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Intelligent Remote Electricity Metering and Billing System

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ABSTRACT: This paper presents the advancement of a fully Automated Vitality Meter which has capabilities like inaccessible observing and controlling of vitality meters. Programmed Meter Reading framework (AMR) persistently monitors the vitality meter and sends information on request of service supplier through SMS. It spares huge human work. The information obtained from an energy meter has been put away in a database server which was found at power Board station through an SMS entryway to encourage processing by a vitality supplier. Vitality supplier sends electricity charge either by email, SMS or by post. This framework permits the clients to pay bill online either by credit card, charge card or by net banking. This framework gives opportunity to electricity companies to take action against lenient clients who have extraordinary dues, otherwise companies can detach the power of client. Companies can reconnect the power after the statement of levy. This system also gives the control cut data and tempering caution. So, the GSM based AMR framework is a more effective and opportune traditional billing system.

KEYWORDS: GSM (Global System Mobile), AMR (Automatic Meter Reading), SMS (Short Message Service), Energy Meter, Vitality Supplier.

I. INTRODUCTION

Most of the houses in India have conventional mechanical watt hour meters and the charging framework is not computerized [1]. At the end of each month an individual from the electricity mains or the meter goes to each house and takes the meter reading manually. These meter readings are used for power charge calculation and this bill is sent to the customer's house by post. Client goes to the power division to pay this bill. But in this procedure we require a great number of people to peruse the meters. The strategies of sending the bills to customers are exceptionally difficult and awkward. But a new technology named Programmed Meter Reading System is discussed. Separated from being a boom, AMR wipes out all the cons of conventional systems. Programmed Meter Perusing Framework is a sophisticated framework which permits companies to collect the perusing without going by the site. AMR incorporate different innovation for data collection such as control line communication, Zig-bee, Radio Recurrence (RF Strategy) and GSM arrange but GSM organize is best among this innovation. So this paper will talk about only the GSM based AMR framework. Programmed meter reading framework makes a difference to the client and energy service supplier to get precise and updated information from the vitality meter. AMR System can send vitality utilization hourly, monthly or on demand. This information is sent to the central framework for charging and troubleshooting. This information is put away into the database server for handling and recording. This innovation mitigates work fetched, collection time, energy theft, and maintains a strategic distance from late installment. Including this it increases information security, progresses customer service, and diminishes income misfortunes. This framework is not as it were sending the information but it does provide control disconnect/connect feature, power cut highlight and treating alarm feature. All these preferences grant this item an edge over other logically winning gadgets.

