# CENG 232 - Logisim

*Middle East Technical University*

*Department of Computer Engineering*

# LOGISIM

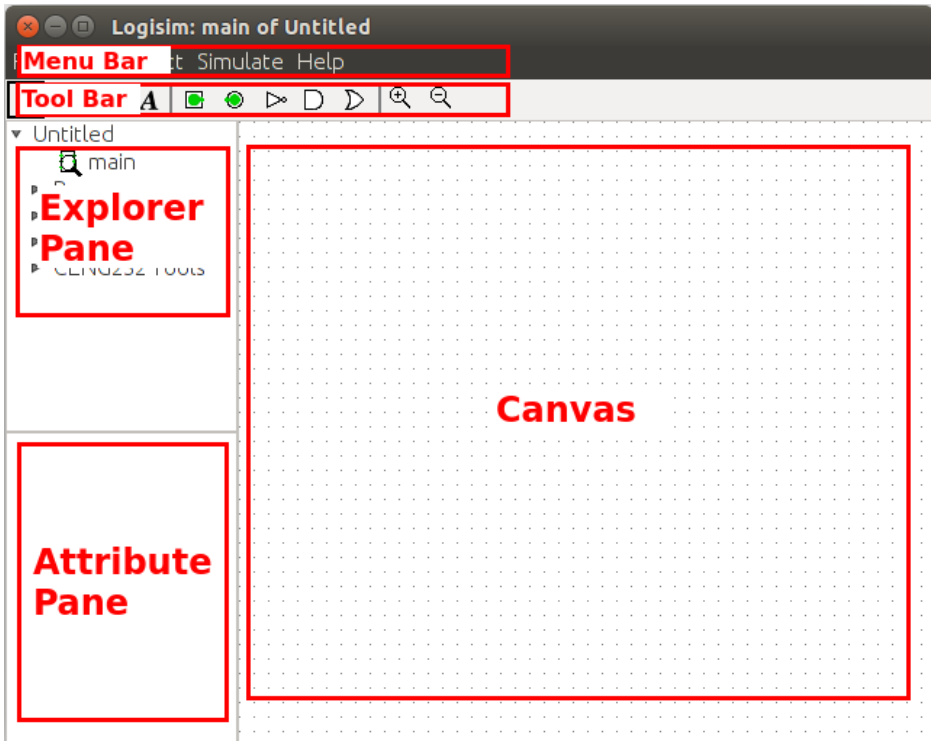
- Tool for designing and simulating digital logic circuits
- Drag and drop GUI
- Provides gates and the integrated circuits

# LOGISIM

- Should be downloaded from ODTUClass course page. (logisim.jar)
- Logisim used in this course is a modified version.
- **DO NOT USE ANY OTHER VERSION!**
  Only use logisim.jar which is given in OdtuClass.
- **Otherwise, grading will not be possible!**

# LOGISIM

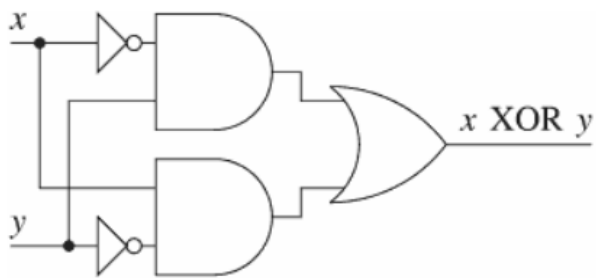
- Java: Works on Windows/Linux/Mac
- In Linux you can run with:
  *"java -jar logisim.jar"*
- For other platforms, just double click to open.
- Java must be installed.



