

Package ‘belg’

July 19, 2020

Title Boltzmann Entropy of a Landscape Gradient

Version 1.4.0

Description Calculates the Boltzmann entropy of a landscape gradient.

This package uses the analytical method created by Gao, P., Zhang, H. and Li, Z., 2018 (<doi:10.1111/tgis.12315>) and by Gao, P. and Li, Z., 2019 (<doi:10.1007/s10980-019-00854-3>). It also extend the original ideas by allowing calculations on data with missing values.

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Encoding UTF-8

LazyData true

ByteCompile true

RoxygenNote 7.1.1

Depends R (>= 3.3.0)

LinkingTo Rcpp, RcppArmadillo

Imports raster, Rcpp

Suggests testthat, sf, sp, stars, covr, knitr, rmarkdown, ggplot2, rasterVis

URL <https://r-spatialecology.github.io/belg/>

BugReports <https://github.com/r-spatialecology/belg/issues>

VignetteBuilder knitr

NeedsCompilation yes

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complex_land	<i>Complex landscape (small)</i>
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Description

A dataset containing small artificial complex landscape

Usage

```
complex_land
```

Format

An object of class RasterLayer of dimension 6 x 8 x 1.

get_boltzmann	<i>Boltzmann entropy of a landscape gradient</i>
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Description

Calculates the Boltzmann entropy of a landscape gradient

Usage

```
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)
```

Default S3 method:

```
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
```

```
    base = "log10",
    relative = FALSE
)

## S3 method for class 'matrix'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)

## S3 method for class 'array'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)

## S3 method for class 'RasterLayer'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)

## S3 method for class 'RasterStack'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)

## S3 method for class 'RasterBrick'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = FALSE,
  base = "log10",
  relative = FALSE
)
```

```
## S3 method for class 'stars'
get_boltzmann(
  x,
  method = "aggregation",
  na_adjust = TRUE,
  base = "log10",
  relative = FALSE
)
```

Arguments

x	stars, RasterLayer, RasterStack, RasterBrick, matrix, or array.
method	A method used. Either "hierarchy" for the hierarchy-based method (Gao et al., 2017) or "aggregation" (default) for the aggregation-based method (Gao et al., 2019).
na_adjust	Should the output value be adjusted to the proportion of not missing cells? Either TRUE (default) or FALSE
base	A logarithm base ("log", "log2" or "log10").
relative	Should a relative or absolute entropy be calculated? TRUE or FALSE (default).

Details

The method for computing the Boltzmann entropy of a landscape gradient works on integer values that are either positive or equals to zero. This function automatically rounds values to the nearest integer value (rounding halfway cases away from zero) and negative values are shifted to positive values.

Value

a numeric vector

References

- Gao, Peichao, Hong Zhang, and Zhilin Li. "A hierarchy-based solution to calculate the configurational entropy of landscape gradients." *Landscape Ecology* 32.6 (2017): 1133-1146.
- Gao, Peichao, Hong Zhang, and Zhilin Li. "An efficient analytical method for computing the Boltzmann entropy of a landscape gradient." *Transactions in GIS* (2018).
- Gao, Peichao and Zhilin Li. "Aggregation-based method for computing absolute Boltzmann entropy of landscape gradient with full thermodynamic consistency" *Landscape Ecology* (2019)

Examples

```
new_c = c(56, 86, 98, 50, 45, 56, 96, 25,
          15, 55, 85, 69, 12, 52, 25, 56,
          32, 25, 68, 98, 58, 66, 56, 58)
```

```
lg = matrix(new_c, nrow = 3, ncol = 8, byrow = TRUE)
get_boltzmann(lg, relative = FALSE, method = "hierarchy", base = "log10")
get_boltzmann(lg, relative = TRUE, method = "hierarchy", base = "log2")
get_boltzmann(lg, relative = TRUE, method = "hierarchy", base = "log")
```

land_gradient1	<i>Complex landscape</i>
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Description

A dataset containing artificial complex landscape

Usage

```
land_gradient1
```

Format

An object of class RasterLayer of dimension 512 x 512 x 1.

land_gradient2	<i>Simple landscape</i>
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Description

A dataset containing artificial simple landscape

Usage

```
land_gradient2
```

Format

An object of class RasterLayer of dimension 512 x 512 x 1.

`simple_land`*Simple landscape (small)*

Description

A dataset containing small artificial simple landscape

Usage

```
simple_land
```

Format

An object of class RasterLayer of dimension 6 x 8 x 1.

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