cedargrove_rgb_spectrumtools

RGB Spectrum Tools

A collection of CircuitPython methods and classes for converting a normalized spectral index to RGB color values. Included in the collection are spectral conversion methods for grayscale, iron temperature color, stoplight (green-yellow-red), and visible light as well as an n-color blended light or continuous spectrum generator.

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Implementation Notes

Hardware:

Software and Dependencies:

- Adafruit CircuitPython firmware for the supported boards: https://github.com/adafruit/circuitpython/releases

grayscale

grayscale(*index=0.0, gamma=0.8*)

Translates the normalized index value into a 24-bit RGB integer with gamma adjustment. The spectral index is a floating point value in the range of 0.0 to 1.0 (inclusive); default is 0.0. The gamma value can be from 0.0 to 1.0 (inclusive); default is 0.8, tuned for TFT displays. If the index or gamma value is outside of the specified range, the 24-bit RGB output will be limited to the minimum (0x0) or maximum (0xFFFFFF) value.

Parameters:	
	• **index** – The normalized spectral input value. Can be a positive floating point value in the range of 0.0 to 1.0. Default value of 0.0.
	• **gamma** — The normalized gamma input value. Can be a positive floating point value in the range of 0.0 to 1.0. Default value of 0.8 for TFT displays.

Example:

```
>>> from cedargrove_rgb_spectrumtools.grayscale import index_to_rgb
>>> hex(index_to_rgb(0.5, 1.0))
'0x8c8c8c'
```

iron

iron(*index=0.0, gamma=0.5*)

Translates the normalized index value into a 24-bit RGB integer with gamma adjustment. The spectral index is a floating point value in the range of 0.0 to 1.0 (inclusive); default is 0.0. The gamma value can be from 0.0 to 1.0 (inclusive); default is 0.5, tuned for TFT displays. If the index or gamma value is outside of the specified range, the 24-bit RGB output will be limited to the minimum (0x0) or maximum (0xFFFFFF) value.

Parameters:	• **index** – The normalized spectral input value. Can be a positive floating point value in the range of 0.0 to 1.0. Default value of 0.0.
	• **gamma** — The normalized gamma input value. Can be a positive floating point value in the range of 0.0 to 1.0. Default value of 0.5 for TFT displays.

Example:

```
>>> from cedargrove_rgb_spectrumtools.iron import index_to_rgb
>>> hex(index_to_rgb(0.5, 1.0))
'0xff0000'
```

stoplight_spectrum

stoplight(*index=0.0, gamma=0.5*)

Translates the normalized index value into a 24-bit RGB integer with gamma adjustment. The spectral index is a floating point value in the range of 0.0 to 1.0 (inclusive); default is 0.0. The gamma value can be from 0.0 to 1.0 (inclusive); default is 0.5, tuned for TFT displays. If the index or gamma value is outside of the specified range, the 24-bit RGB output will be limited to the minimum (0x0) or maximum (0xFFFFFF) value.

Parameters:	• **index** – The normalized spectral input value. Can be a positive floating point value in the range of 0.0 to 1.0. Default value of 0.0.
	• **gamma** — The normalized gamma input value. Can be a positive floating point value in the range of 0.0 to 1.0. Default value of 0.5 for TFT displays.

Example:

```
>>> from cedargrove_rgb_spectrumtools.stoplight import index_to_rgb
>>> hex(index_to_rgb(0.5, 1.0))
''0xffff00'
```

visible_spectrum

visible(*index=0.0, gamma=0.5*)

Translates the normalized index value into a 24-bit RGB integer with gamma adjustment. The spectral index is a floating point value in the range of 0.0 to 1.0 (inclusive); default is 0.0. The gamma value can be from 0.0 to 1.0 (inclusive); default is 0.5, tuned for TFT displays. If the index or gamma value is outside of the specified range, the 24-bit RGB output will be limited to the minimum (0x0) or maximum (0xFFFFFF) value.