# HOW TO START

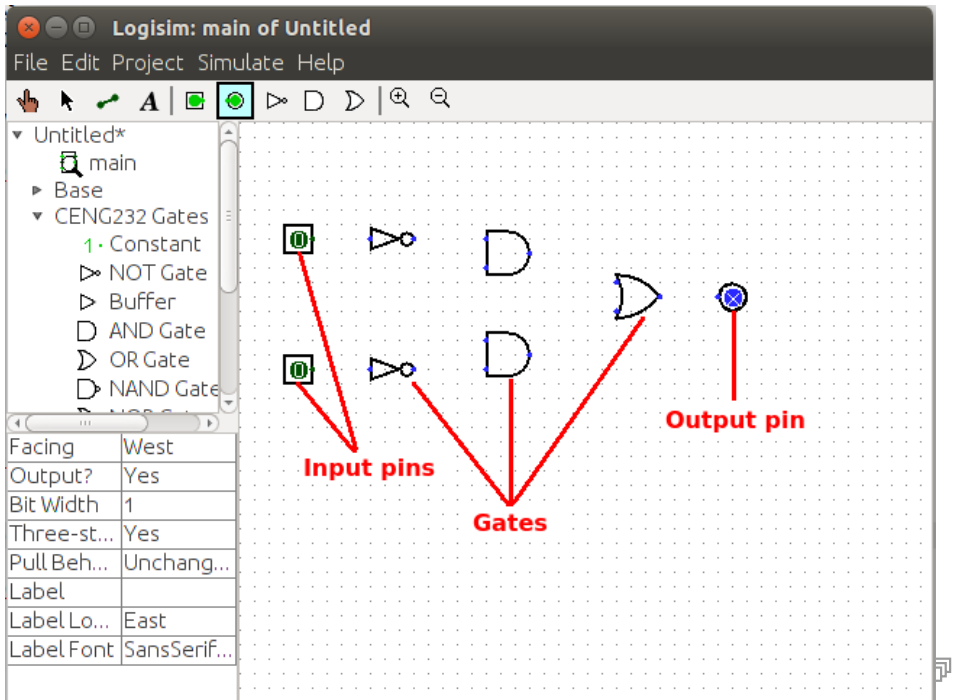
- Example problem:
  - Design XOR using **and**, **or** and **not** gates.
- Design circuit on paper.
- Decide how will you draw (shape).

| $x$ | $y$ | $x$ XOR $y$ |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |



