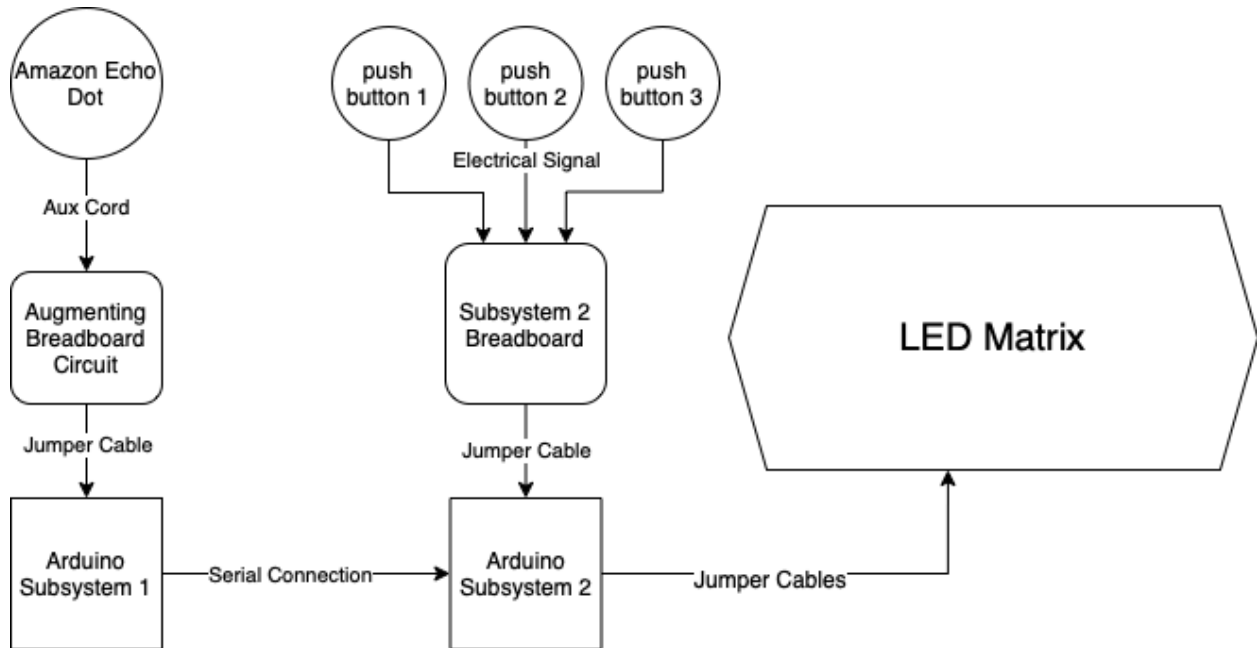
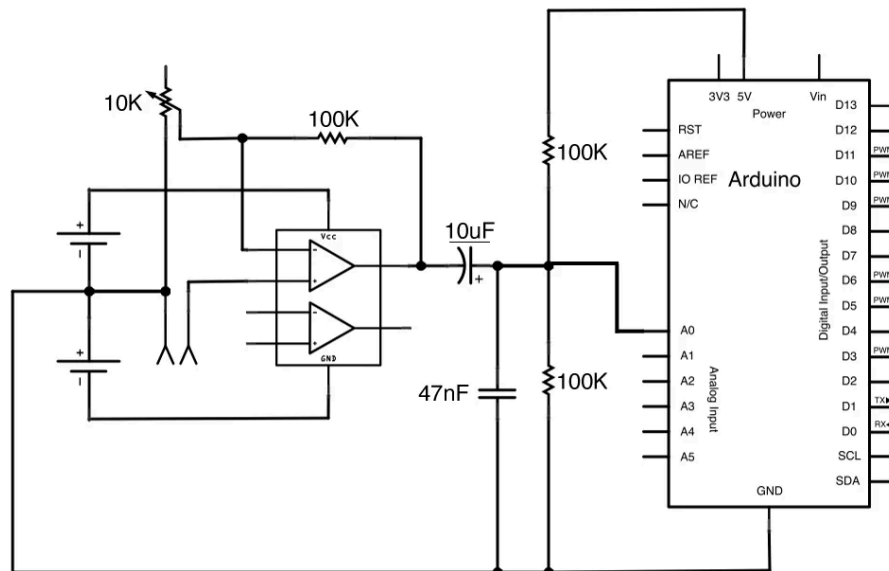


