HACETTEPE UNIVERSITY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERİNG

ELE 401-402 GRADUATION PROJECT

WEARABLE SOLAR CHARGER

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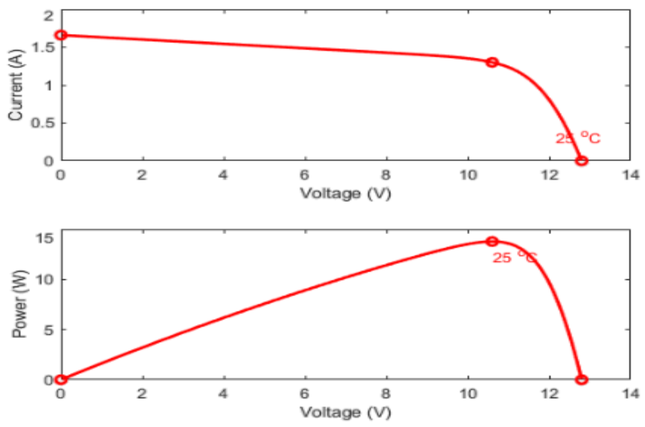
Project Descriptions

The name of our project is "Wearable Solar Charger". The project aims to convert the energy received from the sun's rays to the desired volts and energy using Buck converter. The aim is to charge a phone using solar energy. In our project, we used the vest as a wearable clothes. Since it is widely used in daily life, the sun will benefit more.

Specifications and Design Requirements



The angle, direction of the solar panel and sun clock are important. We obtain the maximum energy at 35 degrees and 1 o'clock. We used twelve volts , twenty watts input power by connecting two panels in series.

System Methodology

The system is basically; It consists of solar panels, power supplies, buck converter, microcontroller, current sensor, phone to be charged.

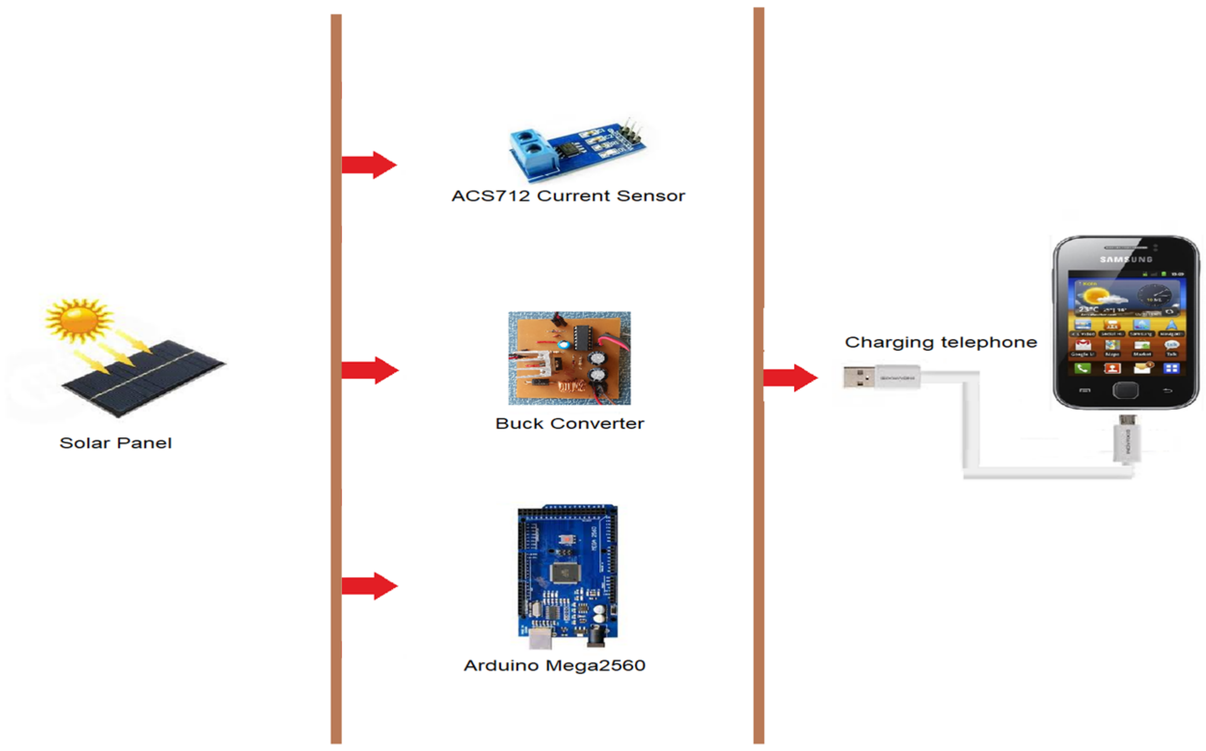


Figure: Project Components

The converter is used to reduce and stabilize the floating DC voltage at the input. Microcontroller (Arduino Mega2560) used to keep the output voltage at the maximum and desired value, and current sensor to read the current. We reduce the voltage from twelve volts to five volts with PWM waves. Depending on the phone, we will use at the output, the charging speed and the current drawn vary.

