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Automatic Meter Reading using Gsm and Arm7

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Abstract - The advantages of remote meter reading and spot billing are well recognized by the various electricity boards in the country today. Not only does spot billing lead to much greater revenue-collection efficiency and better decision systems, it also brings intangibles like transparency and better customer service to the system. Though there exist various devices in the market that aid in spot-meter billing, none has become either an industry standard or widely prevalent. The reasons range from limited computing power and lack of customizability to high price and absence of local technical support.

Keywords - Automatic Meter Reading, ARM based system, GPRS, Relay control.

INTRODUCTION

Electrical power has become indispensable to human survival and progress. Apart from efforts to meet growing demand, automation in the energy distribution is also necessary to enhance people's life standard. Traditional meter reading by human operator is inefficient to meet the future residential development needs. So there is increased demand for Automatic Meter Reading (AMR) systems which collects meter readings electronically, and its application is expanding over industrial, commercial and utility environment. Electronic utility meters are an important step towards automating the utility metering process. Automated utility meters have many new features that help to reduce the cost of utilities to customers and the cost of delivering utilities to the utility provider. Traditional electro-mechanical meters, still widely used today, are prone to drift over temperature and time as a result of the analogue and mechanical nature of the components in these meters. Collection of meter readings is also inefficient, because a meter reader has to physically be onsite to take the readings. This method of collecting of meter readings becomes more problematic and costly when readings have to be collected from vast, and often scattered rural areas. Meter readers are reluctant to make the effort to travel to such areas and will often submit inaccurate estimations of the amount of electricity consumed. There exists chance for missing bills, absence of consumer etc. Even though these conventional meters were replaced with more efficient electronic energy meters these problems still persists. So a system which will provide the bill in users mobile will be more suitable in the current scenario.

EXISTING METHOD

By embedding computational capabilities in all kinds of objects and living beings, it will be possible to provide a qualitative and quantitative leap in several sectors: healthcare, logistics, domestics, entertainment, and so on. Due to the drastic changes in technology in the last decade, so many advancements were introduced in electricity departments. The electricity bill can be paid now through E-Seva centers, Net-banking and even through mobile phones.In this project electricity consumption by the user i.e. Units consumed in that meter will be sent to PC using zigbee module and also 16X2 LCD is provided to read units available. Whenever there is a change in count value / units in the meter gets changed, these values are

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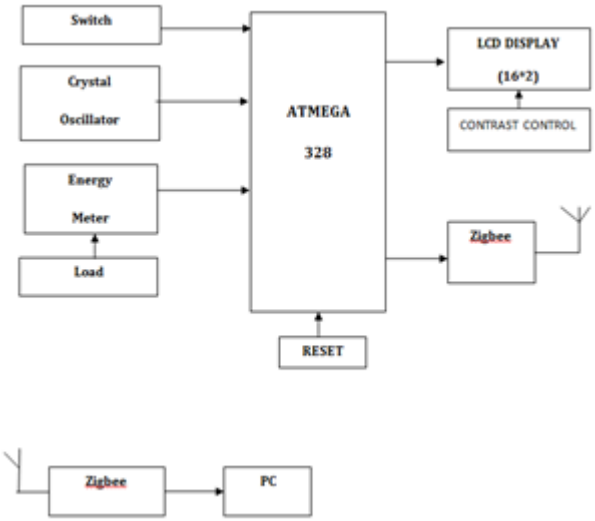
displayed on LCD. Here we are using zigbee for the purpose of communication.



Draw backs

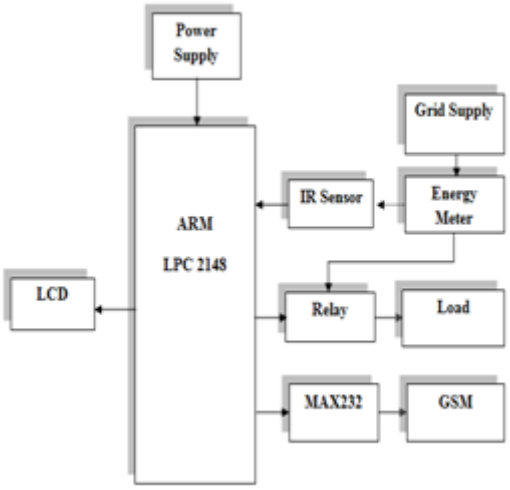
- Limit range
- Requires a computer system
- Low efficiency

Proposed method

The advantages of remote meter reading and spot billing are well recognized by the various electricity boards in the country today. Not only does spot billing lead to much greater revenue-collection efficiency and better decision systems, it also brings intangibles like transparency and better customer service to the system. Though there exist various devices in the market that aid in spot-meter billing, none has become either an industry standard or widely prevalent. The reasons range from limited computing power and lack of customizability to high price and absence of local technical support.

