Introduction to Information Technology

CSC109

2019

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2.4 Instruction Format

- What is a computer program?
- **stored program concept**
  - The program and the data, stored in main memory, waiting to be processed by the processor.
- Fields : An instruction is divided into groups.
- Operation Code “Opcode”/”op” is an instruction that tells processor what to do with the variable or data written besides it.
- opcode command eg: MOV or ADD or JMP
- “Oprand” is a variable that stores data(and data can be a memory address or any data that we want to process).

2.4 Instruction Format

Operation Code	Operand Code

Example: **MOV AL, 34h**

- **Instruction Format**

ADD	Address 1 Address	Address 2 Address

- Instruction Length
- Memory Size
- Memory Organization
- Memory Transfer Length

Zero Address
One Address
Two Address
Three Address
Four Address

- Moreover **Instruction formats** are classified into 5 types based on the type of the CPU organization

2.5 Instruction Set

- Sets of instruction that processor can understand
- An Instruction Set is the set of all the basic operations that a processor can accomplish
- language that a processor can understands
- All programs written in a high-level language are compiled and translated into machine code before execution
- Two processors are different if they have different instruction sets and vice versa (eg: x86 and x64)
- Example: ADD A, B
  MOV B, A

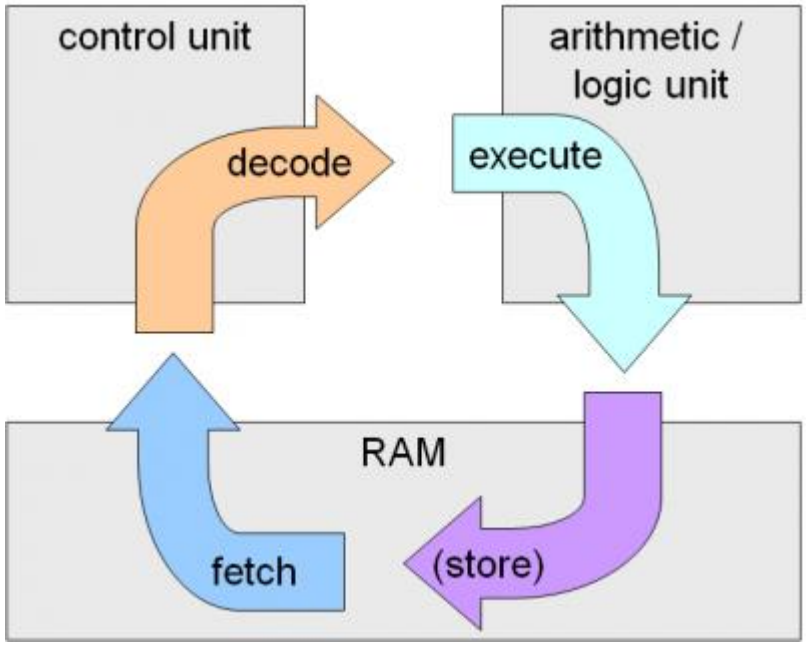
2.5 Instruction Set

4 Types of instructions

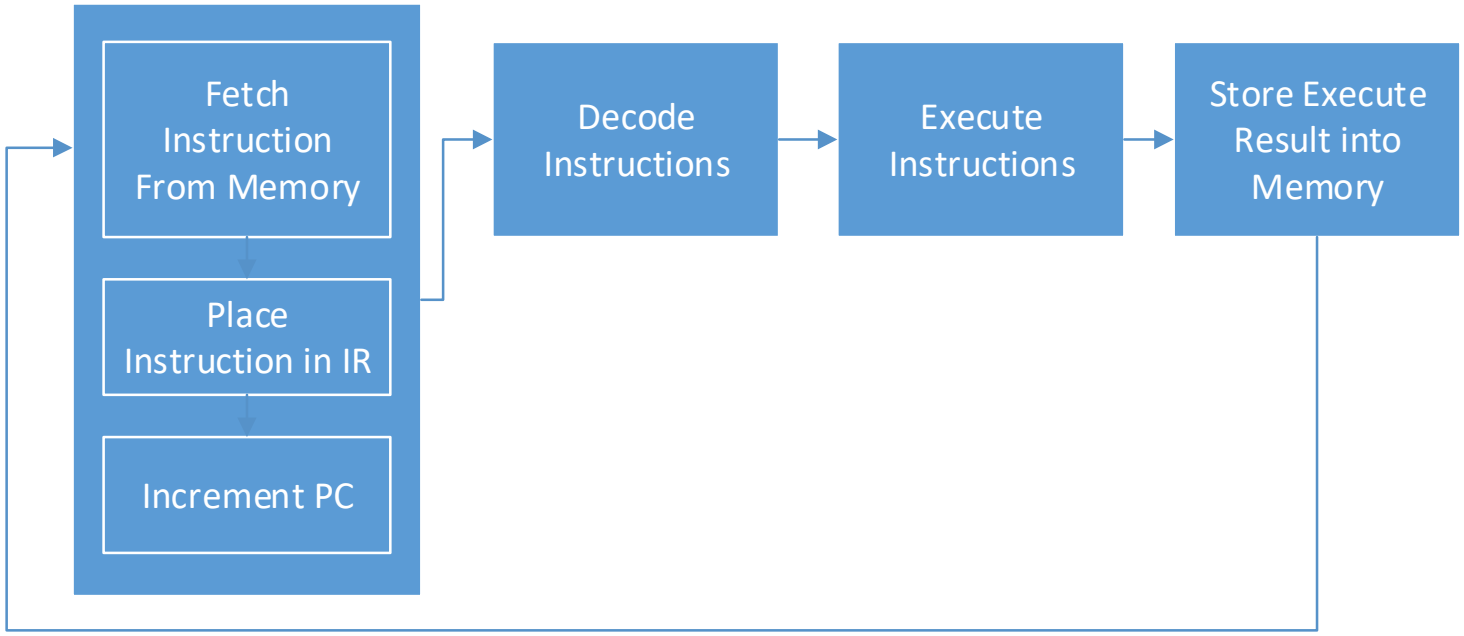
- Memory Access or transfer of data between registers
  -- MOV B, A
- Arithmetic Instructions
  -- ADD, SUB etc
- Logic Instructions
  -- AND, OR, NOT
- Control and Conditional Instruction
  -- JMP, JC, LOOP

