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COE1541 Project 1

Results on our own Test Traces (Task 2):

structural_hazards.tr

five_stage.c

```
 ** opening file structural_hazards.tr
[cycle 5] RTYPE: (PC: 0)(sReg_a: 1)(sReg_b: 2)(dReg: 3)
[cycle 6] RTYPE: (PC: 4)(sReg_a: 1)(sReg_b: 2)(dReg: 3)
[cycle 7] RTYPE: (PC: 8)(sReg_a: 1)(sReg_b: 2)(dReg: 3)
[cycle 8] RTYPE: (PC: 12)(sReg_a: 1)(sReg_b: 2)(dReg: 3)
[cycle 9] LOAD: (PC: 16)(sReg_a: 1)(dReg: 3)(addr: 0)
[cycle 10] STORE: (PC: 20)(sReg_a: 2)(sReg_b: 5)(addr: 0)
[cycle 11] LOAD: (PC: 24)(sReg_a: 2)(dReg: 3)(addr: 0)
[cycle 12] STORE: (PC: 28)(sReg_a: 1)(sReg_b: 6)(addr: 0)
+ Simulation terminates at cycle : 12
```

superscalar.c

```
 ** opening file structural_hazards.tr
[cycle 5] RTYPE: (PC: 0)(sReg_a: 1)(sReg_b: 2)(dReg: 3)
[cycle 5] NOP:
[cycle 6] RTYPE: (PC: 4)(sReg_a: 1)(sReg_b: 2)(dReg: 3)
[cycle 6] NOP:
[cycle 7] RTYPE: (PC: 8)(sReg_a: 1)(sReg_b: 2)(dReg: 3)
[cycle 7] NOP:
[cycle 8] RTYPE: (PC: 12)(sReg_a: 1)(sReg_b: 2)(dReg: 3)
[cycle 8] LOAD: (PC: 16)(sReg_a: 1)(dReg: 3)(addr: 0)
[cycle 9] NOP:
[cycle 9] STORE: (PC: 20)(sReg_a: 2)(sReg_b: 5)(addr: 0)
[cycle 10] NOP:
[cycle 10] LOAD: (PC: 24)(sReg_a: 2)(dReg: 3)(addr: 0)
[cycle 11] NOP:
[cycle 11] STORE: (PC: 28)(sReg_a: 1)(sReg_b: 6)(addr: 0)
+ Simulation terminates at cycle : 11
```

data_hazards.tr

five_stage.c

```
 ** opening file data_hazards.tr
[cycle 5] RTYPE: (PC: 0)(sReg_a: 2)(sReg_b: 3)(dReg: 5)
[cycle 6] STORE: (PC: 4)(sReg_a: 2)(sReg_b: 5)(addr: 0)
[cycle 7] LOAD: (PC: 8)(sReg_a: 6)(dReg: 4)(addr: 0)
[cycle 8] RTYPE: (PC: 12)(sReg_a: 1)(sReg_b: 4)(dReg: 1)
[cycle 9] RTYPE: (PC: 16)(sReg_a: 2)(sReg_b: 1)(dReg: 3)
[cycle 10] RTYPE: (PC: 20)(sReg_a: 1)(sReg_b: 3)(dReg: 2)
+ Simulation terminates at cycle : 10
```

superscalar.c

```
 ** opening file data_hazards.tr
[cycle 5] RTYPE: (PC: 0)(sReg_a: 2)(sReg_b: 3)(dReg: 5)
[cycle 5] NOP:
[cycle 6] NOP:
[cycle 6] STORE: (PC: 4)(sReg_a: 2)(sReg_b: 5)(addr: 0)
[cycle 7] NOP:
[cycle 7] LOAD: (PC: 8)(sReg_a: 6)(dReg: 4)(addr: 0)
[cycle 8] NOP:
[cycle 8] NOP:
[cycle 9] RTYPE: (PC: 12)(sReg_a: 1)(sReg_b: 4)(dReg: 1)
[cycle 9] NOP:
[cycle 10] RTYPE: (PC: 16)(sReg_a: 2)(sReg_b: 1)(dReg: 3)
[cycle 10] NOP:
[cycle 11] RTYPE: (PC: 20)(sReg_a: 1)(sReg_b: 3)(dReg: 2)
[cycle 11] NOP:
+ Simulation terminates at cycle : 11
```

data_hazards2.tr

five_stage.c

```
 ** opening file data_hazards2.tr
[cycle 5] LOAD: (PC: 0)(sReg_a: 1)(dReg: 4)(addr: 100)
[cycle 6] LOAD: (PC: 4)(sReg_a: 4)(dReg: 3)(addr: 100)
[cycle 7] RTYPE: (PC: 8)(sReg_a: 2)(sReg_b: 3)(dReg: 1)
+ Simulation terminates at cycle : 7
```

superscalar.c

```
 ** opening file data_hazards2.tr
[cycle 5] NOP:
[cycle 5] LOAD: (PC: 0)(sReg_a: 1)(dReg: 4)(addr: 100)
[cycle 6] NOP:
[cycle 6] NOP:
[cycle 7] NOP:
[cycle 7] LOAD: (PC: 4)(sReg_a: 4)(dReg: 3)(addr: 100)
[cycle 8] NOP:
[cycle 8] NOP:
[cycle 9] RTYPE: (PC: 8)(sReg_a: 2)(sReg_b: 3)(dReg: 1)
[cycle 9] NOP:
+ Simulation terminates at cycle : 9
```

