Labo Piano Light FX
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https://learn.adafruit.com/lab-piano-light-fx

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Overview

Nintendo Labo Toy-Cons are a lot of fun to build, but customizing them is the real icing on the cake. Let's spice up the Piano Toy-Con with sound-triggered lighting effects courtesy of Circuit Playground Express.

What you'll need

- Nintendo Switch
- Assembled Labo Piano Toy-Con
- Circuit Playground Express
- Electret Microphone Amplifier Board
- Silicone Cover Stranded Wire in three different colors (solid core works too!)
- LiPo Battery
- Soldering Iron & Solder
- Double Sided Tape
- Wire Strippers
- Micro USB cable
- Computer

Wiring

Circuit Playground Express has a built-in microphone, but we'll need to mount it away from the Switch's speakers in order to see our lighting effects. Let's use a separate
mic that we can mount close to the Switch's speaker - then use wires to connect it to
the Circuit Playground Express.

**Prep the wires**

Cut three pieces of wire - each about 30cm long, one in blue, one in white, and
one in red.
Strip about 7mm of shielding from both ends of each wire.
Tin each exposed end with solder.
Solder wires to the Circuit Playground Express

Now we'll connect those wires to the Circuit Playground's contacts. Each wire color connects to a specific contact pad:

- Red wire connects to 3.3V
- Blue wire connects to GND
- White wire connects to A7
Poke each tinned wire lead through its corresponding contact pad, bend the wire around the outside of the pad to keep it in place - and then solder it securely.
Solder Wires to the Electret Microphone Amplifier

Next, we'll connect our wiring to the Microphone board. Each wire color connects to a specific pad on the Microphone board. Poke each wire through its respective pad and solder in place:

- Red wire connects to V+
- Blue wire connects to GND
- White wire connects to Out

At this point, you can loosely braid the wires in order to keep them grouped neatly together. This is optional :)

Once each wire is soldered to the board, clip any excess leads off to avoid accidental bridging between the pads.

That's all for soldering and wiring - now we can move on to programming the board.

Software

Now we'll add the software that will make Circuit Playground Express's neopixels light up whenever the Electret Microphone board detects sound.
Connect

Connect the Circuit Playground Express to your computer with a micro USB cable. You should see a drive named "CIRCUITPY" appear on your computer.

Install Libraries

You'll need to have the Neopixel library installed on your Circuit Playground Express in order to run this project's CircuitPython code. Follow the steps on this page to install the CircuitPython library bundle.

Upload Project Code

Copy the following code, paste it into a plain text file or code editor such as Mu. Save the file as "code.py" to the CIRCUITPY drive.

```
# SPDX-FileCopyrightText: 2018 Collin Cunningham for Adafruit Industries
#
# SPDX-License-Identifier: MIT
```
import board
from rainbowio import colorwheel
import neopixel
from analogio import AnalogIn

n_pixels = 10  # Number of pixels you are using
dc_offset = 0  # DC offset in mic signal - if unsure, leave 0
noise = 100  # Noise/hum/interference in mic signal
lvl = 10  # Current “dampened” audio level
maxbrt = 127  # Maximum brightness of the neopixels (0-255)
wheelStart = 0  # Start of the RGB spectrum we’ll use
wheelEnd = 255  # End of the RGB spectrum we’ll use

mic_pin = AnalogIn(board.A7)

# Set up NeoPixels and turn them all off.
strip = neopixel.NeoPixel(board.NEOPIXEL, n_pixels,
                           brightness=0.1, auto_write=False)
strip.fill(0)
strip.show()

def remapRangeSafe(value, leftMin, leftMax, rightMin, rightMax):
    # this remaps a value from original (left) range to new (right) range

    # Force the input value to within left min & max
    if value < leftMin:
        value = leftMin
    if value > leftMax:
        value = leftMax

    # Figure out how 'wide' each range is
    leftSpan = leftMax - leftMin
    rightSpan = rightMax - rightMin

    # Convert the left range into a 0-1 range (int)
    valueScaled = int(value - leftMin) / int(leftSpan)

    # Convert the 0-1 range into a value in the right range.
    return int(rightMin + (valueScaled * rightSpan))

while True:
    n = int((mic_pin.value / 65536) * 1000)  # 10-bit ADC format
    n = abs(n - 512 - dc_offset)  # Center on zero
    if n >= noise:  # Remove noise/hum
        n = n - noise

    # "Dampened" reading (else looks twitchy) - divide by 8 (2^3)
    lvl = int(((lvl * 7) + n) / 8)

    # Color pixels based on rainbow gradient
    vlvl = remapRangeSafe(lvl, 0, 255, wheelStart, wheelEnd)
    for i in range(0, len(strip)):
        strip[i] = colorwheel(vlvl)
    # Set strip brightness based on code audio level
    brightness = remapRangeSafe(lvl, 50, 255, 0, maxbrt)
    strip.brightness = float(brightness) / 255.0
    strip.show()

After the file saves, your Circuit Playground Express should reboot and start running
the light effects code.
Test It

To make sure everything is working, disconnect the Circuit Playground Express from your computer and connect the LiPo battery.

Now, try tapping the microphone - If the Circuit Playground's neopixels light up with each tap, then you'll know it's good to go!

Install & Use It!

Now, we just need to install the Circuit Playground Express & Electret Microphone board in the Piano Toy-Con.
Install the mic

Push back the large cardboard plate that supports the Switch until the interlocking front lip pops up.
Pull the large backing plate forward a bit and slide the microphone board behind it - be sure to keep the silver microphone cylinder facing forward. Tuck the wires behind the backing plate and route them up the right side - there's a triangular opening that will allow them to reach the Circuit Playground Express on top of the piano.
Once the wires are routed, push the front lip back in place with its tab locked into the backing plate.

Mount the Circuit Playground Express

Use a small piece of double-sided tape to stick the LiPo battery to the back of the Circuit Playground Express.

Use another piece of tape to secure the LiPo battery and Circuit Playground Express to the top of the piano.
Play - with lights!

Install the right Joy-Con in the holder at the back of the piano and place the Switch console in its spot at the center. Set the Switch's volume all the way up and start up the Piano Play mode in the Labo Variety pack cartridge. Now - you're good to go!

Now, when you play the piano - you'll have a light show with every performance :)

To preserve battery, remember to disconnect the battery from the Circuit Playground Express when not in use.