

Etude 4: EmitEmo

CART 360 AUTUMN 2020

DUE: November 6th by 13H30

SUBMIT: To the Etude 4 Assignment Resource on the CART 360 Moodle page

WHAT: 1. REFER TO "WHAT TO SUBMIT"

ETUDE 4 DESCRIPTION:

Etude 4, an extension of Etude 3. In Etude 3, you were required to assemble the circuit on your breadboard, correctly connect all respective I/O to your Arduino and load the provided Arduino framework, in which you added (programmed) the missing code functionality to arrive at the desired goal. Sound and State Change Control of your Arduino!

For Etude 4, the primary focus is to continue with State Change Detection along with the incorporation of Timers and use of Averaging Algorithms (**Running Average**). The intention of Etude 4 is to showcase why Timers are a preferred option to using Delays (hardcoded wait periods) and why Averaging Algorithms (Average Filter, Buffered Average and Weighted Average) are necessary when dealing with your I/O data. Refer **Algorithmic Approaches (Slides)**.

The circuit for Etude 4, Fritzing Diagram is included below, is essentially the same as for Etude 3, except for one minor addition – Etude 4 incorporates a Photocell as an additional Analog Input. The input of the Photocell will be used to modulate (alter) your sound.

***In Etude 4, you are NOT REQUIRED to store (record) the modulated sound for use in your playback modes – the feature is beyond the scope of Etude 4.**

You will use:

The completed circuit from Etude 3, along with the inclusion of the Photocell and the Etude 4 Arduino Framework.

The outcome of the etude will extend the playable quality of the keyboard by:

- a) Modulating the sound of each note using the Photocell as modulator in both live mode and record mode (* See Above)
- b) Capturing the length (time) of each note played in **Record Mode Only**
- c) RGB LED in Etude 4 has Two Functions (Mode & Note Intensity) – RGB LED intensity (brightness) will change based on note intensity in Playback Mode
- d) Incorporate Timers and calculate the Running Average for your I/O.

Carefully Read the Etude 4 Instructions in the provided Arduino Etude 4 Framework

PART ONE: GET THAT TIME (3.5 Pts)

Use: CART_360_ETUDE_4 SKETCH

INSTRUCTIONS:

- Step 1: Please build the circuit as **depicted in** the Fritzing Diagram – see below.
- Step 2: Hook up your RGB Led to digital pins (acting as analog pins through PWM) 9, 10, 11
- Step 3: Hook up the buttons connected to the resistor ladder to analog pin A0
- Step 4: Hook up the Piezo Buzzer to pin 3 as an analog output
- Step 5: Hook up the mode button to pin 2 as a digital input
- Step 6: Hook up the Photocell to Analog Pin A1 as analog input
- Step 7: Please make a **copy of the template code file supplied** and **follow** the instructions as specified in the provided Arduino Sketch.
- Step 8: Please provide meaningful comments for any code that you write.
- Step 9: Once completed, make a short video of your keyboard working in all 5 modes (~ 1-2 min).
- Step 10: Save your CART_360_ETUDE_4 SKETCH (REFER TO "WHAT TO SUBMIT")

PART TWO: OPTIMISE APPROACH (1.5 Pts)

In your completed Arduino Sketch for **PART ONE** of Etude four, in a multiline comment section at the end of the file – provide a concrete suggestion for how the Timer functionality can be used for the Live Mode? As pseudo-arduino-code, what would the **code flow** for this improved Live Mode function appear.

