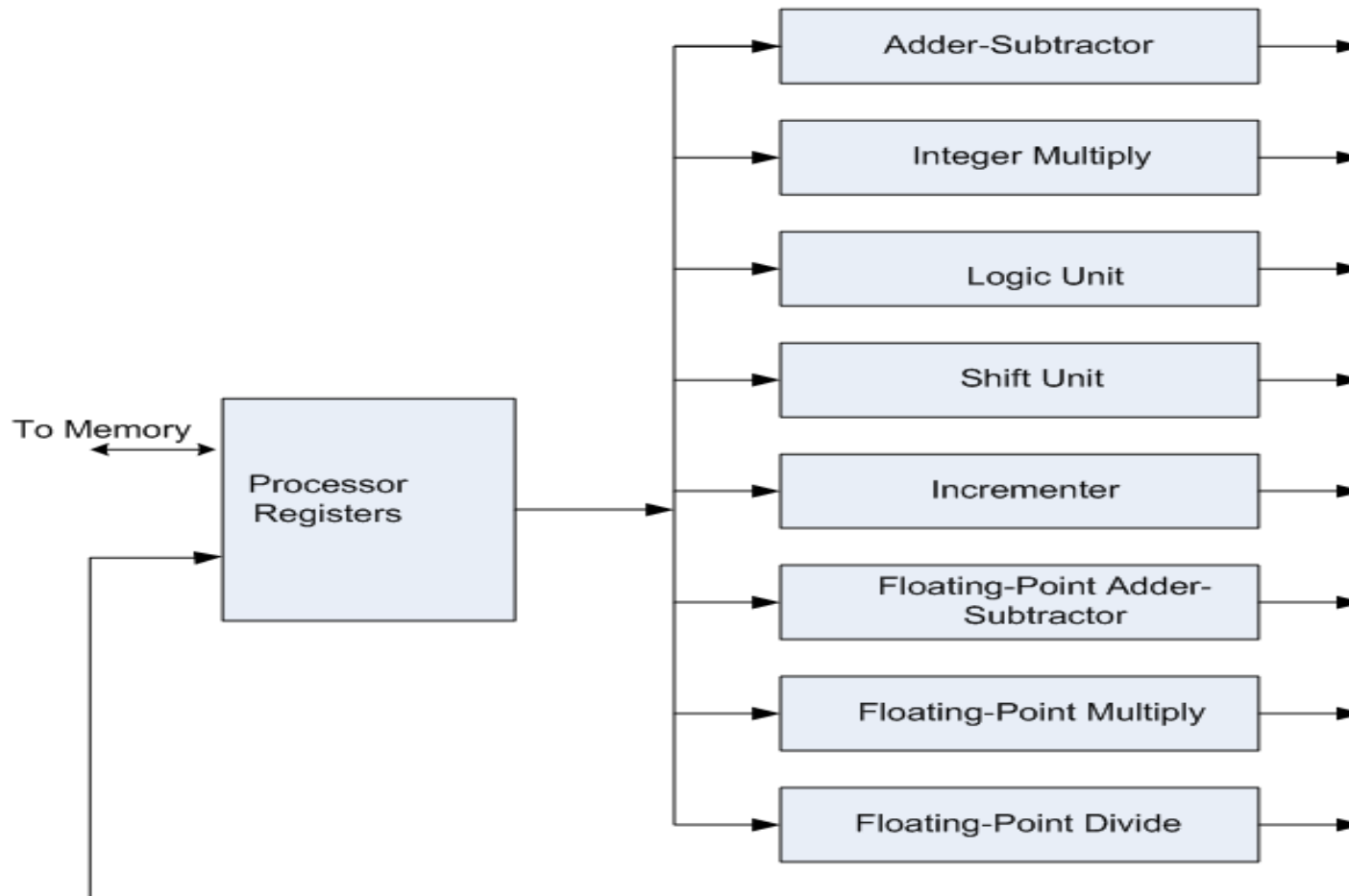# Parallel Processing

Parallel Processing

- Parallel processing is a term used for a large class of techniques that are used to provide simultaneous data-processing tasks

- Parallel processing system is able to perform concurrent data processing to achieve faster execution time.

- The purpose of parallel processing is to increase the computational speed of a computer system.

- Ex: While an instruction is being executed in the ALU, the next instruction can be read from memory.

- The amount of H/W increases with parallel processing and cost of the system also increases.

Parallel Processing

- Parallel processing is established by distributing the data among multiple functional units.

- The following figure shows one possible way of separating execution unit into 8 functional units operating in parallel.

