

EMBEDDED SYSTEM

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1.1 Understand the concept of embedded system

- 1.1.1 Describe the meaning of embedded system
- 1.1.2 Explain microcontroller as the heart of embedded system
- 1.1.3 Relate embedded system examples with real life application
- 1.1.4 Differentiate Microcontroller and microprocessor
- 1.1.5 Discuss the advantages of microcontroller application

1.1.1 Describe the meaning of embedded system

Embedded System:-

- ❑ An embedded system is a system that has software embedded into computer-hardware, which makes a system dedicated for an application(s) or specific part of an application or product or part of a larger system.
- ❑ An embedded system is one that has a dedicated purpose software embedded in a computer hardware



1.1.1 Describe the meaning of embedded system

Embedded System:-

- It is a dedicated computer based system for an application(s) or product. It may be an independent system or a part of large system. Its software usually embeds into a ROM (Read Only Memory) or flash.



1.1.1 Describe the meaning of embedded system

Embedded System:-

- ❑ Embedded Systems are the electronic systems that contain a microprocessor or a microcontroller, but we do not think of them as computers– the computer is hidden or embedded in the system. -*Todd D. Morton*

1.1.2 Explain microcontroller as the heart of embedded system

- ▶ Microcontroller is an IC chip that takes input process data according to program written in its memory and gives output as control signal for controlling other machines and devices.

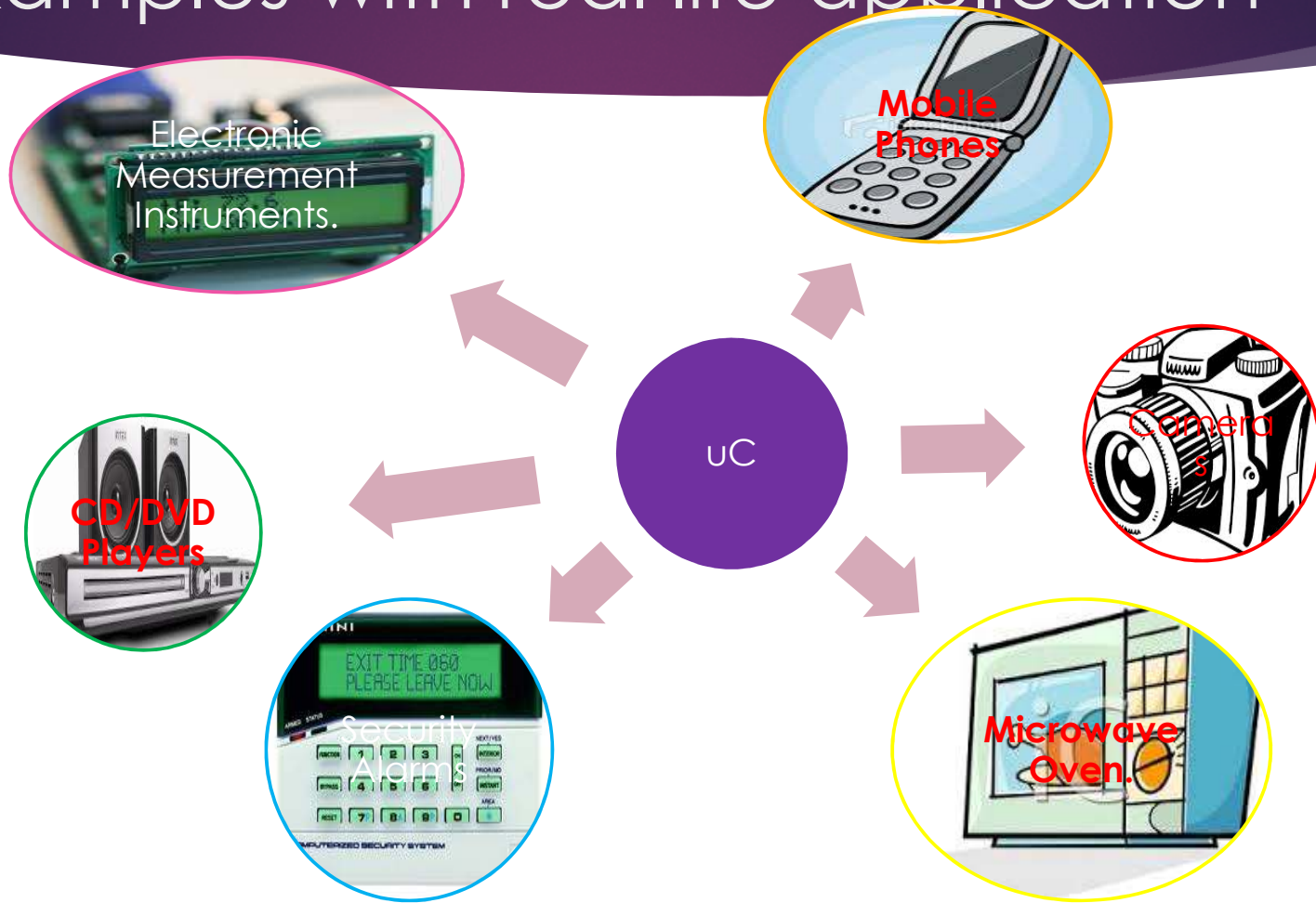
1.1.2 Explain microcontroller as the heart of embedded system

