ISSN 2277-2685
IJESR/January. 2021/ Vol-11/Issue-1/149-155
B. Haneesh, G.V.V. Nagaraju et. al., / International Journal of Engineering & Science Research

SMART ENERGY METER WITH OVERLOAD PROTECTION AND ALERT SYSTEM

B. Haneesh[*1], G.V.V. Nagaraju[*2]
[*1, 2] Assistant Professor, Dept. of Electrical and Electronics Engineering.
A.M Reddy Memorial College of Engineering and Technology, Andhra Pradesh.

Abstract: Advancements in automation are revolutionizing our surroundings and simplifying our lives. Our concept revolves around developing an automated electricity billing system to enhance daily life convenience. The primary objective is to design a system that automatically generates electricity bills. The entire module will monitor electricity consumption, with an Arduino microcontroller unit employed to track all units consumed. Users will have the flexibility to set a predetermined load value, and if this limit is exceeded, they will receive a notification on the LCD display indicating "system overload" for that phase. This alerts users to their load status, empowering them to manage their usage effectively. Our prototype offers two key advantages: users can define an energy threshold, and they are promptly notified if this threshold is surpassed. This not only benefits users but also the electricity provider by promoting efficient energy management. Additionally, the meter will trip in cases of high energy consumption, thereby enhancing safety for domestic users.

Keywords: Arduino micro-controller, Arduino IDE, Energy Meter, LCD, GSM Module.

Introduction

In the early phase of household technology, delivery of electricity is completely depended on traditional energy meters. These meters play a key role in measuring the consumption of electrical energy in individual households. The usage of these meters has been slowly declining with the improvement in technology as fast changes has been made to encounter the problems occurred by the traditional meters.

- **Problem Description**

The major problem arises when habitants are unaware of their daily behavior. Monthly feedback given to the consumers is not sufficient as the consumers will not have knowledge on how much energy does the individual appliances consume. To overcome the problems of traditional electricity meters, electronic meter or static energy meter comes in picture. Now a day's, technology is developing rapidly. High automated and secured systems are preferred in all fields including electricity distribution. Energy is the prime mover of economic growth and is vital to the sustenance of modern economy. Future economic growth crucially depends on the long term availability of energy from its sources.

- **Scope**

The "Smart Electric Energy Meter" mainly aims at the middle class and the lower class family to bring their electricity bill down with the help of the power consumption alert system. It benefits the government as it is helps in reducing the power consumption and succeeding can reduce the unusual power usage. Energy meters being deployed at homes are used for reading the power that is being consumed. Each consumer may fix a customized threshold value (unit). If the value reaches above the threshold, it will alert to the consumer by sending massage. This system may install at any place where the energy consumption should be regularly monitored and controlled. The consumers can fix their own

threshold budget values and can be easily customized based on their requirements. This is used to continuously monitor the meter reading and give Information about the number of units consumed to the consumer.

- **Objectives**

One avenue through which today's energy problems can be address through the reduction of energy usage in households. This has increased the emphasis on the need for accurate and economical methods of power measurements. The good goal of providing such data is to optimize and reduce their power consumption. The objectives are as follows:

1. To design a circuit which continuously monitors the meter reading and display the information to users.

2. In day to day life, people does not keep constant watch on the energy meter readings so, the another objective is that by to send message on user's devices, make that user aware of his/her consumption.

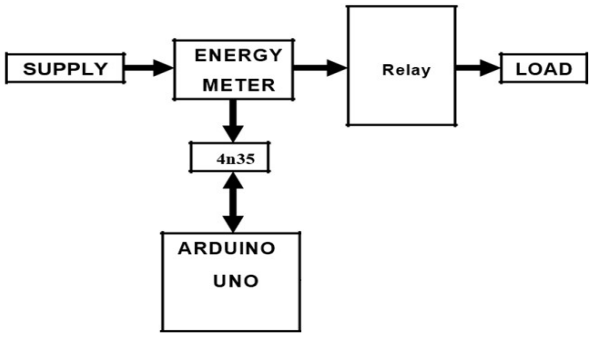
EXISTING METHOD:

In existing system either an electronic energy meter or an electro-mechanical meter is fixed in the premise for measuring the usage. The meters currently in use are only capable of recording kWh units. The kWh units used then still have to be recorded by meter readers monthly, on foot. The recorded data need to be processed by a meter reading company. For processing the meter reading, company needs to firstly link each recorded power usage datum to an account holder and then determine the amount owed by means of the specific tariff in use many systems built on various platforms have been proposed by different research groups all over the world for Automatic Meter Reading. Tele watt meters were implemented to transmit data on monthly basis to a remote central office through a dedicated telephone line and a pair of modems. A microprocessor or DSP- based meter is used in this to measure the electricity consumption of multiple users in a residential area. A master PC at the control centre was used to send commands to a remote meter, which in turn transmitted data back, using the Power Line Communication technique. These techniques were mainly implemented in areas that had a fixed telephone network. Bluetooth energy meters were designed and implemented in some areas where several meters in close proximity, communicated wirelessly with a Master PC. In this measurement technique that encompasses the GSM network as a mean of transmitting energy data is more relevant. The GSM network offers most coverage in most developed and developing countries

