Package 'enerscape'

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Type Package

Title Compute Energy Landscapes

Version 1.2.0

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Description Compute energy landscapes using a digital elevation model and body mass of animals.

License GPL-3

Encoding UTF-8

LazyData true

Imports Rcpp, methods, terra

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

LinkingTo Rcpp

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Contents

`circuitscape_skeleton` *Create the initialization file for the julia package Circuitscape*

Description

This creates the init file for the julia package Circuitscape: https://juliapackages.com/p/circuitscape.

Usage

```
circuitscape_skeleton(en = NULL, path = NULL, points = NULL)
```

Arguments

`en`	an enerscape object.
`path`	full path where to write the .ini file.
`points`	data.frame with origin and destination coordinates.

Value

Nothing, only write the circuitscape.ini file to disk.

distances *Spatial distances*

Description

Spatial distances

Usage

```
distances(x, center, res)
```

Arguments

x	matrix with values
center	numeric value (double) with the value of the focal cell
res	numeric value (double) of the spatial resolution of the matrix

Value

Vector with values the distances between x and center

energy *Energy Landscape*

Description

Energy Landscape

Usage

```
energy(mass, slope, distance, res, kcal)
```

Arguments

mass	body mass of species (kg)
slope	vector with slopes
distance	vector with distances
res	numeric value (double) of the spatial resolution of the matrix
kcal	(boolean) if to return the result in kCal (true) or J (false)

Value

Vector with the energy cost of locomotion (EnergyScape)

energyHuman *Energy Landscape for walking people*

Description

Energy Landscape for walking people

Usage

```
energyHuman(mass, v, slope, distance, res, kcal)
```

Arguments

mass	body mass of species (kg)
v	speed
slope	vector with slopes
distance	vector with distances
res	numeric value (double) of the spatial resolution of the matrix
kcal	(boolean) if to return the result in kCal (true) or J (false)

Value

Vector with the energy cost of locomotion (EnergyScape)

energyscape *Energy Landscape*

Description

Energy Landscape

Usage

```
energyscape(x, mass, n, res, kcal)
```

Arguments

x	matrix with values the elevation.
mass	body mass of species (kg).
n	(integer) number of neighbours to consider (either 4 or 8).
res	numeric value (double) of the spatial resolution of the matrix.
kcal	(boolean) if to return the result in kCal (true) or J (false).

Value

Matrix with the energy cost of locomotion (EnergyScape).

`energyscapeHuman` *Energy Landscape*

Description

Energy Landscape

Usage

```
energyscapeHuman(x, mass, v, n, res, kcal)
```

Arguments

`x`	matrix with values the elevation.
`mass`	body mass of species (kg).
`v`	speed
`n`	(integer) number of neighbours to consider (either 4 or 8).
`res`	numeric value (double) of the spatial resolution of the matrix.
`kcal`	(boolean) if to return the result in kCal (true) or J (false).

Value

Matrix with the energy cost of locomotion (EnergyScape).

`enerscape` *Compute Energy Landscapes*

Description

This is the main function to compute energy landscapes from a digital elevation model and body mass of animals based on the model from Pontzer (2016).

Usage

```
enerscape(dem, m, unit = "joule", neigh = 8)
```

Arguments

`dem`	raster file of the digital elevation model, either a raster or a full path location of the file.
`m`	species body mass (kg).
`unit`	if joules ('joule') or kilocalories ('kcal').
`neigh`	number of neighbor cells that are connected together.

Value

EnergyScape raster.

References

Pontzer, H. (2016). A unified theory for the energy cost of legged locomotion. Biology Letters, 12(2), 20150935. doi:10.1098/rsbl.2015.0935.

Examples

```
library(terra)
library(enerscape)

data("volcano")
dem <- rast(volcano)
en <- enerscape(dem, 10, unit = "kcal", neigh = 16)
```

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humanscape *Compute Energy Landscapes for Walking People*

Description

This is the main function to compute energy landscapes from a digital elevation model, body mass of a person, and walking speed from Looney et al. (2019).

Usage

```
humanscape(dem, m, v = 1.39, unit = "joule", neigh = 8)
```

Arguments

dem	raster file of the digital elevation model, either a raster or a full path location of the file.
m	species body mass (kg).
v	walking speed (m/s).
unit	if joules ('joule') or kilocalories ('kcal').
neigh	number of neighbor cells that are connected together.

Value

EnergyScape raster.

References

Looney, D. P., Santee, W. R., Hansen, E. O., Bonventre, P. J., Chalmers, C. R., & Potter, A. W. (2019). Estimating energy expenditure during level, uphill, and downhill walking. Med. Sci. Sports Exerc., 51(9), 1954-1960. doi:10.1249/MSS.0000000000002002.

Examples

```
library(terra)
library(enerscape)

data("volcano")
dem <- rast(volcano)
en <- humanscape(dem, 10, 1, unit = "kcal", neigh = 16)
```

`neighbours` *Neighbours*

Description

Neighbours

Usage

```
neighbours(i, j, n, x)
```

Arguments

`i`	row index
`j`	column index
`n`	number of neighbours (4 or 8)
`x`	matrix with values

Value

Vector with values the neighours of x

`omniscape_skeleton` *Create the initialization file for the julia package Omniscape*

Description

This creates the init file for the julia package Omniscape: https://juliapackages.com/p/omniscape.

Usage

```
omniscape_skeleton(en = NULL, path = NULL, radius = NULL, aggr_fact = 1)
```

Arguments

`en`	an enerscape object.
`path`	full path where to write the .ini file.
`radius`	radius in pixels of the moving window.
`aggr_fact`	the block size to compute the Omniscape.

Value

Nothing, only write the omniscape.ini file to disk.

`pontzer` *Energy cost of transport from Pontzer (2016)*

Description

Energy cost of transport from Pontzer (2016)

Usage

```
pontzer
```

Format

A data frame with 92 rows and 5 variables:

Species species name

Incline incline of movement

Mass species body mass

Cost.of.Transport cost of transport

Source original source of data

Source

doi:10.1098/rsbl.2015.0935

References

#' Pontzer, H. (2016). A unified theory for the energy cost of legged locomotion. Biology Letters, 12(2), 20150935.

sirente *Monte Sirente Digital Elevation Model*

Description

A matrix with the digital elevation mode of the Monte Sirente (Central Italy).

Usage

```
sirente
```

Format

An object of class `matrix` (inherits from `array`) with 393 rows and 594 columns.

slope *Slopes*

Description

Slopes

Usage

```
slope(x, center, res)
```

Arguments

`x`	matrix with values
`center`	numeric value (double) with the value of the focal cell
`res`	numeric value (double) of the spatial resolution of the matrix

Value

Vector with values the slopes (degrees) between x and center

`slopeRadiant` *Slopes in radians*

Description

Slopes in radians

Usage

```
slopeRadiant(x, center, res)
```

Arguments

`x`	matrix with values
`center`	numeric value (double) with the value of the focal cell
`res`	numeric value (double) of the spatial resolution of the matrix

Value

Vector with values the slopes (degrees) between x and center

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