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Energy monitoring, controlling and common power distribution by using iot and microcontroller

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Abstract

This paper presents the development of Automatic Trip Control System for Energy Management using IoT(Internet of Things). The proposed system monitors the usage level of electricity of every consumer at all the time. By using the embedded C language, electricity board can desire the power level for power utilization in home. During excess of electrical energy more than desired level used by consumer, the system will give the alerts through an IoT to consumer. After the alerts, the consumer has to take an alternative solution to cut-off excess supply from the Electricity Board (EB) to stop alarming. Otherwise, the relay will come into OFF position and the supply will be tripping-off coming from EB. The information about the particular consumer will be sent to EB through IoT (Internet of Things). Then, the consumer has to click the restarting switch in the energy meter for making the system coming into normal with the help of PIC microcontroller, which is programmed to monitor the parameters of electrical energy. This system used to distribute power commonly in peak value time and helps for monitoring the energy, maintaining data on tariff. The implementation and demonstration of the system were made. The solar system is another power source used in peak value time and it is helps to energy meter in ON stage.

Introduction

During low power generating time, we can't provide power to all areas, hence the power shutdown for some area is unavoidable one. Instead of power shutdown for some areas, we can share the power to all areas.The electricity board can do the common power distribution during low power generation by using this smart meter with IoT and microcontroller. By using the solar system consumer can generate power for extra usage of load.Internet of things used to connect the smart meter to electricity board, hence electricity board and consumer can receive information about power consumption. The electricity board can fix the power consumption in every house with the help of IoT, pic microcontroller and embedded C programming. The liquid crystal display used to show the power

consumption in every one hour to the electricity board with help of IoT. The GSM is used for 2G mobile user for receive the information about power consumption and billing details.

Existing system

Automated EB Billing system using Ad-Hoc wireless routing. In this system the central EB office has immediate access to all consumer homes in a locality with the help of the RF system. The EB meter present in each house is connected by wireless network with the EB office which periodically gets updated from the meter. The EB officer using a backend database calculates the amount to be paid according to the number of units consumed and sends it back to the meter for display and also to the user mobile phones.

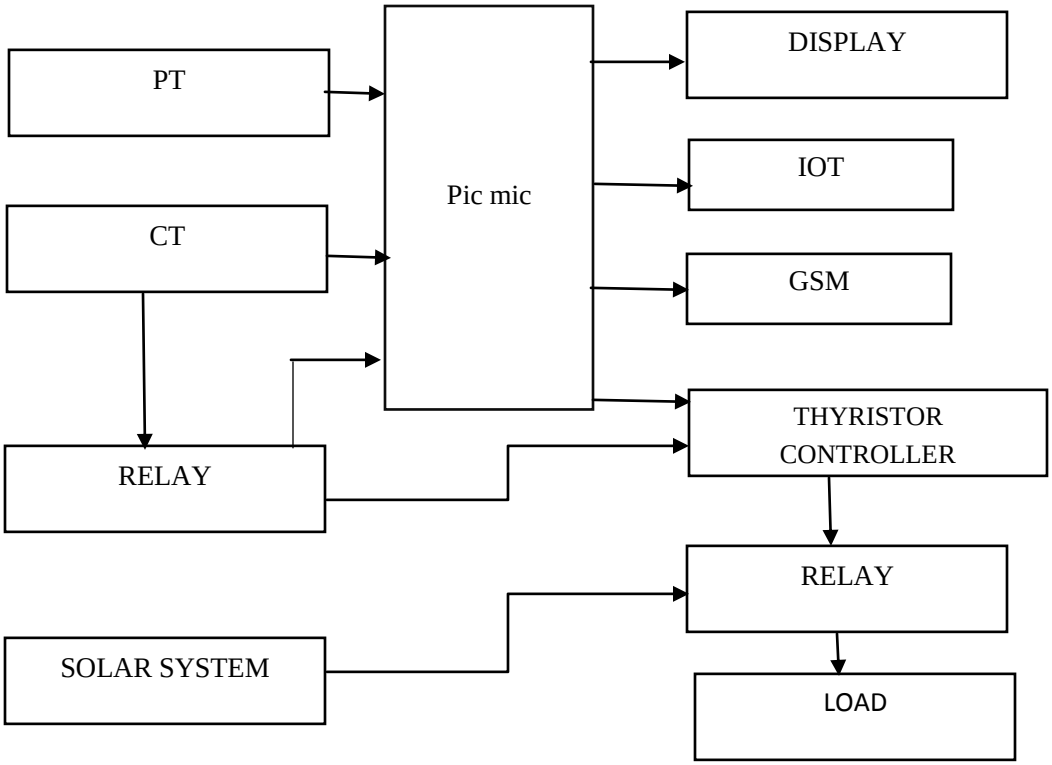
Problems identification in existing method

