
**“SMART ENERGY MANAGEMENT AND OVERLOAD CONTROL OF
HOSTEL MANAGEMENT USING IOT.”**

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ABSTRACT

The rapid increase in electricity consumption in hostels leads to uneven power usage and higher electricity bills due to limitless use of high-power appliances. This paper presents a Smart Energy Management & Overload Control System using Internet of Things (IoT) technology to monitor & control energy consumption at the individual room level. The proposed system uses a PIC18F4520 microcontroller integrated with current & voltage sensors to measure real-time electrical variables such as voltage, current, power, and energy. The measured data is displayed on an LCD and transmitted to an IoT web server via GSM/Wi-Fi module for remote monitoring. When overload situations are detected, warning notifications are sent to the respective room inhabitant, and the system automatically breaks the supply after repeated violations using a relay mechanism. The introduced system ensures fair energy distribution, prevents electrical threats, & boosts energy-saving practices in hostels.

INTRODUCTION

In this project we propose energy management & automatic controlling system for hostel rooms. We see in hostel user needs to utilizes general load. But many times, some people may use extra power for their inessential uses like ironing, water heater, home theaters, induction

etc. so common load and respective light bill may enhance due to few of people & that bill have to pay by all. So, to conquer this scenario we introduced a smart energy meter which place on every room to monitor load consumption. And units of all rooms will be monitor on IOT web server. When any one uses overload equipment's then 2 warning SMS send on respective room owner mobile number. and After 3rd warning supply automatically breaks.

Smart Power Monitoring and Analysis is focused at designing a solution to keep track of each electrical appliance & monitors the energy/power used consumed by an Android device. As mentioned, this study's main problem statement is that majority of the power meters installed in any hostel illustrated the all consumption of the electricity used. So with the upcoming of machine to machine communication where devices can be interconnected without wire leading to IoT, we here have designed an IoT based Smart Energy Management system.

LITERATURE SURVEY

Several researchers have introduced IoT-based smart monitoring systems for boosting energy/power efficiency and remote control of electrical appliances. Lavanya et al. designed an IoT-based automated monitoring system for real-time tracking of environmental parameters. Abhijeet Rajurkar et al. introduced a smart home control and monitoring system using IoT with a convenient interface for overall approach. Similarly, Suresh Sankaranarayana et al. implemented a smart home monitoring system using Android devices & wireless sensor networks to measure electrical variables such as voltage & current in real time.

These systems illustrate the performance of IoT in remote monitoring and energy/power management applications. Further research has focused on energy conservation through automated control mechanisms. Suresh et al. introduced an automatic lighting & control system for classrooms to enhance energy efficiency, while Shamika Kshirsagar et al. developed an appliance-level smart energy management system to observe & regulate household power usage.

Vinay Sagar et al. demonstrated a home automation system using IoT for remote appliance control. However, most of these systems are limited to home environments and do not specifically address room-wise monitoring & automatic overload disconnection in hostel settings. The introduced system extends these concepts by integrating real-time monitoring, warning notifications, & automatic supply cutoff to ensure fair energy distribution & enhanced electrical safety in hostels.

PROPOSED SYSTEM

The proposed system is a Smart Energy Management & Overload Control system designed specifically for hostel environments using Internet of Things (IoT) technology. The main objective is to observe room-wise electricity consumption & prevent overload conditions produced by excessive usage of high-energy/power appliances.

A. System Overview

The proposed system integrates hardware & software components to observe & control energy usage in hostel rooms. Each room is equipped with current and voltage sensors connected to a PIC18F4520 microcontroller. The system measures electrical parameters & sends data to an IoT web server through a GSM/Wi-Fi module. If overload is detected, warning messages are sent, and after repeated contraventions, the relay disconnects the power supply.

B. Key Components

- **PIC18F4520 Microcontroller** – Processes sensor data & controls outputs.
- **Current Sensor (ACS712)** – Measures load current.
- **Voltage Sensor** – Measures supply voltage.
- **Transformer, Rectifier & Regulator** – Power supply unit.
- **Buzzer** – Allocates audible warning.
- **IoT Web Server** – Stores & displays real-time data.
- **GSM/Wi-Fi Module** – Permits IoT communication.
- **Relay Driver Circuit** – Break load during overload.
- **LCD Display** – Displays voltage, current, & power.

C. Working Principle

1. The transformer steps down AC voltage.
2. The bridge rectifier converts AC to DC.
3. The voltage regulator delivers constant DC supply.
4. Current and voltage sensors measure electrical parameters.
5. The microcontroller calculates power/energy consumption.
6. Data is displayed on the LCD and transmitted to the IoT web server.
7. If current exceeds preset threshold:-
 - First & second warning notifications are sent.
 - On third violation, relay disconnects power supply.

8. System resets manually or automatically after compliance.

D. Advantages

- Room wise energy monitoring
- Fair electricity billing
- Remote monitoring via IoT
- Energy-saving awareness
- Automatic disconnection system
- Cost-less & scalable solution
- Prevents overload & fire hazards

E. Application

- **Remote Power Monitoring:** Enables real-time monitoring & control through web or mobile purposes.
- **Hostel Energy Monitoring:** Used for room-wise electricity consumption tracking in hostels.
- **Overload Protection System:** Automatically disconnects power supply when current exceeds the secure threshold limit.
- **Smart Building Automation:** Integrates with IoT-based smart building management systems for integrated monitoring.
- **Hotel Power Management:** Requires for monitoring & controlling electricity consumption in hotel rooms.
- **Fair Electricity Billing:** Ensures clear billing by monitoring individual room power usage.
- **Energy Conservation Programs:** Promotes responsible energy usage among students & residents.

