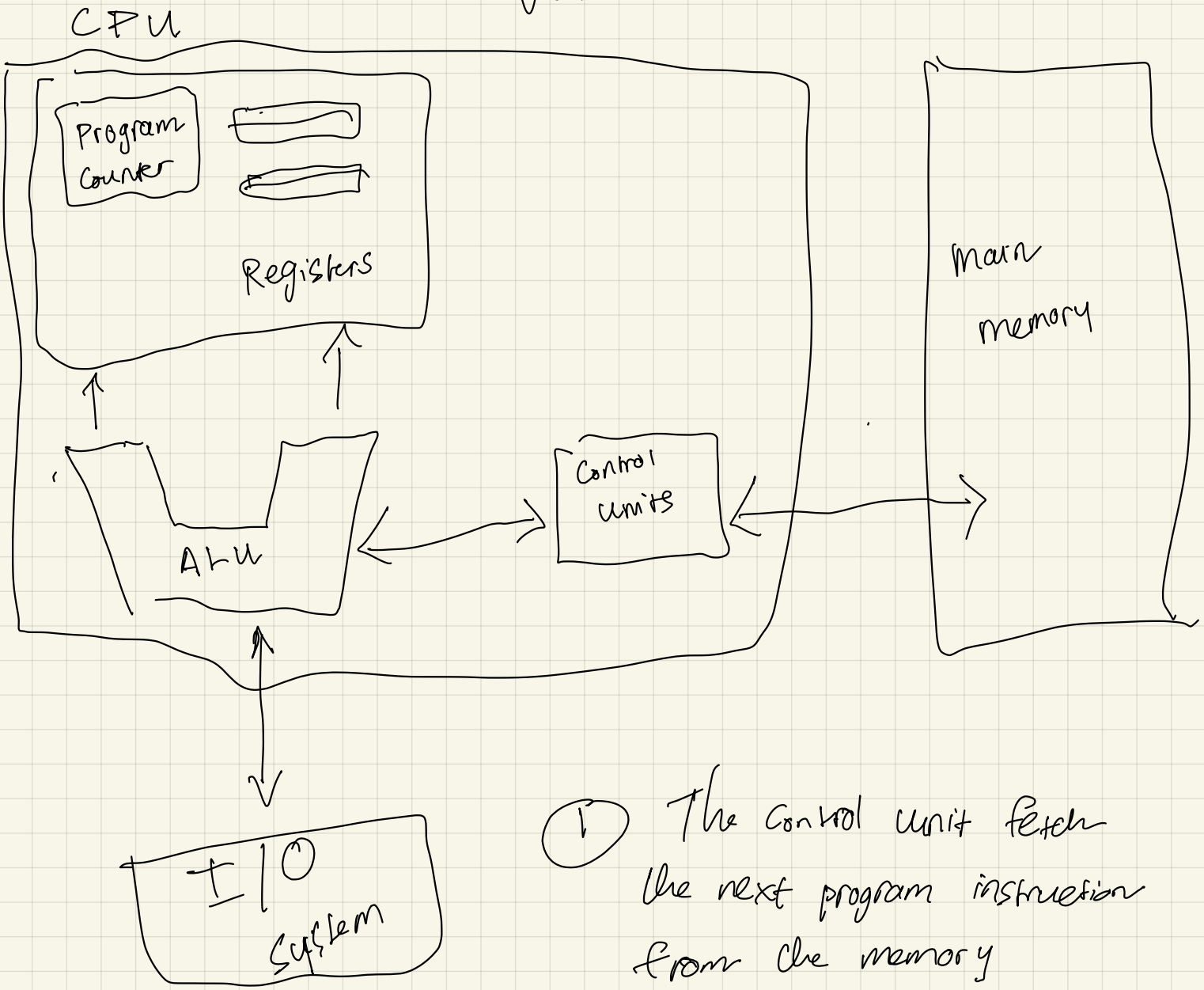
Computer Architecture

— Von Neumann model —



① The control unit fetch the next program instruction from the memory
- Using program counter to determine where the instructions is located.

