

# INTRODUCTION TO COMPUTER ARCHITECTURE

## LAB 4

### Detecting a sequence

#### 1 Building a sequence detector

As we discussed during lecture, we want to build a circuit that can detect whether a particular sequence of input values is being given to a sequential circuit. Specifically, for this project, we want to detect the following sequence of 1-bit values:

0, 0, 1, 1, 0, 1

Using a single switch to control the input value  $A$ , and a single button for the  $CLK$  to control when  $A$  is entered as the next value in the sequence, there should be a single output  $Y$  that is 1 if the last six clocked values match the sequence above, and 0 otherwise.

The recommended approach is:

1. Draw the *finite state machine* that represents this problem.
2. Convert that FSM to a truth table representing the sequential logic.
3. Write and simplify the logic functions described by the truth table.
4. Build the circuit that implements the sequential logic and its functions.

**Making it debuggable:** To see how the inputs affect the state, you should number the states of your FSM *in order of the progression through the sequence*. That is, the initially, the circuit should start in state 0; as each correct digit is entered, the state number should increment until the terminal state is reached. By numbering them in this way, you can connect the state number being emitted by the register to LED's, and track that the circuit is moving correctly through the states for any given input.

## 2 Submitting your work

Once you have a detector working, demonstrate the working circuit:

1. **Take a video:** Capture a video of the circuit by resetting to the initial state 0, and then moving through the following sequence of values as a test of it, resetting the circuit to state 0 before each sequence:

INPUT SEQUENCE	STATE NUMBER SEQUENCE
1	0
0, 1	1, 0
0, 0, 0	1, 2, 2
0, 0, 1, 0	1, 2, 3, 1
0, 0, 1, 1, 1	1, 2, 3, 4, 0
0, 0, 1, 1, 0, 0	1, 2, 3, 4, 5, 2
0, 0, 1, 1, 0, 1	1, 2, 3, 4, 5, <b>6</b> (terminal)

2. **Submit the video:** Go to the CS submission site at:

`<https://www.cs.amherst.edu/submit>`

Login and navigate your way to COSC-163, Lab-4, and submit your video file.

**This assignment is due Thursday, Oct-03, at 11:59 pm.**