A Monthly Electricity Billing Display with Bill SMS Feature

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Abstract-
Over recent years the MIMO (Multiple-Input Multiple-Output) system has become a popular technique in wireless communication. MIMO is a system with multiple transmitting and multiple receiving antennas. With increasing the number of transmitting and receiving antennas significant improvement in the bit error rate (BER) was observed than that with single transmitting and single receiving antenna system. Also with increase in the number of transmitting and receiving antennas the data rate of the system was found increased, hence considerable improvement in an information rate. Performance of the bit error rate probability of the cha nel with variable signal to noise ratio will change with channel quality in case of the non adaptive modulation scheme. In some application, system will require the minimum BER. Hence fixed modulation scheme will not perform better in such application. With the use of the adaptive modulation scheme, system will automatically cope up with the changing channel condition and accordingly selects the modulation scheme for maintaining minimum required BER. The throughput of the system was found improved with the use of adaptive modulation in MIMO system. For simulation Rayleigh channel model has been considered.

Keywords: 8051 series Microcontroller, GSM module, Tranfomer, Crystal Oscillator, Energy Meter.

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1. INTRODUCTION

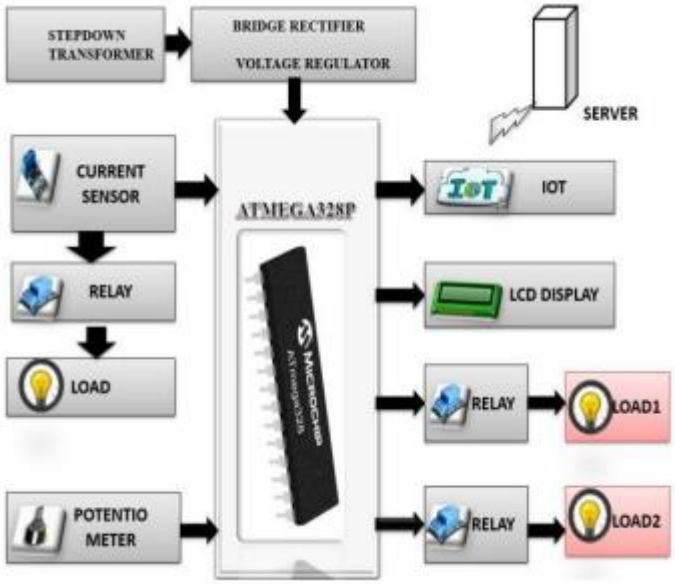
This idea is economically efficient as well because we can get the meter reading at a very low cost. The implementation is done in such a way that a SMS is delivered to the Modem whose reading is to be noted and then that meter replies to the server in the SMS format and it is known that SMS costs are very low. The purpose of this project is to remote monitoring and control of the Domestic Energy meter. This system enables the Electricity Department to read the meter readings regularly without the person visiting each house. This can be achieved by the use of Microcontroller unit that continuously monitors and records the Energy Meter readings in its permanent (non-volatile) memory location.

This system also makes use of a GSM modem for remote monitoring and control of Energy Meter. The Microcontroller based system continuously records the readings and the live meter reading can be sent to the Electricity department on request. This system also can be used to disconnect the power supply to the house in case of non-payment of electricity bills. A dedicated GSM modem with SIM card is required for each energy meter. The GSM based monthly energy meter billing system takes the advantage of available GSM infrastructure nationwide coverage and the Short Messaging System (SMS) cell broadcasting feature to request and retrieve individual houses and building power consumption reading back to the energy provider wirelessly. The Store and Forwarding feature of SMS allow reliable meter reading delivery when GSM signal is affected by the poor weather conditions. The stored message is archive in the mobile operator and can be later retrieve for billing purposes.

2. LITERATURE SURVEY

For this work existing meter reading techniques in India are analyzed and conducted an extensive study on different energy measuring instruments available now. In existing system either an electronic energy meter or an electromechanical meter is fixed in the premise for measuring the usage. The meters currently in use are only capable of recording kWh units. The kWh units used then still have to be recorded by meter readers monthly, on foot. The recorded data need 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 account holder and then determine the amount owed by means of the specific tariff in use. In this project the front end is User friendly and any employee with minimum knowledge of computers can work on this software. Employees can read the meter by sitting in their office.

3. BLOCKDIAGRAM



4. PROBLEM STATEMENT

In the last decade, electricity bill is been charged by power supply companies & this lead to over change on the bill because most customer do not know hoe the bill is been calculated & do not know how to calculate it & because of this, supplies companies are taking the benefits of their ignorance. On keeping this issue , we have designed a system that is called a monthly electricity billing system with bill SMS features with the help of PIC controller, energy meter & LCD display. This system could be installed with customer energy meter & display the energy meter reading with their consumable units & costs. By using this system, the customer can easily know their energy meter reading, monthly bill at their meter display board, & this saves their time and over charging of supplies companies.

