CpE 313 HW 02 – Fall 2004
Getting to Know SimpleScalar

This exercise will help you become familiar with some of the functionality of the SimpleScalar tool set. Please start as soon as possible to deal with any last-minute unexpected compilation problems. Please use one of the ***ECE*** Sun machines for this assignment.

This assignment is due on or before Tuesday, Sep 21. You have to turn in a part of the assignment using email by 5pm on the due date. The other part will be turned in as usual in class, at the beginning.

Part 1: Using a SimpleScalar simulator

1) **The SimpleScalar simulator has already been installed in /home/fac/shoukat/simplesim-3.0. You will run the simulators from this location but save the results in your own account's directory**.

2) Execute **`/home/fac/shoukat/simplesim-3.0/`**`sim-safe` with no command-line arguments. Information about the usage, description of the simulator and default values for the command-line options will print to the screen. The name of the option and the type of values it takes appears as the first item on each line. The next items on the line are the option's default values, and then a description of the option. Take note of the following options:

Option Name	Arg Type	Default Value	Description
-redir:sim	string	null	Redirect simulator output to file named "string"
-redir:prog	string	null	Redirect simulated program's output to file named "string"
-max:inst	unsigned integer	0	Maximum number of instructions to execute

3) Make a results directory in your own computer account (***not*** in `/home/fac/shoukat/simplesim-3.0/`).

```
mkdir results
```

4) Run sim-safe with command line arguments for redirecting simulator output and program output set to be written into the results directory. In this case, the benchmark we will be using is a test program called test-math. It is located in `simplesim-3.0/tests/bin.big`. The command line is as follows:

```
/home/fac/shoukat/simplesim-3.0/sim-safe –redir:sim
results/sim1.out –redir:prog results/prog1.out
/home/fac/shoukat/simplesim-3.0/tests/bin.big/test-math
```

5) Change to the results directory and examine sim.out and prog.out. In sim.out, in the first part of the file you should see the same information you saw when you ran sim-safe without any arguments. The lower half of the file contains various statistics that sim-safe collects. In particular, note sim_num_insn (total number of instructions executed) and sim_num_refs (number of loads and stores). It should read as follows:

sim_num_insn 216084 # total number of instructions executed
sim_num_refs 56936 # total number of loads and stores executed

6) Rerun sim-safe on test-math, but this time set the –max:inst option to 50000 instructions (`-max:inst 50000`). Redirect simulator output to results/sim2.out and program output to results/prog2.out. When you examine sim2.out, you should see the following:

sim_num_insn 50000 # total number of instructions executed
sim_num_refs 15626 # total number of loads and stores executed

7) Email to shoukat@umr.edu copies of sim1.out and sim2.out.

Part 3: Using sim-profile

1) Sim-profile is a more detailed simulator that generates different kinds of profiling information for the binary program being executed on the SimpleScalar "processor." Some options for this simulator are:

`-iclass` - instruction class profiling (e.g., ALU, branch)
`-iprof` - instruction profiling (e.g., bnez, addi, etc...)
`-brprof` - branch class profiling (e.g., direct, calls, cond)
`-amprof` - address mode profiling (e.g., displaced, R+R)
`-segprof` - load/store segment profiling (e.g., data, heap)
`-tsymprof` - execution profile by text symbol (i.e., funcs)
`-dsymprof` - reference profile by data segment symbol
`-taddrprof` - execution profile by text address
`-all` - enable all of the above options

2) Run sim-profile with command line arguments for redirecting simulator output and program output set to be written into the results directory. In this case, we will use the benchmarks called test-math, anagram, and test-printf. These benchmarks are located in

/home/fac/shoukat/simplesim-3.0/tests/bin.big. One sample command line is as follows:

```
/home/fac/shoukat/simplesim-3.0/sim-profile –redir:sim
results/simClass.out –redir:prog results/progClass.out –iclass
/home/fac/shoukat/simplesim-3.0/tests/bin.big/test-math
```

You have to run sim-profile 12 times: 4 times for each of the three benchmarks. For each benchmark, run it separately for the options, -iclass, -iprof, -brprof, and -amprof. Name the outputs for –iprof option "simProf" and "progProf." Name outputs for other options similarly.

3) Based on data from item 2 above, draw tables to express relative frequency of different instruction classes, different instructions, different control instructions, and different addressing modes. Please submit hard copies of the tables.

4) Execute the following two commands from the **directory one level above the results directory**.

```
tar cvf results.tar results
gzip results.tar
```

Email me the resulting file, which will be named by the gzip program as `results.tar.gz`.