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COA IA II

Different Multiprocessor Configuration

Flynn Classification

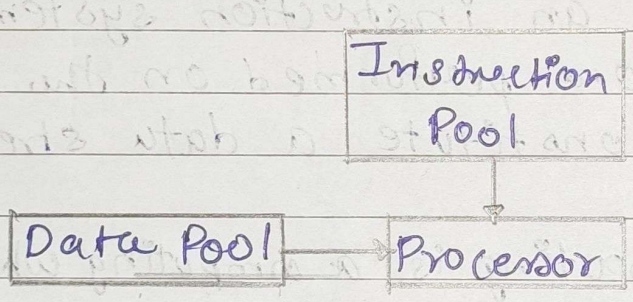
- M. J Flynn proposed a classification for the organisation of a computer system by the number of instructions and data items that are manipulated simultaneously.
- The sequence of instructions read from memory constitutes an instruction system.
- The operations performed on the data in the processor constitute a data stream.

- Parallel computing is a computing where the jobs are broken into discrete parts that can be executed concurrently. Each part is further broken down to a series of instructions. Instruction from each part execute simultaneously on different CPUs. Parallel systems deal with the simultaneous use of multiple computer resources that can include a single computer with multiple processors, a number of computers connected by a network to form a parallel processing cluster or a combination of both.

Data Streams	Instruction Streams: one	Instruction Streams: many
one	SISD: Traditional von Neuman single CPU computer	MISD: May be pipelined computers
many	SIMD: Vector processors fine grained data Parallel computers	MIMD: Multi computers Multiprocessors

- **Single - Instruction, single data (SISD) systems -**

→ An SISD computing system is a uniprocessor machine which is capable of executing a single single instruction, operation on a data stream. In SISD, machine instructions are processed in a sequential manner and computers adopting this model are popularly called sequential computers. Most conventional computers have SISD architecture. All the instructions and data to be processed have to be stored in primary memory.



SISD

- **Single - Instruction, Multiple Data (SIMD) systems -**

→ A SIMD system is a multiprocessor machine capable of executing the same instruction on all the CPUs but operating on different data streams. Machine based on an SIMD model are well suited to scientific computing since they involve lots of vector and matrix operations. So that the information can be passed to all the processing elements (PEs) organized data elements of vector can be divided into multiple sets (N - set for N PE systems) and each PE can process one data set.

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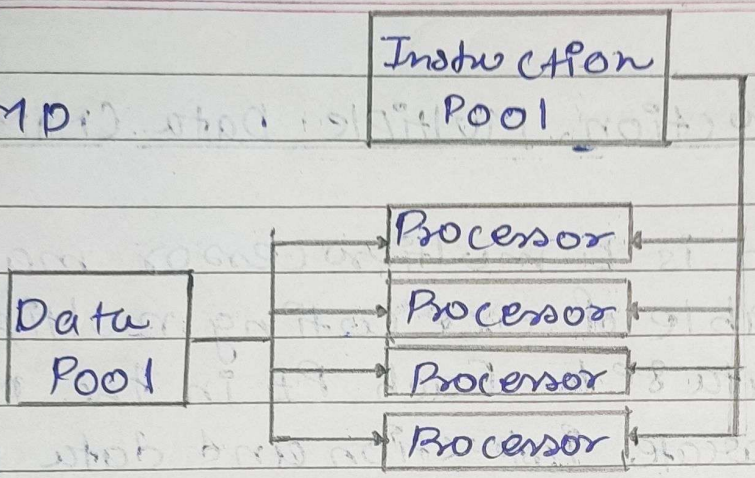
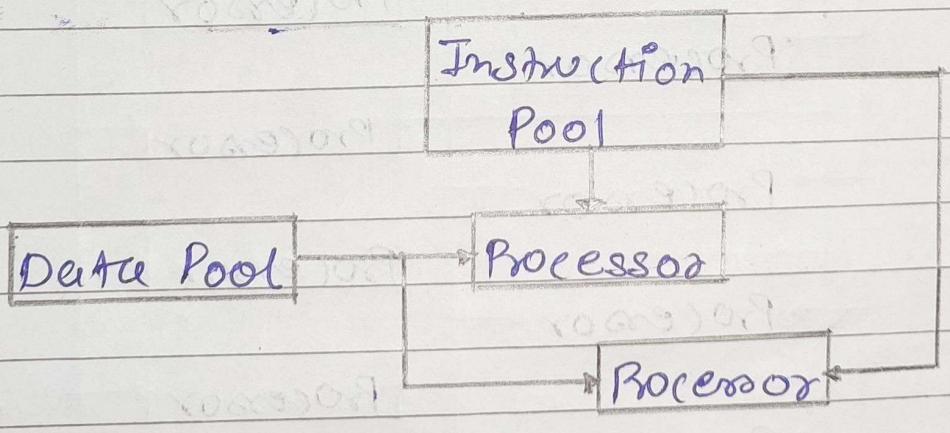
SIMD:



- **Multi - Instruction, single Data (MISD) systems**

→ An MISD commuting system is a multiprocessor machine capable of executing different instructions on different PEs but all of them operating on the same dataset.



MISD

- ## Multiple - Instruction, Multiple Data (MIMD) systems

→ A MIMD system is a multiprocessor machine which is capable of executing multiple instruction on multiple data sets. Each PE in the MIMD model has separate instruction and data streams, therefore machines built using this model are capable to any kind of application. Unlike SIMD and SISD machines, PEs in MIMD machines work Asynchronously.