Package ‘maptools’

May 14, 2020

Version 1.0-1
Date 2020-05-05
Title Tools for Handling Spatial Objects
Encoding UTF-8
Depends R (>= 2.10), sp (>= 1.0-11)
Imports foreign (>= 0.8), methods, grid, lattice, stats, utils,
grDevices
Suggests rgeos (>= 0.1-8), spatstat (>= 1.60), PBSmapping, maps,
RColorBrewer, raster, polyclip, spatstat.utils
Enhances gpclib
Description Set of tools for manipulating geographic data. It includes binary ac-
cess to ‘GSHHG’ shoreline files. The package also provides interface wrappers for exchang-
ing spatial objects with packages such as 'PBSmapping', 'spatstat', 'maps', and others.
License GPL (>= 2)
URL http://maptools.r-forge.r-project.org/,
http://r-forge.r-project.org/projects/maptools/
RoxygenNote 6.1.1
NeedsCompilation yes
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Repository CRAN

Date/Publication 2020-05-14 18:20:02 UTC

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as.im

Coercion between sp objects and spatstat im objects

Description

Functions to convert between spatstat raster format im and sps SpatialGridDataFrame as well as one-way conversion from rasters rasterLayer to im. S4-style as() coercion can be used between im and SpatialGridDataFrame objects.
Usage

as.im.SpatialGridDataFrame(from)
as.SpatialGridDataFrame.im(from)
as.im.RasterLayer(from)

Arguments

from        object to coerce from

Details

A SpatialGridDataFrame object may contain several columns of data such that several values are associated with each grid cell. In contrast an im object can only contain a single variable value for each cell. In as.im.SpatialGridDataFrame() the first data column is used. To convert another column to im format simply extract this column first as shown in the example below.

Methods

coerce signature(from = "SpatialGridDataFrame",to = "im")
coerce signature(from = "im",to = "SpatialGridDataFrame")

Warning

In spatstat all spatial objects are assumed to be planar. This means that spatstat is not designed to work directly with geographic (longitude and latitude) coordinates. If a sp object is declared to have geographic (unprojected) coordinates maptools refuses to convert directly to spatstat format. Rather, these should be projected first using e.g. spTransform. If you know what you are doing, and really want to force coercion, you can overwrite the proj4string of the sp object with NA, proj4string(x) <- CRS(NA), which will fool the system to think that the data is in local planar coordinates. This is probably not a good idea!

Author(s)

Edzer Pebesma <edzer.pebesma@uni-muenster.de>, Roger Bivand

See Also

Other converters between sp and spatstat: as.ppp.SpatialPoints, as.psp.SpatialLines, as.owin.SpatialPolygons, as.SpatialPolygons.tess.

Examples

run <- FALSE
if (require(spatstat, quietly=TRUE)) run <- TRUE
if (run) {
  ## Extract an example SpatialGridDataFrame and plot it
  data(meuse.grid) # A data.frame
grided(meuse.grid) = ~x+y # Now a SpatialPixelsDataFrame
  fullgrid(meuse.grid) <- TRUE # Finally a SpatialGridDataFrame
  mg_dist <- meuse.grid["dist"] # A SpatialGridDataFrame with a single column
as.linnet.SpatialLines

Convert SpatialLines to Linear Network

Description

Convert an object of class SpatialLines or SpatialLinesDataFrame (from package sp), representing a collection of polygonal lines, into an object of class linnet (from package spatstat), representing a network.

Usage

as.linnet.SpatialLines(X, ..., fuse = TRUE)

## S4 method for signature 'SpatialLines,linnet'
coerce(from, to = "linnet", strict = TRUE)

## S4 method for signature 'SpatialLinesDataFrame,linnet'
coerce(from, to = "linnet",
       strict = TRUE)

Arguments

X, from     Object of class SpatialLines or SpatialLinesDataFrame to be converted.
to          output object of class "linnet".
strict      logical flag. If TRUE, the returned object must be strictly from the target class.
...         Ignored.
fuse        Logical value indicating whether to join different curves which have a common vertex.
Details

This function converts an object of class SpatialLines or SpatialLinesDataFrame into an object of class linnet. It is not a method for the spatstat generic function as.linnet, but like other S4 coercion functions for sp classes to spatstat classes, it may be called directly as a function.

An object of class SpatialLines or SpatialLinesDataFrame (from package sp) represents a list of lists of the coordinates of lines, such as a list of all roads in a city. An object of class linnet in the spatstat package represents a linear network, such as a road network.

If fuse=FALSE, each “Line” object in X will be treated as if it were disconnected from the others. The result is a network that consists of many disconnected sub-networks, equivalent to the list of “Line” objects.

If fuse=TRUE (the default), the code will search for identical pairs of vertices occurring in different “Line” objects, and will treat them as identical vertices, effectively joining the two “Line” objects at this common vertex.

If X belongs to class SpatialLinesDataFrame, the associated columns of data in the auxiliary data frame slot(X, "data") will be copied to the output as the marks attached to the line segments of the network. See the Examples.

Value

An object of class linnet.

Author(s)

Adrian Baddeley.

See Also

as.linnet

Examples

```r
run <- FALSE
if(require(spatstat, quietly=TRUE)) run <- TRUE
if (run) {
  dname <- system.file("shapes", package="maptools")
  fname <- file.path(dname, "fylk-val.shp")
  fylk <- readShapeSpatial(fname, proj4string=CRS("+proj=utm +zone=33 +ellps=WGS84"))
  is.projected(fylk)
}
if (run) {
  L <- as(fylk, "linnet")
  print(max(vertexdegree(L)))
}
if (run) {
  L0 <- as.linnet.SpatialLines(fylk, fuse=FALSE)
  print(max(vertexdegree(L0)))
}
if (run) {
  ## extract data associated with each network segment
```
as.owin

Description

Functions to convert between \texttt{spatstat} observation window (\texttt{owin}) format and various \texttt{sp} formats. S4-style as() coercion can be used as well.

Usage

\begin{verbatim}
as.owin.SpatialPolygons(W, ..., fatal) as.owin.SpatialGridDataFrame(W, ..., fatal) as.owin.SpatialPixelsDataFrame(W, ..., fatal) as.SpatialPolygons.owin(x)
\end{verbatim}

Arguments

- \texttt{W} \hspace{1cm} \texttt{SpatialPolygons} object to coerce to \texttt{owin}
- \texttt{x} \hspace{1cm} \texttt{owin} object to coerce to \texttt{SpatialPolygons} format
- \texttt{...} \hspace{1cm} ignored
- \texttt{fatal} \hspace{1cm} formal coercion argument; ignored

Details

An observation window in \texttt{spatstat} defines a planar region. It is typically used to represent a sampling region. It comes in three different formats: a simple rectangle, a polygon (vector format) or a binary mask (TRUE/FALSE grid; raster format). These can all be coerced to polygonal form internally in \texttt{spatstat} and then converted to \texttt{SpatialPolygons}, which is what \texttt{as.SpatialPolygons.owin()} does. For objects of class \texttt{SpatialPolygons} (and \texttt{SpatialPolygonsDataFrame}) the \texttt{sp} polygons are simply extracted and cast into \texttt{spatstats} polygon format inside the \texttt{owin} object. For \texttt{SpatialPixelsDataFrame} and \texttt{SpatialGridDataFrame} the grid is extracted and cast into \texttt{spatstats} mask format inside the \texttt{owin} object. In all cases any data apart from the spatial region itself are discarded.
Methods

coerce signature(from = "SpatialPolygons", to = "owin")
coerce signature(from = "SpatialPixelsDataFrame", to = "owin")
coerce signature(from = "SpatialGridDataFrame", to = "owin")
coerce signature(from = "owin", to = "SpatialPolygons")

Warning

In spatstat all spatial objects are assumed to be planar. This means that spatstat is not designed to work directly with geographic (longitude and latitude) coordinates. If a sp object is declared to have geographic (unprojected) coordinates maptools refuses to convert directly to spatstat format. Rather, these should be projected first using e.g. spTransform. If you know what you are doing, and really want to force coercion, you can overwrite the proj4string of the sp object with an empty string, proj4string(x) <-""", which will fool the system to think that the data is in local planar coordinates. This is probably not a good idea!