Figure:

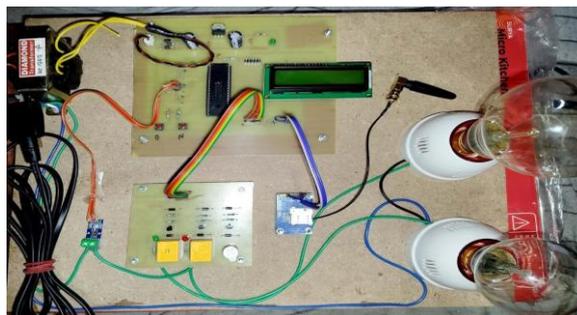
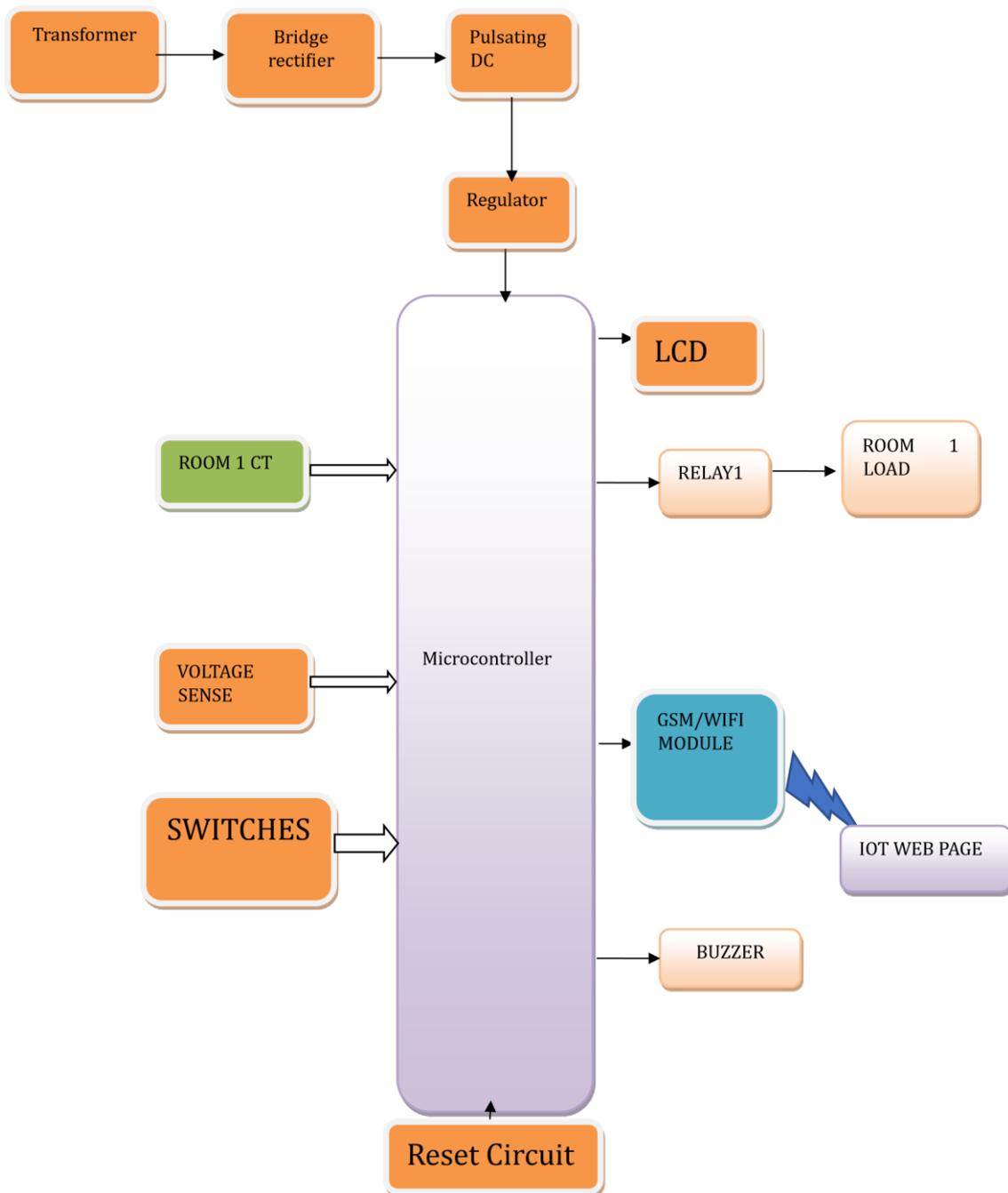


Fig. Hardware Prototype of IoT-Based Smart Energy Management System.

Block Diagram:**RESULTS AND DISCUSSION**

The system was tested under different load situations including normal load & overload scenarios. The sensors precisely measured voltage & current values. The IoT platform successfully displayed real-time data of individual rooms.

During overload conditions:

- Warning notifications were formed correctly.
- Relay successfully break supply after threshold violations.

- LCD indicated real-time parameter updates.

The system effectively decreased unnecessary high-power appliance usage & ensured controlled power distribution. Experimental results confirm that the introduced system enhanced safety & energy efficiency in hostel environments.

CONCLUSION AND FUTURE WORK

Conclusion

This paper shows a Smart Energy Management & Overload Control System using IoT for hostel applications. The system gives real-time monitoring, overload detection, and automatic break of power supply. It ensures fair energy distribution & enhances electrical safety. The implementation confirms to be reliable, cost-less, & suitable for hostel management systems.

Future Work

- Integration of mobile application with designed analytics.
- Implementation of AI-based load prediction.
- Smart prepaid energy billing system.
- Solar energy integration.
- Cloud-based data storage.
- Extension\Expansion to multi-floor hostel management.

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