

Etude 2: Perceptron-P

CART 360 AUTUMN 2019

DUE: September 27th by 1:30pm

PUSH: To your CART360 Github ONLINE Repository in the ETUDES directory

WHAT: 1. REFER TO "WHAT TO SUBMIT"

DESCRIPTION:



In Etude-Two, the medium of expression is Light, you are tasked with building a fully functional Perceptron-P – a POV (Persistence of Vision) circuit. Etude-Two has two purposes: a) Translate a Simple Circuit Diagram into a Fully Functional Circuit and b) Solder Components onto a Perforated Circuit Board in order to produce a Fully Functioning Perceptron-P. In both part a) and b) of the Etude, you will need to recall concepts presented during last week's lecture i.e. Identification of Components, Polarity and Flow 'n Control of an Electric Signal (Voltage/Current/Resistance). In addition, Etude-Two will require the usage and familiarization of Essential Tools to successfully complete the circuit i.e. Perf Board, Solder Iron, Solder, Desoldering Pump, Wire, Discrete Components and the Circuit diagram. For this Etude-Two to be successful, you need to plan your Circuit building approach. There will be a (single) fully operational demonstration circuit for reference in the Sensor Lab.

Finally, for Etude-Two, there is **no requirement** for you to write the Arduino code needed to make the Perceptron-P function. The code for Perceptron-P will be included with this description as an Arduino Project, the code will be presented in-class.

Sensor Lab will provide you with the following components:

- a) Perforated Circuit Board
- b) Momentary Switch
- c) 2032 Coin Cell Battery Clip
- d) 2032 Coin Cell
- e) Five Blue LEDs
- f) One 220 Ohm Resistor

From your Kit you will source the following components:

- a) ATtiny 85 Microcontroller
- b) ATtiny Microcontroller PDIP Connector

Sensor Lab will provide you with the following Essential Tools to complete the task:

- a) Solder Iron Station
- b) Solder
- c) Masking Tape
- d) Fume Extractor
- e) Desoldering Pump
- f) Wire Cutter / Strippers
- g) Wire Side Cutters

Nota Bene: Etude-Two is intended to be completed, within 4 Hours, the majority of which could be allocated to working in the Sensor Lab over the course of the week – **during Sensor Lab Open Hours.**

PRELUDE: Arduino IDE Setup

Prepare your Arduino IDE, such that it can be used to program the ATtiny85. Programming the ATtiny85 will be done in the Sensor Lab, but from within your Arduino IDE on your laptop. For this procedure, you need to install the ATtiny85 Hardware Definition Library – such that the Arduino IDE can communicate appropriately with the ATtiny85.

Step One: Open the Preferences Dialog in the Arduino IDE

Step Two: Find the "Additional Boards Manager URLs"

Step Three: Copy, without the quotes, " https://raw.githubusercontent.com/damellis/attiny/ide-1.6.x-boards-manager/package_damellis_attiny_index.json " into the "Additional Boards Manager URLs" Field.

Step Four: Click on "OK", update your Arduino Preferences.

Step Five: Open the Boards Manager located in "Tools > Board > Boards Manager ..."

Step Six: Search for "ATtiny"

Step Seven: Select the "ATtiny" Entry. An "Install" Button should appear. Click "Install"

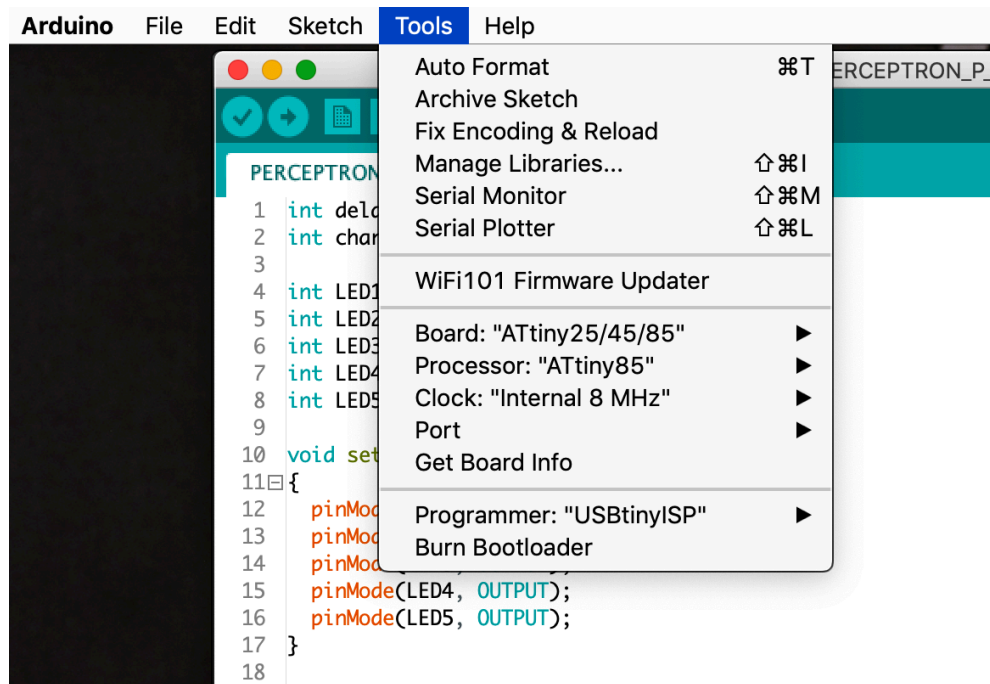
Step Eight: "Installed" should appear. Close the Board Manager ...