Note

When coercing a SpatialPolygons object to an owin object, full topology checking is enabled by default. To avoid checking, set spatstat.options(checkpolygons=FALSE) (from spatstat (1.14-6)). To perform the checking later, owinpolycheck(W, verbose=TRUE).

Author(s)

Edzer Pebesma <edzer.pebesma@uni-muenster.de>, Roger Bivand

Examples

run <- FALSE
if (require(spatstat, quietly=TRUE)) run <- TRUE
if (run) {
  ## SpatialPixelsDataFrame -> owin
  data(meuse.grid) # A data.frame
grided(meuse.grid) = ~x+y # Now a SpatialPixelsDataFrame
  mg_owin <- as(meuse.grid, "owin")
  mg_owin
} if (run) {
  ## SpatialGridDataFrame -> owin
  fullgrid(meuse.grid) <- TRUE # Now a SpatialGridDataFrame
  mg_owin2 <- as(meuse.grid, "owin")
} if (run) {
  ## SpatialPolygons region with a hole
  ho_sp <- SpatialPolygons(list(Polygons(list(Polygon(cbind(c(0,1,1,0,0),
    c(0,0,1,1,0))), Polygon(cbind(c(0.6,0.4,0.4,0.6,0.6),
    c(0.2,0.2,0.4,0.4,0.2))), hole=TRUE)), ID="ho")))
  plot(ho_sp, col="red", pbg="pink")
} if (run) {
## SpatialPolygons -> owin
ho <- as(ho_sp, "owin")
plot(ho)
}
if (run) {
## Define owin directly and check they are identical
ho_orig <- owin(poly=list(list(x=c(0,1,1), y=c(0,0,1)),
  list(x=c(0.6,0.4,0.4,0.6), y=c(0.2,0.2,0.4,0.4))))
identical(ho, ho_orig)
}
if (run) {
## owin -> SpatialPolygons
ho_sp1 <- as(ho, "SpatialPolygons")
all.equal(ho_sp, ho_sp1, check.attributes=FALSE)
}

---

### as.ppp

Coercion between sp objects and spatstat ppp objects

#### Description

Functions to convert between spatstat planar point pattern (ppp) format and sp SpatialPoints and SpatialPointsDataFrame as well as one-way conversion from SpatialGridDataFrame to ppp. S4-style as() coercion can be used as well.

#### Usage

as.ppp.SpatialPoints(X)
as.ppp.SpatialPointsDataFrame(X)
as.SpatialPoints.ppp(from)
as.SpatialPointsDataFrame.ppp(from)
as.SpatialGridDataFrame.ppp(from)

#### Arguments

- **from, X**: object to coerce from

#### Details

The main conversion is between sps SpatialPoints/SpatialPointsDataFrame and spatstat ppp. Conversion between SpatialGridDataFrame and ppp should rarely be used; using as.owin.SpatialGridDataFrame is more transparent.

#### Methods

- **coerce**
  - signature(from = "SpatialPoints", to = "ppp")
  - signature(from = "SpatialPointsDataFrame", to = "ppp")
  - signature(from = "ppp", to = "SpatialGridDataFrame")
  - signature(from = "ppp", to = "SpatialPointsDataFrame")
  - signature(from = "ppp", to = "SpatialPoints")
Warning

In `spatstat` all spatial objects are assumed to be planar. This means that `spatstat` is not designed to work directly with geographic (longitude and latitude) coordinates. If a `sp` object is declared to have geographic (unprojected) coordinates `maptools` refuses to convert directly to `spatstat` format. Rather, these should be projected first using e.g. `spTransform`. If you know what you are doing, and really want to force coercion, you can overwrite the `proj4string` of the `sp` object with `NA`, `proj4string(x) <- CRS(NA)`, which will fool the system to think that the data is in local planar coordinates. This is probably not a good idea!

Note

The `ppp` format requires an observation window which is the sampling region. The `sp` formats contain no such information and by default the bounding box of the points is simply used. This is almost never the correct thing to do! Rather, information about the sampling region should be converted into `spatstat` `owin` format and assigned as the observation window. Usually conversion from `ppp` to `sp` format simply discards the `owin`. However, `as.SpatialGridDataFrame.ppp` actually first discards the points(!), second checks that the corresponding `owin` is in a grid format (matrix of TRUE/FALSE for inside/outside sampling region), and finally converts the TRUE/FALSE grid to a `SpatialGridDataFrame`.

Author(s)

Edzer Pebesma <edzer.pebesma@uni-muenster.de>, Roger Bivand

Examples

```r
run <- FALSE
if (require(spatstat, quietly=TRUE)) run <- TRUE
if (run) {
  ## Convert SpatialPointsDataFrame into a marked ppp
data(meuse)
coordinates(meuse) = ~x+y
meuse_ppp <- as(meuse, "ppp")
meuse_ppp # Window is the bounding rectangle
} if (run) {
  plot(meuse_ppp, which.marks = "zinc")
} if (run) {
  ## Convert SpatialPoints into an unmarked ppp
meuse2 <- as(meuse, "SpatialPoints")
as(meuse2, "ppp")
} if (run) {
  ## Get sampling region in grid format and assign it as observation window
data(meuse.grid)
gridded(meuse.grid) <- ~x+y
mg_owin <- as(meuse.grid, "owin")
Window(meuse_ppp) <- mg_owin
meuse_ppp # Window is now a binary image mask (TRUE/FALSE grid)
}
```
if (run) {
  plot(meuse_ppp, which.marks = "zinc")
}

if (run) {
  ## Convert marked ppp back to SpatialPointsDataFrame
  rev_ppp_SPDF <- as.SpatialPointsDataFrame.ppp(meuse_ppp)
  summary(rev_ppp_SPDF)
}

if (run) {
  ## Convert marked ppp back to SpatialPoints (discarding marks)
  rev_ppp_SP <- as.SpatialPoints.ppp(meuse_ppp)
  summary(rev_ppp_SP)
}

if (run) {
  ## Convert marked ppp back to SpatialGridDataFrame (extracting the window grid)
  rev_ppp_SGDF <- as.SpatialGridDataFrame.ppp(meuse_ppp)
  summary(rev_ppp_SGDF)
}

---

as.psp

Coercion between sp objects and spatstat psp objects

Description

Functions to convert between spatstat planar segment pattern (psp) format and various sp line formats. S4-style as() coercion can be used as well.

