Computer Programming

Dr. Deepak B Phatak
Dr. Supratik Chakraborty
Department of Computer Science and Engineering
IIT Bombay

Session: Mr Buddhuram Dumbo

Recap

IIT Bombay

- Computer can handle numbers
- It can
  - Collect input values,
  - Calculate new values using its computational abilities
  - Give us desired results as output values
- It can operate only when a ‘program’ is given to it
  - Program is a set of instructions
  - Computer first reads and understand the entire program
  - It then executes the instructions in specified order

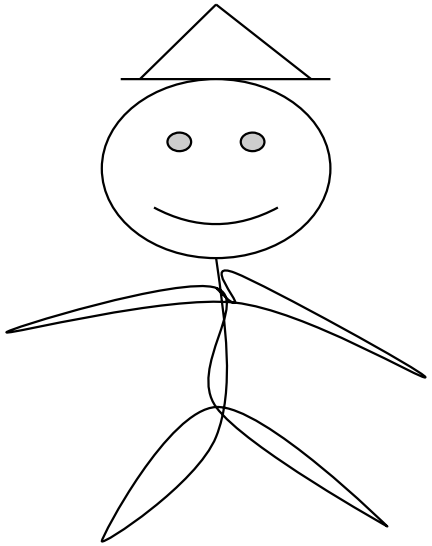
Overview of This Lecture

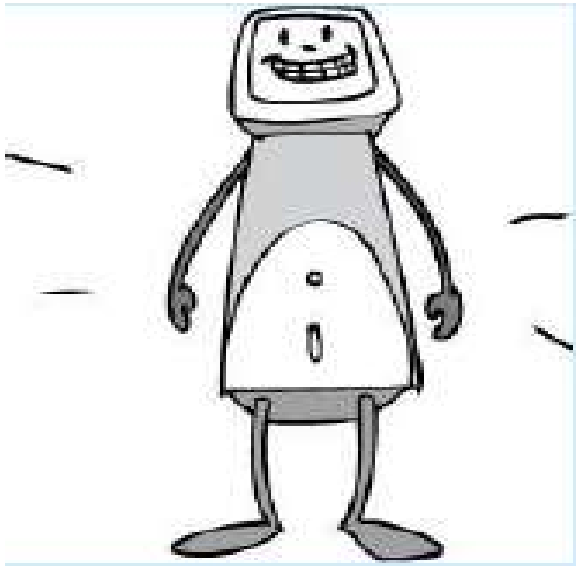
IIT Bombay

- A conceptual model of the computer
  - Mr. Buddhuram Dumbo
  - Dumbo's tools
  - How to instruct Dumbo
    (Writng a program for Dumbo)
  - Input, Output, and Assignment instructions
  - A declarative instruction

