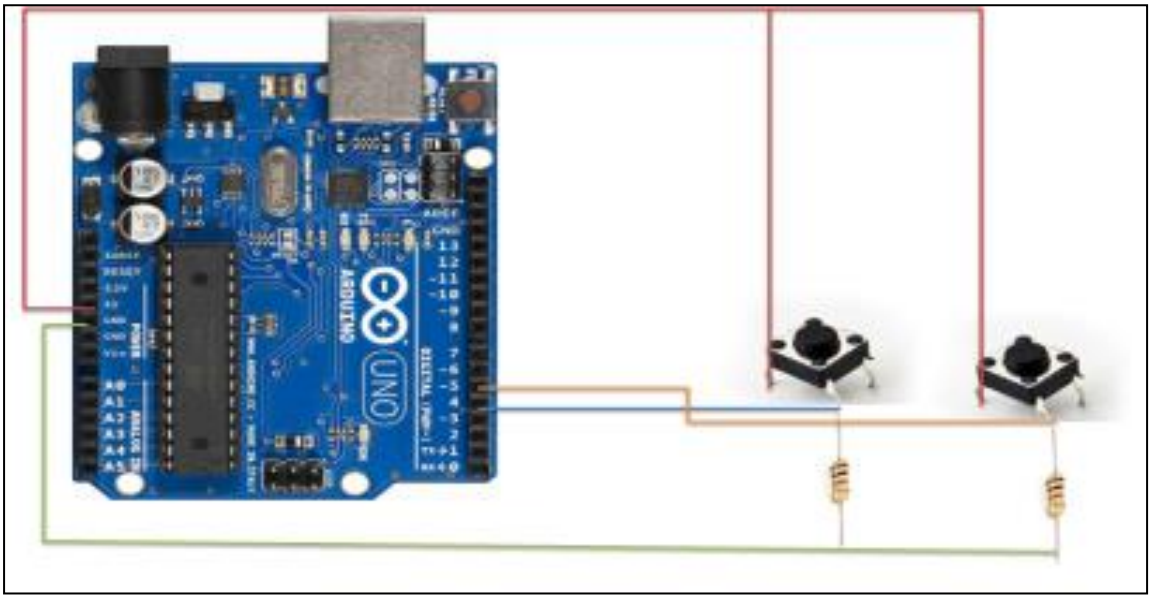

Image 3. Arduino and Button 4x4

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Table 2. Test Result Arduino R3 With Button

No	Voltage	Distance	Serial Monitor	IC Condition Arduino	Information	Object Of Research
1	3.3 VDC	B1	Not Active	Medium	Not Active	Button 4x4
2		B2	Not Active	Medium	Not Active	
3		B3	Not Active	Medium	Not Active	
4	5 VDC	B1	Active	Medium	Active	
5		B2	Active	Medium	Active	
6		B3	Active	Medium	Active	

Analysis Suite Solar Module 1 Watt

Explanation Of The Design Of Solar Modules 1 Watt :

a. The positive solar module is connected to the diode and positive foot micro USB charger.
b. The negative solar module is connected to a negative foot micro USB charger.
c. The positive battery is connected to the micro positive USB leg and USB boost 5V.
d. The negative battery is connected to a negative leg USB charger and USB boost 5V.

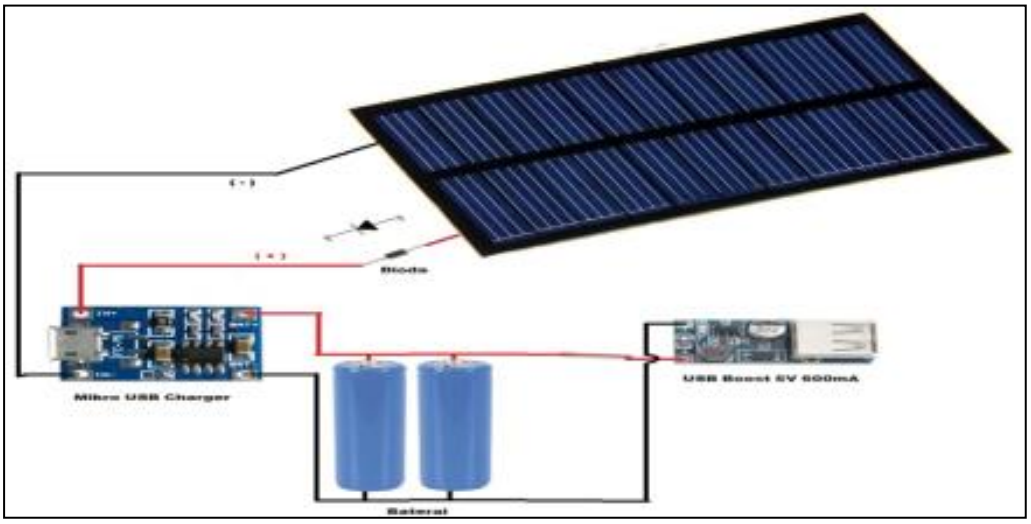

Image 4. 1 Watt Solar Module Circuit Without Load

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Analysis Suite Solar Module With Load

Explanation of the 1 Watt Solar Module Design Circuit Using Load :

a. The positive leg solar module is connected to the diode and the positive leg micro USB charger.
b. The negative foot of the solar module is connected to the negative foot of the micro USB charger.
c. The positive leg of the battery is connected to the micro positive leg of the USB charger, 5V USB boost, and the NO channel 1 channel relay module.
d. The battery negative leg is connected to the micro USB negative leg charger, 5V USB boost, and 1 channel relay module COM leg.

