CSE M226: Programming Languages

Lecture 0: Introduction and Course Outline

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What is programming?

- Computers are deterministic machines, controlled by low-level (usually binary) machine code instructions.
- A computer can **[only] do whatever we know how to order it to perform** (Ada Lovelace, 1842)
- Programming is communication:
  - between a person and a machine, to tell the machine what to do
  - between people, to communicate ideas about algorithms and computation

From machine code to programming languages

- The first programmers wrote all of their code directly in machine instructions
  - ultimately, these are just raw sequences of bits.
- Such programs are extremely difficult to write, debug or understand.
- Simple "assembly languages" were introduced very early (1950's) as a human-readable notation for machine code
- FORTRAN (1957) - one of the first high-level - languages (procedures, loops, etc.)

What is a programming language?

- For the purpose of this course, a programming language is a **formal**, **executable** language for **computations**
- Non-examples:
  - English (not formal)
  - First-order Logic (formal, but not executable in general)
  - HTML4 (formal, executable but not computational)
- (HTML is in a gray area ? with JavaScript or HTML5 extensions it is a lot more ?computational?)

Why are there so many?

- Assembly languages were invented to allow operations to be expressed with **mnemonic** abbreviations
- Assemblers were eventually augmented with elaborate "**macro expansion**" facilities
  - to permit programmers to define parameterized abbreviations for common sequences of instructions
- **Problem**: each different kind of computer had to be programmed in its own assembly language
- People began to wish for a machine-independent languages
- These wishes led in the mid-1950s to the development of standard higher-level languages compiled for different architectures by

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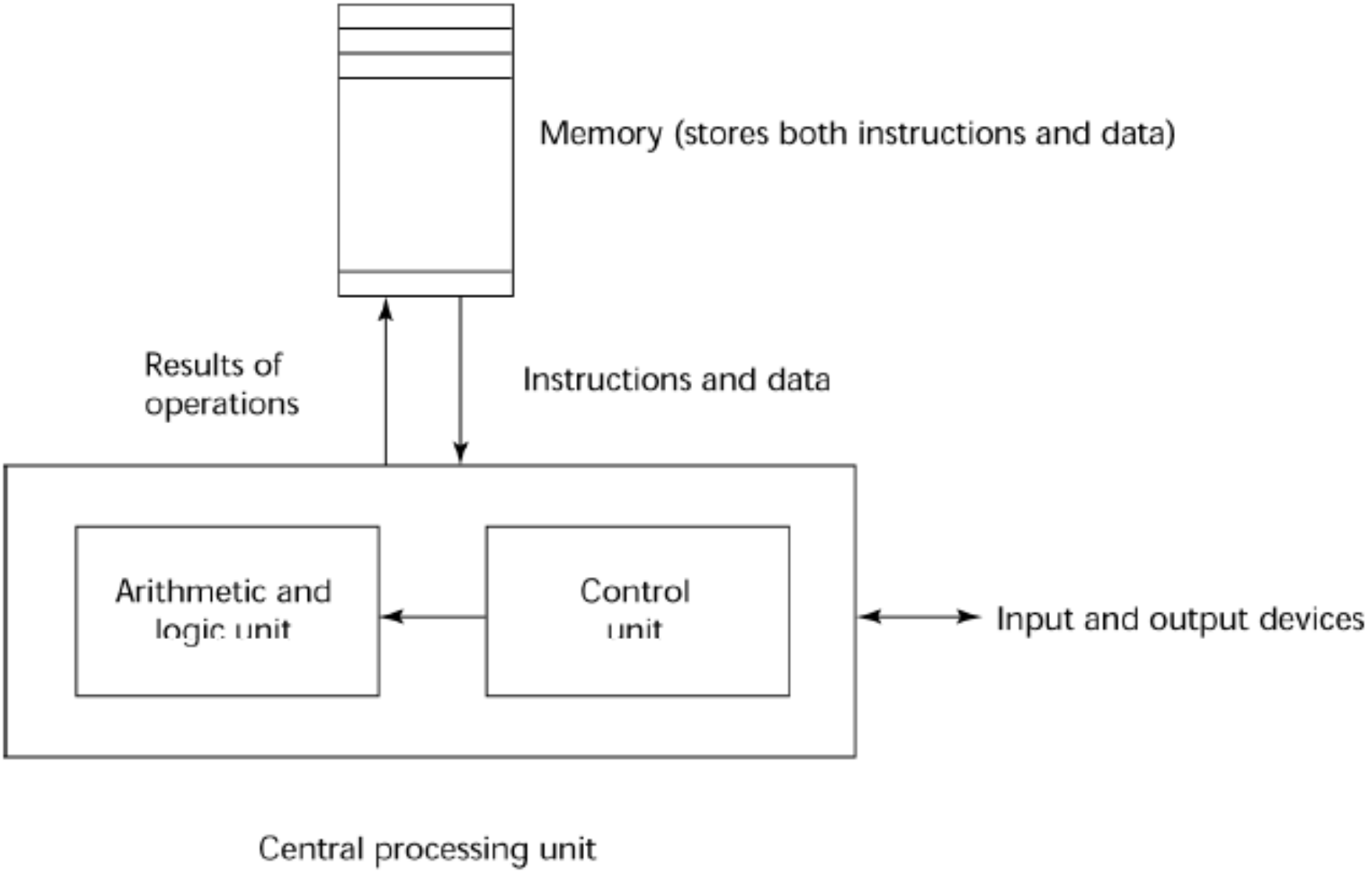
von Neumann Architecture



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Course Format

Class Test: 2, Presentation: 1, Homework:1

- Class Test:
  - based on class lectures.
  - Do not depend exclusively on slides. Read text books, Please :)
- Presentation:
  - Group: maximum 2 person
  - Will provide a list of items. You can also suggest. It must be a programming language.
- Homework:
  - A small programming project implemented by the language chosen for the class presentation.

Text Book

- Scott, Michael L., **Programming Language Pragmatics (PLP)**, (4^{th} ed.) Morgan Kaufmann, 2015
- Robert Harper, **Practical Foundations for Programming Languages (PFPL)** (2^{nd} Edition). Cambridge University Press, 2016.
- John Mitchell , **Concepts in Programming Languages (CPL)** (11^{th} Edition), Cambridge University Press, 2015.