CircuitMaker 6 Student Version – Basic Digital Logic Tutorial
EE244, Digital Logic Design
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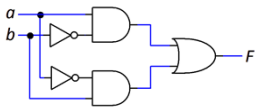
CircuitMaker is a schematic capture and circuit simulation computer tool. The free Student Version has a limitation of 50 devices per circuit.

This basic tutorial will provide very basic guidance for installation of the software, and creation and simulation of a basic digital circuit.

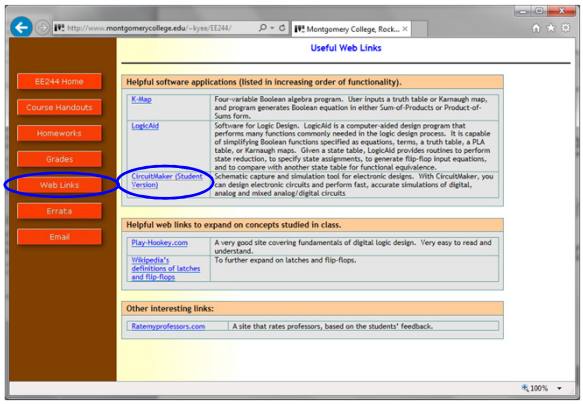
1. Install CircuitMaker (a circuit design tool)
2. Create a circuit for $F(a,b) = a\,b' + a'b$
3. Test the circuit (circuit simulation)

a	b	F
0	0	0
0	1	1
1	0	1
1	1	0



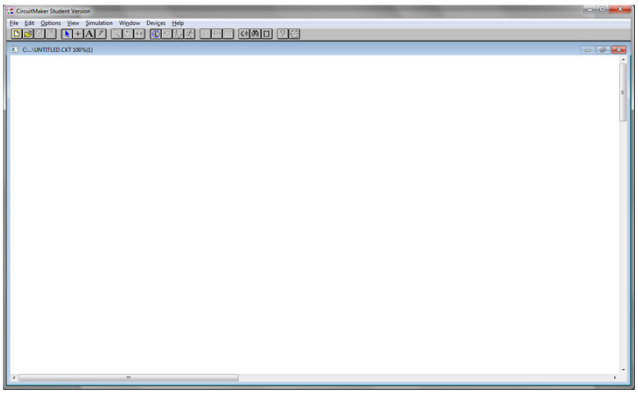
1. Installing CircuitMaker

Install the software from the EE244 Course Website:
http://www.montgomerycollege.edu/~kyee/EE244



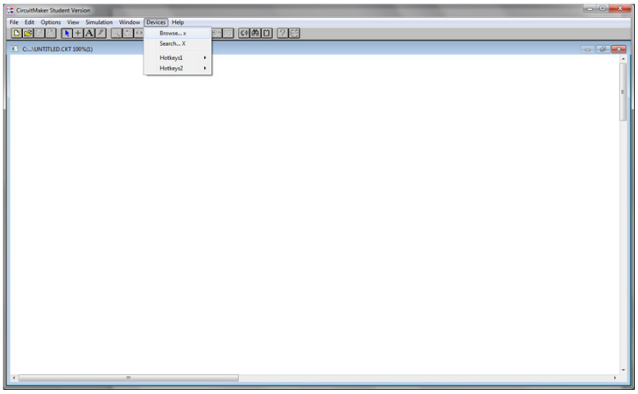
2. Creating a Simple Logic Circuit

Start the CircuitMaker software.



