

Package ‘adehabitatMA’

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Imports utils, graphics, grDevices, stats

Title Tools to Deal with Raster Maps

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Description A collection of tools to deal with raster maps.

VignetteBuilder utils

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adeoptions	<i>Setting options for the adehabitat* package</i>
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Description

The function `adeoptions` defines the options for the package `adehabitatMA`, and more generally, for all brother packages (`adehabitatHR`, `adehabitatHS` and `adehabitatLT`).

Usage

```
adeoptions(...)
```

Arguments

... a list of named elements giving the value of options for the package `adehabitatMA`

Details

This functions sets the value of components of the internal list `.adeoptions`, which contains the values of the options. Two options are currently implemented:

`epsilon`: The smallest significant distance between two points above which we should consider to deal with two separate locations.

`shortprint`: logical. Defines whether special show methods should be used when printing objects belonging to classes of the package `sp`

Value

a list of options for the package `adehabitatMA`

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

Examples

```
## load the data
data(lynxjura)

## short printing method
oldopt <- adeoptions(shortprint=TRUE)

lynxjura$map

## 'sp' print method for Spatial objects
adeoptions(shortprint=FALSE)

lynxjura$map

## original options
adeoptions(oldopt)

lynxjura$map
```

ascgen

Making Raster Maps From SpatialPoints Objects

Description

ascgen creates an object of class `SpatialPixelsDataFrame` using a set of points contained in an object of class `SpatialPointsDataFrame`.

Usage

```
ascgen(xy, cellsize = NULL, nrcol = NULL, count = TRUE)
```

Arguments

xy	an object inheriting the class <code>SpatialPoints</code>
cellsize	the cell size (resolution) of the object of class <code>SpatialPixelsDataFrame</code> to be built
nrcol	the size of the square raster map to be created (number of rows/columns)
count	logical. If <code>TRUE</code> , the resulting object contains the number of points in each cell. If <code>FALSE</code> , all the cells are set to zero

Value

Returns an object of class `SpatialPixelsDataFrame`.

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[SpatialPixelsDataFrame-class](#) for additional information on objects of class `SpatialPixelsDataFrame` and [SpatialPoints-class](#) for additional information on objects of class `SpatialPoints`.

Examples

```
## generates a random sample of points
xy <- matrix(runif(1000), ncol=2)

## coerce them to SpatialPoints
xy <- SpatialPoints(xy)
plot(xy)

## generate a SpatialPixelsDataFrame
## (and count the number of points)
spd <- ascgen(xy, cellsize=0.1)
image(spd)
```

buffer

Compute Buffers Regions

Description

buffer computes buffers regions from spatial objects belonging to the following classes:

- SpatialPoints (all pixels located within a specified distance of a point take the value one)
- SpatialPointsDataFrame with one column (this column is considered to be a factor, and the buffer is computed for each level of this factor)
- SpatialLines to compute buffers from lines.
- SpatialPolygons to compute buffers from polygons.

Usage

```
buffer(xy, x, dist)
```

Arguments

xy	an object of class <code>SpatialPoints</code> , <code>SpatialPointsDataFrame</code> with one column (a factor considered to be the identity of the points), <code>SpatialLines</code> , or <code>SpatialPolygons</code> .
x	an object inheriting the class <code>SpatialPixels</code> with the same attributes (resolution, size) as those desired for the output.
dist	a value of distance

Value

An object of class `SpatialPixelsDataFrame`.

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[SpatialPixelsDataFrame-class](#) for additional information on objects of class `SpatialPixelsDataFrame`.

Examples

```
data(lynxjura)

# locs is the SpatialPointsDataFrame containing the
# locations of lynx indices in the Jura mountains
locs <- lynxjura$locs
head(locs)

## just for the sake of illustration: sample 100 points
suppressWarnings(RNGversion("3.5.0"))
set.seed(233)
locs <- locs[sample(1:nrow(locs), 100),]

# sa is the SpatialPixelsDataFrame object containing
# maps of the study area
sa <- lynxjura$map

# Buffer of 2000 m from all points
bu <- buffer(locs, sa, 2000)
image(bu)

# displays all the pixels of the study area within 2000 m
# of a point, for each type of indices (see ?lynxjura)
buani <- buffer(locs[,2], sa, 2000)
buani
par(mar=c(0,0,2,0))
opar<-par(mfrow=c(3,4))
lapply(1:11, function(i) {
  image(buani[,i])
  title(main = names(slot(buani, "data"))[i])
})
par(opar)

## buffer from a polygon
sa2 <- sa[,4]
sa2[[1]][sa2[[1]]<5000] <- NA
image(sa2)

## gets the contour line
gc <- getcontour(sa2)
```

```
plot(gc, add=TRUE)

## a buffer of 2000 metres
image(buffer(gc, sa, 2000))
plot(gc, add=TRUE)
```

calcperimeter	<i>Compute Perimeters of Objects of Class "SpatialPolygonsDataFrame" and "PolyLinesDataFrame"</i>
---------------	---

Description

calcperimeter computes the perimeters of polygons in objects of class SpatialPolygonsDataFrame and PolyLinesDataFrame.