Step Nine: Open "Tools > Boards" – ATtiny should now be listed. Look for "ATtiny25/45/85"– Select

Step Ten: Make sure all the entries in your Arduino IDE look like in the image below. Check: Board, Processor, Clock, Programmer.

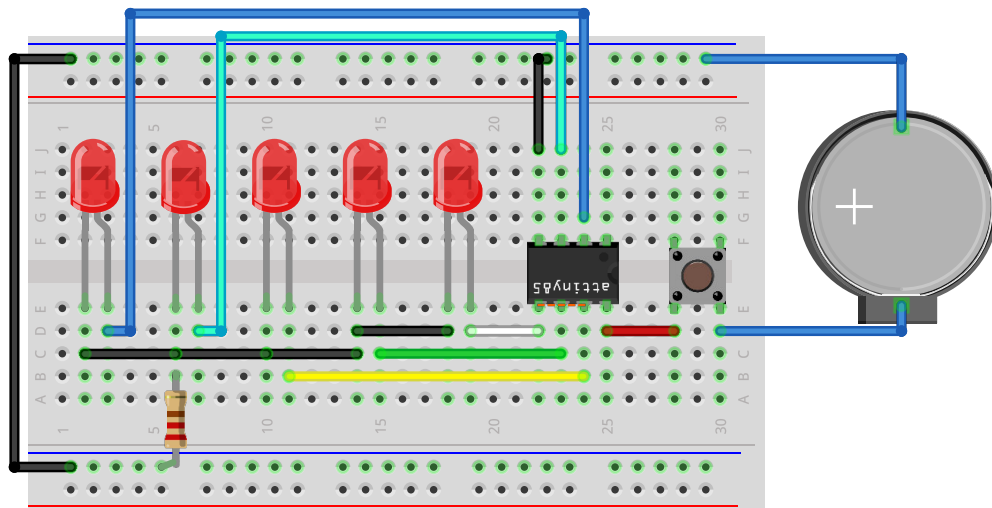
Test ATtiny Library Installation: Start the Arduino IDE and then Open the provided Etude-Two Sketch. Once opened, click on "Verify" (Checkmark Icon). If it succeeds, your Arduino IDE is

correctly setup to program the ATtiny85.

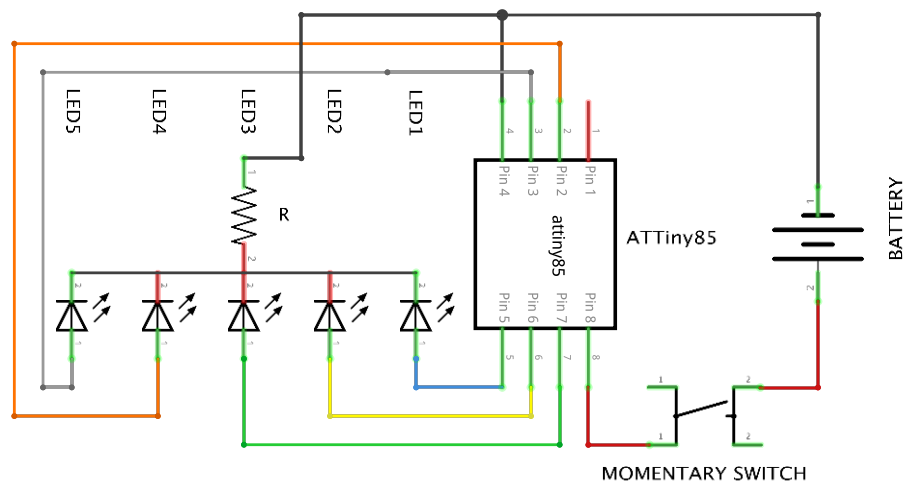


Arduino Configuration for Programming the ATtiny85.

