

## CS270 Recitation 4

### “Digital Logic Simulation using Logisim”

#### Goals

To understand how to design and debug combinatorial circuits using the Logisim logic simulator.

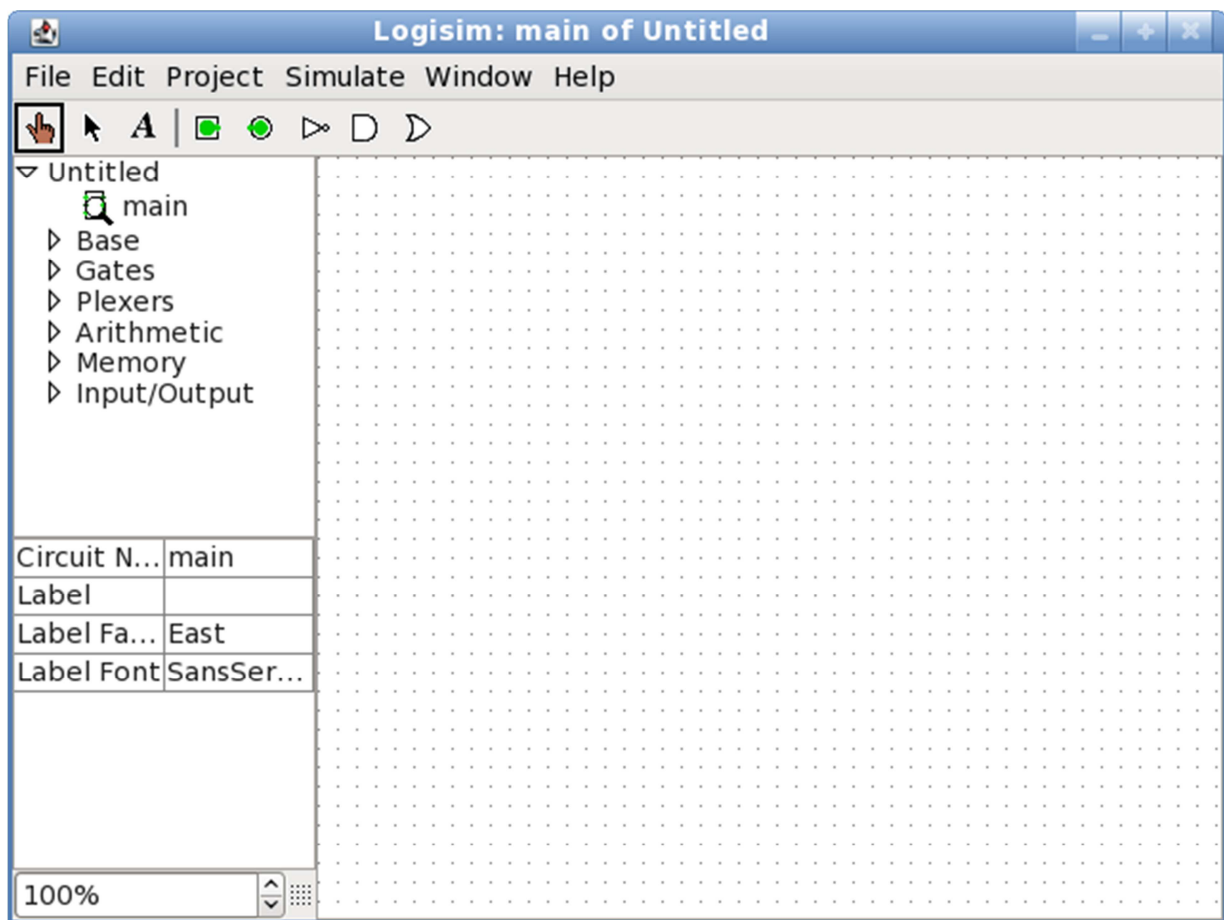
#### The Assignment

Make a subdirectory called R4 for the recitation assignment, all files should reside in this subdirectory. Download the Logisim software (jar file) from <http://ozark.hendrix.edu/~burch/logisim/>, and put it in your R4 directory. Run Logisim with the following command:

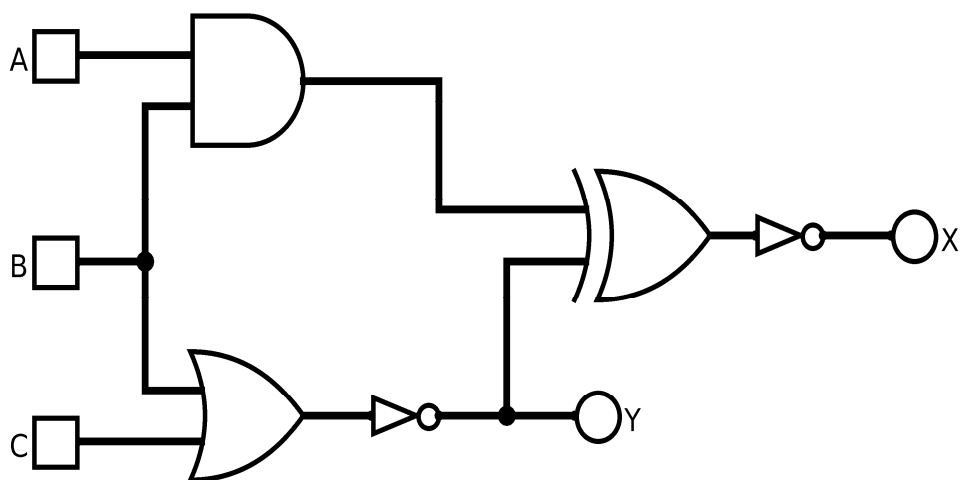
```
$ java -jar logisim-2.7.1.jar
```

You should see the window shown below. Icons for AND, OR, and NOT gates are along the top. More gates can be found in the Gates section of the tree browser on the left side. Outputs are the circles, and inputs are the squares. Select any of the icons by clicking and you will be able to drop it in the circuit area. Once you have all the components placed, connect them with wires by dragging the mouse from one component to another. Outputs and inputs can be named by double clicking on them and entering a label on the bottom left.

Note: at home, you can download the file appropriate for your PC.



1) Design the following circuit, and save it as r4.circ in your R4 directory:



2) Export the circuit as a PNG file called r4.png and save it to your R4 directory.

3) Fill in the rest of the truth table for the circuit manually by looking at the circuit:

Inputs			Outputs	
A	B	C	Y	X
0	0	0	1	
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		0

4) Play around with generating truth table values by manually toggling the input values and examining the output values. This is done in Logisim by selecting the hand icon and then clicking on the input. Generate the truth table with Logisim by the menu item “Projects->Analyze Circuit” and viewing the Table tab. Does it match the one you filled in above? If not, check your answers (or circuit).

5) Build a circuit that implements the following truth table, and verify it by the truth table made with Logisim. What kind of circuit does this represent?

Inputs		Outputs			
A	B	W	X	Y	Z
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

6) Show both of your circuits and truth tables to the GTA.