# GSM based Meter Billing System

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*Abstract*— Since last few decades, there has been sudden hike in technological advancement. Dependency on electronic devices and appliances has gradually escalated. Eventually it has resulted in formation of home automation system .The paper deals with the home automation system using voice command to give instructions using smartphone to enable vehicle motion in the given direction. Hence project mainly involve important components: at mega 328 microcontroller for communication among external appliance Wireless automation in the generation, transmission and distribution of electricity and billing has come of age. Traditional metering methods for retrieving the energy data of consumers is not convenient. The present system of energy billing is error prone, time, resource and labour consuming. The problem worsens when consumers try to bypass meter units, thereby pay less than what is actually consumed or the case of overbilling by the Electricity Company. The objective of this project is to facilitate energy consumption measurement and its corresponding billing scheme.

*Key words:* GSM, Meter Billing System

## I. INTRODUCTION

Electricity has become one of the basic requirements of human civilization, being widely deployed for domestic, industrial and agricultural purposes. In spite of the very well developed sources of electricity, there are a number of problems with distribution, metering, billing and control of consumption. Electricity is one of the vital requirements for sustainment of comforts of life and so it should be used very judiciously for its proper utilization [1]. But in our country we have lot of localities where we have surplus supply for the electricity while many areas do not even have access to it. Our policies of its distribution are also partially responsible for this because we are still not able to correctly estimate our exact requirements and still power theft is prevailing. Thus this project presents an innovation towards the minimization of technical errors and reduction in human dependency at the same time. With the help of this project the monthly energy consumption of a consumer will be received from a remote location directly.
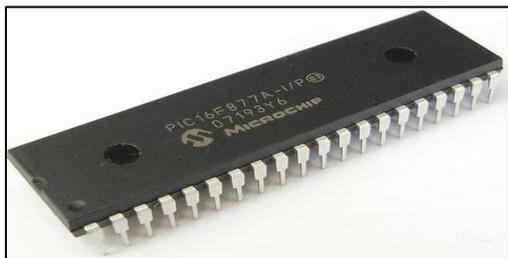
### A. PIC 16F



Fig. 1:

Pic 16f is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed which is most preferred microcontroller among Arduino boards. Its mass manufacture is Microchip Technology. Main specifications of the microcontroller are

- Data Memory-368 Bytes
- Programmable Memory of upto 8K.
- 20Mhz maximum operating frequency.
- USB Compatibilty.

### B. GSM Antenna



Fig. 2:

GSM Antenna is one kind of Antenna to transmit GSM signal at specified frequency 850, 900, 1800, 1900, 2100MHz. 2100MHz is separated into UMTS (Universal Mobile Telecommunications System) frequency band for 3G, and other frequencies are separated into 2G.GSM Antenna will boost the signal strength in receiving and transmitting. Various mounting GSM antenna like Glass Mount, Magnetic Mount, Stubby Antennas. GSM Standard is the most common application for mobile communication field in global.
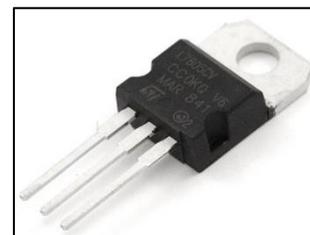
### C. Voltage Regulator LM-7805



Fig. 3:

Voltage sources in a circuit may have fluctuations resulting in not providing fixed voltage outputs. A voltage regulator IC maintains the output voltage at a constant value. 7805 IC, a member of 78xx series of fixed linear voltage regulators used to maintain such fluctuations, is a popular voltage regulator integrated circuit (IC). The xx in 78xx indicates the output voltage it provides. 7805 IC provides +5 volts regulated power supply with provisions to add a heat sink.

## II. LITERATURE SURVEY

The demography of the world population shows a trend that elderly population worldwide is increasing rapidly as a result of the increase of the average life expectancy of people.

1) The existing systems consist of an electronic energy meter/electro-mechanical meter fixed in the premise for meas-uring the consumption of electricity. The meters currently in use are only capable of recording kWh units. The kWh units used have to be recorded by meter readers regularly. The recorded data needs to be processed by a meter reading company. For processing the meter reading, company needs to firstly link each recorded power usage datum to an ac-count holder and then determine the amount owed by means of the specific tariff in use. Many e-metering systems have been proposed based on GSM, GPRS, Bluetooth as ex-plained in [2] , [3], [4].The GSM/GPRS enabled system is very convenient for sending data via SMS due to its good area coverage capability and cost effectiveness.

