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Analysis of Energy consumed by Appliances using IOT

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Abstract:

The project aims in designing a system which makes electric bill payment easier and also controlling of digital meter for electricity department becomes more easily using IOT technology. The GPRS modem provides the communication mechanism between the Server and the energy meter. This project also sends SMS alerts to the user in case of balance goes below some set limit.

IOT based prepaid electricity is a unique and new concept which saves lot of time and power for electricity department. User can recharge the card whenever the power is required. If the amount is low then the status is indicated on webpage by using GPRS technology and if amount is zero, then louds cut off automatically.

Keywords

Automated traffic monitoring and controlling, Arduino, IR sensors, Traffic congestion and IoT.

1. Introduction

The project aims in designing a system which makes electric bill payment easier and also controlling of digital meter for electricity department becomes more easily using GSM technology. The GSM modem provides the communication mechanism between the user and the energy meter by means of SMS messages.

GSM based prepaid electricity is a unique and new concept which saves lot of time and power for electricity department. User can recharge the card whenever the power is required. Electricity department authorities send specially decoded SMS message to the modem connected to the energy meter.

IoT based applications are becoming more popular and provide effective solutions for many real time problems. In this research, real-time monitoring system for residential energy meter is proposed. The presented system provides ubiquitous and continuous access to energy consumption to the consumer by exploiting the advancement of IoT technology. The proposed system is cost effective as it requires a simple upgrade on the existing meters than complete replacement. Further, it is light weight and compact with the usage of soc for control and communication. Through the experimental analysis, it is found that from the collected data, it is possible to obtain the pattern of consumption as well as faultiness present in the existing system. The presented work can also be extended to large scale from which load distributed in the area can be estimated so that the system can be strengthened to enhance performance.

In recent years, due to the advancement in internet technology computerized electricity billing and online bill payment has become possible. However, the assessment of meter reading is still carried out manually. This requires huge manpower. Further, the incorrectness in assessment leads to high revenue loss. AMR (Automated Meter Reading) is the technology that combines automatic assessment of consumption, analysis on the assessed data for billing and payment. To achieve AMR, assignment of IP address to each energy meter is essential. This technology of bringing any device online and connecting it to the internet is termed as internet of things. Based on the communication medium used for data delivery, the existing AMR systems can be classified into two categories namely wired systems and wireless systems. In a wired system, the data transfer is performed either through PLC (Power Line Carrier) or HFC (Hybrid Fiber-Coaxial). In the case of wireless, it is executed using GPRS (General Packet Radio Service), ZigBee or WiFi (Wireless Fidelity). Energy metering through the wire is expensive as it requires infrastructural changes.

The authors have developed standard models for data acquisition, processing algorithms for stakeholder applications. They have developed an AMR system to detect energy consumption and also optocoupler sensor to detect the optical pulse

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generated by the led present in the energy meter. Based on the sensor output, the energy consumption is computed in the microcontroller, alternatively current and voltage transformer are used to read the meter. Further, it also uses both for query processing and open source messaging application for server – client interaction.

In recent years, due to increase in technology computerized electricity billing and online bill payment has become possible. However, the assessment of meter reading is still carried out manually and it requires huge manpower. Further, the incorrectness in assessment leads to high revenue loss.

The main aim of this project is to monitor and control of the digital energy meter. This system enables the user to read the meter readings regularly without any confusion. The advantage of this system is that the user can easily identify the load of each device. As the devices are connected through IoT, they can be operated from any place and at any time.

2. System Design and Architecture

In this design architecture we mainly have 4 components:

1) Arduino
2) GSM
3) Energy Meter
4) LCD display

The block diagram of this system is as follows:

