EMBEDDED SYSTEMS

ROSLIN SHIBINA PETER, R.RAJA RAJESHWARI, R.LAVANYA

ADITHYA INSTITUTE OF TECHNOLOGY

ABSTRACT

This paper entirely gives knowledge about EMDDED SYSTEMS. This paper includes Introduction, History, Characteristics, Architecture, Design, Applications, Future of embedded systems and Summary.

An embedded system is a special-purpose computer system designed to perform one or few dedicated functions, often with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded system controls many of the common devices in use today. If asked to define, it is hard to define. It is found to be embedded within electronic devices. It has the following characteristics like

- Special-purpose
- Tightly constrained
- Reactive and real time
- Hardware and software co-exist

It is typically designed to execute a single program, repeatedly. It was used to be single purpose. Now used as multi-functioned. It is tactic. It has many features like low cost, simple systems, fewer components based, fast access, minimum power required. It continually reacts to external events. Sometimes it is a must to compute certain results in real-time.

INTRODUCTION

Any electronic device that incorporates a Microprocessor within its implementation is called **Embedded system**. An embedded system is a computer-controlled system. The core of any embedded system is a Microprocessor, programmed to perform a few tasks. A combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a dedicated function. The characteristics include heterogeneous which implies, it is a combination of software, electronics, mechanical, optics etc. It is real-time applicable, low power required, reliable system. It is highly flexible. It is communicative.

HISTORY

In the earliest years of computers in 1930-40 s, computers were sometimes dedicated to a single-purpose task. One of the first recognizably modern embedded systems was the Apollo Guidance Computer, developed by Charles Stark Draper at the MIT Instrumentation Laboratory. Since these early applications in the 1960s, embedded systems have come down in price and there has been a dramatic rise in processing power and functionality. The first Microprocessor for example, the Intel 4004 was designed for calculators and other small systems but still required many external memory and support chips. The first mass produced embedded system was the guidance computer for the Minuteman missile in 1961. It was the Automatics D-17 guidance computer. In 1970's the first consumer-oriented microprocessor was norm, but in general still required external memory chips, and decoding logic, as well as any interfaces to the external world. In mid 1980's higher level of integration meant that most of the previously external systems components moved onto the same chip as the processor. Such integrated systems were called microcontrollers. By the end of 1980's embedded systems were the norm rather than the exception for almost all electronic devices. This trend is been continued still.

CHARACTERISTICS

It has many features like low cost, simple systems, fewer components based, fast access, minimum power required. It continually reacts to external events. Sometimes it is a must to compute certain results in real-time. The characteristics include heterogeneous which implies, it is a combination of software, electronics, mechanical, optics etc. It is real-time applicable, low power required, reliable system. It is highly flexible. It is communicative. It is networked, connected, unobtrusively communicating: typically by means of sensors and actuators. Decentralized control, adaptive behavior, self configuring, self restoring. Several components of vastly different functionalities are found in embedded system software. It is unique in response time constraint and strict deadlines. All components are supposed to use memory optimally. Each software component execution speed must be optimum. Software must have controlled complexity and must be thoroughly tested and debugged for errors.

ARCHITECTURE

Real-time programming

Programming the processes or instruction set with constraints of time for its response, process with latencies and process with deadlines. Procedure oriented C and object oriented programming C++ and Java languages are used in most embedded systems programming. Embedded programming is such that

methods to optimize the system memory requirements are also used.

The core of any embedded system is a Microprocessor, programmed to perform a few tasks. A combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a dedicated function.

DESIGN

The software development process can be represented by lifecycle, also called a waterfall or linear incremental model. Analysis, design implementation and maintenance are four stages of this model

User Interface

Embedded systems range from no user interface at all. It is dedicated to one single task. For example it can be employed to full user interfaces similar to desktop operating systems in devices such as PDAs

APPLICATIONS

- Air conditioner 1.Navigation system
- ATM machine 2.PDA
- Battery charger 3.Photocopier
- Digital camera 4.Printer
- DVD player 5.Router
- Fax machine 6.Scanner
- Home security system 7.TV
- Mobile phone 8.Video game console
- Modem 9.Wearable computer

Where Embedded Systems are using?

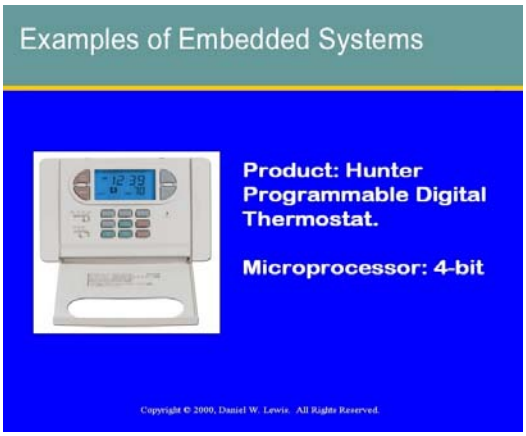
ATM (Automatic Teller Machines), Cell phones and Phone switches (EPABX's etc), Network routers, timer servers, firewalls. Computer peripherals (Printers, disk drivers, Floppy controllers, etc), Engine controllers, Antilock brake controllers for automobiles etc, PLC's in Process Control Industry, Home appliances: Air conditioner, DVD players, TV's, Video games, Security monitoring systems, Avionics: Missiles, tracking systems etc.

Aerospace: Navigation system, Automatic landing systems, Flight altitude control, Space exploration (Mara Path Finder).

Automotive: Fuel injection control, anti-lock braking systems, GPS mapping

Communications: Satellites, network routers, switches, hubs etc.

Computer Peripherals: Printer, scanner, keyboards, displays, modems, CD-ROM etc.



FUTURE OF EMBEDDED SYSTEM

Embedded processor accounts for 100% worldwide microprocessor production

Microprocessor production is Embedded: Desktop = 100:1

Embedded processors in house 40 – 50 (approx)

Embedded processors in modern cars 50 – 60.

CONCLUSION

The key characteristic, however, is being dedicated to handle a particular task. Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale. Hence to conclude with, embedded systems has a wide future in the forthcoming technological developments.