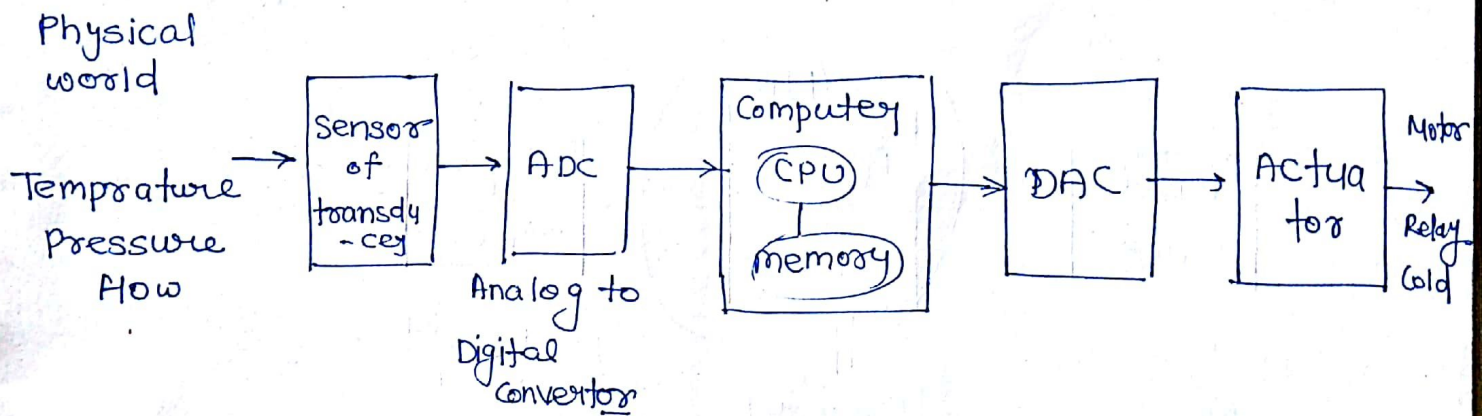


Syllabus

- ① Microprocessor, MC, PLC
 └→ Micro Controller
- ② Sensors , actuators
- ③ Control System.



Mechatronics:- It is an approach aiming at the Synergistic (All together) integration of mechanics, electronics, control theory and computer science within product design and manufacturing in order to improve and/or optimize its functionality.

Microprocessor, Microcontrollers, PLC,
(MP) (MC)

1947 - transistor
is a

then IC - Integrated circuit

In an IC

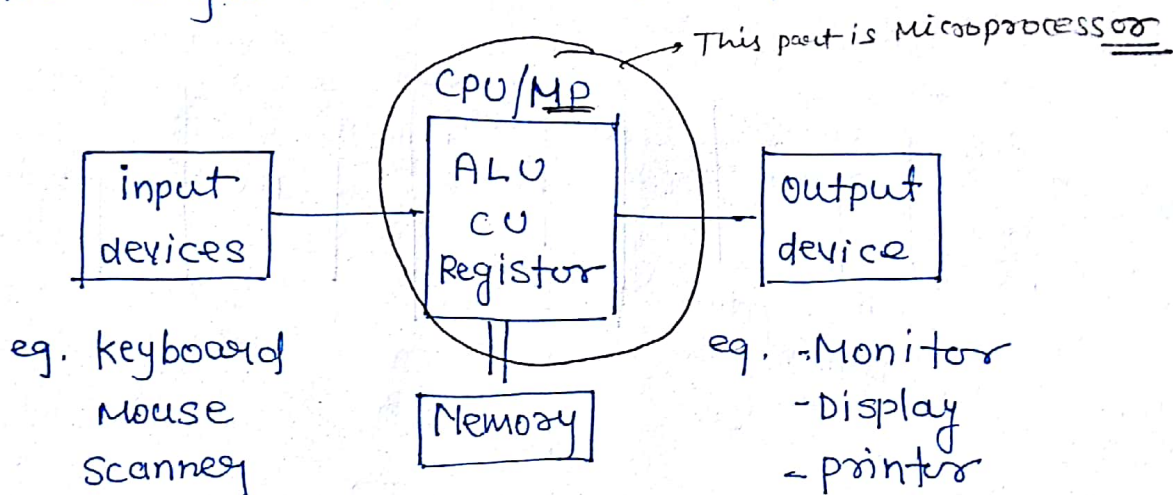
Simple scale SSI < 10 Component
Integration

Medium - MSI 10 - 100

Large - LSI 100 - 10K

Very large - VLSI > 10 K

• Block diagram of a Computer



ALU - Arithmetic logic unit
CU - Control Unit.

