iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** IV **Month of publication:** April 2023

DOI: https://doi.org/10.22214/ijraset.2023.51295

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue IV Apr 2023- Available at www.ijraset.com

Automatic GSM Arduino based Energy Meter Reading

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Abstract: ***The main objective of the project is to develop a GSM Aurdino based energy meter reading system and load control through GSM.***
Electricity department sends employees to take meter reading every month, which is an expensive and time consuming job. The proposed project provides a convenient and efficient method to avoid this problem. The electricity department and the user can get the readings of the energy meter of consumers via SMS. The loads can also be controlled by the user of this system via GSM using this project.
A Controller input is effectively in GSM Based to a digital energy meter that takes the reading from the energy meter and displays the same on an cell phone display. The reading of the aurdino based energy meter is also sent to the control room by GSM.
This GSM can also receive commands from the Software to control the owners electrical loads. On receiving command it can switch ON/OFF the loads.

I. INTRODUCTION

Electrical power has become indispensable to human survival and progress. Apart from efforts to meet growing demand, automation in the energy distribution is also necessary to enhance peoples life standard. Traditional meter reading by human operator is inefficient to meet the future residentialdevelopment needs. So there is increased demand for Automatic Meter Reading (AMR) systems which collects meter readings electronically, and its application is expanding over industrial, commercial and utility environment.

Electronic utility meters are an important step towards automating the utility metering process. Automated utility meters have many new features that help to reduce the cost of utilities to customers and the cost of delivering utilities to the utility provider. The onset of rural electrification provides opportunities for new and more efficient metering technologies to be implemented. Traditional electro-mechanical meters, still widely used today, are prone to drift over temperature and time as a result of the analogue and mechanical nature of the components in these meters. Collection of meter readings is also inefficient, because a meter reader has to physically be on site to take the readings.

This method of collecting of meter readings becomes more problematic and costly when readings have to be collected from vast, and often scattered rural areas. Meter readers are reluctant to make the effort to travel to such areas and will often submit inaccurate estimations of the amount of electricity consumed. For households at the top of high buildings and luxury housing plots, traditional meter reading is highly inefficient.