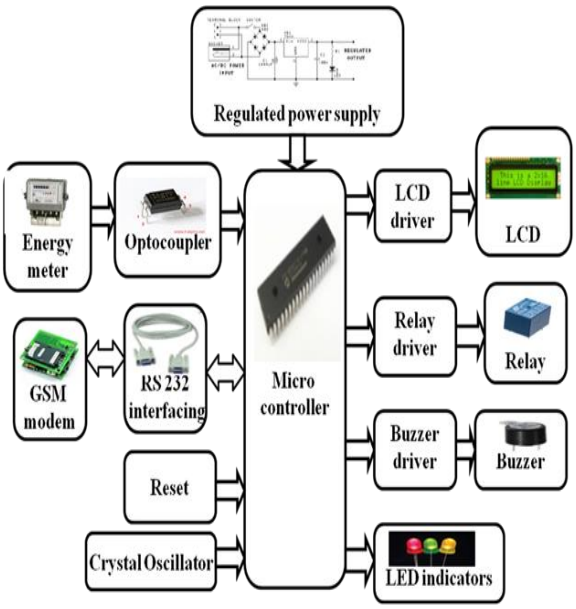


Fig 1: Block Diagram of the Design

3. Results

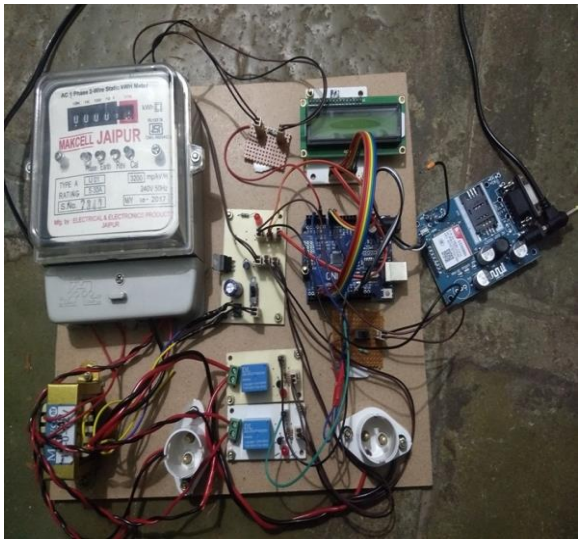
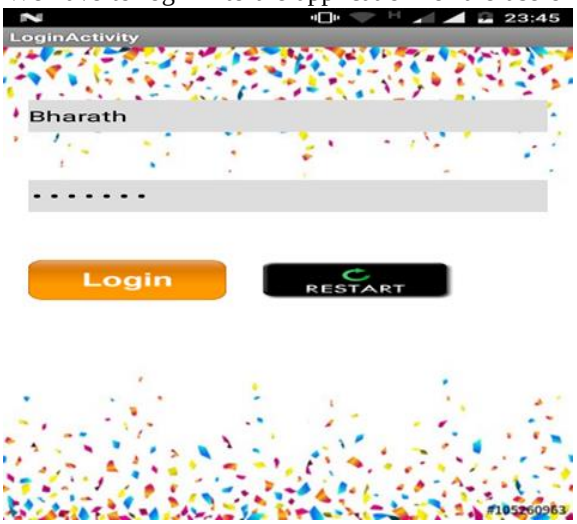


Fig 2: System Architecture

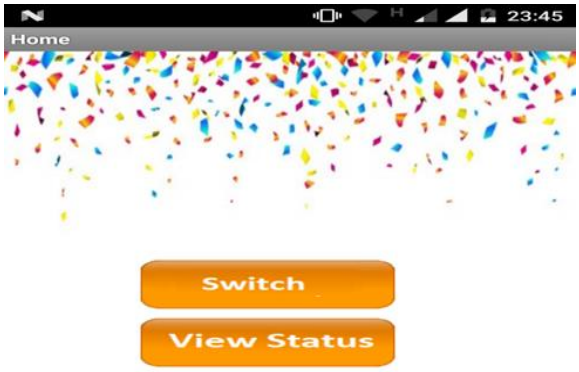
Fig 3: This is the image of the Android application

We have to login into the application for the use of

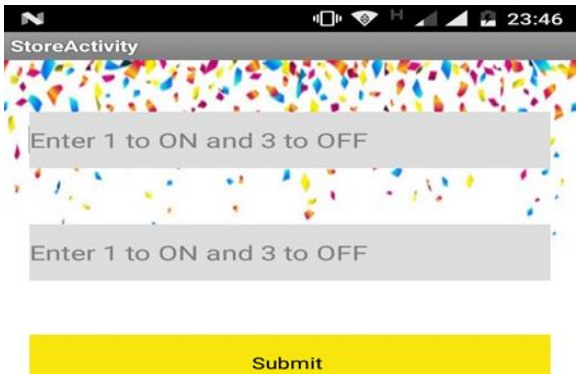


home automation.

After logging into the application then two options are displayed i.e., switch and status. For controlling of appliances we have to click on switch

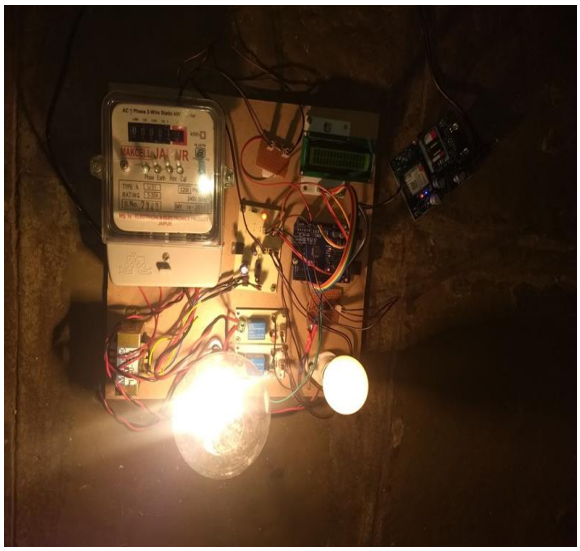


We can switch on appliances by pressing 1 and can switch off by clicking 3



Now both the fields are entered with 1. So that, we can see both the bulbs will glow.

We can see the two bulbs are glowing



We can enter 1 in field1 and 3 in field2 so that we can see one bulb glows and other will be off.

We can see one bulb glows and other one is off

After both fields are entered with 3 we can see both the bulbs are offed.

We can see both the bulbs are switched off.

Advantages

- Energy conservation can be monitored on LCD display.
- The system alerts through SMS.
- Efficient and low cost design.
- Low power consumption.
- Fast and accurate result.

Disadvantages

- Interfacing energy meter to the Micro controller is sensitive.
- It uses wired mechanism.
- Depends on network signal strength.

Applications

This system can be practically implemented in real time in industries and domestic houses.

- House electrical systems.
- Railway electrical systems.
- Remote controlling systems.
- Phone Billing systems

4. Conclusion

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested

Our project "Pre-paid Energy meter using GSM" is mainly intended to design a system which helps in continuous monitoring of energy meter reading and to alert when meter reading goes beyond a set level. This system has an energy meter, load, and LCD and GSM modem interfaced to the micro controller. The micro controller is programmed in such a way that the energy meter always gives the reading to the controller which is displayed on the LCD. The system also alerts through SMS messages using GSM. This project can be extended by eliminating wired mechanism by interfacing a Zigbee module, which helps in monitoring multiple energy meter readings on PC. GSM module can also be interfaced to monitor as well as to control the energy meter from anywhere in the world.

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