COMPONENTS USED IN CIRCUIT

1. 8051 series Microcontroller
2. GSM module
3. Tranfomer
4. Lcd
5. Led
6. Crystal Oscillator
7. Diode
8. Regulator
9. Lamp
10. Energy Meter

1. 8051 series Microcontroller

8051 microcontroller is designed by Intel in 1981. It is an 8-bit microcontroller. It is built with 40 pins DIP (dual inline package), 4kb of ROM storage and 128 bytes of RAM storage, 2 16-bit timers.It consists of are four parallel 8-bit ports, which are programmable as well as addressable as per the requirement. An on-chip crystal oscillator is integrated in the microcontroller having crystal frequency of 12 MHz. There are two buses in 8051 Microcontroller one for the program and another for data. As a result, it has two storage rooms for both programs and data of 64K by 8 sizes. The microcontroller comprises of 8-bit accumulator & an 8-bit processing unit. It also consists of 8 bit B register as majorly functioning blocks and 8051 microcontroller programming is done with embedded C language using Keil software. It also has several other 8 bit and 16-bit registers.

2. GSM module

GSM (Global System for Mobile communication) module is a type of wireless communication module that allows devices to communicate over a cellular network. It provides a means for devices to send and receive data, voice, and short messages (SMS) over the cellular network.The GSM module is a compact device that includes a microcontroller, SIM card holder, and an antenna. It operates on the cellular network and is compatible with standard GSM frequencies used in different parts of the world.One of the primary advantages of GSM modules is their low power consumption, which makes them ideal for use in battery-powered devices such as remote sensors, security systems, and tracking devices. They can also operate in low signal areas and are highly reliable, with minimal interference. GSM modules can be programmed to perform a wide range of functions, including sending and receiving text messages, making and receiving calls, and transmitting data over the internet. They are also highly flexible and can be integrated with different types of microcontrollers, sensors, and other devices. GSM modules are widely used in various applications, including security systems, vehicle tracking, remote monitoring, and industrial automation. They provide a convenient and reliable means of wireless communication that can be easily integrated into different types of devices and systems. In conclusion, GSM modules are an important component of modern wireless communication systems, providing a reliable and efficient means of communication over the cellular network. With ongoing advancements in technology, GSM modules are becoming even more versatile and powerful, allowing for even more innovative applications in different fields.

3. Transformer

A transformer is an electrical device that is used to transfer electrical energy from one circuit to another through electromagnetic induction. It consists of two or more coils of wire that are wound around a magnetic core. The primary coil is connected to the power source and generates a magnetic field when an alternating current flows through it. This magnetic field then induces a current in the secondary coil, which is connected to the load.Transformers are used in a wide range of applications, including power transmission and distribution, voltage regulation, and electrical isolation. They are particularly useful for stepping upor stepping down the voltage of an electrical system, which is necessary for efficient power transmission over long distances.

Transformers come in different types and sizes, depending on their application. The most common type is the power transformer, which is used in power transmission and distribution systems to step up or step down the voltage of the electrical power. Other types include autotransformers, isolation transformers, and instrument transformers.

One of the main advantages of transformers is their high efficiency, which can be up to 99%. This means that very little energy is lost during the process of transferring electrical energy from one circuit to another. Transformers are also important for electrical safety, as they can provide electrical isolation between different circuits. This is particularly important in medical equipment and other applications where electrical shock could be dangerous.

In conclusion, transformers are an essential component of modern electrical systems, providing efficient and safe transfer of electrical energy between circuits. With ongoing advancements in technology, transformers are becoming even more efficient and versatile, allowing for even more efficient power transmission and electrical safety.

4. LCD

LCD stands for Liquid Crystal Display, which is a type of display technology used in electronic devices such as televisions, computer monitors, and mobile phones. LCDs are designed to produce clear, high-quality images with high resolution and vibrant colors. LCDs work by using a liquid crystal layer

sandwiched between two polarizing filters. When an electrical current is passed through the liquid crystal layer, it changes the alignment of the crystals, allowing light to pass through or blocking it. This creates the image that is displayed on the screen. One of the main advantages of LCD technology is that it is energy-efficient, making it an ideal choice for devices that run on battery power. In addition, LCDs are thinner and lighter than traditional cathode ray tube (CRT) displays, making them more portable and easier to install. LCDs also have a wider viewing angle than CRT displays, allowing for clear images even when viewed from an angle. They are also more durable and have a longer lifespan than CRT displays, which can be prone to burn-in and other issues. There are different types of LCD technology, including twisted nematic (TN), in-plane switching (IPS), and vertical alignment (VA). Each type has its own unique characteristics and advantages, depending on the application. In conclusion, LCD technology is an important component of modern electronics, providing clear, high-quality images with energy efficiency and durability. With ongoing advancements in technology, LCDs are becoming even more advanced, allowing for even better image quality and lower energy consumption.

