CSE 1051

classmate
Date
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PROBLEM SOLVING USING COMPUTERS

→ Introduction to computing:-

problem solving :- sequential process of analyzing info

- general problem solving step:-
  1) define the problem
  2) develop a plan
  3) implementing
  4) Evaluate

- steps for computing (step-by step solving)
  1) Analyzing
  2) development of an algorithm
  3) coding
  4) Testing & debugging

- skill set required by a software developer
  - technical skills
  - Problem solving (most imp) (logical & analytical thinking)
  - soft skill (comm., negotiation, team work)

what is a problem?
- needs logical thinking to solve (or maths?)

- to solve a problem, you need:-
  - Logic : • language for reasoning
    • collection of rules we use when doing reasoning.
    - the process part of finding the sol. requires logic.
    - for solving 1 problem, several logics can be applied.

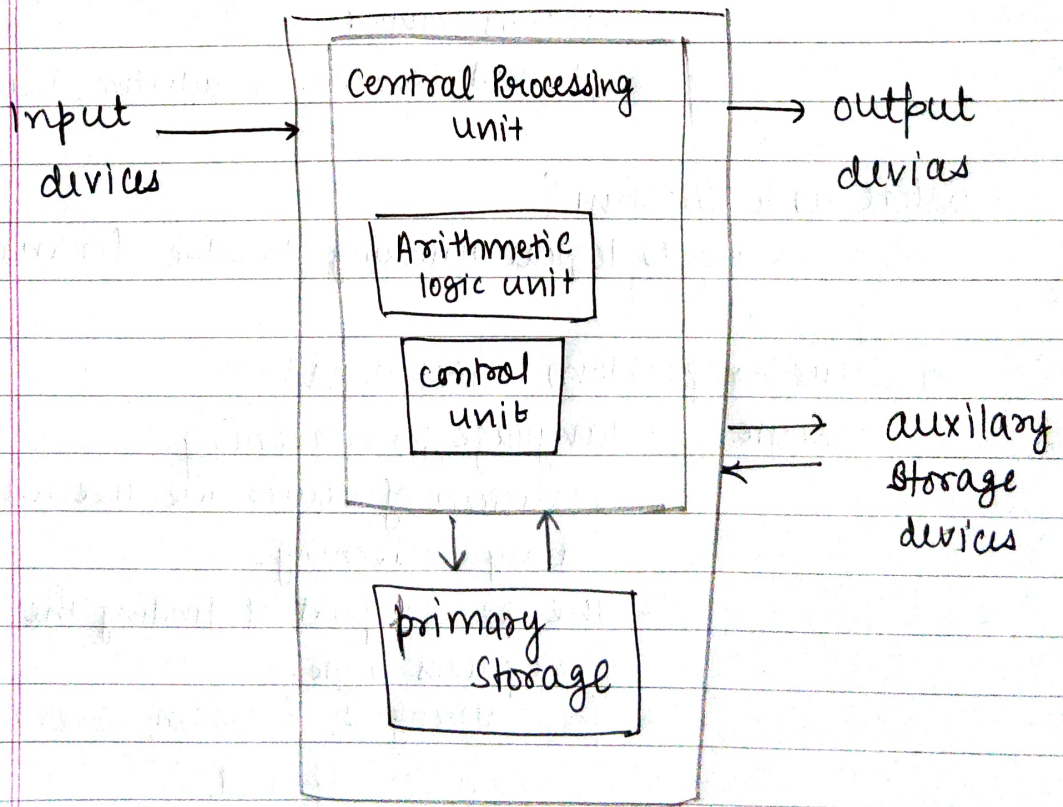
→ Computational problem :-

- definition ?

- applications :-
  1) decision problem (answer = Y/N?)
  2) searching & sorting problem (ordering)
  3) Counting problem (no. of occurences)
  4) optimization problem (best solution)

- classification
  1) concurrent : operation overlap in time
  2) sequential : step-by-step method
  3) disturbed : performed at diff. location
  4) event based : based on input

→ Computer organization



- CPU

- data & instructions r processed here

- Arithmetic & logic unit
  - +, -, *, /, //, %.
  - logic : OR, AND, NAND

- control unit :
  controls the order in which program instructions r execu

Functions of control unit:-

1) fetches data & instruction to main memory.
2) interprets instruction.
3) controls transfer of data to & fro from main memo
4) controls input & output devices
5) over supervision of comp. system.

