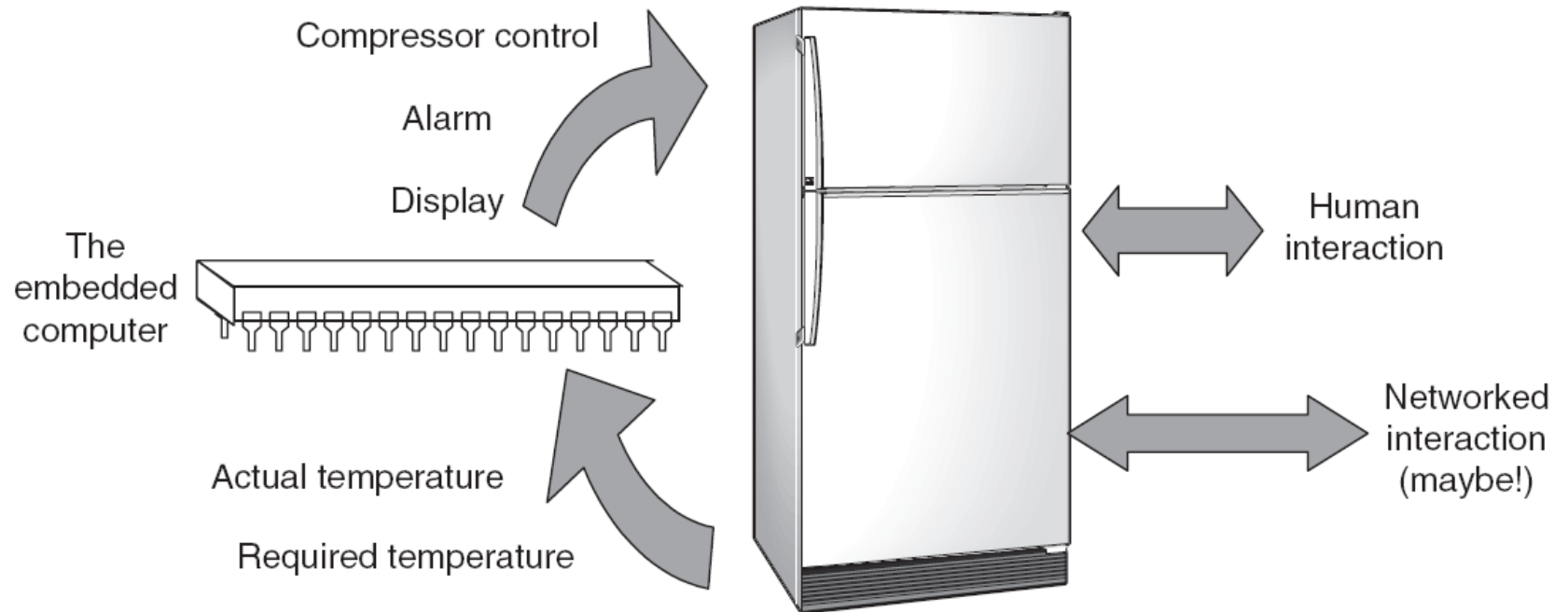# Applications of Embedded Systems

Outline

- Definition of Embedded Systems
- Examples
