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Python Assignment 1

How CPU work:

Electric Circuit & Binary

Brought to you by Robotics Team - VRC 99909A Rising Phoenix

Class Recap

- Computer is basically an electrical system - very complicated electric circuits (like TV or Fridge).
- Electric circuit is a closed loop formed by wires, batteries, switches, and devices (like light bulbs).
- Electricity is a flow of electrons around a closed electric circuit. The electron flows like dominos.
- Electric circuit has 2 states:
    - On (closed loop) -> Represent binary 1
    - Off (open loop) -> Represent binary 0
- Digital signals - a continuous stream of alternating on/off (or more precisely rising edge/falling edge) that represents binary values
- Binary is a base-2 number system, just like decimal is the base-10 number system that we are all very familiar with. The same numeric value can be expressed in decimal, binary, hexadecimal, or some other number systems.

- The same set of binary bits could represent 4 different things in computer:
  - Binary number
  - Character (text) - through encoding system like ASCII
  - Boolean value (True and False)
  - OpCode - the portion of a machine language instruction that specifies what operations to be performed by CPU

Assignment 1:

Make an electric circuit with a switch so it can be turned on and off.

Assignment 2:

Express the following values in binary and hexadecimal form:

- 0
- 10
- 203

Assignment 3:

What does the following stream of binary bits represent in both numeric value (expressed in both decimal and hexadecimal) and character?

- 1101110
- 1000100

Assignment 4:

What boolean value does the following binary value represent?

- 1
- 0

Assignment 5:

What operations (OpCode) do the following hexadecimal values represent? Show the binary bits as well.

- 0xA7
- 0x98

Reference: https://en.wikipedia.org/wiki/X86_instruction_listings