Package: spectra2rgb (via r-universe)

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Type Package

Title Convert Spectral Signatures to sRGB and CIELAB Colour Coordinates

Version 0.1.0

Description Converts hyperspectral reflectance signatures to device-independent sRGB hex codes and CIE L*a*b* coordinates using the CIE 1931 2-degree standard observer and the D65 standard illuminant. Includes bundled reference data so the package is self-contained. Handles missing and non-finite reflectance values via a configurable policy.

License GPL (>= 3)

Encoding UTF-8

Depends R (>= 4.0)

Imports stats, grDevices, utils

Suggests testthat (>= 3.0.0), readxl, knitr, rmarkdown

VignetteBuilder knitr

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`hs_to_xyz` *Convert hyperspectral reflectance to CIE XYZ*

Description

Integrates a reflectance spectrum (or a matrix of spectra) against the CIE 1931 2-degree standard observer and the D65 standard illuminant to obtain tristimulus values XYZ.

Usage

```
hs_to_xyz(wavelengths, reflectance)
```

Arguments

`wavelengths`	Numeric vector of wavelengths in nanometres.
`reflectance`	Numeric vector (single spectrum) or matrix (rows = samples, columns = wavelengths). Column order must match `wavelengths`.

Details

The CIE 1931 colour-matching functions (`ciexyz31`) and the D65 illuminant (`illuminantD65`) are bundled with the package. Values are linearly interpolated onto `wavelengths`. Wavelengths outside the CMF range are extrapolated flat (`rule = 2` in `approx`); the user is responsible for ensuring the input range is appropriate (400-700 nm is standard for visible colour).

Non-finite reflectance values are replaced by 0 and values are clamped to $[0, 1]$ before integration.

Value

A data.frame with columns `X`, `Y`, `Z`.

Examples

```
wl  <- seq(400, 700, by = 10)
ref <- rep(0.5, length(wl))
hs_to_xyz(wl, ref)
```

rgb_to_lab — *Convert sRGB to CIELAB*

Description

Convert sRGB to CIELAB

Usage

```
rgb_to_lab(R, G, B, white = c(X = 95.047, Y = 100, Z = 108.883))
```

Arguments

R, G, B	Integer vectors (0-255).
white	Reference white point.

Value

A data.frame with numeric columns L, a, b.

spectra_to_lab — *Convert a data frame of spectra to CIELAB*

Description

Convert a data frame of spectra to CIELAB

Usage

```
spectra_to_lab(
  df,
  id_col = NULL,
  na_action = c("zero", "drop", "keep"),
  white = c(X = 95.047, Y = 100, Z = 108.883)
)
```

Arguments

df	A data.frame or matrix where each row is a sample and each column is a wavelength band. Column names must be parseable as numeric wavelengths in nanometres.
id_col	Optional character vector of sample IDs, or a column name or index in df. If NULL, the row names are used, or seq_len(nrow(df)) if row names are absent.
na_action	One of "zero" (default; replace non-finite with 0), "drop" (remove all-NA rows with a warning), or "keep" (preserve NA in the output).
white	Reference white point for XYZ -> sRGB.

Value

A data.frame with columns `Sample_ID`, `L`, `a`, `b`.

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spectra_to_rgb *Convert a data frame of spectra to sRGB*

Description

Convert a data frame of spectra to sRGB

Usage

```
spectra_to_rgb(
  df,
  id_col = NULL,
  na_action = c("zero", "drop", "keep"),
  white = c(X = 95.047, Y = 100, Z = 108.883)
)
```

Arguments

`df`	A data.frame or matrix where each row is a sample and each column is a wavelength band. Column names must be parseable as numeric wavelengths in nanometres.
`id_col`	Optional character vector of sample IDs, or a column name or index in `df`. If `NULL`, the row names are used, or `seq_len(nrow(df))` if row names are absent.
`na_action`	One of `"zero"` (default; replace non-finite with 0), `"drop"` (remove all-NA rows with a warning), or `"keep"` (preserve NA in the output).
`white`	Reference white point for XYZ -> sRGB.

Value

A data.frame with columns `Sample_ID`, `R`, `G`, `B`, `hex`.

---

spectra_to_rgb_lab *Convert a data frame of spectra to sRGB and CIELAB*

Description

Convert a data frame of spectra to sRGB and CIELAB

Usage

```
spectra_to_rgb_lab(
  df,
  id_col = NULL,
  na_action = c("zero", "drop", "keep"),
  white = c(X = 95.047, Y = 100, Z = 108.883)
)
```

Arguments

df	A data.frame or matrix where each row is a sample and each column is a wavelength band. Column names must be parseable as numeric wavelengths in nanometres.
id_col	Optional character vector of sample IDs, or a column name or index in df. If NULL, the row names are used, or seq_len(nrow(df)) if row names are absent.
na_action	One of "zero" (default; replace non-finite with 0), "drop" (remove all-NA rows with a warning), or "keep" (preserve NA in the output).
white	Reference white point for XYZ -> sRGB.

Value

A data.frame with columns Sample_ID, R, G, B, hex, L, a, b.

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xyz_to_lab *Convert CIE XYZ to CIELAB*

Description

Convenience wrapper: XYZ -> sRGB -> CIELAB. Uses the sRGB path so the result matches what rgb_to_lab produces from the same XYZ.

Usage

```
xyz_to_lab(XYZ, white = c(X = 95.047, Y = 100, Z = 108.883))
```

Arguments

XYZ	A data.frame with columns X, Y, Z, or a numeric matrix with 3 columns.
white	Reference white point.

Value

A data.frame with columns L, a, b.

`xyz_to_rgb` *Convert CIE XYZ to sRGB*

Description

Convert CIE XYZ to sRGB

Usage

```
xyz_to_rgb(XYZ, white = c(X = 95.047, Y = 100, Z = 108.883))
```

Arguments

`XYZ`	A data.frame with columns `X`, `Y`, `Z` (as returned by `hs_to_xyz`), or a numeric matrix with 3 columns.
`white`	Reference white point. Defaults to D65 (`c(X = 95.047, Y = 100, Z = 108.883)`).

Value

A data.frame with integer columns `R`, `G`, `B` (0-255) and character column `hex` (e.g. `"#654909"`).

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