

Automatic Energy Meter Reading System with Instant Billing and Load Control Based on GSM Technology

AYESHA AMREEN¹, PROF.K.SOMASEKHARA RAO²

¹PG Scholar, Dept of ECE, Geethanjali College of Engineering & Technology, Hyderabad, India.

²Professor, Dept of ECE, Geethanjali College of Engineering & Technology, Hyderabad, India.

Abstract: The technology of e-metering (Electronic Metering) has gone through rapid technological advancements and there is increased demand for a reliable and efficient Automatic Meter Reading (AMR) system. This paper presents the design of a simple low cost wireless GSM energy meter and maintained automating billing and managing the collected data globally. The proposed system replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider. A GSM based wireless communication module is integrated with electronic energy meter of each entity to have remote access over the usage of electricity. To maintain user billing information and handling bill generation and payment modes of bill with consideration of Energy utilization is done by means of Short Message System (SMS) to the Registered Number in the Energy Distribution Office.

Keywords: Automatic Meter Reading System (AMRS); GSM; Short Messaging System (SMS); Embedded-C.

I. INTRODUCTION

Electrical energy has become essential for human survival and progress. Apart from efforts to meet the growing demand, the automation of power distribution is also needed to improve living standards of people. Traditional meter reading by human operator is inefficient to meet future residential development needs. So there is a greater demand for Automatic Reading System which collects readings of electronic meters, and its application is expanding in the industrial, commercial and utility environment. Meters of electronic public services are an important step towards automation of the measurement process service step. Automated utility meters have many new features that help reduce the cost of customer services and the cost of delivery of public services to the utility provider. The start of the rural electrification offers opportunities for new and more efficient technologies to be applied measurement. Traditional electromechanical meter, still widely used today, are prone to drift over time and temperature as a result of the analog components and mechanical nature on these meters. Collection of meter readings is also inefficient, because a meter reader have to be physically there to take readings. This method of collecting meter readings becomes more problematic and costly when readings have to be collected from large, often isolated rural areas.

Meter readers are reluctant to make the effort to travel to these areas and often present inaccurate estimates of the amount of electricity consumed. For households in the top of tall buildings and plots of luxury homes, traditional meter reading is highly inefficient. There is possibility that the missing bills, the absence of consumers, etc. Although these

conventional meters were replaced by more efficient electronic counters energy these problems persist. So a system that will provide the bill to mobile users will be more appropriate in the current scenario. Here a new method of measuring postpaid electronic energy is introduced in this paper which automatically detects the energy used continuously reading these records, then sends it to the point of billing through the existing GSM network. Finally, after processing the collected project data is generated using a GSM and sent back to the client as SMS. As once the data is updated, registered users and authority can monitor and analyze the bill generated every month by sitting anywhere in the world.

II. RELATED WORKS

In the existing system either an accountant or an electromechanical electronic energy meter is set at the premise for measuring usage. The meters are used currently only able to record kWh units. kWh units used then still have to be registered by the meter readers monthly, on foot. The recorded data need to be processed by an enterprise meter reading. For processing the meter reading, the company must first bind each data recorded energy use to account holder and then determine the amount owed by the specific rate in use. Many systems built on various platforms have been proposed by different research groups worldwide for Automatic Meter Reading. There are two types of AMR systems based on wire and wireless. Power Line Carrier (PLC) and the Telephone Line (optical / cable) are the AMR system based on wire and several related jobs are available. Now many systems have been proposed for metering mail based on GPRS, Bluetooth, and GSM as explained in [1], [3], [4], [5], [6], [7] and [8].

Design an electricity meter for the transfer of information from long-distance data based on GPRS is proposed in [1]. These systems cannot be applied as easily because the regular use of GSM is still a dream for ordinary people. A GSM energy meter installations Instant Billing is introduced in [2] and [3], but still the problem lack of SMS will degrade the accuracy and performance.

