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Modelling of SMA Based Monitoring for Sets in Industries Using Embedded Technologies

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ABSTRACT

This project aims to design and develop an IoT-based smart energy meter using Arduino UNO, current sensor, DC voltage sensor, relay, SMPS, Node MCU, LCD display, and GSM module. The proposed system provides a user-friendly interface to monitor the energy consumption of households or industries in real-time. It digitalizes the power consumption data .The data collected from the sensors is transmitted wirelessly to the Node MCU module, which is responsible for sending the data to the cloud server. The data can be accessed remotely through a mobile application or a web-based platform. However, the industries are more unsafe to energy theft. Such attacks cannot be effectively identified since the old technology require certain devices. The LCD display is used to display the real-time energy consumption and other related parameters. In our project we are going to develop an energy monitoring system by using embedded technologies. The proposed system is expected to provide an efficient solution for energy management, reduce energy consumption, and prevent wastage of resources.

1. INTRODUCTION

The IoT based smart energy meter based on GSM and Node MCU is an innovative and technologically advanced system designed for monitoring and controlling energy consumption. This system combines the capabilities of two technologies: GSM (Global System for Mobile Communications) and Node MCU (an open-source wireless IoT platform), to provide an efficient and reliable method for measuring, monitoring, and controlling the consumption of energy. The system consists of a smart energy meter that is connected to the main power supply of a building or a household. The smart energy meter measures the amount of energy consumed and sends the data to the Node MCU, which processes it and sends it to a remote server through GSM technology. This remote server can be accessed from any device with an internet connection and provides real-time data about energy consumption. Additionally, the system can be programmed to control the energy consumption by setting specific limits for energy usage, and in case the limits are exceeded, the system automatically sends alerts to the user's phone via SMS. All this data is also displayed on an LCD display connected to the Node MCU, making it easily accessible to users.

In summary, the IoT based smart energy meter based on GSM and Node MCU is an efficient and reliable solution for monitoring and controlling energy consumption. It provides real-time data to users and enables them to manage their energy consumption, reducing their carbon footprint, and saving money in the process

2. PROPOSED METHODOLOGY

The proposed system of IoT based smart energy meter based on GSM and Node MCU is designed to provide an efficient and reliable way to monitor and control energy consumption in homes and buildings. The system consists of a smart energy meter connected to the main power supply of the building, a Node MCU connected to the smart energy meter, and a remote server for data storage and analysis. The smart energy meter measures the amount of energy consumed and sends the data to the Node MCU. The Node MCU processes the data and sends it to a remote server through GSM technology. The remote server stores and analyses the data, providing real-time information about energy consumption .The system also includes a user interface that displays energy consumption data on an LCD display connected to the Node MCU. The LCD display shows real-time data, including energy consumption, and the status of various appliances. The system can also be programmed to control energy consumption by setting specific limits on energy usage. If the limits are exceeded, the system sends notifications to the user's phone via SMS .The proposed system has several advantages, including real-time monitoring, control over energy consumption, and remote access to data. This system can help users to monitor their energy consumption and save money on electricity bills by reducing excess energy waste. The system also reduces the carbon footprint and promotes environmental sustainability..

