Etude 2: LoopyLoop

CART 360 AUTUMN 2021

DUE: October 15th by 13H30

SUBMIT: To the Etude 2 Assignment Resource on the CART 360 Moodle page

WHAT: 1. REFER TO "WHAT TO SUBMIT"

DESCRIPTION:
The purpose of this exercise is to become familiar with programming in the Arduino IDE as well as basic input /output processes and decision making.

You will use:
An RGB led (**Mode Indicator**)
4 buttons (Keyboard: 4 Notes Input)
1 button (**Mode Selector**: live /record /playback /playback custom mode/ reset)
1 Piezo Buzzer (Sound Output)
Resistors (10K Ohm) *** See Notes on Resistors**

The outcome of the exercise is that you will create a simple keyboard – using the 4 buttons, each one will output a different note – you can then play live, record a small sequence, play back that sequence, play a custom sequence and reset. The RGB Led will be an indicator of the mode you are in (reset/live/record/playback/custom playback mode) by illuminating a different colour. **At any given time, you can only be in 1 mode.**

Notes on Resistors
For this etude, as seen in the Fritizing Diagram, the initial reference circuit is built using an initial set of resistors (10K Ohm). This set of resistors (Resistor Ladder) can be used to *differentiate* the *input* connected to a single pin.

Each set consists of three resistors connected in **Series** (Resistor Ladder) on your Keyboard. It is strongly recommended to experiment i.e. SetOne = {1M Ohm, 1M Ohm, 1M Ohm }, SetTwo = {10K Ohm, 10K Ohm, 10K Ohm }, SetThree = {10K Ohm, 1K Ohm, 200 Ohm }, SetFour = {200 Ohm, 200 Ohm, 200 Ohm }. Mix them up.

PART ONE: BASIC ANALOG TONE CREATION (2.5 Pts)
Use: CART_360_ETUDE_2_MODE SKETCH

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: Please make a **copy of the template code file supplied** and **follow** the instructions as specified in the provided Arduino Sketch.
Step 7: Please provide meaningful comments for any code that you write.
Step 8: Once completed, make a short video of your keyboard working in all 5 modes (~ 1 – 2 min).
Step 9: Save your CART_360_ETUDE_2_MODE SKETCH (REFER TO "WHAT TO SUBMIT")

PART TWO: SHORT ANSWER (1.5 Pts)
In your completed Arduino Sketch for **PART ONE of Etude Two**, in a multiline comment section at the end of the file – provide an analysis of the observed behaviour of the resistor ladder (keyboard), mode selector and what is occurring on the Arduino as a voltage. How does the input become audible sound?

PART THREE: #INCLUDE PITCHES.H INTO SKETCH (1.0 Pts)
USE: CART_360_ETUDE_2_PITCHES SKETCH

For Part three of Etude Two, you will utilise the **exact same circuit as in part one.** Part three requires you to **#include** the "pitches.h" into a new Arduino Sketch - CART_360_ETUDE_2_PITCHES.INO.

Step 1: Please use the circuit as **built** for Part One.
Step 2: Open CART_360_ETUDE_2_PITCHES SKETCH
Step 3: #include "pitches.h" into the CART_360_ETUDE_2_PITCHES.INO
Step 4: **REPURPOSE CODE FROM CART_360_ETUDE_2_MODE.INO for: reset(), live(), play(), record(), looper() (Merely Copy 'n Paste between Arduino Sketches).**
Step 5: For Part three, you will need to discern how to CAPTURE and TRANSFORM the button press event (Sound Producing Event) into a specific Pitch Range (C5_D5_E5_F5_G5) – look inside "pitches.h" to see how Notes are defined – use the Note Constants in the code.

Each Button Press (Button 1..4) will output a discrete number within a range (0..1023). You will need to determine what these discrete values are - Serial.println(analogRead(0)). Once determined you can proceed to Step 6.