Microprocessor:- It is a semiconductor component designed by using VLSI technology and it contains ALU, CU and Register of a CPU in a single package.

Intel is a 1st Company to manufacture.

$$\left| \begin{array}{l} \text{Distance b/w Component} \\ \text{in } \mu\text{m} \\ f = \text{MHz} \\ T = \frac{1}{f} = \mu\text{s} \end{array} \right|$$

Imp

Note:- For a processor memory is connected externally

→ The register inside the processor can not be consider a memory, As they used to hold the data temporary. [In latest processor can be present inside eg. cache memory] which can be used to store frequently used data & instruction]

*

Bit → Binary Digit

0/1

Nibble → 4 bits

Byte → 8 bits = 2 Nibble

word length → Depends on type of μP

Word length:- Number of bits can be processed by a processor parallelly at a time.

eg:- 8 bit μP → 8 bits / 1 byte

* 1971 Intel 4004 → 4 bit μP (First μP)

1972 Intel 8008 → 8 bit μP

1974 Intel 8080 → 8 bit μP

✓ 1977 Intel 8085 → 8 bit μP (First successful Architecture μP)

1978 Intel 8086 → 16 bit μP

8088, 80186, 80286, 80386 (32 bit μP)

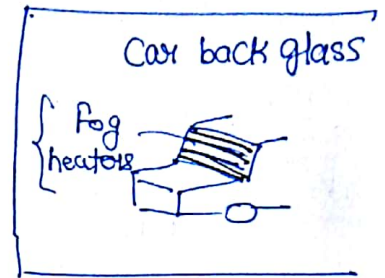
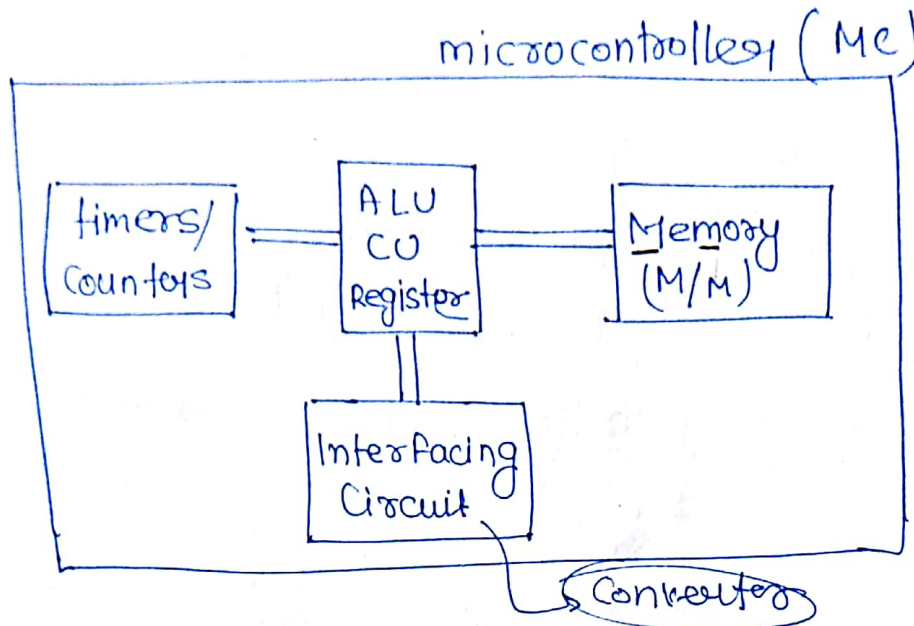
pentium, Dual Core, i3, i5, i7 (64 bit μP)

word length:- eg: 16 bit μP → 16 bits / 2 byte
word length

32 → 4 bytes
word length.

