Micro-computer Organization and Architecture

Covering topics

- Overview
- Components of micro-computer
- Intel 8086 Microprocessor Architecture
- Instruction Execution
- I/O Devices

Overview

- IBM PC particular
- Main hardware components
- Relation with software
- Instruction Execution

Components of Micro-computer

- Central Processing Unit
- Memory circuit
- I/O circuits.
- Digital circuits(transistors) discrete voltage signals(low and high 0,1)

Memory

- Flip Flops stores 0 or 1
- Bytes and words
- 20 bit address can address 1MB memory or 1,048,576 bytes.
- Two operations read and write

Buses

- Processor deal with I/O and memory circuits by using signals traveling along a set of wires called buses.
- Control bus
- Address bus
- Data bus

Computer organization

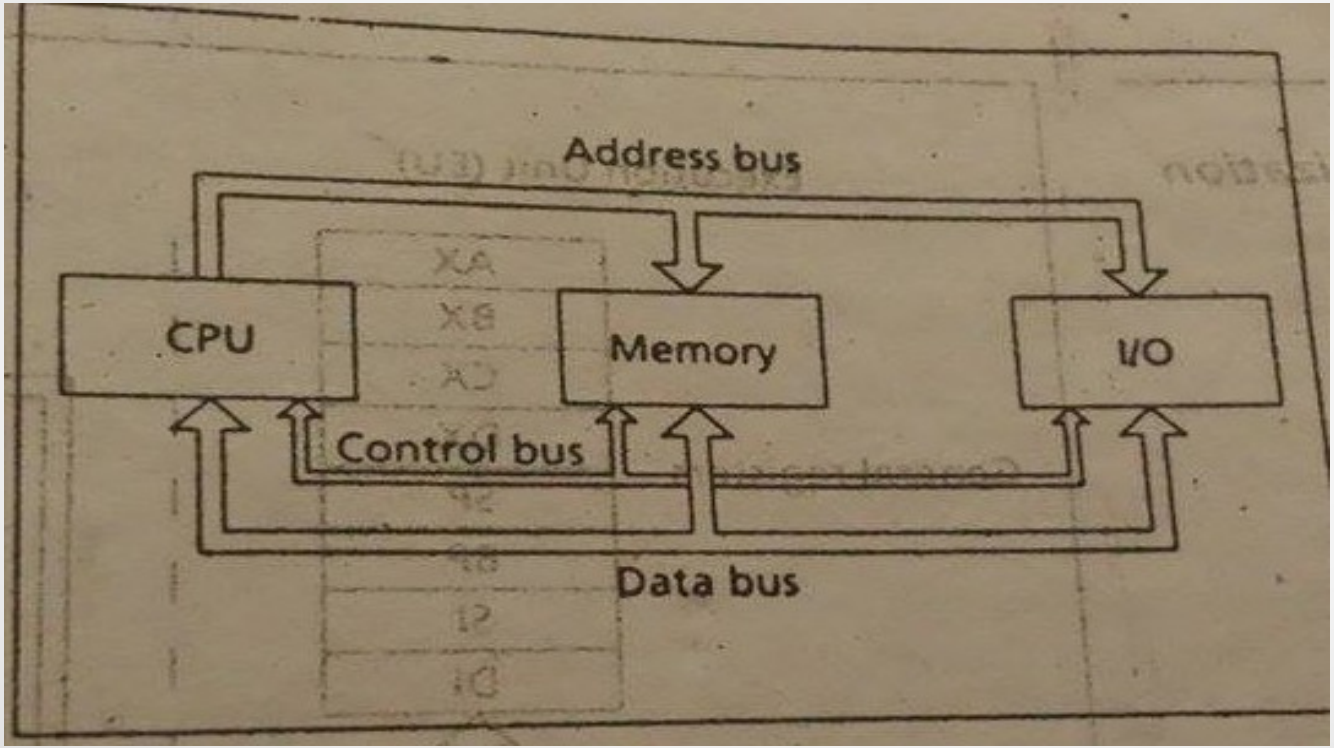

Figure 1.0

CPU

- Execute programs(system or application) stored in memory.
- Instructions are bit string.
- Has two main components execution unit and bus interface unit.