- ▶ A microcontroller (sometimes abbreviated μC , uC or MCU) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals.

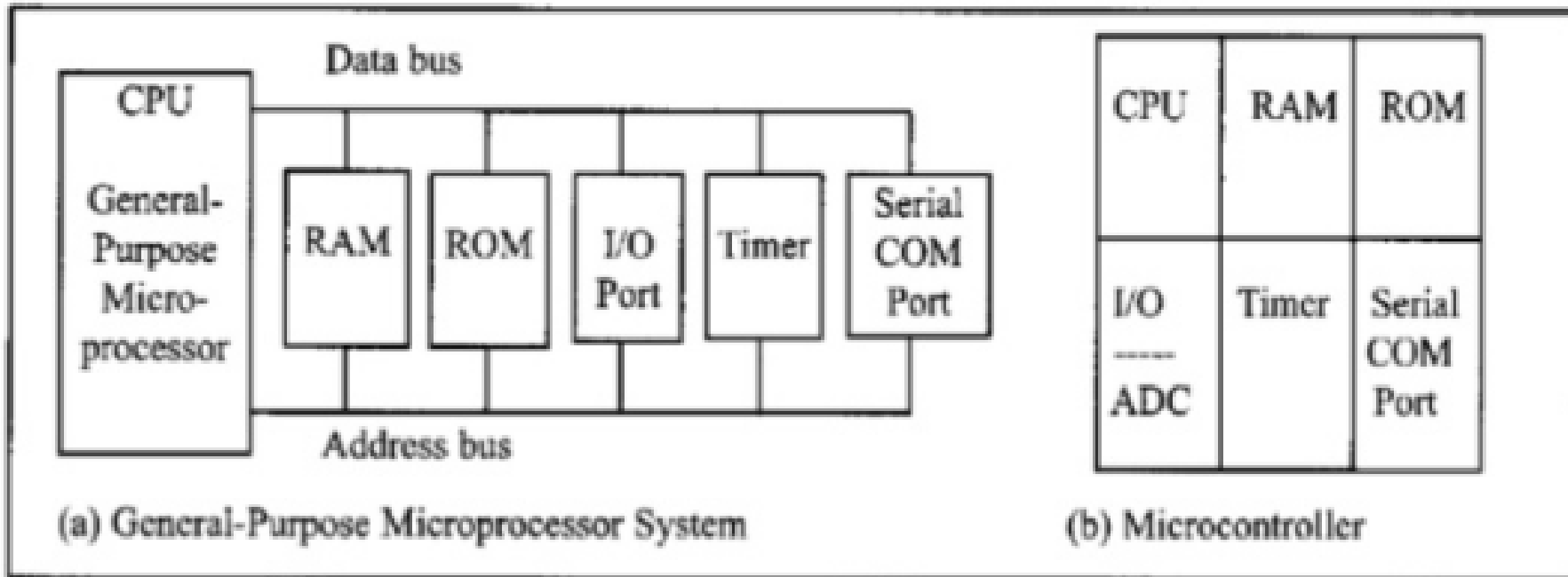
1.1.3 Relate embedded system examples with real life application

- ▶ In today's world of technology, we found Microcontrollers in almost every electronic device we uses. Almost all general purpose devices such as Digital Watches, Washing Machines, CD/DVD Players, Mobile Phones and Microwave Ovens works on the bases of Microcontroller.

1.1.3 Relate embedded system examples with real life application



1.1.4 Differentiate Microcontroller and microprocessor



1.1.4 Differentiate Microcontroller and microprocessor

Microprocessor :

- ❑ Microprocessor is the heart of any processing device. Its a basic building block of modern processors and controllers.
- ❑ Its a register based multi-purpose electronics device which takes input from us, process that input data according to the program written in external memory and gives us useful results.