- Computer Essentials
- Microprocessors and Microcontrollers
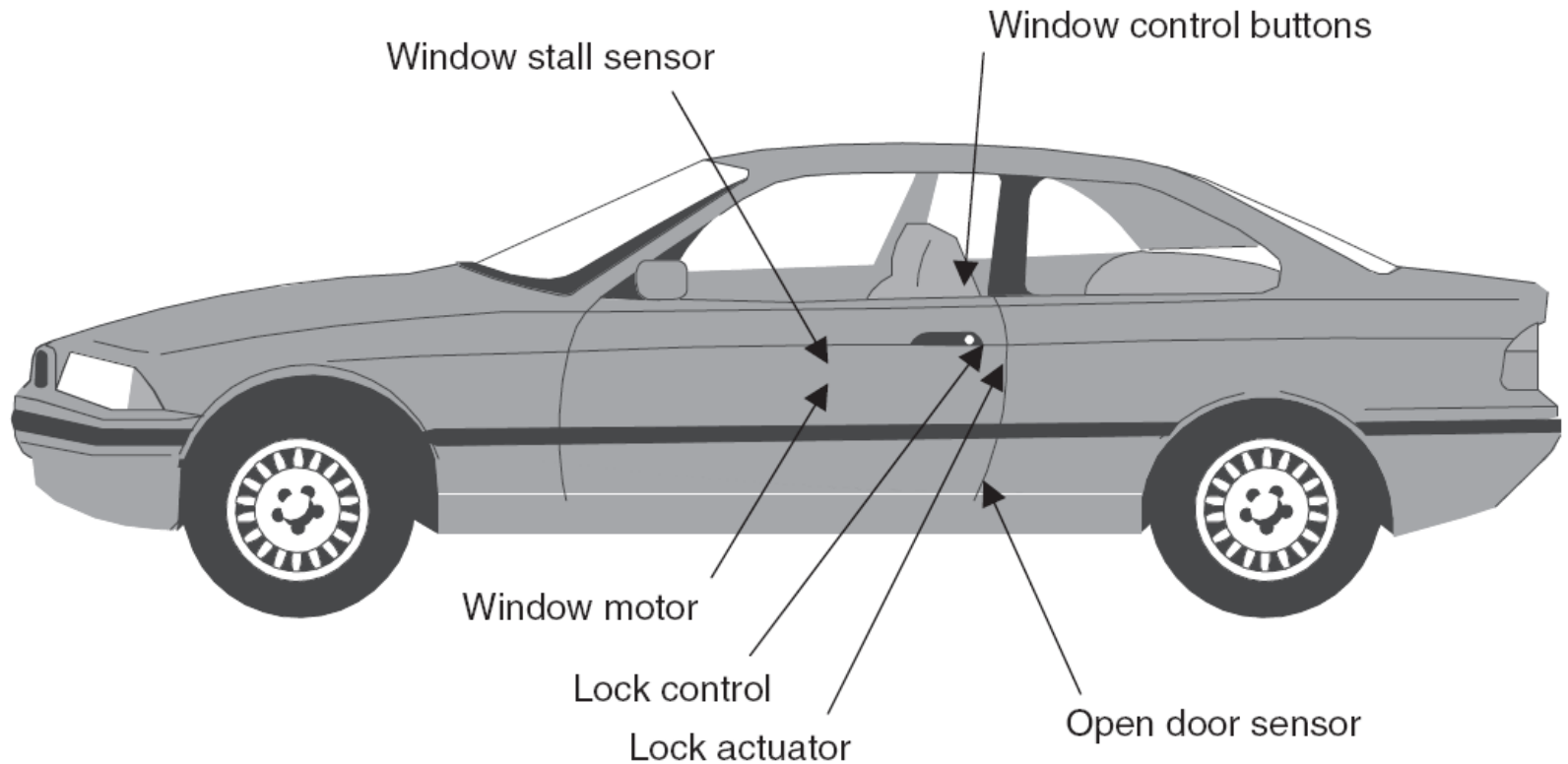- PIC Microcontrollers
- 12 Series PIC