Usage

as.psp.Line(from, ..., window=NULL, marks=NULL, fatal)
as.psp.Lines(from, ..., window=NULL, marks=NULL, fatal)
as.psp.SpatialLines(from, ..., window=NULL, marks=NULL, characterMarks = FALSE, fatal)
as.psp.SpatialLinesDataFrame(from, ..., window=NULL, marks=NULL, fatal)
as.SpatialLines.psp(from)

Arguments

from       object to coerce from
...         ignored
window      window of class owin as defined in the spatstat package
marks       marks as defined in the spatstat package
characterMarks default FALSE, if TRUE, do not convert NULL marks to factor from character
fatal       formal coercion argument; ignored
Methods

\texttt{coerce signature(from = "Line",to = "psp")}
\texttt{coerce signature(from = "Lines",to = "psp")}
\texttt{coerce signature(from = "SpatialLines",to = "psp")}
\texttt{coerce signature(from = "SpatialLinesDataFrame",to = "psp")}
\texttt{coerce signature(from = "psp",to = "SpatialLines")}

Warning

In \texttt{spatstat} all spatial objects are assumed to be planar. This means that \texttt{spatstat} is not designed to work directly with geographic (longitude and latitude) coordinates. If a \texttt{sp} object is declared to have geographic (unprojected) coordinates \texttt{maptools} refuses to convert directly to \texttt{spatstat} format. Rather, these should be projected first using e.g. \texttt{spTransform}. If you know what you are doing, and really want to force coercion, you can overwrite the \texttt{proj4string} of the \texttt{sp} object with \texttt{NA}, \texttt{proj4string(x) <-CRS(NA)}, which will fool the system to think that the data is in local planar coordinates. This is probably not a good idea!

Author(s)

Edzer Pebesma <edzer.pebesma@uni-muenster.de>, Roger Bivand

Examples

\begin{verbatim}
run <- FALSE
if (require(spatstat, quietly=TRUE)) run <- TRUE
if (run) {
  data(meuse.riv)
  mr <- Line(meuse.riv)
  mr_psp <- as(mr, "psp")
  mr_psp
} if (run) {
  plot(mr_psp)
}
if (run) {
  xx_back <- as(mr_psp, "SpatialLines")
  plot(xx_back)
} if (run) {
  xx <- readShapeLines(system.file("shapes/fylk-val.shp", package="maptools")[1],
    proj4string=CRS("+proj=utm +zone=33 +ellps=WGS84"))
  xx_psp <- as(xx["LENGTH"], "psp")
  xx_psp
} if (run) {
  plot(xx_psp)
} if (run) {
  xx_back <- as(xx_psp, "SpatialLines")
  plot(xx_back)
\end{verbatim}
as.SpatialPolygons.tess

Coercion of spatstat tess object to sp SpatialPolygons object

Description

This function coerces \texttt{spatstat} tessellation objects of class \texttt{tess} to \texttt{sp} \texttt{SpatialPolygons} class. S4-style \texttt{as()} coercion works as well.

Usage

\begin{verbatim}
as.SpatialPolygons.tess(x)
\end{verbatim}

Arguments

\begin{itemize}
  \item \texttt{x} \hspace{1cm} \texttt{spatstat} object of class \texttt{tess} to coerce from
\end{itemize}

Methods

\begin{verbatim}
coerce signature(from = "tess", to = "SpatialPolygons")
\end{verbatim}

Author(s)

Edzer Pebesma \texttt{<edzer.pebesma@uni-muenster.de>}, Roger Bivand

Examples

\begin{verbatim}
run <- FALSE
if (require(spatstat, quietly=TRUE)) run <- TRUE
if (run) {
  A <- tess(xgrid=0:4, ygrid=0:4)
  A_sp <- as(A, "SpatialPolygons")
  plot(A_sp)
  text(coordinates(A_sp), labels=row.names(A_sp), cex=0.6)
}
\end{verbatim}
Conditioned choropleth maps permit the conditioning of a map of a variable on the values of one or two other variables coded as factors or shingles. This function uses `spplot` after constructing multiple subsets of the variable of interest defined by the intervals given by the conditioning variables.

### Usage

```r
CCmaps(obj, zcol = NULL, cvar = NULL, cvar.names = NULL, ..., names.attr, 
scales = list(draw = FALSE), xlab = NULL, ylab = NULL, 
aspect = mapasp(obj, xlim, ylim), sp.layout = NULL, xlim = bbox(obj)[1, ], 
ylim = bbox(obj)[2, ])
```

### Arguments

- **obj**: object of class `SpatialPolygonsDataFrame`
- **zcol**: single variable name as string
- **cvar**: a list of one or two conditioning variables, which should be of class factor or shingle
- **cvar.names**: names for conditioning variables, if not given, the names of the variables in the `cvar` list
- **...**: other arguments passed to `spplot` and `levelplot`
- **names.attr**: names to use in panel, if different from `zcol` names
- **scales**: scales argument to be passed to Lattice plots; use `list(draw = TRUE)` to draw axes scales
- **xlab**: label for x-axis
- **ylab**: label for y-axis
- **aspect**: aspect ratio for spatial axes; defaults to "iso" (one unit on the x-axis equals one unit on the y-axis) but may be set to more suitable values if the data are e.g. if coordinates are latitude/longitude
- **sp.layout**: NULL or list; see `spplot`
- **xlim**: numeric; x-axis limits
- **ylim**: numeric; y-axis limits

### Value

The function returns a `SpatialPolygonsDataFrame` object with the `zcol` variable and the partitions of the `cvars` list variables invisibly.

### Author(s)

Roger Bivand
checkPolygonsHoles

References


See Also

spplot

Examples

```r
nc.sids <- readShapeSpatial(system.file("shapes/sids.shp", package="maptools")[[1]], IDvar="FIPSNO", proj4string=CRS("+proj=longlat +ellps=clrk66"))
nc.sids$ft.SID74 <- sqrt(1000)*(sqrt(nc.sids$SID74/nc.sids$BIR74) + sqrt((nc.sids$SID74+1)/nc.sids$BIR74))
nc.sids$ft.NWBIR74 <- sqrt(1000)*(sqrt(nc.sids$NWBIR74/nc.sids$BIR74) + sqrt((nc.sids$NWBIR74+1)/nc.sids$BIR74))
library(lattice)
sh_nw4 <- equal.count(nc.sids$ft.NWBIR74, number=4, overlap=1/5)
CCmaps(nc.sids, "ft.SID74", list("Nonwhite_births"=sh_nw4), col.regions=colorRampPalette(c("yellow1", "brown3"))(20), main="Transformed SIDS rates 1974-8")
```

---

**checkPolygonsHoles**

*Check holes in Polygons objects*

**Description**

The function checks holes in Polygons objects. Use of the rgeos package functions is preferred, and if rgeos is available, they will be used automatically. In this case, member Polygon objects are checked against each other for containment, and the returned Polygons object has component hole slots set appropriately. In addition, the output Polygons object may be provided with a comment string, encoding the external and internal rings. For gpclib use, see details below.

**Usage**

```r
checkPolygonsHoles(x, properly=TRUE, avoidGEOS=FALSE, useSTRtree=FALSE)
gpclibPermitStatus()
gpclibPermit()
rgeosStatus()
```
Arguments

x An Polygons object as defined in package sp
properly default TRUE, use gContainsProperly rather than gContains
avoidGEOS default FALSE; if TRUE force use of gpclib even when rgeos is available
useSTRtree default FALSE, if TRUE, use rgeos STRtree in checking holes, which is much faster, but uses a lot of memory and does not release it on completion (work in progress)

Details

If the gpclib package is used, an intersection between a gpc.poly object with one or more polygon contours and its bounding box is used to set the hole flag. The function will set single polygon contours to hole=FALSE, and if multiple polygon contours are holes, will set them TRUE. The gpclibPermit function is used to choose to permit the use of gpclib if installed, and gpclibPermitStatus reports its status. The licence for gpclib is not Free or Open Source and explicitly forbids commercial use. See library(help=gpclib).

Value

An Polygons object re-created from the input object.

