SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Sub: Microcontroller Programming And Interfacing
Subcode:23ECB202
Unit-I

PIC Microcontrollers: History, Features, & Architecture

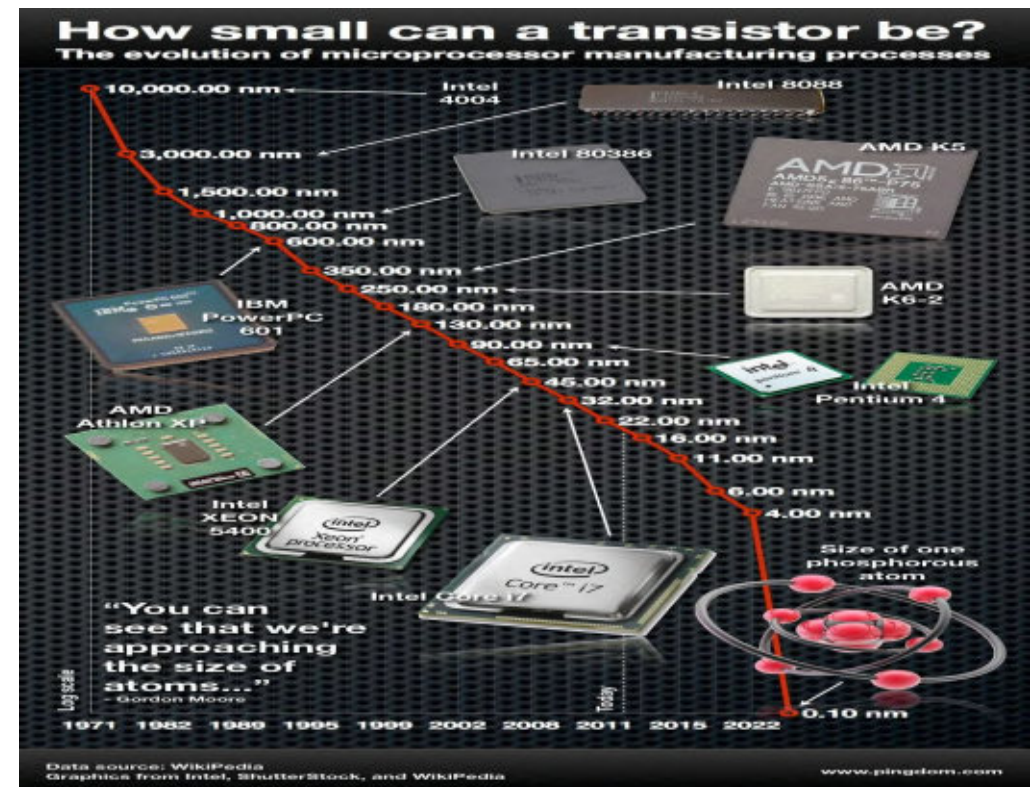Topic: Evolution Of Microcontroller and Embedded Processor

Evolution of Microprocessors and Microcontrollers

Over the years, microprocessors have become faster, more efficient, and capable of handling complex tasks.
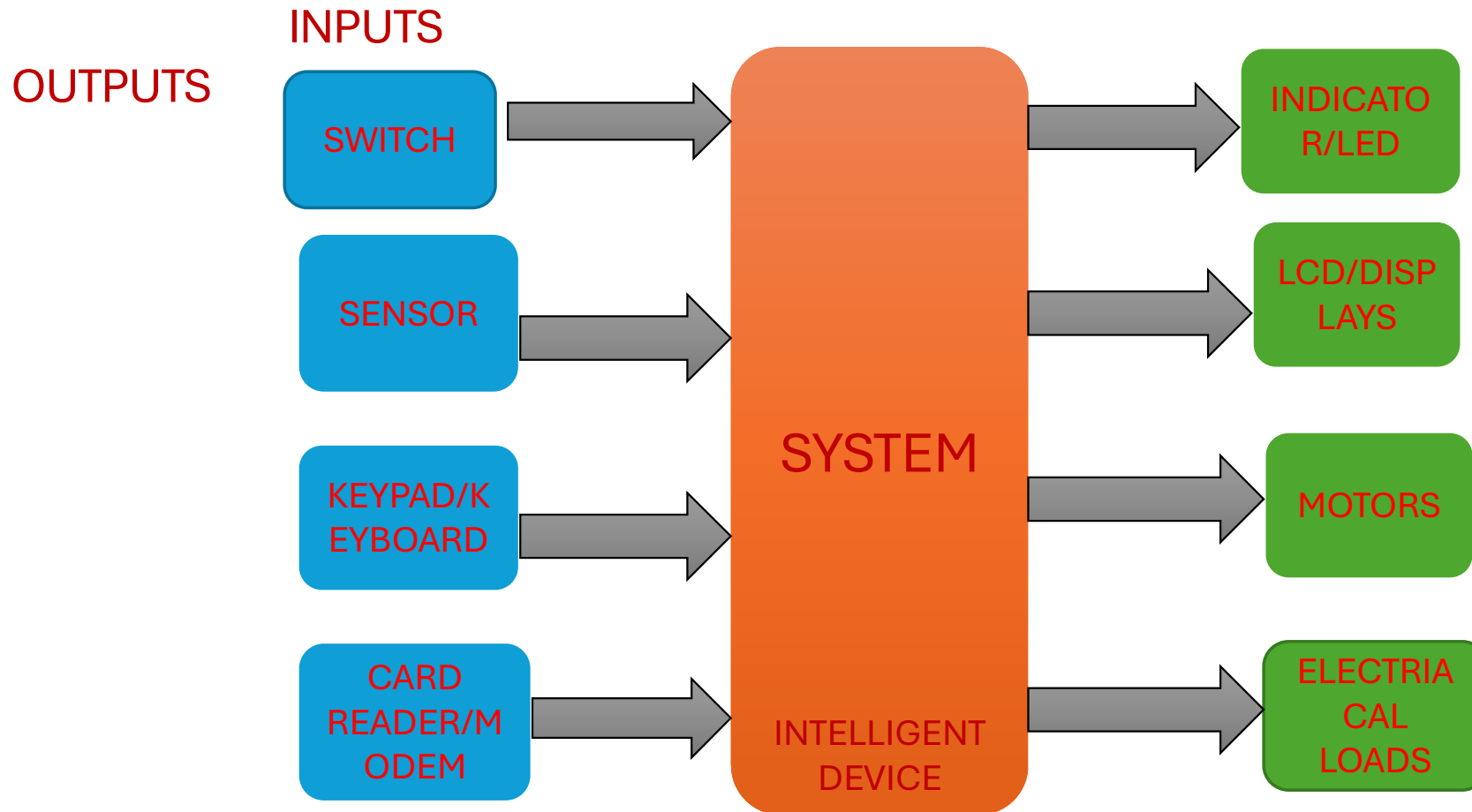
Microcontrollers have evolved to include more features, such as wireless connectivity, advanced analog-to-digital converters, and security features.