III. GSM METER ARCHITECTURE

In developing a technology that could replace one that has been in use for over thirty years, not only the key question must be addressed, but added functionality and solutions to other obstacles of the prior art must be addressed. Even existing meter readers and other employers have to accept the quality and effectiveness of the proposed system. The engineering challenge is to develop a product that can serve as a replacement for the wireless system and measurement system currently in use billing. This emphasis on the development phase meter has to work under the old conditions and perform all the above functions, but also be able to transmit information in a new way and perform additional functions without the need to replace the entire meters grid simultaneously. The AMR system developed consists of three main parts: a GSM digital power meter installed on each individual unit consumption, transmission facilities, and the billing server-side energy supplier. Description and details of functional blocks shown in Fig.1.

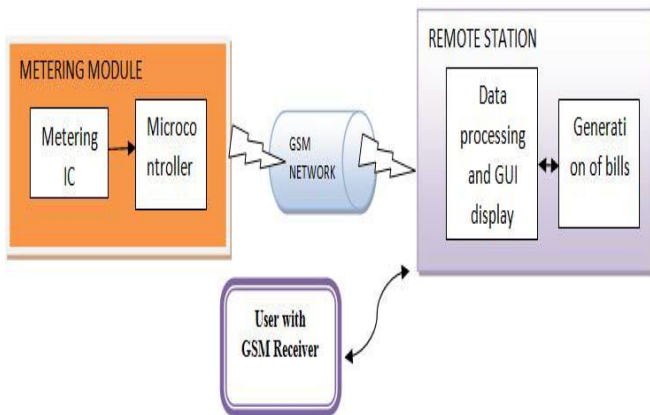


Fig.1. Overview of Proposed System.

IV. DETAILED DESIGN

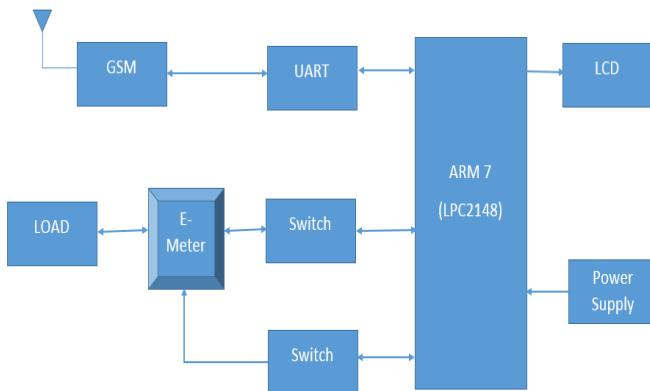


Fig.2. Detailed architecture of Proposed Model.

In this application the following hardware components are used they are GSM Modem as shown in Fig.2. (SIM 300), ARM7 processor (LPC2148), E-Meter, LCD and UART0/1 with some other supported power supply and minima required components. The volatile memory should maintain by ARM7, user energy utilization and bill desk detail notification should take care by GSM with help of UART. The E-Meter should display the energy consumption.

V. MAJOR HARDWARE DETAILED DESIGN

A. GSM Modem



Fig.3. GSM Modem.

This is a plug and play GSM Modem with a simple interface to the serial interface. Use it to send SMS, make and receive calls, and do other GSM operations by monitoring through simple AT commands to micro controllers and computers. It uses the very popular SIM300 module for all its operations. This Modem has a standard RS232 interface that can be easily connected to any microcontrollers and computers as shown in Fig.3. The modem will include all required external circuitry needed to start experimenting with the SIM300 module as the power control, external antenna, SIM Holder, etc.

B. ARM 7(LPC2148)



Fig.4. ARM7 (LPC2148).

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LPC2148 Development Board Pro is a powerful development platform based on LPC2148 ARM7TDMI microcontroller with 512K on-chip memory as shown in Fig.4. This board is powered by the USB port and requires no external power supply. It is ideal for developing embedded applications involving communication high speed wireless, recording USB data based, monitoring of real-time data and control, interactive dashboards etc. The on-chip USB controller provides a direct high speed interface to a PC / laptop with speeds up to 12 Mb/s. The UART boot loader eliminates the need for an additional programmer and allows you to program using the serial port. The board peripherals include SD/MMC card interface, USB 2.0 interface, I2C EEPROM 4Kbit, wireless interface module ULN2003 500mA current sinking driver, L293D DC motor controller, 16X2 character LCD and many more. The on-chip and external hardware on the development board peripherals are interconnected by bridges and male connectors. The I/O pins microcontroller can be accessed from a 50-pin male. This direct access to the pins of I/O allows you to easily connect their own devices to the processor. The board is double sided PTH PCB board to provide increased resistance to the connector joints for increased reliability.

