ECE 486/586

Project Description

Spring 2019

Portland State University

Basics

- **Objective**
  - Develop an execution-driven MIPS-lite pipeline simulator
- **Programming Language**
  - Any high-level programming language (C, C++, JAVA etc.)
- **Simulator Inputs**
  - Memory trace for the simulated program
  - Provided by the instructor
- **Simulator Output**
  - Program output (register values, memory contents)
  - Instruction type frequency statistics
  - Execution time in cycles

Simulator Components

- **Trace Reader**
  - Reads the memory trace and passes the next instruction to the instruction decoder
- **Instruction Decoder**
  - Interprets instruction type , determines the source and destination registers
- **Functional Simulator**
  - Simulates instruction behavior, keeps track of register and memory state changes
- **Pipeline Simulator**
  - Keeps track of current clock cycle
  - Maintains track of instruction in each pipeline stage in each cycle
  - Identify different sources of stalls and hazards
  - Propagates instructions from one pipeline stage to next

Simulator Details

- You will write a simulator which models both the functional and timing behavior of a 5-stage MIPS-like pipelined processor
  - Pipeline details will be studied in class during Week 5 and Week 6
- You will need to do two things:
  - Simulate the computation performed by an instruction and record its impact on the machine state
  - Quantify the impact of instruction execution on the program execution time
    - You will simulate if this instruction needs to be stalled and what is the stall penalty
    - You will have to **visualize** the 5-stage pipeline and the instruction in every stage, and then program your simulator with that in mind

Logistics and Timeline

- You should form groups of 2 students
- Your simulator implementation should follow the detailed project specs, which will be posted on the course website in Week 5
- Each group will be provided with trace(s) that will be used to test the simulator
- At the completion of the project, you will need to turn in a project report, which should include all the simulation results
- Important Dates
  - Project specs uploaded on course website: Monday, April 29
  - Group names due to be sent to instructor: Thursday, May 2
  - Final project report due: Friday, June 14