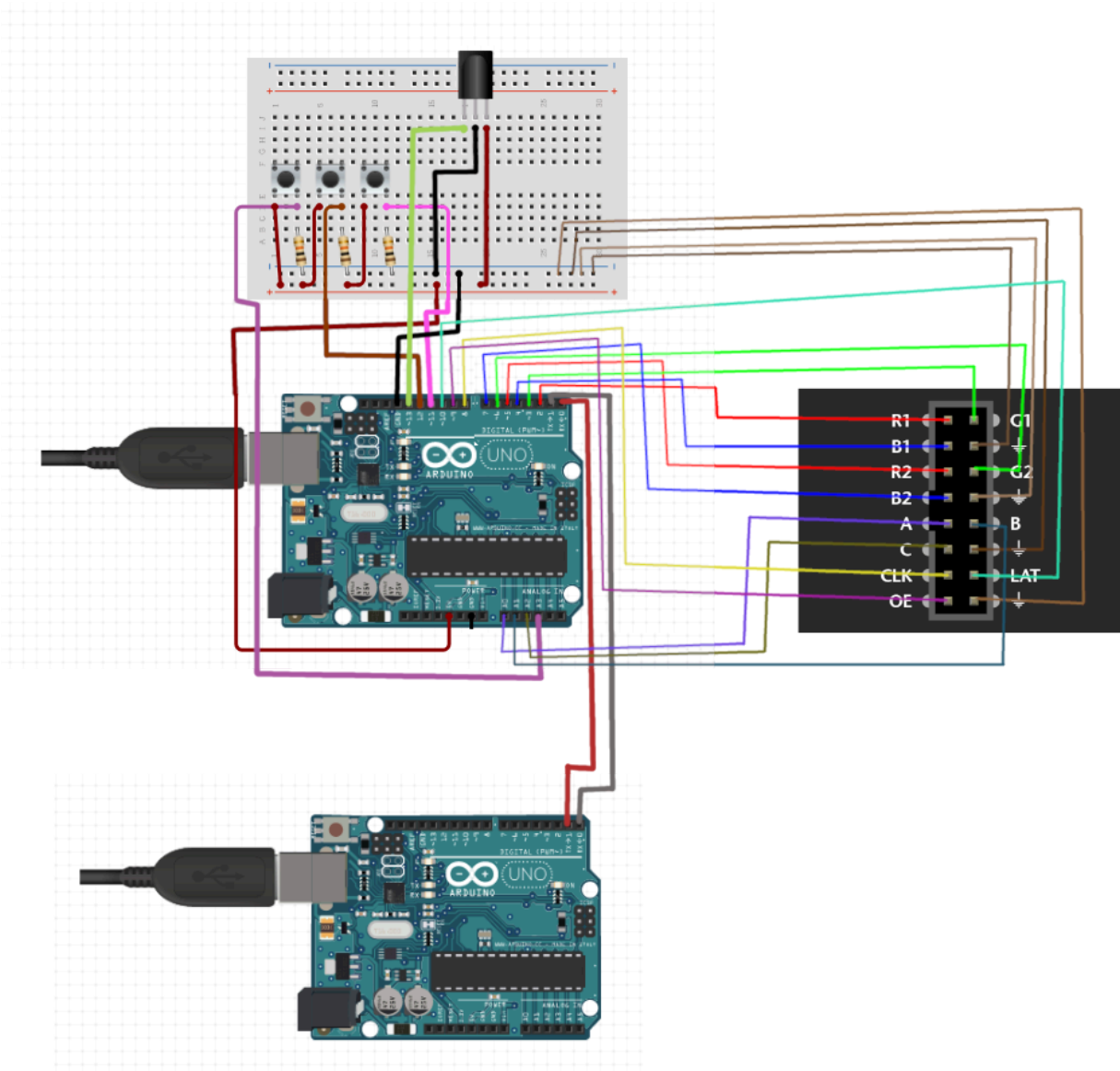
1. System Block Diagram.



