**MICROPROCESSOR**

A microprocessor is literally the brain of the computer. It is a chip that performs/executes instructions. All CPUs are microprocessors but not all microprocessors are CPUs

It is mounted on a single IC (single chip).

The basic task of a microprocessor is to input instructions from the memory, decode, process, and produce output, all in binary.

To be able to fetch instructions from memory (RAM), it makes use of the memory address.

Microprocessor does not access hard drive because accessing hard drive is slower than accessing RAM.

Bus Lines- Data bus, Address bus, Control Bus which are usually external

Divided into -

* ALU
* Registers (General Purpose Registers, Specific Registers, Memory Registers) – can hold data address, makes use of Flip Flops
* Control Unit – Controls the flow of data between the microprocessor and the system

Memory Unit of a microprocessor is RAM

VLSI – Very Large-Scale Integration

Types of Microprocessors-

* Complex Instruction Set Microprocessor (CISC) - Intel 386, Intel 486, Pentium, Pentium Pro, Pentium II, etc.
* The Application Specific Integrated Circuit
* Reduced Instruction Set Microprocessor (RISC) - IBM RS6000, DEC Alpha 21064, DEC Alpha 21164, etc.
* Digital Signal Multiprocessor (DSP)

Usually used in Calculators, Accounting Systems, Traffic lights, Computation Systems, etc.

**MICROPROCESSOR 8085/8086 (Intel family of microprocessors i3, i5, i7)**

8085 is an 8bit microprocessor used in washing machines, microwaves, mobile phones.

Performs arithmetic, logical, I/O operations. Connected to an ALU.

Has 6 general purpose registers which can hold 8-bit values viz B,C,D,E,H,L. W and Z are reserved registers.

8086 is an enhanced version of 8086. It is a 16-bit microprocessor.

8085 can access up to 64Kb, whereas 8086 can access up to 1 Mb of memory.

**MICROCONTROLLERS**

A microcontroller is literally the heart of an embedded system. A chip used to control electronic devices. It has a greater number of registers and hence a program is easy to write.

8051 microcontroller is used in home applications, watches, and communication systems.

Consists of CPU, Memory, programmable I/O all in one chip.

Are simpler, slower, and inexpensive if compared to microprocessors.

Types of Microcontrollers

* 8-bit Microcontroller
* 16-bit Microcontroller
* 32-bit Microcontroller
* Embedded Microcontroller
* External memory Microcontroller

**ARDUINO**

Arduino is an open-source electronics platform or board and the software used to program it. It makes electronics accessible to artists and designers.

Arduino boards are circuit boards that include a microcontroller which is programmed using Arduino programming language, which is a simplified form of C, C++, and an Arduino IDE. They consist of sets of digital and analog I/O pins. Current Arduino boards are programmed via [Universal Serial Bus](https://en.wikipedia.org/wiki/Universal_Serial_Bus) (USB).

Most Arduino boards consist of an Atmel 8-bit AVR (ATmega8, ATmega168, ATmega328, ATmega1280, or ATmega2560) with varying amounts of flash memory, pins, and features.

Arduino Shields- Circuit boards that plug into the main Arduino Circuit board to expand its functionalities. Provides motor control 3D Printing, Satellite Navigation, Ethernet, LCD, breadboarding. Examples, Arduino motor shields, Arduino Communication Shields, etc.

**TYPES OF ARDUINOS-**

* Arduino Uno (standard, widely available)
* Arduino Mega
* Arduino Micro
* Arduino Pro Micro
* Arduino Pro Mini
* Arduino Pro (No USB)
* Arduino Nano
* Arduino Due
* Arduino Ethernet
* Arduino Fio
* Lilypad Arduino
* Arduino Robot
* Arduino Esplora
* Arduino Yun

**PWM – Pulse Width Modulation**

A technique to control analog circuits/semiconductor devices with a microcontroller.

It is generated using a comparator. A PWM output wave is always a square wave. It is used in a variety of power applications, in telecommunication for encoding purposes and in AV amplifiers. Using PWM and Arduinos, the LED can be dimmed or you can control a motor.

The three conventional types of pulse width modulation are:

* Trail Edge Modulation
* Lead Edge Modulation
* Pulse Centre Two Edge Modulation

**ANALOG PINS**

Analog pins in Arduinos are built in and read analog sensors from analog devices. They can take any number of values. An analog pin can also be used as a digital pin.

Arduino Uno, the most common and easy to use Arduino has 6 analog input pins A0 to A5 in the range of 0-5V.

**DIGITAL PINS**

A digital input detects if a voltage is above/below a specific threshold. If the voltage is higher than some value, evive will detect the digital input as HIGH/1. If the voltage is lower than some value, evive will detect the digital input as LOW/0.

A digital output allows you to control a voltage with evive. If evive instructs the output to be high, the output will produce a voltage (generally about 5 or 3.3 volts). If evive instructs the output to be LOW, it is connected to the ground and produces no voltage.

Digital pins are default assigned input but they need to be configured as OUTPUT with pinMode() if it needs to be used as an output pin.