



Professor Yoon Hwa



Darian Wong



Charleston Wong



Everardo Roman Llanes



Jordan Valentine

Portable Solar Power Provider

Creating a solar-powered device suitable for disaster areas and remote environments

Introduction

Solar panels have become increasingly popular amid growing climate awareness and the push for more sustainable energy sources. Typically installed on rooftops, solar panels harness solar energy, a renewable resource, to generate electricity. Solar energy remains a key source of clean energy, and improvements have been made to ensure that solar panels become more affordable and efficient.

However, many challenges make solar panels hard to implement. Despite widespread use, residential solar panels are often large, bulky, and require significant space, making them impractical for many homeowners. The high installation and maintenance costs also create a barrier to widespread adoption.

This project's goal is to design a solar energy solution that is portable and cost-effective, capable of efficiently capturing solar power while minimizing space requirements and lowering maintenance costs.

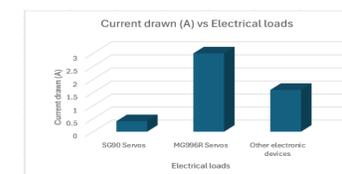


Results

Current is supplied by a 12.6V 25A 18650 battery system. The BMS allows up to 25A to be drawn from the 18650 3S6P 18650 battery pack.

There are 2 buck converters (rated at 1.5A and 5A). The 1.5A buck converter supplies current to the Arduino Uno and PCB. The 5A buck converter supplies current to servos and charging devices.

Item	No. of Servos	Average current drawn (A)	Total current drawn (A)
SG90 servos	2	0.2	0.4
MG996R servos	2	1.5	3
Total current drawn from 5A buck converter			3.4



The servos draw a total current of 3.4A which leaves 1.6A to charge portable devices. Portable devices require 0.5-1A for charging. 3 devices can be charged be at the same time.

Voltage of solar panel (V)	12
Power of solar panel (W)	10
Current of Solar panel (A)	0.383724
Total battery capacity (Ah)	12
Charging time (h)	31.27247709

Length of solar panel (m)	0.136
Width of solar panel (m)	0.11
Area (m ²)	0.01496
Power from sunlight exposure per day (W/m ²)	342
Power received by solar panel (W)	5.11632

It took approximately 31 hours to fully charge the BMS. Due to varying exposure to sunlight, solar panels supplied approximately 5.1W to the BMS.

Conclusion

The team has managed to complete the main objectives for the project. The solar panels can absorb sufficient solar energy to power up small devices and can be set up in remote locations, suitable for disaster areas. Additional changes were also made, such as creating a mechanical design to optimize the opening and closing of the solar panels. The project is engineered to maintain full functionality over extended periods which ensured reliability.

The project has addressed several issues that were present in similar projects such as the lack of solar-tracking technology and the lack of portability due to the huge size. It is also durable and suitable for long-term use. The project was scaled down to ensure it was usable and portable.

Theory

The demand for solar power has increased over the years, which has led to the viability of the team's final product.

For ultimate customers, this project provides a scalable, cost-effective solution that enhances disaster preparedness, and promotes energy independence. The project can serve as a backup portable power charging station that can provide electricity to buildings wherever needed if the electricity supply gets cut off. It reduces the resources required for power generation during emergencies.

Moreover, it can still generate sufficient power even in the limited presence of sunlight in the area due to conditions such as cloud cover. It is a significant improvement over the traditional battery charging station, which requires sufficient battery charging to power homes with electricity. Efficient power management is essential for optimal charging of devices.