2. Hardware Diagram

Subsystem 1 augmenting circuit (diagram sourced from [source](#), also cited in references) (Adrian)





Subsystem 2 LED panel schematic (Tom)

3. *List of Materials*

- (1) IR Receiver Module
- (1) Remote Control
- (2) Arduino Unos
- (3) 220 ohm resistors
- (3) 10K ohm resistors
- (1) Potentiometer
- (1) 3.5mm TRRS Audio Jack
- (1) 5V Voltage Regulator
- (1) 100nF Ceramic Capacitor

(1) 1uF/50V Electrolytic Capacitor -
<https://octopart.com/uvk1h010mdd1td-nichicon-30498148>

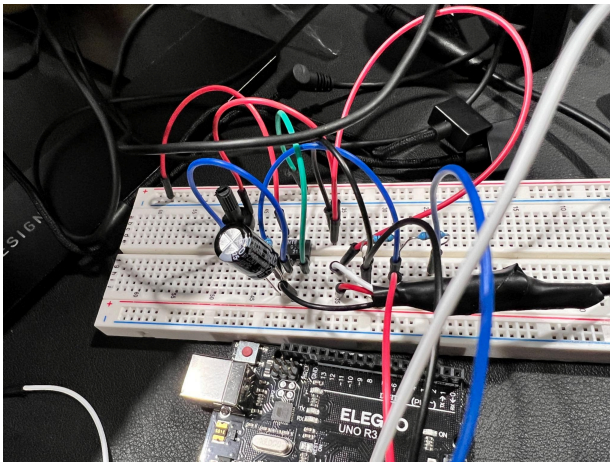
(1) 16x32 LED Matrix

(2) 9V batteries

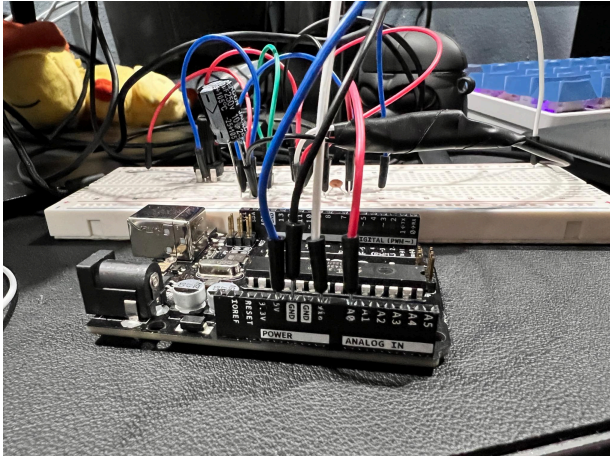
Wires, USB cables, and adaptors

4. *Steps to build your project*

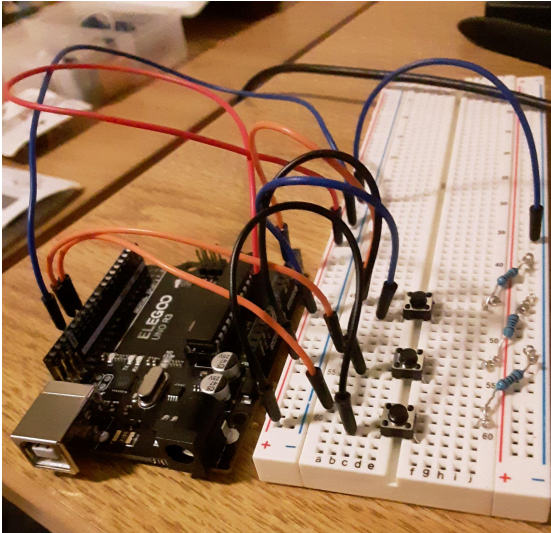
1. Wire augmenting circuit to subsystem 1 breadboard



