MALAYSIA UNIVERSITY of SCIENCE and TECHNOLOGY

School of Information technology

Smart Solar Tracker With IoT Swtich

INTRODUCTION

1. BACKGROUND

- The Smart Sun Tracking System with IoT Switch captures solar energy, stores it in a power bank, and allows remote control via smartphone or computer using Blynk. It provides a stable 5V 2A output, suitable for fast charging phones, powering LED lights, and running IoT devices. Using LDR sensors and an Arduino, the system tracks sunlight and adjusts the solar panel's position for maximum energy capture. The IoT switch enables users to remotely turn the system ON or OFF and logs usage data. This eco-friendly device helps reduce electricity use and is ideal for small-scale applications, emergency power, and outdoor activities like camping.

2. Objectives

- Integrate IoT Technology
- Optimize Energy Management
- Support Future Development
- Promote Clean Energy Adoption

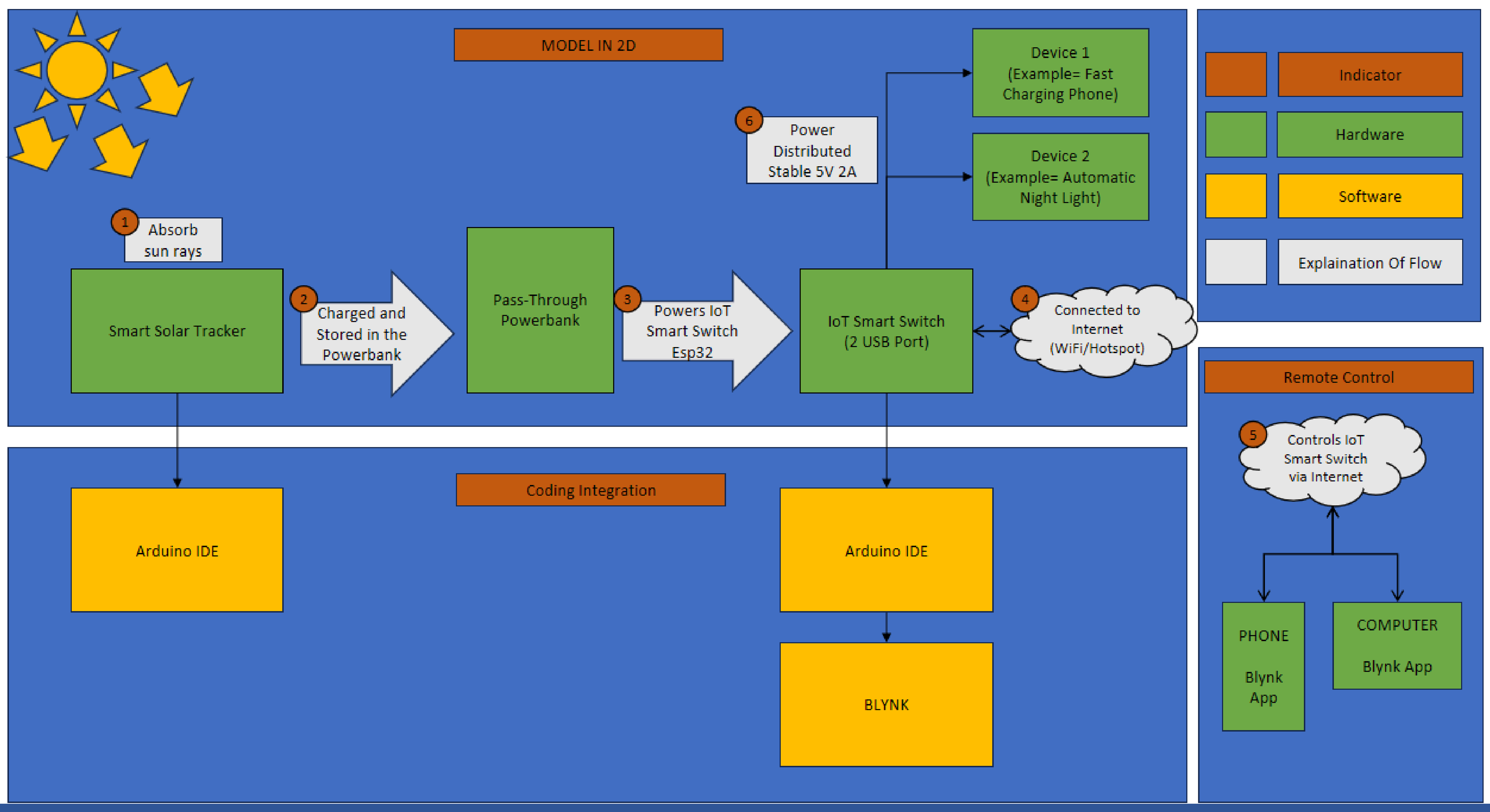
3. Scope

- Development of a solar tracking system powered by photoresistors (LDRs) for sunlight detection.
- Integration of a pass-through power bank for energy storage.
- Implementation of an IoT switch to allow remote on/off control via the Blynk App.
- Aiming to power at least charging 2 smartphone using the IoT snart switch.

4. Constraints

- **Weather dependency:** affected by cloud cover and weather conditions
- **Limited power capacity:** The system is designed to power low-energy devices (5V, 2A)
- **Tracking accuracy:** The tracking mechanism relies on photoresistor readings.
- **Dependence on mobile or internet connectivity:** Remote control and data logging require reliable internet access and a smartphone app.

DESIGN & METHODOLOGY



IMPLEMENTATION & ANALYSIS

1. Graphs/Tables (Not Implemented)

- In this project, no graphs or tables were implemented. However, based on observation, the smart solar tracker was able to follow the sunlight direction throughout the day, and the IoT switch responded correctly to user commands via the mobile interface.

2. Test Analysis

- The system was tested under normal daylight conditions. The solar panel successfully rotated to follow the sun's position using LDR sensors and servo motors, ensuring optimal sunlight exposure. It was able to charge a power bank, while power from the solar panel also passed through the power bank to supply the IoT switch. The IoT switch was tested using a smartphone and responded quickly to commands. When turned on, it could charge or power 5V 2A devices effectively. When the power button was turned off, the power supply to the connected devices was successfully cut off.

