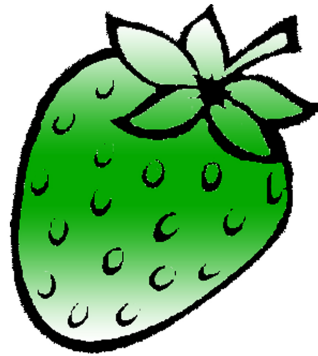# STRAWBERRY

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UNIT VIII:
MULIPROCESSOR ORGANIZATION

Agenda

- Flynn's Classification of parallel processing systems
- Parallel Computer Model
- Data & Resource Dependencies – Unit V
- Pipelining Concept – Unit V

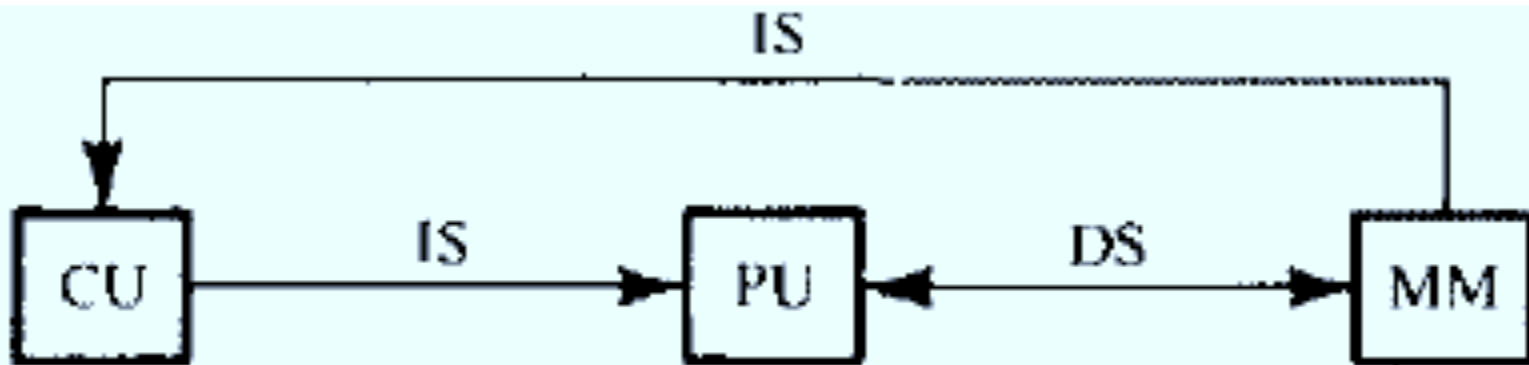# Flynn's Classification of parallel processing systems

- Flynn's Classification(1966) is based on the multiplicity of instruction streams & data streams in a computer system.

- A computing process is the execution of a sequence of instructions on a set of data.

- Instruction Stream is a sequence of instructions as executed by the machine.

- Data Stream is a sequence of data including input, partial or temporary results, called for by the instruction stream.

- Both instructions & data are fetched from the memory modules.

- Instructions are decoded by the control unit, which sends the decoded instruction stream to the processor unit for execution.

- Data stream flow between the processors & the memory bidirectionally.

- Listed below are Flynn's four machine organizations:

  — Single instruction, single data stream - SISD

  — Single instruction, multiple data stream - SIMD

  — Multiple instruction, single data stream - MISD

  — Multiple instruction, multiple data stream- MIMD

Single Instruction, Single Data Stream - SISD

- Single processor
- Single instruction stream
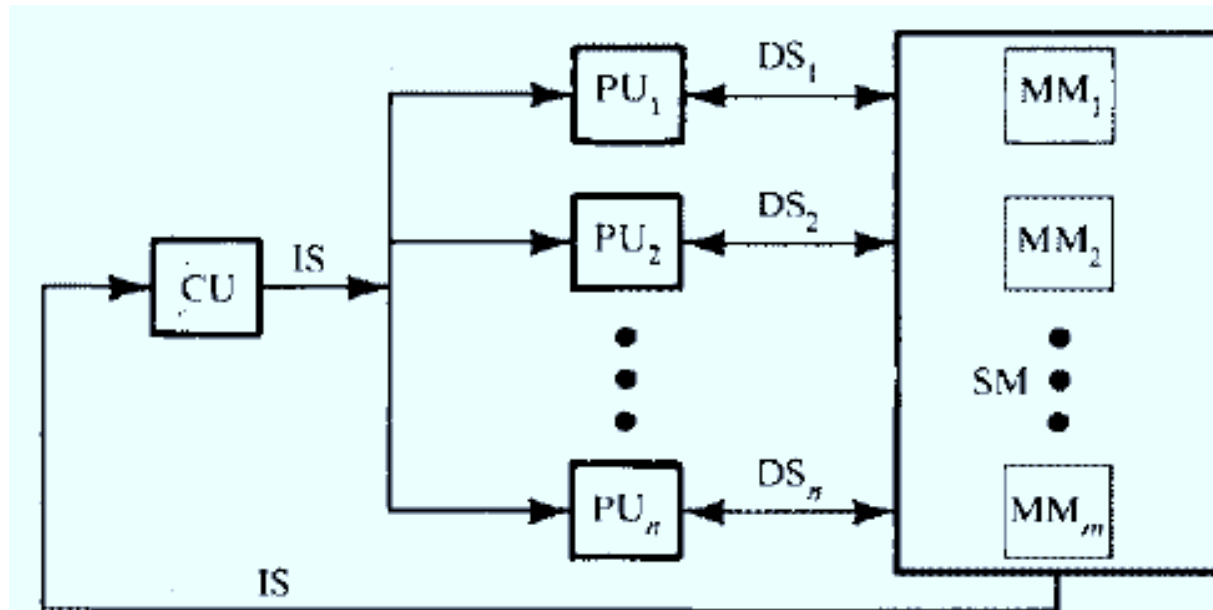- Data stored in single memory
- Uni-processor

