Review: Top Down Design

Algorithm Design

Strategy: Top-Down Design

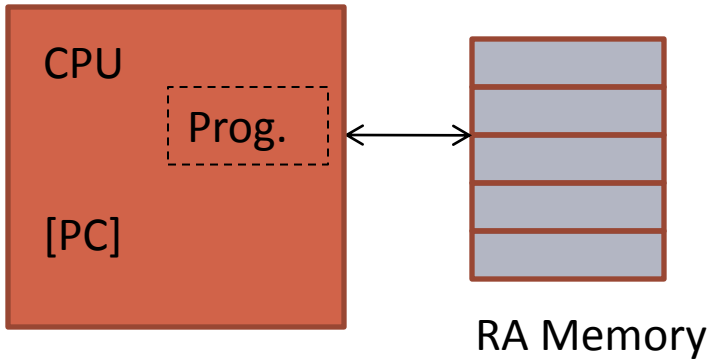
Technique: Divide-and-Conquer

Course Motivation

- Solving Problems
  - Requires writing Programs ("Concrete solutions")
    - Solve one specific problem i.e. for a class of inputs
    - That can run on one specific language/platform
- Writing Programs
  - Requires designing Algorithms ("abstract solutions")
    - May solve a class of problems
    - Solution not dependent on specific language/platform

Algorithm Design – Machine Model

- High level Specification
  - i.e. independent of specific machines/machine architectures and/or specific language constructs
- Generic Machine Model
  - Random Access Machine Model

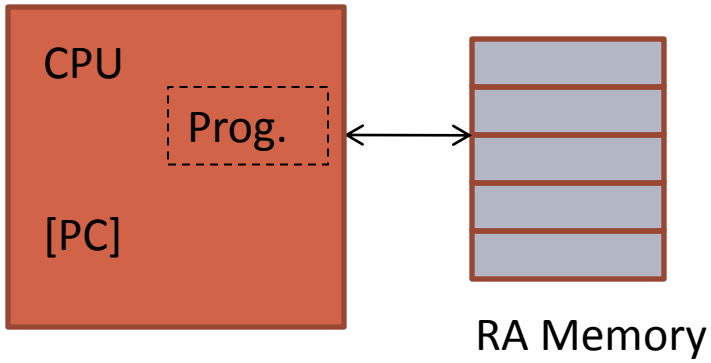


What does Random Access mean?

What is the cost of accessing a location?

Random Access Machine Model

- Generic Machine Model
  - Random Access Machine Model



Typical Instruction Set

Instructions for
- arithmetic/logic operations,
- load / store, and
- control (jmp/br)

- Instructions operate on single memory words (or registers of same size).

- Q: Why is this relevant?
- Hint: How many operations are required for 10^20 + 10^15 ?

RAM Model – Cost Models

- Uniform Cost Model:
  - Cost of a basic operation is constant i.e. independent of the size of the operands
    - e.g. x + y will take unit time to execute irrespective of the values of x and y
- Logarithmic Cost Model:
  - Cost of a basic operation is a function of the size of the operands
    - e.g. x + y will take time that is a function of log(x) and log(y)