II. BLOCK DIAGRAM

Block diagram of the project

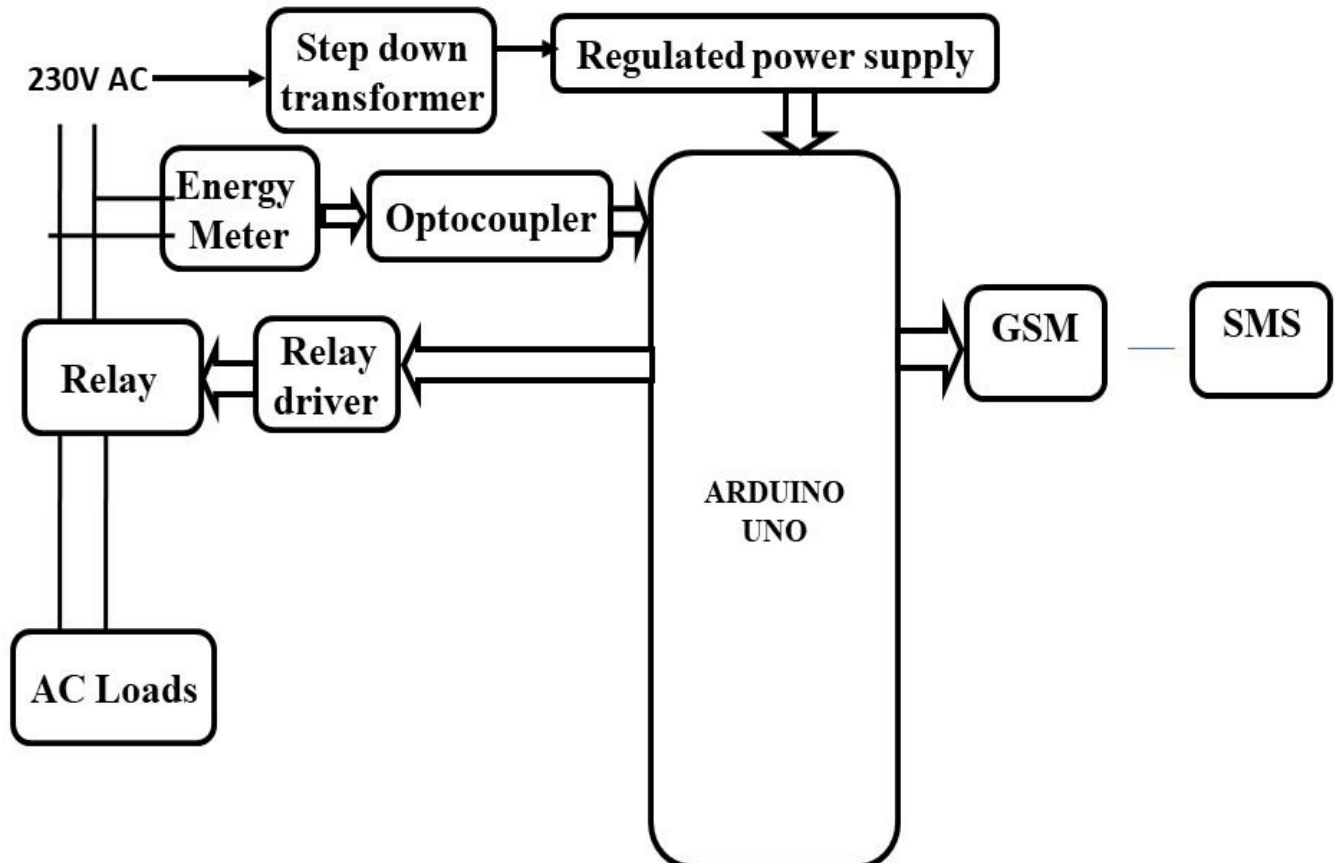


Fig. 1. Block Diagram of proposed Work



III. COMPARISON BETWEEN AUTOMATIC METER READING SYSTEM AND CONVENTIONAL METERING SYSTEM

S. No	Features	GSM based AMR System	Conventional Metering System
1.	Remote Monitoring	Possible (Electricity Department read the meter readings regularly without a visiting person).	Not Possible
2.	Control the Domestic Energy Meter	Anywhere in the world.	Only at respective Customer house
3.	Tampering alert Feature	It provides a temping alert feature. In case of tempering, an SMS alert is sent to the electricity company.	Not Possible
4.	Auto disconnect feature	It provides remote shut-off facilities to rogue customers that have large outstanding dues.	It does not provide auto disconnect feature
5.	Power cut Information Feature	This system provides the power cut information.	It does not provide power cut information
6.	Operation costs	Very less because we are accessing the system on request at any time without Visiting person.	More because we require a person for accessing the system
7.	Data security	AMR system avoid meter reading error and reading data automatically also provides increased security of data.	In this system meter reading error possible and its provide less security of data
8.	Man Power	Huge man power not required .	Man power required

Table 1. Succinctly spouts out comparison between Automatic Meter Reading System and Conventional Metering System. Using AMR Technology we can control and monitor any energy meter located anywhere in the world .GSM based energy meter or AMR provides tempering alert, auto disconnect feature, power cut facility. Automatic meter reading system is access to real time data and receives customer complaints. So costs for meter reading will be reduced. AMR system avoids meter reading error and reading data automatically. It also provides increased security of data.

