International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 12 | Dec 2022 www.irjet.net p-ISSN: 2395-0072

ENERGY METER READING SYSTEM WITH AUTOMATIC BILLING USING CLOUD

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Abstract - *The paper presents a method that permits readings of both the amount of electricity consumed and the amount charged to the customer. Our device displays the electricity readings on an LCD screen and can send the user an SMS with the reading and cost in rupees. In recent years, e-meter (electronic meter) has played a pivotal role in the development of energy- and cost-efficient systems. In the distant future, it will have a highly dependable and productive programmable meter-reading architecture (AMRS). This study intends to outline a simple easiness. An Internet of Things-based energy meter reading system with defect indication. This eliminates the possibility of manipulating with a user's electric bill by allowing the user to view his exact electricity consumption and cost directly from his meter. The project allows a dual interpretation. One for the LCD display and the other for SMS. Our paper consists of a GSM modem coupled to an 8051-family microcontroller. Continuously monitoring electrical pulses and calculating consumption per unit, the system. The system then utilizes the price per unit to determine the cost of electricity. It then transmits this information to the user and electric company via SMS and shows it on an LCD screen. The system is capable of receiving user messages and controlling load activities. The suggested technology disregards the standard digital meter reading system and permits remote electronic meter access. With appropriate authentication, users can access the developed website's features from any location on the earth. The benefits of this project include cost savings, increased energy efficiency, and reduced manpower and time requirements. This project is built using both hardware and software.*

Key Words: Energy Meters, GSM Module, Cloud Computing, Automatic meter reading.

1.INTRODUCTION

Traditional meter reading by a human operator is inefficient to meet the demands of future residential construction. The application of Automatic Meter Reading (AMR) systems, which electronically collect meter readings, is expanding across industrial, commercial, and utility environments. Electronic utility meters are crucial to automating the utility metering procedure. Automated utility meters have numerous new features that reduce the cost of utilities for customers and the cost of utility delivery for the utility provider. The advent of rural electrification presents opportunities for the implementation of new, more efficient metering technologies.

Traditional electromechanical meters, which are still widely used today, are susceptible to drift over time and temperature due to the analogue and mechanical nature of their components. Also inefficient is the collection of meter readings, as a meter reader must be physically present to obtain the readings. This method of collecting meter readings becomes more difficult and expensive when readings must be collected from vast, dispersed rural areas. The reluctance of meter readers to make the effort to travel to these areas results in frequently inaccurate estimates of the amount of electricity consumed. Traditional meter reading is inefficient for households located on the top floors of high-rise buildings and on estates. There is a possibility for unpaid bills, consumer absence, etc. Despite the fact that these conventional meters have been replaced with more efficient electronic energy meters, the problems persist. Consequently, a system that delivers the bill to the user's mobile device is preferable in the current context.

This paper introduces a new method of postpaid electronic energy metering that automatically senses the consumed energy, records these readings continuously, and transmits them to the billing point via the existing GSM network. Lastly, after processing the collected data, an SMS bill is generated using web-based system software and sent to the customer (Short Messaging System). As it is web-based, once the data has been updated, the registered users and authority can monitor and analyses the generated monthly bill from any location.

In residential properties, traditional meter reading is inefficient. There is a possibility for unpaid bills, consumer absence, etc. Despite the fact that these conventional meters have been replaced with more efficient electronic energy meters, the problems persist. Consequently, a system that delivers the bill to the user's mobile device is preferable in the current context.

Using a current sensor, we developed a GSM-based energy meter for our proposed system. This meter computes the bill based on the number of electricity units consumed and sends an SMS to both the electricity department and the user. The user and supplier can check the bill amount from anywhere remotely. The proposed project provides a practical and efficient method for reading energy meters. The primary objective is to reduce manual labor by automatically generating the electricity bill based on the house's electricity consumption. The Arduino-installed programmer will perform the calculations, and the bill will be generated. The user can check their bill amount via an SMS sent to their registered mobile number.

2. METHODOLOGY

2.1 Arduino UNO

The Arduino UNO is the standard Arduino board. In this context, UNO signifies "one" in Italian. It was designated as UNO as the initial release of Arduino Software. It was also the first USB board that Arduino released. It is regarded as the most effective board for numerous projects. Arduino.cc designed and manufactured the Arduino UNO board. ATmega328 microcontroller is the foundation of Arduino UNO. Compared to other boards, such as the Arduino Mega board, etc., it is simple to use. The board includes of digital and analogue Input/Output (I/O) pins, shields, and other circuits.

