CS270 Recitation 5

"Finite State Machine Design and Simulation using Logisim"

Goals

To understand how to design and debug sequential circuits using the Logisim logic simulator.
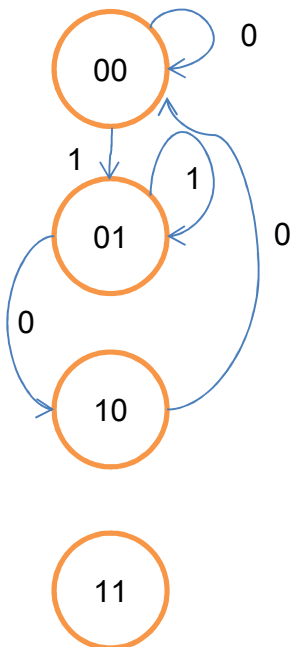
The Assignment: Design and implement a 101 recognizer

Design:

Specification. The sequential circuit has an input x and output z. The circuit recognizes the sequence 101 on the input x makes z=1 when it has recognized the sequence.

Example:

x	1	1	0	1	0	1	0
z	0	0	0	0	1	0	1

1. Draw the state diagram.
2. Get the state table.

Input	Present State		Next State		Output
x	Q1	Q0	Q1'	Q0'	z
0	0	0	0	0	0
0	0	1	1	0	0
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1	0	1	1

3. In Logisim design a subcircuit called Comb which will form the combinational part of the sequential circuit. Its inputs are x, present state and outputs are z and the D inputs to the flip-flops to get the next state. Note that the D input to a flip-flop will be the next state of the flip-flop. Thus the state table above can be used as the truth table for the combinational circuits with d1 and d0 corresponding to Q1' and Q0'. You can minimize it and automatically generate Comb using Logisim (Use commands Window > Combinational Analysis and save circuit with name Comb.

4. For the main screen of Logisim, use the newly designed subcircuit Comb, an input pin, an output pin, two D flip-flops (under Memory) and a clock (under Wiring), to construct the complete sequential circuit. Simulate it to verify the operation (Simulate > Tick Once will cause the clock to go up or down).

5. Verify all transitions of the state diagram.

6) Show your circuit to the GTA.