Microcontroller :-

5



Difference between μP and μC

μP

- ① It has ALU, CU & register
- ② No Internal M/M
- ③ No Interfacing Circuit
timers/Counters
- ④ Used for General purpose application
- ⑤ eg. Intel 8085, i7
MC6800, Z80, AMD
Fairchild, Rockwell
National semiconductor

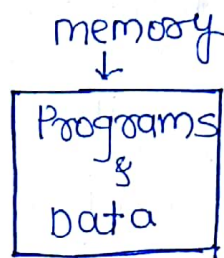
μC

- ① It has ALU, CU, Register
- ② has internal M/M
- ③ has interfacing circuit
timers/Counters
- ④ Used for specific purpose application.
eg:- washing machine uc cannot use in car.
- ⑤ Intel 8051 (8 bit), 8096 (16 bit)
TM81000 (4 bit), PIC - 8 bit/16 bit
AT89C51, Motorola, phillips,
Freescale

* Depending on How programmes and Data are stored in the memory they 2 type of architecture:

- (i) Von-Neumann/^{princeton}~~princeton~~ architecture
 (ii) Harvard Architecture.

(i) ^{Princeton}~~Princeton~~ :-

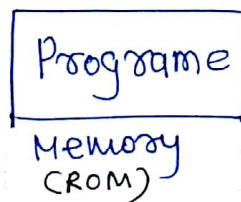


both programmes and data are in same memory

eg:- Intel 8085, 8086

(ii) Harvard :-

eg. Intel 8051 (MC)

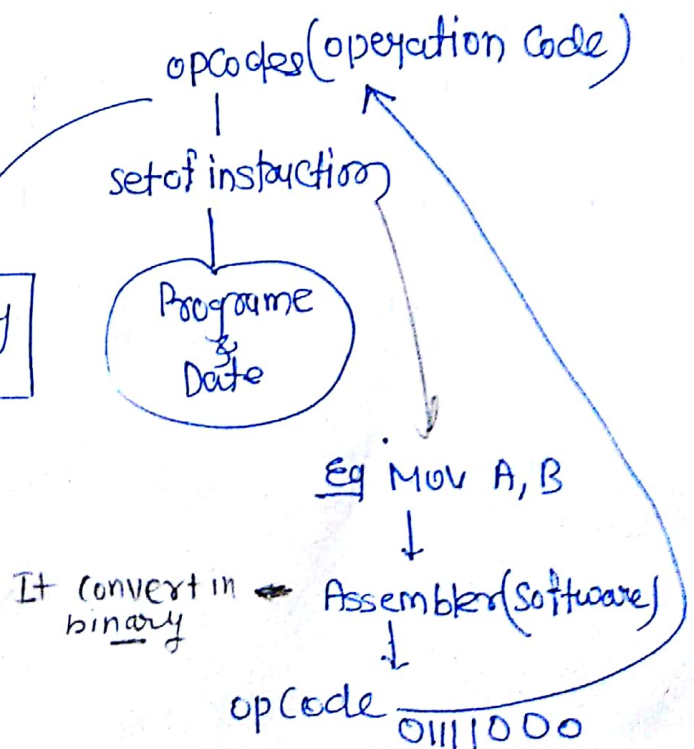
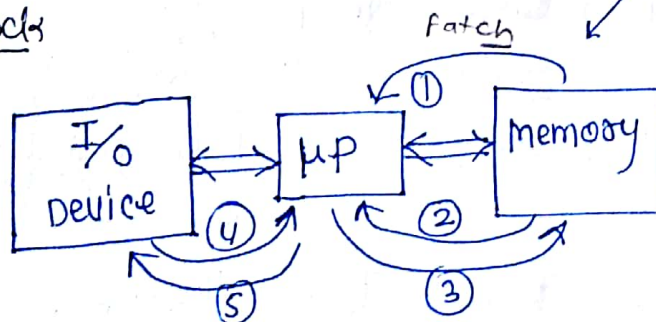


Program Memory (ROM)
Data Memory (RAM)

programme and data are in separate memory.

Basic operations of a MP :-

3 imp blocks



- | | |
|----------------|-----------------|
| ① opcode fetch | } machine cycle |
| ② M/M Read | |
| ③ M/M write | |
| ④ I/o Read | |
| ⑤ I/o write. | |

① opcode fetch:- Reading or accessing instruction i.e. opcode or operation code from memory into the processor. (In some instruction execution may also be complete may also be completed in fetch operation.)

② M/M Read:- Reading or accessing data from memory

③ M/M write:- sending or transferring data to memory.

④ I/o ~~was~~ Read:- Reading or accessing data from input port or device.

⑤ I/o write:- transferring data to output port or device

* Port indicate connection of an I/o device.
input/output