Author(s)

Roger Bivand

Examples

if (rgeosStatus()) {
  nc1 <- readShapePoly(system.file("shapes/sids.shp", package="maptools")[[1]],
    proj4string=CRS("+proj=longlat +ellps=clrk66"))
  pl <- slot(nc1, "polygons")
  sapply(slot(pl[[4]], "Polygons"), function(x) slot(x, "hole"))
  pl[[4]] <- Polygons(list(slot(pl[[4]], "Polygons")[[1]],
    Polygon(slot(slot(pl[[4]], "Polygons")[[2]], "coords"), hole=TRUE),
    slot(pl[[4]], "Polygons")[[3]], slot(pl[[4]], "ID"))
  sapply(slot(pl[[4]], "Polygons"), function(x) slot(x, "hole"))
  pl_new <- lapply(pl, checkPolygonsHoles)
  sapply(slot(pl_new[[4]], "Polygons"), function(x) slot(x, "hole"))
  srs <- slot(slot(pl[[1]], "Polygons")[[1]], "coords")
  hle2 <- structure(c(-81.64093, -81.38380, -81.34165, -81.66833, -81.64093,
    36.57865, 36.57234, 36.47603, 36.47894, 36.57865), .Dim = as.integer(c(5, 2)))
  hle3 <- structure(c(-81.47759, -81.39118, -81.38486, -81.46705, -81.47759,
    36.56565, 36.49907, 36.50380, 36.56289), .Dim = as.integer(c(5, 2)))
  x <- Polygons(list(Polygon(srs), Polygon(hle2), Polygon(hle3)),
    ID=slot(pl[[1]], "ID"))
  sapply(slot(x, "Polygons"), function(x) slot(x, "hole"))
  res <- checkPolygonsHoles(x)
  sapply(slot(res, "Polygons"), function(x) slot(x, "hole"))
  ## Not run:
  opar <- par(mfrow=c(1,2))
SPx <- SpatialPolygons(list(x))
plot(SPx)
text(t(sapply(slot(x, "Polygons"), function(i) slot(i, "labpt"))),
     labels=sapply(slot(x, "Polygons"), function(i) slot(i, "hole")), cex=0.6)
title(xlab="Hole slot values before checking")
SPres <- SpatialPolygons(list(res))
plot(SPres)
text(t(sapply(slot(res, "Polygons"), function(i) slot(i, "labpt"))),
     labels=sapply(slot(res, "Polygons"), function(i) slot(i, "hole")), cex=0.6)
title(xlab="Hole slot values after checking")
par(opar)
p1 <- Polygon(cbind(x=c(0, 0, 10, 10, 0), y=c(0, 10, 10, 0, 0))) # I
p2 <- Polygon(cbind(x=c(3, 3, 7, 7, 3), y=c(3, 7, 3, 3, 3))) # H
p8 <- Polygon(cbind(x=c(1, 1, 2, 2, 1), y=c(1, 2, 1, 1))) # H
p9 <- Polygon(cbind(x=c(1, 1, 2, 2, 1), y=c(5, 6, 5, 5))) # H
p3 <- Polygon(cbind(x=c(20, 20, 30, 30, 20), y=c(20, 30, 30, 20, 20))) # I
p4 <- Polygon(cbind(x=c(21, 21, 29, 29, 21), y=c(21, 29, 29, 21, 21))) # H
p14 <- Polygon(cbind(x=c(21, 21, 29, 29, 21), y=c(21, 29, 21, 21))) # H
p5 <- Polygon(cbind(x=c(22, 22, 28, 28, 22), y=c(22, 28, 22, 22, 22))) # I
p15 <- Polygon(cbind(x=c(22, 22, 28, 28, 22), y=c(22, 28, 22, 22, 22))) # I
p6 <- Polygon(cbind(x=c(23, 23, 27, 27, 23), y=c(23, 27, 23, 23, 23))) # H
p7 <- Polygon(cbind(x=c(13, 13, 17, 17, 13), y=c(13, 17, 13, 13, 13))) # I
p10 <- Polygon(cbind(x=c(24, 24, 26, 26, 24), y=c(24, 26, 24, 24, 24))) # I
p11 <- Polygon(cbind(x=c(24.25, 24.25, 25.75, 25.75, 24.25),
                      y=c(24.25, 24.25, 25.75, 25.75, 24.25))) # H
p12 <- Polygon(cbind(x=c(24.5, 24.5, 25.5, 25.5, 24.5),
                      y=c(24.5, 24.5, 25.5, 24.5, 24.5))) # I
p13 <- Polygon(cbind(x=c(24.75, 24.75, 25.25, 25.25, 24.75),
                      y=c(24.75, 24.75, 25.25, 24.75))) # H
lp <- list(p1, p2, p13, p7, p6, p5, p4, p3, p8, p11, p12, p9, p10, p14, p15)
# 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
# 0 1 11 0 6 0 8 0 1 13 0 1 0 (7) (6)
# I H H I H I H I H I H I H I ? ?
pls <- Polygons(lp, ID="1")
comment(pls)
pls1 <- checkPolygonsHoles(pls)
comment(pls1)
opar <- par(mfrow=c(1,2))
plot(SpatialPolygons(list(pls)), col="magenta", pbg="cyan", usePolyPath=FALSE)
title(xlab="Hole slot values before checking")
plot(SpatialPolygons(list(pls1)), col="magenta", pbg="cyan", usePolyPath=FALSE)
title(xlab="Hole slot values after checking")
par(opar)

## End(Not run)
Description

These functions show how to build converters to SpatialLinesDataFrame objects: ArcObj2SLDF from the list returned by the get.arcdata function in the RArcInfo package; ContourLines2SLDF from the list returned by the contourLines function in the graphics package (here the data frame is just the contour levels, with one Lines object made up of at least one Line object per level); and MapGen2SL reads a file in "Mapgen" format into a SpatialLines object.

Usage

ArcObj2SLDF(arc, proj4string=CRS(as.character(NA)), IDs)
ContourLines2SLDF(cL, proj4string=CRS(as.character(NA)))
MapGen2SL(file, proj4string=CRS(as.character(NA)))

Arguments

arc a list returned by the get.arcdata function in the RArcInfo package
IDs vector of unique character identifiers; if not given, suitable defaults will be used, and the same values inserted as data slot row names
cL a list returned by the contourLines function in the graphics package
proj4string Object of class "CRS"; see CRS-class
file filename of a file containing a Mapgen line data set

Value

A SpatialLinesDataFrame object

Note

Coastlines of varying resolution may be chosen online and downloaded in "Mapgen" text format from http://www.ngdc.noaa.gov/mgg/shorelines/shorelines.html, most conveniently using the interactive selection tool, but please note the 500,000 point limit on downloads, which is easy to exceed.

Author(s)

Roger Bivand; Edzer Pebesma

See Also

SpatialLines-class

Examples

#data(co37_d90_arc) # retrieved as:
# library(RArcInfo)
# f1 <- "http://www.census.gov/geo/cob/bdy/co/co90e00/co37_d90_e00.zip"
# download.file(f1, "co37_d90_e00.zip")
# e00 <- zip.file.extract("co37_d90.e00", "co37_d90_e00.zip")
# e00toavc(e00, "ncar")
# arc <- get.arcdata('.', "ncar")
# res <- arcobj2SLDF(arc)
# plot(res)
# invisible(title(''))
res <- ContourLines2SLDF(contourLines(volcano))
plot(res, col=terrain.colors(nrow(as(res, "data.frame"))))
title("Volcano contours as SpatialLines")

dotsInPolys  

**Description**

Make point coordinates for a dot density map

**Usage**

```r
dotsInPolys(pl, x, f = "random", offset, compatible = FALSE)
```

**Arguments**

- **pl**: an object of class SpatialPolygons or SpatialPolygonsDataFrame
- **x**: integer vector of counts of same length as pl for dots
- **f**: type of sampling used to place points in polygons, either "random" or "regular"
- **offset**: for regular sampling only: the offset (position) of the regular grid; if not set, `c(0.5,0.5)`, that is the returned grid is not random
- **compatible**: what to return, if TRUE a a list of matrices of point coordinates, one matrix for each member of pl, if false a SpatialPointsDataFrame with polygon ID values

**Details**

With f="random", the dots are placed in the polygon at random, f="regular" - in a grid pattern (number of dots not guaranteed to be the same as the count). When the polygon is made up of more than one part, the dots will be placed in proportion to the relative areas of the clockwise rings (anticlockwise are taken as holes). From maptools release 0.5-2, correction is made for holes in the placing of the dots, but depends on hole values being correctly set, which they often are not.