3. Application

- This smart solar tracker can be used for small-scale renewable energy setups, especially in rural or remote areas. With the IoT switch, users can control the panel's operation remotely, making it easier to manage even without physical presence.

4. Benefit

- Increases energy efficiency by automatically tracking sunlight.
- Reduces the need for manual adjustment.
- IoT switch adds convenience through remote control.
- Serves as a good early-stage development for more stable, independent energy systems.
- Encourages clean energy adoption.

CONCLUSION

1. Summary of the Project:

- The Smart Solar Tracker with IoT switch improves energy efficiency by ensuring the solar panel always faces the sun, optimizing power generation.
- The system tracks sunlight using LDR sensors and servo motors, charges a pass through power bank then powers the IoT smart switch controls devices remotely through the Blynk App, allowing users to power 5V 2A devices with ease.

2. Findings and Contributions:

- The project supports clean energy adoption by enabling solar power use in remote or off-grid areas, where access to electricity is limited.
- It provides a solution for remote monitoring and control, making it ideal for locations that require minimal maintenance but efficient energy usage.

3. Limitations of the Project:

- **Weather sensitivity:** The system performance is affected by cloudy or rainy conditions, as the sensors rely on sunlight.
- **Low power capacity:** The system currently supports only low-power devices (5V 2A), limiting its applications to smaller electronics.
- **Basic tracking accuracy:** The solar tracker's positioning may need refinement to improve tracking precision, especially in variable light conditions.

4. Future Development:

- Integration of additional renewable sources: Future upgrades could include wind or water power, providing a more stable and consistent energy supply, especially in areas with variable sunlight.
- The development of a multi-source energy system would enhance power reliability and make the system more sustainable for long-term use.

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