The demand for smaller, more power-efficient devices has driven continuous innovation in microprocessor and microcontroller technology.

GENERAL ELECTRONIC SYSTEM

INPUTS

OUTPUTS

SWITCH

SENSOR

KEYPAD/KEYBOARD

CARD READER/MODEM

SYSTEM

INTELLIGENT DEVICE

INDICATOR/LED

LCD/DISPLAYS

MOTORS

ELECTRIACAL LOADS

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ELECTRONIC SYSTEM DESIGN

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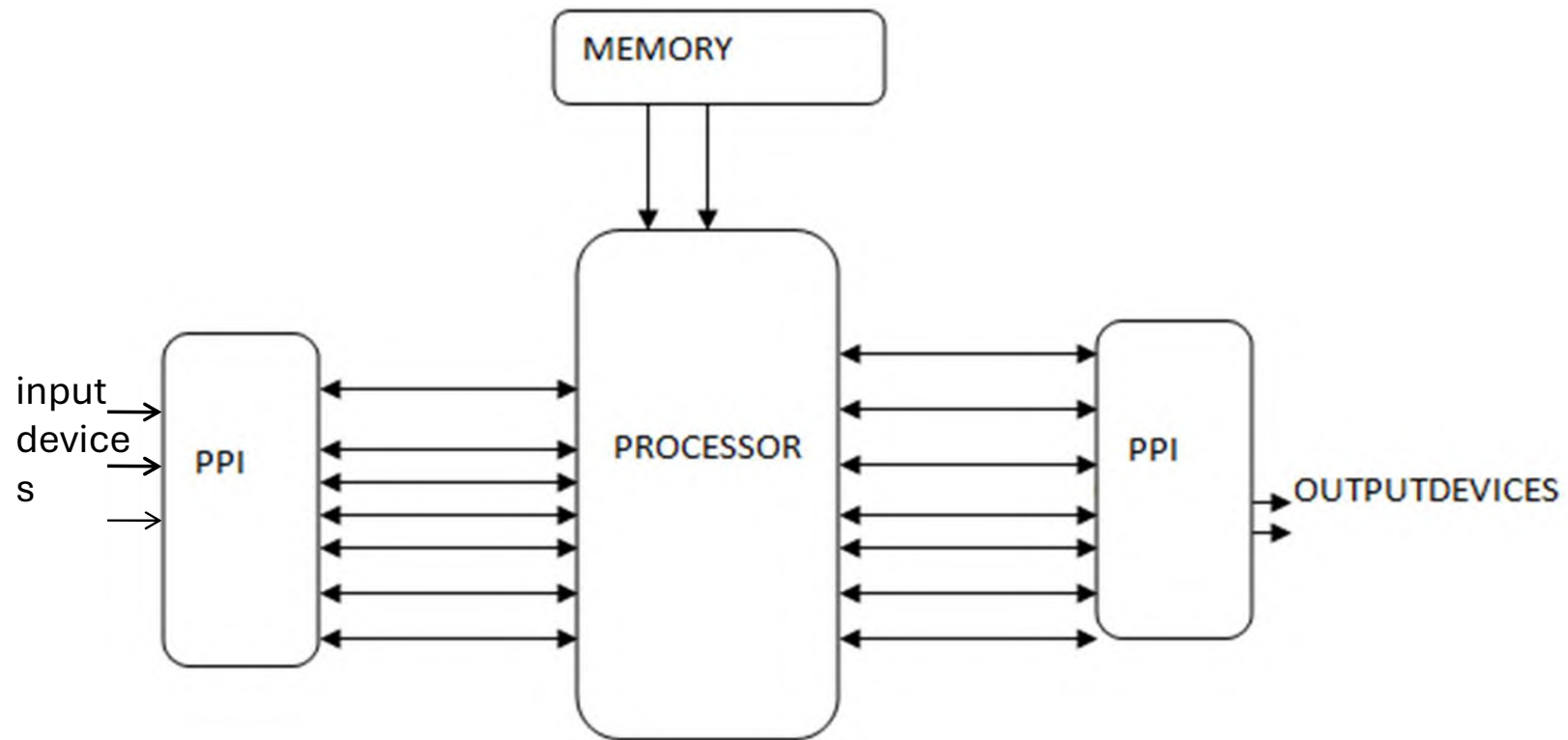
EVOLUTION OF PROCESSORS

❖**The first microprocessor introduced by Intel Corporation in 1971 with 4-bit capacity.**

➢ **4-bit -- 4001**

➢ **8-bit -- 8085**

➢ **16-bit – 8086/186/286/386**

➢ **32-bit -- Pentium-I, II, III, IV**

➢ **64-bit- core2duo, I-series processors**

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Introduction to Microprocessor and Microcontroller

A microprocessor is the brain of a computer, responsible for executing instructions and performing calculations.

A microcontroller is a compact integrated circuit designed for specific tasks, often found in embedded systems.

Both microprocessors and microcontrollers are essential components in modern electronic devices.

Architecture of a Microprocessor

A microprocessor typically consists of an arithmetic logic unit, control unit, registers, and cache memory.

The instruction set architecture (ISA) defines the operations that a microprocessor can perform.

Microprocessors can vary in complexity and performance based on factors such as clock speed and number of cores.


