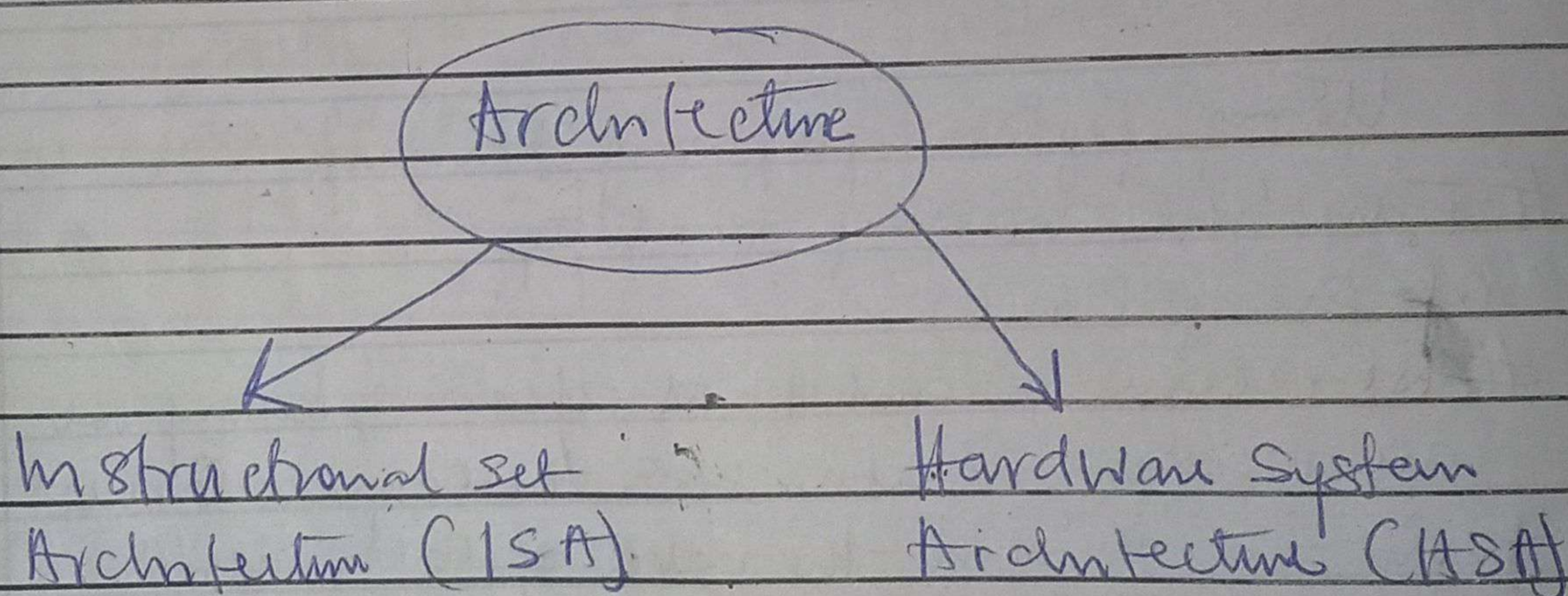


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They are passed by value or reference. Python is dynamic language and everything is passed by object reference.

Computer Architecture

This is the design of computers, including their instruction sets, hardware components and system organization.



$$X = 2 + 3$$

Instructional set Architecture (ISA)