2.6 Instruction Cycle

- The series of Step for executing an instruction by CPU
- 4 Steps
  - Fetching
  - Decoding
  - Executing
  - Storing



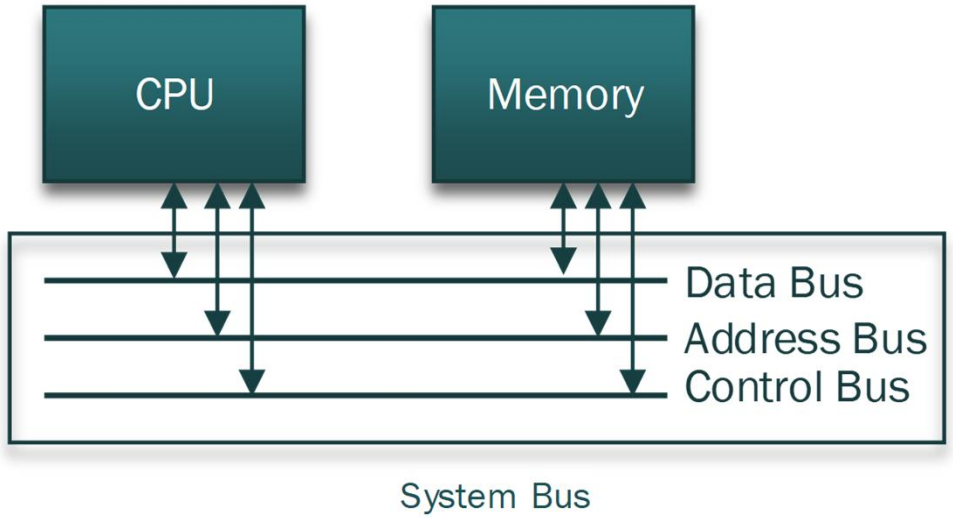
Steps of Instruction Cycle



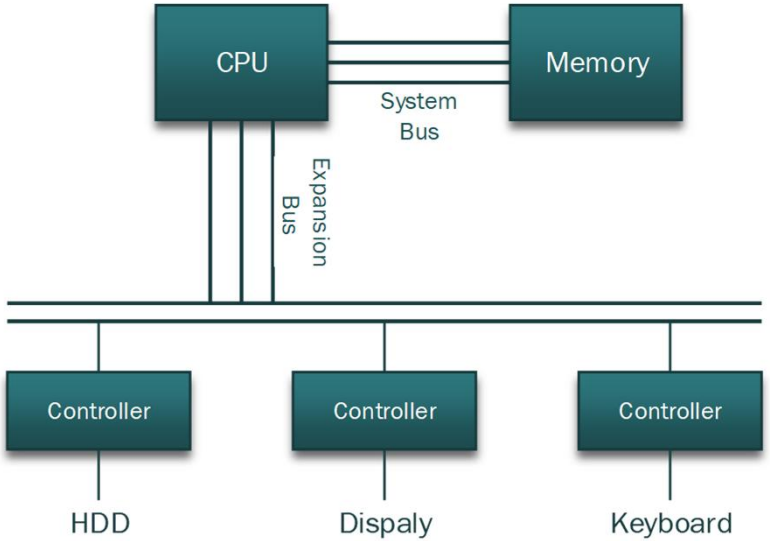
- ✓**Fetch the Instruction**: the next instruction is fetched from the momory address that is currently stored in the Program Counter (PC) and stored in Instruction register (IR)
- ✓**Decode the instruction:** During this cycle the encoded instruction present in IR is interpreted by the decoder
- ✓**Execute the instruction**: the control unit of the CPU passes the decoded information as a sequence of control signals to the relevant function units of the CPU to perform the actions required by the instruction.
- ✓**Store**:

2.8 Interconnecting The Units Of A Computer

- **BUS**
  - ✓ set of electronic signal pathways that allows information and signals to travel between components inside or outside of a computer
  - ✓ components of computer, like CPU, I/O unit, and memory unit etc are connected with each other by a bus.
  - ✓ Two Types
    - ✓ Internal (System Bus)
    - ✓ External (Expansion Bus)



- Connects Different External Devices, Peripherals, expansion Slots and I/O ports to the rest of computers



- Allow expansion of computer's capability
- Slower than internal bus (System Bus)
- Also referred as expansion bus

Data Bus: used to transfer data between I/O devics and CPU

- EISA (The most commonly used standard is Extended Industry Standard Architecture (EISA) which is a 32-bit bus architecture.)
- PCI (Peripheral Component Interconnect for hard disks, sound cards, network cards and graphics cards)
- AGP (Accelerated Graphics Port for 3D and full motion video
- USB

Address Bus: Carries the address of different I/O device to be accessed

Control Bus: Used to carry read/write command, status of I/O Devices etc.

External Ports

- ✓The peripheral devices interact with the CPU of the computer via the bus.
- ✓The connections to the bus from the peripheral devices are made via the ports and sockets
- ✓mouse, keyboard, monitor, network, modem, and, audio port, serial port, parallel port and USB port
- ✓MSB: Most Significant Bit
- ✓LSB: Least Significant Bit