**Value**

If compatible=TRUE, the function returns a list of matrices of point coordinates, one matrix for each member of pl. If x[i] is zero, the list element is NULL, and can be tested when plotting - see the examples. If compatible=FALSE (default), it returns a SpatialPointsDataFrame with polygon ID values as the only column in the data slot.

**Note**

Waller and Gotway (2004) Applied Spatial Statistics for Public Health Data (Wiley, Hoboken, NJ) explicitly warn that care is needed in plotting and interpreting dot density maps (pp. 81-83)
elide-methods

Methods for Function elide in Package ‘maptools’

Description

Methods for function elide to translate and disguise coordinate placing in the real world.

Usage

elide(obj, ...)

Arguments

obj

object to be elided

... other arguments:

bb if NULL, uses bounding box of object, otherwise the given bounding box
shift values to shift the coordinates of the input object; this is made ineffective
by the scale argument
reflect reverse coordinate axes
scale if NULL, coordinates not scaled; if TRUE, the longer dimension is scaled
to lie within [0,1] and aspect maintained; if a scalar, the output range of
[0,1] is multiplied by scale
elide-methods

**flip**  translate coordinates on the main diagonal
**rotate**  default 0, rotate angle degrees clockwise around center
**center**  default NULL, if not NULL, the rotation center, numeric of length two
**unitsq**  logical, default FALSE, if TRUE and scale TRUE, impose unit square
   bounding box (currently only points)

**Value**

The methods return objects of the input class object with elided coordinates; the coordinate reference system is not set. Note that if the input coordinates or centroids are in the data slot data.frame of the input object, they should be removed before the use of these methods, otherwise they will betray the input positions.

**Methods**

- obj = "SpatialPoints"  elides object
- obj = "SpatialPointsDataFrame"  elides object
- obj = "SpatialLines"  elides object
- obj = "SpatialLinesDataFrame"  elides object
- obj = "SpatialPolygons"  elides object
- obj = "SpatialPolygonsDataFrame"  elides object

**Note**

Rotation code kindly contributed by Don MacQueen

**Examples**

```r
data(meuse)
coordinates(meuse) <- c("x", "y")
proj4string(meuse) <- CRS("+init=epsg:28992")
data(meuse.riv)
river_polygon <- Polygons(list(Polygon(meuse.riv)), ID="meuse")
rivers <- SpatialPolygons(list(river_polygon))
proj4string(rivers) <- CRS("+init=epsg:28992")
rivers1 <- elide(rivers, reflect=c(TRUE, TRUE), scale=TRUE)
meuse1 <- elide(meuse, bb=bbox(rivers), reflect=c(TRUE, TRUE), scale=TRUE)
par <- par(mfrow=c(1,2))
plot(rivers, axes=TRUE)
plot(meuse, add=TRUE)
plot(rivers1, axes=TRUE)
plot(meuse1, add=TRUE)
par(par)
meuse1 <- elide(meuse, shift=c(10000, -10000))
bbox(meuse)
bbox(meuse1)
rivers1 <- elide(rivers, shift=c(10000, -10000))
bbox(rivers)
bbox(rivers1)
```
meuse1 <- elide(meuse, rotate=-30, center=apply(bbox(meuse), 1, mean))
bbox(meuse)
bbox(meuse1)
plot(meuse1, axes=TRUE)

---

**gcDestination**

*Find destination in geographical coordinates*

**Description**

Find the destination in geographical coordinates at distance dist and for the given bearing from the starting point given by lon and lat.

**Usage**

```r
gcDestination(lon, lat, bearing, dist, dist.units = "km", model = NULL, Vincenty = FALSE)
```

**Arguments**

- **lon**: longitude (Eastings) in decimal degrees (either scalar or vector)
- **lat**: latitude (Northings) in decimal degrees (either scalar or vector)
- **bearing**: bearing from 0 to 360 degrees (either scalar or vector)
- **dist**: distance travelled (scalar)
- **dist.units**: units of distance "km" (kilometers), "nm" (nautical miles), "mi" (statute miles)
- **model**: choice of ellipsoid model ("WGS84", "GRS80", "Airy", "International", "Clarke", "GRS67")
- **Vincenty**: logical flag, default FALSE

**Details**

The bearing argument may be a vector when lon and lat are scalar, representing a single point.

**Value**

A matrix of decimal degree coordinates with Eastings in the first column and Northings in the second column.

**Author(s)**

Eric Archer and Roger Bivand
getinfo.shape

References

http://www.movable-type.co.uk/scripts/latlong.html#ellipsoid,
the file earlier available at http:\/\williams.best.vwh.net/avform.htm,
http://www.movable-type.co.uk/scripts/latlong-vincenty-direct.html,
Original reference http://www.ngs.noaa.gov/PUBS_LIB/inverse.pdf:
Vincenty, T. 1975. Direct and inverse solutions of geodesics on the ellipsoid with application of
nested equations. Survey Review 22(176):88-93

See Also
gAzimuth

Examples

data(state)
res <- gcDestination(state.center$x, state.center$y, 45, 250, "km")
plot(state.center$x, state.center$y, asp=1, pch=16)
arrows(state.center$x, state.center$y, res[,1], res[,2], length=0.05)
llist <- vector(mode="list", length=length(state.center$x))
for (i in seq(along=llist)) llist[[i]] <- gcDestination(state.center$x[i],
state.center$y[i], seq(0, 360, 5), 250, "km")
plot(state.center$x, state.center$y, asp=1, pch=3)
nll <- lapply(llist, lines)

---

getinfo.shape  Get shapefile header information

Description

Get shapefile header information; the file should be given including its ".shp" extension, and the
function will reconstruct the names of the database (dbf) file and the index (shx) file from these.

Usage

getinfo.shape(filen)
## S3 method for class 'shapehead'
print(x, ...)

Arguments

filen  name of file with *.shp extension
x      a shapehead list as returned by getinfo.shape
...    other arguments passed to print
getKMLcoordinates

Details

The function calls code from shapelib to read shapefiles, a file format used by ESRI GIS software among others.

Value

The function returns a list of class shapehead.

Author(s)

Roger Bivand <Roger.Bivand@nhh.no>; shapelib by Frank Warmerdam

References

http://shapelib.maptools.org/

Examples

```r
res <- getinfo.shape(system.file("shapes/fylk-val.shp", package="maptools")[1])
res
str(res)
```

---

getKMLcoordinates  Get a list of coordinates out of a KML file

Description

This function parses a KML file to get the content of <coordinates> tags and returns a list of matrices representing the longitude-latitude or if ignoreAltitude is FALSE the longitude-latitude-altitude coordinates of a KML geometry.

