Introduction to Objects in Python

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Last Lecture

- Short Presentation
- Review the Last Lecture
- Problem Modeling
- Data types in Python
- Interpret your commands with Python
- Programming with Python
- Application of Programming in the Digital Age!

Today

- Short Presentation
- Review the Last Lecture
- What are objects in real world and Python?
- What are statements from flowchart view?
- Programming with Python
- Application of Programming in the Digital Age!

Together

Send your feedback about the class whenever you want!

Contact me

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Main links for our class

گروه خصوصی شد!

- Telegram group: *
- GitHub organization: github.com/SharifPythonSpace

Grading

راه جبران هم تحت شرایطی وجود داره!

- Approx. 25% Programming Assignments (judgment with Quera)
- Approx. 14% Mid-term Project (alone, judgment with TAs and Quera)
- Approx. 37% Final Project (team work~5 member, judgment with TAs and Quera)
  - *Proposal (about real needs)*
  - *Coding*
  - *Release*
- Approx. 30% Final Exam (algorithm-based paper exam)
- Approx. 5% Short Presentation(extra score , for the next week lecture, only for the first two person)
- Approx. 2% Challenging Questions and Contributions in Class (extra score)
- Approx. 7% long presentation (extra score)

Short Presentations

Design and explain a flowchart for a simple Homsa! You can propose new features!

Who is volunteer for the short presentation?

Short Presenration

Review the Last Lecture

From question to algorithm!

- Understand your needs or questions!
  - explain easily for someone else
- Decompose your problem (make some steps)!
- Make a flowchart for the decomposed version of your problem
- Explain each steps in one or two sentences (paper-based or paperless)
  - input, output, process
- Explain each steps mathematically…
- Develop your algorithms for each steps
- Check your process flow from the first step to the last one!

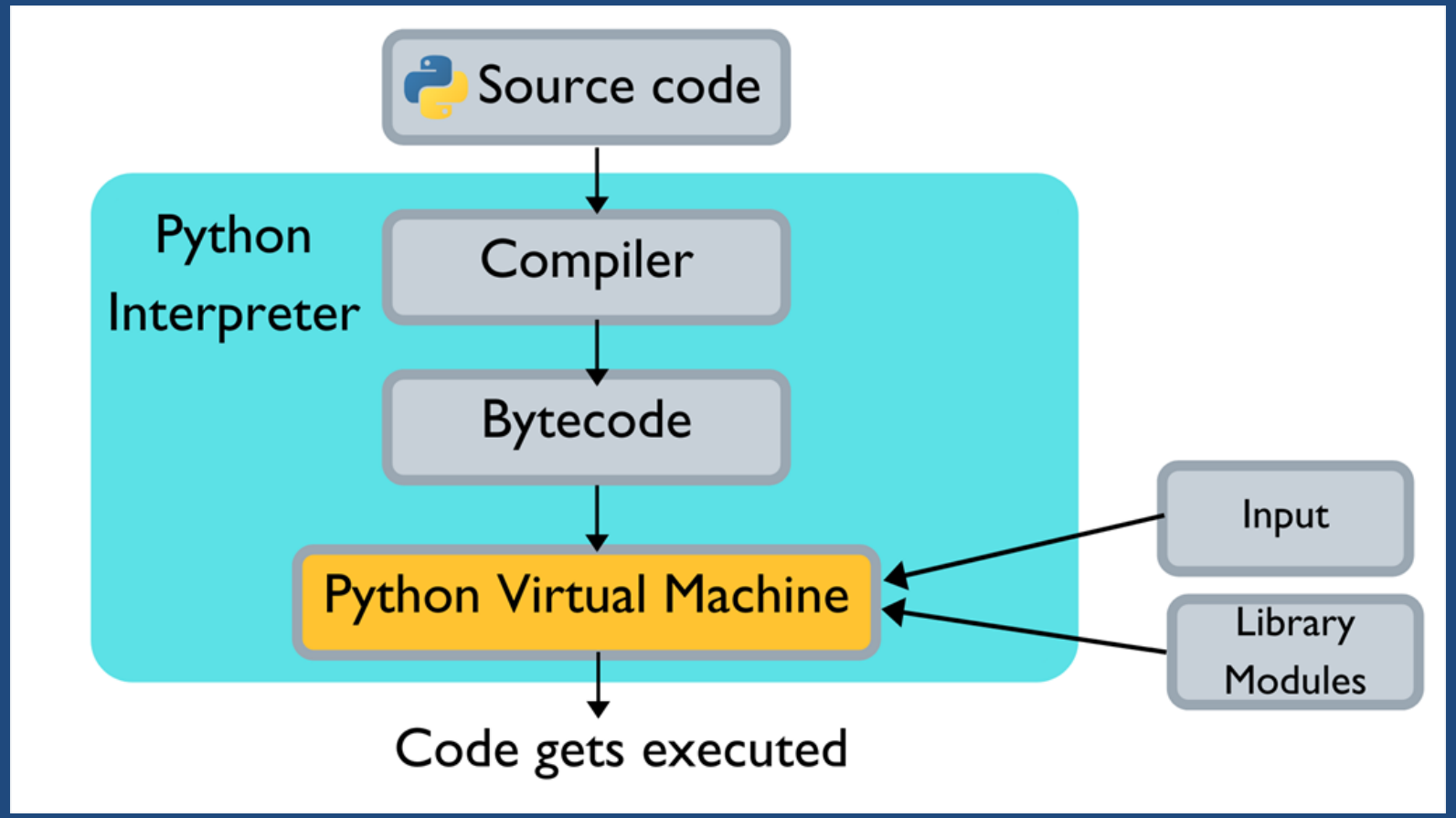
Different problem, different data!