CPU organization

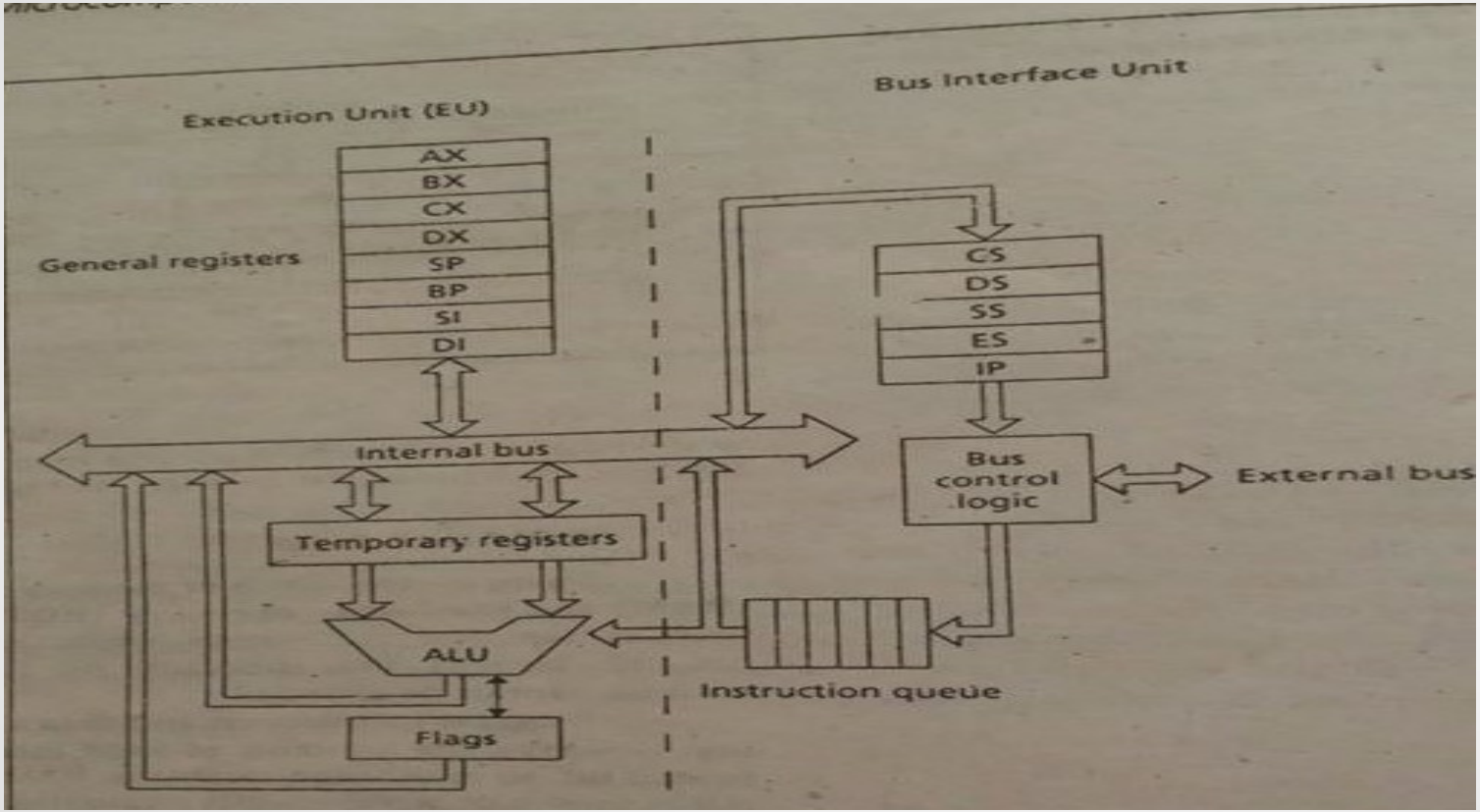

Figure 1.0

Execution Unit

- Executes instruction
- Contains arithmetic and logic unit(ALU)
- ALU(+,-,/,*)
- Logic(AND,OR,NOT)
- Data for operations are stored in *registers*
- Refer to it by its name rather then an address

Bus Interface Unit

- Facilitates communication between EU and memory or I/O
- Responsible for transmitting address, data and control signals on the buses
- Their registers are CS,DS,SS,ES and IP; holding address of memory locations
- EU and BU are connected by internal bus
- Instruction prefetch; fetching next instruction and placing it in instruction queue by BIU
- If EU needs to communicate with memory or I/O, BIU suspends instruction prefetch and performs the needed operation

Instruction Execution

- Machine instruction has: **opcode** and **operands**
- fetch-execute cycle
- Fetch:
  - Fetch instruction from memory
  - Decode instruction
  - Fetch data from memory if necessary
- Execute:
  - Perform operation on that data
  - Store result in memory if needed

I/O ports

- I/O connected through I/O circuits containing several registers called I/O ports
- Some used for data others for control commands
- I/O ports has addresses(*I/O addresses*) and connected to bus system
- I/O addresses can only be used in input or output

References

- Assembly Language Programming and Organization of the IBM PC (Ytha Yu, Charles Marut)
- Figure 1.0 page 7, and Figure 2.0 page 8, Assembly Language Programming and Organization of the IBM PC (Ytha Yu, Charles Marut)