Computer Science 210

Computer Systems 1

2007 Semester 1

Lecture Notes

The Alpha Architecture

Lecture 2
20 Mar 07

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Recommended Readings

- These notes (only after the lecture):
  http://www.cs.auckland.ac.nz/compsci210s1t/lectures
- Dr. Bruce Hutton's lecture notes:
  http://www.cs.auckland.ac.nz/compsci210s1t/resources
- Today's lecture mostly based on chapter 2 of Dr. Hutton's notes.
- You are responsible for the first 13 chapters of Dr. Hutton's notes.
  - However, if I don't talk about it in class, it probably won't be on the exam!

The Instruction/Execution Cycle

Do forever {
  Fetch instruction into IR from memory address in IP
  Update IP for next instruction
  Decode instruction
  Evaluate addresses
  Fetch operands from memory
  Store result
}

The Instruction/Execution Cycle:

Variant for Control Instructions

Do forever {
  Fetch instruction into IR from memory address in IP
  Update IP for next instruction
  Decode instruction
  Evaluate test criterion
  If success, store new address to PC
}

A Simple Program

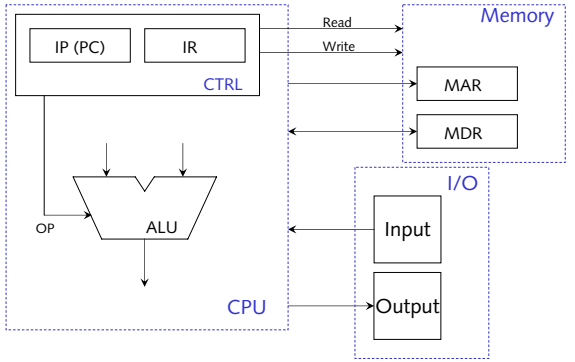
Instructions:

```
L1:   add   VA, VB, VA
L2:   sub   VC, VD, VC
L3:   mul   VC, VE, VE
L4:   bne   VA, VC, L1
L5:   halt
```

Initial values:

```
VA: 0 → 1 → 2
VB: 1
VC: 6 → 4 → 2
VD: 2
VE: 5 →20 →80
IP: L1L2L3L4L1L2L3L4L5
```

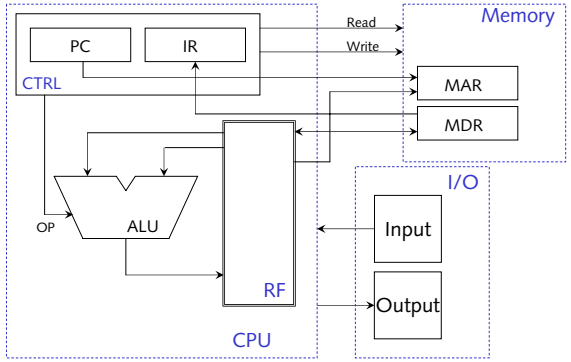

The Von Neuman Computer



The von Neuman Model

- Computer consists of CPU, Memory, I/O
- Memory may contain instructions or data (or meta-data)
- Does only one thing: the Instruction/Execution cycle

The Alpha Computer



Four Categories of Instructions

- Arithmetic/Logical
  - Arithmetic
  - Logical
  - Shift
  - Compare
- Control
  - Branch on condition
  - Jump
    - Jump and link
- Memory: Load & Store
- Special