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GSM TECHNOLOGY BASED SMART ENERGY METER

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Abstract: Human assistance is still required for unit reading from energy meter to record the units from the houses. The consumers do not know the accuracy of the power used and they have to wait for the bill to make the payments. The meter value is prone to human errors and hence the value of meter may not be very accurate. In the proposed system an interface is done between the microcontroller and the energy meter for getting the units and also the details using GSM Technology. This project is further enhanced to execute logical functions, store data in SQL database, send monthly bill to consumer cell phone number and remotely disconnecting the electricity for non-payment of bill and remotely reconnecting immediately after payment.

Keywords: Microcontroller PIC1, GSM Module, Relational database model, PCB design and layout , Wireless device ,Database query processing, Structured Query Language, Embedded software.

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I INTRODUCTION

The main idea of this project is providing the user with the electricity billing information through SMS on their mobile. Microcontroller is used to measure Voltage, current and power factor. Interfacing between the GSM module and the microcontroller is done. Also the Energy meter is connected with microcontroller. Microcontroller is used for reading voltage, current and power values scanned by the energy meter and send the readings to the service provider for further calculation of bill of user by doing some mathematical calculations on data. After calculating bill the service provider sends billing information to user number with the help of GSM module. In this project one can measure the current consumption from remote locations. Also for dealing with non-payment of bills, an additional feature of remotely switching meter on/off is added.

An energy meter acts as an interface between the service provider and the consumer. To take the reading of this meter, the service providers recruit employees, in turn increasing manual labor. So this meter will benefit the consumer as well as the service provider by sending SMSs for billing details. Also, large number of consumers who do not pay the bills on time and hence makes the service providers loss ridden. In the proposed system the service providers will no longer have to deal with late payments or non-paying bill by the consumers as a remote meter on/off system is implemented. Hence to reduce the human labors, human errors in meter reading and nuisance of non-payers of bill, this system is proposed.

II LITREATURE SURVEY

To understand the depth of this subject, the analysis of the meter reading techniques which are existing currently, is done. According to the research done, the existing component is an electronic or electromechanical energy meter which is present in the premise to measure the usage. The meter that are currently used, record the energy consumption in kWh and these units are still recorded by a person from the service provider every month, on foot. The meter reading company or the service provider process the recorded data. The processing of the meter reading is done by first linking each recorded power usage data to an account holder and then determining the amount of that consumer through the specific tariff in use, which is a very tiresome job.

Many research groups have proposed system built on various platforms all over the world for reading meter automatically, known as Automatic Meter Reading (AMR). The AMR's are classified in two types, Wireless and Wired/ Wire-based. For areas having meters with close proximity, Bluetooth energy meters were designed which communicated wirelessly with master PC which were basically for low

power consumption. This technique wasn't efficient as it operated within a short range. Looking towards the wired/ wire-based system, the Power Line Carrier (PLC) and the Telephone Line Network are the AMR systems available. To transmit the data every month remotely to the central office, tele watt meters were used. This was done with the help of dedicated telephone lines and a pair of modems. A command was send to the remote meters by the master PC at the control center to get the data using Power Line Communication technique, which was mainly implemented in the areas with fixed telephone network.

III DESIGN ISSUES

The current methodology for meter reading a manual labor i.e. a service provider visit each and every house for reading meter units and taking photos of the meter reading. Then that person reports back to service provider. There is an issue of efficiency in this method, because, it is prone to human errors and is time consuming. Also it is not cost efficient to hire multiple employees for visiting every house. Another methodology is the consumers himself upload a photo of meter every month. Problem with this methodology is that it leads to irregular bill generation which results in increasing the overhead of the service provider. Also for the consumers who do not upload the meter reading photos, extra employees are required for fetching of units. Another method is our proposed system which fetches the units instantaneously and updates service provider database regularly. As there is not much of a human intervention, this method eliminates the human error completely. Also instant action is taken against non-payers of bill.

