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Multiport universal solar power bank

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Abstract. In an era of ubiquitous electricity dependence, the need for a reliable and portable power source is increasingly vital. This proposal advocates for the development of a solar-powered portable device capable of harnessing solar energy to charge itself and subsequently supply power to various electronic devices. The envisioned solution aims to address critical scenarios such as emergencies, where access to electricity is crucial, as well as recreational activities like camping, especially in remote locations. The proposed portable power bank will be equipped with solar panels for efficient energy absorption, ensuring self-sufficiency and sustainability. The device will feature both DC and AC outputs, catering to a wide range of electronic gadgets, thereby enhancing its versatility. In the event of a disaster, this innovation could prove invaluable by providing a reliable source of electricity when traditional power infrastructure is compromised. Moreover, in recreational settings, such as desert camping in locations like Saudi Arabia, users can harness the power of the sun to charge their devices in the open, offering convenience and environmental friendliness. This solar-powered portable energy hub embodies a step towards fostering energy independence and resilience in the face of unpredictable circumstances, catering to both emergency preparedness and everyday scenarios.

Introduction

To design Multiport Universal Solar Power Bank that can use the energy of the sun with the help of a photovoltaic system such as a solar panel. The system will have some subsystems that will monitor the power level of the battery.

- Project [1] Comparison

Our solar power bank project contrasts with Project [3], which is tailored for military use. Our design boasts a cooling system and wireless monitoring, enhancing its suitability for a range of civilian applications, including emergency and outdoor use. However, it may not match the extreme condition optimization of military-spec devices. Conversely, Project [3] excels in robustness and energy density for military environments but lacks the adaptability and user-friendly features of our project, such as wireless monitoring for everyday civilian use.

- Project [2] Comparison

We see significant differences in focus and application. While their project revolves around a specific application of a mobile charger using recycled materials, our project encompasses a broader spectrum of functionalities, including a cooling system and wireless monitoring, aiming to provide versatile and accessible electricity for a variety of scenarios. Our project emphasizes

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adaptability, environmental sustainability, and user-friendliness, demonstrating a comprehensive approach to portable solar energy solutions.

- Project [3] Comparison

Comparing our project with theirs, there are notable distinctions. Our project caters to a wider civilian audience, providing a versatile solar power bank with innovative features like a cooling system and wireless battery monitoring. This contrasts with the other project's military-focused design, which prioritizes high energy density and robustness for field operations. While their charger is specialized for military needs, ours is tailored for diverse environments and user convenience, highlighting our commitment to adaptable and user-friendly solar energy solutions.

- Project [4] Comparison

The SunBlazer IV focuses on larger-scale, community-based applications with a strong emphasis on scalability and modularity. It aims to empower entire communities by providing a robust, adaptable solar energy system. In contrast, our project centers on individual use with a portable solar power bank, enhanced with features like a cooling system and wireless monitoring. Our project is designed for personal convenience, adaptability, and a wide range of scenarios, whereas the SunBlazer IV caters to broader community needs and sustainable development goals.

Traditional energy sources, primarily fossil fuels, contribute significantly to carbon emissions, a leading cause of climate change. Your project, by using solar energy, helps reduce this carbon footprint. Also, fossil fuels are non-renewable and their extraction can be environmentally damaging. Solar energy, being renewable, offers a sustainable alternative. Fossil fuel combustion releases pollutants that harm air quality and public health. Solar power generation, in contrast, produces no air pollutants, making it a cleaner option.

The contributions of this research are as follows:

- **Easier access to electricity in remote areas.**
- **Use renewable resources to reduce the number of non-renewable resources used.**
- **To be used in case of a power outage.**
- **Create a solar power bank that is compatible with a wide range of electronic devices.**
- **Strive for a compact and lightweight design, making the power bank easy to carry and suitable for on-the-go activities, such as camping, or emergency situations.**
- **Implement safety features to protect both the power bank and connected devices from overcharging, overheating, and other potential risks, ensuring user safety and the longevity of the device.**

System Specifications

This project will involve the design and testing of different subsystems. Each subsystem will follow a specific job.

- Convert DC from solar panel to DC into the battery using (DC Regulator).
- Supply different voltages to different devices.
- Measures battery level.
- Can act as an AC power source with a max output of 400[W].
- The Capacity will be around 20000[mAH].
- The model will be 50[cm^2] with a height of 20[cm].

