CS270 Recitation 4
"Moving on with Logisim"

Goals

To reuse sub-circuits and build circuits with a structure, and get practice with "fat" combinational circuits.

The Assignment

Make a subdirectory called R4 for this recitation assignment, all files should reside in this subdirectory. Logisim can be found in the ~cs270/logisim/ directory, and can be run with the command below. See http://www.cs.colostate.edu/~fsieker/misc/cs270.html for instructions on how to modify the $PATH variable so that you only need to type `logisim` in the future.

```
   ~cs270/logisim/logisim
```

You may also find it useful to have the Logisim User Guide open in a separate window, and follow the instructions to create subcircuits. First create a subcircuit called HA (for half-adder) that has two inputs (A and B) and two outputs S and Cout, where S = OR(A,B) and Cout = AND(A,B).

Next, create another subcircuit, FA (for full adder) which is the same as the circuit described in class with three inputs (A, B, and Cin) and two outputs (S and Cout) for sum and carry. Build this circuit using the Combinational analysis tools in Logisim – you will need to spend a bit of time on the documentation and once you get over that, it will be easy.

Next, build a 4-bit adder as your main circuit where you instantiate one HA and three FA subcircuits. Connect two input pins and one output pin to the circuit, but play with the attributes of these pins so that they can be 4-bit wide. Also use three splitters to break out the 4-bits into individual values that go into each of the four subcircuits you have instantiated.

Save the adder as a subcircuit and finally, use it to build a 4-bit 3-function ALU the performs the following functions: ADD (op-code 00) AND (op code 01) and NOT (op-code 10). The op code 11 is not used and should produce 0.

Demonstrate that your circuit correctly adds 4-bit unsigned numbers.