Introduction to computers and programming

Lecture 1, SF Free Coding Bootcamp

Before we start

- The goal of this bootcamp is to learn, help each other and make friends.
- It is important to follow the Coursera course mentioned in the syllabus.
  - Going through the material twice will help with retention.
  - Coursera course has many more interesting videos about computer programming that will keep you motivated.
- Finally, you should give yourself time to learn.
  - Teach yourself programming in ten years, by Peter Norvig (Google Research).

About me

- I have been writing computer programs, initially only for fun, since 1994.
  - One of my favourite programs was the one which reproduced the telephone ring. I used it to prank my mom who thought that the real phone is ringing!
- My first computer was a 386, and had 0.5 MB of RAM, and 40 MB of Hard Drive space.
  - Your phone is about 10,000 times faster than my first computer
- My first job was at Google, where I developed ranking algorithms for Google News.
- Nowadays, I am learning to program in Scala language, and learning some advanced machine learning concepts - which are required for my work at InMobi.
- I love to run long distances, and my wife claims I cook pastas better than many restaurants!

Computer is a machine

- A machine has buttons and levers. Based on what buttons you press or levers you operate, it does something for you.
- A mechanical computer: Babbage's Difference engine was used to calculate a mathematical function. https://vimeo.com/49080293
- A computer is ***programmable***.

Container Crane: An analogy

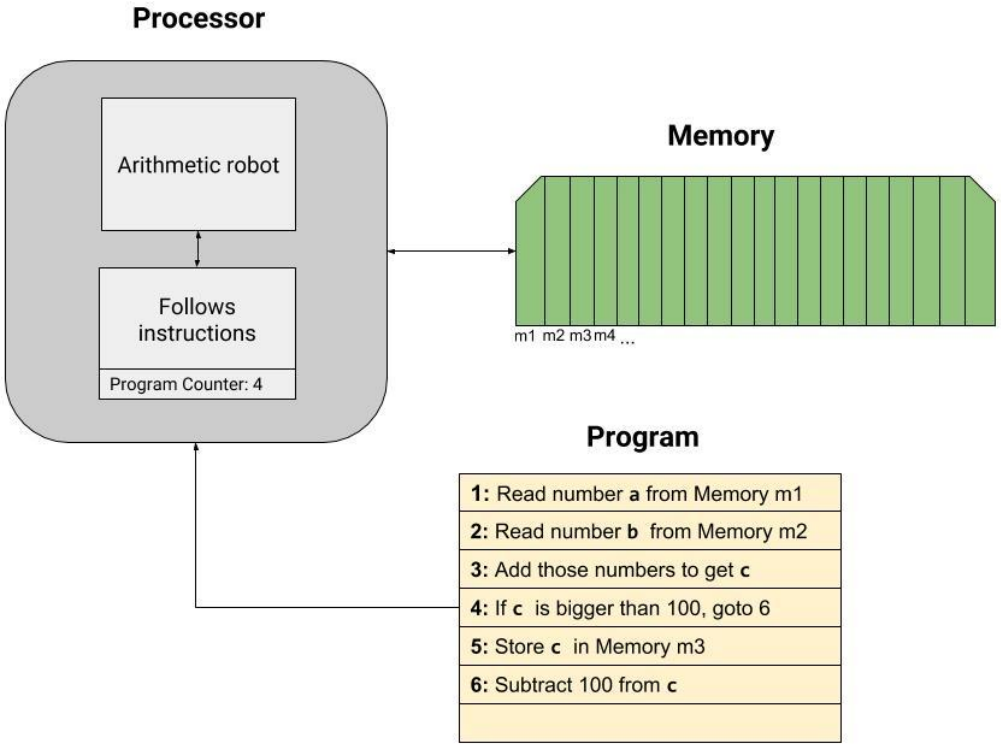
- A container crane is used at shipping docks to move containers to and from the ships.
- Each of the eight levers move the crane in a certain way, or pick up and drop the container.

Image credit: www.forsmw.com

Program to unload a ship’s containers

- Repeat for each container on the ship:
  - Using levers 1 and 2, move the hook on top of that container
  - Descend the hook till you reach the container using lever 3.
  - Attach the container to the hook.
  - Move the hook and the attached container back up using lever 3.
  - Move the hook on top of the space where container is to be placed using levers 1 and 2.
  - Use lever 3 to descend the hook until the container touches the ground or another container.
  - Release the container from the hook using button A.
  - Move the hook back up using lever 3.

A Simplified Computer



What is a modern computer made of?

Image credit: www.energicplus.com

Billions of switches

- A transistor acts as a switch.
  - Invented in 1947 at Bell Labs. It's inventors won the Physics Nobel Prize in 1956.
- A switch can be used to store 0s and 1s.
- A switch can also be used to implement logic circuits.
- Modern phone CPUs have 3 Billion transistors, each 20 nanometer in size. (human hair is 100,000 nanometers wide).
- Look inside a chip: https://www.youtube.com/watch?time_continue=40&v=Fxv3JoS1uY8
- Moore's Law: Transistor count in chips doubles every two years.
  - Gordon Moore was the co-founder of Intel Corporation.

