Single-Cycle Implementation

3-19-2003

Opening Discussion

▮ What did we talk about last class?

▮ Have you seen anything interesting in the news?

▮ Do you have any questions about the graded midterms?
  ▮ There was a 20 point curve
  ▮ A=6, B=2, C=4, D=4, F=0

"Parsing" Instructions

▮ How does the datapath actually go from the loaded instruction to telling the ALU to do an add or whatever?

▮ We can try to figure this out by looking at the values for the fields of some basic instructions.

▮ We can also read section 5.3 which describes how it is done.

Single Cycle Implementation

▌ One of the keys of the datapath and the clocking is that there should be no feedback inside of a single clock cycle.

▌ This means that any components that are used more than once have to be duplicated because we can't have them used for multiple different calculations in a single cycle.

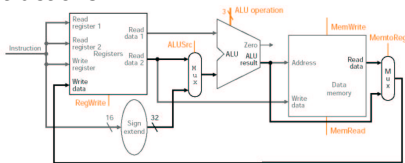▌ A big key here is that we really need separate instruction and data memory.

Combining the Datapaths

▌ Now we want to combine the pieces we looked at last time into a single datapath. We start with the R-type and memory instructions.
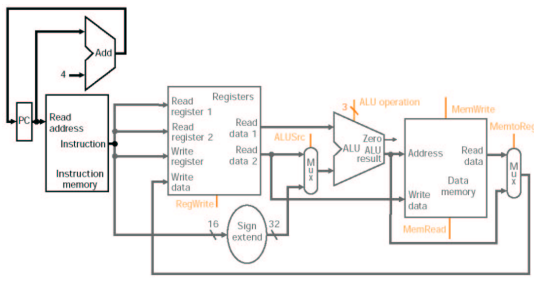

Adding Instruction Fetching

Adding Branches
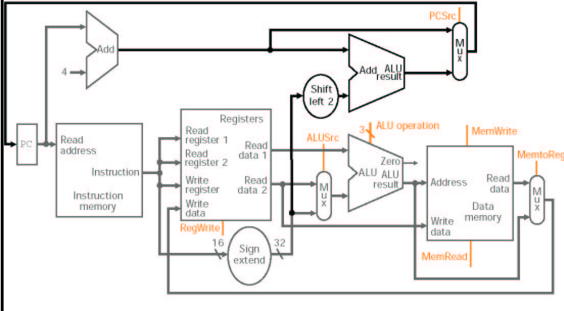
ALU Control

- Our ALU from chapter 4 only used 5 of the 8 options from the 3 input lines.
  - 000 - AND, 001 - OR, 010 - add, 110 - subtract, 111 - set on less than
- Determining what to set these to uses an ALUOp (00 = lw/sw, 01 = branch, 10 = R-type) and the funct field for R-type.
- Implementing this can be done with a truth table because not all options are possible.

Datapath with Multiplexors
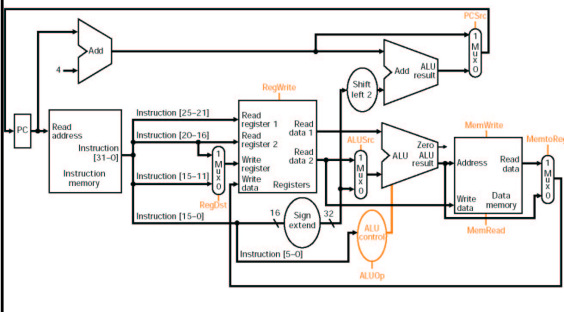
Datapath with Control Unit
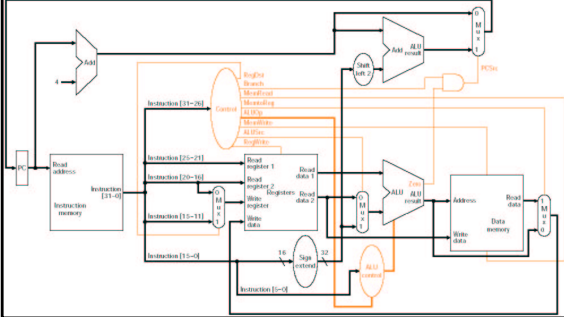
Minute Essay

- What did we talk about today?