- You can encounter with different types of data in input, output, or even in process (auxiliary)

Data in Python

- **Primitive data**
  - Numbers
    - Int, float, complex
  - String
  - List
  - Tuple
  - Set
  - dictionary
- **User-defined data**
  - Class

How Python Works

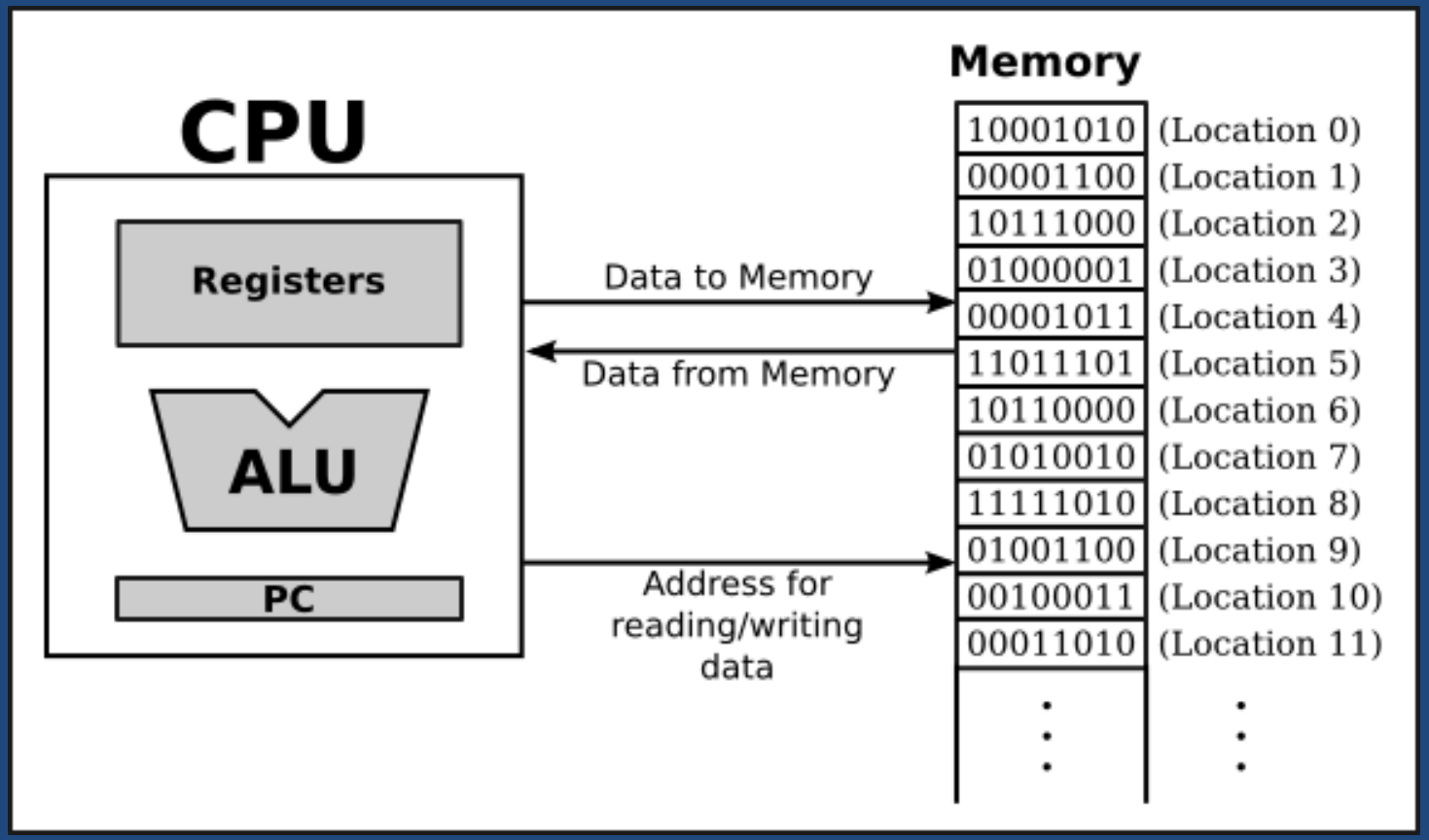


What are objects in real world and Python?