Usage

```
calcperimeter(x)
```

Arguments

x object of class SpatialPolygonsDataFrame or PolyLinesDataFrame

Value

an object of class SpatialPolygonsDataFrame or PolyLinesDataFrame with an additional column containing the perimeter of the polygons/polylines.

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[SpatialPolygonsDataFrame-class](#) for additional information on objects of class SpatialPolygonsDataFrame.

Examples

```
data(meuse.grid)
a <- SpatialPixelsDataFrame(points = meuse.grid[c("x", "y")],
                           data = meuse.grid)

## the contour of the map
gc <- getcontour(a[,1])
plot(gc)
```

```
## Transforms the SpatialPolygons into SpatialPolygonsDataFrame
gc <- SpatialPolygonsDataFrame(gc, data.frame(x=1))

## The perimeter of this map (in units of the data):
ii <- calcperimeter(gc)
as.data.frame(ii)
```

count.points	<i>Number of Points in Each Pixel of a Raster Map</i>
--------------	---

Description

count.points counts the number of points in each pixel of a raster map inheriting the class SpatialPixels.

Usage

```
count.points(xy, w)
```

Arguments

xy	an object of class SpatialPoints, or SpatialPointsDataFrame with one column. In the latter case, the column is considered as a factor giving, for each point, the membership of the point to a set.
w	an object inheriting the class SpatialPixels.

Value

an object of class SpatialPixelsDataFrame containing the number of points in each cell of the raster map. If xy is a SpatialPointsDataFrame with one column (a factor), the resulting object contains one column per level of this factor.

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[SpatialPixelsDataFrame-class](#) for additional information on objects of class SpatialPixelsDataFrame.

Examples

```
data(lynxjura)

# locs is the SpatialPointsDataFrame containing the
# locations of presence indices of Lynx in the Jura mountains (France)
locs <- lynxjura$locs
head(locs)

# sa is the SpatialPixelsDataFrame object containing
# maps of the study area
sa <- lynxjura$map

# Count all points
cp <- count.points(locs, sa)
cp
image(cp)

# count the points per type of lynx presence indices:
cp <- count.points(locs[,2], sa)
cp
```

distfacmap

Compute distances to the different levels of a factor map

Description

This function computes maps of distances to patches belonging to the different levels of a factor variable (mapped in an object of class `SpatialPixelsDataFrame`).

Usage

```
distfacmap(x, lev = NULL)
```

Arguments

x	an object of class <code>SpatialPixelsDataFrame</code> with one column (considered as a factor by the function)
lev	a vector of character strings giving the labels of the levels of the factor.

Value

An object of class `SpatialPixelsDataFrame`.

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[SpatialPixelsDataFrame-class](#) for additional information on objects of class `SpatialPixelsDataFrame`.

Examples

```
## Load meuse.grid data set and converts it to
## SpatialPixelsDataFrame
data(meuse.grid)
m <- SpatialPixelsDataFrame(points = meuse.grid[c("x", "y")],
                           data = meuse.grid)

## look at the soil type
image(m[,6])

## compute the distance to each soil type
sor <- distfacmap(m[,6], lev = c("type1", "type2", "type3"))

## The results
sor
mimage(sor)
```

explore

*Interactive Exploration of Maps of Class 'SpatialPixelsDataFrame'
(requires the package tkrplot)*

Description

This interface allows to explore distances, values, etc. on a map of class `SpatialPixelsDataFrame`.

Usage

```
explore(ka, coltxt="black",
        hscale = 1, vscale = 1,
        panel.last = NULL, ...)
```

Arguments

ka	An object of class <code>kasc</code>
coltxt	character. the color of the text to be printed
hscale	passed to <code>tkrplot</code>
vscale	passed to <code>tkrplot</code>
panel.last	an expression to be evaluated after plotting has taken place
...	additional parameters to be passed to the function <code>image</code>

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[SpatialPixelsDataFrame-class](#) for additional information on objects of class `SpatialPixelsDataFrame`.