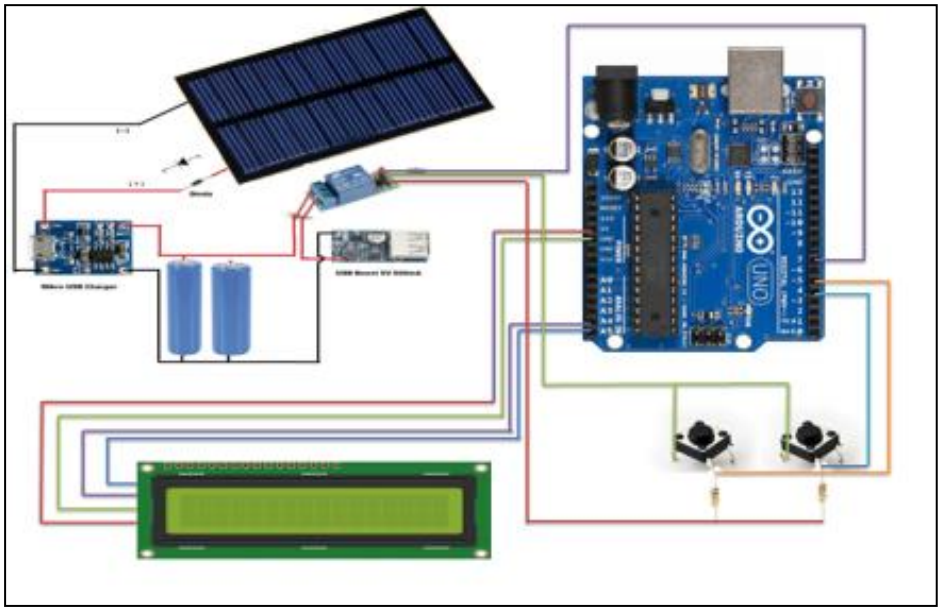

Image 5. The Overall Design Of The Series Of Charger Systems Mobile Phone On A Helmet Using Solar Panels

Table 3. Load Relay Test Results

No	Relay	Voltage	Load	Information	VDC Relay	Object Of Research
1	1 channel	Active	Solar Module	Active	5 VDC	Relay 1 Channel
2	2 channel	Active		Active	5 VDC	
3	1 channel	Not Active		Active	3.3 VDC	Relay 1 Channel
4	2 channel	Not Active		Active	3.3 VDC	

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Image 6. Display Of Solar Modules Mounted On A Helmet

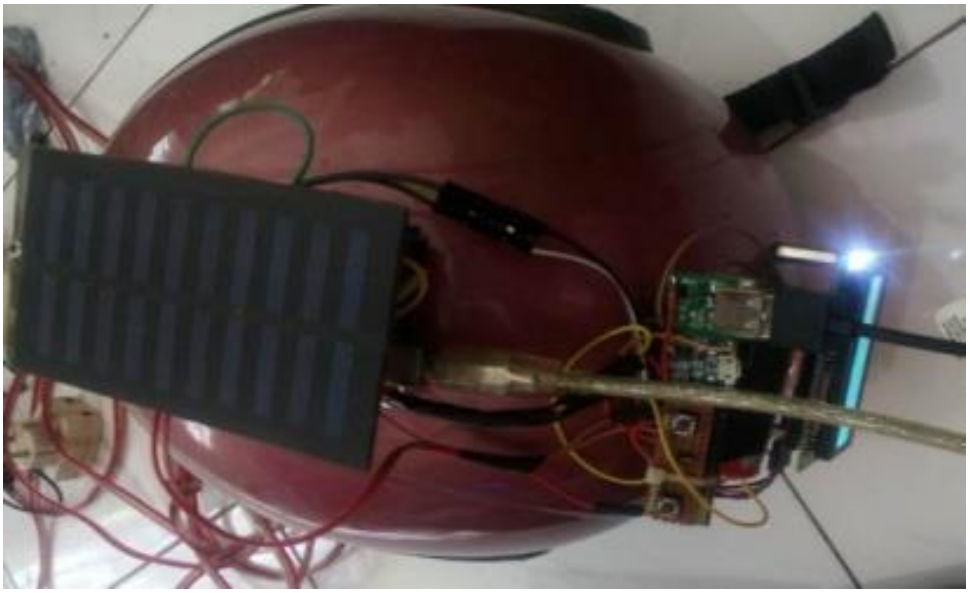

Image 7. Display From A Distance And When Charging A Cellphone

CONCLUSION

The 1-watt solar module is only capable of supplying a voltage of 3.7 V with the help of the TP4056 USB module. When the 3.7V lithium battery is charging the cellphone and the solar module is also exposed to light, the system on the USB TP4056 is open to charge the lithium battery and charge the handphone battery. When the button is given a high value, the position of the relay will change from normal open to normal close, so the system will turn on and the relay will be active.

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