Stage of Simulating

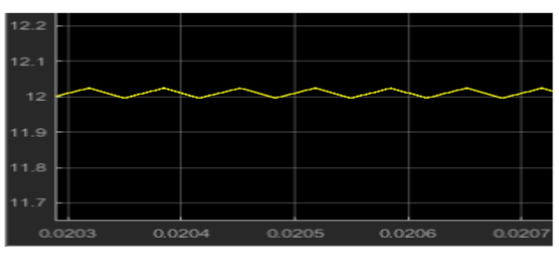


Figure 1 : Solar Panel Voltage

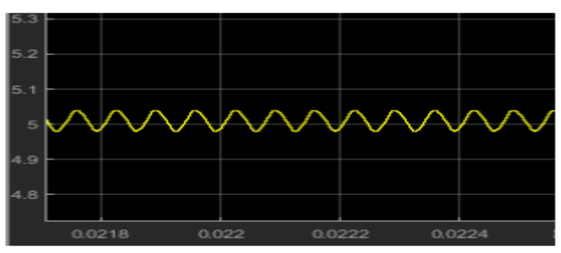


Figure 2 : Output Voltage

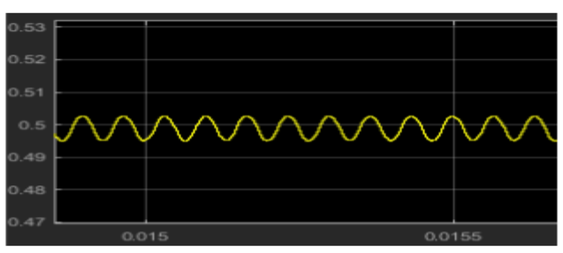


Figure 3 : Output Current

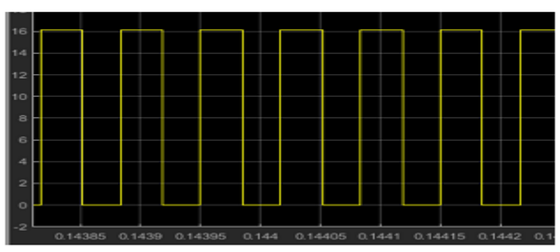
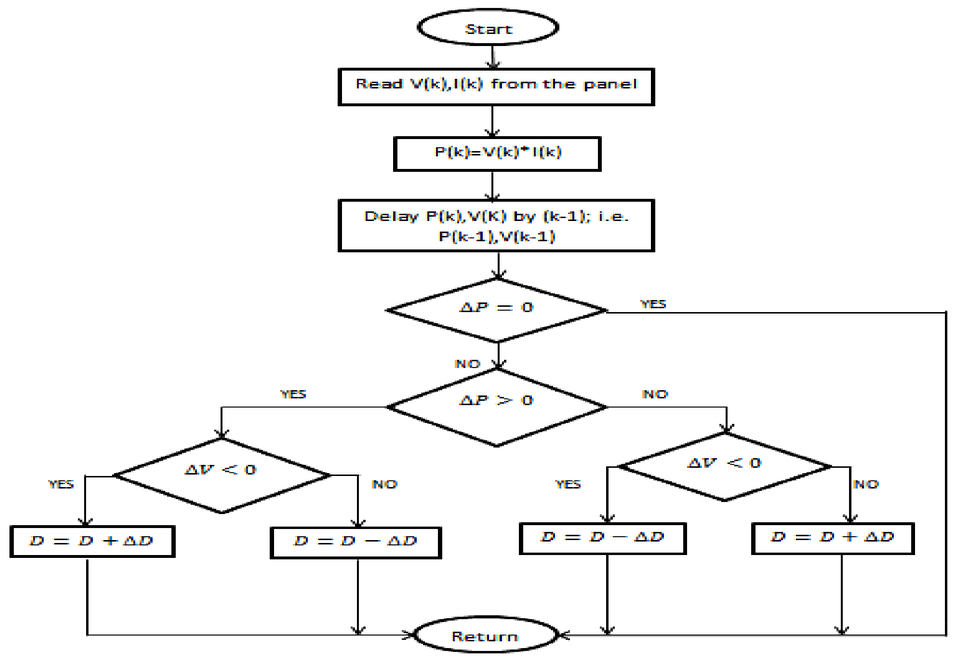


Figure 4 : Gate Voltage

PWM and MPPT Control Algorithm

The voltage dropped from twelve volts to five volts with PWM waves. MPPT control algorithm is applied to keep the voltage around five volts. We applied MPPT with Perturb & Observe method.



Thanks to the MPPT, maximum power is achieved by changing the duty cycle values and reducing and increasing the voltage principle. Mosfet that provides this by turning it on and off. It opens and closes according to the set time value.

Test of Project

Result

In our project, we used an input power of 12V, 1.67A, 20W by connecting two panels in series. With the help of converter circuit and microcontrollers, we obtained 5.4V, 1.66A, 9W power at the output. We tried to provide maximum power by controlling the voltage at the output with MPPT. At some moments, the power we got came up to 10W.

Depending on the phone we will use at the output, the charging speed and current draw vary. The Samsung Galaxy YS5360 model phone I used has reached 5.4V, 0.66 A, 3.5W power, reaching 100 percent charge capacity in about an hour and a half. Thus, thanks to this outfit we designed, our charging trouble will disappear.

Acknowledgements

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