IV. SYSTEM OVERVIEW OF AUTOMATIC METER READING SYSTEM

Figure-1 shows a System overview of AMR. AMR Continuously monitors and records the energy meter. This can be achieved by using a microcontroller unit. Microcontroller units are interfaced with digital energy meter. Microcontroller units are interfaced with the RTC by using 2 wire serial interfaces for date and time and RTC memory is also used as data storage permanently. Microcontroller units are also interfaced GSM modem for remote monitoring and control of domestic energy meters. The data received through GSM Modem and network. Data is being sent to the AMR on request and within a particular interval. Once the meter receives the request of data from the energy provider, SMS gateway will immediately reply to the meter reading with that date and time. The data received from the meter is stored in the database server through SMS gateway for processing and record. This data received from meters are stored in the database server according to the Meter ID that is provided to the customer house. At the end of each month the server uses the details of database server and cal mount and send the complete detail of consummation of the unit, and total bill amount. Users can verify the same AMR possess transparency on the part of the customer and service provider.

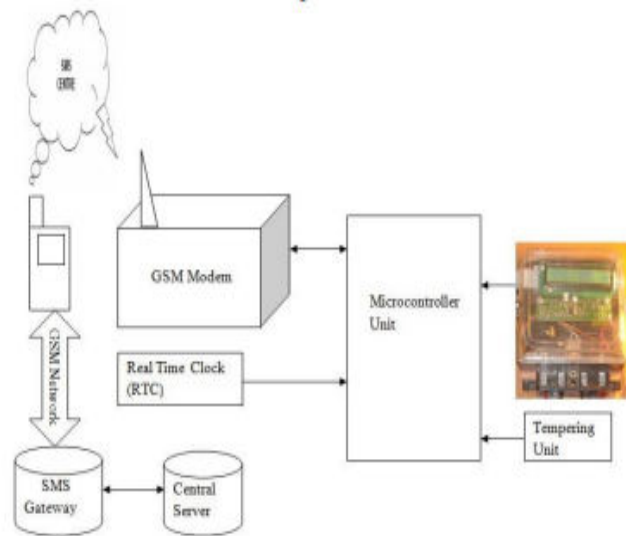


Figure 1. Block diagram of GSM based AMR

V. FLOW DIAGRAM OF AMR

Flow diagram succinctly shows that the Energy provider installs the system in particular houses

The meter constantly gives the rise in meter reading and no. of units consumed. Electricity department will be requiring data for processing and bill calculation so they send a message for required data. When an interrupt occurs it means microcontroller unit receive a message through GSM modem. So microcontroller read the message and also read message received number and check the authentication. If the number is authenticate It reads current data from EPROM and sends the data to an authenticated number. GSM based AMR sends a SMS alert to the energy provider, if the system access mobile number is not authenticated. This SMS alert has a detail of unauthenticated numbers but has no data. Fig.2 is working according to programs written in Embedded C. It also provides the facility of power disconnection to customers that have large outstanding dues. Electricity department sends a code to the energy meter that has large outstanding dues. Microcontroller has a program of matching of this code to power disconnect code. If this code is matched then power disconnects to the respective meter. It also provides a facility to power reconnect due to the deposit of the large outstanding previous bill amount. Again the Electricity department sent a code to the energy meter that deposits the large outstanding previous bill amount. Microcontroller has a program of matching of this code to power reconnect code. If this code is matched then power reconnects to the respective meter. It also provides power cut information. Meter automatically sends a SMS alert to the energy provider of power cut when the power cut in a particular area including AMR. AMR also provides a tempering alert facility to energy provider.

