**محاظرات معمارية حاسبه**

**المرحله الثالثه**

**قسم علوم الحاسبات/ كلية التربية/الجامعه المستنصريه**

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**Part ( 1)**

**computer architecture**

**Computer Architecture:** The general layout of computer's major components, the principle features of these components, and how they are connected together.

**Classification of computer architecture**

**Flynn’s taxonomy:**

Classification of computer systems according to Michael Flynn (1966) is based on the presence of **single** or **multiple** streams of instruction and data:

***Instruction stream***: a sequence of instructions executed by a processor.

***Data stream***: a sequence of data required by an instruction stream.



**SISD:** Execution of instruction in SISD processors is illustrated bellow:



The SISD organization



• Instructions are executed sequentially.

• This is the oldest and until recently, the most common form of computer

• Examples: most PCs, single CPU workstations and mainframes

**SIMD:** Execution of instruction in SIMD processors is illustrated bellow:



The SIMD organization



• A type of parallel computer

• Best suited for specialized problems such as image processing and vector computation.

**MISD:** Execution of MISD processor is illustrated bellow:



The MISD organization



• This architecture is also known as systolic arrays for pipelined execution of specific instructions

• Few actual examples of this class of parallel computer have ever existed. One is the experimental Carnegie-Mellon C.mmp computer (1971).

**MIMD** Execution of MIMD processor is illustrated bellow:



The MIMD organization

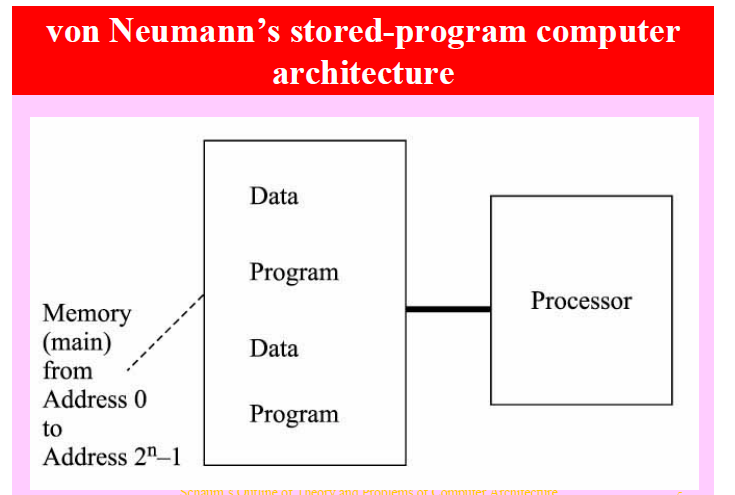


• As shown in the above figure there are different processor each processing different task.

• Examples: most current supercomputers, networked parallel computer .

**Von Neumann Machines:**

• The "von Neumann" in von Neumann architecture refers to Hungarian-American mathematician John von Neumann, Von Neumann became a consultant to the E NIAC ( E ctronic Numerical Integrator and Computer) project, which upon its completion in 1945 became the world's first general purpose electronic computer.



\* The principal feature of a von Neumann computer is that the program and any data are both stored together . A von Neumann computer has five parts:

\* arithmetic-logic unit

\* control unit

\* memory

\* some form of input/output

\* A bus that provides a data path between these parts.

Such a computer operates by performing the following sequence of steps:

**1**. Fetch the next instruction from memory at the address in the program counter.

**2**. Add the length of the instruction to the program counter.

**3**. Decode the instruction using the control unit. The instruction may change the address in the program counter, permitting repetitive operations. The instruction may also change the program counter only if some arithmetic condition is true.

**4**. Go back to step 1.

**Von Neumann computers drawbacks*:***

**\*** They carry out instructions one after another, in a single linear sequence

**\*** They spend a lot of time moving data to and from the memory.

**The solution:**

**\*** To build the computer so it performs operations in parallel (so-called parallel processing).

**\*** Separating the bus into two or more busses, one for instructions, another for data.

**The (Non )Von Neumann Architecture**

\*One example is the MIMD architecture which is : Multiple instruction/Multiple data

\*Other examples are Analog Computers, Optical Computers, Quantum Computers, Cell Processors, DNA, Neural Nets (in Silicon).

\*Most Non Von Neumann models distributes the computation amongst processing units - for example FPGA or neural networks.

\*They can be thought of as a class of computer programs ideally suited for parallel computation.