**CS375 Lab 6 – Synchronous Change Detector**

The second generation of the electronic chess board used two shift registers to compare the current state of the board with the previous state of the board. Changes in state were then forwarded to the host computer. We will implement a similar circuit for this lab that compares the current state of the 10 toggle switches on the Cyclone board with their previous states. The circuit will cause the number of the most recently changed toggle switch to appear on an LED (you can use your seven-segment decoder from the previous lab to do that), and the current state of the switch (on or off) will be indicated on the corresponding LED (you will need all 10 of the green LED’s).

**Required architecture:**

1. Create a 10-bit shift register using D flip-flops. The circuit will be similar to the one on page 403 of your textbook, but will not have a parallel load capability.
2. Create a 10-bit shift register with parallel load using the Quartus megafunctions.
3. Create a 1Hz clock using the either the 50MHz or 27MHz on chip clock. Use a meg functions counter to divide the on chip clock down to 1Hz. Use this as the clock for all components.
4. Use flip-flops to create a 4-bit counter that counts from 0 to 9.
5. Connect the shift out from the megafunction shift register with the input shift in your D flip-flop shift register.
6. When the 4-bit counter = 0, load the shift register from the toggle switches.
7. Extra credit
   1. Add circuitry that keeps track of the last 4 changes
      1. Hint: Use a 16-bit shift register to record that last 4 changes