

Cloud Based Remote Network Station Power Consumption Meter with GPRS Technology

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ABSTRACT

The use of wireless automation in almost all the fields of power, gas and water generation, distribution and billing has come of age. Here with the inclusion of wireless communication with the automation may lead to paradigm change in the current trend. The design presents a new methodology for avoiding the high construction and maintenance costs in the existing meter reading technology. Apart the use of wireless meter reading with network technologies has become need of the day. The designed system avoids the human intervention in Power Management. The Consumer has to pay the bill in time, if couldn't, the power connection may be disconnected automatically from the remote server. It displays the corresponding billing information on LCD and data is sent to the server through the GSM Module.

Keywords : GSM Module, LCD, Energy Meter, Arduino Board

I. INTRODUCTION

With the rapid developments in the Wireless communication technology by the use of microcontrollers, there are many improvements in automating various industrial aspects for reducing manual efforts. The traditional manual Meter Reading was not suitable for longer operating purposes as it spends much human and material resource. It brings additional problems in calculation of readings and billing manually. Now-a-days the number of Electricity consumers is increasing in great extent. It became a hard task in handling and maintaining the power as per the growing requirements. Presently maintenance of the power is also an important task as the human operator goes to the consumer's house and produces the bill as per the meter reading. If the consumer is not available, the

billing process will be pending and human operator again needs to revisit. Going to each and every consumer's house and generating the bill is a laborious task and requires lot of time. It becomes very difficult especially in rainy season. If any consumer did not pay the bill, the operator needs to go to their houses to disconnect the power supply.

II. LITERATURE SURVEY

1. Petri Oksa This paper describes the development in the Energy Meter an initial amount comfortable for the user is given as an input to the system. Daily usage of electricity is measured and units used for the complete day along with the tariff for the consumed units is calculated and an prediction is provided to the registered mobile number as an intimation through gsm.

2. Chih-Hung Wu The fundamental point of this anticipates is to remote checking and control of computerized vitality meter. This framework empowers the power office to peruse the meter perusing routinely without the individual going to inside every house. This can be accomplished by the utilization of Microcontroller unit that persistently screen and record the Energy Meter perusing in its permanent memory area.

3. Liting Cao In this paper we have presented Automatic energy meter reading using different communication protocol. Now a days the electric board using conventional method, by sending meter readers on two months ones in Tamilnadu why because reducing man power so that at a same time calculating a amount and unit its storing in temporary data loader. In our automatic meter reading AMR used to different applications such as water meter, gas meter, energy meter and broad band etc.

4. Li Xiaoguang Hu AMR Automatic Meter Reading and PQ power quality management based on kinds of network technologies has become a trend. However, because of the high construction and maintenance costs with the existing meter reading technology, the applicability to different residential buildings and different network infrastructure should be improved, it is greatly significant to research new kind of power meter and the meter reading technology, which can accelerate the evolution of the Next Generation Network and facilitate people's lives.

III. SYSTEM ARCHITECTURE

Hardware Architecture:

a. Energy Meter:

Energy Meter is a device that measures the amount of electric energy consumed by a residence, a business, or an electrically powered device. Electric utilities use electric meters installed at customers' premises to measure electric energy delivered to their customers for billing purposes. They are typically calibrated in billing units, the most common one being the

kilowatt hour [*kWh*]. They are usually read once each billing period. When energy savings during certain periods are desired, some meters may measure demand, the maximum use of power in some interval. "Time of day" metering allows electric rates to be changed during a day, to record usage during peak high-cost periods and off-peak, lower-cost, periods. Also, in some areas meters have relays for demand response load shedding during peak load periods.



Figure 1. Energy Meter

b. LCD Display :

A liquid-crystal display LCD is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images as in a general-purpose computer display or fixed images with low information content, which can be displayed or hidden, such as pre-set words, digits, and 7-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

LCDs are used in a wide range of applications including computer monitors, televisions, instrument panels, aircraft cockpit displays, and indoor and outdoor signage.



Figure 2. LCD Display

Software Architecture:

a. Arduino IDE Software



Figure 3. Arduino Board

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is opensource, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources.

The Arduino project was started in Italy to develop low cost hardware for interaction design. The Arduino hardware comes in several flavours. The Arduino programming language is a simplified version of C/C++. If you know C,

Programming the Arduino will be familiar. If you do not know C, no need to worry as only a few commands are needed to perform useful functions. An important feature of the Arduino is that you can create a control program on the host PC, download it to the Arduino and it will run automatically. Remove the USB cable connection to the PC, and the program will still run from the top each time you push the reset button. Remove the battery and put the Arduino board in a closet for six months.