fro from main memory
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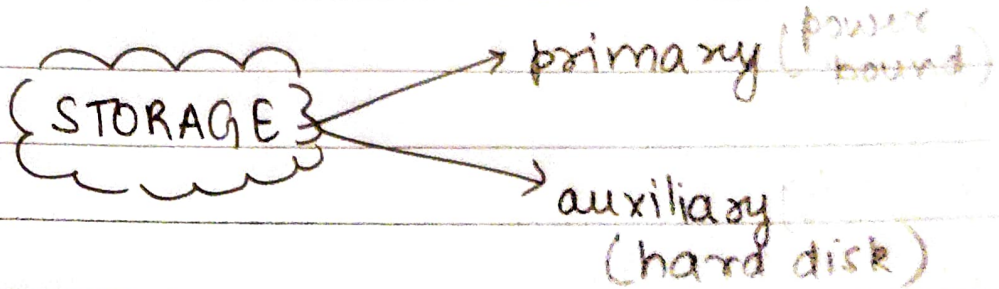
supervision of
. system.

~ SESSION - II ~



flow :-

auxiliary storage → primary storage → CPU (CU) → ALU

Execution

output device ← input (data)

primary storage + Auxiliary Storage → Memory unit

- Memory unit :-
  - data & instructs fed by the USER are STORED
  - an ordered sequence of storage cell, holding a piece of info
  - each cell has its own address
  - info can be input data, instruction, computed values.

- the memory is measured in terms of bits, bytes and words.
- A bit is a binary digit (either 0 or 1)
- A byte is unit of memory and is defined as sequence of 8 bits
- the word can be defined as a sequence of or 2/4/8 bytes respectively.

→ Computer memory classification
- → Main / primary
- → Auxiliary / secondary
- → cache memory

(1) Main Memory (Primary memory)

• memory where data & inst., currently being executed are stored
- located outside CPU
- high speed (relative wrt Auxiliary)
- data erased when power goes off
- primary / temporary
- semiconductor memory
- measured in terms of megabytes (10^6) & gigabytes (10^9)

Main Memory
Main memory is volatile and limited.
→ Hence, it is essential for other types of storage devices where program can be stored when they r no longer being processed.
Installed within computer at the factory or added later.

(i) Random Access Memory)
- Read & write memory
- info typed by user is stored
- any memory location can be accessed w/o scanning it (random access)
- Volatile memory (erased)

• ROM (Read only memory)
- permanent memory
- non volatile
- data location cannot be changed
- stores mainly stored program

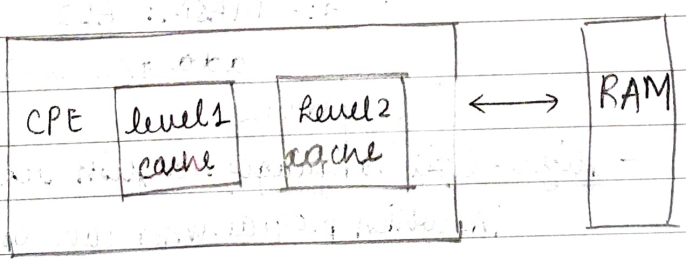
(2) Secondary memory (Auxiliary)

- Non-volatile.
- Made up of magnetic material.
- stores large amount of information for a long time.
- low speed (wrt primary memory)
- holds programs not currently being

(3) Cache Memory:- (semiconductor)

- high speed memory placed b/w CPU & main memory
- stores data & instruction currently to be executed.
- More costlier but less capacity than main memory
- Users can not access this memory.