There is no involvement of internet of things hence we can't transfer the information to android mobile phone.In this existing system, we can't desire power level to power utilization in home.There is no involvement of solar system which is useful to energy meter in ON stage any time.

Proposed method

Proposed system involves internet of thinks with microcontroller and relay system. In the existing system, we can't fix the power level for consumer. By using proposed system we can desire power level for every home. The relay system used to power cut in home where power consumption more than desired power level.

Block diagram of proposed system



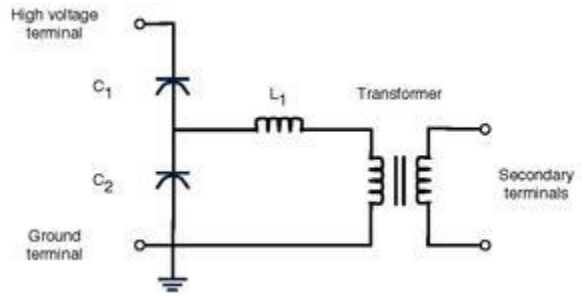
SYSTEM SPECIFICATION

TRANSFORMER

A transformer is a static device that transfers electrical energy from one circuit to another through inductively coupled conductors—the transformer's coils. A varying current in the first or primary winding creates a varying magnetic flux in the transformer's core and thus a varying

magnetic field through the secondary winding. This varying magnetic field induces a varying electromotive force (EMF) or "voltage" in the secondary winding. This effect is called mutual induction.

POTENTIAL TRANSFORMER



A voltage transformer theory or potential transformer theory is just like a theory of general purpose step down transformer. Primary of this transformer is connected across the phase and ground. Just like the transformer used for stepping down purpose, potential transformer i.e. PT has lower turns winding at its secondary. The system voltage is applied across the terminals of primary winding of that transformer, and then proportionate secondary voltage appears across the secondary terminals of the PT.The secondary voltage of the PT is generally 110 V. In an ideal potential transformer or voltage transformer, when rated burden gets connected across the secondary; the ratio of primary and secondary voltages of transformer is equal to the turns ratio and furthermore, the two terminal voltages are in precise phase opposite to each other. But in actual transformer, there must be an error in the voltage ratio as well as in the phase angle between primary and secondary voltages. Potential transformers (PT) also called voltage transformers (VT)) are a parallel connected type of instrument transformer. They are designed to present negligible load to the supply being measured and have an accurate voltage ratio and phase relationship to enable accurate secondary connected metering.

CURRENT TRANSFORMER

A current transformer (CT) is used for measurement of alternating electric currents. Current transformers, together with voltage (or potential) transformers (VT or PT), are known as instrument transformers. When current in a circuit is too high to apply directly to measuring instruments, a current transformer produces a reduced current accurately proportional to the current in the circuit, which can be conveniently connected to measuring and recording instruments. A current transformer isolates the measuring instruments from what may be very high voltage in the monitored circuit. Current transformers are commonly used in metering and protective relays in the electrical power industry.

MICROCONTROLLER (PIC 16F877A)

PIC is a family of modified Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1650 originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Peripheral Interface Controller". PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or

free development tools, and serial programming (and re-programming with flash memory) capability.