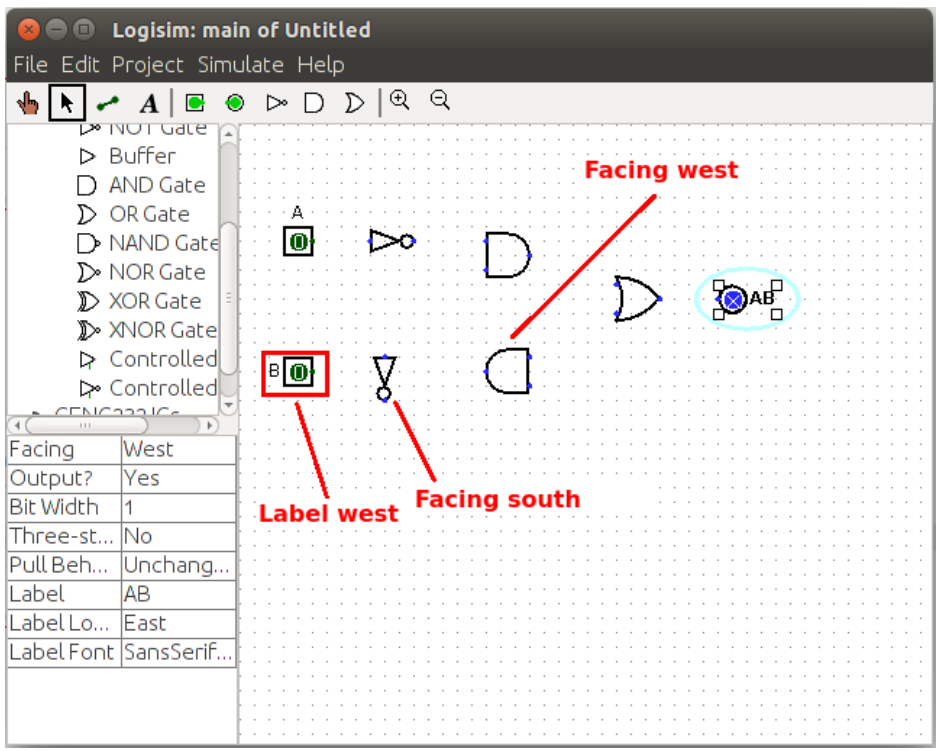
# ADDING GATES

- First, add gates to build a skeleton.
- Find, `Ceng232 Gates` from explorer pane.
- Choose the appropriate gate and click on canvas.
- To add more than one of the same gate, just continue clicking on canvas.
- *Input Pin*s and *Output Pin*s should be added from tool bar at the top. Do not add *pin*s from elsewhere.



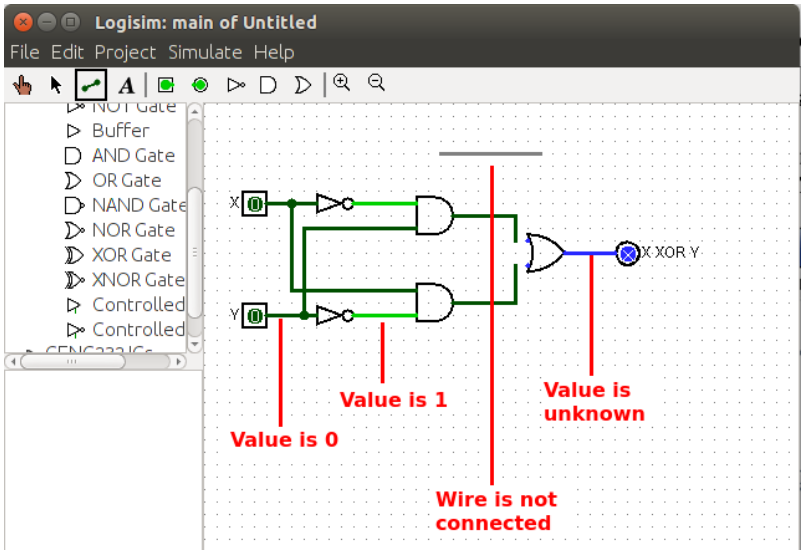
# CHANGING ATTRIBUTES

- Is done by using the attributes pane.
- *Facing* attribute sets the direction you connect cables.
- You can add a *Label* to give input and output pins a name.
- Attributes of gates can only be changed before adding it to canvas.



