

# Prepaid Energy Meter Using Smart Card

Gottimukla Bhagyasri<sup>1</sup>, Jangamshivai Uttej<sup>2</sup>, Mr. T. Sanjeeva Rao<sup>3</sup> and Mrs. S. Bharathi<sup>4</sup>

<sup>1,2</sup> UG Students, Department of Electrical and Electronics Engineering, Malla Reddy Engineering College (A), India

<sup>3</sup> Associate Professor, Department of Electrical and Electronics Engineering, Malla Reddy Engineering College (A), India.

<sup>4</sup> Assistant Professor, Department of Electrical and Electronics Engineering, Malla Reddy Engineering College (A), India.

E-Mail: sanjeev707@gmail.com

**Abstract**— An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost conscious market. Every embedded system consists of custom-built hardware built around a Central Processing Unit (CPU). This hardware also contains memory chips onto which the software is loaded. The software residing on the memory chip is also called the ‘firmware’. The embedded system architecture can be represented as a layered architecture.

**Keywords**— Combination, Embedded System, Energy Meter, micro-controller, Smart Card

## I. INTRODUCTION

An embedded system is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a traditional business or scientific application. High-end embedded & lower end embedded systems. High-end embedded system - Generally 32, 64 Bit Controllers used with OS. Examples Personal Digital Assistant and Mobile phones etc .Lower end embedded systems - Generally 8,16 Bit Controllers used with an minimal operating systems and hardware layout designed for the specific purpose.