PERIPHERAL FEATURES

Timer0: 8-bit timer/counter with 8-bit prescaler.

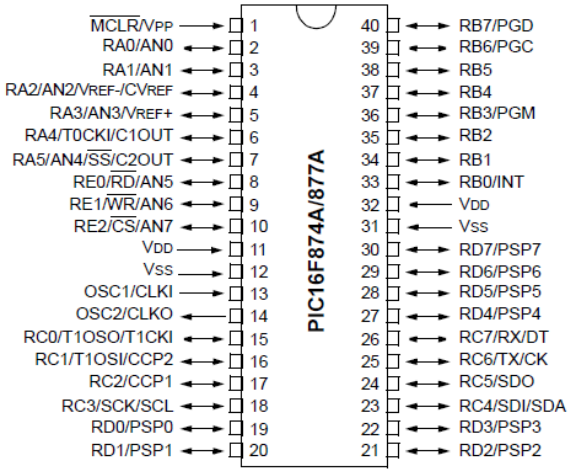
Timer1: 16-bit timer/counter with prescaler.

Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler.

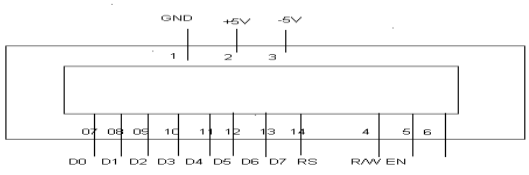
It has a Capture, Compare, PWM (CCP) module. Capture is of 16-bit and it has a maximum resolution of 12.5 ns. Compare is of 16-bit and it has a maximum resolution of 200ns.Pulse Width Modulation has a maximum resolution of 10-bit.8-bit,

8 channel analog-to-digital converter with 10 bit each. It has a Synchronous Serial Port (SSP) with SPI (Master/Slave) and I2C, USART with 9 bit detection.

PIN DIAGRAM



LIQUID CRYSTAL DISPLAY (LCD)



LCD is a type of display used in digital watches and many portable computers. LCD displays utilize to sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them. LCD technology has advanced very rapidly since its initial inception over a decade ago for use in lap top computers. Technical achievements has resulted in brighter displace, higher resolutions, reduce response times and cheaper manufacturing process.

The liquid crystals can be manipulated through an applied electric voltage so that light is allowed to pass or is blocked. By carefully controlling where and what wavelength (color) of light is allowed to pass, the LCD monitor is able to display images. A backlight provides LCD monitor's brightness.

Over the years many improvements have been made to LCD to help enhance resolution, image, sharpness and response times.

One of the latest such advancement is applied to glass during acts as switch allowing control of light at the pixel level, greatly improving LCD's ability to display small-sized fonts and image clearly.

Other advances have allowed LCD's to greatly reduce liquid crystal cell response times. Response time is basically the amount of time it takes for a pixel to "change colors", in reality response time is the amount of time it takes a liquid crystal cell to go from being active to inactive.

Relay

Relay is an electromagnetic device which is used to isolate two circuits electrically and

connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit to an electrical circuit which works at very high voltage.

A relay switch can be divided into two parts: input and output. The input section has coil which generate magnetic field when a small voltage from an electronic circuit is applied to it. This voltage is called operating voltage. Commonly used relays are available in different configuration of operating voltage. The output section consists of contactors which connect or disconnect mechanically. In a basic relay there are three contactors: normally open(NO), normally closed(NC) common(COM). At no input state the COM is connected to NC. When the operating voltage is applied the relay coil gets energized and the COM changes to NO.

INTERNET OF THINGS

The 'Thing' in IoT can be any device with any kind of built-in-sensors with the ability to collect and transfer data over a network without manual intervention. The embedded technology in the object helps them to interact with internal states and the external environment, which in turn helps in decisions making process.

In a nutshell, IoT is a concept that connects all the devices to the internet and let them communicate with each other over the internet. IoT is a giant network of connected devices – all of which gather and share data about how they are used and the environments in which they are operated.