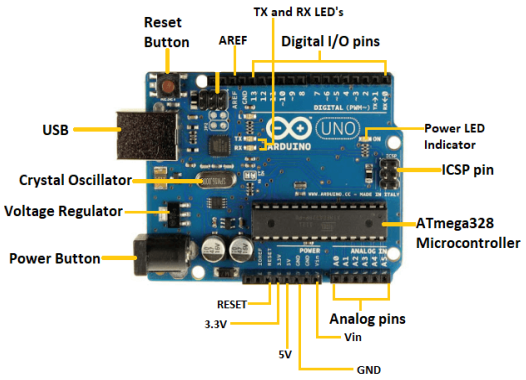

Fig1. Arduino UNO

2.2 Current Sensor

The device is comprised of a precise, low-offset, linear Hall circuit with a copper conduction route placed close to the die surface. Through this copper conduction channel, an applied current generates a magnetic field, which the Hall IC transforms into a proportional voltage. The proximity between the magnetic signal and the Hall transducer optimizes the precision of the device. The low-offset, chopper-stabilized, BiCMOS Hall IC, which is programmed for precision after packaging, provides a precise, proportional voltage.

Fig 2. Current Sensor

2.3 GSM Module

A computer and a GSM-GPRS system can communicate via a GSM/GPRS module. Global System for Mobile communication (GSM) is an architecture utilised in the majority of countries for mobile communication. Global Packet Radio

Service (GPRS) is a GSM expansion that facilitates faster data transmission. GSM/GPRS module comprises a GSM/GPRS modem assembled with a power supply circuit and computer connection interfaces (such as RS-232, USB, etc.). The MODEM is the life force of these modules