8085 Microprocessor Architecture
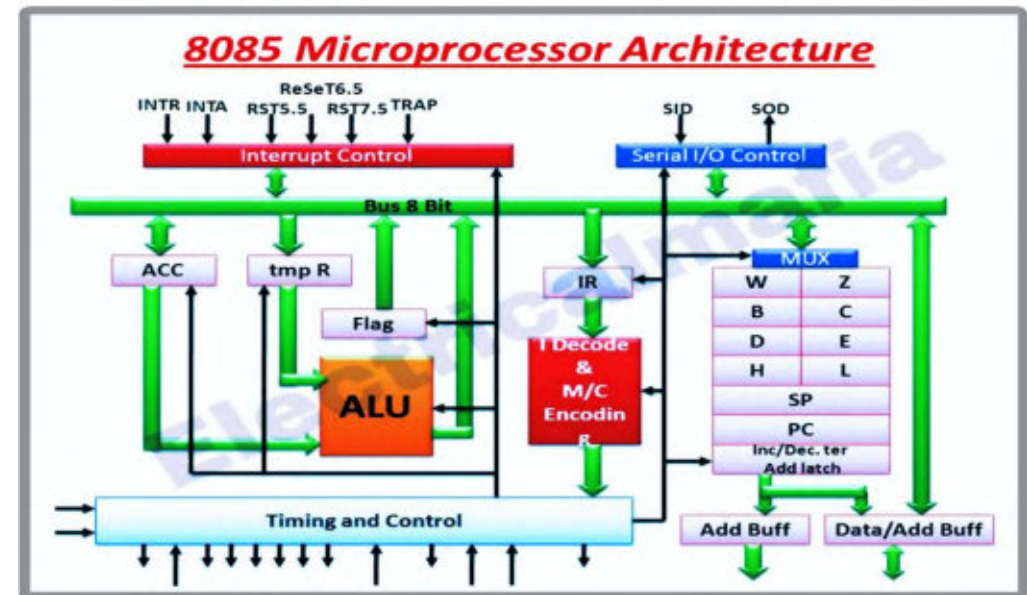
Applications of Microprocessors

Microprocessors are commonly used in personal computers, servers, smartphones, and smartphones, and other consumer electronics. electronics.

They are also utilized in industrial control systems, medical devices, and automotive electronics.

Advances in microprocessor technology have enabled the development of artificial intelligence and machine learning applications.
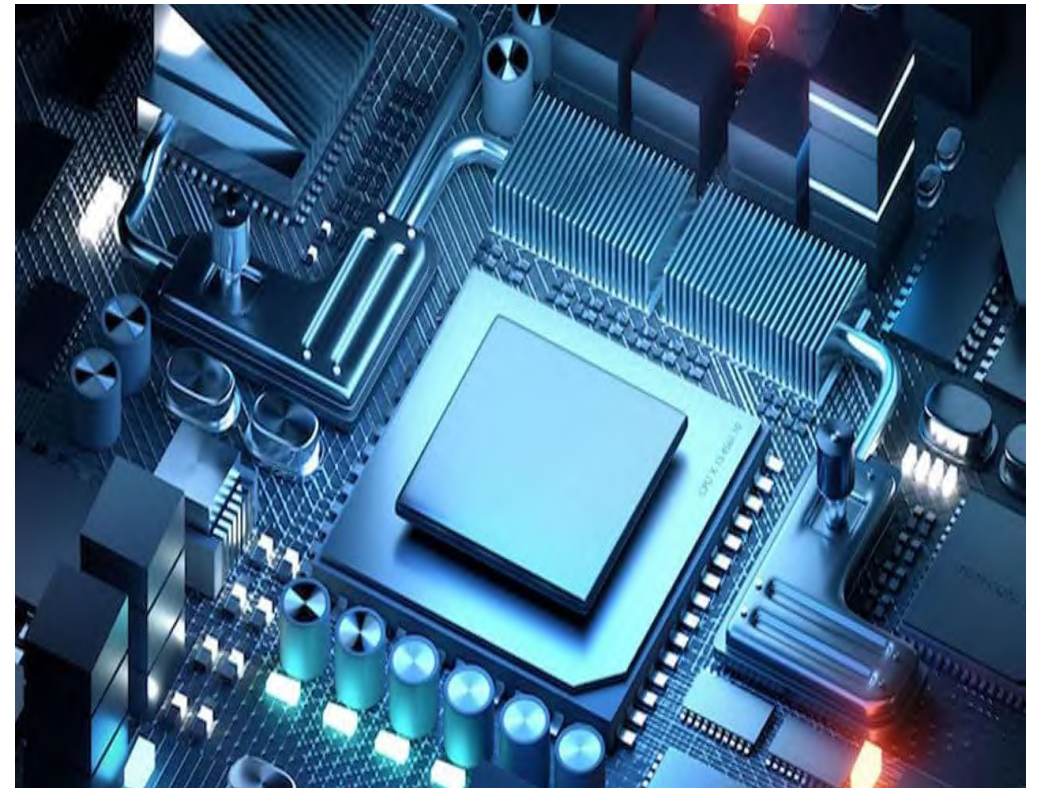
Applications of Microcontrollers

Microcontrollers are widely used in home appliances, consumer electronics, and IoT devices.

They play a crucial role in robotics, automation, and sensor-based systems.

The simplicity and efficiency of microcontrollers make them ideal for battery-powered devices and embedded systems.

Key Features of Microcontrollers

Microcontrollers integrate a CPU, memory, and peripherals on a single chip.

They are often used in applications that require real-time processing and control, such as in automotive systems and industrial automation.

Microcontrollers are designed to be low-cost, low-power, and easy to program.

