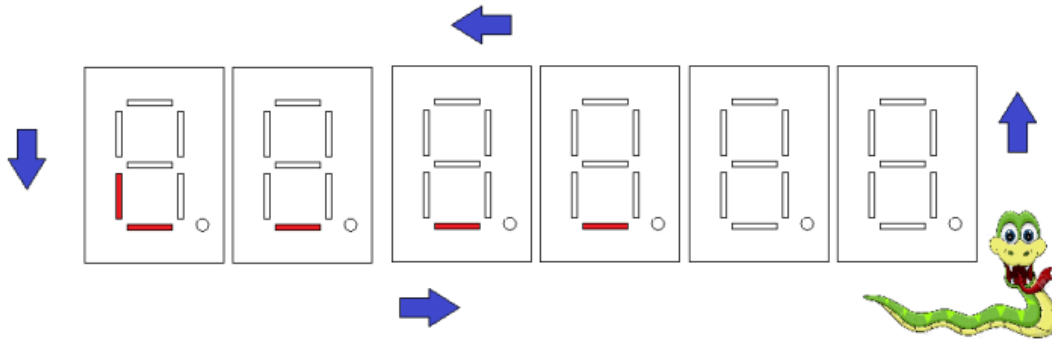


EE457 Spring 2025 Graduate Lab. "The Dizzy Snake"

This lab involves the students designing a state machine that will simulate a snake of various lengths trapped inside the DE10-Lite board.

"Morton" our snake is going to be spinning around the 7-segment display at **1** increment per second.



He will spin clockwise to start with switch0 down/off. Switch 0 up/on 'will make him decide to head counter-clockwise.

His length will be controlled by switches 1-4 using Binary Hex data for link length (Starting right and moving left)

For example:

Sw4 : On, Sw3 : On , Sw2 : On, Sw1 : On, = 15 Links long

Sw4 : On , Sw3 : On, Sw2 : On, Sw1 : Off = 14 Links long

Sw4 : Off , Sw3 : On, Sw2 : On, Sw1 : On = 7 Links long

Sw4 : Off , Sw3 : Off, Sw2 : Off, Sw1 : Off = 0 Links long (Morton has left the building....)

Morton will also be reset to all 15 segments with Key 1 depressed.

Hints:

Consider a 16 bit unsigned with all zeros except for a single '1' Each bit = one possible place for Morton to be in.

If I were to rotate the single '1' right, or left depending direction, I would know exactly where he was at each one-second tick mark.

You may take 1 or 2 50MHz clocks to paint out his length, the human eye won't notice.

You need to provide a testbench that appropriately tests for various conditions. As this is a grad lab, I really am looking for a detailed analysis in the lab report of the test conditions that go along with the testbench. 3 test cases is likely not enough to fully exercise this design. I also strongly encourage you to actually run this on real hardware, by borrowing a board from bill or another student who has borrowed one. Your lab report counts very heavily in the grade for this and this whole lab is worth 10% of your grade.

I challenge the students to find solutions that are more elegant as long as it works.

The lab may be done with other students. The code may be shared between the members of the group and turned in as a group. The lab write-ups are individual assignments.