LD 02H MOV R1, 02H

ADD 03H or MOV R2, 03H or ADD X, 02/03H or Push

STA X ADD R1, R2 Push

STORE X, R1 ADD

POP X

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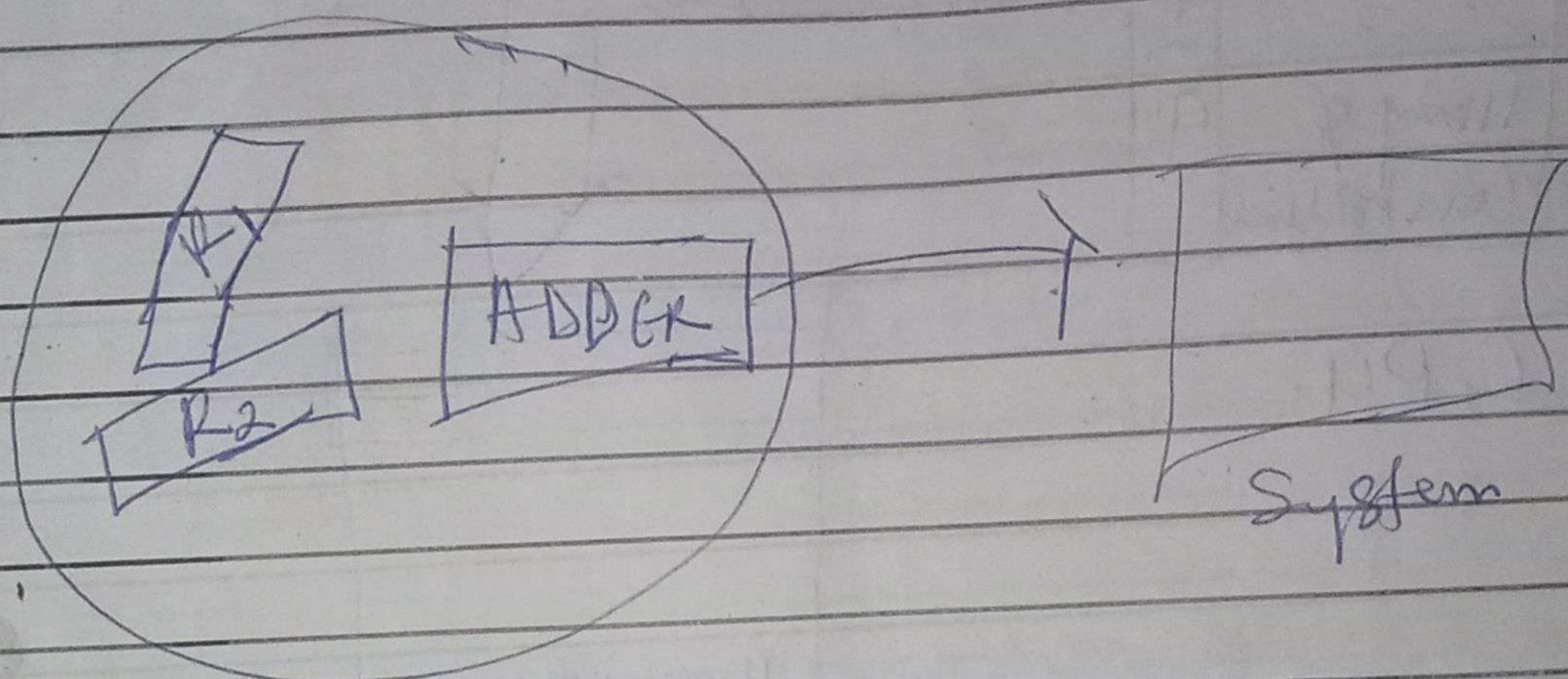
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Hardware System Architecture (HSA)



History

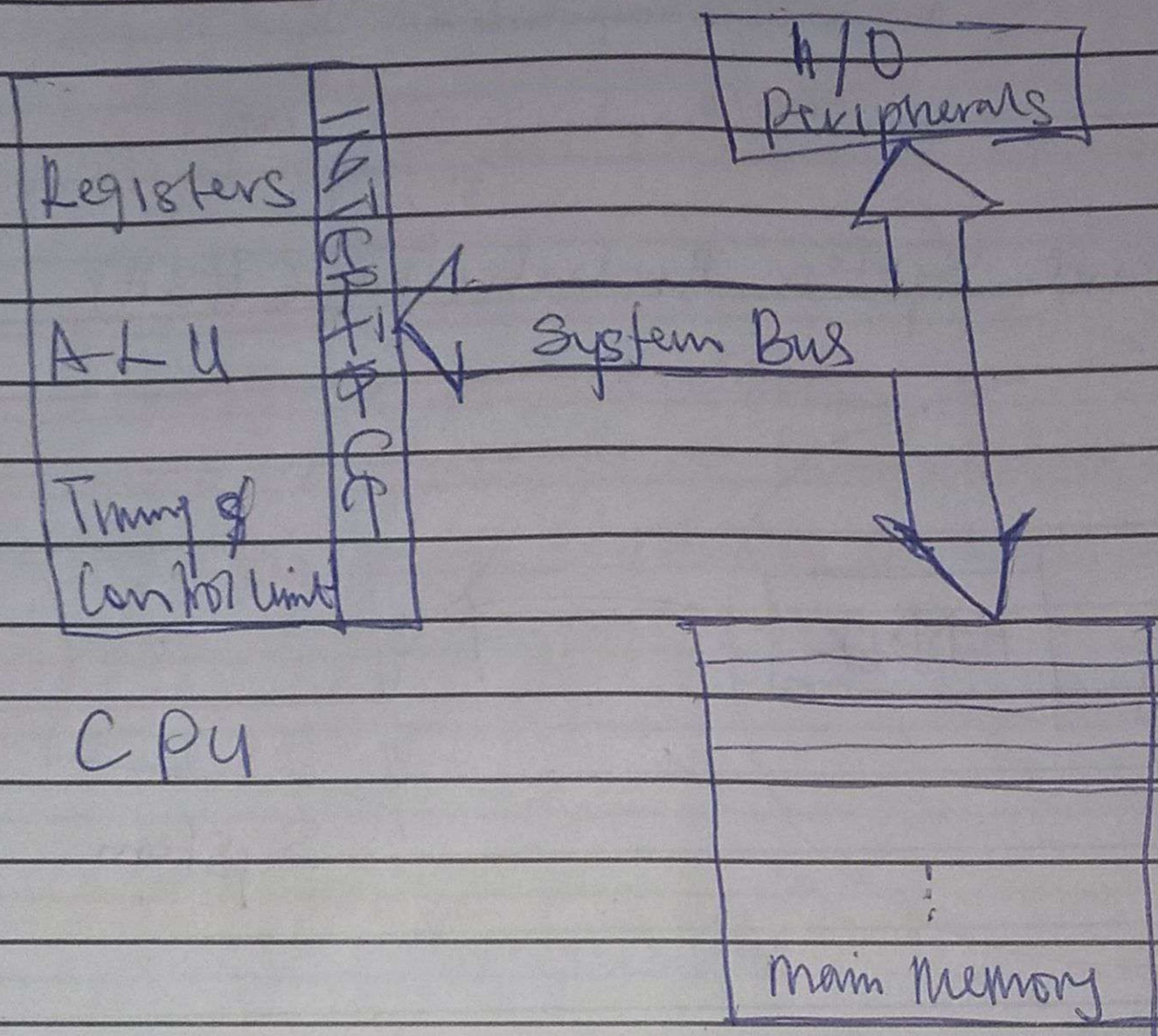
- ① first to design
- ① first computer designed is called Analytical Engine by Charles Babbage assisted by a lady called Ada Lovelace (software)
- ② Alan Turing updated the system by adding the computability theorem.
- ③ Johann von Neuman was the first to introduce computer architecture.