Examples

```
## Not run:

data(meuse.grid)
m <- SpatialPixelsDataFrame(points = meuse.grid[c("x", "y")],
                           data = meuse.grid)

explore(m[,3:5])

data(lynxjura)
explore(lynxjura$map, panel.last=function() points(lynxjura$locs))

## End(Not run)
```

`getcontour`*Computes the Contour Polygon of a Raster Object*

Description

`getcontour` computes the contour polygon of a raster object of class `SpatialPixelsDataFrame`. When the object is made of several parts, the function returns one polygon per part.

Usage

```
getcontour(sp)
```

Arguments

`sp` an object of class `SpatialPixelsDataFrame`

Value

Returns an object of class `SpatialPolygons`.

Warning

Holes in the polygons are not taken into account by the function.

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[SpatialPixelsDataFrame-class](#) for additional information on objects of class SpatialPixelsDataFrame.

Examples

```
data(meuse.grid)
a <- SpatialPixelsDataFrame(points = meuse.grid[c("x", "y")],
                           data = meuse.grid)

## the contour of the map
gc <- getcontour(a[,1])
plot(gc)
```

hist.SpatialPixelsDataFrame

Histograms of Mapped Variables

Description

hist.SpatialPixelsDataFrame performs histograms of the variables mapped in objects of class SpatialPixelsDataFrame.

Usage

```
## S3 method for class 'SpatialPixelsDataFrame'
hist(x, type = c("h", "l", "b"),
      adjust = 1, col, border,
      lwd = 1, ...)
```

Arguments

x	a raster map of class SpatialPixelsDataFrame
type	what type of plot should be drawn. Possible types are: * "h" for histograms, * "l" for kernel density estimates (see ?density). * "b" for both histograms and kernel density estimates (see ?density). By default, type = "h" is used. If type = "l" is used, the position of the mean of each distribution is indicated by dotted lines
adjust	if type = "l", a parameter used to control the bandwidth of the density estimate (see ?density)
col	color for the histogram
border	color for the border of the histogram
lwd	if type = "l", line width for the density estimate
...	further arguments passed to or from other methods

Author(s)

Mathieu Basille <basille@ase-research.org>

See Also

[SpatialPixelsDataFrame-class](#) for additionnal information on objects of class SpatialPixelsDataFrame.

Examples

```
data(lynxjura)
hist(lynxjura$map, type = "h")

hist(lynxjura$map, type = "l")
```

join	<i>Finds the Value of Mapped Variables at some Specified Locations (Spatial Join)</i>
------	---

Description

join finds the value of a mapped variable at some specified locations.

Usage

```
join(xy, x)
```

Arguments

x an object of class SpatialPixelsDataFrame
xy an object of class SpatialPointsDataFrame

Value

If only one variable is mapped in x, a vector with length equals to the number of points in xy.

If only several variables are mapped in x, a data.frame with a number of columns equal to the number of variables in the object of class SpatialPixelsDataFrame, and with each row corresponding to the rows of xy.

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[SpatialPixelsDataFrame-class](#) for additionnal information on objects of class SpatialPixelsDataFrame.
[SpatialPoints-class](#) for additionnal information on objects of class SpatialPoints.

Examples

```

data(lynxjura)

## show the data
image(lynxjura$map)
points(lynxjura$locs)

## join the data to the maps:
res <- join(lynxjura$locs, lynxjura$map)
head(res)

```

kasc2spixdf	<i>Conversion of old classes (adehabitat) to new classes (sp,adehabitatMA)</i>
-------------	--

Description

These functions convert maps of classes available in adehabitat toward classes available in the package sp and conversely.

kasc2spixdf converts an object of class kasc into an object of class SpatialPixelsDataFrame.

asc2spixdf converts an object of class asc into an object of class SpatialGridDataFrame.

area2spol converts an object of class area into an object of class SpatialPolygons.

spol2area converts an object of class SpatialPolygons or SpatialPolygonsDataFrame into an object of class area.

attpol2area gets the data attribute of an object of class SpatialPolygonsDataFrame and stores it into a data frame.

Usage

```

kasc2spixdf(ka)
asc2spixdf(a)
area2spol(ar)
spol2area(sr)
attpol2area(srdf)

```

Arguments

ka	an object of class kasc.
a	an object of class asc.
ar	an object of class area.
sr	an object of class SpatialPolygons or SpatialPolygonsDataFrame.
srdf	an object of class SpatialPolygonsDataFrame.

Details

We describe here more in detail the functions `spol2area` and `attpol2area`. Objects of class `area` do not deal with holes in the polygons, whereas the objects of class `SpatialPolygons` do. Therefore, when holes are present in the `SpatialPolygons` object passed as argument, the function `spol2area` ignore them and returns only the external contour of the polygon (though a warning is returned).