Parameters:	• **index** – The normalized spectral input value. Can be a positive floating point value in the range of 0.0 to 1.0. Default value of 0.0.
	• **gamma** — The normalized gamma input value. Can be a positive floating point value in the range of 0.0 to 1.0. Default value of 0.5 for TFT displays.

```
>>> from cedargrove_rgb_spectrumtools.visible import index_to_rgb
>>> hex(index_to_rgb(0.5, 1.0))
'0x6dff00'
```

n-color_spectrum

class n_color_spectrum.Spectrum(*colors=None, mode="continuous", gamma=0.55*)

A class that translates the normalized index value into a 24-bit RGB integer with gamma adjustment. The spectral index is a floating point value in the range of 0.0 to 1.0 (inclusive); default is 0.0. The gamma value can be from 0.0 to 3.0 (inclusive); default is 0.55, tuned for TFT displays. If the index or gamma value is outside of the specified range, the 24-bit RGB output will be limited to the minimum (0x0) or maximum (0xFFFFFF) value.

The class converts a spectrum index value consisting of a positive numeric value (0.0 to 1.0, modulus of 1.0) to an RGB color value that representing the index position on a graduated and blended multicolor spectrum. The spectrum is defined by a list of colors that are proportionally distributed across the spectrum.

Two spectrum modes are currently supported:

- "light" mode produces a blended color spectrum that mimics a typical wavelength-of-light representation. The spectrum does not wrap; the first and last colors are not blended to each other.

- "continuous" mode blends the color list's first color and last color at the start and end, creating a continuously blended spectrum. This is the default mode.

This class calculates resultant color values on-the-fly to reduce memory consumption with a slight speed performance sacrifice. Use the **n-color_spectrum_table.Spectrum** class for improved performance.

Parameters:	•	**colors**– A list of 24-bit integer color values. Up to 260 colors can be included the list, depending on available memory. Default value of None.
	•	**mode**– Specifies the type of spectrum, "light" or "continuous". Default value of "continuous".
	•	**gamma** — The normalized gamma input value. Can be a positive floating point value in the range of 0.0 to 3.0. Default value of 0.55 for TFT displays.

Example:

```
>>> from cedargrove_rgb_spectrumtools.n_color_spectrum import Spectrum
>>> # Create Red/Yellow/Green light-style spectrum
>>> spectrum = Spectrum([0xFF0000, 0xFFFF00, 0x00FF00], mode="light", gamma=0.6)
>>> print(hex(spectrum.color(index=0.36)))
0xff9c00
```

n-color_spectrum_table

class n_color_spectrum_table.Spectrum(*colors=None, mode="continuous", gamma=0.55*)

A class that translates the normalized index value into a 24-bit RGB integer with gamma adjustment. The spectral index is a floating point value in the range of 0.0 to 1.0 (inclusive); default is 0.0. The gamma value can be from 0.0 to 3.0 (inclusive); default is 0.55, tuned for TFT displays. If the index or gamma value is outside of the specified range, the 24-bit RGB output will be limited to the minimum (0x0) or maximum (0xFFFFFF) value.

The class converts a spectrum index value consisting of a positive numeric value (0.0 to 1.0, modulus of 1.0) to an RGB color value that representing the index position on a graduated and blended multicolor spectrum. The spectrum is defined by a list of colors that are proportionally distributed across the spectrum.

Two spectrum modes are currently supported:

- "light" mode produces a blended color spectrum that mimics a typical wavelength-of-light representation. The spectrum does not wrap; the first and last colors are not blended to each other.

- "continuous" mode blends the color list's first color and last color at the start and end, creating a continuously blended spectrum. This is the default mode.

This class calculates resultant color values from a pre-compiled internal color list to improve speed performance but with increased memory useage. Use the **n-color_spectrum.Spectrum** class for reduced memory usage.

Parameters:	•	**colors**– A list of 24-bit integer color values. Up to 260 colors can be included the list, depending on available memory. Default value of None.
	•	**mode**– Specifies the type of spectrum, "light" or "continuous". Default value of "continuous".
	•	**gamma** — The normalized gamma input value. Can be a positive floating point value in the range of 0.0 to 3.0. Default value of 0.55 for TFT displays.

Example:

```
>>> from cedargrove_rgb_spectrumtools.n_color_spectrum_table import Spectrum
>>> # Create Red/Yellow/Green light-style spectrum
>>> spectrum = Spectrum([0xFF0000, 0xFFFF00, 0x00FF00], mode="light", gamma=0.6)
>>> print(hex(spectrum.color(index=0.36)))
0xff9c00
```