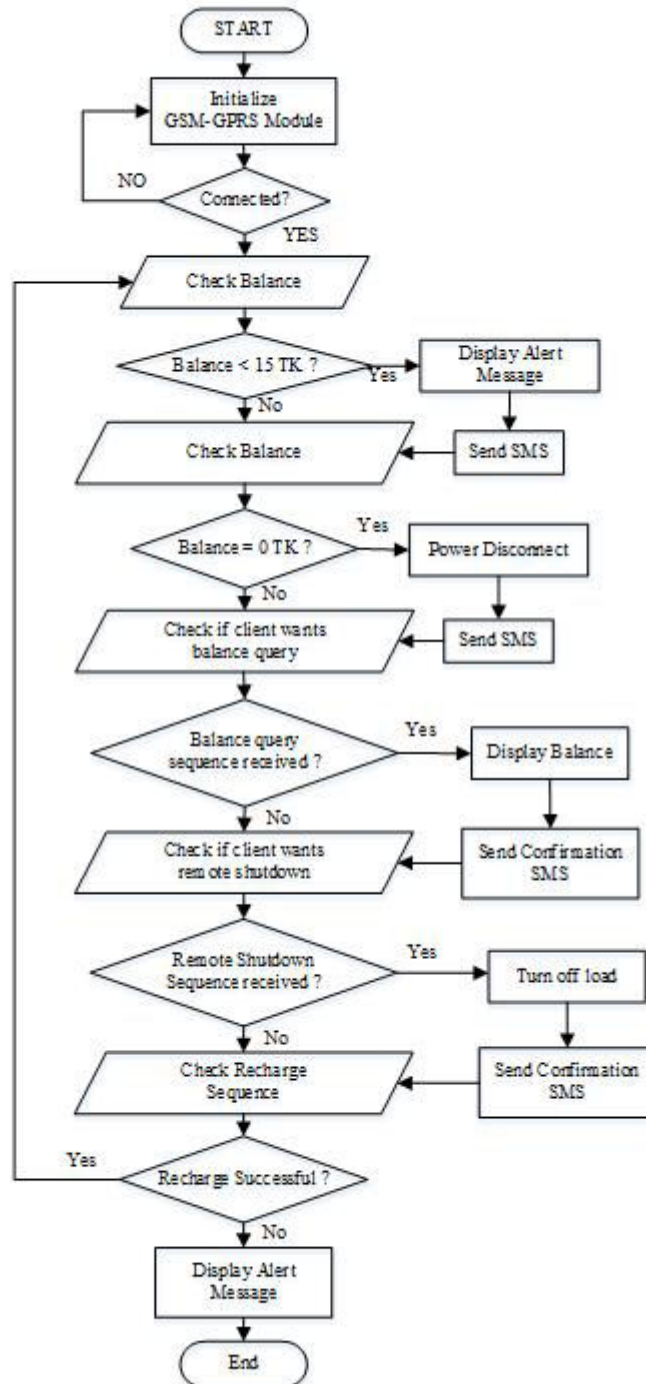


Fig. 2. Flowchart of the procedure

Figure 2. Flow diagram of Controlling Program of GSM based of AMR

VI. SYSTEM IMPLEMENTATION AND RESULTS

In fig.3 shows a complete set up of GSM based energy meter .Microcontroller interfaced with GSM module and energy meter .

Pulse and unit in energy meter are continuously incremented according to power consumption. For implementation of AMR a SIM card is required for the GSM modem of energy meter .An Identification(ID) number allotted according to SIM contact number. According to the requirement of data, the electricity department sent a message to a particular energy meter. When a microcontroller receives a message its respective port bits are high and an interrupt signal occurs. Microcontroller starts to execute the interrupt service subroutine until it reaches the last instruction of the subroutine. After executing the RET instruction microcontroller returns to the main program that is incrementing the pulse program. After Every one month data will be received by the electricity company automatically and the Electricity Company can access the system at any time on request. After bill calculation the bill is sent to the customer by post, by mail, by SMS and the customer also sees the bill by login of our account. In fig.4 shows the email alert of bill amount and deposit from the electricity department to the customer. The Electricity department also sent a SMS alert to customer 's mobile number for Bill information that is shown in fig.5. After that person can pay our bill by accessing our login into the web portal. Electricity bill payment online can be done via online pay where the person first reads the statement of the amount paid and then pays the amount of the bill rather than going to the electricity department to pay the bill. Online electricity bill payment can be made through credit card, debit card or by net banking. The acknowledgement is mailed in form of SMS for the online bill payment within 12 hours of transition. This helps to avoid any late fees or payments which may affect your credit rating. So it saves a lot of time and energy.



