

REVIEW ARTICLE



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## A SURVEY ON EMBEDDED SYSTEM

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### HISTORY OF EMBEDDED SYSTEM

[1],[3],[7] Now a days the Embedded computers is used in Military and Space application, now they are found in Automobiles, coffee makers and all other electronic device. The cost and size of the computer chips also decreased with the help of semiconductor technology

In 1960's the embedded system (AGC) was a larger device the weighing in pounds and costing thousands of dollars .The first embedded computer system was the Apollo Guidance Computer (AGC) was developed by Charles Stark Draper at the MIT instrumentation Laboratory. This Apollo project is used in 1968 and (AGC) was considered as very riskiest item due to its weight, the National Aeronautics and Space Administration reports that the AGC weighed approximately 70 pounds.©KY Publications

During this period the D -17 guidance computer was developed for missile which contains transistor logic and had a hard disk for main memory and later it was replaced with a new computer that was the first high volume use of integrated circuits so that the cost of the Devices was reduced

Since this early application from 1960's the embedded system have become low in price and high in power and functionality. Later in 1970's the first microprocessor – Intel 4004 was designed for calculators and other small system but still it need some memory, then the microcontroller were introduced with memory and peripherals build into a single chip. In 1978 National Engineering Manufacturers Association released a "Standard" for the programmable microcontrollers like event based controllers, numerical and single board computers.

In 1980's intel released the 8051 - (a Harvard architecture) single chip microcontroller. The 8051 and other processor will became one of the most widely used microcontroller. In this year the microcontrollers saw drastic improvement in

memory capacity, operating system and software development tool such as compilers.

In the other word in the Mid of 1980's, the previous external system components had been integrated into the same chip as the processor and this modern microcontroller has been used wildly.

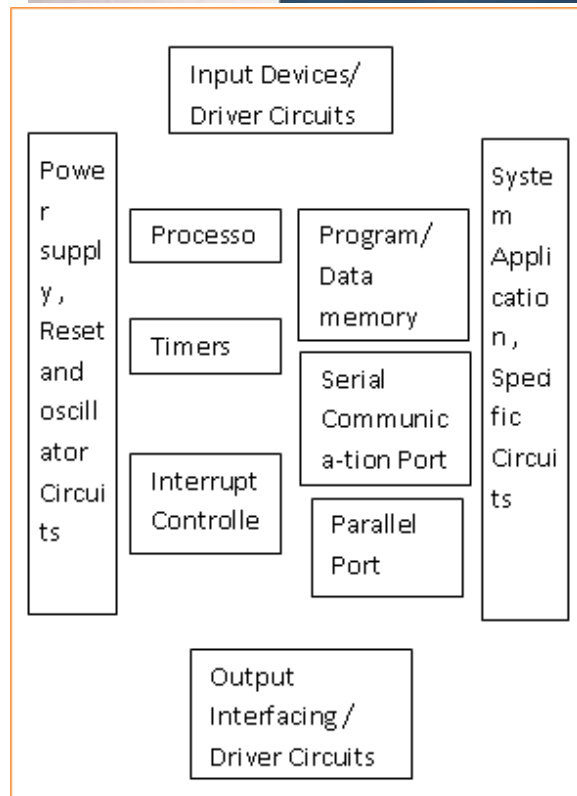
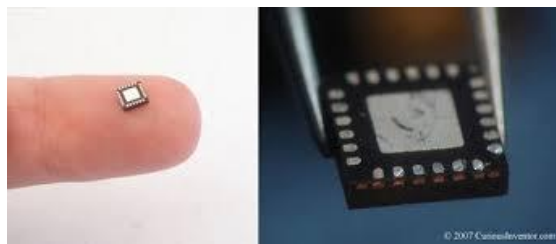
In 1990's, during development and testing the embedded system has become rewritable system, frequent reprogramming in completed products is common. In earlier technologies the chips were 'one time write' technology ROM – Read Only Memory or UV erasable i.e. PROM – Programmable Read Only Memory. These are all became one use components and later microchip introduce the microcontroller with EEPROM – Electrically Erasable Programmable Read Only

Memory, it is a non-volatile memory used in computers and other electronic devices. This EEPROM can save the data even after the power has shut down.

In 1997, Atmel introduced a microcontroller with flash program memory, which makes reprogram easier to improve the performance of the system. The Integration of microcontroller has further increased the applications for which embedded system are used in to areas where traditionally a computer would not have been considered.

In 2000, the embedded system will become more discipline with the appearance of tool UML – Unified Modelling Language. In 2010, Atmel announced availability of the world’s smallest microcontroller.

The 8 – Pad UDFN package – Dual-flat no-leads used in ATtiny devices.