Definition of Embedded Systems

- **Embedded system**: is a system whose principal function is not computational, but which is controlled by a computer embedded within it.
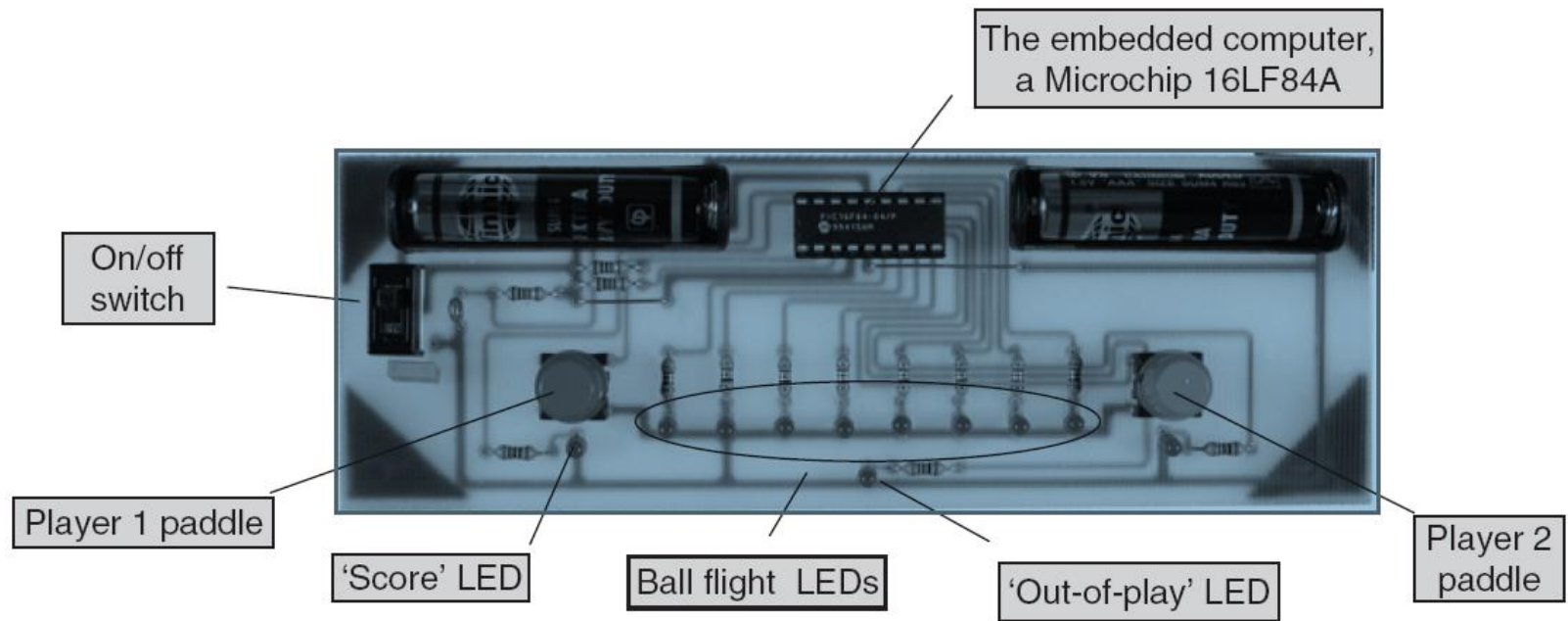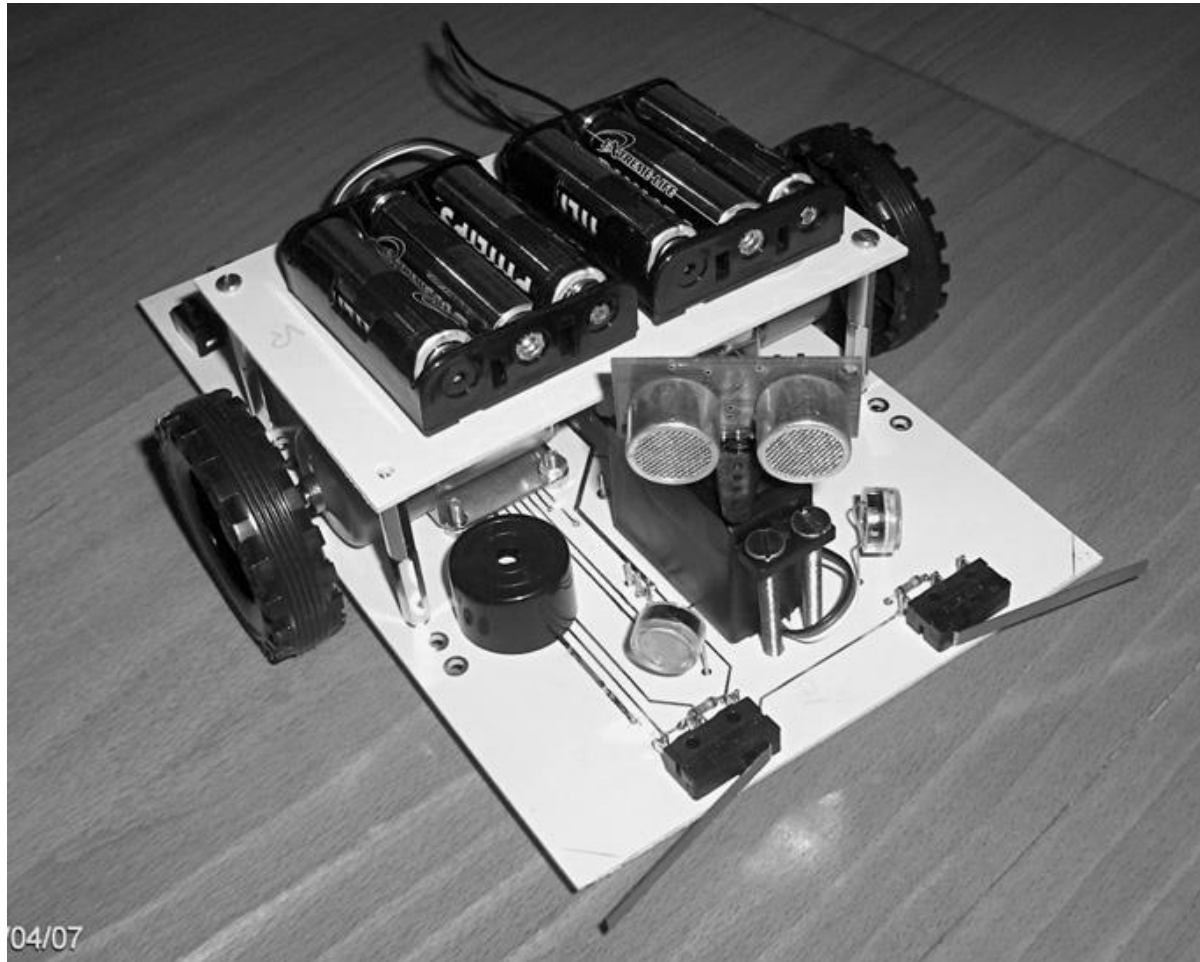
Examples: Refrigerator