Microcontroller 8051 Architecture and Block Diagram
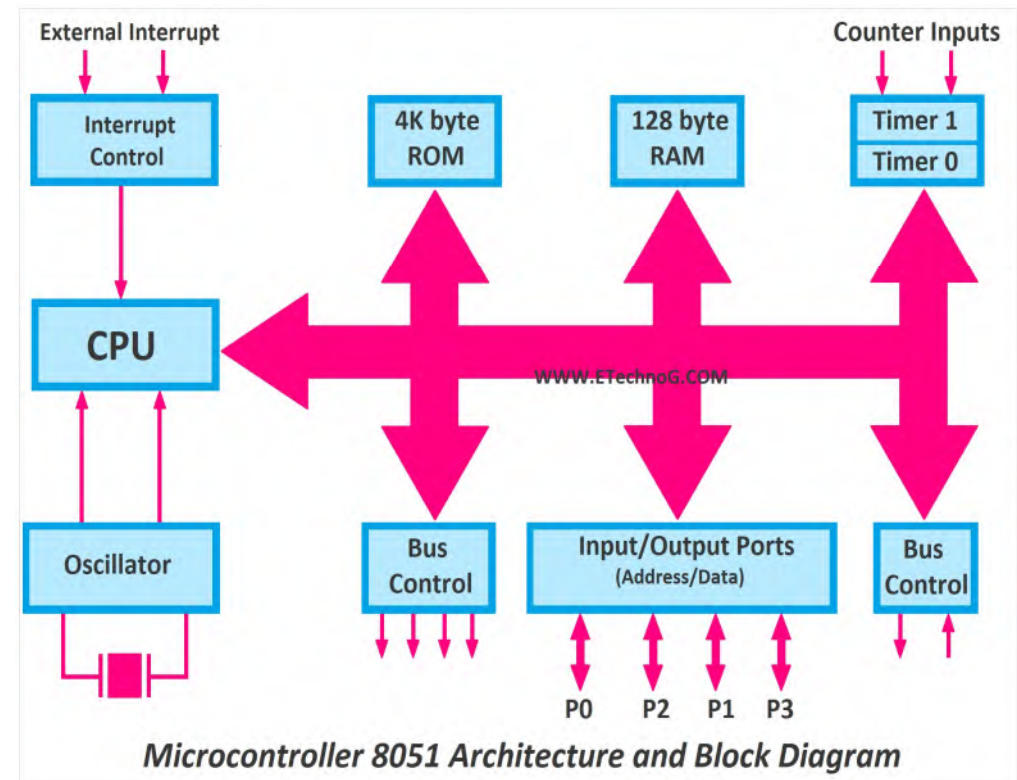
Future Trends in Microprocessor and Microcontroller Technology

Emerging technologies like artificial intelligence, Internet of Things (IoT), and edge computing are driving the development of more powerful and efficient microprocessors and microcontrollers.

Advancements in nanotechnology and materials science are enabling the creation of smaller, faster, and energy-efficient chips.

The convergence of hardware and software technologies is leading to the development of intelligent systems that can adapt and learn from their environment.
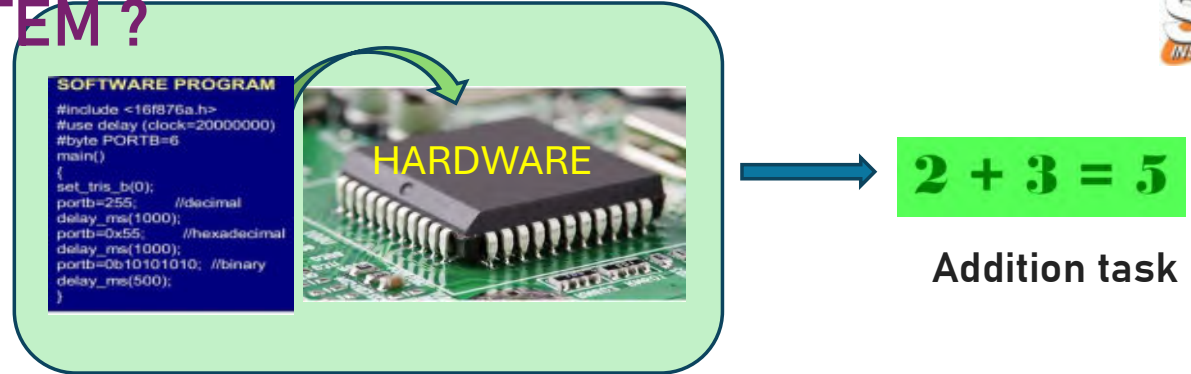

Discover the Future of Microcontroller Technology

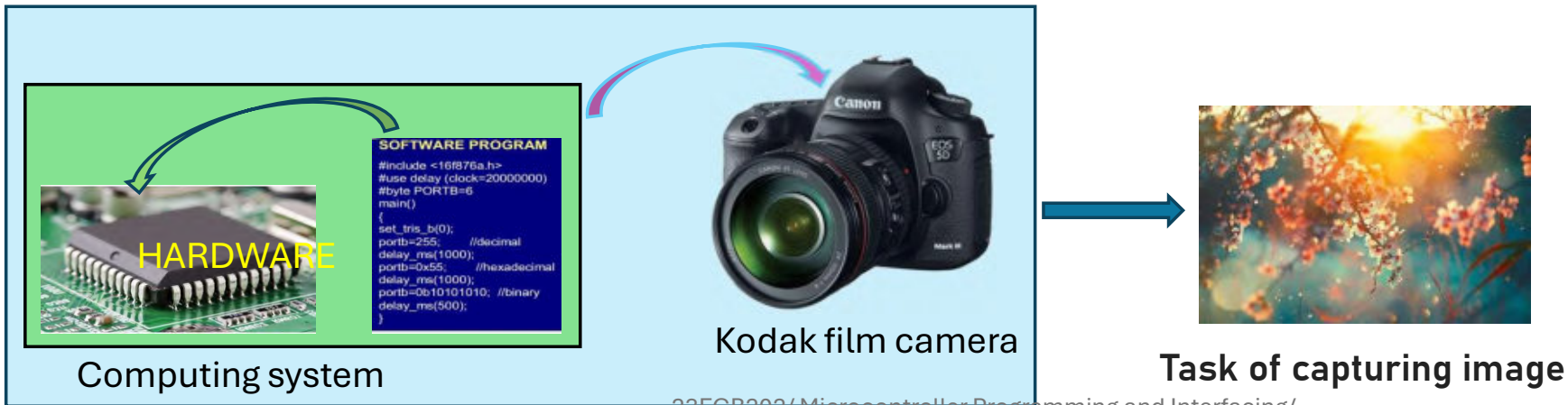Stay ahead of the game with our expert insights

WHAT IS EMBEDDED SYSTEM ?