CU: control unit
PU: processor unit
MM: memory module
SM: shared memory
IS: instruction stream
DS: data stream

(a) SISD computer

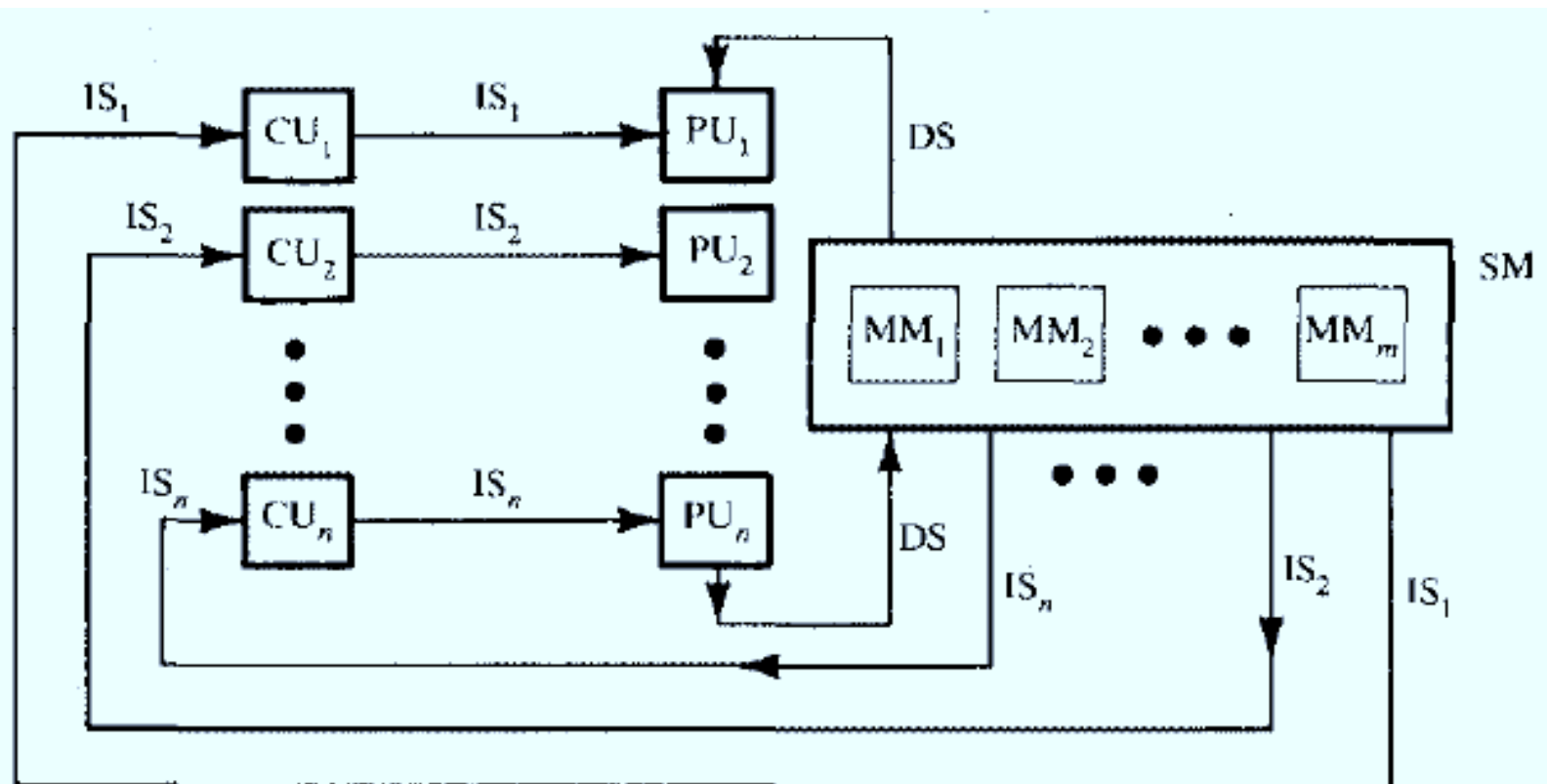# Single Instruction, Multiple Data Stream - SIMD