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

labcon

Labelling Connected Features

Description

This function attributes unique labels to pixels belonging to connected features on a map of class `SpatialPixelsDataFrame`.

Usage

```
labcon(x)
```

Arguments

`x` an object of class `SpatialPixelsDataFrame` with one column

Value

Returns a matrix of class `asc`, of type "factor", with a number of levels equals to the number of connected components

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[SpatialPixelsDataFrame-class](#) for further information on the class `SpatialPixelsDataFrame`

Examples

```
data(lynxjura)
sa <- lynxjura$map[,1]

## build an image with separate components
sa[[1]][sa[[1]]<50] <- NA

## show the connected components
image(sa)
image(labcon(sa))
```

lowres

Reducing the Resolution of a Map

Description

lowres is used to reduce the resolution of maps of class `SpatialPixelsDataFrame`.

Usage

```
lowres(x, np = 2, which.fac=NULL, ...)
```

Arguments

x	an object of class <code>SpatialPixelsDataFrame</code>
np	a number giving the number of pixels to merge together (see below)
which.fac	a vector containing the indices of the columns of x, which should be considered as a factor
...	further arguments passed to or from other methods

Details

The function merges together squares of $np * np$ pixels. For variables of type "numeric", the function averages the value of the variable. For maps of type "factor", the function gives the most frequent level in the square of $np * np$ pixels. When several levels are equally represented in the square of $np * np$ pixels, the function randomly samples one of these levels.

Value

Returns an object of class `SpatialPixelsDataFrame`.

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[SpatialPixelsDataFrame-class](#) for further information on objects of class `SpatialPixelsDataFrame`.

Examples

```
data(meuse.grid)
m <- SpatialPixelsDataFrame(points = meuse.grid[c("x", "y")],
                           data = meuse.grid)

m

m <- m[,3:6]

## The initial image
image(m,3)

## The transformed image
m2 <- lowres(m, np = 4)
image(m2, 3)
```

lynxjura

Monitoring of Lynx

Description

This data set stores the results of the monitoring of lynx in the French Jura between 1980 and 1999. These data have been collected by the Lynx Network of the french wildlife management office (Office national de la chasse et de la faune sauvage).

Usage

```
data(lynxjura)
```

Format

The list `lynxjura` has two components: `map` is an object of class `SpatialPixelsDataFrame` (see `help(SpatialPixelsDataFrame)`) that describes several variables on the study area: `forets` is the density of forests, `hydro` is the density of rivers, `routes` is the density of roads and `artif` is the distance from urbanized areas.

`locs` is an object of class `SpatialPointsDataFrame` containing the locations of presence indices of the lynx. `X` and `Y` are the x and y coordinates, `Date` is the date of the collection of the indice and `Type` represents the type of data (C: alive lynx captured, D: attacks on livestock, E: prints or tracks, F: feces, J: hairs, L: corpse of lynx, O: sightings and P: attacks on wild prey).

Source

Vandel, J.M. (2001) *Repartition du Lynx (Lynx lynx) en France (Massif Alpin, Jurassien et Vosgien). Methodologie d'étude et statut actuel*. Ecole Pratique des Haute Etudes de Montpellier II: Dissertation.

mimage

Displaying Multi-layer Raster Maps

Description

This function allows to display the whole content of an object of class `SpatialPixelsDataFrame`

Usage

```
mimage(x, var = names(slot(x, "data")), col = gray((240:1)/256), mfrow = NULL)
```

Arguments

<code>x</code>	an object of class <code>SpatialPixelsDataFrame</code>
<code>var</code>	The names or index of the variables to be plotted
<code>col</code>	a vector of colors to be used for plotting
<code>mfrow</code>	The parameter <code>mfrow</code> for the resulting graph (see <code>help(par)</code>)

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[par](#) for information about `mfrow`, and [SpatialPixelsDataFrame-class](#) for additional information on objects of class `SpatialPixelsDataFrame`.

Examples

```
data(lynxjura)

lynxjura$map

mimage(lynxjura$map)

mimage(lynxjura$map, c("forets", "routes"),
       col=grey(seq(0,1, length=100)))
```

Description

morphology performs morphological operations on images of class `SpatialPixelsDataFrame`.

Usage

```
morphology(x, operation = c("erode", "dilate"), nt = 5)
```

Arguments

x	a matrix of class <code>SpatialPixelsDataFrame</code> with one column
operation	a character string indicating the operation to be processed: either "erode" or "dilate"
nt	the number of times that the operation should be processed

Value

Returns an object of class `SpatialPixelsDataFrame` with one column, containing 1 when the pixel belong to one feature of the image and NA otherwise (see examples).