1.1.4 Differentiate Microcontroller and microprocessor

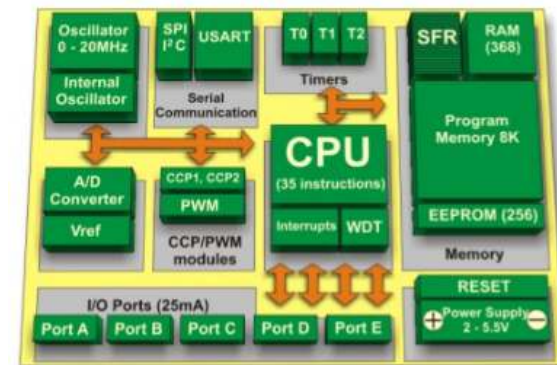
Microprocessor :

- ❑ This device is only consists of processing unit, that is Memory and I/O devices are need to be connected externally.
- ❑ As it requires external memory and I/O devices so it requires large space and is larger in size. It is of no use without interfacing with external memory and I/O ports.

1.1.4 Differentiate Microcontroller and microprocessor

Microcontroller :

- ❑ Microcontroller is also like a Microprocessor except that a Microcontroller made by Integrating Memory and I/O ports on a single chip.
- ❑ It doesn't require external ROM, I/O ports for its operation. As memory such as ROM/RAM is integrated on a single IC chip, thus it is small in size.



1.1.4 Differentiate Microcontroller and microprocessor

Microcontroller :

- ❑ It is basically used for controlling various machines. Programming of both Microcontroller And Microprocessor is almost similar.

1.1.4 Differentiate Microcontroller and microprocessor

COMPARISON

Microcontroller	General purpose microprocessor
Depend mainly on its peripherals like: Program memory, I/O ports, timers, interrupt circuitry, ADC...Etc.	Depend mainly on other devices like: I/O devices, memory, DMA controllers ..Etc.
Used for a few dedicated functions determined by the system designer.	Used in many applications, according to the program running on it
Usually used as a part of a larger system	It's in the heart of our PC's.

POPULAR MICROCONTROLLERS

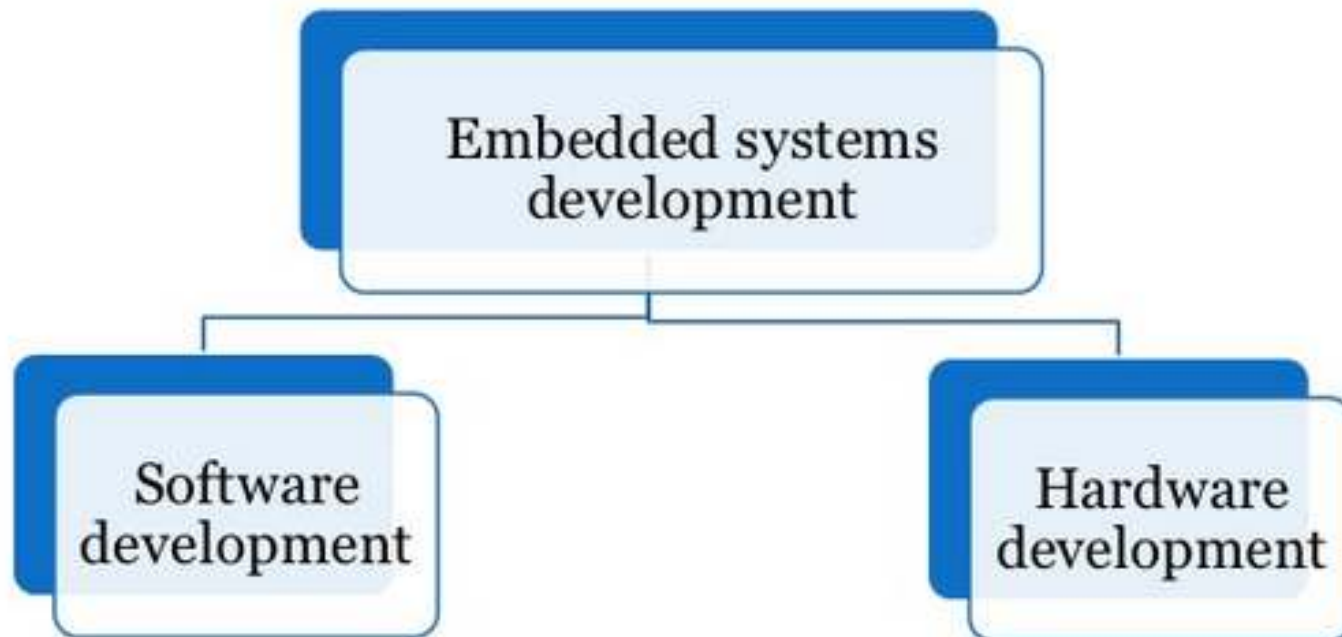
- 8051 (Intel and others)
- 80386 EX (Intel)
- PIC (Microchip)
- 68HC05 (Motorola)
- Z8 (Zilog)

1.1.5 Discuss the advantages of microcontroller application

Some of the benefits are based tools microcontroller:

- ❑ High reliability and high degree of integration;
- ❑ Reduction in size;
- ❑ Reduced component count and manufacturing cost owner;
- ❑ Shorter development time;
- ❑ Shorter time to market;
- ❑ Lower power consumptions.