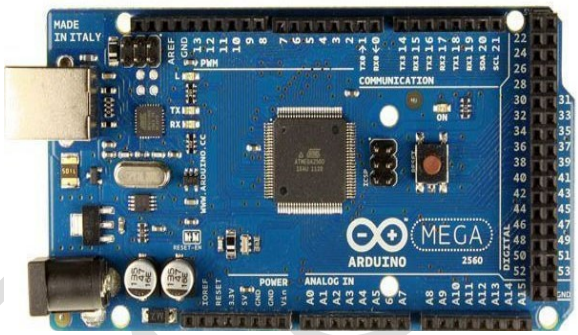
PROPOSED METHOD:

The proposed system operate with high speed and it will sends the messge before increasing of unit charge by using data provided in the main server system for this here using GSM system which uses GPRS network for connecting . these will increase electricity bill more so by using this proposed system we can reduce majorly. It usefull for both the user and electricity board it reduces human needs by providing services using cellular network.

Block diagram



ARDUINO



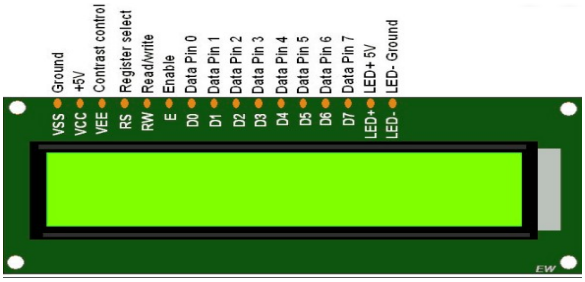
Overview:

Arduino Uno is a microcontroller board subject to the ATmega328P (datasheet). It has 14 pushed information/yield pins (of which 6 can be utilized as PWM yields), 6 essential information sources, a 16 MHz completed resonator (CSTCE16M0V53-R0), a USB alliance, a force jack, an ICSP header, and a reset button. It contains all that ordinary to help the microcontroller; on a crucial level interface it to a PC with a USB association or force it with an AC-to-DC connector or battery to begin. You can intrude with your Uno without anguishing essentially overachieving something mistakenly, most central outcome possible you can trade the chip for two or three dollars and start once more. "Uno" suggests one in Italian and was picked to stamp the presence of Arduino Software (IDE) 1.0. The Uno board and structure 1.0 of Arduino Software (IDE) were the reference sorts of Arduino, direct made to unendingly current deliveries. The Uno board is the first in the headway of USB Arduino sheets and the reference model for the Arduino stage; for a sweeping once-over of current, past, or old sheets see the Arduino report of sheets. •

LCD

LCD (Liquid Crystal Display) is such a level board show which utilizes fluid noteworthy stones in its major sort of development. LEDs have a gigantic and moving methodology of usage cases

for clients and connections, as they can be customarily found in telephones, TVs, PC screens, and instrument sheets.



Induction Type Energy Meter

In this energy meter two coils are connected in different circuit for measurement of power. The fixed coil are connected in series with the load and so carry the current in the circuit. The fixed coil therefore forms the current coil of the wattmeter. The moving coil is connected across the voltage, therefore carries a current proportional to the voltage. A high non inductive resistance is connected in series with the moving coil to limit the current to the small value. Since the moving coil carries a current proportional to voltage.

SOFTWARE TOOLS

Arduino IDE (Integrated Development Environment)

The Arduino progress condition contains a word processor for including code, a message zone, a book maintains, a toolbar with gets for crucial cutoff regular environmental factors, and an improvement of menus. It interfaces with the Arduino contraption to move activities and talk with them.

Making Sketches

Programming made using Arduino is called follows. These depictions are written in the substance boss. Depictions are saved with the record progress .ino. It has featured for cutting/staying and for looking/dislodging content. The message a region gives input while saving and passing on what's more shows abuses. NB: Versions of the IDE before 1.0 saved draws with the expansion pde It is possible to open these records with understanding 1.0, you will be begun to save the sketch with the .ino progression on save.

The Arduino condition uses the opportunity of a sketchbook: a standard spot to store your undertakings (or depicts). The depictions in your sketchbook can be opened from the File Sketchbook menu or the Open catch on the toolbar.

Tabs, Multiple Files, and Compilation

Connects with you to figure out draws with more than one record (all of which appear in its own astounding tab). These can be typical Arduino code records (no new unexpected new development), C reports (.c speeding up), C++ records (.cpp), or header records (.h).

Advantages :

1. It has efficient damping system.
2. It has scale having large division thus it is easier to take reading with this instrument.
3. It has independent of field flux effect.

Disadvantages :

1. It can work only on AC.
2. It consume more electric power.

Conclusion

Automatic meter reading at not only reduces the problem of manual meter reading but also provide additional features such as power disconnect due to outstanding dues, power cut alert, tempering alert. It displayed the information on lcd to the consumer and can be to the energy provider company whether a consumer using more than specify limit of load. The statistical load used and profile can help the customer to manage their energy consumption. This makes the consumer an active part of energy management.