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>

See Also

[SpatialPixelsDataFrame-class](#) for further information on objects of class `SpatialPixelsDataFrame`.

Examples

```
data(meuse.grid)
a <- SpatialPixelsDataFrame(points = meuse.grid[c("x", "y")],
                           data = meuse.grid)

## dilatation
toto1 <- morphology(a, operation = "dilate", nt = 1)
toto2 <- morphology(a, operation = "dilate", nt = 2)
toto3 <- morphology(a, operation = "dilate", nt = 3)
toto5 <- morphology(a, operation = "dilate", nt = 5)
colo <- grey((1:5)/6)
image(toto5, col = colo[1])
image(toto3, add = TRUE, col = colo[2])
image(toto2, add = TRUE, col = colo[3])
image(toto1, add = TRUE, col = colo[4])
```

```
image(a, add = TRUE)

## erosion
colo <- grey((1:12)/13)
image(a, col = "black")
for (i in 1:12) {
  toto <- morphology(a, operation = "erode", nt = i)
  image(toto, add = TRUE, col = colo[i])
}
```

puechabonsp

Radio-Tracking Data of Wild Boar

Description

This data set stores the results of the monitoring of 4 wild boars at Puechabon (Mediterranean habitat, South of France). These data have been collected by Daniel Maillard (Office national de la chasse et de la faune sauvage).

Usage

```
data(puechabonsp)
```

Details

The list puechabonsp has two components:

puechabonsp\$map is an object of class SpatialPixelsDataFrame that describes several variables on the study area.

puechabonsp\$relocs is an object of class SpatialPointsDataFrame containing the relocations of the wild boar resting sites in summer. Information on wild boars is provided by factors Name, Sex, Age.

References

Maillard, D. (1996). *Occupation et utilisation de la garrigue et du vignoble mediterraneens par le Sanglier*. Universite d'Aix-Marseille III: PhD thesis.

show-methods	<i>Print Functions for Objects of the Package 'sp' Used in 'adehabitatMA'</i>
--------------	---

Description

These are functions allowing a shorter print of the content of objects of class `SpatialPolygonsDataFrame`, `SpatialPixelsDataFrame`, `SpatialPixels`, and `SpatialGridDataFrame`. Original printing methods can be recovered by setting `adeoptions(shortprint=FALSE)`.

Methods

object = "SpatialGridDataFrame" show function for the class `SpatialGridDataFrame`.

object = "SpatialPixels" show function for the class `SpatialPixels`.

object = "SpatialPixelsDataFrame" show function for the class `SpatialPixelsDataFrame`.

object = "SpatialPolygonsDataFrame" show function for the class `SpatialPolygonsDataFrame`.

subsetmap	<i>Storing a Part of a Map</i>
-----------	--------------------------------

Description

`subsetmap` is used to store a part of any given map of class `SpatialPixelsDataFrame` into another object.

Usage

```
subsetmap(x, xlim = NULL, ylim = NULL, ...)
```

Arguments

<code>x</code>	an object of class <code>SpatialPixelsDataFrame</code>
<code>xlim</code>	numerical vector of length 2. The x limits of the rectangle including the new map
<code>ylim</code>	numerical vector of length 2. The y limits of the rectangle including the new map
<code>...</code>	further arguments passed to or from other methods

Details

If `xlim` or `ylim` are not provided, the function asks the user to click on the map to delimit the lower left corner and the higher right corner of the new map (see Examples).

Value

Returns an object of class `SpatialPixelsDataFrame`

Author(s)

Clement Calenge <clement.calenge@ofb.gouv.fr>, improvements by Jon Olav Vik

Examples

```
data(lynxjura)
map <- lynxjura$map

## limits of the new map:
x1 <- c(839938.7, 858990.8)
y1 <- c(2149019, 2168761)

## computation of the new map:
su <- subsetmap(map, xlim = x1, ylim = y1)
su

## Display
opar <- par(mar = c(0,0,0,0))
layout(matrix(c(1,1,1,1,1,1,1,2), byrow = TRUE, ncol = 3))
image(map, axes = FALSE)
polygon(c(x1[1], x1[2], x1[2], x1[1]),
        c(y1[1], y1[1], y1[2], y1[2]))
image(su, axes = FALSE)
box()

par(opar)
par(mfrow = c(1,1))

## Not run:
## Interactive example
su <- subsetmap(map)

image(su)

## End(Not run)
```

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