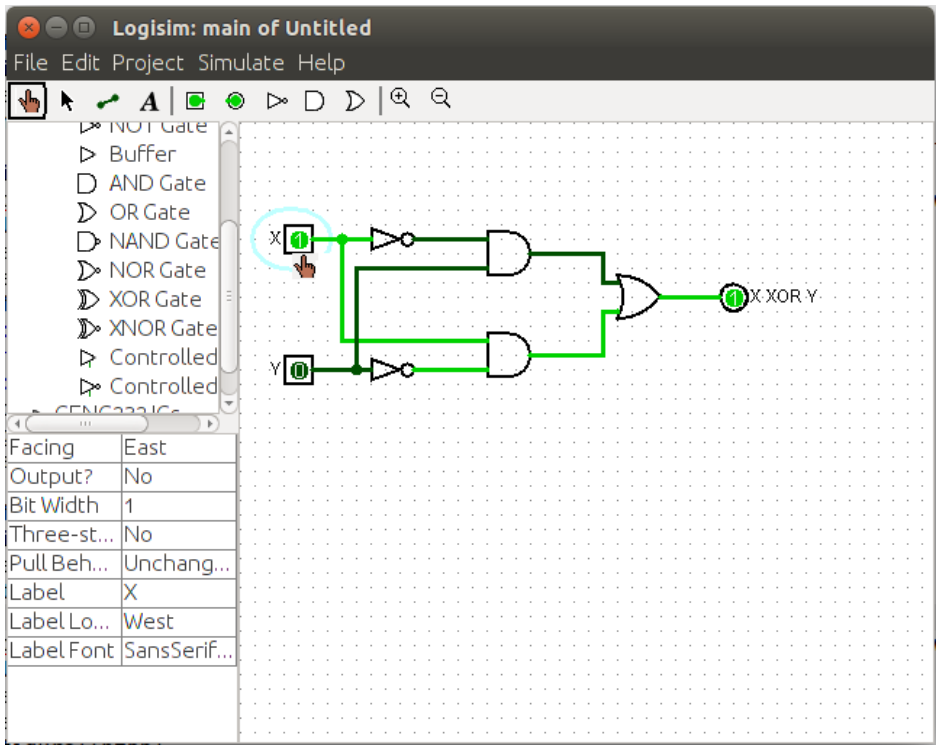
# ADDING WIRES

- Select the wiring tool from tool bar.
- Drag from one position to another in the canvas area, and a wire will start to appear between the two points.
- Wires in Logisim must be horizontal or vertical.
- Logisim automatically draws the circle at a wire intersection to indicate wires are connected.
- Blue in Logisim indicates that the value at that point is *unknown*, and gray indicates that the wire is not connected to anything.



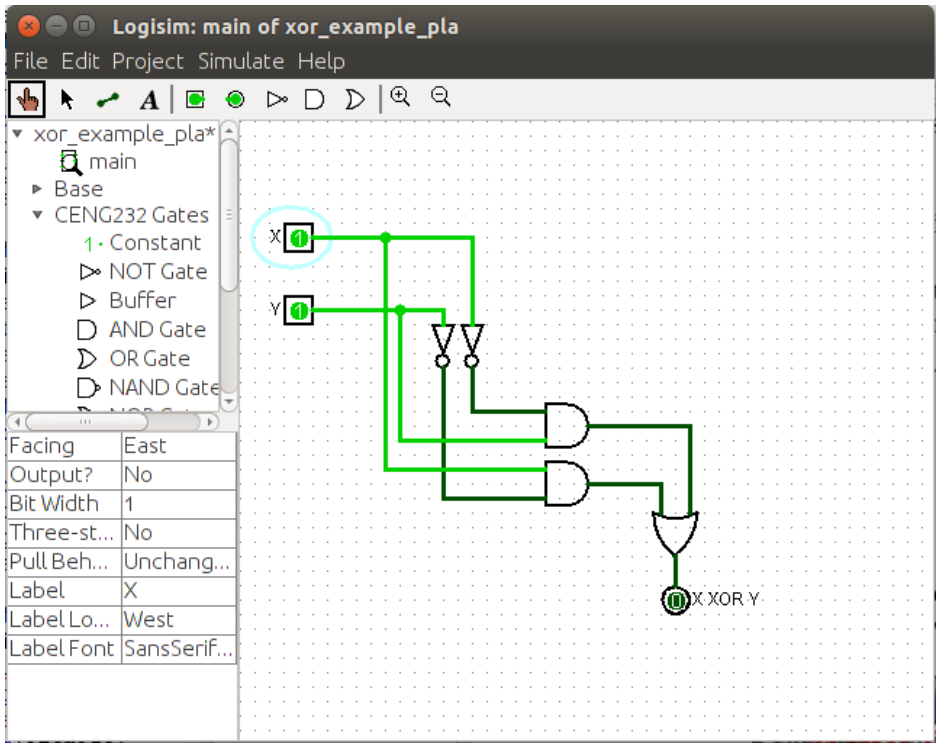
# TESTING YOUR CIRCUIT

- Select poke tool from tool bar.
- Start poking the inputs by clicking on them.
- Each time you poke an input, its value will toggle.