Everything in Python is an OBJECT!  OOP!? 

Memory stores information in what way?

- Program
- Data



How can computer detect which locations in memory are instruction or value or …?

Who is volunteer for the short presentation?

Short Presenration

What is garbage collector? How can do this job?

Who is volunteer for the short presentation?

Short Presenration

So, where is our data???

id(.)

How can CPU process our code?

- On the level of machine language, the operation of the CPU is fairly straightforward (although it is very complicated in detail). The CPU executes a program that is stored as a sequence of machine language instructions in main memory. It does this by repeatedly reading, or fetching, an instruction from memory and then carrying out, or executing, that instruction. This process:
  - fetch an instruction, execute it, fetch another instruction, execute it, and so on forever...

is called the fetch-and-execute cycle.

Object-oriented Thinking

Data and other things in Python are object!

- **Primitive data**
  - Numbers
    - Int, float, complex
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  - List
  - Tuple
  - Set
  - dictionary
- **User-defined data**
  - Class

What are statements from flowchart view?

The most simple statement!

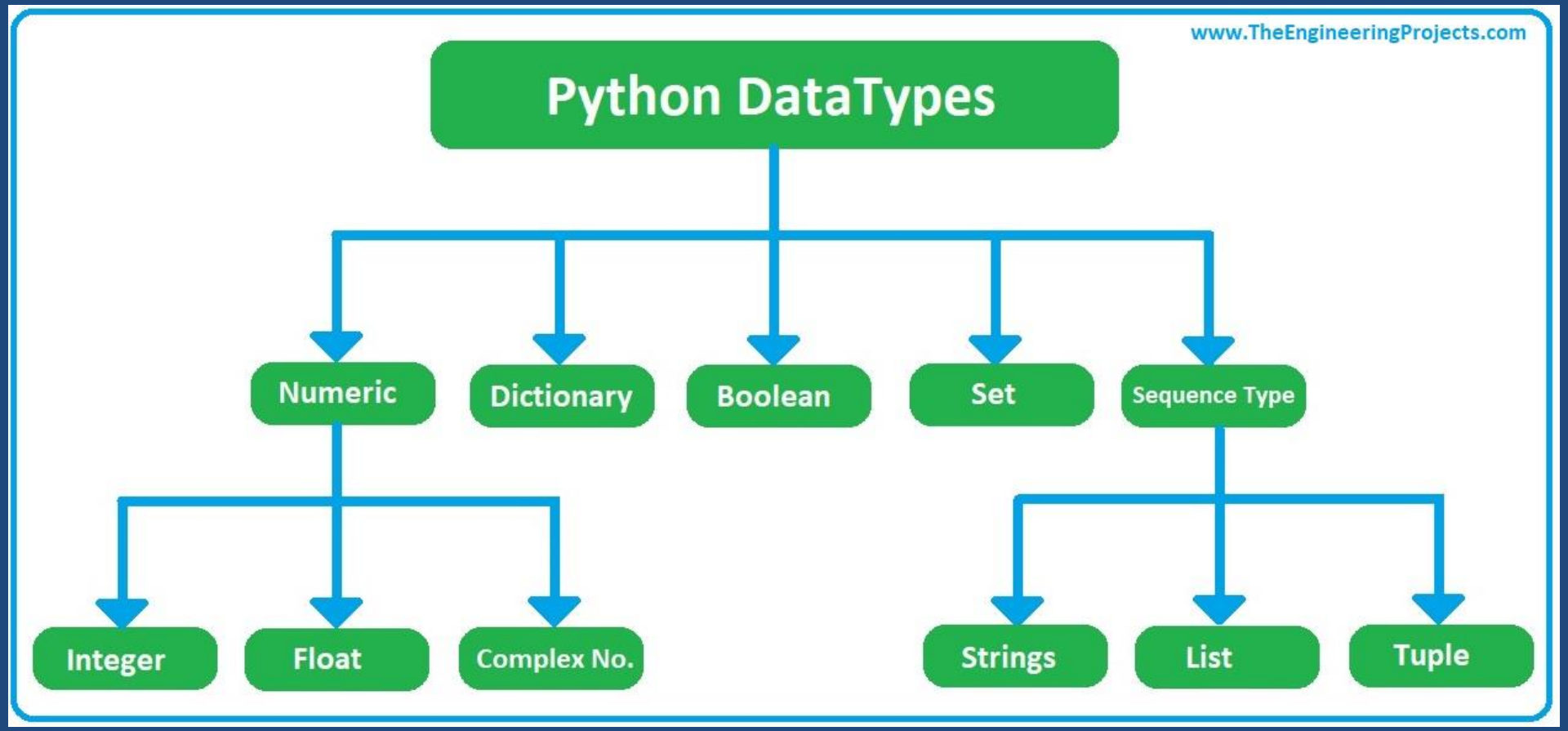
Assignment

- Variables are created by assignment (=)

What is variable?