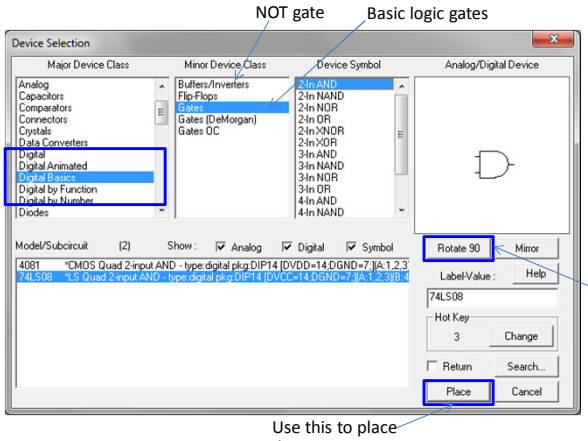
2. Creating a Simple Logic Circuit (Continued)

Add components: Select **Devices → Browse** from top menu bar (or use shortcut lowercase **x**).



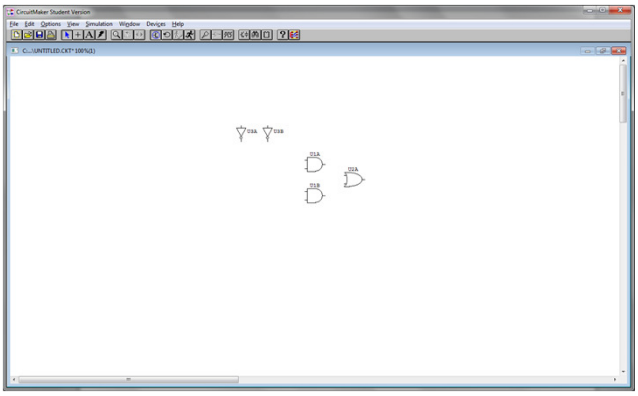
2. Creating a Simple Logic Circuit (Continued)

Most digital devices can be found in the 'Digital' libraries.



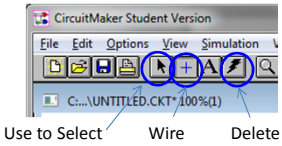
2. Creating a Simple Logic Circuit (Continued)

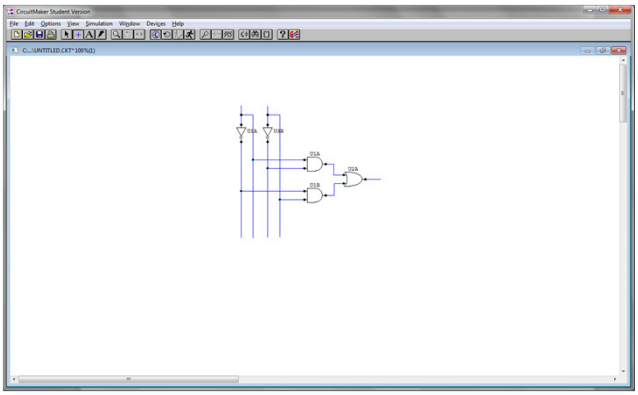
Add 2-input AND gates, 2-input OR gate, and NOT gates.



2. Creating a Simple Logic Circuit (Continued)

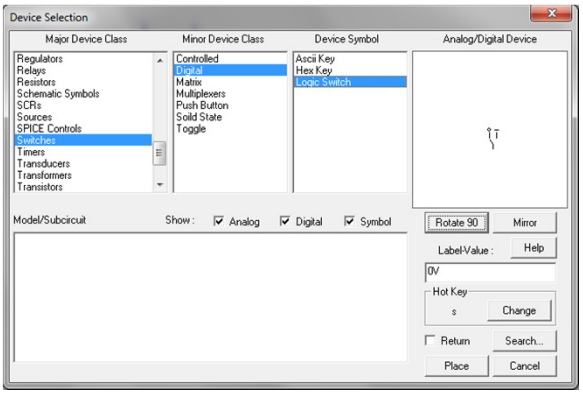
Make wiring connections using the **Wire** tool.
Aesthetics is important (takes some practice).





