1. Project Purpose
This project intends to make you familiar with how SimpleScalar can be used to perform some architectural exploration in terms of performance, power, area and others.

2. Works to Be Done
You are asked to use SimpleScalar to perform the following experiments:
(a). Run the programs given in project 1 without using an instruction cache and data cache. All data and instructions are obtained from memory. Count the number of signal transitions and couplings per instruction fetch on the instruction bus (used to send instruction to CPU) and per data access (write or read) on the data bus. You must supply inputs to the program appropriately. The number of couplings is counted with the assumption that bus bit $i$ is adjacent to bits $i-1$ and $i+1$. If bits $i$ and $i-1$ has a different value in an instruction or data access, we say that there is a coupling between bits $i$ and $i-1$. The same is for bits $i$ and $i+1$. If $i$ is the LSB bit, only the coupling between bits $i$ and $i+1$ is counted. If it is an MSB bit, only the coupling between $i$ and $i-1$ is counted. The coupling between any two adjacent wires can be counted at most only once.
(b). Run the above program with a direct map split cache of size 128 bytes for instructions and data. Count the number of signal transitions and couplings per instruction (the number of executed instructions should be used as a denominator). Repeat this for cache size of 256 bytes, 512 bytes, 1024 bytes, 2k bytes. The cache block is assumed to be 16 bytes. Report cache hit rate.
(c). Repeat the task in (b) for 2-way, 4-way and 8-way set associated cache.
(d). Use CACTI:3.0 to compute the power overhead for adding a cache to the base architecture. See [http://www.research.compaq.com/wrl/techreports/abstracts/93.5.html](http://www.research.compaq.com/wrl/techreports/abstracts/93.5.html) for this tool. Also give the area overhead.

3. Report
You should write a report to describe your work and results. The format of the report is as follows:
1. Introduction
2. Methods
3. Results
4. Discussions