"It is a combination of **hardware and software** intended to perform a **specific task**".
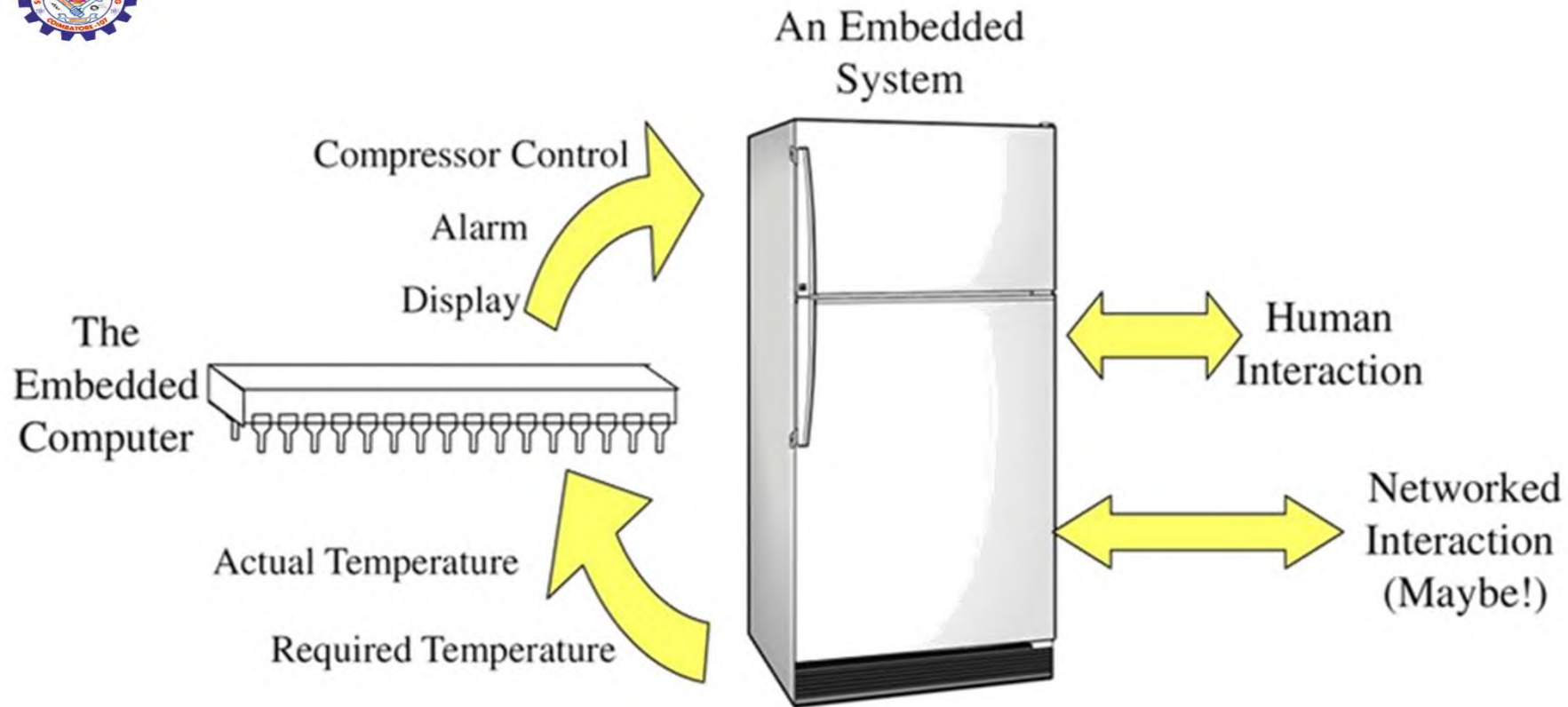

Embedded System

An embedded system is a **computer system** (combination of hardware and software) with a **dedicated function** within a larger mechanical or electrical system.

Embedded system = **information processing systems** embedded into a larger product