2) An electricity meter or energy meter is a device that measures the amount of electric energy consumed by a residence, business, or an electrically powered device. Electricity meters are typically calibrated in billing units, the most common one being the kilowatt hour (kWh). The electric power company which supplies the electricity installs the electric meters to measure the amount of electricity consumed by each of its customers. [3]

3) In, we propose a novel Automatic Meter Reading (AMR) system using the IEEE 802.15.4-compliant wireless networks. The mesh network based automatic utility data collection system (AUDCS) provides a cost-efficient solution by exploring the self-organization, self-healing capabilities of the mesh networks and utilizing the state-of-art semiconductor chips and the radio transceivers compliant with IEEE 802.15.4 standard. An IEEE 802.15.4 network may operate in either the star topology or the peer-to-peer topology. The peer-to-peer mode is chosen for the AUDCS system, as it is more flexible and robust than the centralized implementation based on the star topology. In the AUDCS system, each node has the capability of two-way communications and may relay or forward the data for the neighboring nodes within the transmit range, hence eliminating the need of installing dedicated communication nodes to collect data. In addition, mesh networking provides the self-healing function by automatically re-routing via other neighboring nodes. The application data characteristics are exploited in the data gathering and dissemination to achieve better energy efficiency.
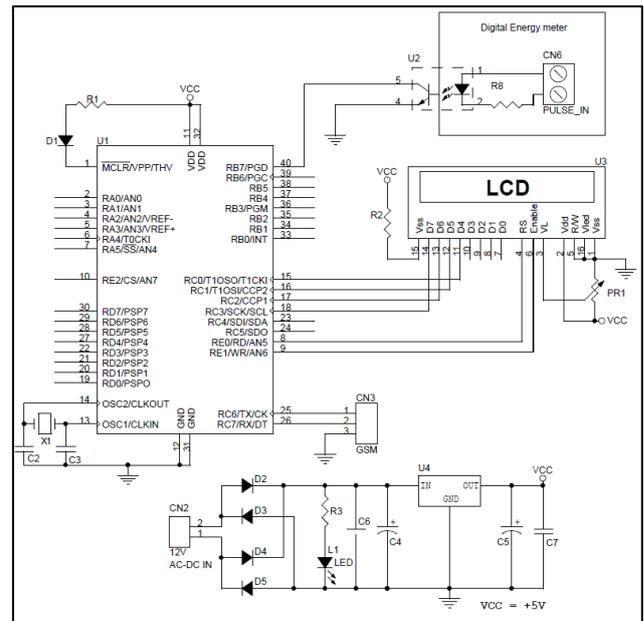


Fig. 4: Circuit diagram of GSM Based Meter Billing System using PIC 16F

## III. PROPOSED SYSTEM

It is an electronic unit design to take real time energy usage using a current sensing method which is then communicated to a microcontroller, who takes the appropriate calculations and displays on an LCD. A GSM MODEM is incorporated with the unit so as to make remote control of the meter unit by doing either of the following:

− Connect the unit to power grid.
− Take Meter Reading.
− Reset the Meter Unit.

### A. Features

*1) Tampering & Security*

Tampering in electric meter and energy theft has become quite common. Electric meters can be manipulated, thus causing them to stop, under-register or even bypassing the meter. Consumers, who tamper with electric meter, effectively use power without paying for it. Electric meter security is looked upon as major issue in many countries today. A large portion of a country's revenue is lost due to the high density of tampering and security in electric meters. Hence it becomes very important to detect tampering in electric meters to ensure proper billing. One of the methods adopted to ensure the efficient supply is to reduce tampering with the electric meters as also proposed in this report.

*2) Messaging Over GSM Network*

GSM is used by over 1.5 billion people all around the world. GSM also pioneered the low cost implementation of the Short Message Service (SMS) which allows parties to exchange delay tolerant short text messages. The popularity and coverage of cellular networks allows the use of SMS service. According to the analysis of real data taken from a real GSM network in India, SMS delivery success rate is found to be 94.3%. Of these successfully delivered messages, 73.3 arrived to their destination within 10 seconds. About 5% of them required more than 1 hour to reach the destination.

*3) Knowing the Stats of Electricity Used*

By using the GSM, it helps in getting the statistics of the power used in the house. It helps in maintaining a record of the electricity used and helps in proper usage of the electricity.
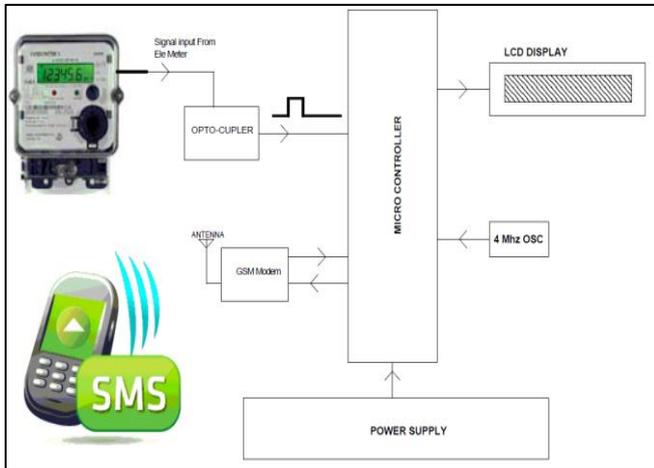
*B. Design*



Fig. 5: Block Diagram of GSM Based Meter Billing System

The block diagram shown above shows the basic work process of the system. A microcontroller input is effectively interfaced to a digital energy meter that takes the reading from the energy meter and displays the same on an LCD. The reading of the energy meter is also sent to the control room by an SMS via SIM loaded GSM modem. This GSM modem can also receive commands from the cell phone to control the owner's electrical loads. It uses a standard digital energy meter that delivers output pulses to the microcontroller to perform counting for necessary action. On receiving command it can switch ON/OFF the loads.