PART ONE: Perceptron-P (Etude-Two Circuit to be built)



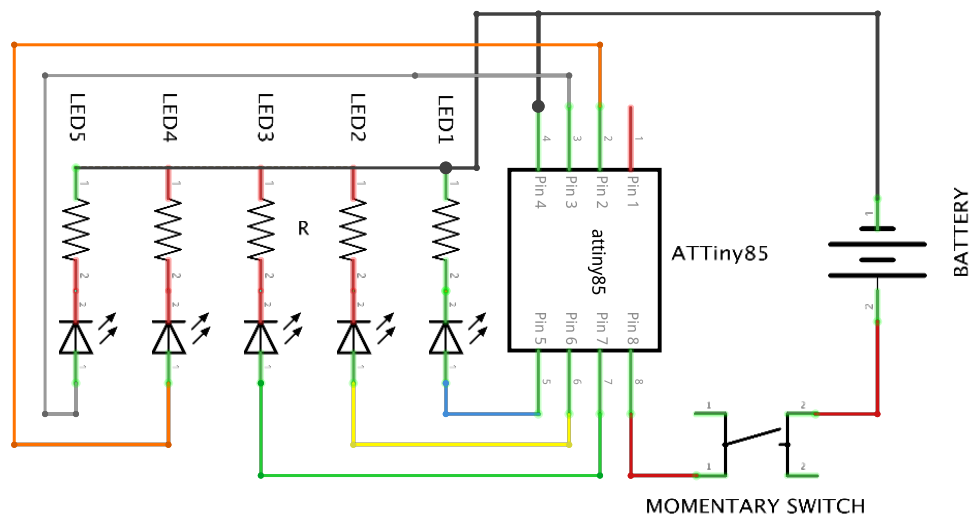
Graphic Depiction of Perceptron-P.



Electronic Schematic of Perceptron-P (Built Circuit).

PART TWO: Perceptron-P (Etude-Two Alternate Circuit)

Compare and contrast the Electronic Schematics of the **Built Circuit** to the **Alternate Circuit**. Determine the feature(s) that distinguish these two circuits – what makes them different? Why? Which of the circuits presented would be more reliable circuit – Why? What is occurring with the $V/I/R$ in the area(s) that you have discerned as important? How would you further extend the Perceptron-P, what would you introduce to the Perceptron-P in order to make the experience more meaningful? Draw the modified circuit in Fritzing (Fritzing.org).



Electronic Schematic of Perceptron-P (Alternate Circuit).

PART THREE: Perceptron-P with new custom Character

In development of the Perceptron-P for this etude you were provided with all of the discrete components to successfully build Perceptron-P. Perceptron-P also has an alphabet = {a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, ?, !, . }. For PART THREE, examine the source code and propose how you would introduce a new custom character (of your choosing) to Perceptron-P's alphabet.

Write the necessary code that you would need to introduce to the Perceptron-P source code, such that it will successfully compile and your compiled program will dynamically showcase your newly added character to Perceptron-P alphabet.

WHAT TO SUBMIT

For your Etude-Two submission, upload to your Github Respository, a single PDF document that will contain the following:

- a) Documentation of PART ONE – clearly document your approach and strategy i.e. notes / observations / photos of circuit building progress.
- b) Answer to PART TWO including your proposed changes and Fritzing Diagram.

Separately, but in the same Etude-Two Folder, ensure:

- c) Upload a video of your working Perceptron-P and five (5) good quality images which showcase the Perceptron-P POV in action.

**** NOTE ABOUT THE PERCEPTRON-P CODE.**

You will be provided the code, as mentioned, in order to complete and test the installation of the **ATtiny Hardware Definition Library** in your Arduino IDE – Etude-Two: Prelude.

The actual programming of the ATtiny85 will be done in the Sensor Lab using the USBtinyISP Programmer i.e From your Arduino IDE > Upload the Perceptron-P code to the ATtiny85. Ensure that your Arduino IDE is correctly Setup.

**** NOTE ABOUT SENSOR LAB OPEN HOURS.**

Ensure that you are aware of the Sensor Lab Open Hours. Additionally, you can work on your Etude-Two during the Open Hours of the Visual Communication Lab. Look at the Open Hours for the Sensor Lab and VC Lab

<https://slab.concordia.ca>
<https://vclab.concordia.ca>

Finally, IF both the Sensor Lab and VC Lab are CLOSED i.e. Wednesday Afternoon – ask Sabine to open the Sensor Lab (Contingent on there being no classes held in the Sensor Lab).