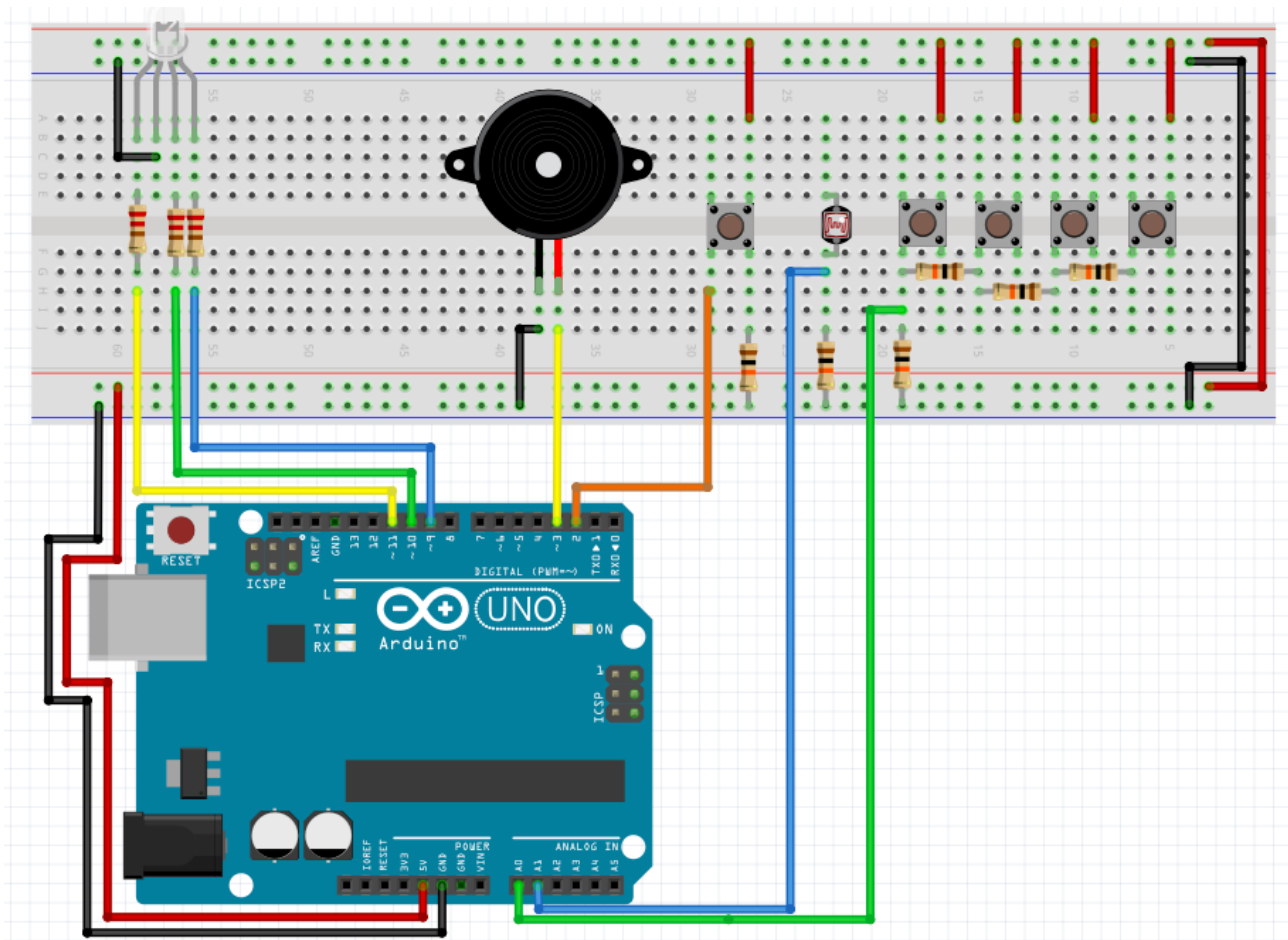
WHAT TO SUBMIT

For ETUDE-FOUR on the CART360 Moodle page, submit a single archive (zip) that will contain the following:

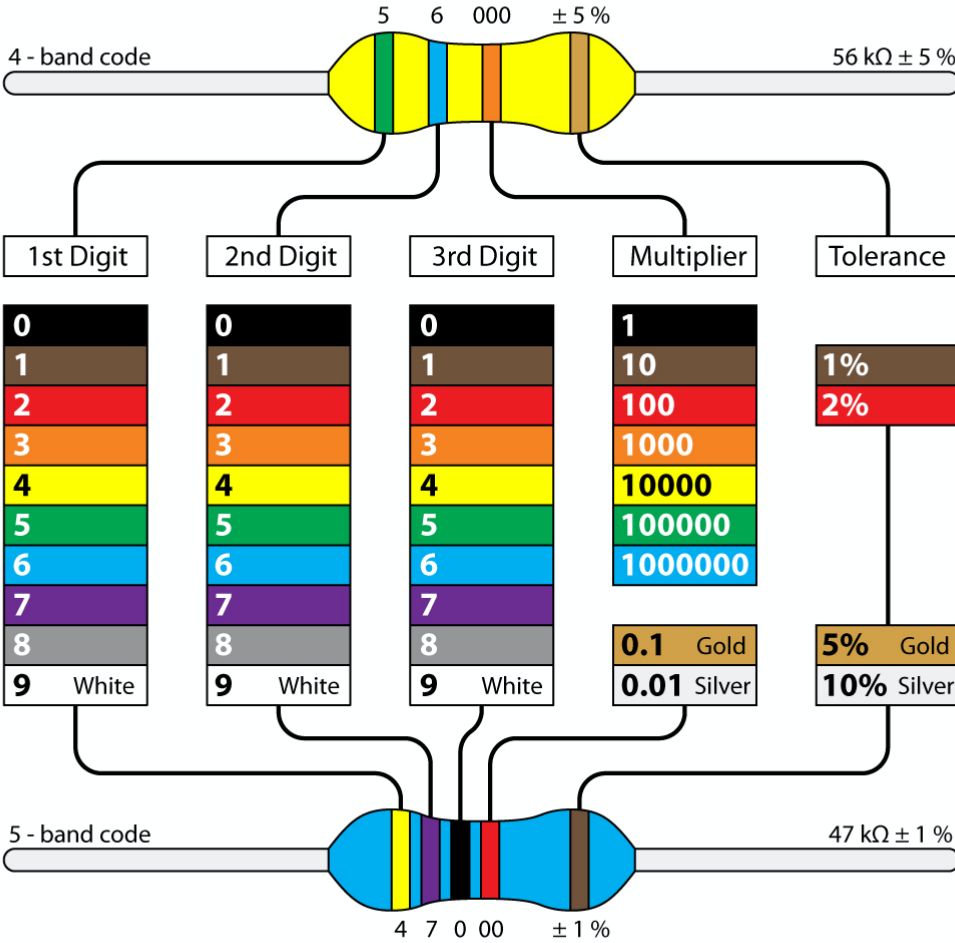
- Documentation of PART ONE – clearly document your approach and strategy i.e. notes / observations / photos of circuit building progress.
- Ensure that the Arduino Sketches for Part One are uploaded/ included– complete with all required code functionality and appropriate comments
- Completed answer to Part Two.

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

- Upload a video of your working Part One, clearly depict all 5 Modes in action, and five (5) good quality images.



Resistor colour code



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