data_structural_hazards.tr

five_stage.c

```
 ** opening file data_structural_hazards.tr
[cycle 5] RTYPE: (PC: 0)(sReg_a: 2)(sReg_b: 3)(dReg: 1)
[cycle 6] LOAD: (PC: 4)(sReg_a: 1)(dReg: 4)(addr: 0)
[cycle 7] RTYPE: (PC: 8)(sReg_a: 4)(sReg_b: 4)(dReg: 1)
[cycle 8] RTYPE: (PC: 12)(sReg_a: 5)(sReg_b: 2)(dReg: 2)
[cycle 9] STORE: (PC: 16)(sReg_a: 3)(sReg_b: 1)(addr: 0)
+ Simulation terminates at cycle : 9
```

superscalar.c

```
 ** opening file data_structural_hazards.tr
[cycle 5] RTYPE: (PC: 0)(sReg_a: 2)(sReg_b: 3)(dReg: 1)
[cycle 5] NOP:
[cycle 6] NOP:
[cycle 6] LOAD: (PC: 4)(sReg_a: 1)(dReg: 4)(addr: 0)
[cycle 7] NOP:
[cycle 7] NOP:
[cycle 8] RTYPE: (PC: 8)(sReg_a: 4)(sReg_b: 4)(dReg: 1)
[cycle 8] NOP:
[cycle 9] RTYPE: (PC: 12)(sReg_a: 5)(sReg_b: 2)(dReg: 2)
[cycle 9] STORE: (PC: 16)(sReg_a: 3)(sReg_b: 1)(addr: 0)
+ Simulation terminates at cycle : 9
```

control_hazards.tr

five_stage.c

```
** opening file control_hazards.tr
[cycle 5] RTYPE: (PC: 0)(sReg_a: 2)(sReg_b: 3)(dReg: 1)
[cycle 6] RTYPE: (PC: 4)(sReg_a: 2)(sReg_b: 3)(dReg: 4)
[cycle 7] BRANCH: (PC: 8)(sReg_a: 1)(sReg_b: 4)(addr: 16)
[cycle 8] RTYPE: (PC: 16)(sReg_a: 3)(sReg_b: 5)(dReg: 1)
[cycle 9] LOAD: (PC: 20)(sReg_a: 4)(dReg: 2)(addr: 100)
+ Simulation terminates at cycle : 9
```

superscalar.c

```
[cycle 5] RTYPE: (PC: 0)(sReg_a: 2)(sReg_b: 3)(dReg: 1)
[cycle 5] NOP:
[cycle 6] RTYPE: (PC: 4)(sReg_a: 2)(sReg_b: 3)(dReg: 4)
[cycle 6] NOP:
[cycle 7] BRANCH: (PC: 8)(sReg_a: 1)(sReg_b: 4)(addr: 16)
[cycle 7] NOP:
[cycle 8] NOP:
[cycle 8] NOP:
[cycle 9] RTYPE: (PC: 16)(sReg_a: 3)(sReg_b: 5)(dReg: 1)
[cycle 9] LOAD: (PC: 20)(sReg_a: 4)(dReg: 2)(addr: 100)
+ Simulation terminates at cycle : 9
```

control_hazards2.tr

five_stage.c

```
 ** opening file control_hazards2.tr
[cycle 5] RTYPE: (PC: 0)(sReg_a: 2)(sReg_b: 3)(dReg: 1)
[cycle 6] RTYPE: (PC: 4)(sReg_a: 2)(sReg_b: 3)(dReg: 4)
[cycle 7] BRANCH: (PC: 8)(sReg_a: 1)(sReg_b: 4)(addr: 16)
[cycle 8] LOAD: (PC: 16)(sReg_a: 4)(dReg: 2)(addr: 100)
[cycle 9] RTYPE: (PC: 20)(sReg_a: 3)(sReg_b: 5)(dReg: 1)
+ Simulation terminates at cycle : 9
```

superscalar.c

```
 ** opening file control_hazards2.tr
[cycle 5] RTYPE: (PC: 0)(sReg_a: 2)(sReg_b: 3)(dReg: 1)
[cycle 5] NOP:
[cycle 6] RTYPE: (PC: 4)(sReg_a: 2)(sReg_b: 3)(dReg: 4)
[cycle 6] NOP:
[cycle 7] BRANCH: (PC: 8)(sReg_a: 1)(sReg_b: 4)(addr: 16)
[cycle 7] NOP:
[cycle 8] NOP:
[cycle 8] NOP:
[cycle 9] RTYPE: (PC: 20)(sReg_a: 3)(sReg_b: 5)(dReg: 1)
[cycle 9] LOAD: (PC: 16)(sReg_a: 4)(dReg: 2)(addr: 100)
+ Simulation terminates at cycle : 9
```

Results on Short and Long Sample Traces (Task 3):

sample.tr

** opening file short_traces/sample.tr
+ Simulation terminates at cycle : 1113

sample1.tr

** opening file short_traces/sample1.tr
+ Simulation terminates at cycle : 1197851

sample2.tr

** opening file short_traces/sample2.tr
+ Simulation terminates at cycle : 1204163

sample3.tr

** opening file short_traces/sample3.tr
+ Simulation terminates at cycle : 1444351

sample4.tr

** opening file short_traces/sample4.tr
+ Simulation terminates at cycle : 3846354

sample_large1.tr

** opening file sample_large1.tr/sample_large1.tr
+ Simulation terminates at cycle : 103834835

sample_large2.tr

** opening file sample_large2.tr/sample_large2.tr
+ Simulation terminates at cycle : 131254468