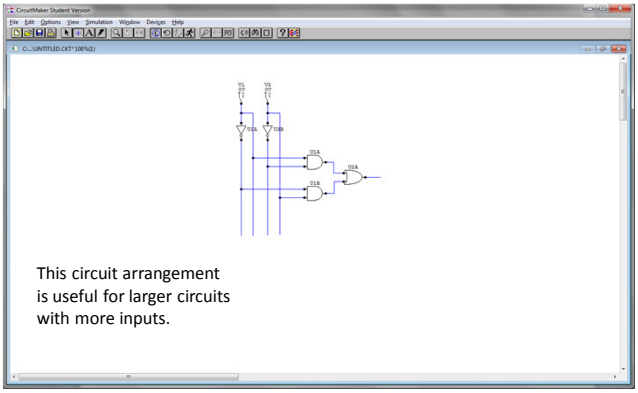
2. Creating a Simple Logic Circuit (Continued)

Add input switches. Rotate them as shown.



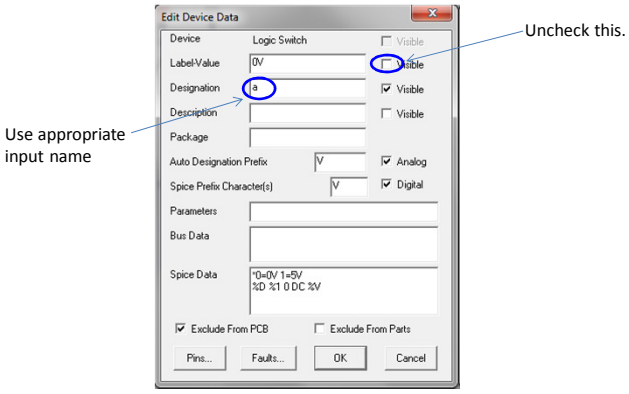
2. Creating a Simple Logic Circuit (Continued)

Place rotated switches in the circuit.



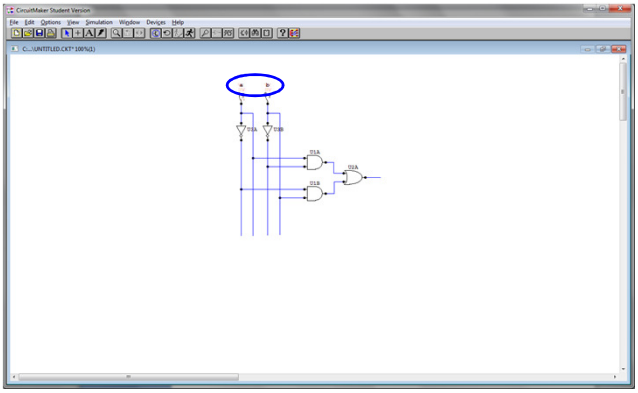
2. Creating a Simple Logic Circuit (Continued)

Double click on switch to change properties. Do this for both switches.



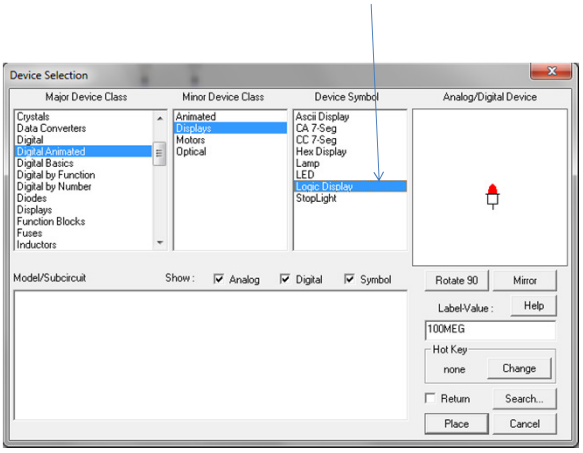
2. Creating a Simple Logic Circuit (Continued)

Inputs have appropriate names that match desired design.