2.1 BLOCK DIAGRAM

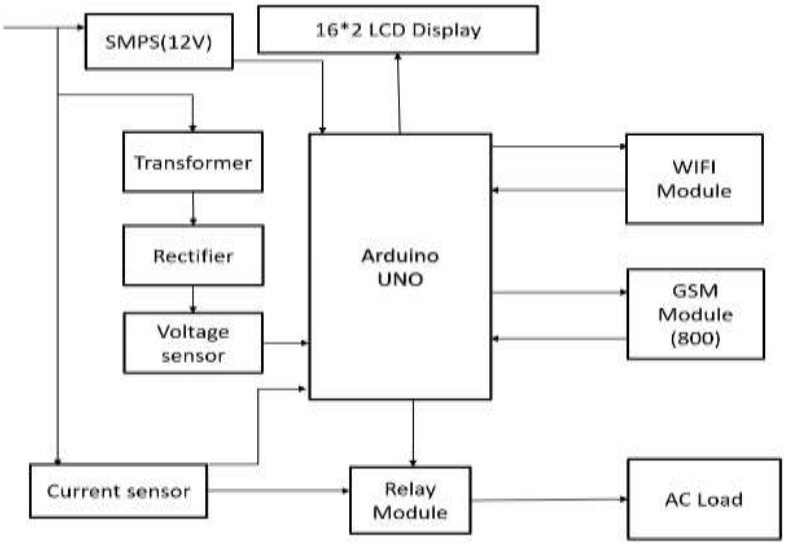

Fig.1 Block diagram

In this project we using A/C current sensor, DC voltage sensor, SMPS (switched mode power supply), Controller (Arduino uno), Relay for controlling purpose, transformer, rectifier and 16×2 LCD display. As its show in the diagram where each hardware will be. The switch-mode power supply (SMPS) is used to convert the AC voltage into 12v and 5v DC voltage and it given to arduino UNO and GSM module. Current Sensor measures the current flowing through the wires and sends the data to the Arduino UNO. Transformer step down the voltage to 12v AC after that rectifier convert AC into DC then DC Voltage Sensor divide the rectified DC voltage and sends the data to the Arduino UNO. The Node MCU is a Wi-Fi enabled microcontroller that communicates with the Arduino UNO and sends the data to the cloud. And the Global System for Mobile Communications (GSM) module is used to send SMS alerts when the energy consumption reaches a certain threshold. We using LCD display to show the energy consumption data in real-time.finaly the relay is used to switch the power supply on or off. The Arduino UNO controls the relay according to the energy consumption data.Overall, the smart energy meter uses various components and sensors to measure energy consumption and send the data to the cloud for analysis and monitoring.

3. WORKING DESCRIPTION

- Initialize the Node MCU microcontroller and connect to the Wi-Fi module network.
- Configure the GSM module to connect to the network of the utility provider.
- Collect energy consumption data using a current sensor attached to the energy meter.
- Transmit the energy consumption data to the central server of the utility provider via the GSM network.
- Verify whether the data transmission is successful.
- If data transmission is successful, wait for the next energy consumption data collection cycle.
- If data transmission is unsuccessful, retry data transmission after a specified time interval.
- Calculate the energy bill based on the consumption data received from the energy meter.
- Display energy consumption data and billing information on a local display or a smartphone application.
- Monitor the energy consumption data regularly and notify the user or the utility company in case of abnormal or emergency situations, such as overloading, power outage, or theft.
- Implement security measures to prevent unauthorized access or tampering with the energy meter or the data transmitted over the network.

4. CONCLUSION

In conclusion, the development of an IoT based smart energy meter based on GSM and Node MCU is a promising technology for managing energy usage and reducing energy wastage. It offers real-time data monitoring, automatic data transmission, and accurate billing, which helps in improving the

efficiency of energy distribution and consumption. By using the Global System for Mobile Communications (GSM) technology, the energy meter can be connected to the central server of the utility company, making it possible to manage energy usage and billing from a remote location. This implies that homeowners and utility companies can monitor energy usage and billing remotely, irrespective of distance or location, leading to a better energy management system. Moreover, the integration of the Node MCU microcontroller and Wi-Fi module technology in the system enables the energy meter to interact with a range of smart devices and execute complex tasks while providing remote access to energy consumption data. Overall, the IoT-based smart energy meter based on GSM and Node MCU is a critical technology in the development of smart grids. Through the integration of IoT, big data, and machine learning, the energy management system can be optimized to minimize energy wastage, improve reliability, and enhance security. This technology presents an enabling environment to solve the challenges associated with traditional energy metering systems, guaranteeing efficient and scalable energy management.

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