CS250: DISCUSSION #4

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OVERVIEW

• Logistics
• Debugging
• Lab 2 Hints
• ALU
LOGISTICS

- Lab #2 is due on Monday, Oct. 3rd at 1pm (pushed 1 week)
- Make sure your work is both committed AND pushed to github
DEBUGGING

• General idea: Debug with the C++ emulator only

• Various methods of debugging
  • View waveforms
  • Text tracing in testbench

• Various references
  • ISA simulator output
  • Instruction by instruction
GENERATION WITH CHISEL

Inline

• if(isBranchPrediction){
  something := val
}

• if(isBranchPrediction){
  val something = val
}

Components

var btb:DpathBTB = null;
if(isBranchPrediction){
  btb = new DpathBTB;
  btb.io.current_pc4 := ...
}

IO Bundles

val ctrl = new IoCtrlToDpath().flip();
val ctrl_bp = new IoCtrlToDpathBP().flip();

IO

if(isBranchPrediction){
  c.io.ctrl_bp <> d.io.ctrl_bp;
  c.io.dpath_bp <> d.io.dpath_bp;
}
DESIGN SPACE GENERATION

- gen_design_space.py
- Creates symbolic link trees to mimic project directory
- Within each design point, run as if normal project
ALU OPTIMIZATION

- Pure behavioral:
  - Inefficient

- Need to support:
  - ADD, SUB, SLT, SLTU, SLTI, SLTIU
  - SL, SR, SRA
  - AND, OR, NOR
  - Eg. SUB \( xc, xa, xb \)
    - \( xc = xa + (\neg xb + 1) \) (use the carry input)
  - Draw a single ALU, and mux its inputs

Thursday, September 22, 2011
SLT

• Algorithm: To test \( \text{in1} < \text{in0} \), do \( \text{in1} - \text{in0} \)
  
  • If the MSB is 1 (then answer is negative and slt is true)
  
  • If the MSB is 0 (then the answer is positive and slt is false)

• What about overflow? eg. \(-4 < 3\)

  • \(-4 - 3 = 100+100+001 = 1010\) MSB says slt false, but we know that it is true.
    Rule: Flip answer if overflow

• What is overflow? eg. \(3 < -4\) has overflow but is correct

  • Answer: Operands (of a and \(\sim b\)) same sign but result is different sign