Compressor control

Alarm

Display
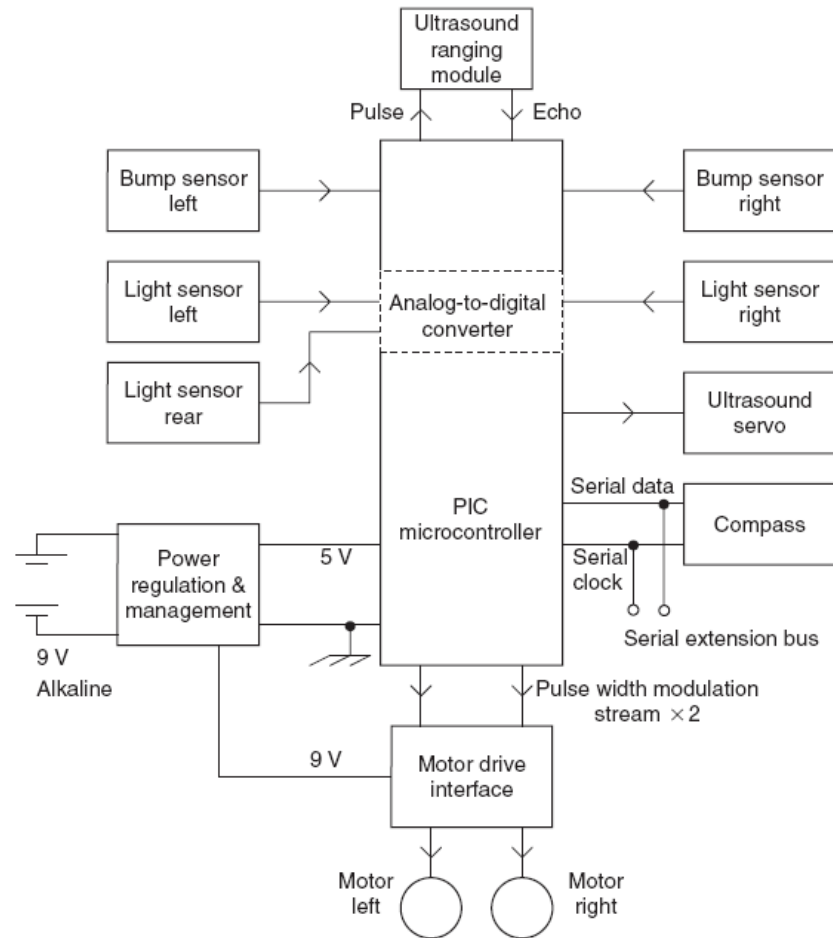
The embedded computer

Actual temperature

Required temperature

Human interaction

Networked interaction (maybe!)