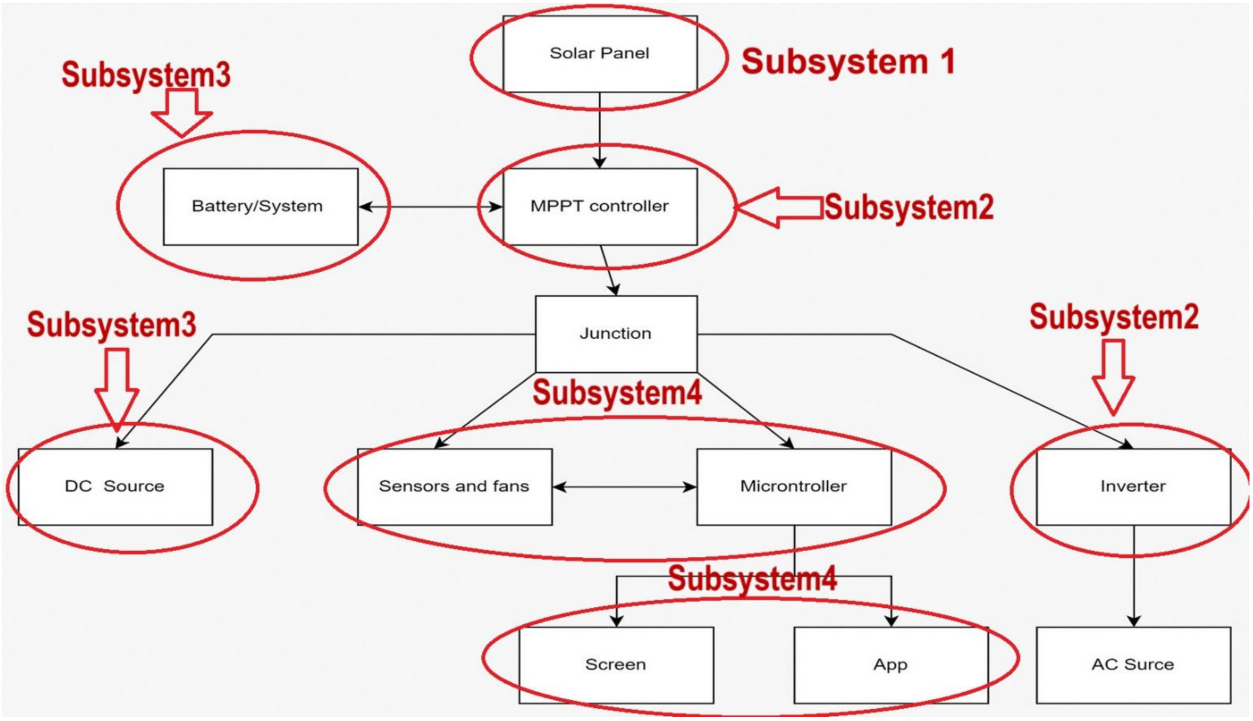

Figure 1: A block diagram of the proposed system.

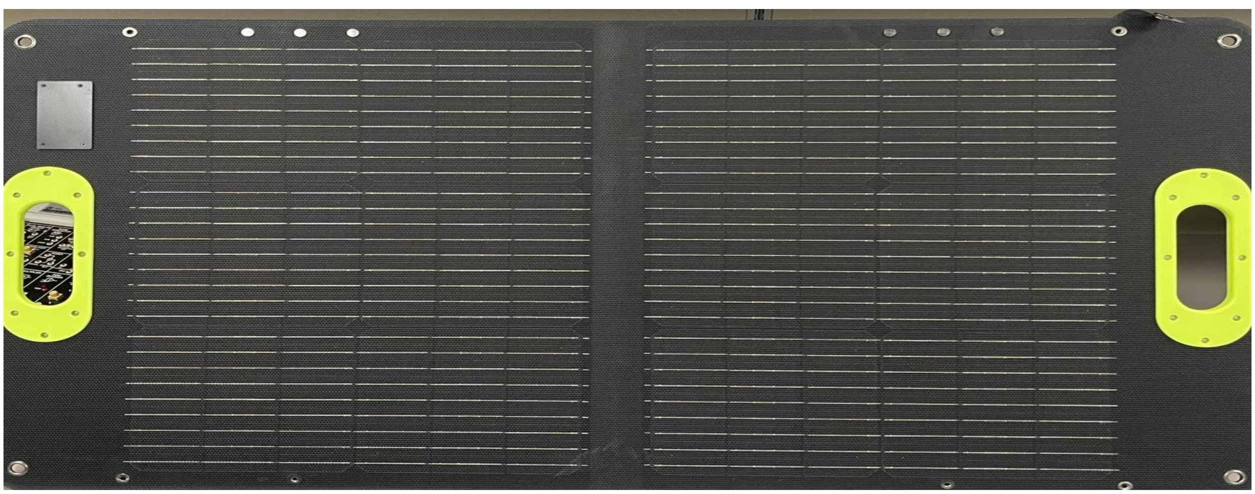

Figure 2: Solar pannel used for this project.

Figure 2: Inverter and controller used for this project.

The summary of the paper on the development of a Multiport Universal Solar Power Bank highlights the project's successful integration of innovative design, renewable energy technology, and user-centric features to address the growing need for portable, reliable, and sustainable power sources. By harnessing solar energy through efficient photovoltaic systems and incorporating versatile functionality, the project not only provides a practical solution for emergency and recreational power needs but also contributes to environmental sustainability by reducing reliance on non-renewable energy sources.

The project's emphasis on compatibility with a wide range of electronic devices, coupled with its compact and lightweight design, ensures that it meets the demands of both emergency preparedness and outdoor activities. The inclusion of safety features and adherence to engineering standards further enhances the reliability and user safety of the solar power bank.

Moreover, by focusing on sustainability through the use of renewable resources and eco-friendly materials, the project aligns with global efforts to mitigate environmental impact and promote energy independence. The consideration of economic, social, and ethical factors in the design and manufacturing processes demonstrates a comprehensive approach to addressing the multifaceted challenges of modern energy needs.

Summary and Conclusion

In summary, the Multiport Universal Solar Power Bank project represents a significant step forward in the development of portable solar energy solutions. Its ability to provide a reliable, safe, and environmentally friendly power source in a variety of scenarios underscores the potential of renewable energy technologies to improve quality of life and foster sustainable development. As the project moves forward, it holds the promise of broadening access to energy, enhancing emergency preparedness, and contributing to a more sustainable and resilient energy future. The proposed system can be used during outdoor activities, emergency cases, and backup power source for small appliances.

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