SUSTAINABLE DIGITAL ADVERTISING WITH SOLAR POWERED E- PAPER DISPLAY

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Introduction:

Digital advertising systems using LED and LCD displays consume high power and require continuous electricity, making them unsuitable for sustainable outdoor applications. These systems increase operational costs and depend heavily on grid power. E-paper display technology provides a low-power alternative, as it consumes energy only during screen updates and retains images without continuous power. It also offers excellent readability in sunlight, making it ideal for outdoor environments. In this project, solar energy is integrated with e-paper technology to create a fully autonomous system. A solar panel, MPPT charge controller, and rechargeable battery ensure continuous operation. A Raspberry Pi 3B+ is used to control the display and manage advertisement content stored locally. Additionally, an external LDR-based circuit using a MOSFET controls an LED strip to provide automatic night-time visibility. Thus, the system offers an eco-friendly, low-cost, and energy-efficient solution for modern digital advertising.

Objectives:

To design a solar-powered digital advertising system.

1. To reduce power consumption using e-paper display technology.
2. To implement MPPT for efficient solar energy utilization.
3. To provide automatic night-time visibility using an external LDR-based lighting system.

Methodology:

The project is implemented in the following sequence:

1. Solar panel converts sunlight into electrical energy.
2. MPPT charge controller regulates the voltage and extracts maximum power.
3. Battery stores the energy and provides power to the system.
4. Raspberry Pi 3B+ acts as the main controller for processing data.

5. Advertisement images are stored and processed in Raspberry Pi.
6. E-Paper display is interfaced using driver HAT via SPI communication.
7. Display shows content and retains image without continuous power.
8. LDR sensor detects ambient light conditions.
9. MOSFET acts as a switch to control LED strip.
10. LED strip turns ON during night for visibility and OFF during daytime.

Result and Conclusion:

In conclusion the proposed system successfully demonstrates a sustainable and energy-efficient digital advertising solution using solar power and e-paper display technology. The system operates independently of grid electricity and significantly reduces power consumption compared to conventional displays. The integration of MPPT ensures efficient energy utilization, while the rechargeable battery provides reliable backup during low sunlight conditions. The use of an external LDR and MOSFET circuit enables automatic night-time visibility, improving usability. Overall, the system is cost-effective, environmentally friendly, and suitable for outdoor applications such as public information boards and digital signage, contributing to sustainable development.

References:

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Future Scope:

The future scope of this project includes:

1. Integration of IoT for remote content updating and monitoring.
2. Use of full-color e-paper displays for better advertisement quality.
3. Implementation of advanced power management techniques for improved efficiency.