Examples: Car Door

Window stall sensor

Window control buttons

Window motor

Lock control

Lock actuator

Open door sensor

Examples: Electronic Ping-pong

The embedded computer, a Microchip 16LF84A

On/off switch

Player 1 paddle

'Score' LED

Ball flight LEDs

'Out-of-play' LED

Player 2 paddle

Examples: Derbot Autonomous Guided Vehicle

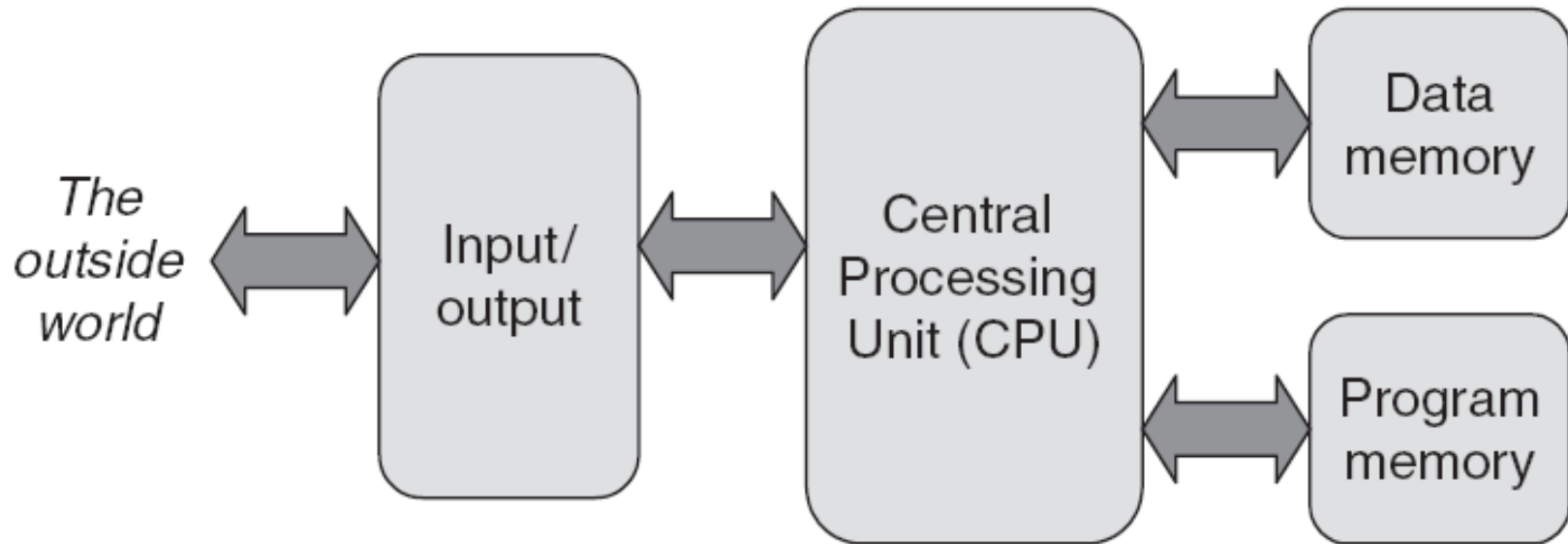

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Examples: Derbot Autonomous Guided Vehicle

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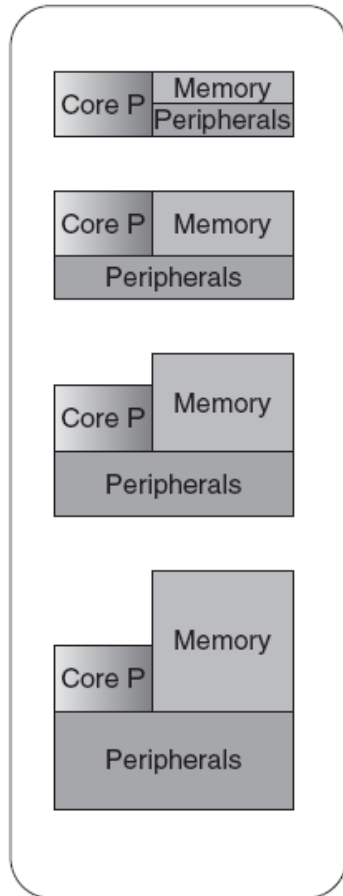- 12 Series PIC

Computer Essentials
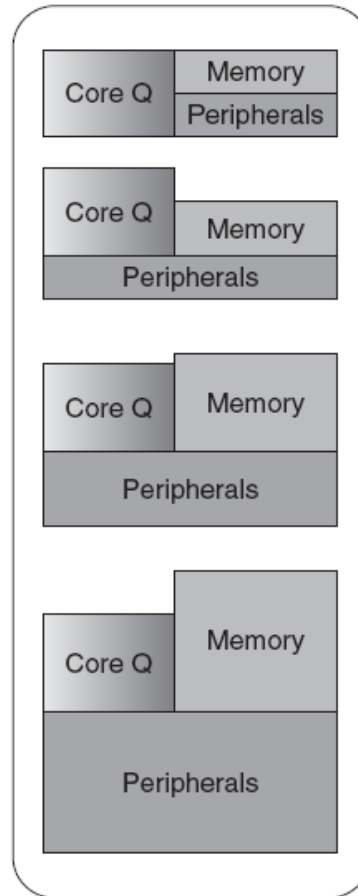
Computer Essentials

- Instruction Sets
  - CISC: Complex Instruction Set Computer
  - RISC: Reduced Instruction Set Computer