- Single machine instruction
- Controls simultaneous execution
- Number of processing elements
- Each processing element has associated data memory
- Each instruction executed on different set of data by different processors
- Vector and array processors

(b) SIMD computer
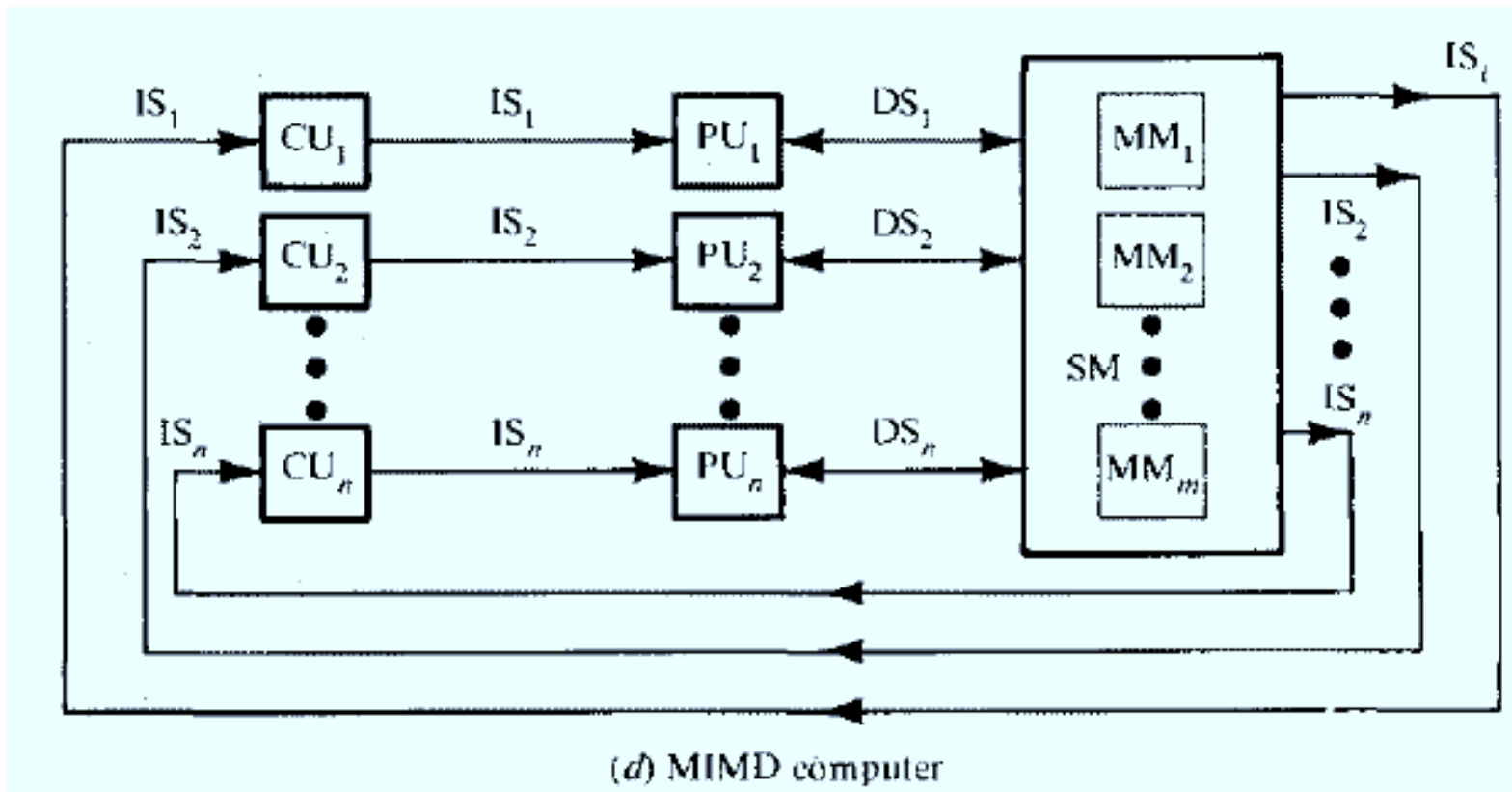
Multiple Instruction, Single Data Stream - MISD