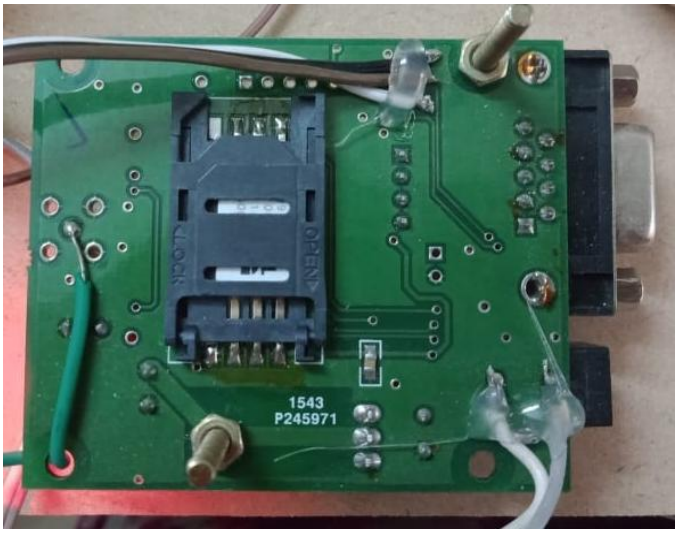

Fig 3. GSM Sensor

2.4 Circuit Diagram

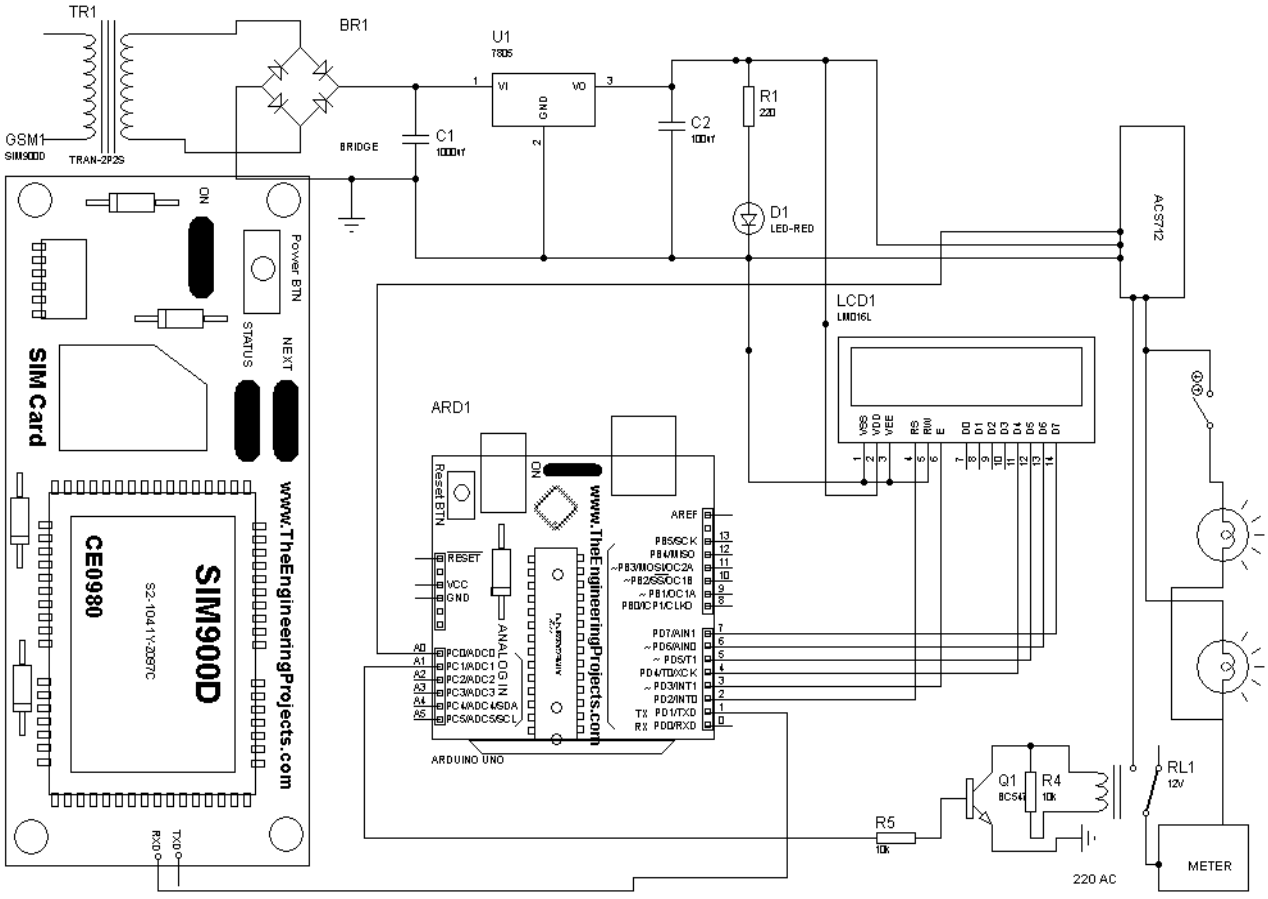

Fig 4.Circuit Diagram

2.5 Flow Chart

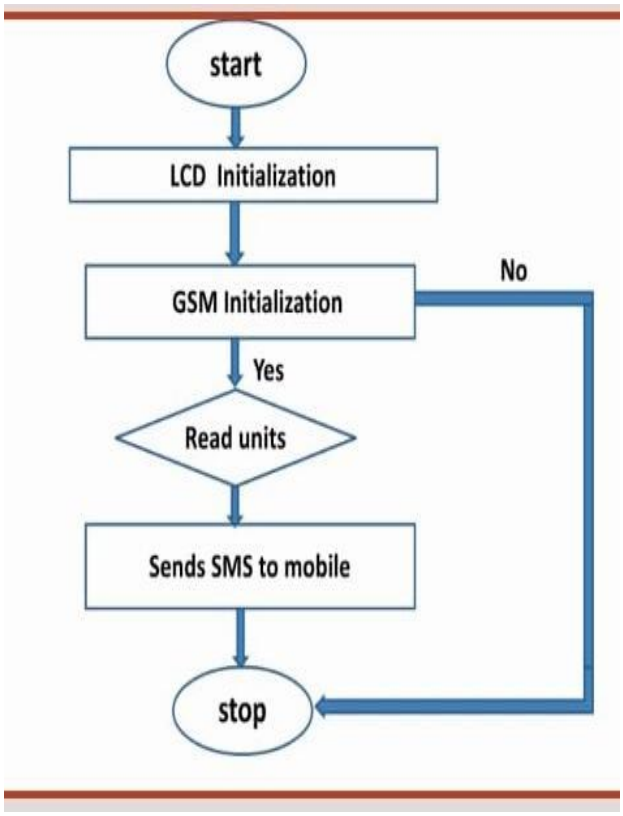

Fig 5. Flow chart

2.6 Procedure

Using the current sensor, we constructed an energy meter in this study. In the GSM Module, a SIM card will be inserted. First, we shall feed the load with fuel (bulb). The adapter will provide the Arduino with its power supply. The current sensor measures the current flowing through the load and transmits the data to the Arduino. Installed on the Arduino UNO, the application watches electrical pulses and calculates unit consumption. Here, the number of electrical pulses is indicated by the number of flashes of the LED light. On the Arduino's LCD, the number of consumed units and the price per consumed unit will be displayed. Through the GSM Module, an SMS containing the number of units consumed and their price is sent to the user's mobile device.