Usage

```r
getKMLcoordinates(kmlfile, ignoreAltitude=FALSE)
```

Arguments

- `kmlfile`  connection object or a character string of the KML file
- `ignoreAltitude`  if set to TRUE the altitude values of a KML points will be ignored

Value

`coords` is a list of matrices representing the longitude-latitude or if ignoreAltitude is FALSE the longitude-latitude-altitude coordinates

Author(s)

Hans-J. Bibiko
See Also

kmlPolygon, kmlLine

Examples

data(wrld_simpl)
## creates a KML file containing the polygons of South Africa (plus hole)
sw <- slot(wrld_simpl[wrld_simpl$NAME=="South Africa",,"polygons"])[[1]]
# set up kml coordinates
kmlPolygon(sw, kmlfile=tf, name="South Africa", col="#df0000aa", lwd=5,
        border=4, kmlname="R Test",
        kmldescription="This is a <b>R</b> test.")
zz <- getKMLcoordinates(tf, ignoreAltitude=TRUE)
str(zz)
zz <- getKMLcoordinates(system.file("shapes/Testing.kml", package="maptools"))
str(zz)

---

GE_SpatialGrid  Create SpatialGrid for PNG output to GE

Description

The function sets up metadata in the form of a SpatialGrid object for defining the size and placing of a PNG image overlay in Google Earth. The internal function Sobj_SpatialGrid can also be called to build a grid for arbitrary Spatial* objects.

Usage

GE_SpatialGrid(obj, asp = NA, maxPixels = 600)
Sobj_SpatialGrid(obj, asp=1, maxDim=100, n=NULL)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>a Spatial* object</td>
</tr>
<tr>
<td>asp</td>
<td>if NA, will be set to the latitude corrected value</td>
</tr>
<tr>
<td>maxPixels</td>
<td>the maximum dimension of the output PNG</td>
</tr>
<tr>
<td>maxDim</td>
<td>the maximum dimension of the output grid; ignored if n not NULL</td>
</tr>
<tr>
<td>n</td>
<td>if not NULL, the minimum number of cells in the returned grid</td>
</tr>
</tbody>
</table>

Details

The function is used together with kmlOverlay to wrap around the opening of a PNG graphics device, plotting code, and the closing of the device. The computed values take account of the adjustment of the actual data bounding box to an integer number of rows and columns in the image file.

The approach may be used as an alternative to writing PNG files from SpatialGrid and SpatialPixel objects in rgdal using writeGDAL, and to writing KML files using writeOGR for vector data objects.
The output PNG files are likely to be very much smaller than large vector data KML files, and hinder the retrieval of exact positional information. Note that the geometries should be in geographical coordinates with datum WGS84 for export to KML.

Value

returns an S3 object of class GE_SG with components:

- **height**: Integer raster height for png call
- **width**: Integer raster width for png call
- **SG**: a SpatialGrid object with the grid topology of the output PNG
- **asp**: the aspect value used
- **xlim**: xlim taken from SG
- **ylim**: ylim taken from SG

Author(s)

Duncan Golicher, David Forrest and Roger Bivand

See Also

kmlOverlay

Examples

```r
opt_exask <- options(example.ask=FALSE)
qk <- SpatialPointsDataFrame(quakes[, c(2:1)], quakes)
summary(Sobj_SpatialGrid(qk)$SG)
t2 <- Sobj_SpatialGrid(qk, n=10000)$SG
summary(t2)
prod(slot(slot(t2, "grid"), "cells.dim"))
proj4string(qk) <- CRS("+proj=longlat +ellps=WGS84")
tf <- tempfile()
SGqk <- GE_SpatialGrid(qk)
png(file=paste(tf, ".png", sep=""), width=SGqk$width, height=SGqk$height,
    bg="transparent")
par(mar=c(0,0,0,0), xaxs="i", yaxs="i")
plot(qk, xlim=SGqk$xlim, ylim=SGqk$ylim, setParUsrBB=TRUE)
dev.off()

kmlOverlay(SGqk, paste(tf, ".kml", sep=""), paste(tf, ".png", sep=""))
## Not run:
qk0 <- quakes
qk0$long <- ifelse(qk0$long <= 180, qk0$long, qk0$long-360)
qk0a <- SpatialPointsDataFrame(qk0[, c(2:1)], qk0)
proj4string(qk0a) <- CRS("+proj=longlat +ellps=WGS84")
# writeOGR(qk0a, paste(tf, "v.kml", sep=""), "Quakes", "KML")
# system(paste("googleearth ", tf, " .kml", sep=""))
## End(Not run)
options(example.ask=opt_exask)
```
**Description**

How to plot polygons with holes - holes are encoded by coordinates going anticlockwise, and overplotting is avoided by re-ordering the order in which polygons are plotted.

This example is retained for historical interest only, other solutions are present in the sp package.

**Usage**

```r
data(gpcholes)
```

**Details**

"Date: Tue, 11 May 2004 12:54:20 +0900 From: Hisaji ONO To: r-help

I've tried to create a polygon with one hole by gpclib using following example script.

```r
holepoly <- read.polyfile(system.file("poly-ex/hole-poly.txt", package="gpclib"), nohole = FALSE)
area.poly(holepoly) plot(holepoly,poly.args=list(col="red",border="blue"))
```

And I noticed plot function couldn't draw polygons with holes correctly.

Does anyone know how to solve this situation?"

*(h1pl has reversed the y component of polygon 1, to make its ring direction clockwise, h2pl reverses the order of the two polygons in holepoly1@pts)*

**Source**

Data file included in "gpclib" package.

**Examples**

```r
data(gpcholes)
opar <- par(mfrow=c(1,2))
plot(SpatialPolygons(list(h2pl)), col="red", pbg="white", border="blue")
plot(SpatialPolygons(list(h1pl)), col="red", pbg="white", border="blue")
par(opar)
```
gzAzimuth

Find azimuth for geographical coordinates

Description

The function finds azimuth values for geographical coordinates given as decimal degrees from the from coordinates to the to coordinate. In function trackAzimuth, the azimuth values are found between successive rows of the input coordinate matrix.

Usage

gzAzimuth(from, to, type = "snyder_sphere")
trackAzimuth(track, type="snyder_sphere")

Arguments

from a two column matrix of geographical coordinates given as decimal degrees (longitude first)
track a two column matrix of geographical coordinates given as decimal degrees (longitude first)
to a one row, two column matrix or two element vector of geographical coordinates given as decimal degrees (longitude first)
type default is "snyder_sphere", otherwise "abdali"; the results should be identical with slightly less trigonometry in "abdali"

Details

The azimuth is calculated on the sphere, using the formulae given by Snyder (1987, p. 30) and Abdali (1997, p. 17). The examples use data taken from Abdali (p. 17–18). There is a very interesting discussion of the centrality of azimuth-finding in the development of mathematics and mathematical geography in Abdali’s paper. Among others, al-Khwarizmi was an important contributor. As Abdali puts it, "This is a veritable who’s who of medieval science" (p. 3).

Value

values in decimal degrees - zero is North - of the azimuth from the from coordinates to the to coordinate.

Author(s)

Roger Bivand, with contributions by Sebastian Luque

References

kmlLine

Examples

```r
name <- c("Mecca", "Anchorage", "Washington")
long <- c(39.823333, -149.883333, -77.0166667)
lat <- c(21.423333, 61.2166667, 38.9)
x <- cbind(long, lat)
row.names(x) <- name
crib <- c(-9.098363, 56.575960)
r1 <- gzAzimuth(x[2:3,], x[1,])
r1
all.equal(r1, crib)
r2 <- gzAzimuth(x[2:3,], x[1,], type="abdali")
r2
all.equal(r2, crib)
trackAzimuth(x)
```

kmlLine  

Create and write a KML file on the basis of a given Lines object

Description

The function is used to create and write a KML file on the basis of a given Lines object (a list of Line objects) for the usage in Google Earth resp. Google Maps.

