

color_index_to_rgb

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_spectrum

```
helper_class grayscale_spectrum(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.

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| Parameters: | <ul style="list-style-type: none">• 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. |
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Example:

```
>>> from cedargrove_unit_converter.index_to_rgb.grayscale_spectrum import index_to_rgb
>>> hex(index_to_rgb(0.5, 1.0))
'0x8c8c8c'
```

iron_spectrum

```
helper_class iron_spectrum(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.

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| Parameters: | <ul style="list-style-type: none">• 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. |
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Example:

```
>>> from cedargrove_unit_converter.index_to_rgb.iron_spectrum import index_to_rgb
>>> hex(index_to_rgb(0.5, 1.0))
'0xff0000'
```

stoplight_spectrum

helper_class stoplight_spectrum(*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_unit_converter.index_to_rgb.stoplight_spectrum import index_to_rgb
>>> hex(index_to_rgb(0.5, 1.0))
'0xffff00'
```

visible_spectrum

helper_class visible_spectrum(*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_unit_converter.index_to_rgb.visible_spectrum 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)
```

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:	<ul style="list-style-type: none">• 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.
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Example:

```
>>> from cedargrove_unit_converter.index_to_rgb.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)
```

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 usage. Use the **n-color_spectrum.Spectrum** class for reduced memory usage.

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| Parameters: | <ul style="list-style-type: none">• 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. |
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Example:

```
>>> from cedargrove_unit_converter_table.index_to_rgb.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
```