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Energy Management System and Theft Detection

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Abstract

In order to achieve efficient meter reading will reduce billing error and operation costs, Automatic Meter Reading (AMR) system plays an important role to address the above mentioned problems. AMR is an effective means of data collection that allows substantial saving through the reduction of meter re-reading, it provide greater accuracy, it allows frequent reading, better deployment of human resource, improved billing and customer service. In this project, GSM technology will be used to implement an AMR system. The GSM Energy Profiling System (GEPS) takes advantage of the available GSM infrastructure's nationwide coverage and the Short Messaging Service (SMS) to transmit energy reading from the digital meters, to the supplier (server) and receive alerts at the consumer (User) end. An interface has been developed at the server end to receive the readings transmitted by the consumers and update the records in the billing & consumption database. The collected data is uploaded to the web server and illustrative energy consumption profiles of all users are maintained.

Introduction

Remote Energy Monitoring and Profiling System Traditional meter reading for electricity consumption and billing is done by human operators from house to house. This requires huge number of labor operators and long working hours to achieve

complete area data reading and billing. Human operator billing is prone to reading error as sometimes the houses electric power meter is placed in a location where it is not easily accessible. Labor billing job is sometimes also restricted and slowed down by bad weather conditions. The increased development of residential housing and commercial building in a developing country, such as Pakistan, requires more human operators and longer working hours to complete the meter reading task.

Literature Survey

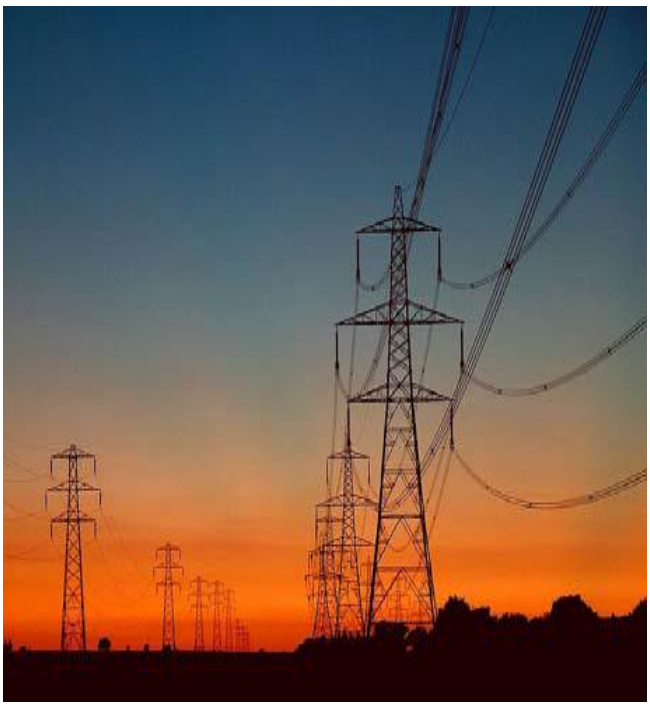
The currently system involves the user to go up to the EB office to manually pay his bills. The readings are taken using the analogue meter present in the customer's house. The readings are taken using an employee working at the EB office. It has a set of disadvantages which are given below:

1. Erroneous Readings – This involves errors present in the meter reading which are committed due to human mistakes.
2. Easy Manipulation – Since all data here are taken manually dates' can be easily manipulated by third parties which affect the EB office and the customer.
3. Manual Labour – The amount of workforce involved in this prevailing EB system is too large as the EB people have to visit many areas at roughly the same date.
4. Time Consuming – This system takes a lot of time to go personally to the customer's house and take the readings.

A. Current System

This system has been recently proposed by the IEEE to eliminate a few drawbacks in the old EB system. This system enables the transfer of the EB details through the power lines in each house. This way the EB office employee's jus notes the readings in the customer's house and sends the details to the EB office by any means. The user gets the details displayed in his house by the data received from the power lines. This system also has a few drawbacks which are:

1. Manual Labour – The workforce still involved here is the same as the existing system which is too vast.
2. Taking time – The way of waiting at the queues and then paying the bill is still there and this system does not help the customer in that way.
3. Power Blackout – The details since sent through power lines has a problem of being delivered to far areas if certain areas have a power failure. This also delays in delivering the bill.