Computing system

Kodak film camera

Task of capturing image

Digital Camera

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An Embedded System

Compressor Control
Alarm
Display

The Embedded Computer

Actual Temperature

Required Temperature
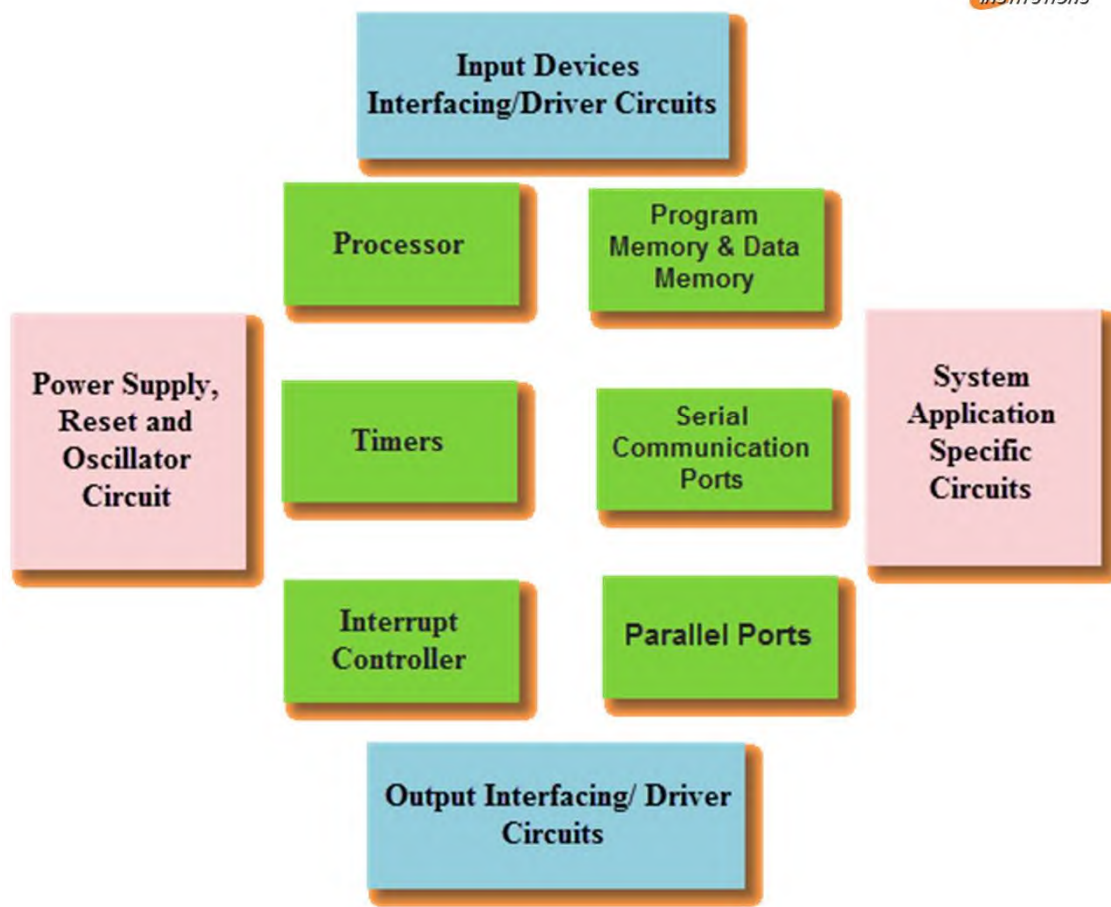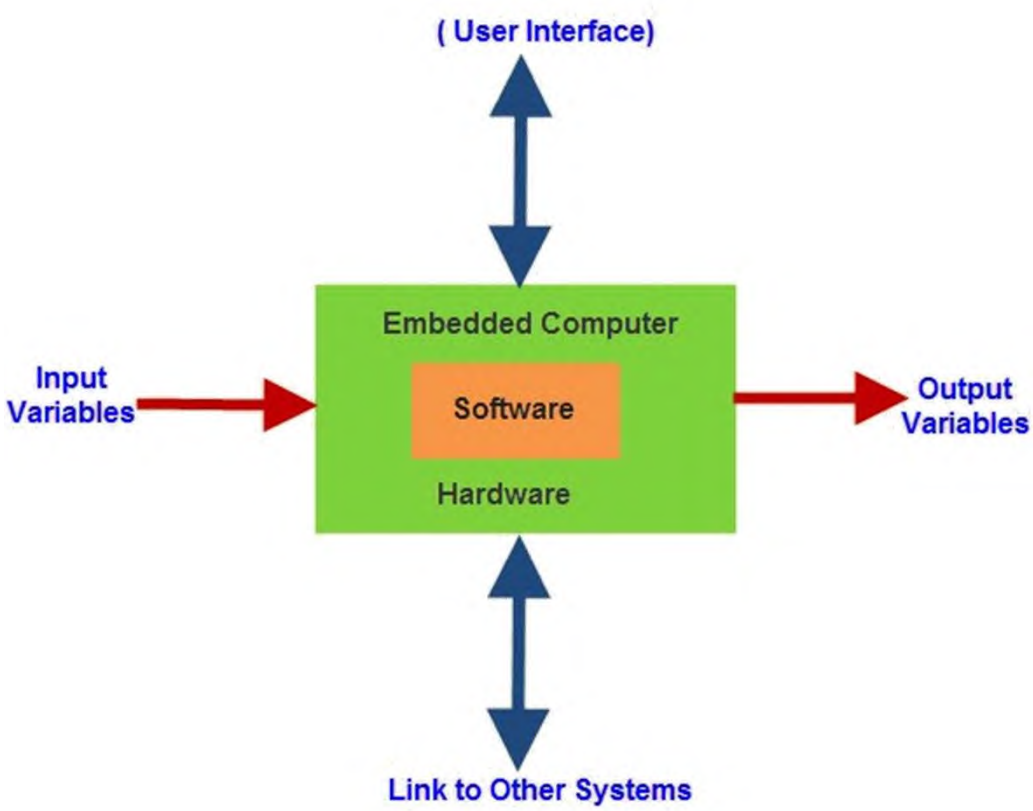
Human Interaction

Networked Interaction (Maybe!)

"Any sort of device which includes a programmable computer but itself is not intended to be a general-purpose computer"

Marilyn Wolf

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Components of Embedded Systems

(User Interface)

Input Variables → Embedded Computer [Software / Hardware] → Output Variables

Link to Other Systems

Input Devices Interfacing/Driver Circuits

Processor

Program Memory & Data Memory

Power Supply, Reset and Oscillator Circuit

Timers

Serial Communication Ports

System Application Specific Circuits

Interrupt Controller

Parallel Ports

Output Interfacing/ Driver Circuits

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Real Time Examples of Embedded Systems

Industrial Robots

GPS Receivers

Digital Cameras

DVD Players

Wireless Routers

Microwave Ovens

Photocopiers

Set top Boxes

Gaming Consoles

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APPLICATIONS OF EMBEDDED SYSTEMS

EVERYWHERE

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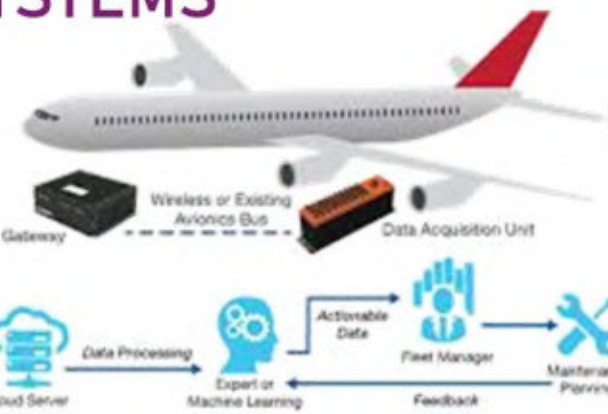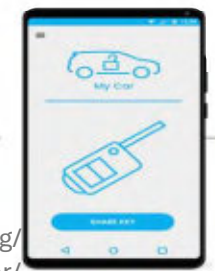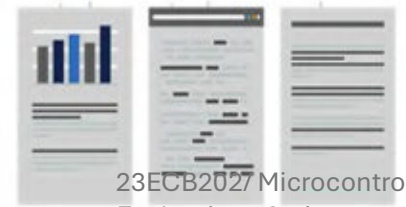
Is Desktop/Laptop computers an Embedded System ????

An Embedded System is an application oriented system i.e. it is dedicated to perform a single task (or a limited number of tasks, but all working for a single main aim).

A desktop computer is considered as a General Purpose System as it can do many different tasks (playing videos, working on office suites, editing images (or videos), browsing the web, etc.) that too simultaneously.