### A. System Design Calls

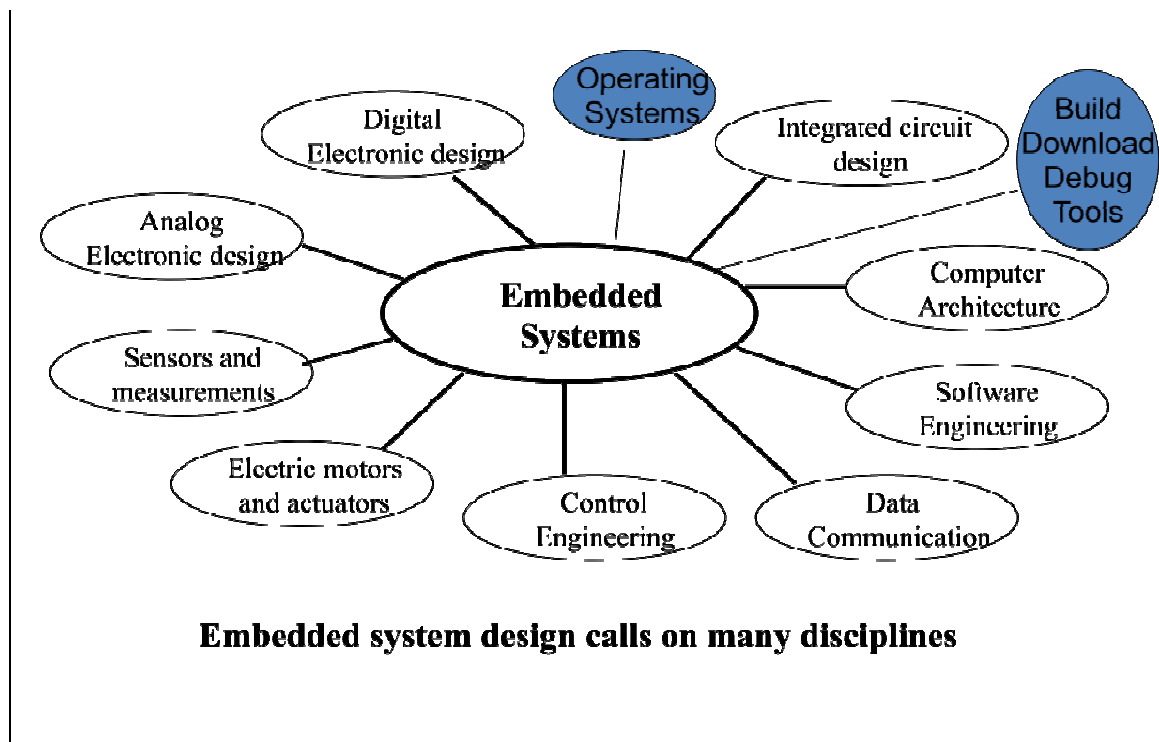


Fig.1. Embedded system design calls

## II. EMBEDDED SYSTEM DESIGN CYCLE

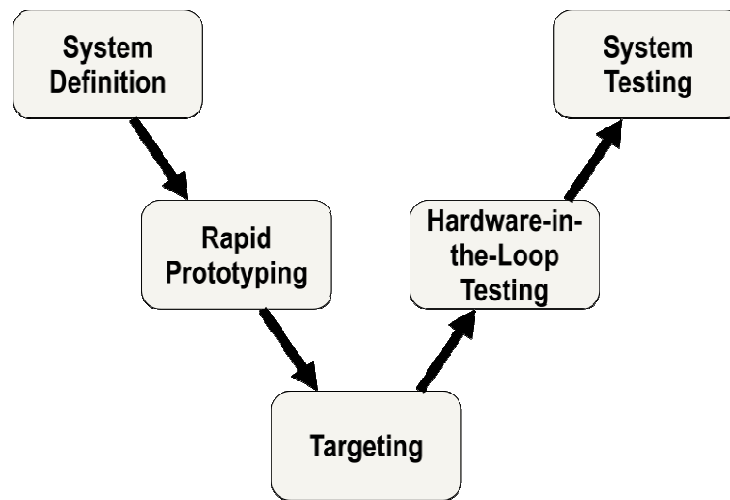


Fig. 1.2. V Diagram

## III. CHARACTERISTICS OF EMBEDDED SYSTEM

1. An embedded system is any computer system hidden inside a product other than a computer.
2. They will encounter a number of difficulties when writing embedded system software in addition to those we encounter when we write applications
3. Throughput – Our system may need to handle a lot of data in a short period of time.
4. Response–Our system may need to react to events quickly
5. Testability–Setting up equipment to test embedded software can be difficult
6. Debugability–Without a screen or a keyboard, finding out what the software is doing wrong (other than not working) is a troublesome problem
7. Reliability – embedded systems must be able to handle any situation without human intervention
8. Memory space – Memory is limited on embedded systems, and you must make the software and the data fit into whatever memory exists
9. Program installation – you will need special tools to get your software into embedded systems
10. Power consumption – Portable systems must run on battery power, and the software in these systems must conserve power
11. Processor hogs – computing that requires large amounts of CPU time can complicate the response problem
12. Cost – Reducing the cost of the hardware is a concern in many embedded system projects; software often operates on hardware that is barely adequate for the job.

Embedded systems have a microprocessor/ microcontroller and a memory. Some have a serial port or a network connection. They usually do not have keyboards, screens or disk drives.

Password Based Door Lock System is designed using ARDUINO UNO where in once the correct code or password is entered, the door is opened and the concerned person is allowed access to the secured area. Password Based Door Lock System using Arduino UNO is a simple project where a secure password will act as a door unlocking system. Old fashioned lock systems use mechanical locking and these can be replaced by new advanced techniques of locking systems. These methods are a combination of mechanical and electronic devices and are highly intelligent. One of the distinct features of these intelligent lock systems is their simplicity and high efficiency. Such an automated lock system consists of electronic control assembly, which controls the output load through a password. The example of this output load can be a motor or a lamp or any other mechanical/electrical load.

Here, we made an electronic code lock system using Arduino UNO, which provides control to the actuating the load. It is a simple embedded system with takes input from the keyboard and the output being actuated accordingly.

This system demonstrates a Password based Door Lock System using Arduino UNO, wherein once the correct code or password is entered, the door is opened and the concerned person is allowed access to the secured area. If another person

arrives, it will ask to enter the password again. If the password is wrong, then door would remain locked, denying access to the person.

Main idea behind this project is of a door-latch opening using a password entered through keypad. As well as turning on the Buzzer when passcode is entered wrong for multiple times. User can modify this password anytime he/she wishes using a keypad. The main component in the circuit is Arduino UNO which is basically used to send a text message to owner of the house about the breach of security. 4\*4 keypad is used to enter the password. The entered password is compared with the known password. If it is correct password, the system opens the door by servo motor and displays the status of door on LCD. If the password is wrong then door remains closed and displays "WRONG PASSWORD" on LCD.