Remote electricity billing is a unique concept, in which the electricity board can collect the consumed units data from consumer on mobile phone using GSM network. Each consumer is provided with a unique energy meter, which is having a GSM modem, microcontroller unit and a display unit internally. A SIM card is required for communication. Whenever this system receives an SMS from electricity board, it calculates the number of units consumed and billing amount on slab rate, displays on LCD for user interface. This system also sends the same message to the electricity board for departmental information and database.

Block diagram



Modules used in this project

The LPC2148 are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory.

A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.

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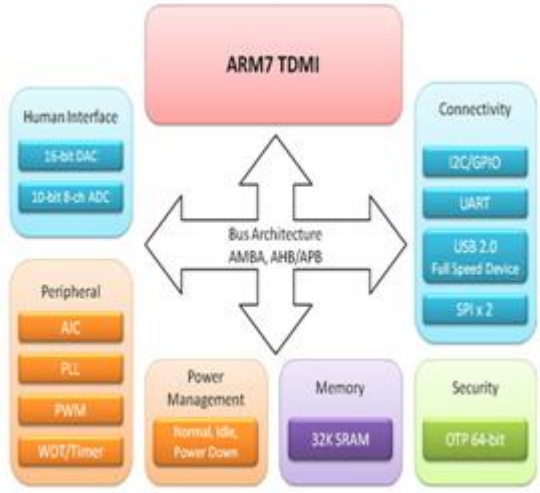


This project uses regulated 3.3V, 500mA power supply. Unregulated 12V DC is used for relay. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

ARM7TDMI Processor Core

- Current low-end ARM core for applications like digital mobile phones
- TDMI
  - T: Thumb, 16-bit compressed instruction set
  - D: on-chip Debug support, enabling the processor to halt in response to a debug request
  - M: enhanced Multiplier, yield a full 64-bit result, high performance
  - I: Embedded ICE hardware
- Von Neumann architecture

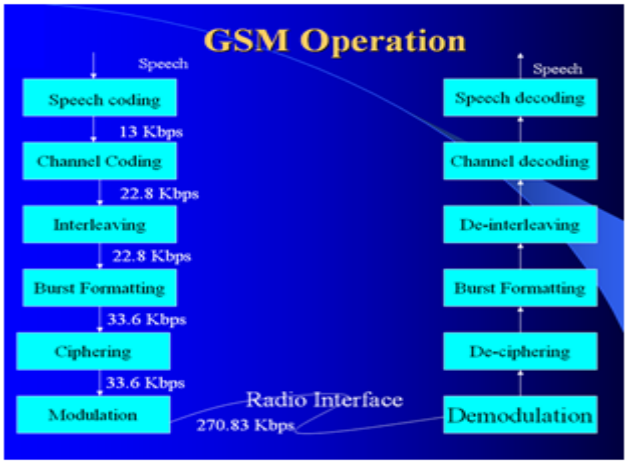
Global System for Mobile Communication (GSM)

GSM, which stands for Global System for Mobile communications, reigns (important) as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication.GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. It is estimated that many countries outside of Europe will join the GSM partnership.

General Features:

- Tri-band GSM/GPRS900/1800/1900Mhz
- GPRS multi-slot class 10
- GPRS mobile station class –B
- Complaint to GSM phase 2/2+
  - I. -class 4(2W @900MHz)
  - II. -class 1(1W @/18001900MHz)
- Dimensions: 40x33x2.85 mm
- Weight: 8gm

- Control via AT commands
- (GSM 07.07, 07.05 and SIM COM enhanced AT commands)
- SIM application tool kit
- supply voltage range 3.5 to 4.5 v
- Low power consumption
- Normal operation temperature: -20 'C to +55 'C
- Restricted operation temperature : -20 'C to -25 'C and +55 'C to +70 'C
- storage temperature: -40 'C to +80 'C



Energy meter

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The energy meter is an electrical measuring device, which is used to record Electrical Energy Consumed over a specified period of time in terms of units.The most common type of meter measures kilowatt hours. When used in electricity retailing, the utilities record the values measured by these meters to generate an invoice for the electricity.