Program

- An ordered list of instructions for the computer to follow.
- Programs can solve real life problems, or can be completely meaningless garbage.
- *Computer Programmers* write programs for computers to run.
- Ada Lovelace (1815 - 1852), an English mathematician, is widely regarded as the first computer programmer.

Do computers speak English?

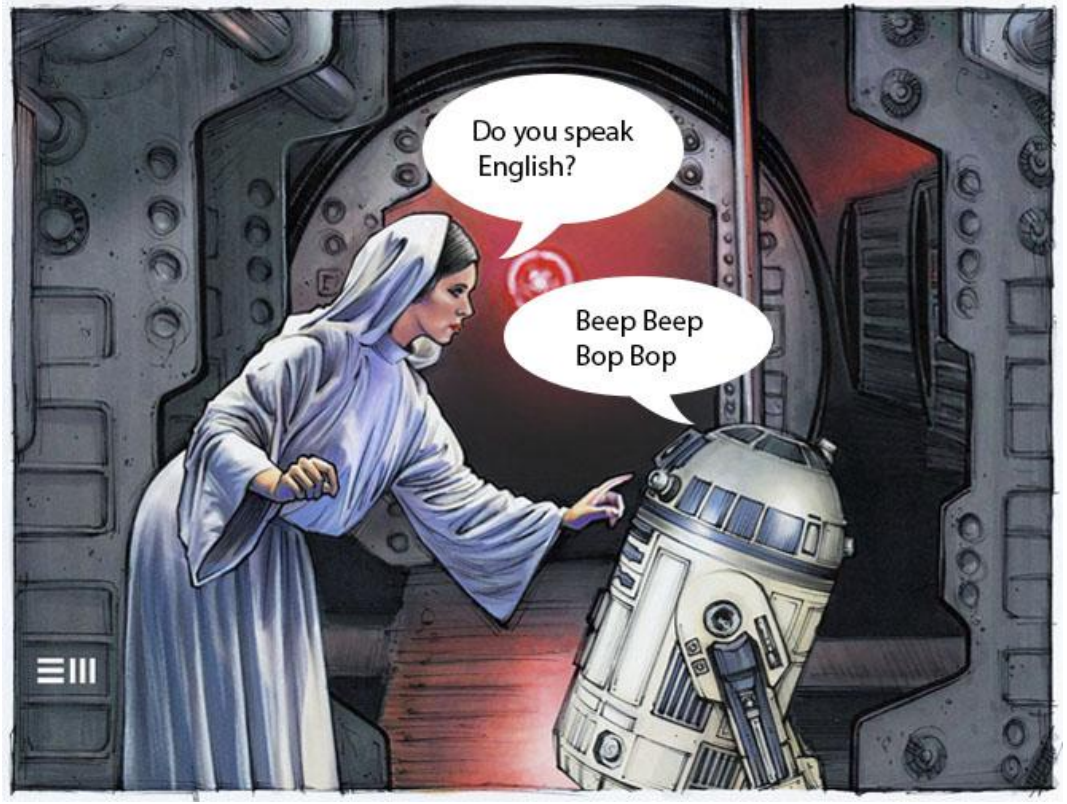


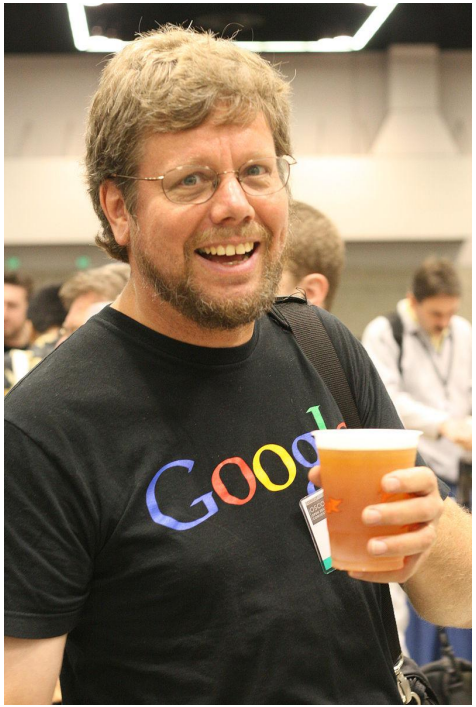
Image credit: Erik-Maell

Programming Languages

- What is a language?
  - the method of communication, either spoken or written, consisting of the use of words in a structured way.
- Computers *only* understand the machine language.
  - Research has shown that humans are bad at learning machine language. (j/k)
- Enterprising people have *designed* new languages which humans can be better at.
- They have also written translators to translate a human readable program to machine language.
- Different languages have different appeal and different sets of features.

Python Programming Language

- Designed by Guido van Rossum and first released in 1991.
- It is easy to understand.
- Allows programmers to express concepts in fewer lines of code.
- Currently, the most popular language to introduce programming to beginners (I just made this up).
- The language has changed evolved over time, and we will use the latest version (Python 3.6).
- Python 2.x programs don’t work with Python 3.x programs, and vice versa.



Official Title
Benevolent Dictator for life, Python
(since 1995)