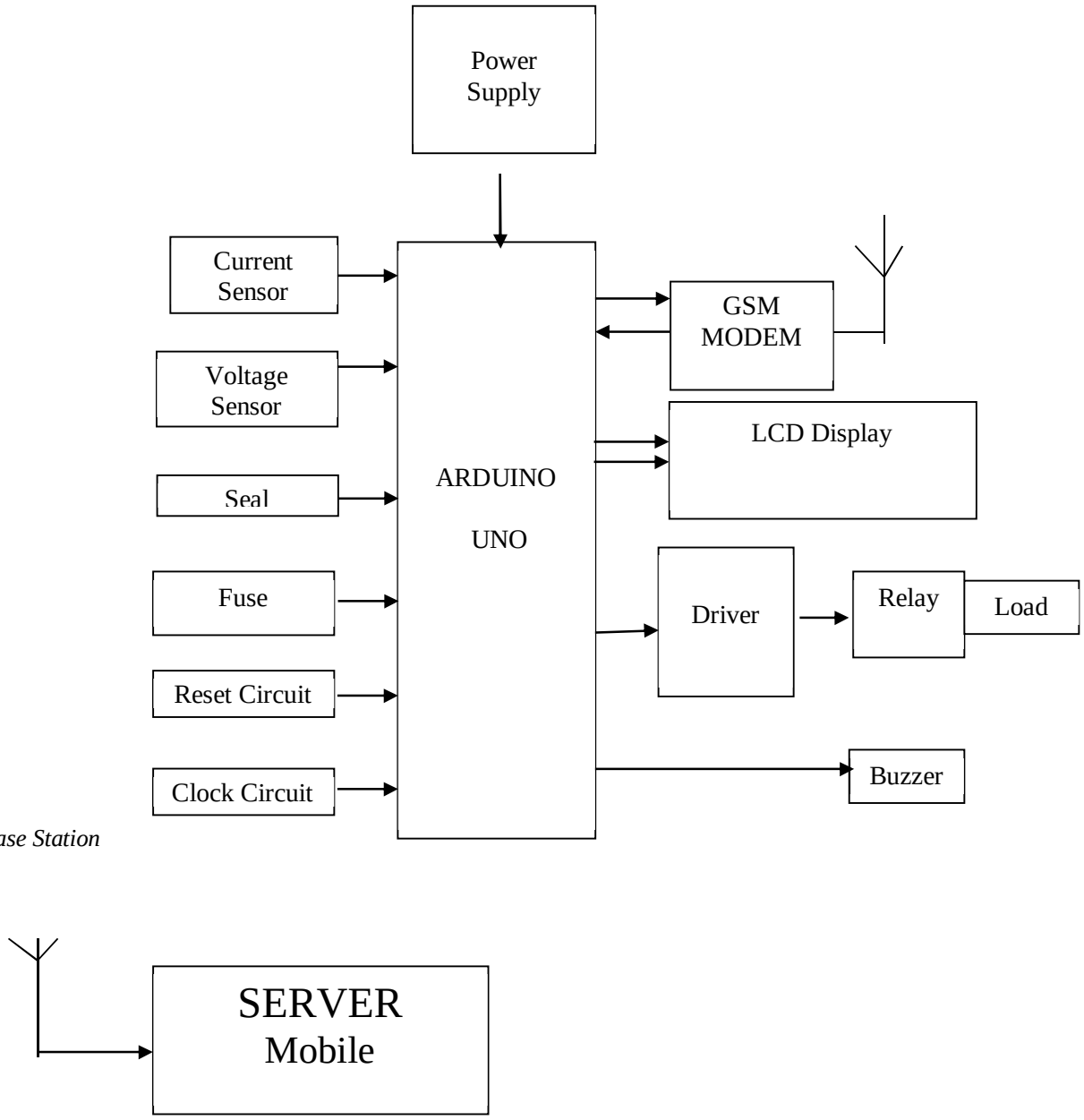
There exists chance for missing bills, absence of consumer etc. Even though these conventional meters were replaced with more efficient electronic energy meters these problems still persists. So a system which will provide the bill in users mobile will be more suitable in the current scenario.

Here a new method of postpaid electronic energy metering is introduced in this paper which will automatically sense the used energy, records these reading continuously, then sends it to the billing point through the existing GSM network. Finally after processing the collected data bill is generated using a web based system software and is send back to the customer as SMS (Short Messaging System)

.As it is web oriented once the data is updated, the registered users and authority can monitorand analyse the generated bill of any month by sitting anywhere in the world.

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A. Consumer



B. Base Station

Fig 1: Block diagram of automatic GSM ardunio based energy meter reading

C. Block Diagram Explanation

In this project we have used Microcontroller Atmega328P, Buzzer, Relay and Relay Driver, LCD, Current Sensor ACS 712, Variable Pot, and Jumpers.

In this Energy Meter GSM is used to communicate with the KEB Station Directly with out interference of the any user. Like it is used to update the Units of Energy Meter to KEB Station when ever they ask for billing. GSM will be used as communication media between the Energy meter and KEB Station. Even this GSM is used to transmit the warning message to the KEB Station about the theft made at the meter. Once again it is also used to receive the permitted message from the KEB Station after the user has paid the penalty. The buzzer is used to alarm during the theft, Fuse blown and message from Server.

Current Sensor is used to sense the current how much the connected Load is drawing and it will give the drawn current in the form of voltage.

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By the output voltage of the Current Sensor controller will count the number of units drawn from the load. And when NOT PAID Message is arrived from Server to Meter then the load controlling relay will be switched OFF by microcontroller through Relay driver. By which Load will be disconnected from the mains.
LCD is used to Display information related to Bill amount with date and warning messages.
Variable Pot is used to give Fluctuating voltage as input to microcontroller. Where controller will detect and Switches OFF the Load through relay and relay driver for protection and safety of Load.
We have used the Jumper for Fuse and seal demonstration purpose. If seal is broken then controller will cut OFF power to home and send warning message to KEB Station using GSM MODEM. Similarly if fuse is broken then Controller will send Fuse Blown message to KEB Station through SMS

II. RELATED WORK

In this project we have used Microcontroller Atmega328P, Buzzer, Relay and Relay Driver, LCD, Current Sensor ACS 712, Variable Pot, and Jumpers.

