Stranger Things Lights 5

Light up LEDs which correspond to letters entered by the user (or by Will Byers!)

Teaches: Python Dictionaries, NeoPixel library

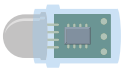
60 mins

1. What it does

For those of you who have not seen Stranger Things, messages are received using fairy lights with letters painted underneath. As individual lights flash, messages are spelt out letter-by-letter. This is a simple, fun activity — especially at Christmas or Halloween!

2. Component list

We could build this using 26 individual LEDs connected to the Raspberry Pi, but this would create a lot of wiring. Instead, we are going to use pre-wired addressable RGB LEDs and an existing library to control them.


WS2811 pre-wired addressable RGB LEDs (minimum of 26 in a set)

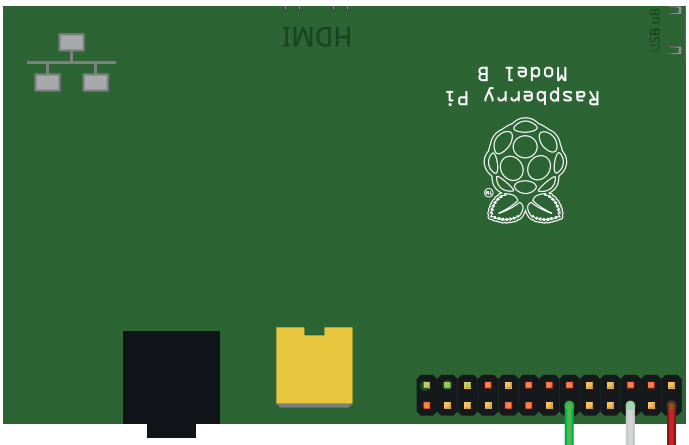

3 x Male to female jumpers

Post-It Notes for the letters and tape to affix the LEDs

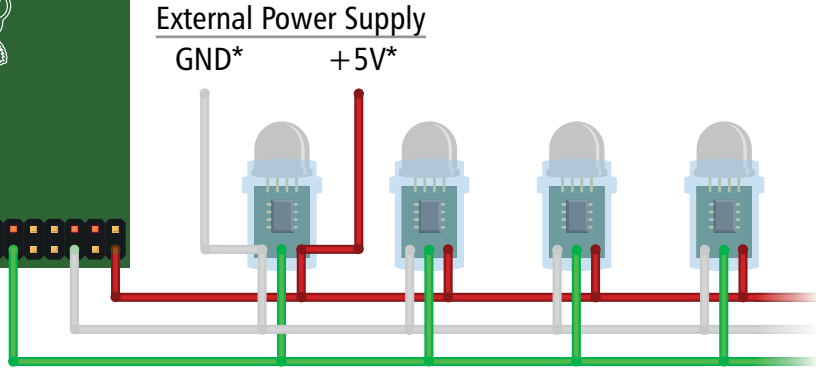
The WS2811 LEDs draw a lot of current, enough to **permanently damage** your Raspberry Pi!

Our program only illuminates one LED at a time, which should not cause a problem to your device. If you are worried about damaging your Raspberry Pi, or intend to light several LEDs simultaneously, you **must** use an additional power supply connected to the spare wires on the WS2811 string. Consult your WS2811 instructions for further information. **Use at your own risk.**

3. Build the circuit



In our diagram, the red wire is +5v, green is data, and white is Ground. Colours may vary between suppliers, so check your documentation.



If your LED string has a moulded connector, insert the jumper wires to easily connect it to the Pi's GPIO pins.

4. Installing the NeoPixel Library

From the Terminal, enter the following to install the NeoPixel Library:

```
sudo pip3 install rpi_ws281x adafruit-circuitpython-neopixel
```

5. The code

```
# Import libraries
import board
import neopixel

from time import sleep

# Define number of LEDs (our set has 50)
num_leds = 50

# Define data pin
data_pin = board.D18

# Set up the LEDs
led = neopixel.NeoPixel(data_pin, num_leds,
 brightness = 1)

# Define LED colours in hexadecimal (0xGGRRBB)
white = 0xffffff
red = 0x00ff00
orange = 0x3aff00
yellow = 0x89ff00
green = 0xff0000
cyan = 0xff00ff
blue = 0x0000ff
magenta = 0x00ffff
purple = 0x00ff89
off = 0x000000

# Turn off all LEDs
led.fill(off)

# Dictionary to store LED number and colour.
# Usage: "letter": [lednumber, colour]
alpha = {
    "a": [0, white],
    "b": [1, blue],
    "c": [2, red],
    "d": [3, green],
    "e": [4, cyan],
    "f": [5, yellow],
    "g": [6, red],
    "h": [7, cyan],
    "i": [8, purple],
    "j": [9, red],
    "k": [10,blue],
    "l": [11, green],
    "m": [12, yellow],
    "n": [13, magenta],
    "o": [14, purple],
    "p": [15, cyan],
    "q": [16, red],
    "r": [17, green],
    "s": [18, white],
    "t": [19, yellow],
    "u": [20, blue],
    "v": [21, red],
    "w": [22, cyan],
    "x": [23, yellow],
    "y": [24, red],
    "z": [25, magenta],
    " ": [26, off]
    }


# Main program
while True:

    # Get input from user
    userInput = input("Enter message: ")

    # Convert to lower case
    userInput = userInput.lower()

    # Iterate through input
    for i in userInput:

        # Attempt to find the character in the
         dictionary
        try:

            # Assign LED colour the LED number in
             dictionary
            led[alpha[i][0]] = alpha[i][1]

            print(i, "on pin", alpha[i][0])

            # Light for 1 second
            sleep(1)

            # Turn off LED
            led[alpha[i][0]] = off

        # Print message if character not in
         dictionary
        except:
            print("Invalid character")
```

6. Running your program

The NeoPixel Library can only be executed with super user privileges, so your program cannot be run from Python. To run your program, enter the following into the Terminal:

```
sudo python3 YOURPROGRAMNAME.py
```

References and further information:
Adafruit: https://learn.adafruit.com/neopixels-on-raspberry-pi/overview
Paul Larson: https://hackaday.io/project/14838-stranger-things-alphabet-message-rgb-leds/details