# PLA STYLE

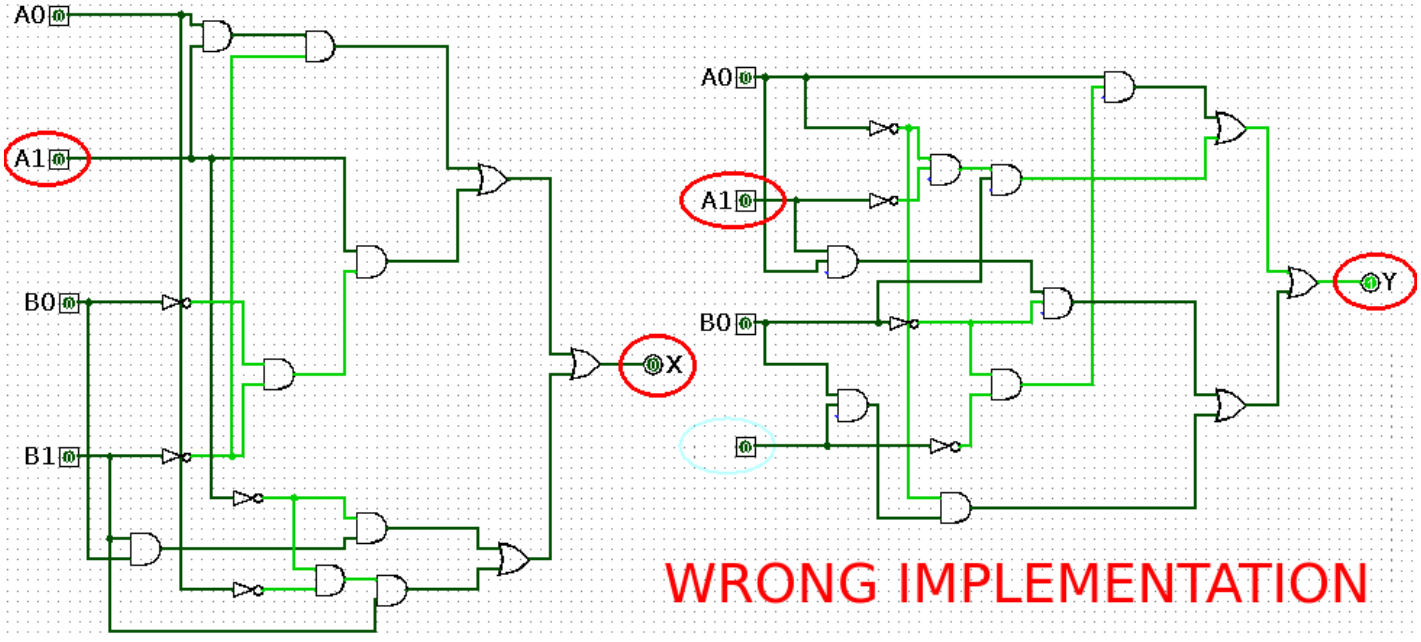
- PLA = Programmable Logic Array
  - A topic that will be covered in the class later.
- Make a 90 degree turn before adding each level of gates.
- More readable and useful when the circuit is large.



