

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!

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## 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  
}
```

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## 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  
}
```

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## 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

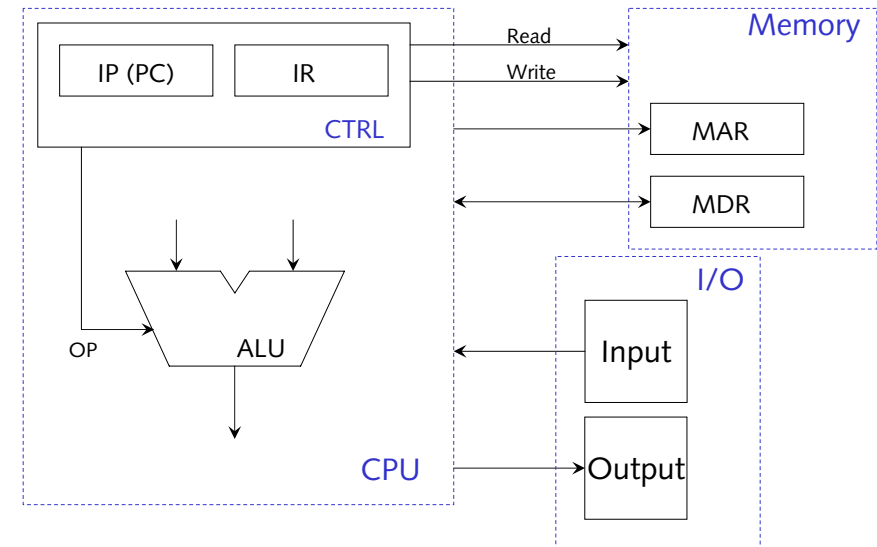
VC: 6 → 4 → 2

VD: 2

VE: 5 → 20 → 80

IP: L1L2L3L4L1L2L3L4L5

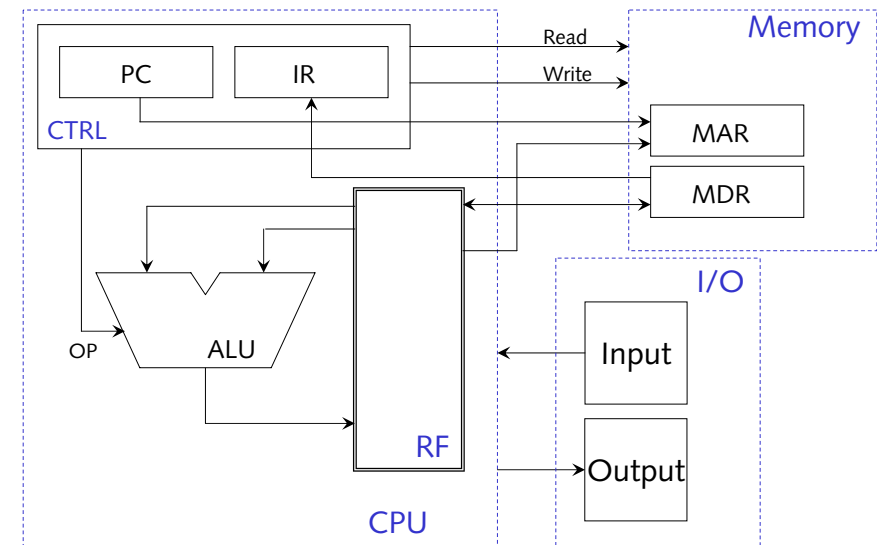
## The Von Neuman Computer



## 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