Computer Architecture classification

① Von Neuman Architecture

② Non-Von Neuman Architecture

Von Neuman Architecture



- * The CPU executes one operation at a time.
- * The CPU has a single path between the main memory and itself.
- * ~~Both~~ The processor can read instructions and operate on data simultaneously.

Non-Von Neuman Architecture

Harvard
Architecture

Modified Harvard
Architecture

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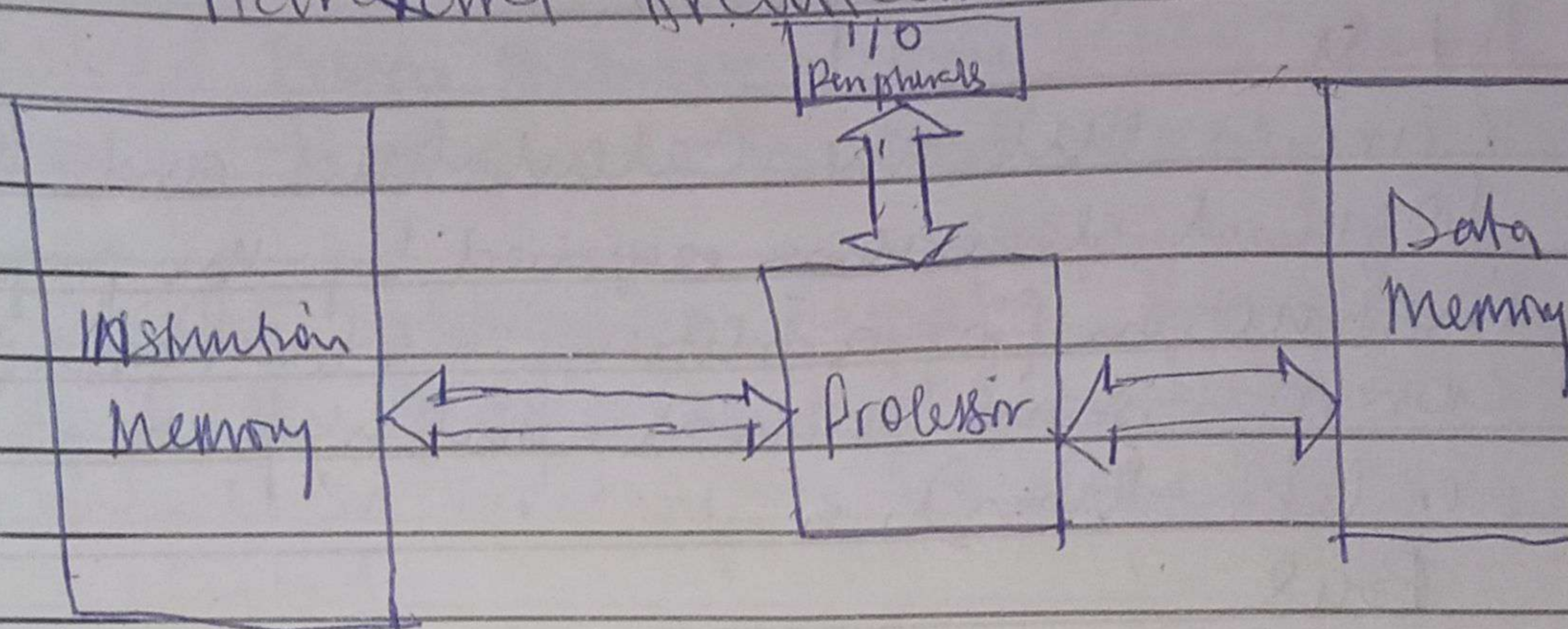
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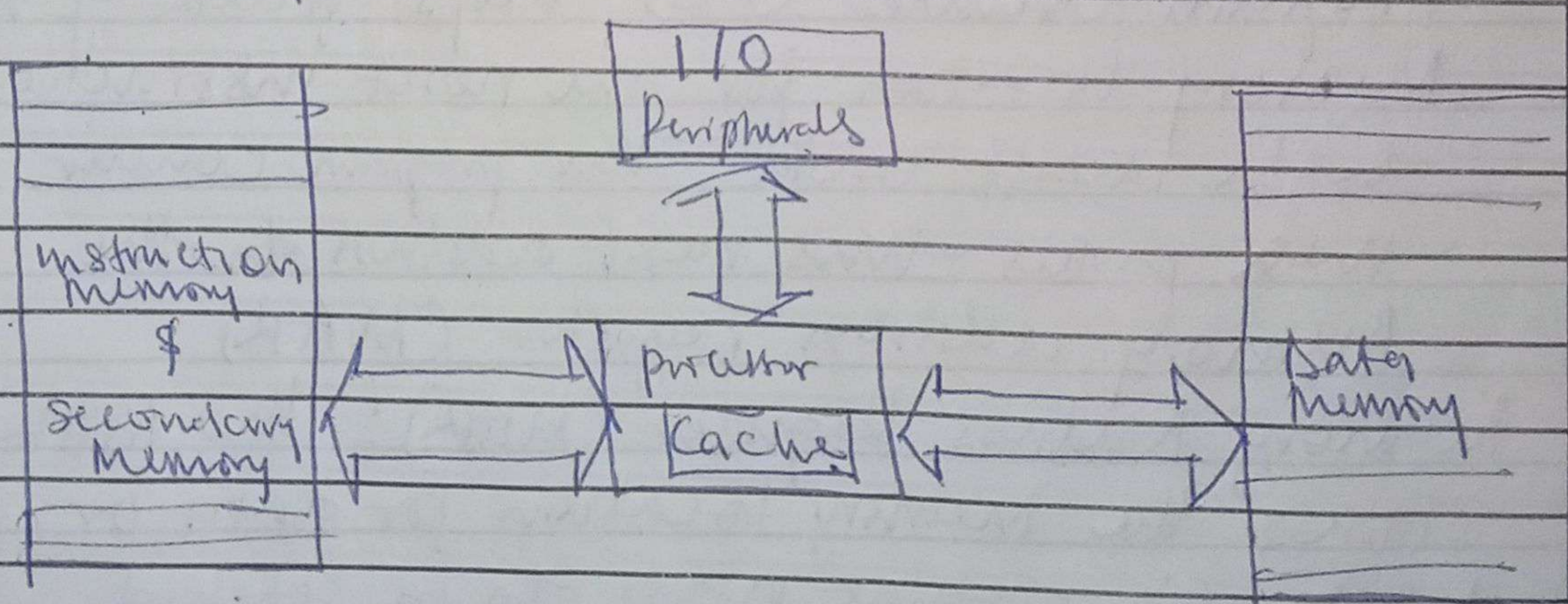
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Harvard Architecture



- * Processor can read instruction and perform data memory at the same time
- * The Computer under this Architecture is fast because instruction fetches and data access is not competing in the same path.

3 Modified Harvard Architecture



- * Processor is accompanied by a cache

Von Neumann Layout

Control Unit:

- 1. Responsible for decoding the instructions and controlling how data moves around the computer system.

ALU

Carries out the calculations and the logical decisions required by the program instruction (e.g. addition, subtraction, and comparisons such as equal to, greater than, or less than).

Bus

The lines that carry data around a computer.

Register

These are memory locations with specific purposes.

Accumulator: Stores the result of calculations made by the ALU.

Program Counter (PC): Keeps track of the memory location for the next instruction to be dealt with. The program counter then passes this next address to the memory address register (MAR).

Memory Address Register (MAR): The MAR stores the memory location for data or instructions that needs to be fetched from memory or stored into memory.

Memory Data Register: Register that is used to store any data or instructions.

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fetches from memory or any data that is to be transferred to, and stored in memory.

(CIR)

Current Instruction Register: Register that stores the most recently fetched instruction while it is waiting to be decoded and executed.

MAR vs MDR

- 1 Memory Address Register - holds the location in the memory of the data/instruction.
- 2 Memory Data Register - holds the data/instruction