Lab 1.1: Fritzing

Introduction

When working on your circuits at home, it is often not practical to share a video of your breadboard to get assistance from the TA. In addition, since electronic components are usually small and the density of breadboard wires is typically high, it is often impossible to plan out a circuit without a schematic. Fritzing is a program lets you draw a schematic and use that to generate a breadboard layout. The goal of this lab is to install Fritzing, load additional libraries needed for future labs, and use Fritzing to layout the schematic and then circuit for Lab 1.2 and the Lab 1 report.

For Lab 1 we will be using the 555 timer circuit setup as an astable multivibrator, for more information on this circuit, see the Lab 1.2 document.

Prelab Deliverables:

- There is no prelab for Lab 1.
- It is recommended to parse the Arduino Nano Every starter document.
- Make sure you can use the Fritzing software. It is an essential part for asking for help in future labs.

Challenges

Install Fritzing and the ECE 206 libraries, use them to create a version of your NE555 circuit from Lab 1.2 to include with your lab report.

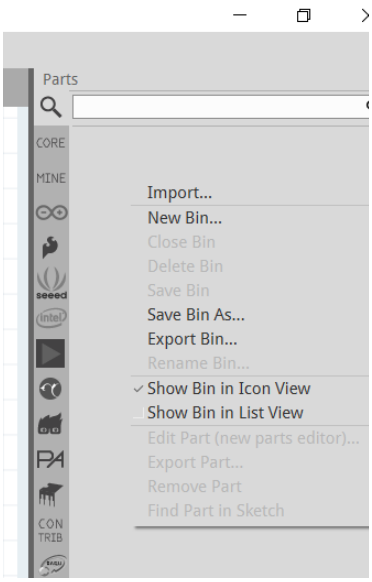

Figure 1. Right click menu in fritzing, note the import button on the top.

- Download the Fritzing installer for your platform (Windows or MAC OS) as well as the ECE 206 libraries.
- Start Fritzing; right-click in the top right region labeled "Parts" and select "Import…" from the menu as demonstrated in Fig. 1. You will then point the application to each of the libraries (i.e., "tsop382.fzpz") wherever you downloaded and extracted them on your computer.
- Select the breadboard window from the primary tabs (the central portion of the application window). Notice that it will show, by default, a blank breadboard.
- Select the third category labeled " MINE " on the top right panel (Parts). These are your custom parts.
- For this lab we will use the Arduino Nano (Rev. 3) found in the fourth category as a stand in for the Arduino Nano every since they have the same pinout. Click and drag the Arduino Nano into the main area and onto the breadboard. Since we are using the Arduino Nano Every for our labs, this will be our' default configuration'. Your screen should look like Figure 2 (USB port facing off the board).
- You can save your sketch by going to "File->Save As," that way, you can start from this layout in the future (e.g., ECE_206_default.fzz).

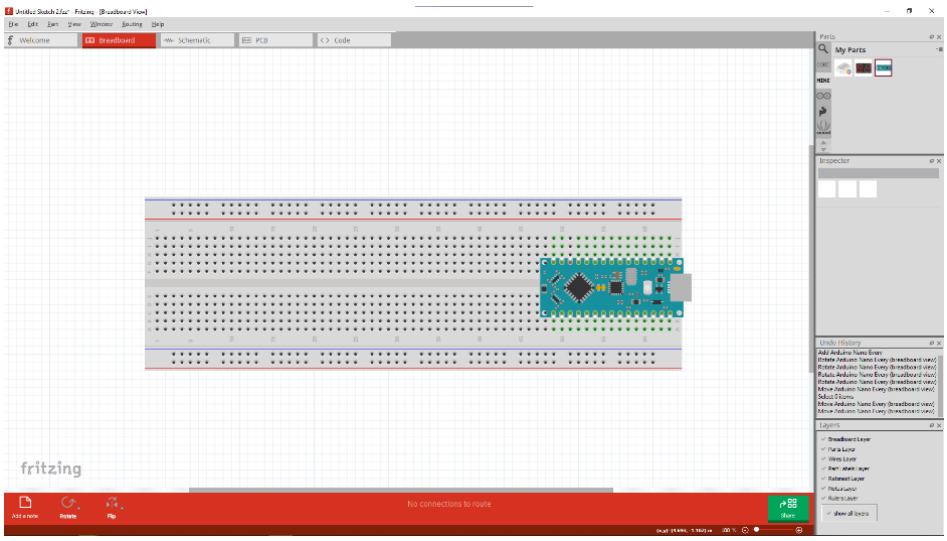

Figure 2. Default configuration for ECE 206.