By doing so, each of your devices will be learning from the experience of other devices, as humans do. IoT is trying to expand the interdependence in human-i.einteract, contribute and collaborate to things. I know this sounds a bit complicated, let's understand this with an example.

A developer submits the application with a document containing the standards, logic, errors & exceptions handled by him to the tester. Again, if there are any issues Tester communicates it back to the Developer. It takes multiple iterations & in this manner a smart application is created.

Similarly, a room temperature sensor gathers the data and send it across the network, which is then used by multiple device sensors to adjust their temperatures accordingly. For example, refrigerator's sensor can gather the data regarding the outside temperature and accordingly adjust the refrigerator's temperature. Similarly, your air conditioners can also adjust its temperature accordingly. This is how devices can interact, contribute & collaborate.

GSM

The GSM system was designed as a second generation (2G) cellular phone technology. One of the basic aims was to provide a system that would enable greater capacity to be achieved than the previous first generation analogue systems. GSM achieved this by using a digital TDMA (time division multiple access approach). By adopting this technique more users could be accommodated within the available bandwidth. In addition to this, ciphering of the digitally encoded speech was adopted to retain privacy. Using the earlier analogue cellular technologies it was possible for anyone with a scanner receiver to listen to calls and a number of famous personalities had been "eavesdropped" with embarrassing

consequences. The above both IOT and GSM are used to transfer data.

Proteus software

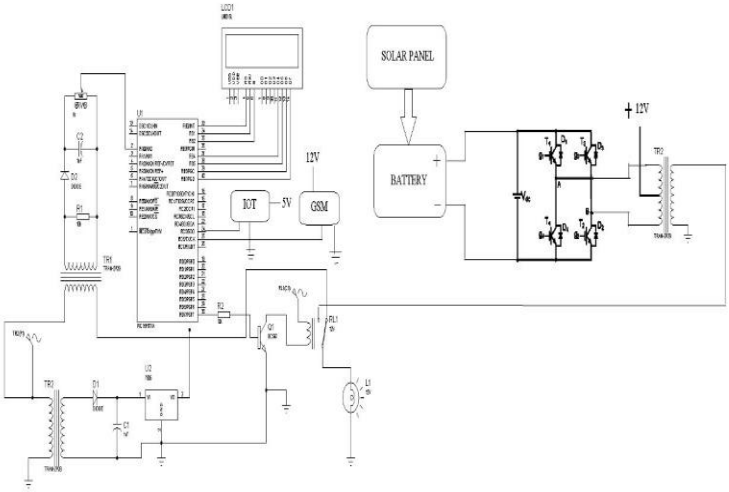
The proteus design suite is a proprietary software tool suit used primarily for electronic design automation. The software is used mainly y electronic design engineer and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

MPLAB IDE

Microchip has a large suit of software and hardware development tools integrated within one software package called MPLAB integrated development environment(IDE). MPLAB IDE is a free, integrated toolset for development of embedded applications on microchip's PIC and dsPIC microcontrollers. It is called IDE, because it provides a single integrated environment to develop code for embedded microcontrollers.

MPLAB IDE serves as a single, unified graphical user interface for additional microchip and third party software and hardware development tools. Moving between tools is a snap and upgrading from the free software simulator to hardware debug and programming tools is done in flash because MPLAB IDE has the same user interface for all tools.

CIRCUIT DIAGRAM



CONCLUSION

This paper represents the concept and implementation of automatic trip control system for energy management using Embedded controller and IoT. The electricity board can distribute existing power to all domestic areas.It mainly focused on domestic areas. This research work can make a great change in assessment of electricity bill and can give the benefits to the government by reducing the man power and time consumption.

REFERENCES

A.Vijayaraj*et* -"Automated EB Billing system using Ad-Hoc wireless routing". IrfanQuazi*et* - "Prepaid Energy meter based on AVR Microcontroller".

Liang Zhao- "Development of an energy monitoring system for large public buildings".

M. Trejo-Perea -"A real time energy monitoring platform user-friendly for buildings ". AbhinandanJain[8] "Smart and Intelligent GSM based Automatic Meter Reading System".