- Memory Types
  - Volatile: Random Access Memory (RAM)
  - Non-volatile: Read Only Memory (ROM)
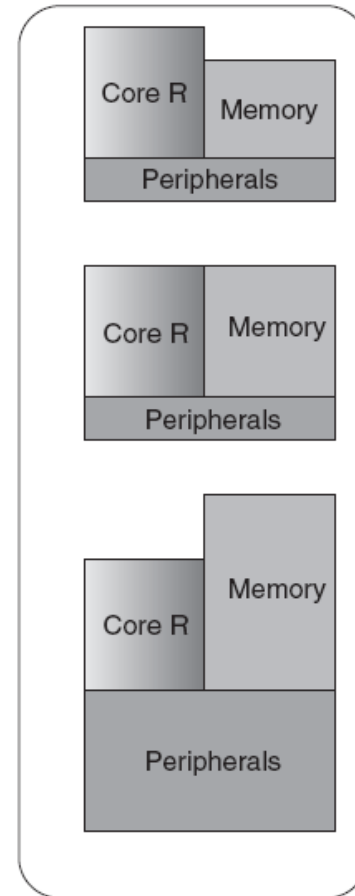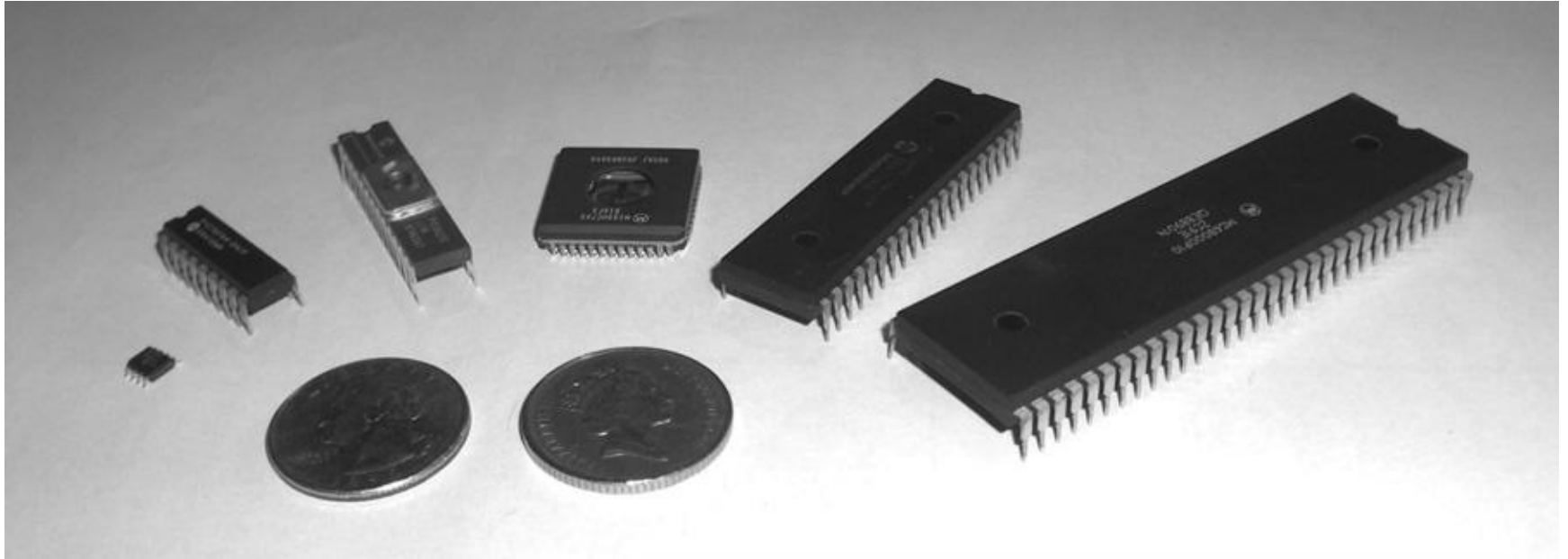
Microcontroller Families

Microcontroller Packaging and Appearance

From left to right: PIC 12F508, PIC 16F84A, PIC 16C72, Motorola 68HC05B16, PIC 16F877, Motorola 68000

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Summary

- An embedded system is a product that has one or more computers embedded within it, which exercise primarily a control function.

- The embedded computer is usually a microcontroller: a microprocessor adapted for embedded control applications.

- Microcontrollers are designed according to accepted electronic and computer principles, and are fundamentally made up of microprocessor core, memory and peripherals.

- Microchip offers a wide range of microcontrollers, divided into a number of different families. Each family has identical central architecture and instruction set. However, common features also appear across all their microcontrollers.

- The Microchip 12F508 is a good microcontroller to introduce a range of features of microcontrollers in general and of PIC microcontrollers in particular.