Arduino is an open-source project that created microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog input/output I/O pins that can interface to various expansion boards termed shields and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus USB on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment IDE based on a programming language named Processing, which also supports the languages C and C++.

b. Visual Basics Software

Visual Basic is a third-generation language and integrated development environment IDE from Microsoft for its Component COM programming model first released in 1991 and declared legacy in 2008. Microsoft intended Visual Basic to be relatively easy to learn and use. Visual Basic was derived from BASIC, a user-friendly programming language designed for beginners, and it enables the rapid application development RAD of graphical user interface GUI applications, access to databases using Data Access Objects, Remote Data Objects, or ActiveX Data Objects, and creation of ActiveX controls and objects.

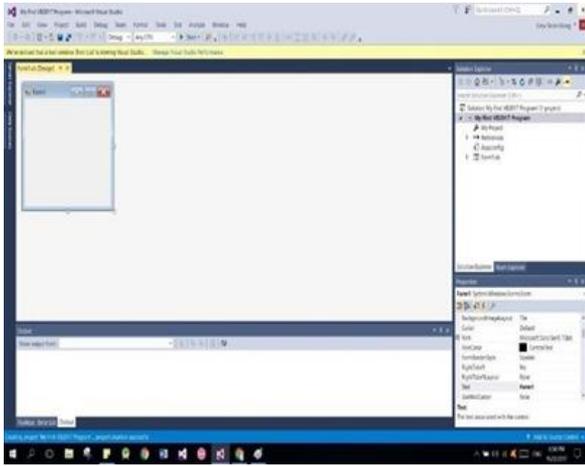


Figure 4. Sample Format of visual basic

IV. SYSTEM DESIGN

Hardware system:

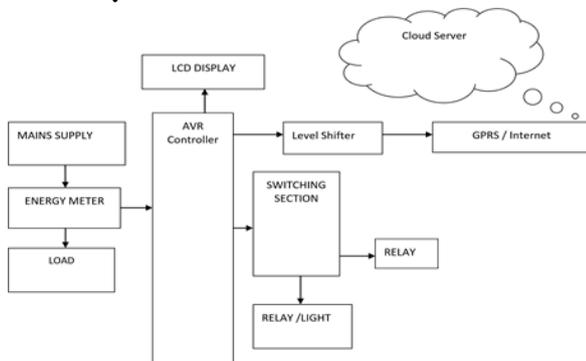


Figure 5. Block Diagram of Hardware system

Software system:

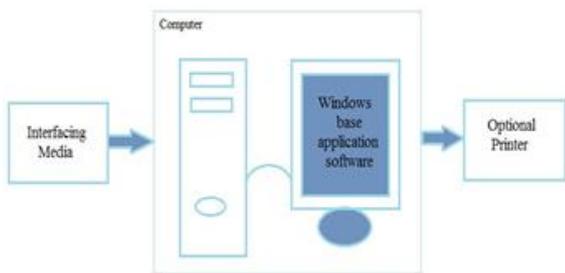


Figure 6. Block Diagram of Software system

Working

The Power Supply section supplies all other components with required Power. The ARM7 LPC2148 microcontroller module takes the data from the energy meter and performs the necessary control operations like breaking the circuit through Relay control unit and the required information to the mobile phone via the communication module GSM.

The MAX-232 which was inbuilt in the ARM7 is used as a serial communication interface for the GSM modem for transmitting the data from the controller to the mobile phone. In the Load bank section a 60W incandescent bulb is used as a load for the purpose of energy consumption of the user. The user can obtain the status of the energy consumption and the billed amount by sending the corresponding commands from the mobile phone to the GSM modem. Then it sends the commands to the microcontroller section and the required information is sent to the user mobile through the GSM modem. If the consumer fails to pay the billed amount in time, the disconnection and reconnection can be done by sending their corresponding commands to the controller. Whenever a request is obtained by the user to the controller and the data has been sent the DC buzzer gives a beep sound as an indication that a request has obtained and sends the data to the user.