1) *Microcontroller Atmega 2560:* It is the controller which will be programmed to control the peripherals connected to it.
2) *Power Supply Section:* It provides the power for the controller and other hardware connected to it.
3) *LCD:* we have used the 16X2 Liquid Crystal Display where we can display 16 Characters in each line. There are 2 Lines so we can display 32 Characters at a time on this LCD screen. It consumes 5V DC and we can display only text. It is a 8 bit display we have used. But we used this in the 4 Bit mode so by which the I/O line of Microcontroller can be saved. We used this LCD to display warning Messages from microcontroller when ever controller gets warning signals from the sensors connected at its Input.
4) *Relay and Relay Driver:* Where this PC 817 has LED at its input and Photo Transistor at its output. Microcontroller will give signal to input LED of PC 817 and in turn this LED will switches ON the Photo Transistor and from there the NPN Transistor which is connected to this PC 817 output will get ON and by this transistor relay coil will get the energy to switch ON the Output loads connected to Relay. These are Electromagnetic Switch which will be used to switch ON/OFF the 240V AC loads which will be used in the Project. This relay will have coil at it's input which will be driven by small DC Voltage 5V. we are going to use SPDT type. We have used Free wheeling Diode in parllel to relay Coil by which relay will be Turn OFF Suddenly without any delay. Here Photo Coupler provide good isolation between the controller and Relay by acting as a Relay driver in this project.
5) *GSM Modem:* We have used the GSM Modem as a serial communication device to transmit and receive SMS from the Microcontroller. It is from 2.5G Technology, It is transceiver We can communicate only Voice and Text, It has got the Baud Rate of 9600, We are going to use the Module SIM 300. Where this modem will be Initialized and Communicated with the Microcontroller with the help of AT Commands. This GSM Modem is used to send warnig Messaged to the user and KEB Station in this project. And it is used to receive SMS sent by Server and further that particular message is processed and Displayed on LCD Screen.
6) *Jumper:* We have used the Jumper for Fuse and seal demonstration purpose. If Jumper is removed from its position then we get High signal in Controller input from which we come to know Seal is broken then controller will cut OFF power to home by sending signal to Relay through Relay driver according to the program written by programmer and send warning message to KEB Station using GSM MODEM. Similarly if fuse is broken then Controller will send Fuse Blown message to KEB Station through SMS.
7) *Variable Pot:* In this project for demonstrating Voltage Fluctuation we have used Variable Pot. The Variable pot is used to give Fluctuating voltage as input to microcontroller analog pin. Where controller will detect the fluctuation and further Switches OFF the Load through relay and relay driver for protection and safety of Load.
8) *Current Sensor:* Hall effect Sensor ACS 712 is used to sense the flow of current, that how much the connected Load is drawing and it will give the drawn current in the form of voltage. By the output voltage of the Current Sensor given to analog channel of microcontroller, it will count and calculate the number of units drawn from the load. And update to server when request is received. when NOT PAID Message is arrived from Server to microcontroller through GSM then the load controlling relay will be switched OFF by microcontroller through Relay driver. By which Load will be disconnected from the mains.

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III. CONCLUSION

There is a lot of wastage of power due to the consumer‟s lack of planning of electrical consumption in an efficient way. Since the supply of power is limited, as a responsible citizen, there is a need to utilize electricity in a better and efficient way. The distribution company has to receive huge amounts in the form of pending bills, which results in substantial revenue losses and also hurdles to modernization because of lack of funds.

The billing system is minimally able to detect power theft and even when it does at the end of the month. Also, the distribution company is facing many problems in terms of losses. The distribution company is unable to keep track of the changing maximum demand for domestic consumers.

The consumer is facing problems like receiving due bills for bills that have already been paid as well as poor reliability of electricity supply and quality even if bills are paid regularly. The remedy for all these problems is to keep

track of the consumers load on a timely basis, which will help assure accurate billing, track maximum demand, and detect online theft. These are all the features to be taken into account for designing an efficient energy billing system.