IV TASK NETWORK AND ARCHITECTURE DESIGN
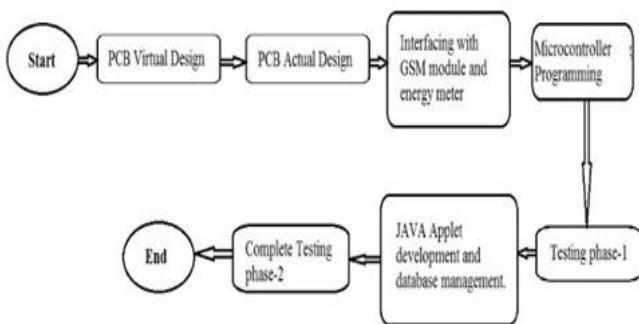
A. *TASK NETWORK:*

Figure 1: Task Network

B. *ARCHITECTURE DESIGN:*

Energy Meter:
- An energy or electric meter is a device that is used to measure the amount of electrical energy consumed by a residence, business, or an electrically powered device.

- Typically, the energy meters are measured in billing units, the most commonly used is the kilowatt hour.
- Periodic readings of electric meters establish billing cycles and energy used during a cycle.
- Microcontroller:
- It is used for embedded computing and storage of data.
- It has on-chip RAM, ROM, I /O ports for communications.
- GSM Module:
- A GSM module is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM module looks just like a mobile phone.
- When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network.
- DB 9:
- The DB9 (originally DE-9) connector is an analog 9-pin plug of the D-Sub miniature connector family (D-Sub or Sub-D).
- It is used specifically for connection between MAX232 and GSM module.
- MAX232:
- The MAX232 is an integrated circuit which is used to convert signals from an RS-232serial port to signals suitable to use in TTL compatible digital logic circuits.
- The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.
- Opto-Isolator:
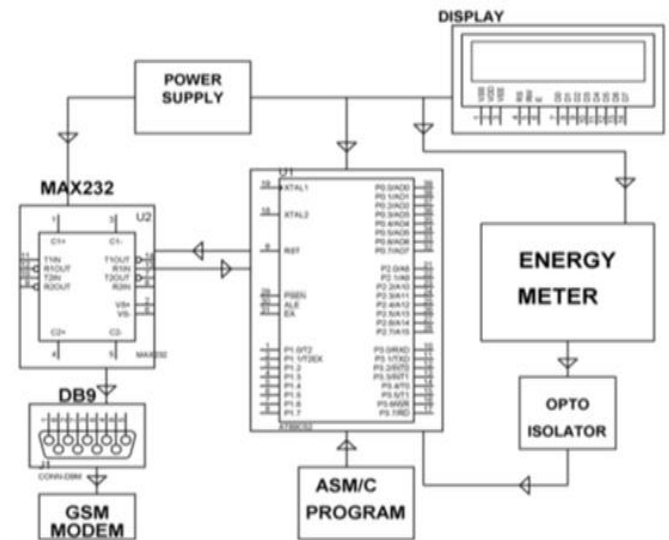- The energy meter is interfaced with the microcontroller using an interfacing device Opto-isolator

Figure 2: Architecture Design

V SCENARIO IN WHICH MULTI CORE,EMBEDDED AND DISTRIBUTER COMPUTING IS USED.

The proposed system is developed on the basis of embedded computing methodology. The embedded computing use two main components

A. *Hardware:*

Here a custom-designed PCB can be used as a base for interfacing. Microprocessor is used for embedded assembly language programming and execution. Also GSM Module will be interfaced with PCB for sending and receiving SMSs. Energy meter will be interfaced with PCB with the help of opto-isolator and relay will be attached for switching of meters

B. *Embedded Real-time system:*

In this system, the meter reading and sending is done in real-time. The embedded system is developed as such to fulfill the requirements of the service provider. Functionalities such as automatic billing, current usage retrieval, switching of meters, graphical representation is all included in this embedded system.

VI RESULTS AND ANALYSIS

Outcomes:
-    Smart Unit Scanning and providing it to service provider.
-    Remote on/off of the electricity supply based on payment of bill.
-    Reduces the illegal aspects which takes place due to non- payment of bills.
-    On request current status of meter.
Applications:
- The proposed system can be used for multiple service providers.
- It can also be implemented for gas meter reading and water meter reading.

VII CONCLUSION

Various electronic meters have been developed and are still being developed. However the use of GSM in this particular system provides numerous advantages over methods that have been previously used. Data transmission is charged at standard SMS rates, thus the charges are not based on the duration of data transmission. The efficient remote transmission of the readings and automatic processing ensures errorless billing system. The system also consist of the remote on/off of the energy meter which will solve the issue of the non-payment of the bill.

ACKNOWLEDGMENT

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