B. Proposed Work

The conventional billing system for electricity is that an assigned person visits each house and manually read the meter readings. Then the collected meter readings are used for bill calculation. This manual readig become very time consuming and tiresome. It may cause human error and can open an opportunity for corruption done by the human meter reader. Thus the billing system become inaccurate and inefficient. The recent advantages in the field of information technology have made the exchange of information fast and secured. The digital revolution caused the rapid drop of digital devices such as telecommunication devices and computers. Communication networks like the internet, GSM networks, GPRS etc., are available almost all the countries in the world. In the work presented here, a technique has been developed to

read electricity meter readings from a remote server automatically using the existing GPRS networks for cellular phones. The meters send the meter readings like kilo-watt-hour (kWh), voltage, current, bill, etc. by SMS to a central server. The server stores the information in database for analysis and sends the bill to the customer by SMS. The SMS based data collection can be done very efficiently and quickly. Data can be collected after any desired time interval such as weekly, or monthly basis. As there is no human intervention, there is no chance of human error and corruption. Remote meter can be used in residential apartments and especially in industrial consumers where bulk energy is consumed.

C. Benefits of AMR

The primary benefit of this technology is more accurate and precise measurement of electricity or gas consumption. Consumers will be billed the amount that exactly corresponds to what they have consumed. On the other hand, utility companies will have more efficient operations. Less manpower and resources are needed in meter reading and data gathering; they only need to access the main database to get the information that they need for billing and analysis.

Working Procedure AMR

First, the meter must be read by the meter interface. After that, this same interface has to translate the data into digital information to facilitate transmission. There must also be a code added to the meter data reading so that the data can be attributed to the correct subscriber. Once the data is ready, the data has to be picked up by a meter person. Picking up meter data, however, involves digital transfer from the meter interface to a device that the meter reader controls. Data can also be automatically transmitted to the database through automatic data transmission protocols.

Technological advances have expanded the scope of AMR activities. Other possible uses for the AMR include monitoring for leaks and theft and detecting meter tampering. Consumer profiling (especially on such points as peak and lean periods of use), providing empirical data on the effects of energy saving devices and mindsets, and so on can also be done. An AMR system also has a transmission and communications protocol in place for transferring or transmitting data from the meter to the server.

Data is temporarily stored in their device until it's downloaded at the office. Data transmission may also be sent to the office through wires (data is transmitted through Ethernet cables, broadcasting cable, or power lines).

Pic Process of The System

The PIC is the main part of AMR and theft control. It is based on 16bit PIC16F877A processor. PIC used to produce high performance with low cost of network technology. The memory of PIC organized asthree blocks . The program memory organization consists of 13bit program count memory space. Data memory organized into number of banks and it consist of GPR and SFR. The general purpose register file

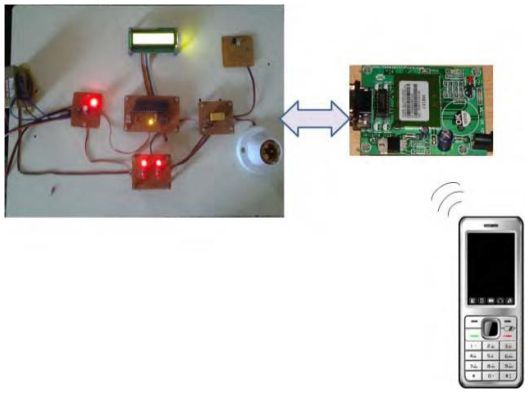
can be accessed in a straight line or in some way through the file select register. SFR is used for controlling the system.

Theft Control System

The theft in energy meter is the major drawback in our country because of theft more than lakes of money loss per state in our country. So this project deals with the theft control in energy meter by using embedded systems. Theft control by using the step down circuit, when there is short circuit or step down in the current flow. If there is any step down in the current flow at the time the circuit send the information about the step down between the circuit to the PIC micro controller and then message send to the higher officer of the EB (electricity board).

Hardware Design

The hardware of the AMR and theft control systems by using GSM consist of the PCB PIC board design. In this project the creation of energy meter with current transformer to calculate the reading. After sensing the theft message send to the controller and government electricity board by help of GSM. The digital energy connected to the controller and GSM for transmitting the energy meter reading to the government electricity board. Whenever there is a power cut the rechargeable battery give power to the AMR. So during power or power cut the theft circuit is helpful to detect the theft in power supply. Then the message is sent to the higher authority of government electricity board for further action to detect the theft in underground cable connection of power.



Conclusion

The project model reduces the manual manipulation work and theft .Use of GSM in our system provides the numerous advantages of wireless network systems. It saves money by the control of theft in energy meter and also more beneficial for customer side and the government side. The metering IC ensure the accurate and reliable

measurement of power consumed. Its cost low when compared to other energy meter without automatic meter reading and theft control.

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