Buddhu Ram Dumbo

IIT Bombay





Mr. Dumbo has poor memory

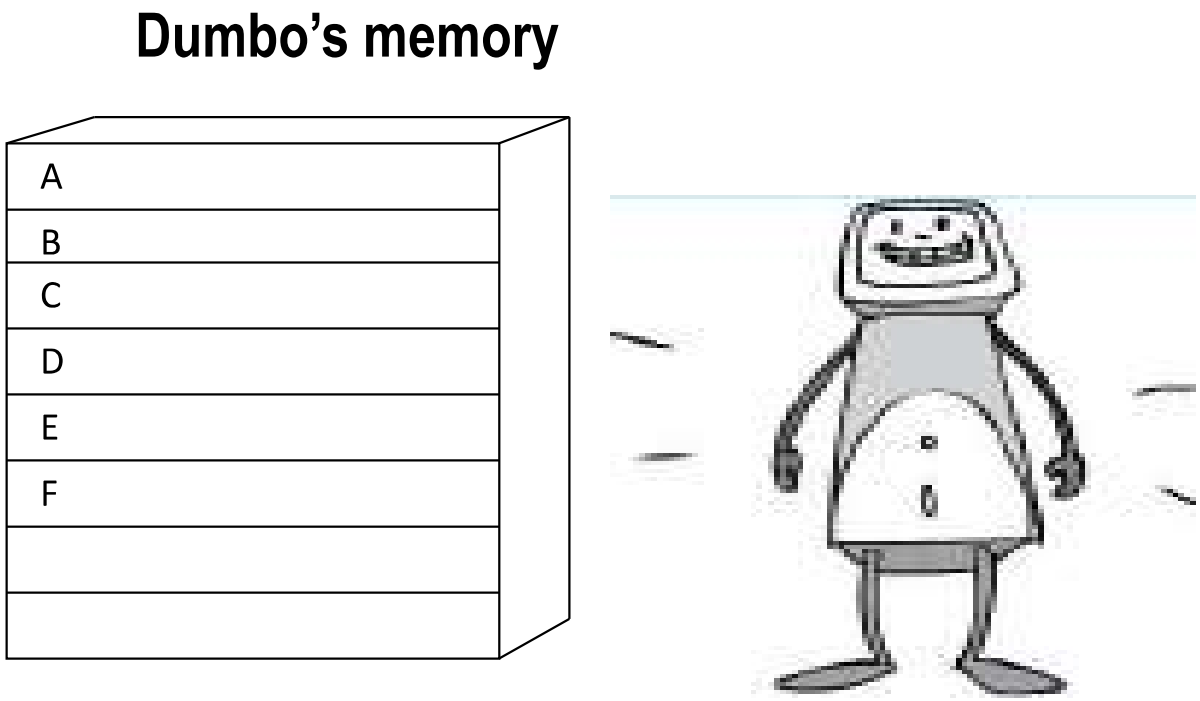
IIT Bombay

- Mr Dumbo cannot remember anything in his head

Mr. Dumbo uses a special device as memory

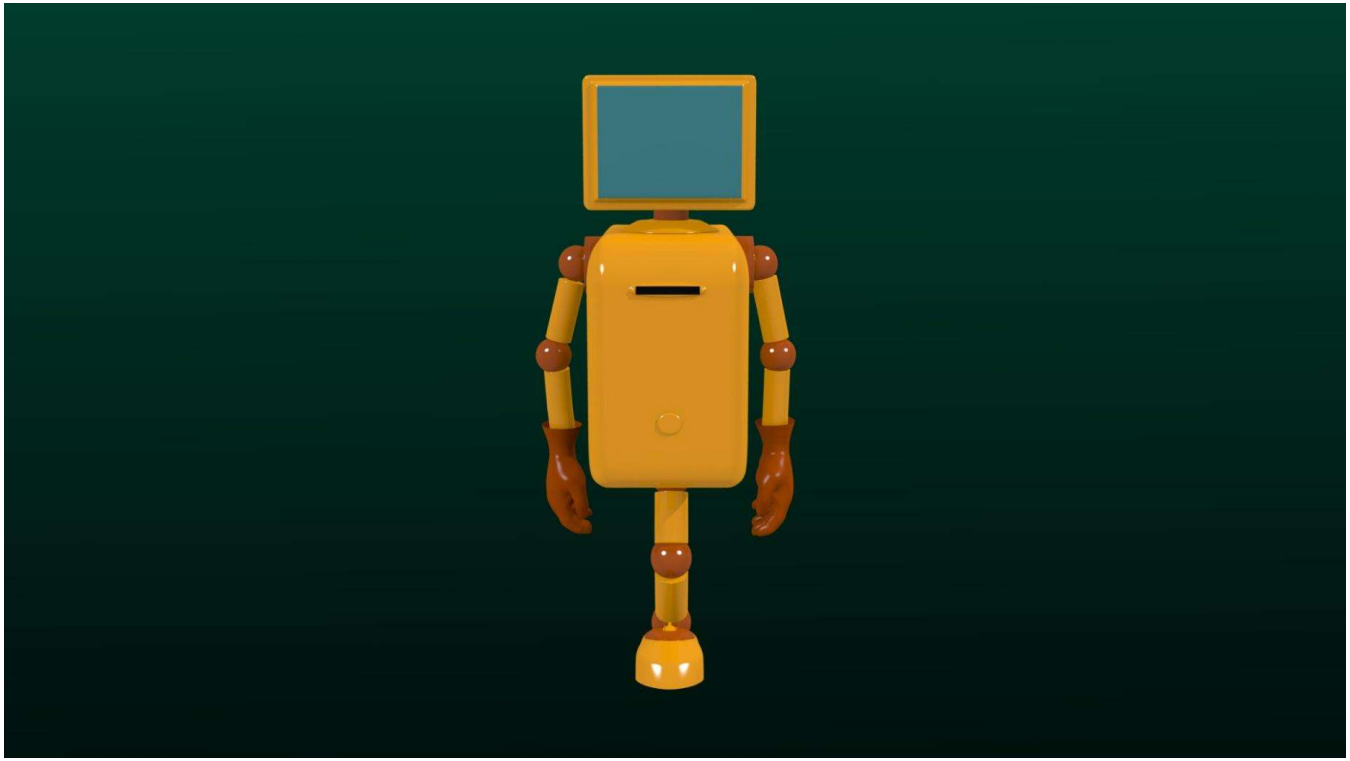
IIT Bombay

- Dumbo uses a cupboard with drawers serving as memory locations



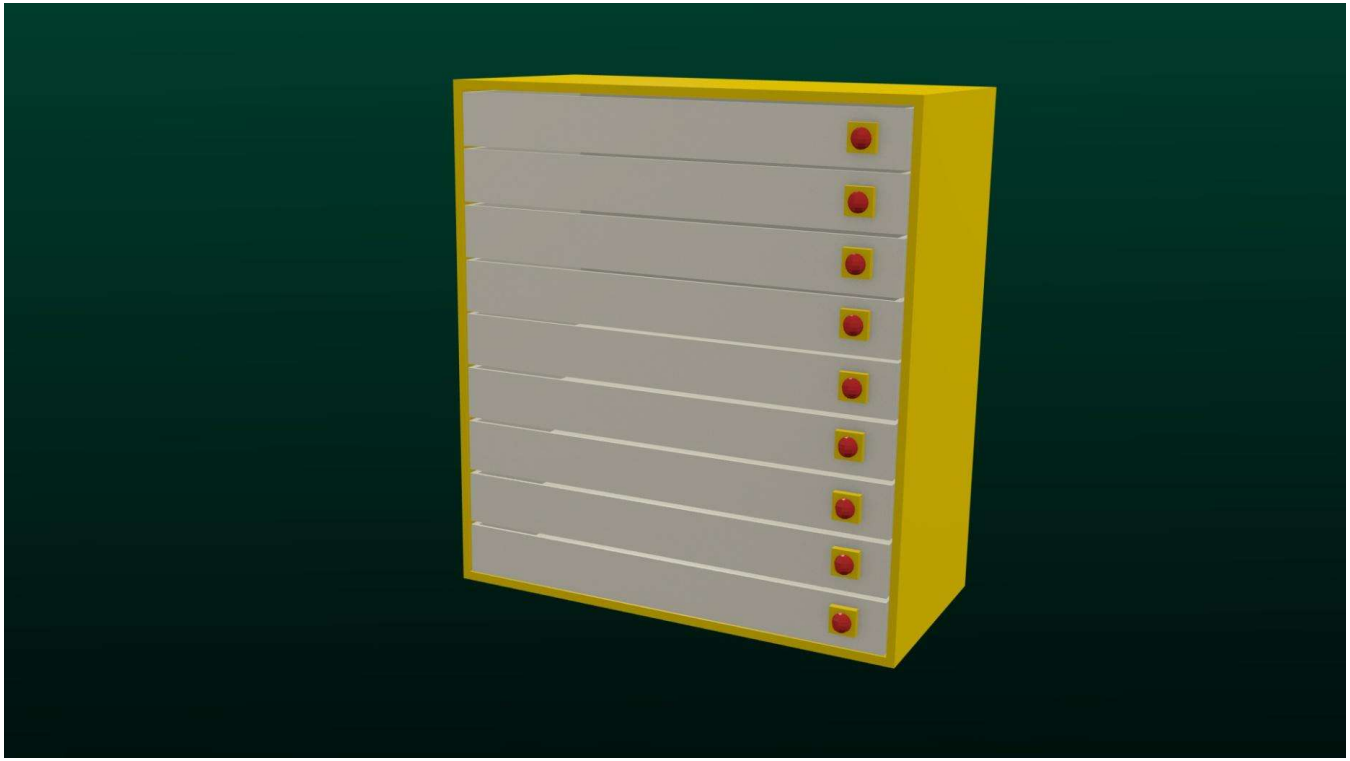
Dumbo and his tools

IIT Bombay



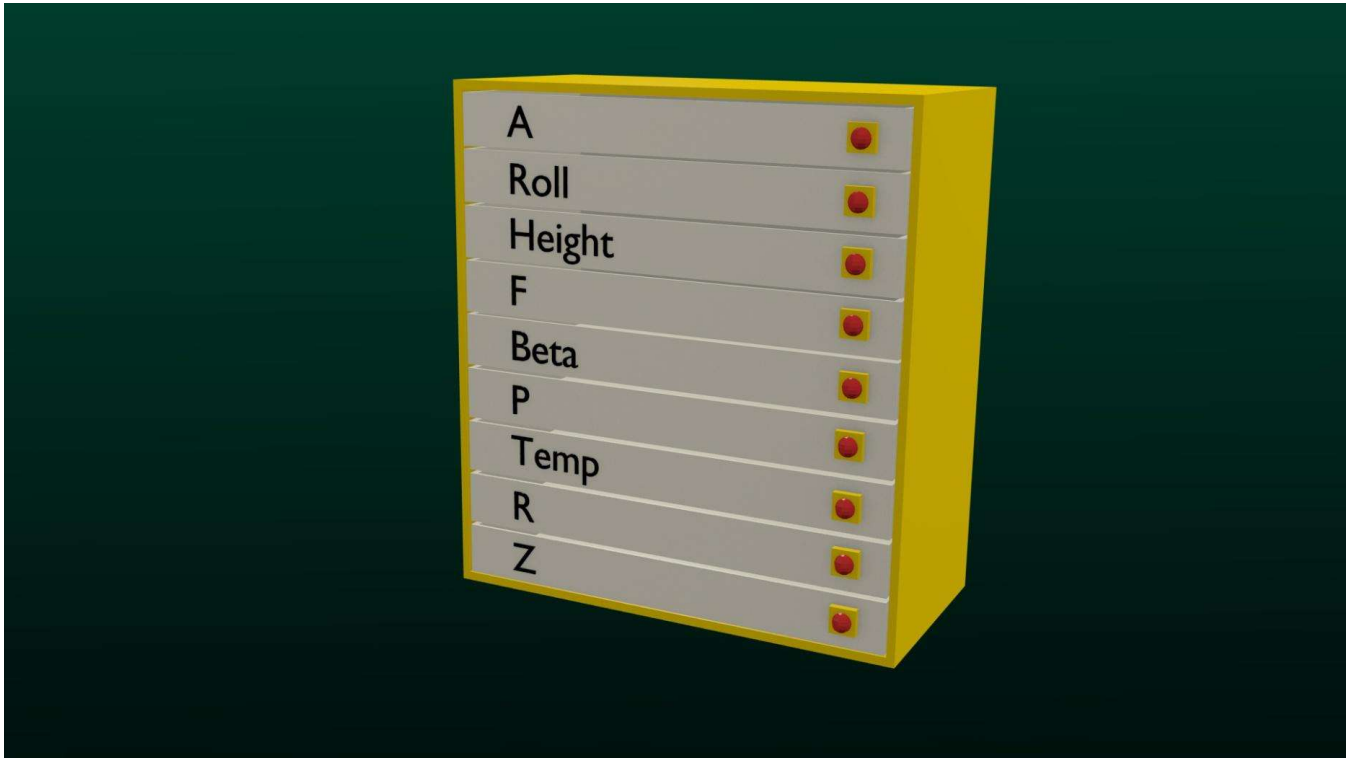
Dumbo and his tools

IIT Bombay



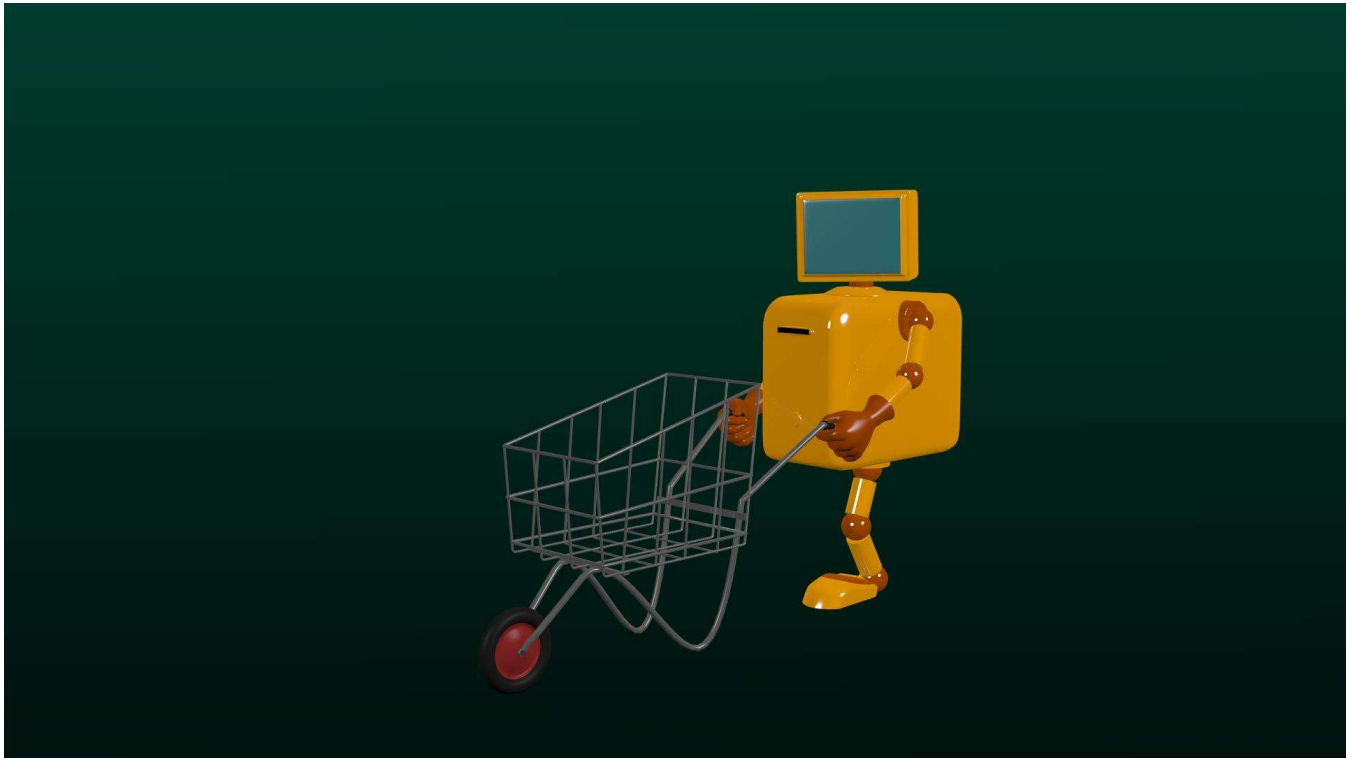
