International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

SECURE ENERGY MANAGEMENT SMART METERING MODEL SYSTEM USING IOT DEVICES

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ABSTRACT

This paper presents a system for monitoring and managing energy consumption in residential and commercial settings. The system utilizes an Arduino UNO microcontroller, sensors (voltage, current, and RTC), and communication devices (ZIGBEE and GSM modules) to collect and transmit energy usage data. An IoT module, specifically the ESP 8266, is integrated into a master device, which continuously updates the sensor values into a database for analysis and monitoring. A real-time LCD display provides immediate feedback on energy consumption, while the GSM module enables SMS communication with the service provider for notifications and alerts. The proposed system offers advantages such as enhanced energy management, remote monitoring and control, and prompt notifications. It finds applications in various areas, including residential energy monitoring, smart buildings, and

industrial energy management. The system contributes to energy conservation, sustainability, and cost savings, making it a valuable tool for energy efficiency initiatives.

I. INTRODUCTION

Electricity theft, a pervasive issue in many parts of the world, involves the illegal consumption of electrical power without proper authorization or payment. This unlawful practice has far-reaching consequences, affecting not only utility companies but also society as a whole. Electricity theft occurs through various means, including tampering with meters, bypassing meters, or clandestinely tapping into power lines. These actions result in revenue losses for utility providers, leading to higher costs for honest consumers and reduced investments in infrastructure improvements. To combat electricity theft, utilities employ advanced metering technologies, conduct regular inspections, and raise awareness about the legal and ethical implications of theft. Reducing electricity theft is not only vital for ensuring the sustainability of energy resources but also for maintaining a fair and reliable electrical supply for all consumers.

II.PROPOSED SYSTEM

The master device, equipped with an ESP 8266 IoT module, continuously updates sensor values into a database, enabling efficient monitoring and analysis of energy consumption over time. The integrated GSM module ensures timely SMS communication with the service provider for critical alerts and abnormal consumption patterns. The proposed system is a pressing concern in the electricity sector is effectively managing energy consumption, especially with the increasing demand for electricity in our daily lives.

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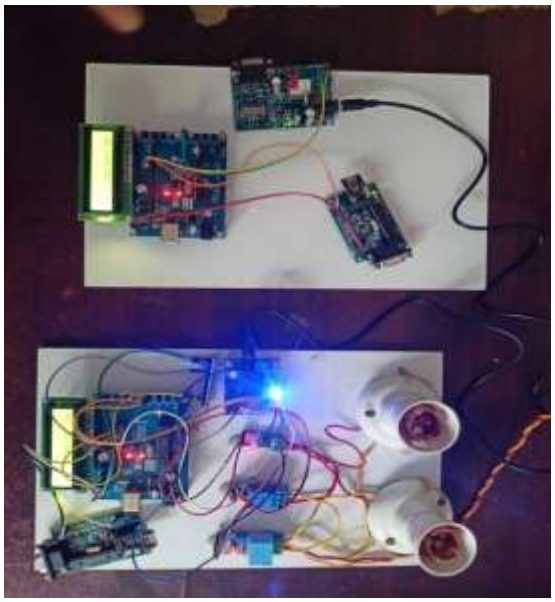
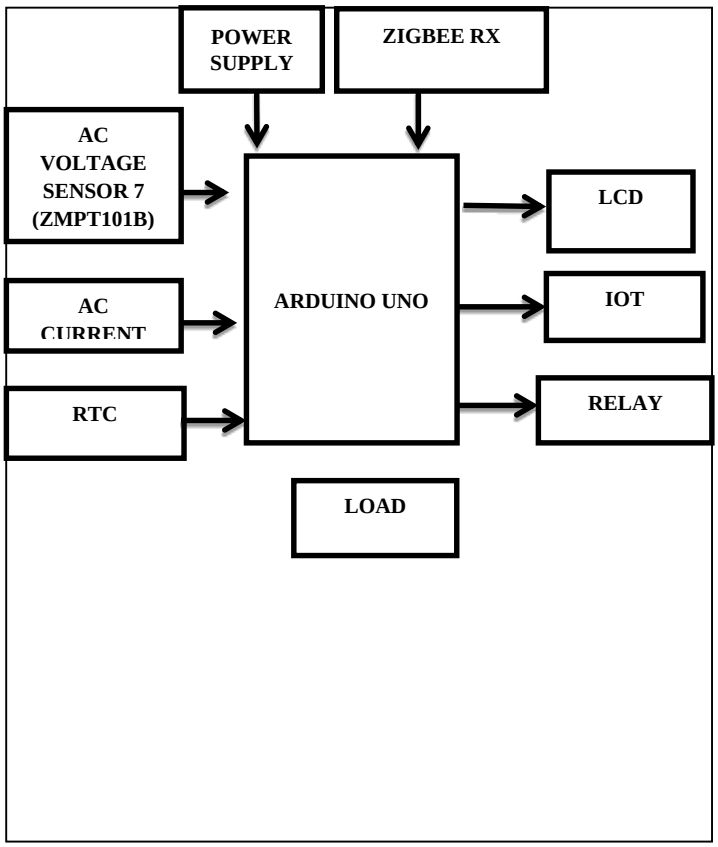
III.KITPROTOTYPE

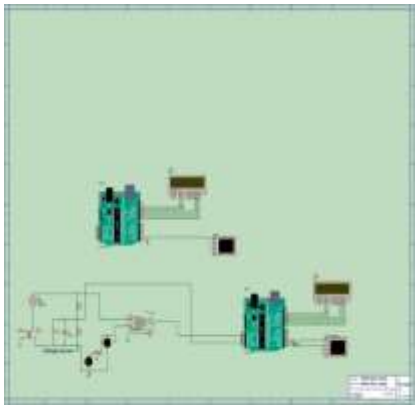


IV. BLOCK DIAGRAM DESCRIPTION

The proposed system is a pressing concern in the electricity sector is effectively managing energy consumption, especially with the increasing demand for electricity in our daily lives. To address this, it's crucial to control and reduce household energy usage, offering consumers cost savings, carbon emissions reduction, and improved risk management. In the past, energy monitoring was primarily done through traditional energy meters, which relied on manual meter reading, posing a risk of human error. However, recent advancements have replaced conventional systems with smart energy meters, enabling comprehensive household control and monitoring through IoT-based smart metering, incorporating PLC and SCADA technology. This shift is especially significant in countries like India, where manual meter reading processes were slow and often inaccurate, leading to customer dissatisfaction.



V. SIMULATION PROTOYPE



VI. CONCLUSION

In conclusion, the proposed system, built around an Arduino UNO microcontroller, presents an efficient and versatile solution for real-time power usage monitoring and communication with service providers. By integrating a voltage sensor and a current sensor, it offers homeowners the ability to not only keep track of their energy consumption but also assess the quality and stability of their electrical supply. The inclusion of a Real-Time Clock ensures precise timestamping of data, crucial for accurate monitoring and analysis. The use of the ZIGBEE network enables wireless data transmission to a master device, equipped with an ESP8266 IoT module, for continuous database updates and long-term energy consumption insights. The LCD display adds a user-friendly element, granting homeowners immediate access to their energy consumption data. Furthermore, the incorporation of a GSM module ensures effective communication in critical situations through SMS alerts to the service provider. This comprehensive system empowers homeowners with the tools to make informed decisions regarding their energy usage and facilitates seamless communication with service providers, ultimately contributing to more efficient and sustainable energy management in households.

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