VI. RESULTS

The fig.5, shows the complete application of the proposed model.

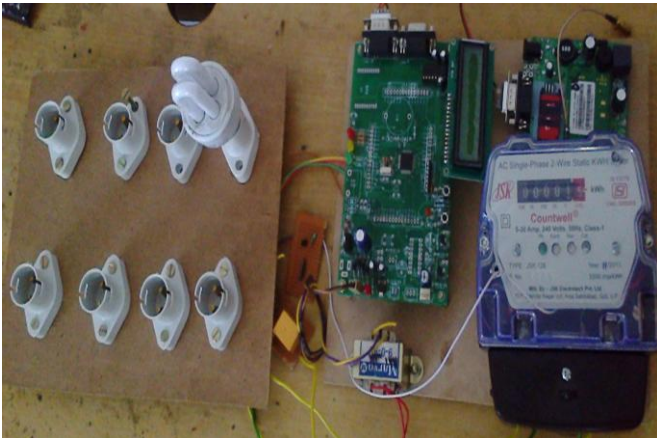


Fig.5. Proposed Model Hardware Setup.

The results of LCD will show the commutation details between GSM modem and ARM. When application will start the LCD gives the description of application and then starts to process request details, one request process can observe in fig.6.



Fig.6. LCD Request Process.

The proposed model description first stage the peoples energy bill generation and sending to user GSM mobile devices will observe in the fig.7 as message.

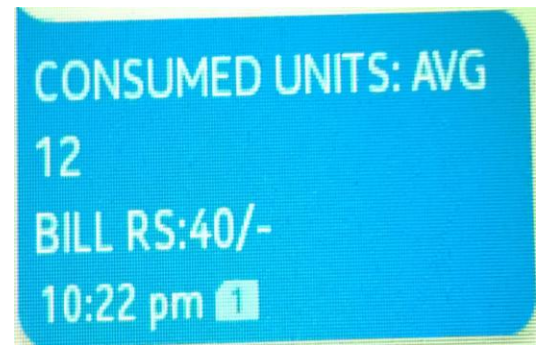


Fig.7. Energy Bill.

Once the generation of bill is completed, people should pay the bill within the due date, if the user pay the bill successfully within the due day, then the user can continue to consume the power. Suppose if the user doesn't pay the bill or forgot to pay the bill. Then the Utilization of power continues even for next month. Energy consumed by the next month bill is send and check whether the dues are cleared are not. If the user doesn't pay the bill then the Energy Distributer cuts the power by sending message that "DUE ARE NOT CLEAR" so POWER CUT. If the user had paid the bill after the power cut, then the user will get the message "bill paid wait" on the LCD screen. After a while, the energy distributor will send a new message as "POWERON1" to the GSM modem which can be seen in LCD screen. Then again the reading continues for next month and we can get a message to the respective mobile number about the consumed units by our Loads and total amount we have to pay. Those all things can observe in the figs. 8 and 9.