Parallel Processing

Parallel Processing

- The operands in the register are applied to one of the units depending on the operation specified by the instruction.
- The adder and integer multiplier perform the arithmetic operation with integer number.
- The floating point operation are separated into 3 circuit operating in parallel.
- The logic, shift and incrementer can be concurrently executed on different data.
- All the units are independent of each other, so one number can be shifted while another number is being incremented.

Parallel Processing

– Parallel Processing classification introduced by M.J.Flynn's known as Flynn's classification

- Based on the multiplicity of *Instruction Streams* and *Data Streams*

- Instruction Stream

    – Sequence of Instructions read from memory

- Data Stream

    – Operations performed on the data in the processor

|		Number of *Data Streams*	
		Single	Multiple
Number of *Instruction Streams*	Single	SISD	SIMD
	Multiple	MISD	MIMD

SISD COMPUTER SYSTEMS

Characteristics:

- ➤ One control unit, one processor unit, and one memory unit

- ➤ Parallel processing may be achieved by means of:
    - ✓ multiple functional units
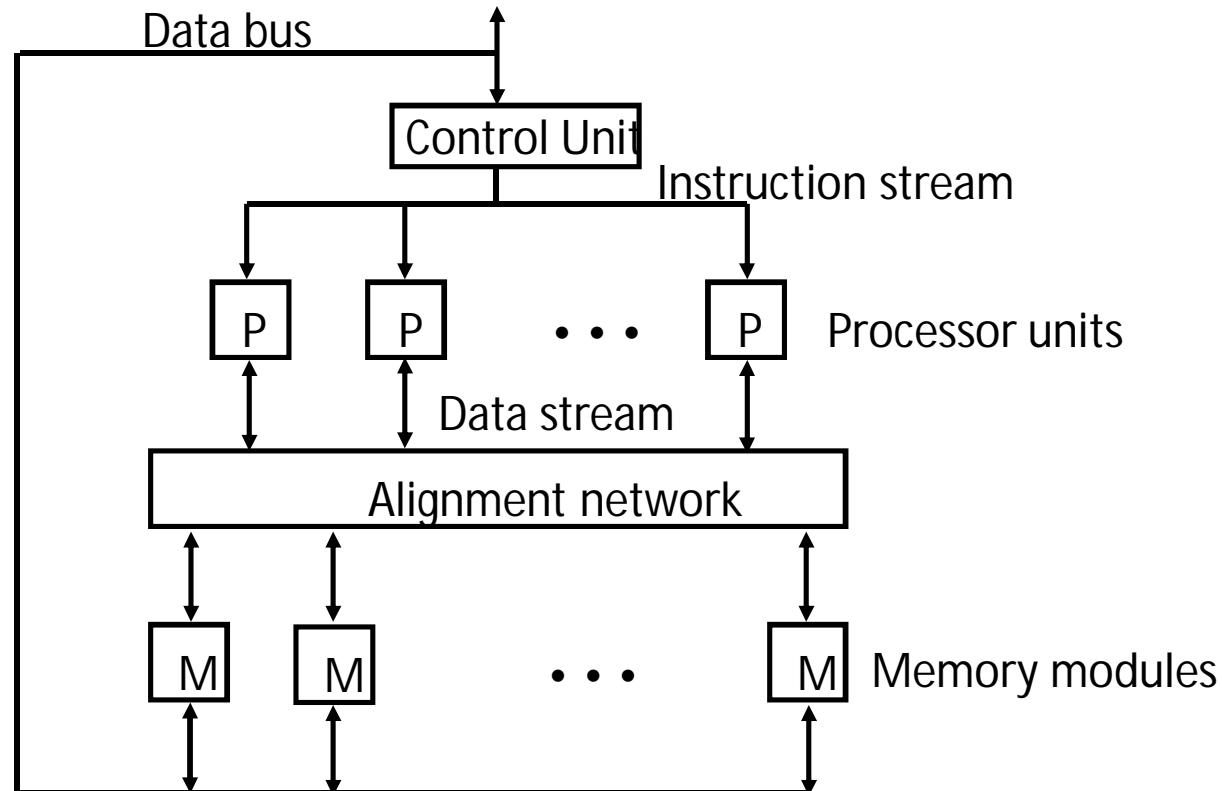   - ✓ pipeline processing
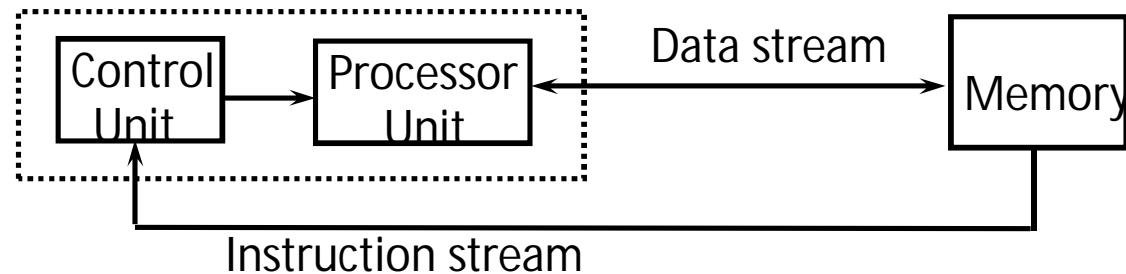
MISD COMPUTER SYSTEMS

