IOT-BASED SMART ENERGY MONITORING AND ALERT SYSTEM

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ABSTRACT

This paper presents an IoT-based smart energy monitoring and alert system designed to measure real-time electricity consumption. The system uses a current sensor and NodeMCU microcontroller to calculate power usage. The collected data is transmitted to a cloud platform for remote monitoring. Additionally, an alert mechanism is included to notify users when power consumption exceeds a predefined limit. This system helps improve energy efficiency and reduce electricity wastage.

KEYWORDS

IoT, Energy Monitoring, NodeMCU, Smart Meter, Embedded Systems

1. INTRODUCTION

Electricity consumption is increasing rapidly due to the widespread use of electrical devices. Traditional energy meters do not provide real-time monitoring, leading to inefficient usage and energy wastage.

To overcome this issue, this project proposes an IoT-based smart energy monitoring system that enables users to track power usage in real time and receive alerts during high consumption.

2. LITERATURE REVIEW

Existing systems use communication technologies such as GSM, Zigbee, and Bluetooth. However, these systems are often costly and complex.

The proposed system uses Wi-Fi-based IoT technology, which is cost-effective, simple to implement, and suitable for real-time monitoring.

3. METHODOLOGY

3.1 Components Used

- NodeMCU (ESP8266)
- ACS712 Current Sensor
- Wi-Fi Module
- Power Supply

3.2 Working Principle

1. The current sensor measures the current flow
2. NodeMCU reads sensor data
3. Power consumption is calculated
4. Data is transmitted to the cloud
5. Alert is generated if power exceeds the limit

4. SYSTEM DESIGN

4.1 Block Diagram

Power Supply → Sensor → NodeMCU → Wi-Fi → Cloud

4.2 Flowchart

Start → Read Data → Calculate Power → Send to Cloud → Display → Repeat

5. IMPLEMENTATION

The system is implemented using NodeMCU and ACS712 sensor. The sensor captures current data, and the NodeMCU processes it to calculate power consumption. The processed data is sent to a cloud platform using Wi-Fi. A simple alert system is included to notify users when consumption exceeds a predefined threshold.

6. RESULTS

Sample Data Table

Time | Voltage (V) | Current (A) | Power (W)

10 AM | 220 | 0.5 | 110

12 PM | 220 | 0.8 | 176

2 PM | 220 | 1.0 | 220

Observation

- Real-time monitoring achieved
- Cloud data transmission successful
- Alert system working properly

7. ADVANTAGES

- Low cost
- Real-time monitoring
- Easy to install
- Remote access

8. CONCLUSION

The IoT-based smart energy monitoring and alert system successfully tracks electricity usage and helps reduce energy wastage. The system is simple, efficient, and suitable for real-time applications.

9. FUTURE SCOPE

- Mobile app notifications
- AI-based prediction
- Automatic control system

10. REFERENCES

1. Arduino Official Documentation
2. IoT-Based Energy Monitoring Research Papers
3. IEEE Smart Grid Journals