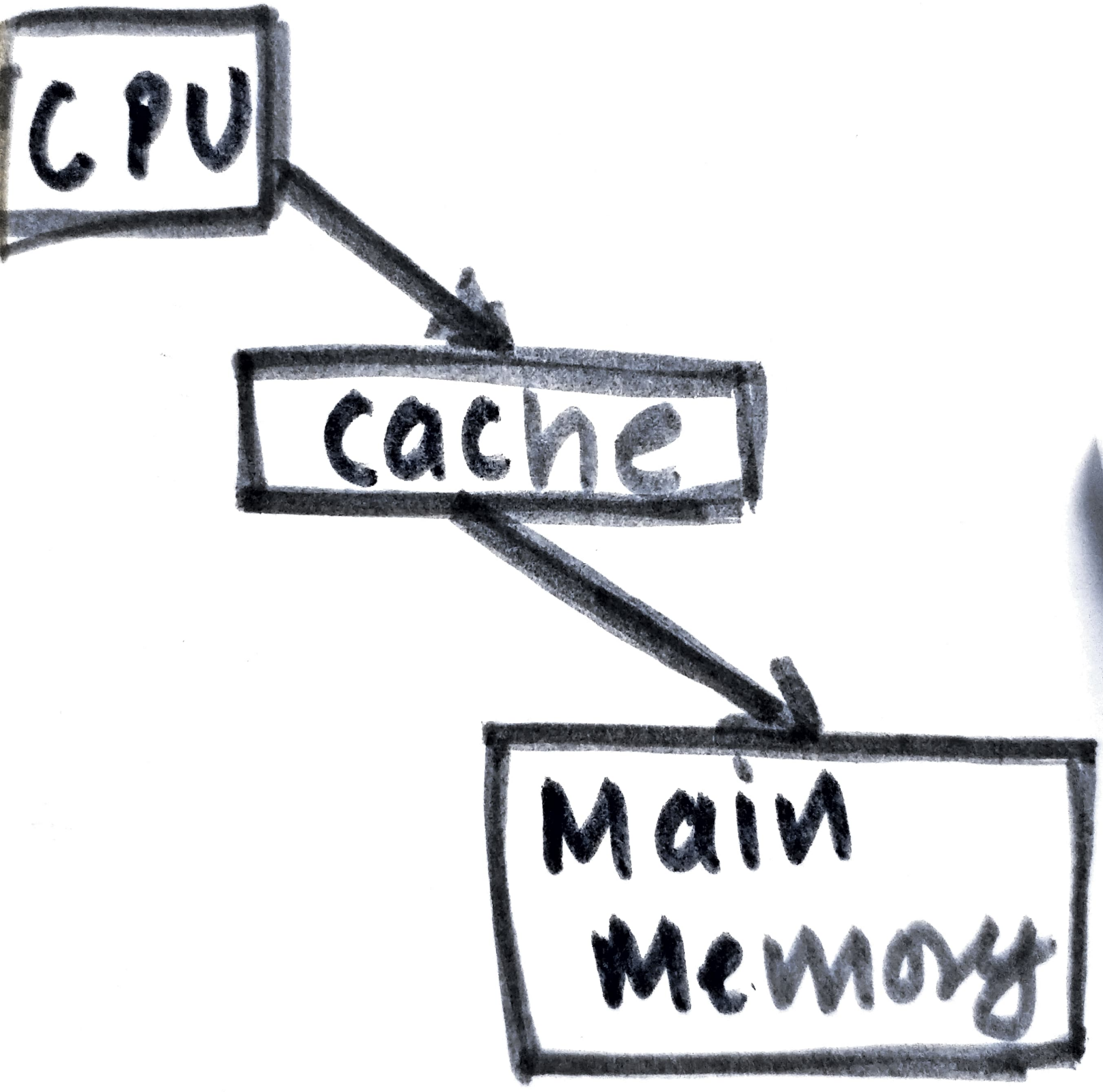
there is a little memory in CPU → Registers (limited size)



- Problem: in the CPU, data goes from CPU to the RAM (Registers → RAM) which takes time.
- ~~interim~~ ∴ cache was introduced.

- there are different levels of chache memory (L_1, L_2, L_3)
- Some levels holds the data, some hold instruction, some hold both.

disadvantages:- (1) limited space (2) very expensive.


CPU
cache
Main
Memory

→ operating system :-
- OS is an integrated collection of programs which make the computer operational and help in executing user program
- acts as an interface b/w the man and machine
- It manages the system resources like memory, processors, input-output devices and files.
- eg:- Windows, DOS, Linux

→ Computer languages :-
- machine language : consists of 1's and 0's (only programming lang available in earlier days.)

TRANSLATORS are used to convert English to binary programs. Called compilers & interpretors.

- Symbolic language or assembly language
  - symbols or mnemonics used to represent instructions.
  - hardware specific
  - eg:- MASM: ADD x, y; → add the content of y and x

(this is the intermediate form b/w English and binary)

THERE IS A DIRECT CO-RELATION B/W ASSEMBLY LANG & MACHINE LANG

- High-level languages : english like language in which programmer can write programs to solve a problem.
  - more concerned with the prob. specification.
  - not oriented towards the details of comp.
  - eg, C++, C, C#, Pascal, Fortran

→ Language Translator :-
- Compiler :- Program that translates entire high-level language program into machine language at a time.

- interpreter:- Program which translates one statement of a high-level language program into machine language at a time and executes it.
  eg:- Java interpreter, Basic interpreter.

- Assembler:- program which translates an assembly language program into machine languge.
  eg. TASM (Turbo ASseMbler) MASM (Macro ASseMbler)