#### A. Applications

- Military and aerospace embedded software applications
- Communication Applications
- Industrial automation and process control software
- Mastering the complexity of applications.
- Reduction of product design time.
- Real time processing of ever increasing amounts of data.
- Intelligent, autonomous sensors.

### IV. REAL TIME SYSTEMS

RTS is one which has to respond to events within a specified deadline. A right answer after the dead line is a wrong answer.

RTS Classification:

- ❖ Hard Real Time Systems
- ❖ Soft Real Time System

#### A. Hard Real Time System

"Hard" real-time systems have very narrow response time.

Example: Nuclear power system, Cardiac pacemaker

#### B. Soft Real Time System

"Soft" real-time systems have reduced constraints on "lateness" but still must operate very quickly and repeatably.

Example: Railway reservation system – takes a few extra seconds the data remains valid

#### C. Application Area

Nearly 99 per cent of the processors manufactured end up in embedded systems. The embedded system market is one of the highest growth areas as these systems are used in very market segment- consumer electronics, office automation, industrial automation, biomedical engineering, wireless communication, data communication, telecommunications, transportation, military and so on.

#### D. Consumer appliances

At home we use a number of embedded systems which include digital camera, digital diary, DVD player, electronic toys, microwave oven, remote controls for TV and air-conditioner, VCR player, video game consoles, video recorders etc. Today's high-tech car has about 20 embedded systems for transmission control, engine spark control, air-conditioning, navigation etc. Even wristwatches are now becoming embedded systems. The palmtops are powerful embedded systems using which we can carry out many general-purpose tasks such as playing games and word processing.

#### E. Office automation

The office automation products using embedded systems are copying machine, fax machine, key telephone, modem, printer, scanner etc.

#### F. Industrial automation

Today a lot of industries use embedded systems for process control. These include pharmaceutical, cement, sugar, oil exploration, nuclear energy, electricity generation and transmission. The embedded systems for industrial use are designed to carry out specific tasks such as monitoring the temperature, pressure, humidity, voltage, current etc., and then take appropriate action based on the monitored levels to control other devices or to send information to a centralized monitoring station. In hazardous industrial environment, where human presence has to be avoided, robots are used, which

Special Issue:

Department of Electrical and Electronics Engineering, Malla Reddy Engineering College (Autonomous).

© IJRAD. Volume 1, Issue 2, pp. 01-04, June 2017.

are programmed to do specific jobs. The robots are now becoming very powerful and carry out many interesting and complicated tasks such as hardware assembly.

#### G. Wireless technologies

Advances in mobile communications are paving way for many interesting applications using embedded systems. The mobile phone is one of the marvels of the last decade of the 20<sup>th</sup> century. It is a very powerful embedded system that provides voice communication while we are on the move. The Personal Digital Assistants and the palmtops can now be used to access multimedia services over the Internet. Mobile communication infrastructure such as base station controllers, mobile switching centers are also powerful embedded systems.

#### V. CONCLUSION

In this project we have studied and implemented a complete working model of a prepaid energy meter using a microcontroller. The reason for using these microcontrollers is its high performance, power efficiency or design flexibility. The recharge section is very much user friendly since we can recharge for the required amount as per our budget. This LCD gives the consumed power, balance amount which are essential for awareness about energy consumption. Prepaid energy meter reduces the billing system and growth to the new technology as a mobile system and online payment modes for electricity billings. Here data transmission is based on smart card technology. And this system records the data according to the tariffs and detects the payment as its units produced. In any case of no payment its relay operates and cut the supply from meter until it recharge again.

#### VI. FUTURE SCOPE

In the present time of 21st century we have no space for errors or faults either in any technical system or in general applications. Prepaid energy meter is an advantageous concept for the future. Its facilitates the exemption from electricity bills. Electricity coupons will be available at nearby shops. The word prepaid means "pay before use" one of the advantageous feature of this concept. Prepaid energy meter is used to prepaid the ongoing supply of electricity to homes, offices etc.