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Embedded system often includes **task–specific hardware mechanical parts** not usually found in a general–purpose computer.
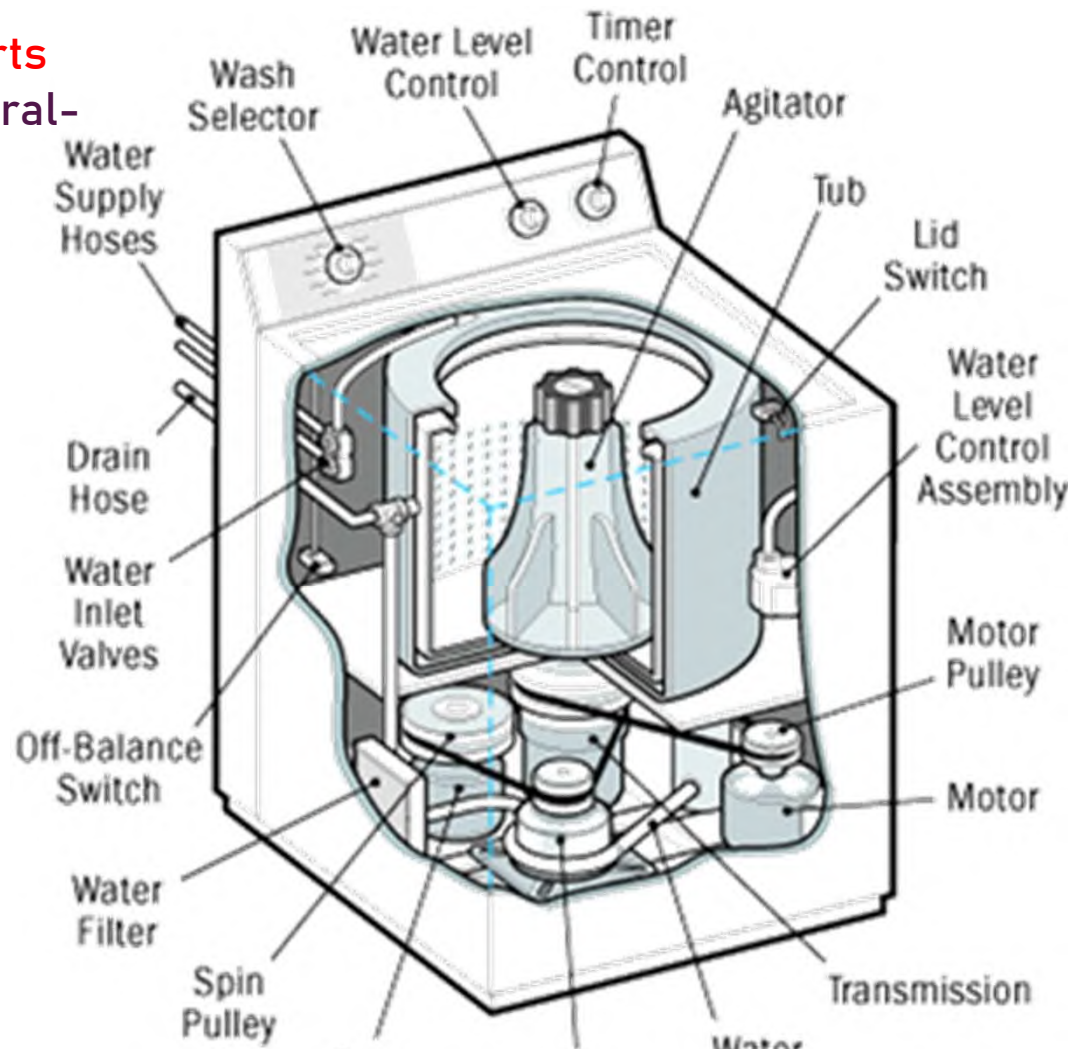
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DIFFERENCE BETWEEN GENERAL PURPOSE SYSTEM AND EMBEDDED SYSTEM

| General Purpose System System	Embedded System
Designed to perform multiple Tasks	Designed to do specific set of Tasks
Task specific hardware component is not required	Requires task specific hardware component
Programmable by end user therefore applications are alterable by the user	Not Programmable by end user therefore applications cannot be altered by the user
High Power consumption	Low Power consumption

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Is Mobile Phone an Embedded System????

A **first generation digital mobile phone**, is probably certainly an **embedded system**.

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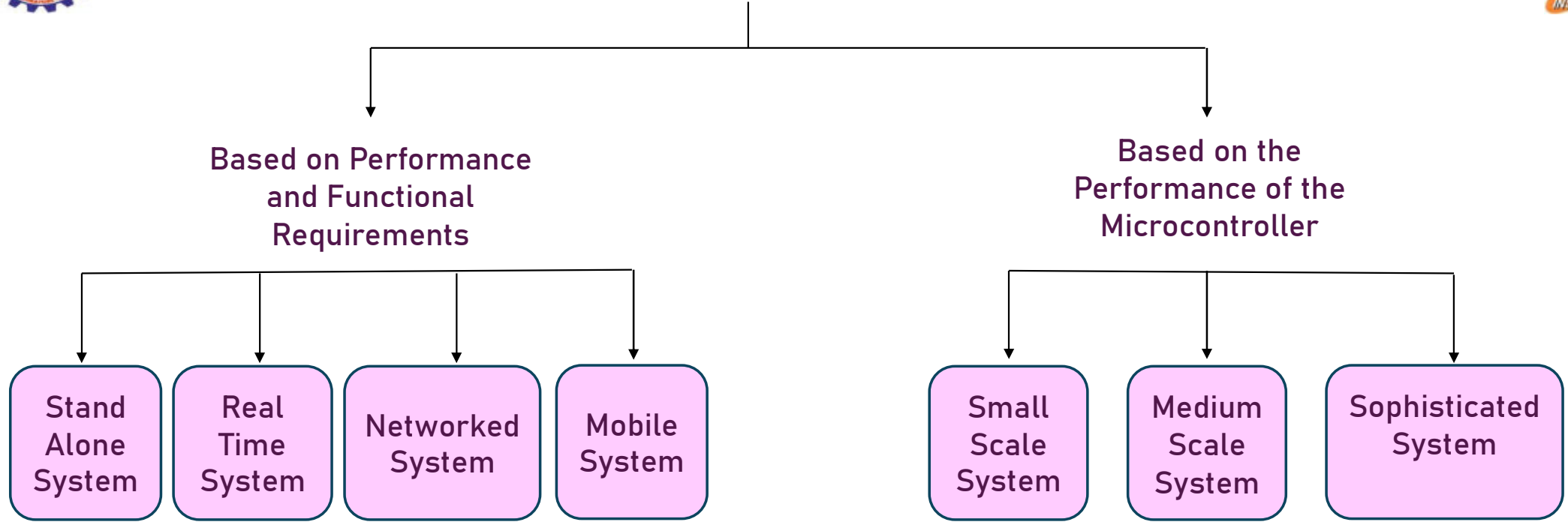
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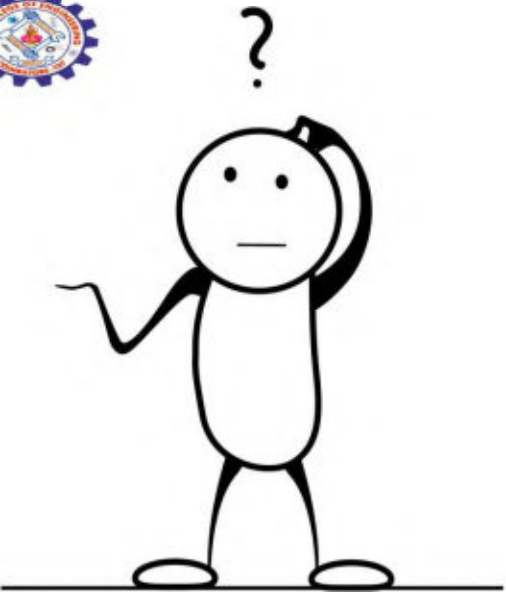
Smartphone is an Embedded System