Step 6: HINT: You will need to create a function that handles the transformation from the determined value to a Note Constant – then store the result in the notes[array] used by the **live(), play(), record(), looper() functions.**
Step 7: Please provide meaningful comments for any code that you write.
Step 8: Once completed, make a short video of your keyboard working in all 5 modes using the Notes generated by inclusion of the pitches.h (~ 1 – 2 min).
Step 9: Save CART_360_ETUDE_2_PITCHES SKETCH (REFER TO "WHAT TO SUBMIT")

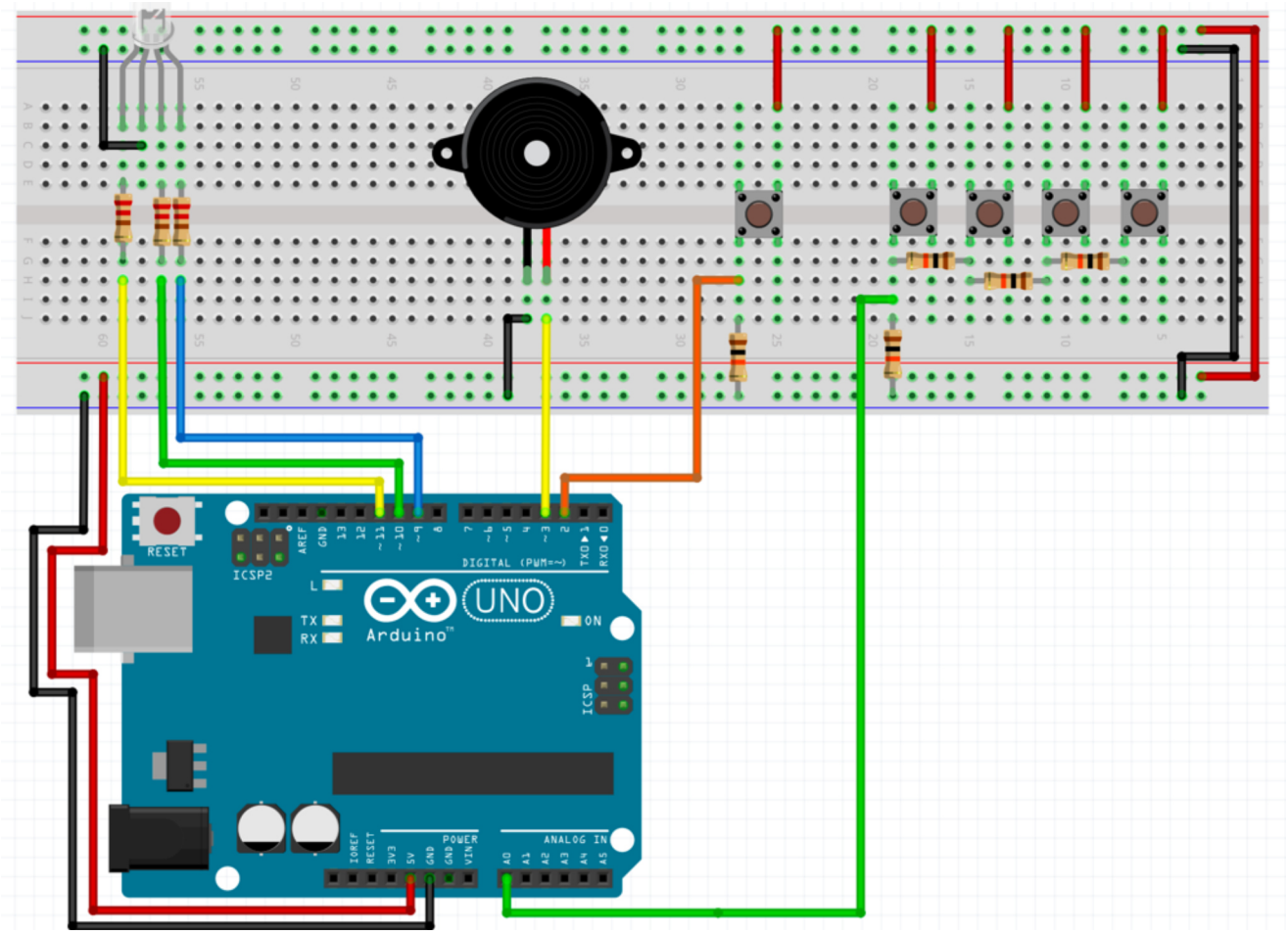
WHAT TO SUBMIT

For ETUDE-TWO on the CART360 Moodle page, submit a single archive (zip) 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) Ensure that the Arduino Sketches for Part One and Part Two are uploaded/ included– complete with all required code functionality and appropriate comments
c) Completed answer to Part Two.

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

d) Upload a video of your working Part One and Part Two, each of which should clearly depict all 5 Modes in action, and five (3) good quality images.



Resistor colour code