#### REFERENCES

- [1]. Devidas, A.R., Ramesh, M.V. "Wireless Smart Grid Design for Monitoring and Optimizing Electric Transmission in India," *2010 Fourth International Conference on Sensor Technologies and Applications (SENSORCOMM)*, pp.637-640, 2010.
- [2]. A.V.Sudhakara Reddy, M. Ramasekhara Reddy, M. Vijaya Kumar "Stability Improvement During Damping of Low Frequency Oscillations with Fuzzy Logic Controller", *International Journal of Engineering Research and Applications (IJERA)*, Vol.2, No.5, pp.1560-1565, September 2012.
- [3]. Md. Mejbaut Haque "Microcontroller Based Single Phase Digital Prepaid Energy Meter for Improved Metering" *International Journal of Power Electronics and Drive System (IJPEDS)* December 2011, pp. 139~147.
- [4]. B Bhargava Reddy, D Sivakrishna and A V Sudhakara Reddy "Modelling and Analysis of Wind Power Generation Using PID Controller", *International Journal For Scientific Research & Development (IJSRD)*, Vol.1, No.9, pp.2045-2049, November 2013.
- [5]. K.Surekha and A.V.Sudhakara Reddy "A New Control Topology for Smart Power Grids using Bi-directional Synchronous VSC", *International Journal of Informative & Futuristic Research*, Vol.2, No.10, PP.3695-3704, June 2015.
- [6]. Raja Reddy, Duvvuru, B.Venkata Prasanth, V.Ganesh, "A Novel Approach for Reducing the Power Oscillations in Transmission System by using Distributed Power Flow Controller(DPFC)" *International Science Press, International Journal of Control Theory and Applications*,9(14) 2016, pp. 6721-6730.
- [7]. A. V. Sudhakara Reddy, Prof. M. Damodar Reddy, "Optimization of network reconfiguration by using particle swarm optimization", *2016 IEEE First International Conference on Power Electronics, Intelligent Control and Energy Systems (IEEE ICPEICES-2016)*, July 4th - 6th, 2016.
- [8]. Ling Zou, Sihong Chu and Biao Guo., "The Design of Prepayment Smart Electricity Meter System," *International Conference on Intelligent Computing and Integrated Systems (ICISS)*, pp. 430-432, 22-24, Dec 2010.
- [9]. D.Raja Reddy, A.Gayathri Reddy "Controlling Power Oscillations in Real and Reactive Power using Symmetrical HYBRID PFC (Power Flow Controller)" *i-manager's Journal on Electrical Engineering*, Vol. 10, Issue. No. 3, pp. 11-17, January - March 2017.
- [10]. A. V. Sudhakara Reddy, Prof. M. Damodar Reddy, "Optimization of Distribution Network Reconfiguration Using Dragonfly Algorithm", *Journal of Electrical Engineering*, Vol.16, No.4, No.30, pp.273-282, ISSN:1582-1594, March 2017.
- [11]. S.Bharathi, A.V.Sudhakara Reddy and M.Damodar Reddy, "Optimal Placement of UPFC and SVC using Moth-Flame Optimization Algorithm", *International Journal of Soft Computing and Artificial Intelligence*, ISSN: 2321-4046, Vol.5, No.1, pp.41-45, May 2017.
- [12]. A. V. Sudhakara Reddy, M. Damodar Reddy and N.Vinoda, "Optimal Placement of Dynamic Voltage Restorer in Distribution Systems for Voltage Improvement Using Particle Swarm Optimization", *International Journal of Engineering Research and Applications (IJERA)*, ISSN: 2248-9622, Vol.7, No.3, pp.29-33, March 2017.
- [13]. Loss, P et al., "A Single Phase Microcontroller Based Energy Meter," *IEEE Instrumentation and Measurement Technology Conference*. St. Paul Minnesota, USA, May 18-21, 1998.
- [14]. [www.8051projects.net/download-d134-prepaidenergy-meter-at-89S52](http://www.8051projects.net/download-d134-prepaidenergy-meter-at-89S52).