- Now go to parts->CORE (the second icon), scroll down until you hit ICs, and select the 555 timer. Drag to place this into the center channel (4 pins on either side of the center slot) just like you would on the physical breadboard.
- Switching to schematic view (above the current workspace), place the additional capacitors and resistors shown in Figure 3 and connect the discrete components, 555 timer, and Arduino Nano. The Arduino Nano provides +5V / V_{cc} and ground, as well as connections to the analog (Ax) pins for $V_c(t)$ and $V_{out}(t)$.
    - To change component values (such as for R_1 and R_2) the inspector sidebar may be used. If it is not on the right side of your screen, under the windows dropdown menu, select it.
- When the schematic is laid out switch back to the breadboard view. Because the breadboard layout is linked to the schematic, the components you placed will appear on this second screen. Though it will reflect your schematic, the organization of the components and dotted lines (air wires) may be hard to follow.
- Rearrange the parts and wires as necessary until you can roughly see the needed connections and component orientations. Start by (if you haven't yet) placing the 555 timer on the breadboard with the bevel, a break in the connected colums of pins, down the center.
- Next connect power and ground from your Arduino Nano to the bus bars, noted with red and blue lines on the top and bottom of the breadboard. These run the entire length (left to right) of your breadboard allowing you to easily make connections anywhere on the breadboard. In addition, it is useful to connect the top and bottom sets together.
- Next connect the power/+5 V/V_{cc} pins of the 555 timer to the respective bus lines. This should do two things. First it resolves 3 of the 8 connections to the 555 timer chip, and second, it decreases the amount of clutter from air wires on your screen.
- Then place and connect the resistors so that R_1 is connected to the +5 V bus, the common node of R_1 and R_2 is connected to pin 7 and the other end of R_2 is connected to pin 6.
- Continue placing and connecting components until all air wires are gone, at this point the circuit is ready to be physically implemented.
- Save this design for your future use (e.g., "ECE_206_Lab1.fzz"). Also, you may export both the schematic and breadboard to use for your lab report. (File->Export->Image)

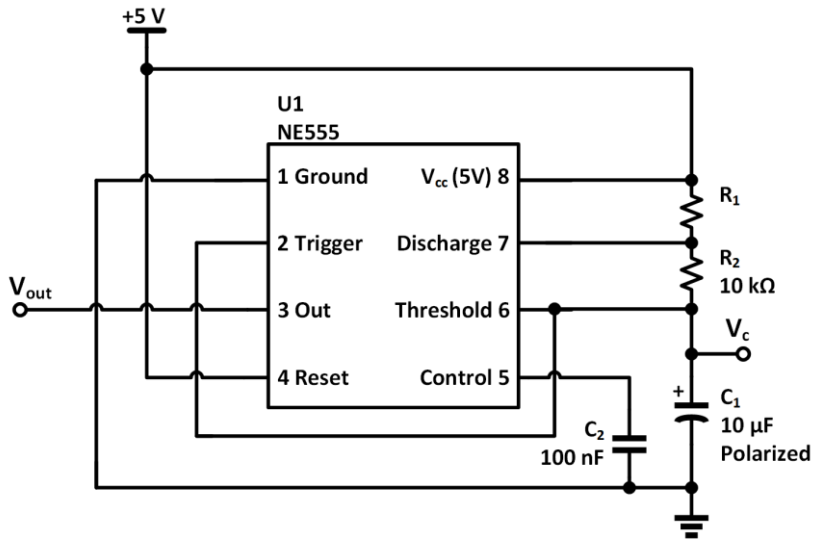

Figure 3. NE555 circuit to be constructed in Lab 1.2. Pin 1 is typically denoted by the beveled edge running along the 1-4 side, a printed or physical dot, or slot in the end between pins 1 and 8. The pins countup counter clockwise around the chip from pin one.

Required Lab Resources

- Fritzing and ECE 206 libraries installed on your computer.

Required Report Deliverables

- Both breadboard layout and schematic to include in your Lab 1 report.