Out: October 7th, 2016
Due: October 21st, 2016

Goal

To perform low level tests on your CME 341 microprocessor, gaining experience in randomization and functional coverage.

Procedure

1. In Lab #2 you developed a test plan spreadsheet (and executed the test(s) using Questa) to verify that your RAM module was working correctly (read/write all addresses) in your CME 341 microprocessor. You used the i_pins and o_reg input/output ports to do this. This assumed that your microprocessor functioned correctly using the Altera megafunction for the RAM in the first place. If this wasn't the case, you may still have some work to do…
2. Add randomization to your test from Lab #2, Part 5). As a constraint make sure that the data written to an address is never the value of the address (i.e., data written to address 0 is never 0, etc.). When doing this both the address and the data must be randomized. This will most likely necessitate changing the assembly language code that you used in Lab #2 Part 5). Add the necessary functional coverage so that 100% coverage is attained. Note that without the appropriate ignore_bins statements you will only get 93.75% coverage. Specifically, you will need to ignore all of the cases where the address is crossed with the same data value:

   ```
   ignore_bins holes = (binsof(address) intersect { 0} && binsof(data) intersect { 0}) ||
                       (binsof(address) intersect { 1} && binsof(data) intersect { 1}) ||
                       etc…
   ```

   You can monitor the coverage while your test bench runs using the $get_coverage() system function. It reports the current functional coverage as a number from 0 to 100. It may take a few thousand loops of your program to get 100% coverage.

   Note: Your test must also be checking that the o_reg output is actually correct for the randomized stimulus that the test generates. 100% coverage without checking does not prove that the DUT is actually operating correctly!

Deliverable

Your assembly language code, test bench (program) .sv file, and proof that 100% coverage was achieved (a screen dump of the Coverage window is sufficient). Package the required files in a zip archive that includes your name, NSID, and student number in the filename, and email to the course lab instructor Chandler Janzen (chandler.janzen@usask.ca) by midnight on October 21st.