For interaction with the processor or controller, the MODEM requires AT commands, which are transmitted via serial connection. These instructions are transmitted by the controller/processor. The MODEM returns a response after receiving a command. The processor/controller/computer can send various AT commands provided by the MODEM to interface with the GSM and GPRS cellular networks. A GSM/GPRS MODEM is capable of the following tasks: Receive, transmit, and delete SMS messages using a SIM. Read, add, and search SIM phonebook entries. Make, accept, or decline a voice call.

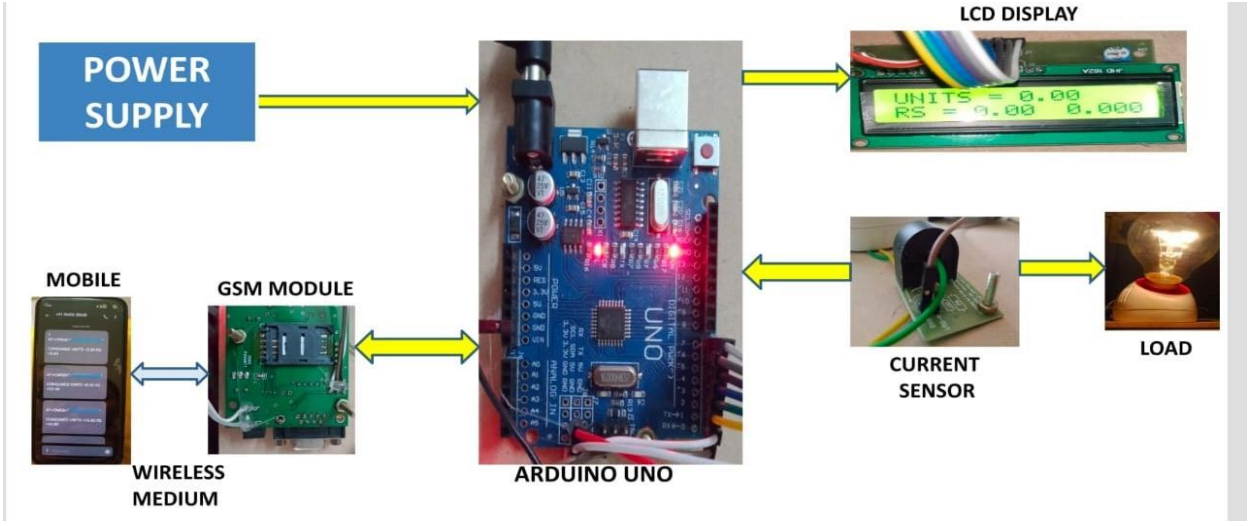

Fig 6. Block Diagram

3. RESULTS AND DISCUSSIONS

Our proposed system displays the electricity usage data on an LCD panel and sends the user an SMS with this reading and the cost in rupees. The system continually analyses electrical pulses and computes electricity usage units. Not only is an SMS sent to the user, but the service provider is also notified. There must be the right signals for the user to receive the bill for the spent electricity.