Dumbo and his tools

IIT Bombay



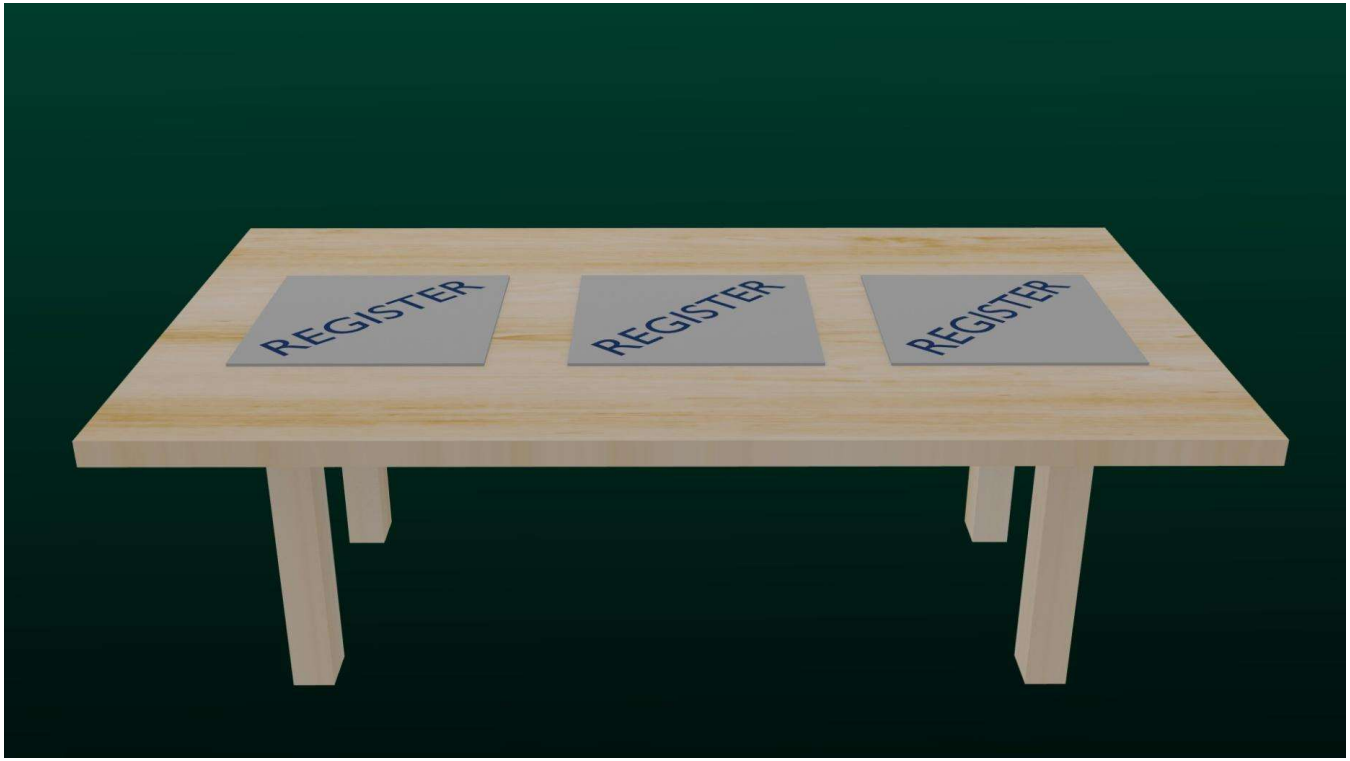
Dumbo and his tools

IIT Bombay



Dumbo and his tools

IIT Bombay



Dumbo and His Tools

IIT Bombay

- Animation showing Dumbo's tools

Instructing Mr. Dumbo

IIT Bombay

- The 'instructions' to be written for Mr. Dumbo, can be
  - To get an input value from us, and to store it in a named location, say X, we will write the following instruction

    ```
    Input X
    ```

  - To give us an output value, from a named location, say Y, we will write the instruction