The present project incorporates these features to address the problems faced by both the consumers and the distribution companies.

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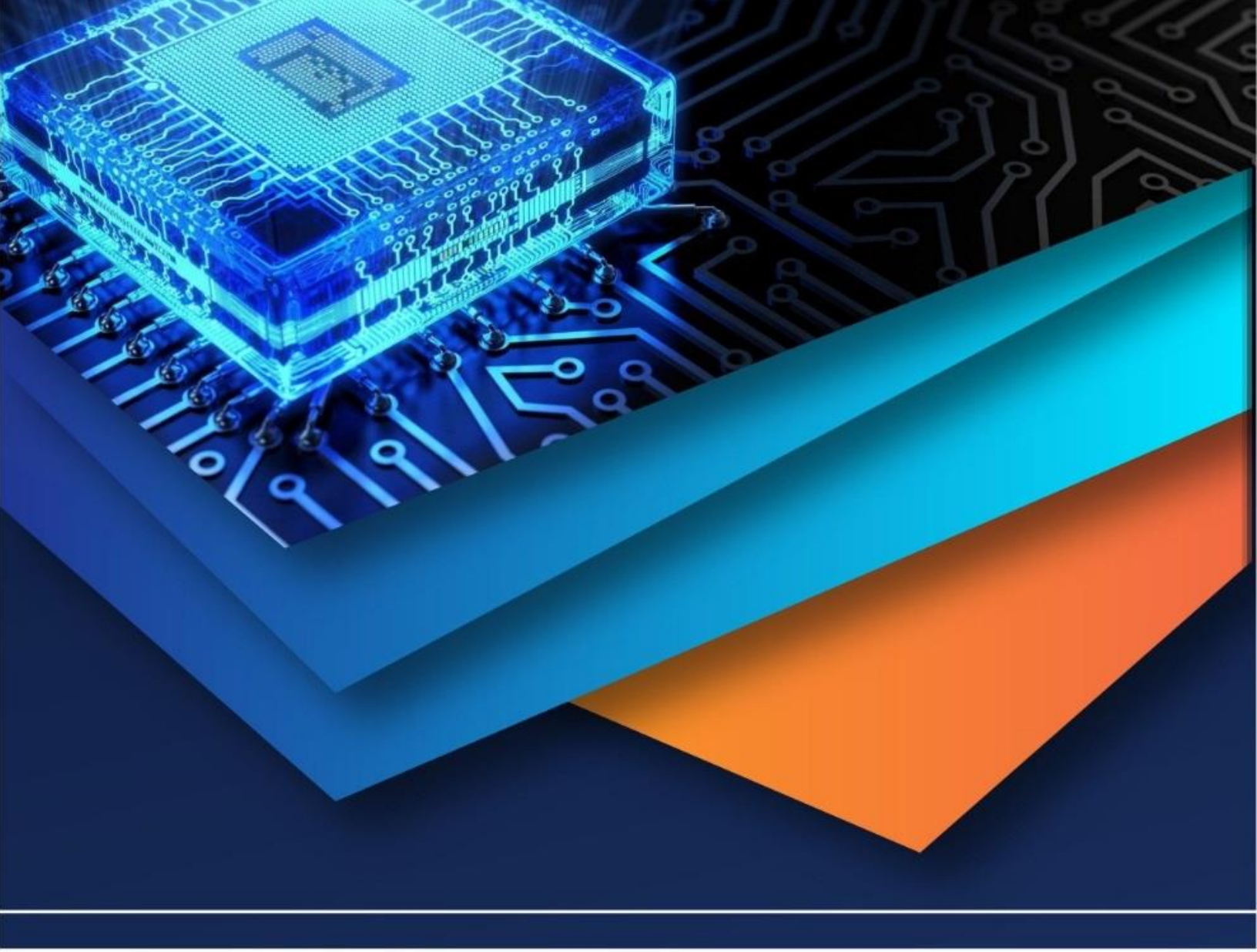
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