SOFTWARE TOOLS

Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code

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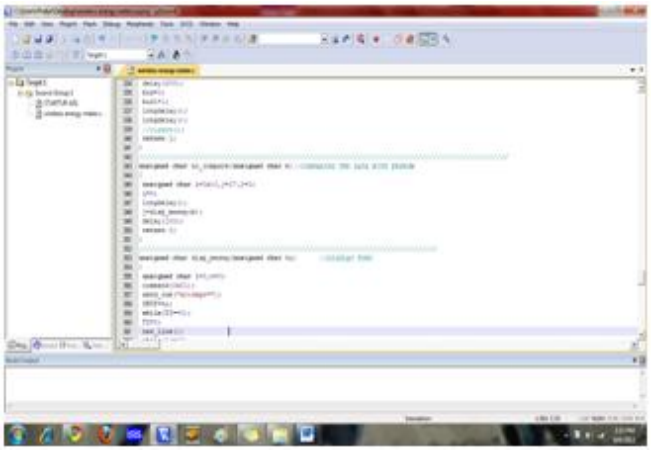
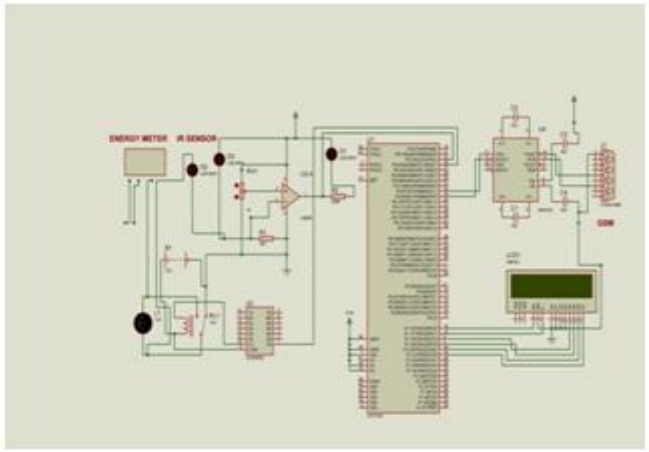


Flash Magic

Flash Magic is a tool which is used to program hex code in EEPROM of micro-controller. It is a freeware tool. It only supports the micro-controller of Philips and NXP. It can burn a hex code into that controller which supports ISP (in system programming) feature. Flash magic supports several chips like ARM Cortex M0, M3, M4, ARM7 and 8051.

Schematic Diagram:



RESULTS

Fig.energy meter setup

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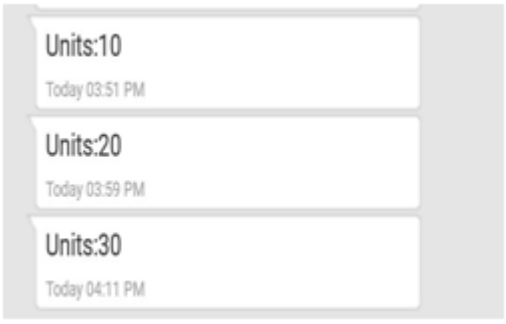

Fig.SMS generated by WAMRCS system showing units

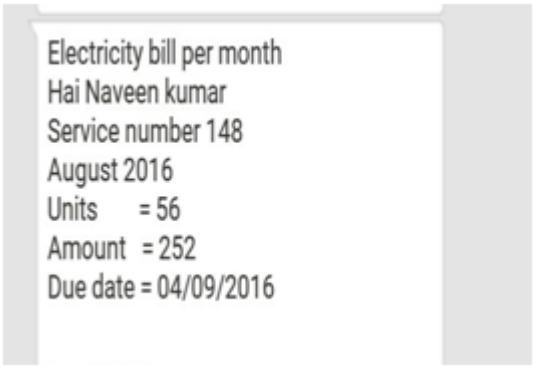

Fig.SMS generated by WAMRCS System showing Billing details

Advantages

- It will reduce the time to measure the meter reading.
- Faster and reliable operation.
- Operational cost is low.

Applications:

Electricity Department, Organization staff quarters

CONCLUSION

In this project work, we have studied and implemented a complete working model using a Microcontroller. The programming and interfacing of microcontroller has been mastered during the implementation. This work includes the study of GSM modem

GSM network operators have roaming facilities, user can often continue to use there mobile phones when they travel to other countries etc..

Hence this project provides a best solution for the users to know how much amount of power is consumed in their day- to- day life and also the amount of power consumed is also under the user control. so by using this project the department can save the time also.

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