DEVELOPING EMBEDDED SYSTEMS



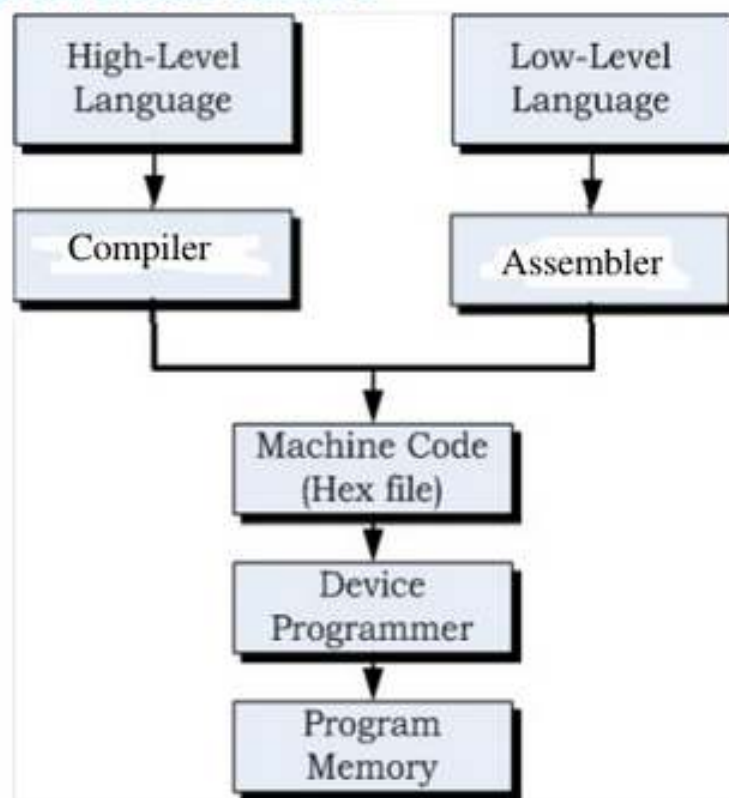
HARDWARE DEVELOPMENT

- This includes choosing the right MCU for your application, so that it can satisfy the requirements of your project.

- The criteria for choosing a microcontroller is:
 - 1- Number of I/O ports.
 - 2- Serial communication modules.
 - 3- Peripherals like (Timer, ADC, PWM ..Etc.)
 - 4- Memory requirements.
 - 5- Processing speed required.
 - 6- Power requirements.

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- Writing the required algorithm using assembly or a high level language (almost C).
 - Using a compiler or assembler and a linker.
 - Debugging your code.

SOFTWARE DEVELOPMENT

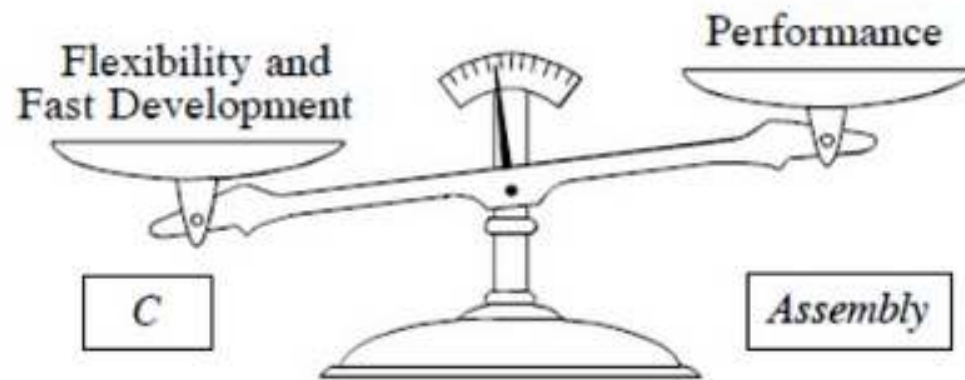


SOFTWARE DEVELOPMENT

- Using **assembly** involves **learning the used microcontroller's specific instruction set** but results in the most compact and fastest code.
- Using **C programming language** makes your code **portable**, which means that you can use it for another target microcontroller without learning its instruction set, this eases the process of software development (short time to market) with acceptable quality.

C Vs Assembly

C VS ASSEMBLY



Assembly programs are optimized more than C programs, but to develop more complicated programs, using C is more practical and also efficient.

Thank You