EMBEDDED SYSTEM

With processing power increasing even the size is small.[4],[6] An Embedded system is the one that has computer hardware with software embedded in it as one of its most important feature. It is a dedicated(Computer) system for an applications or products. It may be an independent system or a group of large system.

Components of the Embedded system hardware:

1. It has hardware ,
- 2.It has main application software.The application software my perform concurrently the series of tasks.
- 3.It has a real time operating system (RTOS) helps the application software to perform the process of the processor as per scheduling and do the context switch between the various processes

An embedded system has a software design to keep in view three constraints , a) available system memory , b) available processor speed, c) to need to limit power dissipation.

**CLASSIFICATIONS OF EMBEDDED SYSTEM**

**[4],[3] Small Scale Embedded System:** - These systems are designed with a single 8 or 16 bit microcontroller. Usually, ‘C’ is used for developing the system, this program compilation is done into the assembly, and executable codes are located in the system memory.

**Medium Scale Embedded System:** - These systems are designed with a single 16 or 32 bit microcontroller or DSP or RISCs. RTOS, simulator, Debugger, Source code engineering tool and Integrated development environment (IDE).

**Sophisticated Embedded System:** - These have enormous software and hardware complexities and may need scalable processors or configurable processors and Programmable logic array. Certain software functions such as encryption and description algorithms, TCP/IP protocol stacking and network driver functions are implemented in the hardware to obtain the additional speeds by saving time.

**PROCESSOR IN THE SYSTEM**

**[4],[5] Microprocessor :-** A Microprocessor is a single VLSI chip that has a CPU and may also have some other units ( for examples - caches, pipelining, floating point processing arithmetic and super scaling units) that are additionally present and that result in faster processing of instructions. Example : Intel-8085. It is an 8 bit processor. Other are 8086 or 8088.

**Microcontroller:** - It is a single chip VLSI unit (also called 'microcomputer') which though having limited computational capabilities, possesses enhanced input-output capabilities and a number of on-chip functional units.

**Embedded processor:** - For fast, precise and intensive calculations and for complex real-time applications, the micro-controllers/processors mentioned above do not suffice. Example: AWACS – Advanced Warning and Control System, which also associates tracking radar, is an example of this complex real-time system. When a microprocessor and microcontroller is specially designed such that it has the following features, then the term embedded processor is preferred instead of microcontroller and microprocessor

**Digital Signal Processor:** - It is an essential unit of an embedded system for a large number of applications needing processing of signals. It is also used in a system for recognizing an image pattern or a DNA sequence fast.

**Application Specific System Processors:** - Lately a new class of embedded system has emerged. System additionally incorporates the ASSP chip or core in its design. Example: 'Serial to Ethernet Converter' (IIM7100).

**Multi-Processor Systems using General Purpose Processors:** - In an embedded system, more no. of processors may be needed to execute an algorithm fast and within a strict dead line. Example: video processing in real-time, the number of MAC operations needed per second may be more than is possible from one DSP unit. An embedded system may incorporate two or more processors running in synchronization.

A multiprocessor unit is most often used in Real-time video processing and multimedia applications in the embedded system.

#### IDEAL APPLICATIONS OF EMBEDDED SYSTEM

1. Telecom,
2. Smart Cards,
3. Missiles and Satellites,
4. Computer Networking Systems and Peripherals,
5. Digital Consumer Electronics,
6. Automotive.

#### ADVANTAGES OF AN EMBEDDED SYSTEM

**[1],[2],[3] Physical Benefits:** - Because an embedded system always performs the same basic tasks, it rarely needs any hardware changes such as adding extra memory or storage space. It helps people to be able to physically access the system. As a result, it's much easier to house an embedded system in a device such as a set-top box that is not designed for user servicing

**Dedicated Tasks:** - Unlike a full-blown computer, usually it performs one task at a time. For example, the cable performs the task of receiving, converting and sending the signal to the television can understand. By dedicating to this task, the box can do it without interruption.

**Operating System:** - Often an embedded system can run an older or less sophisticated operating system. For example, the device from ATMs to airplane seat-back entertainment displays were able to run a special version of Windows XP for years without any problem.

**Specifications and Cost:** - Previously the size, specification and cost was high and after that due to development the size of the embedded system became reduced and cost also. For example, the PC need concentrating on a single task means multi-core processors are not usually needed. Depending on the system purpose, it may be able to work with slow processors so that there is no need to exceed the capacity and the particular work also doesn't need any of it. In turn it reduced the specification so that the cost will also be reduced.

#### CONCLUSION

The Embedded System has virtually entered every sphere of our life. In some way it has reduced the human effort from doing the work manually to access the Appliances (System). This also increases the security of the products.

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