Package: enerscape (via r-universe)

September 8, 2024

Type Package

Title Compute Energy Landscapes

Version 1.1.2

Author Emilio Berti

Maintainer Emilio Berti <emilio.berti@idiv.de>

Description Compute energy landscapes using a digital elevation model raster 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

RoxygenNote 7.3.2

Depends R (>= 2.10)

Config/testthat/edition 3

VignetteBuilder knitr

Repository https://emilio-berti.r-universe.dev

RemoteUrl https://github.com/emilio-berti/enerscape

RemoteRef HEAD

RemoteSha 54ddb5b535a649a60cea7c21233659582b5fd785

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(slope, distance, mass, res, kcal = TRUE)
```

Arguments

`slope`	vector with slopes
`distance`	vector with distances
`mass`	body mass of species (kg)
`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,
  n = 4L,
  mass = 0,
  res = 0,
  kcal = TRUE,
  out = 0L,
  direction = 0L
)
```

Arguments

x	matrix with values the elevation.
n	(integer) number of neighbours to consider (either 4 or 8).
mass	body mass of species (kg).
res	numeric value (double) of the spatial resolution of the matrix.
kcal	(boolean) if to return the result in kCal (true) or J (false).
out	(integer) if to calculate the costs for moving into the cell (0) or from it (1).
direction	(integer) for which direction to calculate costs: 0 for all, 1 for left, 2 for down, 3 for right, 4 for up.

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). The core of the computations are done using the *gdistance* (Etten, 2017) package.

Usage

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

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.
direction	character specifying if costs are to be calcualted for moving into the focal cell ('in'), from it ('out'), or for a specific direction ,i.e. 'up', 'down', 'left', 'right'.

Details

From the digital elevation model, transition slopes, energy costs and conductances (1 / work) are computed based on the model described in Pontzer (2016).

Value

A list with elements a rasterStack of the digital elevation model, slope, energy landscape, and conductance and the conductance as a transitionLayer for path analysis.

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("sirente")
dem <- rast(sirente)
en <- enerscape(dem, 10, unit = "kcal", neigh = 8)
plot(en, col = hcl.colors(100, "Inferno"))
contour(dem, add = TRUE, nlevels = 5, col = hcl.colors(7, "Terrain"))
```

---

neighbours *Neighbours*

Description

Neighbours

Usage

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

Arguments

i	row index.
j	column index.
n	number of neighbours (4 or 8).
x	matrix with values.
direction	(integer) for which direction to calculate costs: 0 for all, 1 for left, 2 for down, 3 for right, 4 for up.

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, out)
```

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
`out`	(integer) if to calculate the costs for moving into the cell (0) or from it (1).

Value

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

Index