- One of the most powerful features of a programming language is the ability to manipulate variables. A variable is a name that refers to a value.

How python can find type of variables?

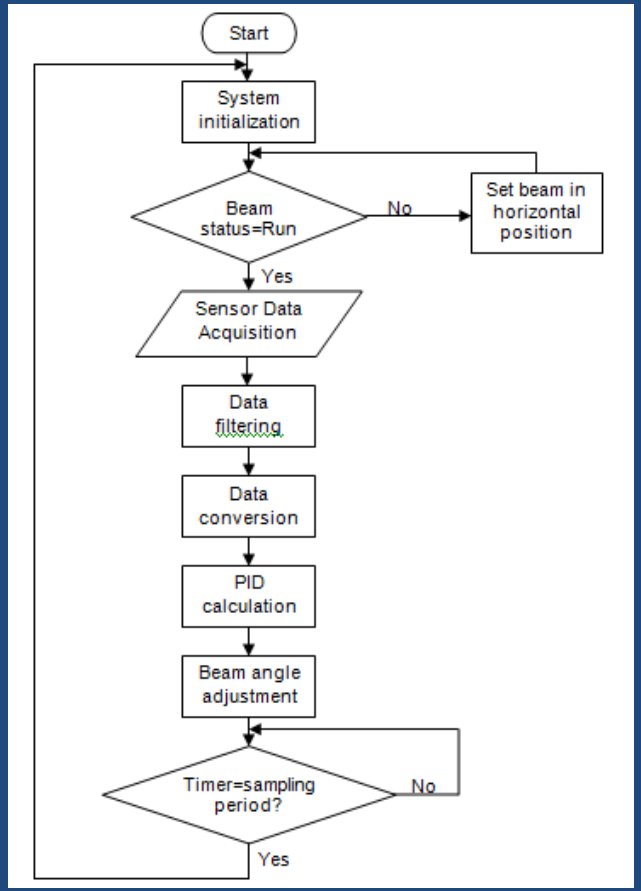


What is the difference between expression and statement?

www

We have different types of statement!

- Simple statement (+)
- Loop statement (while)
- Control statement (if)



Programming with Python

Question

- How can we get more users for our news website?

From question to algorithm!

- Understand your needs or questions!
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What is your solution?

- Input?
- Output?
- Process?

Application of Programming in the Digital Age!

code.NASA.gov

Project 1

Mission Simulation Toolkit (MST)

https://ti.arc.nasa.gov/opensource/projects/mission-simulation-toolkit/ **NASA Open Source 3.0**

MST offers a simulation framework to support research in autonomy for remote exploration. The system allows developers to test models in a high-fidelity simulation and then evaluate system performance against a set of integrated, standardized simulations.

A.I. generated tags: **#nlp:autonomy #nlp:mathematical model #nlp:distributed processing #nlp:computerized simulation #nlp:systems simulation #nlp:dynamic model #nlp:digital simulation #nlp:simulation #nlp:performance prediction #nlp:model**

Human generated tags: **#NASA #ARC #Open Source #Autonomous Systems**

Project 2

Sound Lab (SLAB), Version 5

https://ti.arc.nasa.gov/opensource/projects/slab-spatial-audio-renderer/ **NASA Open Source 3.0**

SLAB is a software-based, real-time, virtual acoustic-environment rendering system designed to study spatial hearing in environments such as concert halls, listening rooms, virtual reality, aviation spatial information displays, and video game sound effects.

A.I. generated tags: **#nlp:real time operation #nlp:game theory #nlp:interactive control #nlp:time dependence #nlp:computer graphic #nlp:virtual reality #nlp:display device #nlp:hearing**

Human generated tags: **#NASA #ARC #Open Source #System Testing**

Lecture Resources

- *https://math.hws.edu/eck/cs124/javanotes6/c1/s1.html#:~:text=When%20the%20CPU%20executes%20a,of%20a%20sequence%20of%20locations.*
- *https://towardsdatascience.com/python-memory-and-objects-e7bec4a2845*
- *P. Wentworth, J. Elkner, A. B. Downey, C. Meyers. How to Think Like a Computer Scientist: Learning with Python. 3rd Edition, Open Book Project, 2011.*