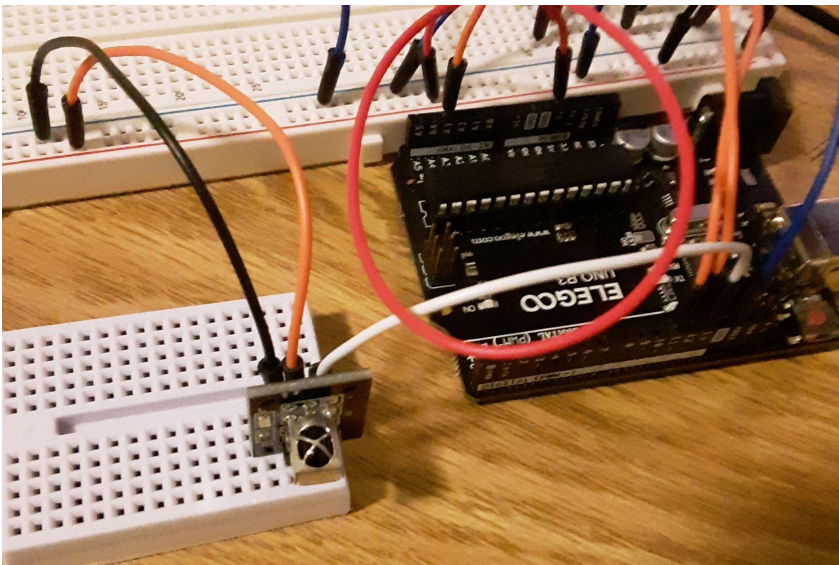
2. Wire circuit to subsystem 1 arduino



3. Wire push button circuits to subsystem 2 breadboard (use 220 ohm resistors here).



4. Wire breadboard to subsystem 2 arduino



5. Wire LED Matrix to arduino (pinout shown below)

Start from brown

2
3
4
Ground
5
6
7
Ground
A0
A1
A2
Ground
8
10
9
Ground

6. Connect Amazon Echo Dot to subsystem 1
7. Connect subsystem 1 serial ports to subsystem 2 serial ports
8. Connect 9V batteries to both subsystems

5. *User Guide*

1. Connect 9V batteries to both subsystems (if they are not already connected)
2. Connect Amazon Echo Dot or other audio device through aux into the subsystem 1 port (if one is not already connected)
3. Play audio on the connected device
4. To change the visualization mode, press push button 1. The user must cycle through modes in one direction to choose. Similarly, the colors and number of bars (classicVisualizer2 only) are cycled through push buttons 2 and 3 in one direction, similarly to push button 1
5. Optionally, the user may use a remote control to operate the Arduino. Note that the remote must be an Elegoo remote (as shown), otherwise the remote controls won't work.
 - a. Buttons 0-5 switch to a visualization mode directly.
 - b. Vol+ and Vol- change the color option, either forwards or backwards.
 - c. "Skip back" lowers the bottom threshold of the audio data, while "skip forward" raises it. The bottom threshold controls what the visualization considers the minimum valid data. Adjusting it may be necessary for certain systems, if the audio data is not within expected boundaries.
 - d. "Down" lowers the top threshold of the audio data, while "Up" raises the top threshold. The top threshold controls what the visualization considers the maximum valid value.
 - e. "Eq" changes the number of bars displayed for certain visualization modes.



6. *Similar Projects (State of the art)*

- Burgess, Phillip. "Tiny Arduino Music Visualizer". Adafruit. November 28, 2012. <<https://learn.adafruit.com/piccolo/overview>>
 - Similarly to subsystem 2, the visualization in this project is implemented through a LED matrix
 - Differently from this project, the audio information is not received through a digital file, but from measured electrical signals
- Bartlett, Michael. "Interactive LED Music Visualizer". Sparkfun. May 27, 2016. <<https://learn.sparkfun.com/tutorials/interactive-led-music-visualizer/all>>
 - Similarly to subsystem 2, audio information is appropriately filtered/formatted and modes are switched through push buttons
 - Differently from subsystem 1, information is received through a microphone rather than aux cable and differently from subsystem 2, implementation occurs through an LED strip rather than a matrix
- Amandaghassaei, & Instructables. (2017, October 27). *Arduino audio input*. Instructables. Retrieved December 7, 2022, from <<https://www.instructables.com/Arduino-Audio-Input/>>
 - This project is the basis for subsystem 1, but does not provide specific instructions for further implementation. This project is open source and is being cited in this paper.

7. *References*

References:

- mircemk. "DIY LUMAZOID Arduino Music Visualiser". Hackaday.io. December 4, 2021. <<https://hackaday.com/2021/12/08/an-easy-music-visualizer-with-the-arduino-nano/>>
- Burgess, Phillip. "Tiny Arduino Music Visualizer". Adafruit. November 28, 2012. <<https://learn.adafruit.com/piccolo/overview>>
- Burgess, Phillip. "32x16 and 32x32 RGB LED Matrix". Adafruit. December 11, 2012. <<https://learn.adafruit.com/32x16-32x32-rgb-led-matrix?view=all>>
- Bartlett, Michael. "Interactive LED Music Visualizer". Sparkfun. May 27, 2016. <<https://learn.sparkfun.com/tutorials/interactive-led-music-visualizer/all>>
- astrodan3. "Arduino Infrared Remote Tutorial". Instructables. September 24, 2014. <<https://instructables.com/Arduino-Infrared-Remote-tutorial>>
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- Amandaghassaei, & Instructables. (2017, October 27). *Arduino audio input*.

Instructables. Retrieved December 7, 2022, from
<<https://www.instructables.com/Arduino-Audio-Input/>>