Future Aspects:

As there are plenty of ideas and innovation that one could implement, there are also many innovative ideas that can be processed further or extended further in our project. Since here we are concentrating on the costumer side and one can also include the features related to ELECTRICITY BROAD. i.e. its help the consumer to know their daily, weekly or monthly unit uses. By providing SMS BY GSM MODULE to the consumer. Which would enhance the experience of the economic consumer with modern digital meter. One can also include PREPAID AND INSTANT BILL at any instant of the time. By this feature consumer can know economical consumer can vary his/her consumption. Also a timer control can be provided which would automatic cut down the system supply. If the payment of

bill is done in the specified time limit. And here we used one GSM modem for one meter but in future work of this project one GSM modem may use for more than one which make it more cost effective.

By using Google cloud service we can put the recorded data on Google cloud. By doing so, we can see the monthly data of power consumption analysis of a certain period. We can easily get our consumption graph from cloud and can check where and how we have used the electricity.

By using SD card module in this project, we can save the counted readings. The benefit of SD card module is if the power failure occurs for some time and if we want to resume our readings again from the reading before power failure; we will be able to do it.

REFERENCES

[1] Bharath P, Ananth N, Vijetha S, Jyothi Prakash K. "Wireless automated digital Energy Meter", ICSET 2008.

[2] P.K. Lee and L.L. Lai, "A practical approach to the wireless GPRS on-line power quality monitoring system", Power Engineering SocietyGeneral Meeting, 2007.

[3] Subhashis Maitra, "Embedded Energy Meter- A new concept to measure the energy consumed by consumer and to pay the bill", Power System echnology and IEEE Power India Conference, 2008.

[4] T El-Djazairy, B J Beggs and I F StewartInvestigation of the use of the Global System for Mobile mmunications network fmetering and load management telemetry", for Electricity Distribution.

[5] Li Kaicheng, Jianfeng, Yue Congyuan, Zhang Ming. "Remote power management and meter-reading system on ARM microprocessor", Precision electromagnetic Measurements Digest,2008. CPEM 2008. Conference on Digital Object Identifier.

[6] M.P Praveen, "KSEB to introduce SMS-based fault maintenance system", The Hindu News on 26/06/2011,

[7] Ashna. k PG Scholar, Electronics & Communication Dept. "GSM Based Automatic Energy Meter Reading" IEEE 2013.

[8] Chengen Wang Zhuming Bi Li Da Xu , "IoT and Cloud Computing in Automation of Assembly Modeling Systems" IEEE Transactions On Industrial Informatics, vol. 10, no. 2, 2014.

[9] Cui Wenshun, Yuan Lizhe, CuiShuo and Shang Jiancheng ,"Design and Implementation of Sunlight Greenhouse Service Platform Based on lOT and Cloud Computing" 2nd International Conference on Measurement, Information and Control, 2013.

[10] Lodhi, Amairullah Khan, M. S. S. Rukmini, Syed Abdulsattar, and Shaikh Zeba Tabassum. "Performance improvement in wireless sensor networks by removing the packet drop from the node buffer." Materials Today: Proceedings 26 (2020): 2226-2230.

[11] Lodhi, Amairullah Khan, and Syed Abdul Sattar. "Cluster head selection by the optimized ability to restrict packet drop in wireless sensor networks." In Soft Computing in Data Analytics, pp. 453-461. Springer, Singapore, 2019.
[12] Lodhi, Amairullah K., M. Santhi S. Rukmini, and Syed Abdulsattar. "Energy-efficient routing protocol for network life enhancement in wireless sensor networks." Recent Advances in Computer Science and Communications (Formerly: Recent Patents on Computer Science) 14, no. 3 (2021): 864-873.
[13] Ketki Ram Bhakre, R. K. Krishna "Distance Distribution Approach of Minimizing energy Consumption in Grid W3ireless sensor network" in the International Journal of Engineering and Advanced Technology (IJEAT), Volume1, Issue5, June 2011.
[14] Lodhi, Amairullah Khan, M. S. S. Rukmini, and Syed Abdulsattar. "Energy-efficient routing protocol based on mobile sink node in wireless sensor networks." International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN (2019): 2278-3075.
[15] Lodhi, Amairullah Khan, M. S. S. Rukmini, and S. Abdulsattar. "Energy-efficient routing protocol for node lifetime enhancement in wireless sensor networks." Int J Adv Trends Comput Sci Eng 8, no. 1.3 (2019): 24-28.

AUTHOR PROFILE

MUZAMMIL HUSSAIN B.Tech student in ECE from Shadan College of Engineering And Technology, Peerancheru, Telangana.

SYED MASIUDDIN B.Tech student in ECE from Shadan College of Engineering And Technology, Peerancheru, Telangana.
E-mail Id: goudnandini694@gmail.com.

MK AMEERUDDIN B.Tech student in ECE from Shadan College of Engineering And Technology, Peerancheru, Telangana.
E-mail Id: mallikarjungoud9699@gmail.com.

Ms. RUBEENA BEGUM, Assistant Professor, ECE DEPARTMENT, Shadan College of Engineering and Technology, Peerancheru, Hyderabad
E-mail Id:rubeenabegum72@gmail.com.