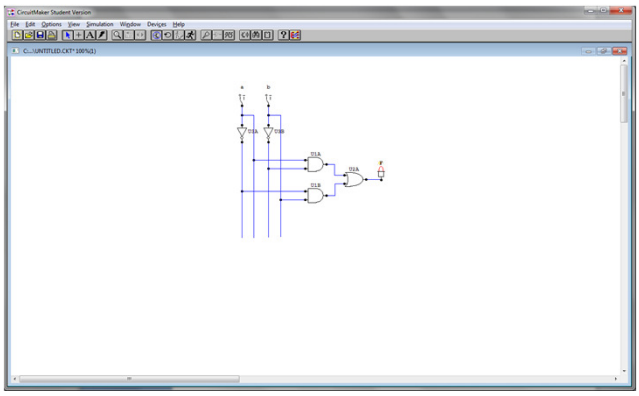
2. Creating a Simple Logic Circuit (Continued)

Add LED for the output. Use the **Logic Display** device.



2. Creating a Simple Logic Circuit (Continued)

Place the LED and connect it to the output of the circuit. Right click on the LED, and select "**Edit Device Data**" to change its default name ("L1") to the desired name ("F").

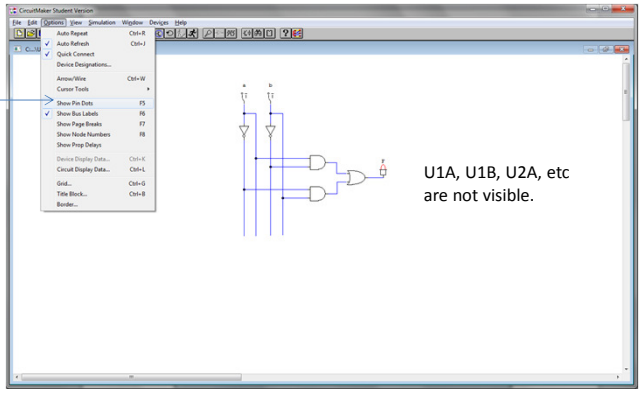


2. Creating a Simple Logic Circuit (Continued)

Circuit is complete at this point. There are two **optional** things that can be done to get a "cleaner" look (this is for aesthetics only):

- Uncheck the **Show Pin Dots** (shortcut: F5 key) to remove unneeded dots.
- Right click on every device, select **Edit Device Data**, and uncheck **Designation** so that those U1A, U1B, U2A, etc, names are not visible.

Don't show pin dots for a cleaner look



U1A, U1B, U2A, etc are not visible.

3. Test the Circuit

Important: Must set to Digital mode in order to simulate digital circuits.

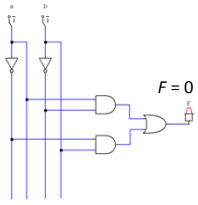
Click to show an AND gate
(AND = digital mode)

Click on Run/Stop to start circuit simulation.
Click again to end circuit simulation.
To edit the circuit (make additional changes), simulation must be stopped.

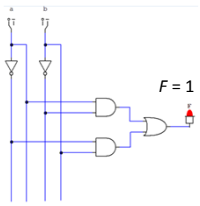
3. Test the Circuit (Continued)

For circuits with few inputs/outputs (as is in this example), one can simply flip switches and observe the output, for every input combination. For more complex cases, a timing diagram might be more appropriate (not covered in this tutorial).

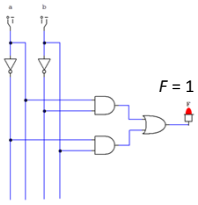
ab = 00



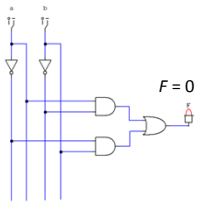
ab = 01



ab = 10



ab = 11



a	*b*	*F*
0	0	0
0	1	1
1	0	1
1	1	0

Matches the desired design.

3. Test the Circuit (Continued)

More than likely, a circuit will not work correctly the first time. You must troubleshoot the circuit in this case.

During simulation, use the **Trace** tool to see state of each wire.