5. LED

A light-emitting diode (LED) is a two-lead semiconductor light source that resembles a basic p-n junction diode, except that an LED also emits light. When an LED's anode lead has a voltage that is more positive than its cathode lead by at least the LED's forward voltage drop, current flows. Electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. An LED is often small in area (less than 1 mm2), and integrated optical components may be used to shape its radiation pattern. Appearing as practical electronic components in 1962, the earliest LEDs emitted low-intensity infrared light. Infrared LEDs are still frequently used as transmitting elements in remote-control circuits, such as those in remote controls for a wide variety of consumer electronics. The first visible-light LEDs were also of low intensity, and limited to red. Modern LEDs are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness. Early LEDs were often used as indicator lamps for electronic devices, replacing small incandescent bulbs. They were soon packaged into numeric readouts in the form of seven-segment displays, and were commonly seen in digital clocks

6. Crystal Oscillator

A mechanical or electronic device that works on the principles of oscillation is an oscillator. In other words, oscillator can be defined as the periodic fluctuations between two things based on changes in energy. The practical applications of oscillators include Computers, clocks, watches, radios etc. An example for simple type of mechanical oscillator is a clock pendulum. According to the oscillation within atoms, the atomic clock keeps time. In order to generate signals in computers, wireless receivers and transmitters and audio-frequency equipments, electronic oscillators are mainly used. Particularly it is used in music synthesizers. Different types of electronic oscillators are available. All the electronic oscillators operate according to the same basic principle. An oscillator always employs a sensitive amplifier, whose output signal is fed back to the input signal in phase. Hence, the signal itself regenerates and sustains. This is called as a positive feedback. Thus the oscillator uses a positive feedback for working. This is almost same to the unwanted "howling" in public-address systems.

A quartz crystal determines the frequency at which an oscillator works. When a direct current is applied, these crystals vibrate at a frequency that depends on its thickness value and on the manner in which it is cut from the original mineral rock. To determine the frequency, some oscillators employ combinations of inductors, resistors, and capacitors. But, the use of quartz crystals gives the best stability (constancy of frequency) in oscillators.

7. Diodes

A p–n junction is a boundary or interface between two types of semiconductor material, p-type and n-type, inside a single crystal of semiconductor. It is created by doping, for example by ion implantation, diffusion of dopants, or by epitaxy (growing a layer of crystal doped with one type of do pant on top of a layer of crystal doped with another type of dopant). If two separate pieces of material were used, this would introduce a grain boundary between the semiconductors that severely inhibits its utility by scattering the electrons and holes.p–n junctions are elementary "building blocks" of most semiconductor electronic devices such asdiodes, transistors, solar cells, LEDs, and integrated circuits; they are the active sites where

the electronic action of the device takes place. For example, a common type of transistor, the bipolar junction transistor, consists of two p–n junctions in series,in the form n–p–n or p–n–p.

8. Regulator

A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line. The 78xx (sometimes L78xx, LM78xx, MC78xx...) is a family of self-contained fixed linear voltage regulator integrated circuits. The 78xx family is commonly used in electronic circuits requiring a regulated power supply due to their ease-of-use and low cost. For ICs within the family, the xx is replaced with two digits, indicating the output voltage (for example, the 7805 has a 5 volt output, while the 7812 produces 12 volts). The 78xx line are positive voltage regulators: they produce a voltage that is positive relative to a common ground. There is a related line of 79xx devices which are complementary negative voltage regulators. 78xx and 79xx ICs can be used in combination to provide positive and negative supply voltages in the same circuit.

9. Lamp

A lamp is an electrical device that produces light through the use of a bulb or LED. Lamps are used in a wide range of settings, from residential and commercial to industrial and outdoor applications. They come in a variety of sizes, shapes, and designs, and can be powered by different energy sources, including electricity, batteries, and solar power.

The most common type of lamp is the incandescent lamp, which uses a filament that is heated by an electrical current to produce light. However, with the advancement of technology, other types of mlamps have been developed, including fluorescent, LED, and halogen lamps.

Fluorescent lamps use a gas and a phosphorescent coating to produce light, while LED lamps use a semiconductor material that emits light when an electrical current passes through it. Halogen lamps are similar to incandescent lamps, but they use a halogen gas that helps to recycle the filament, making them more energy-efficient than traditional incandescent lamps.