Usage

```r
kmlLine(obj=NULL, kmlfile=NULL, 
        name="R Line", description="", col=NULL, visibility=1, lwd=1, 
        kmlname="", kmldescription="")
```

Arguments

- `obj`: a Lines or SpatialLinesDataFrame object
- `kmlfile`: if not NULL the name as character string of the kml file to be written
- `name`: the name of the KML line
- `description`: the description of the KML line (HTML tags allowed)
- `col`: the stroke color (see also Color Specification) of the KML line
- `visibility`: if set to 1 or TRUE specifies that the KML line should be visible after loading
- `lwd`: the stroke width for the KML line
- `kmlname`: the name of the KML layer
- `kmldescription`: the description of the KML layer (HTML tags allowed)
Details

The function is used to convert a given `Lines` object (a list of `Line` objects) or the first `Lines` object listed in a passed `SpatialLinesDataFrame` object into KML line(s). If `kmlfile` is not `NULL` the result will be written into that file. If `kmlfile` is `NULL` the generated KML lines will be returned (see also value).

For a passed `Lines` object the function generates a `<Style>` tag whereby its id attribute is set to the passed object’s ID.

Note that the geometries should be in geographical coordinates with datum WGS84.

The resulting KML line will be embedded in `<Placemark><MultiGeometry><LineString>`.

Value

x is a list with the elements `style` and `content` containing the generated lines of the KML file as character vectors if `kmlfile` is `NULL`.

y is a list with the elements `header` and `footer` representing the KML file’s header resp. footer if `obj` is `NULL`.

Color Specification

The following color specifications are allowed: ‘red’, 2, or as hex code ‘#RRGGBB’ resp. ‘#RRGGBBAA’ for passing the alpha value.

Author(s)

Hans-J. Bibiko

See Also

`kmlOverlay`, `kmlPolygon`, `Line`

Examples

```r
xx <- readShapeSpatial(system.file("shapes/fylk-val-ll.shp", 
  package="maptools")[[1]], proj4string=CRS("+proj=longlat +ellps=WGS84"))
out <- sapply(slot(xx, "lines"), function(x) { kmlLine(x, 
  name=slot(x, "ID"), col="blue", lwd=1.5, 
  description=paste("river: ", slot(x, "ID")))
})
tf <- tempfile()
kmlFile <- file(tf, "w")
tf 
cat(kmlLine(kmlname="R Test", kmldescription="<i>Hello</i>" )$header, 
  file=kmlFile, sep="\n")
cat(unlist(out["style"],), file=kmlFile, sep="\n")
cat(unlist(out["content"],), file=kmlFile, sep="\n")
cat(kmlLine()$footer, file=kmlFile, sep="\n")
close(kmlFile)
```
Create and write a KML file on the basis of a given Lines object

Description
The function is used to create and write a KML file on the basis of a given Lines object (a list of Line objects) for the usage in Google Earth and Google Maps.

Usage
kmlLines(obj=NULL, kmlfile=NULL, 
  name="R Lines", description="", col=NULL, visibility=1, lwd=1, 
  kmlname="", kmldescription="")

Arguments
  obj         a Lines or SpatialLinesDataFrame object
  kmlfile     if not NULL the name as character string of the kml file to be written
  name        the name of the KML line
  description the description of the KML line (HTML tags allowed)
  col         the stroke color (see also Color Specification) of the KML line
  visibility  if set to 1 or TRUE specifies that the KML line should be visible after loading
  lwd         the stroke width for the KML line
  kmlname     the name of the KML layer
  kmldescription the description of the KML layer (HTML tags allowed)

Details
The function is used to convert a given Lines object (a list of Line objects) or the first Lines object listed in a passed SpatialLinesDataFrame object into KML line(s). If kmlfile is not NULL the result will be written into that file. If kmlfile is NULL the generated KML lines will be returned (see also value). Function no longer uses append greatly improving performance on large objects or lists.

For a passed Lines object the function generates a <Style> tag whereby its id attribute is set to the passed object’s ID.

Note that the geometries should be in geographical coordinates with datum WGS84.

The resulting KML line will be embedded in <Placemark><MultiGeometry><LineString>.

Value
x is a list with the elements style and content containing the generated lines of the KML file as character vectors if kmlfile is NULL.

y is a list with the elements header and footer representing the KML file header and footer if obj is NULL.
Color Specification

The following color specifications are allowed: 'red', 2, or as hex code '#RRGGBB' resp. '#RRGGBBAA' for passing the alpha value.

Author(s)

Hans-J. Bibiko, Jon Callahan, Steven Brey

See Also

kmlOverlay, kmlPolygon, Line

Examples

# Maptools library required
library(maptools)
# load line object
rivers <- readShapeSpatial(system.file("shapes/fylk-val-ll.shp", package="maptools")[[1]], proj4string=CRS("+proj=longlat +ellps=WGS84"))
# create km file
td <- tempdir()
kmlfile <- paste(td, "rivers.kml", sep="/"
mlLines(rivers, kmlfile = kmlfile, name = "R Lines",
        description = "Hello!", col = "blue", visibility = 1, lwd = 1,
        kmlname = "", kmldescription = "")

kmlOverlay Create and write KML file for PNG image overlay

Description

The function is used to create and write a KML file for a PNG image overlay for Google Earth.

Usage

kmlOverlay(obj, kmlfile = NULL, imagefile = NULL, name = "R image")

Arguments

obj a GE_SG object from GE_SpatialGrid
kmlfile if not NULL the name of the kml file to be written
imagefile the name of the PNG file containing the image - this should be either relative (same directory as kml file) or absolute (fully qualified)
name the name used to describe the image overlay in GE
Details

The function is used together with GE_SpatialGrid to wrap around the opening of a PNG graphics device, plotting code, and the closing of the device. The computed values take account of the adjustment of the actual data bounding box to an integer number of rows and columns in the image file.

The approach may be used as an alternative to writing PNG files from SpatialGrid and SpatialPixel objects in rgdal using writeGDAL, and to writing KML files using writeOGR for vector data objects. The output PNG files are likely to be very much smaller than large vector data KML files, and hinder the retrieval of exact positional information.

Note that the geometries should be in geographical coordinates with datum WGS84.

Value

x is a character vector containing the generated lines of the kml file

Author(s)

Duncan Golicher, David Forrest and Roger Bivand

See Also

GE_SpatialGrid

Examples

```r
opt_exask <- options(example.ask=FALSE)
qk <- SpatialPointsDataFrame(quakes[, c(2:1)], quakes)
proj4string(qk) <- CRS("+proj=longlat +ellps=WGS84")
tf <- tempfile()
SGqk <- GE_SpatialGrid(qk)
png(file=paste(tf, ".png", sep=""), width=SGqk$width, height=SGqk$height,
    bg="transparent")
par(mar=c(0,0,0,0), xaxs="i", yaxs="i")
plot(qk, xlim=SGqk$xlim, ylim=SGqk$ylim, setParUsrBB=TRUE)
dev.off()
kmlOverlay(SGqk, paste(tf, ".kml", sep=""), paste(tf, ".png", sep=""))
## Not run:
#library(rgdal)
#qk0 <- quakes
#qk0$long <- ifelse(qk0$long <= 180, qk0$long, qk0$long-360)
#qk0a <- SpatialPointsDataFrame(qk0[, c(2:1)], qk0)
#proj4string(qk0a) <- CRS("+proj=longlat +ellps=WGS84")
#writeOGR(qk0a, paste(tf, ".kml", sep=""), "Quakes", "KML")
#system(paste("googleearth ", tf, ".kml", sep=""))
## End(Not run)
options(example.ask=opt_exask)
```
kmlPoints

Create and write a KML file on the basis of a given Points object

Description

The function is used to create and write a KML file on the basis of a given SpatialPointsDataFrame object for the usage in Google Earth resp. Google Maps.