V. PERFORMANCE ANALYSIS

Welcome View:

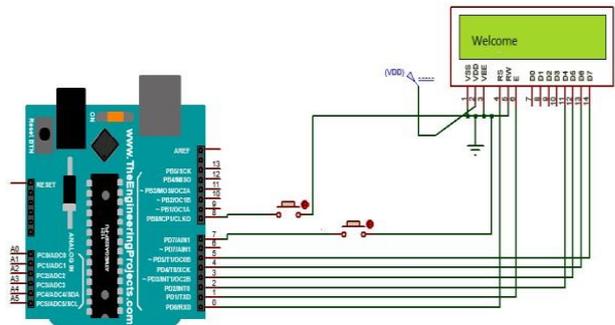


Figure 7. Welcome view of LCD with Arduino Interfacing

Simulation of interfacing of Arduino with LCD

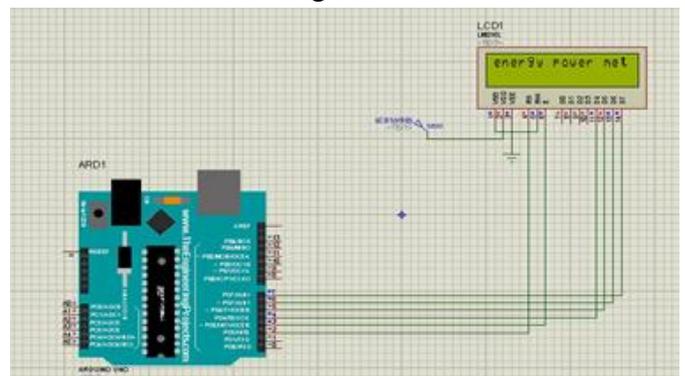


Figure 8. Simulation of interfacing of Arduino with LCD

Simulation of interfacing of Arduino with meter reading

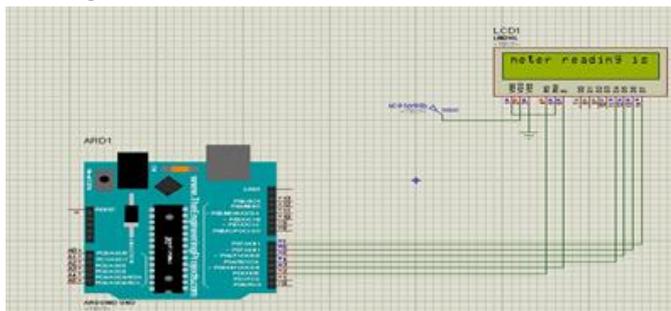


Figure 9. Simulation of interfacing of Arduino with meter reading

VI. FUTURE SCOPE

This system will have high accuracy since human interaction has been minimized. The generated bill is available as SMS at the time of generation itself and if the user is registered he can pay the bill through internet. This can identify the power theft locations and also the fault location and its type.

VII. CONCLUSION

The designed energy monitoring system has proven to successfully acquire accurate measurements for energy meter.

A very systematic approach was used for the overall design of the project, in which power consumption factors were to be controlled.

Thus we can conclude that actually we are transferring the live data on internet. Also time to time monitoring.

VIII. REFERENCES

- [1]. Li Xiaoguang Hu, "Design of an ARM-Based Power Meter Having WIFI Wireless Communication Module" IEEE 2009.
- [2]. B.S.Koay, "Design and implementation of Bluetooth energy meter", Proceedings of the Joint Conference of the Fourth International Conference on Information, vol. 3, pp.1474-1477, Dec. 2003.

- [3]. Petri Oksa, Mikael Soini, "Considerations of Using Power Line Communication in the AMR System", 2006 IEEE International Symposium on 26-29, pp.208-211, Mar. 2006.
- [4]. S. Battermann and H. Garbe, "Influence of PLC transmission on the sensitivity of a short-wave receiving station," IEEE Power Line Communications and Its Applications, pp.224-227, Apr. 2005.
- [5]. Chih-Hung Wu, etc, "Design of a Wireless ARM Based Automatic Meter Reading and Control System", Power Engineering Society General Meeting, 2004. IEEE 610, Vol.1, pp.957-962, June 2004.
- [6]. Yu Qin, "The Research and Application of ARM and GPRS Technology in Remote Meter Reading Terminal Equipment", A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Engineering, 2007.
- [7]. Honestar Electronics Co., Ltd, "Single-phase bidirectional Power/Energy IC- CS5460A", Jan.2003.
- [8]. L. Shiwei, etc, "Design of an automatic meter reading system," Proceedings of the 1996 IEEE IECON 22nd International Conference on Industrial Electronics, Aug. 1996.