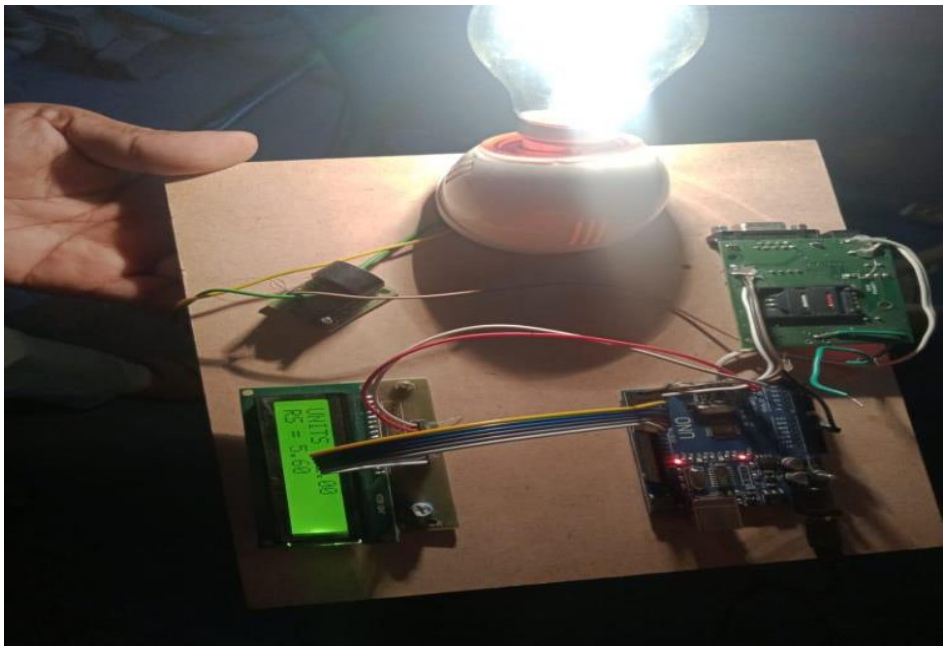

Fig6. LCD displaying units and rupees of electricity consumed

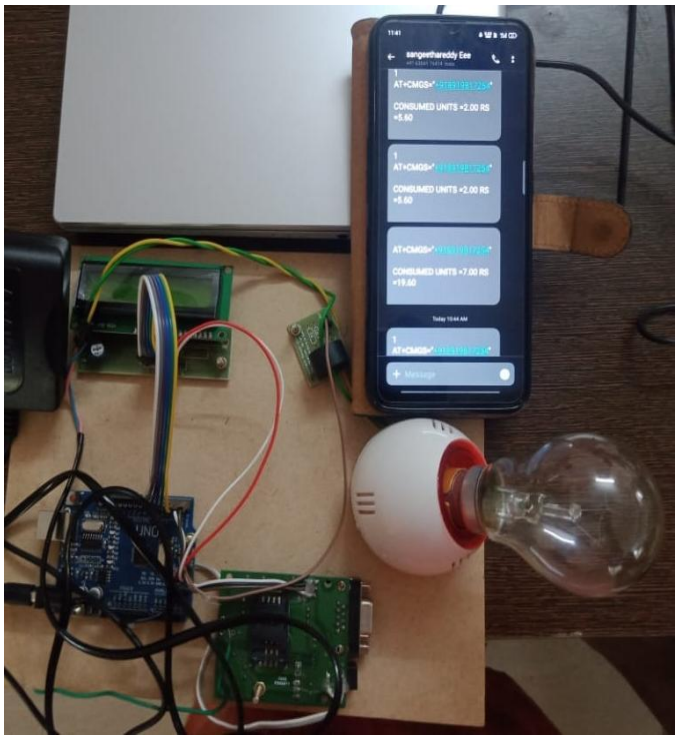

Fig 7. Message of units and rupees of electricity consumed to the user's mobile

4. CONCLUSIONS AND FUTURE SCOPE

Electric utilities use electric meters installed at customer's premises for billing purposes at the end of the month. A person from the electricity department has to visit the consumer premises and note down the reading. This system makes trouble-free for electricity department to access the energy consumed by the consumer from the customer ID also the consumer can monitor the energy consumed by them. The system reads the data from the energy meter without tampering it, the proposed model is used to calculate the energy consumption of the household. This system will bring transparency between provider & consumer.

In addition to this proposed system, the system could be made more smart by allowing the user to check for the power consumption and alert him on his power consumption. And also to include a web/mobile interface that gives the amount of energy consumed by every device in every room and also give the energy conservation tips too, based on the data obtained. The real time data obtained can also be used to built a prediction model over it, for predicting the energy demands trends of the future, over any given time period.

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BIOGRAPHIES

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