# FOR THE LABS

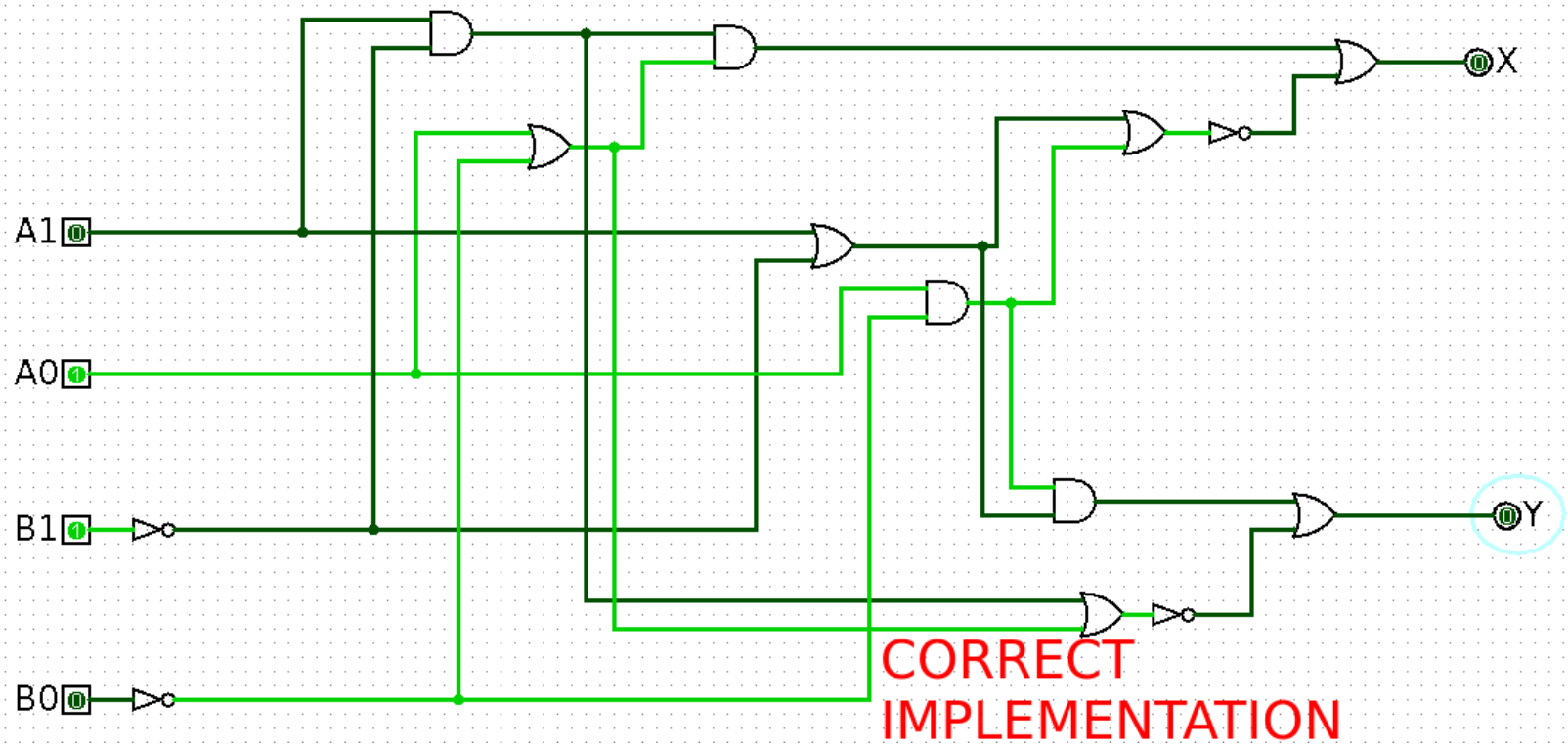
- Label each input and output correctly with the names described in the homework text.
- Generate all outputs by building one circuit (do not build a circuit for each of the outputs !).
- Do not duplicate labels (all labels should be used exactly once).

# FOR THE LABS - DON'TS




- DON'T create duplicate (same name) input and output pins.
- DON'T build separate circuits to provide multiple outputs.
- DON'T forget to label each input pin.
- DON'T use gates apart from CENG232 gates and CENG232 ICs.
- DON'T add a label unless it is specifically wanted.

# FOR THE LABS - DO'S




- Label each input and output.
- Generate a single circuit for all of the outputs.
- Minimize the circuit (use less number of gates).
- Only use the gates allowed for you in that assignment.

# NOTES

- **Black-box testing:**
  - Be careful with labeling.
  - Labels are case sensitive.
  - i.e.: A label ”A0” is not the same label as ”a0” or ”A_0”.

# LINKS AND TOOLS

- Logisim CENG232 version:
  - You can download from ODTUClass course page.
  - Use the provided version only, any other versions won't be graded!