    ```
    Output Y
    ```

  - To perform a computation, say A-B, and to assign the calculated result value to a named location, say R, we will write the instruction

    ```
    R = A - B
    ```

A note on the 'Assignment' Instruction

IIT Bombay

- The instruction R=A−B performs two distinct sub-tasks
- One sub-task deals with the intended calculations, and the other deals with storing the result of the calculations
- These two sub-tasks are written on two sides of '=' symbol
  - A computational expression on RHS
  - The name of a location on LHS
- This instruction is said to perform an 'Assignment' operation
  - It assigns a new value to R

A Declarative instruction for Mr. Dumbo

- We will use several ‘names’ in our instructions
  - Such as `A, B, R,` etc.
- Dumbo has to associate these names with specific drawers
- It is important to tell Dumbo about all such names we use
- We design a ‘declaration’ instruction

```
Use locations A, B, R
```

- While ‘Compiling’ the program, Dumbo will label his memory drawers with these names

A program for Mr. Dumbo


```
Use locations A , B, SUM;
Input A;
Input B;
SUM = A + B;
Output SUM;
```

Summary

IIT Bombay

- We got introduced to Mr Buddhuram Dumbo, who has
  - A set of drawers serving as memory locations
  - A cart to carry input and output values
  - A Workbench to perform computations
- We also defined how to write a program for Mr. Dumbo
- Instructions in a program can be for
  - input,
  - Output
  - Assignment
- A declarative instruction, to announce names we use