② The instruction is decoded into the language that ALU can understand

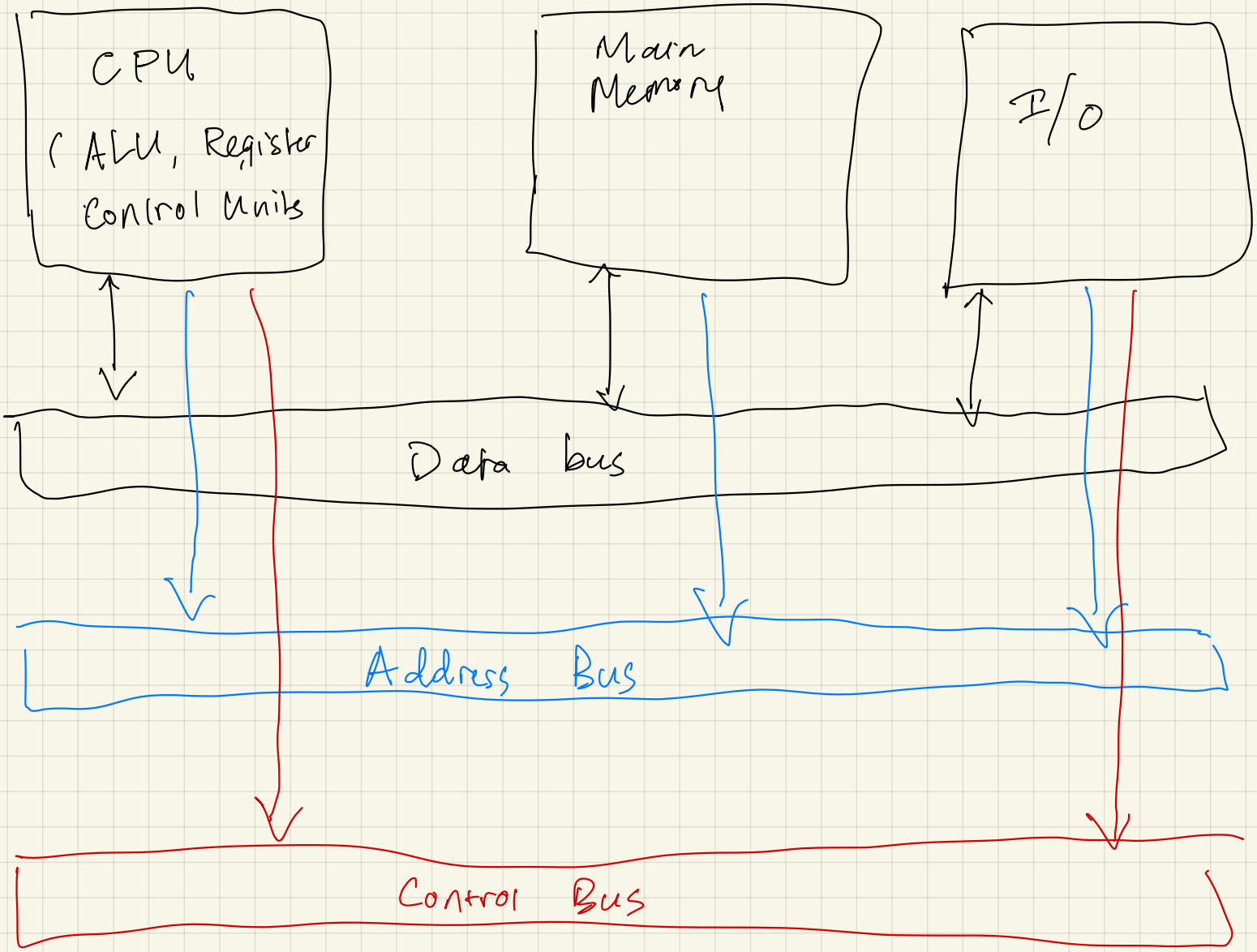
③ Any data required to execute the instruction are fetched from memory and placed in registers

Key words:

ALU → Arithmetic Logical Unit.
performing various operations on data

(4) ALU executes the instructions and stored the results in registers or memory.

System Bus Model



The data Bus moves data from the Main memory to CPU register [Vice versa].

The address bus holds the address of data that the data bus is currently accessing.

The control bus carries the necessary control signal that specify how the information transfer is taking place.

CPU Basics & Organisation

All computers have a CPU can divided into 2 pieces

(1) Datapath:

- Network of registers and ALU connected by buses [Moving data from one place to another].
  And, timing is controlled by clock pulse

(2) Control unit:

- The module responsible for sequencing operations
- Making sure the data where they are need to be at the correct time.

(1) + (2) = Fetching instructions, decoding them then performing indicated sequence of operation

P.S. performance is affected by the design of data path and control unit.

Register:

- Stored variety of data: addresses, program counters, data for program execution.
- It is a hardware stored binary data. located on the CPU so data can be accessed faster.
- Information is written to register, Read / Write from register and transferred from register to register.
- Register are not addressed in the same fashion of memory Registers are addressed and manipulated by the control unit itself.

ALU [Arithmetic Logical Unit] :

- The ALU carries out the logic operations (Ex: Comparisions).
  Or, the arithmetic operations (Ex: Addition, Subtraction)
- ALU often affects bits in [Status register] bits are set to indicate actions such as overflow has occurred].
- ALU knows which operation to perform since it controlled by signals from the control unit.

Control Unit

- The control unit is the traffic manager of the CPU.

- It monitors the execution of all instructions and transfers of all information.

- It extracts instructions from memory, decodes these instructions & making sure data are in the right place at the right time.

- Tells the ALU which registers to use, services interrupt.

- The control unit uses a program counter register to find the next instruction for execution and status register to keep track of overflow