Figure3. SMS alert of bill amount detail send by electricity department to customer

After bill calculation the bill is sent to the customer by post, by mail, by SMS and the customer also sees the bill by login of our account. In fig.4 shows the email alert of bill amount and deposit from the electricity department to the customer.

The Electricity department also sent a SMS alert to customer 's mobile number for Bill information that is shown in fig.3.

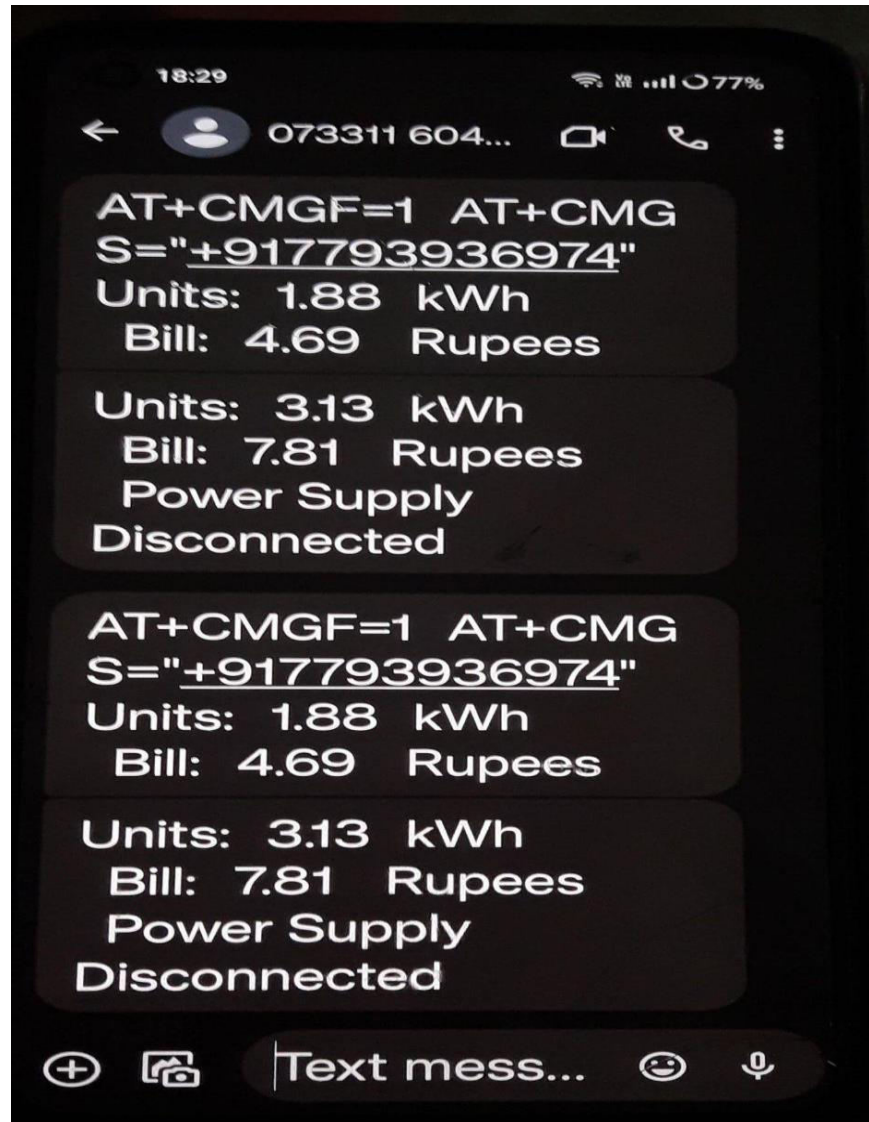


Figure 5. SMS alert of bill amount detail send by electricity department to customer

VII. CONCLUSION

The development of a GSM based energy meter demonstrates the concept and implementation of a new power metering system. GSM based AMR have low infrastructure cost, low operating costs, more data security and less man power required. It not only solves the problem of manual meter reading but also provides additional features such as power disconnect, power connect, power cut alert and tempering alert. Customers can also pay bills via online login on authenticated web. Database servers can store the current month data and also all previous month data for future use. So it saves a lot amount of time and energy.



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