- Sequence of data
- Transmitted to set of processors
- Each processor executes different instruction sequence
- Never been implemented

(c) MISD computer
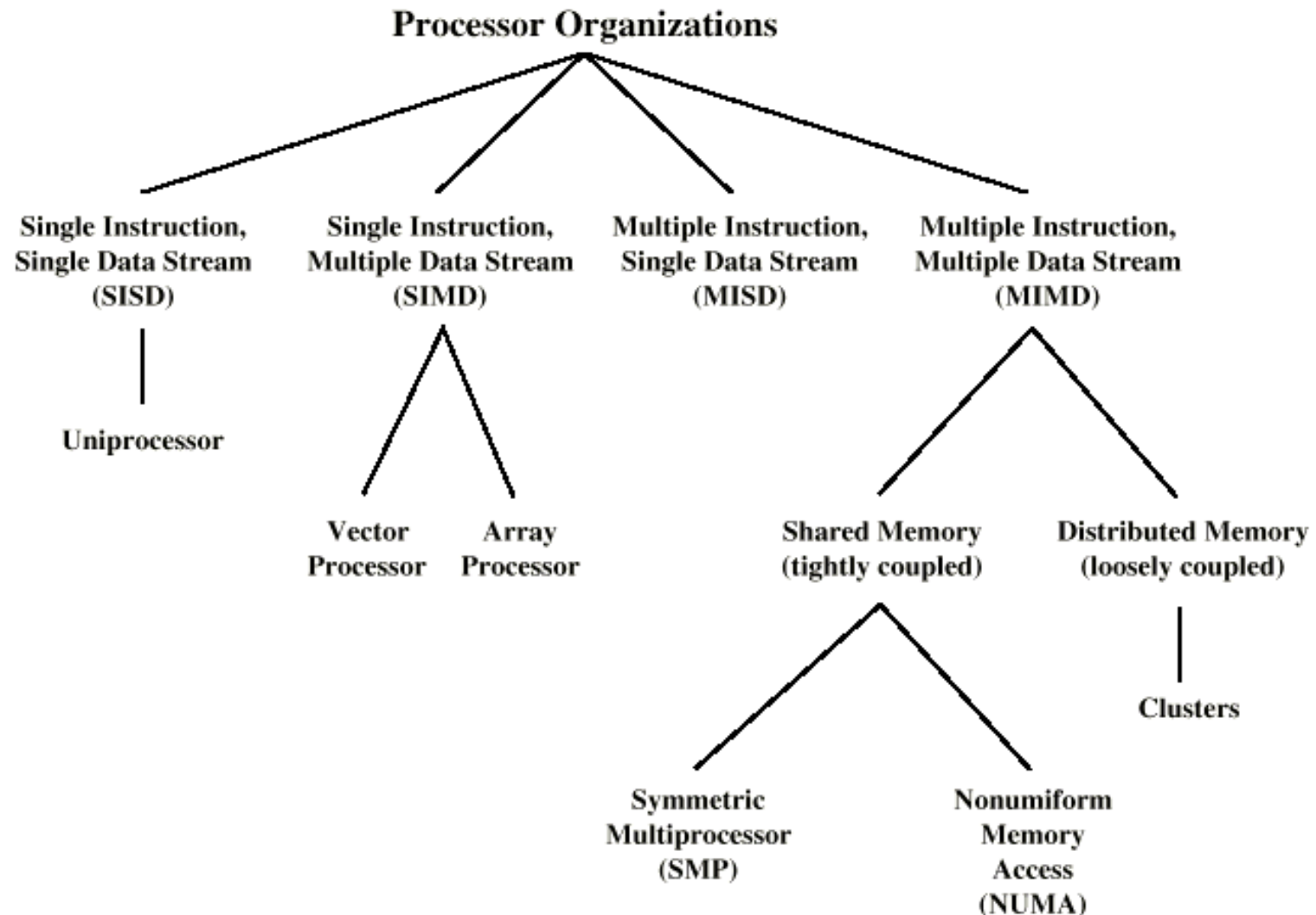
Multiple Instruction, Multiple Data Stream- MIMD

- Set of processors

- Simultaneously execute different instruction sequences

- Different sets of data

- SMPs, clusters and NUMA systems

(d) MIMD computer

Taxonomy of Parallel Processor Architectures
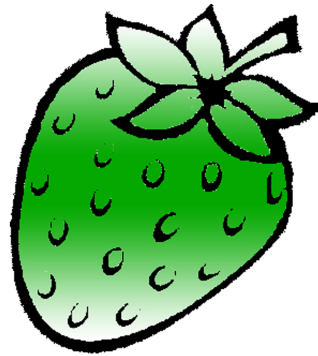
Parallel Computers

- Definition: "A parallel computer is a collection of processing elements that cooperate and communicate to solve large problems fast."

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