Lamps have a wide range of applications, from providing ambient lighting in residential settings to lighting up streets and highways. They are also used in industrial settings to provide task lighting and in outdoor applications such as flood lighting for sports fields and security lighting for buildings.

In conclusion, lamps are an essential part of modern life, providing light for a wide range of applications. With the advancement of technology, lamps have become more energy-efficient and environmentally friendly, making them an important component of sustainable living.

10. Energy Meter

An energy meter is an instrument that measures the amount of electrical energy consumed in a residential or commercial setting. It is a device that is used to measure the amount of electric power consumed by an electrical appliance or an entire building over a period of time. Energy meters come in different types, such as electromechanical meters, electronic meters, and smart meters. Electromechanical meters have a rotating disc that spins at a speed proportional to the energy consumption, while electronic meters use digital technology to measure energy consumption. Smart meters are the latest type of energy meter, which can communicate with utility companies to send information about energy consumption in real-time. They can also provide consumers with information about their energy consumption patterns, helping them to identify ways to reduce energy consumption and save money.

Energy meters are essential for accurate billing and efficient energy management. They help to ensure that consumers are billed for the amount of energy they actually use and can help to reduce energy waste and costs. Additionally, energy meters are important for environmental sustainability as they encourage energy conservation, which helps to reduce carbon emissions and mitigateclimate change.

In conclusion, energy meters play a critical role in ensuring accurate billing, efficient energy management, and environmental sustainability. With the latest smart meter technology, consumers can monitor their energy consumption in real-time and take steps to reduce their energy use and costs.

5. WORKING

MONTHLY ELECTRICITY BILLING DISPLAY WITH BILL SMS FEATURE

The energy meter records the amount of power consumption. It does so by an electromechanical system. The system is provided with such a mechanism that an increment in amount of current flow through circuit causes the disc to rotate faster, means that the rotational speed of disc is directly proportional to the amount of current flowing through circuit. This rotation effect of disc causes the gear mechanism to work accordingly and in similar fashion rate of power consumption increases the blinking rate of LED integrated within the meter. The pulses from this LED are fed to microcontroller for count operation i.e. these pulses a counted by microcontroller and readings are stored into external memory. External memory used here, is EEPROM .This memory is able to store previous database as well in case one needs to check past consumption status.LCD is connected with microcontroller so as to show the current status of GSM Modem.GSM modem is the means to communicate over wireless systems.GSM modem is connected with microcontroller via MAX 232 IC.GSM modem communicates at RS232 standard voltage levels while uC understands TTL logic levels so MAX 232 serves as voltage level converter. It converts Rs232 levels into TTL and viceversa. Whenever a command is sent to the GSM modem, it decodes the commands and works accordingly. e.g. if Meter Read command is sent to modem then it captures the status of memory and picks only integral value and sends the same information via wireless network to another modem whose address has been cited in the program written inside the ROM.

6. ADVANTAGES

1) Reduce Man power.
2) Reduce Paper.
3) Reduce Time.
4) Due to easy phase cut detection, further problems can be avoided.
5) If Customer not paying bill MSEB officer can Cut power Supply Remotely.
6) After Customer paying bill MSEB officer can ON power Supply Remotely.

7. RESULT

This is our system were energy meter is connected to the micro controller one side and on the other hand it is connected to the main supply. Here in the controller we write a code for retrieving the data from the energy meter. From micro controller we connect it to ADC which converts analog data to the digital data and vice versa, from here the data is given to the MAX 232 and RS232 which are used as interfacing unit between energy meter and the GSM network[6]. RS232 is a connector which is used to transmit the electric signals between the system and modem. As per the code written in the micro controller, SMS is sent to the energy Provider Company. Whenever SMS is sent to the energy Provider Company then customer is given an alert alarm which also reminds customer about the bill. This is for the customer flexibility here we also provide LCD Display. This helps the customer for verifying the data when SMS is sent to the energy Provider Company. This reduces mistakes done by the workers during taking the energy meter reading.

8. CONCLUSION

1. GSM based energy meter is easy to installation and beneficial for both energy Provider and Customer.
2. This reduces the manual cost and also reduces the errors done by the humans.
3. This also reduces the problems faced by connected to the SIM number.
4. The statistical load used and profile help the customer to manage their energy consumption.
5. This helps them to reduce their outstanding dues.
6. This system can be used even in the remote areas by changing the type of the modem, and its range of frequency for communication.
7. This device reduces all cases of revenue problems to the country and helps us to improve our usage. GSM based energy meter is easy to installation and beneficial for both energy Provider and Customer.

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