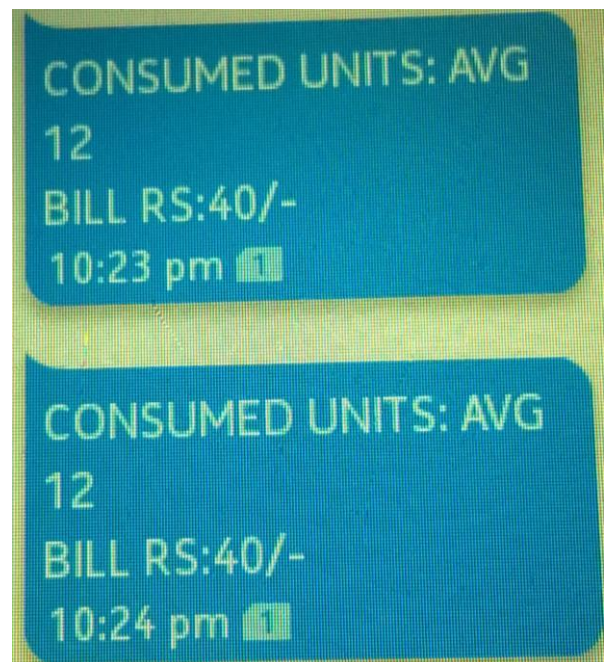
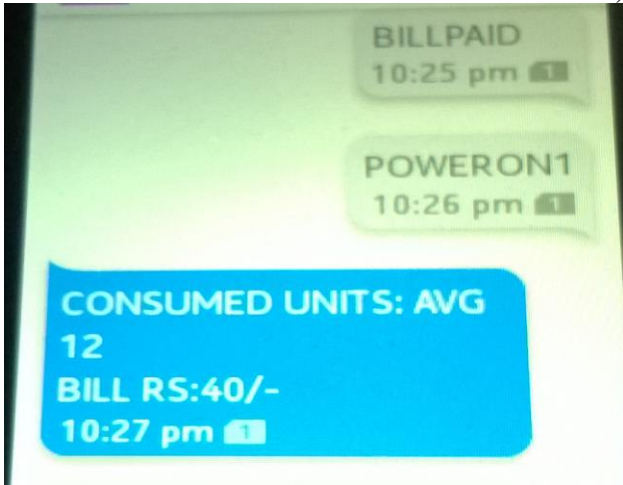


Fig.8. Two months bill details.



[9] M.P Praveen, “KSEB to introduce SMS-based fault maintenance system”, The Hindu News on 26/06/2011, <http://www.hindu.com>.

Fig.9. Case of bill pending and repaid after power cut.

VII. CONCLUSION

In this paper, we are maintaining the greater accuracy and stability in our system. Energy distributors are generating instant billing and even controlling of loads if the dues are not cleared by means of the GSM. We can control our energy meter for both domestic purpose and industrial purpose from the electricity distribution office.

VIII. REFERENCES

- [1] Yujun Bao and Xiaoyan Jiang, “Design of electric Energy Meter for long-distance data information transfers which based upon GPRS”, ISA 2009. International Workshop on Intelligent Systems and Applications, 2009.
- [2] H.G.Rodney Tan,C.H. Lee,V.H.Mok,“Automatic power meter reading system using GSM network”, The 8th International Power Engineering Conference (IPEC 2007).
- [3] Vivek Kumar Sehgal,Nitesh Panda, Nipun Rai Handa, “Electronic Energy Meter with instant billing”,UKSim Fourth European Modelling Symposium on Computer Modelling and Simulation.
- [4] Bharath P, Ananth N, Vijetha S, Jyothi Prakash K. V. ,“Wireless automated digital Energy Meter”, ICSET 2008.
- [5] P.K. Lee and L.L. Lai, Fieeee, “A practical approach to wireless GPRS on-line power quality monitoring system”, Power Engineering Society General Meeting, 2007.
- [6] Subhashis Maitra, “Embedded Energy Meter- A new concept to measure the energy consumed by a consumer and to pay the bill”, Power System Technology and IEEE Power India Conference, 2008.
- [7] T El-Djazairy, B J Beggs and I F Stewart, “ Investigation of the use of the Global System for Mobile Communications (GSM) network for metering and load management telemetry”, Electricity Distribution. Part 1: Contributions. CIREED. 14th International Conference and Exhibition on (IEE Conf. Publ. No. 438).
- [8] Li Kaicheng, Liu Jianfeng, Yue Congyuan, Zhang Ming. “Remote power management and meter-reading system based on ARM microprocessor”, Precision Electromagnetic Measurements Digest, 2008. CPEM 2008. Conference on Digital Object Identifier.