Characteristics:

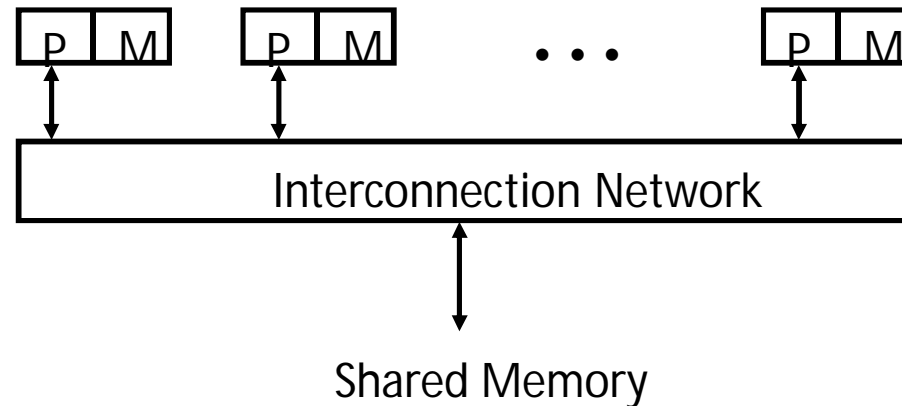- There is no computer at present that can be classified as MISD
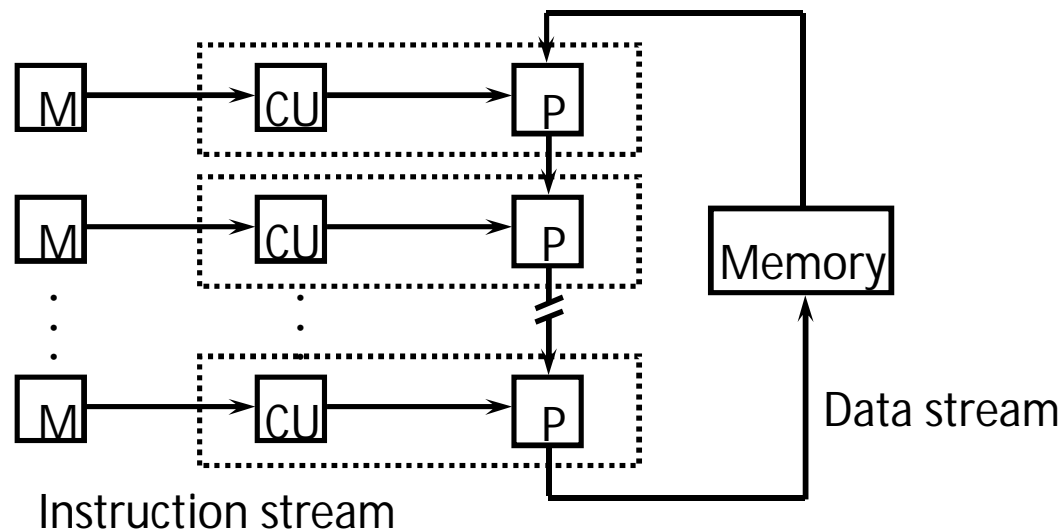
SIMD COMPUTER SYSTEMS

Characteristics:

➤ Many processing units under the supervision of common control unit

➤ All processor receives the same instruction but operate on different items of data

MIMD COMPUTER SYSTEMS

Characteristics:

➢ Multiple processing units (multiprocessor system)

➢ Execution of multiple instructions on multiple data

Types of MIMD computer systems

- Shared memory multiprocessors

- Multicomputer system

The main difference between multicomputer system and multiprocessor system is that the multiprocessor system is controlled by one operating system that provides interaction between processors and all the component of the system.