Modify (Install/uninstall) the applications but, smartphone comes with **pre-installed Operating System** (OS) that cannot be modified.

Functionality of smartphones **cannot be upgraded**.

As these conditions are in line with embedded system definition. smartphone can be viewed as combination of various embedded systems i.e. Camera, Various sensors, Calling function etc. **It is not general purpose computer in true sense.**
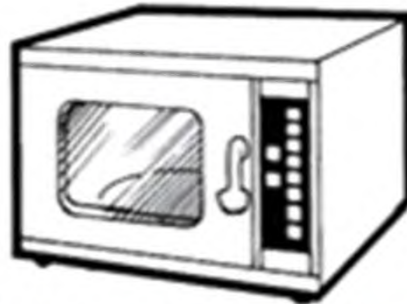
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TYPES OF EMBEDDED SYSTEMS

Based on Performance and Functional Requirements

- Stand Alone System
- Real Time System
- Networked System
- Mobile System

Based on the Performance of the Microcontroller

- Small Scale System
- Medium Scale System
- Sophisticated System

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Stand Alone Embedded System

- Does not require a host system

- Takes input, processes it and produces the result through the connected devices.
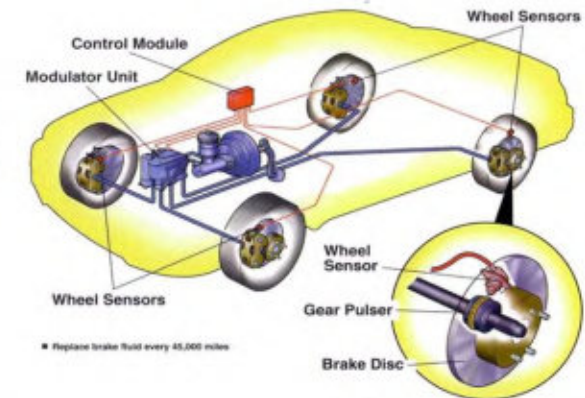
Microwave Ovens

Gaming Consoles

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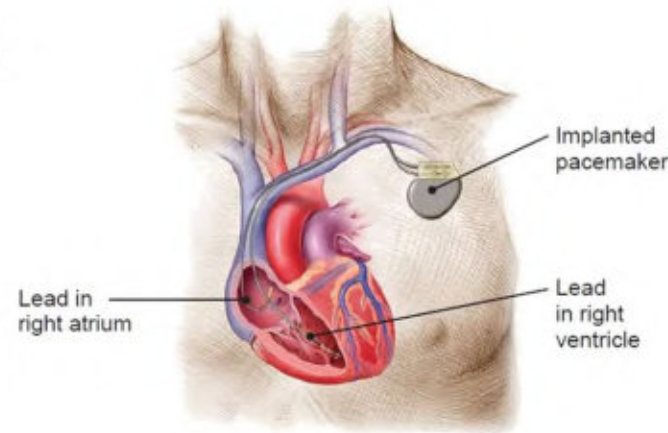
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Real time Embedded System

- Produces output within a specified time limit.

- Gives quick response to critical situation

Types of Real time Systems

1. Hard Real Time System
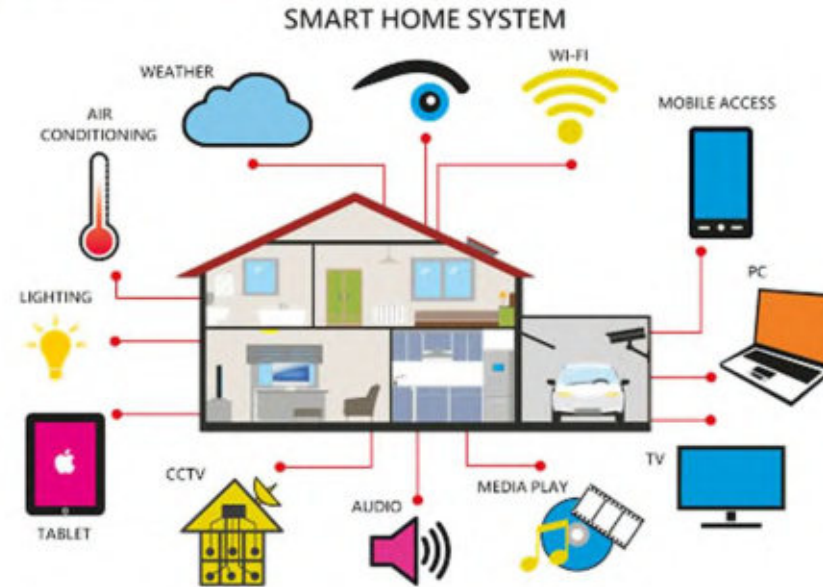
Entire system collapses if misses deadline

2. Soft Real Time System

Missing deadline will only degrade the performance.

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Networked Embedded System

- Connected to the network (LAN or WAN) to access the resource

Mobile Embedded System

- Used in portable devices like mobile phones, digital cameras, mp3 players.

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