## IV. FLOWCHART

Flowchart is very imperative part of any project. Its main aim is to represent whole Process in a sequence of STEPS. Hence, it can be said as a visual representation of the whole process. Each step is connected to next step with the help of lines and arrows which helps to view the process more logically form beginning to end .Flowchart of GSM Based Meter Billing System project is given below which allows Student to understand the design of project more logically.
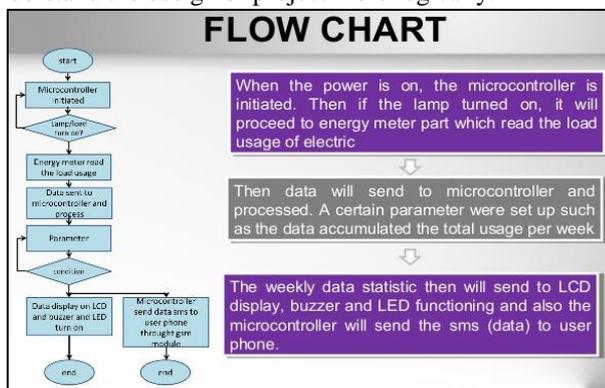


Fig. 6: Flowchart Depicting Control Stages

## V. APPLICATION OF IMAGE PROCESSING

The basic aim of project implementation is to improve meter billing system at a very basic level. The need to implement this project topic is to switch each and every electronic meter with the help of GSM Network. The use of GSM Antenna is crucial as it helps to cover a large area which is easily accessible. The output of this Meter Billing System is fed with SIM of the user. We can easily access or keep a guide on the meter from any remote area. We can install this Meter Billing System for multiple storeys building so that one can easily access or observe electricity reading using less human effort and also time efficient. For electricity department of different regions has proved this system to be of great use. They can easily access without making any extra effort to observe readings of thousands of houses at a very less time. In fast moving life, people forget to turn off home appliances, due to which there is huge electrical power loss hence government of India can take an initiative to implement this GSM Based Meter Billing System in every home to reduce power loss.

## VI. FUTURE SCOPE

This project can be further developed by integrating it with the internet to monitor your Electrical Meter while sitting in a remote area. By doing this, one can keep an eye on his or her Electrical Meter through a cellular network connected to meter and sending messages to mobile phone. This will not only improve the connectivity between the electricity board in this modern day world but will also assist in conservation of energy like if you left any home appliance.

## VII. CONCLUSION

The GSM Based Meter Billing System has been experimentally proven to work satisfactorily by connecting electric meters to cellular networks and were successfully monitored from a wireless mobile device. The Meter Billing System was successfully tested on a multitude of different mobile phones from different manufacturers, thus proving its portability and wide compatibility.

## VIII. RESULT

Through this project, we have shown the design and features of a Smart GSM Meter Billing System which can be remotely observed using GSM Network through a normal smartphone. It is GSM Antenna based and hence wireless and can be flexibly used. It has a special feature for sending message on consuming units at a particular unit period. Circuit is operating well even at large distance due to usage of GSM Network in GSM Based Meter Billing System. The response of system is also fast due to usage of high speed GSM communication. The basic working is also shown as follows

Fig. 7: View of Whole Meter Billing System
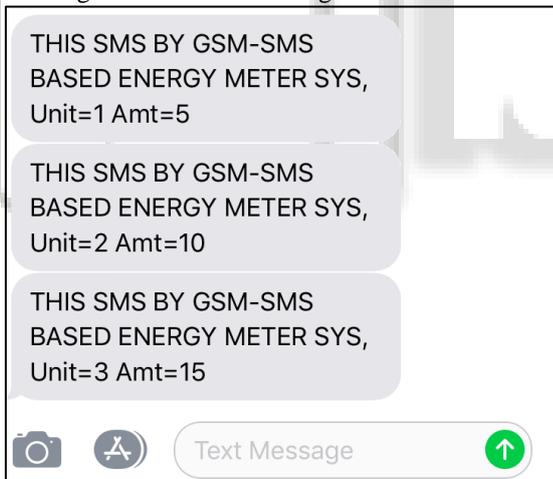

Fig. 8: View with Message Has Been Sent


Fig. 9: Screenshot of Message Sent to the User

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