cedargrove_airqualitytools

A collection of CircuitPython helpers used for the calculation of various air quality parameters including the conversion between temperature units.

- Author(s): JG for Cedar Grove Studios

Implementation Notes

Hardware:

Software and Dependencies:

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

cedargrove_airqualitytools.co2_iaq

CO2 Concentration Indoor Air Quality

helper_class co2_ppm_to_quality(*co2_ppm*)

Calculate the Indoor Air Quality Index (IAQ) as derived from CO2 ppm concentration. Returns a data valid flag, CO2 input concentration value, the RGB warning color integer value, and the corresponding US English description or warning. Input concentration value range is 0 to 6000 ppm. No default.

Parameters:

- **co2_ppm** – The CO2 concentration value in ppm. Range is 0 to 6000 ppm. No default value.

Example:

```
>>> from cedargrove_airqualitytools.co2_iaq import co2_ppm_to_quality
>>> co2_ppm_to_quality(1450)        # Indoor Air Quality calculator
(True, 1450, 16776960, 'POOR')
```

cedargrove_airqualitytools.dew_point

Dew Point

helper_class dew_point(*deg_c, humidity, verbose=False*)

Convert temperature and humidity to a dew point temperature value and the corresponding US English description or warning. Temperature input value is degrees Celsius in the range of -99 to 99 degrees. Humidity input value is percent humidity in the range of 0 to 100. Returns a dew point value in degrees Celsius and a summary description. A detailed description is provided if ***verbose*** is ***True***.

Parameters:

- **deg_c** – The temperature input value. Can be any positive or negative numeric value in the range of -99 to 99. No default value.
- **humidity** – The humidity percent input value. Can be any positive value in the range of 0 to 100 percent. No default value.
- **verbose** – :param bool verbose: The detailed description switch. ***False*** for summary; ***True*** for a detailed description. Defaults to ***False***.

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Example:

```
>>> from cedargrove_airqualitytools.dew_point import dew_point
>>> dew_point(30, 50)         # Dew Point Converter
(18.46, 'Caution')
>>> dew_point(30, 50, verbose=True)
(18.46, 'Caution: Somewhat uncomfortable for most people.')
```

cedargrove_airqualitytools.heat_index
Heat (Comfort) Index

helper_class heat_index(*deg_c, humidity, verbose=False*)

Convert temperature and humidity to a heat index (comfort) temperature value and the corresponding US English description or warning. Temperature input value is degrees Celsius in the range of -99 to 99 degrees. Humidity input value is percent humidity in the range of 0 to 100. Returns a heat index value in degrees Celsius and a summary description. A detailed description is provided if ***verbose*** is ***True***.

Parameters:

- **deg_c** – The temperature input value. Can be any positive or negative numeric value in the range of -99 to 99. No default value.
- **humidity** – The humidity percent input value. Can be any positive value in the range of 0 to 100 percent. No default value.
- **verbose** – :param bool verbose: The detailed description switch. ***False*** for summary; ***True*** for a detailed description. Defaults to ***False***.

Example:

```
>>> from cedargrove_airqualitytools.heat_index import heat_index
>>> heat_index(22, 50)  # Heat Index Calculator
(24.9, 'Safe')
>>> heat_index(22, 50, verbose=True)
(24.9, 'Safe: Heat index is not a factor.')
```

cedargrove_airqualitytools.pm25_aqi
PM2.5 Particulate Air Quality Index

helper_class pm25_ppm_to_quality(*pm25_ppm*)

Calculate the Air Quality Index (AQI) as derived from PM2.5 particulate concentration. Returns a data valid flag, calculated AQI, the RGB warning color integer value, and the corresponding US English description or warning. Input concentration value range is 0 to 500 ppm. No default.

NOTE: The calculated AQI returned by this function should ideally be measured using the 24-hour PM2.5 concentration average. Calculating a AQI without averaging will result in higher AQI values than expected.

Parameters:

- **pm25_ppm** – The CO2 concentration value in ppm. Range is 0 to 6000 ppm. No default value.

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Example:

```
>>> from cedargrove_airqualitytools.pm25_aqi import pm25_ppm_to_quality
>>> pm25_ppm_to_quality(150)         # AQI calculator
(True, 200, 16711680, 'UNHEALTHY')
```

cedargrove_airqualitytools.temperature

Temperature Unit Converters

helper_class celsius_to_fahrenheit(*deg_c*)

Convert degrees Celsius to degrees Fahrenheit. Input value is degrees Celsius. Returns a value in degrees Fahrenheit.

Parameters:
- **deg_c** – The temperature in Celsius. No default.

helper_class fahrenheit_to_celsius(*deg_f*)

Convert degrees Fahrenheit to degrees Celsius. Input value is degrees Fahrenheit. Returns a value in degrees Celsius.

Parameters:
- **deg_f** – The temperature in Fahrenheit. No default.

helper_class celsius_to_kelvin(*deg_c*)

Convert degrees Celsius to Kelvin. Input value is degrees Celsius. Returns a value in Kelvins.

Parameters:
- **deg_c** – The temperature in Celsius. No default.

helper_class kelvin_to_celsius(*kelvins*)

Convert Kelvins to degrees Celsius. Input value is Kelvins. Returns a value in degrees Celsius.

Parameters:
- **kelvins** – The temperature in Kelvins. No default.

Example:

```
>>> from cedargrove_airqualitytools.temperature import *
>>> celsius_to_fahrenheit(100)  # Celsius to Fahrenheit Converter
212.0
>>> fahrenheit_to_celsius(212)
100.0
>>> celsius_to_kelvin(0)       # Celsius to Kelvin Converter
273.15
>>> kelvin_to_celsius(273.15)   # Kelvin to Celsius Converter
0.0
```

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cedargrove_airqualitytools.translate

Air Quality Observation and Warning Translator

helper_class english_to_deutsch.interpret(*enable=True, english_phrase=“”*)

Translate an English phrase to Deutsch (German).

Parameters:
- **enable** – Enable the translator. Defaults to ***True***.
- **english_phrase** — English phrase to be interpreted. Defaults to blank.

helper_class english_to_francais.interpret(*enable=True, english_phrase=“”*)

Translate an English phrase to Français (French).

Parameters:
- **enable** – Enable the translator. Defaults to ***True***.
- **english_phrase** — English phrase to be interpreted. Defaults to blank.

helper_class english_to_pirate.interpret(*enable=True, english_phrase=“”*)

Translate an English phrase to Pirate.

Parameters:
- **enable** – Enable the translator. Defaults to ***True***.
- **english_phrase** — English phrase to be interpreted. Defaults to blank.

Example:

```
>>> from cedargrove_airqualitytools.translate.english_to_deutsch import interpret
>>> interpret(True, “UNHEALTHY”)   # Translate to Deutsch (German)
‘UNGESUND'
>>> interpret(False, “UNHEALTHY”)   # Turn off translator; revert to English
‘UNHEALTHY'
```

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