Usage

kmlPoints(obj=NULL, kmlfile=NULL, kmlname="", kmldescription="", name=NULL, description="", icon="http://www.gstatic.com/mapspro/images/stock/962-wht-diamond-blank.png")

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>a SpatialPointsDataFrame object</td>
</tr>
<tr>
<td>kmlfile</td>
<td>if not NULL the name as character string of the kml file to be written</td>
</tr>
<tr>
<td>kmlname</td>
<td>the name of the KML layer</td>
</tr>
<tr>
<td>kmldescription</td>
<td>the description of the KML layer (HTML tags allowed)</td>
</tr>
<tr>
<td>name</td>
<td>a character vector to be used as names for each KML Placemark</td>
</tr>
<tr>
<td>description</td>
<td>a character vector to be used as the description for each KML Placemark</td>
</tr>
<tr>
<td>icon</td>
<td>a character vector of icon URLs to be used in the style associated with each KML Placemark</td>
</tr>
</tbody>
</table>

Details

The function is used to convert a given SpatialPointsDataFrame object into a series of KML Placemarks, each with a single Point. If kmlfile is not NULL the result will be written into that file. If kmlfile is NULL the generated KML lines will be returned (see also value).

If name=NULL, the <name> tag for each Placemark will be 'site #'. If a single value is used for name or description, that value will be replicated for each Placemark. If a single value is used for icon, only a single style will be created and that style will be referenced by each Placemark.

Note that the geometries should be in geographical coordinates with datum WGS84.

Value

x is a list with the elements style and content containing the generated lines of the KML file as character vectors if kmlfile is NULL.

y is a list with the elements header and footer representing the KML file’ header resp. footer if obj is NULL.
kmlPolygon

KML icons


Author(s)

Jonathan Callahan

See Also

kmlLine, kmlOverlay, kmlPolygon, Line

Examples

data(SplashDams)
num <- length(SplashDams)
td <- tempdir()
kmlfile <- paste(td, "OregonSplashDams.kml", sep="/"
kmlname <- "Oregon Splash Dams"
kmldescription <- paste("Data for Splash Dams in western Oregon.",
"See http://www.fs.fed.us/pnw/lwm/aem/people/burnett.html#projects_activities",
"for more information.")
name <- paste("Dam on",SplashDams$streamName)
description <- paste("<b>owner:</b>", SplashDams$owner, "<b>dates:</b>", SplashDams$datesUsed)

kmlPoints(SplashDams, kmlfile=kmlfile, name=name, description=description,
icon=icon, kmlname=kmlname, kmldescription=kmldescription)

kmlPolygon

Create and write a KML file on the basis of a given Polygons object

Description

The function is used to create and write a KML file on the basis of a given Polygons object (a list of Polygon objects) for the usage in Google Earth resp. Google Maps.

Usage

kmlPolygon(obj=NULL, kmlfile=NULL,
name="R Polygon", description="", col=NULL, visibility=1, lwd=1, border=1,
kmlname="", kmldescription="")
Arguments

`obj`  
a Polygons or SpatialPolygonsDataFrame object

`kmlfile`  
if not NULL the name as character string of the kml file to be written

`name`  
the name of the KML polygon

`description`  
the description of the KML polygon (HTML tags allowed)

`col`  
the fill color (see also Color Specification) of the KML polygon

`visibility`  
if set to 1 or `TRUE` specifies that the KML polygon should be visible after loading

`lwd`  
the stroke width for the KML polygon

`border`  
the stroke color (see also Color Specification) for the KML polygon

`kmlname`  
the name of the KML layer

`kmldescription`  
the description of the KML layer (HTML tags allowed)

Details

The function is used to convert a given Polygons object (a list of Polygon objects) or the first Polygons object listed in a passed SpatialPolygonsDataFrame object into KML polygon. If `kmlfile` is not NULL the result will be written into that file. If `kmlfile` is NULL the generated KML lines will be returned (see also value).

The conversion can also handle polygons which are marked as holes inside of the Polygons object if these holes are listed right after that polygon in which these holes appear. That implies that a given plot order set in the Polygons object will not be considered.

For a passed Polygons object the function generates a `<Style>` tag whereby its id attribute is set to the passed object’s ID.

Note that the geometries should be in geographical coordinates with datum WGS84.

The resulting KML polygon will be embedded in `<Placemark><MultiGeometry><Polygon>`.

Value

`x` is a list with the elements style and content containing the generated lines of the KML file as character vectors if `kmlfile` is NULL.

`y` is a list with the elements header and footer representing the KML file’ header resp. footer if `obj` is NULL (see second example).

Color Specification

The following color specifications are allowed: ‘red’, 2, or as hex code ‘#RRGGBB’ resp. ‘#RRGGBBAA’ for passing the alpha value.

Author(s)

Hans-J. Bibiko

See Also

`kmlOverlay`, `kmlLine`, `SpatialPolygons`
Examples

data(wrld_simpl)
## creates a KML file containing the polygons of South Africa (plus hole)
sw <- slot(wrld_simpl[wrld_simpl$NAME=="South Africa",], "polygons")[[1]]
tf <- tempfile()
kmlPolygon(sw, kmlfile=tf, name="South Africa", col="#df0000aa", lwd=5,
   border=4, kmlname="R Test",
   kmldescription="This is &lt;b&gt;only&lt;/b&gt; a &lt;a href="http://www.r-project.org">R</a> test.")
tf

## creates a KML file containing the polygons of South Africa, Switzerland, and Canada
sw <- wrld_simpl[wrld_simpl$NAME %in% c("South Africa", "Switzerland", "Canada"),]
out <- sapply(slot(sw, "polygons"), function(x) { kmlPolygon(x,
   name=as(sw, "data.frame")[slot(x, "ID"), "NAME"],
   col="red", lwd=1.5, border='black',
   description=paste("ISO3: ", slot(x, "ID"))) })
tf <- tempfile()
kmlFile <- file(tf, "w")
tf
cat(kmlPolygon(kmlname="R Test", kmldescription="&lt;i&gt;Hello&lt;/i&gt;"), file=kmlFile, sep="\n")
cat(unlist(out["style",]), file=kmlFile, sep="\n")
cat(unlist(out["content",]), file=kmlFile, sep="\n")
cat(kmlPolygon()$footer, file=kmlFile, sep="\n")
close(kmlFile)


kmlPolygons

Create and write a KML file on the basis of a given Polygons object or
list of Polygons or SpatialPolygonsDataFrame

Description

The function is used to create and write a KML file on the basis of a given
Polygons object (a list of Polygon objects of SpatialPolygonsDataFrame class) for the usage in
Google Earth and Google Maps.

Usage

kmlPolygons(obj=NULL, kmlfile=NULL,
   name="KML Polygons", description="", col=NULL, visibility=1, lwd=1,
   border="white", kmlname="", kmldescription="")

Arguments

obj a Polygons or SpatialPolygonsDataFrame object or list of objects
kmlfile if not NULL the name as character string of the kml file to be written to working
directory as "NAME.kml"
name the name of the KML polygon in Google Earth
description  the description of the KML polygon displayed in Google Earth or Maps (HTML tags allowed)
col        the fill color (see also Color Specification) of the KML polygon. If passing a list of Polygons or SpatialPolygonsDataFrame and length(col) is less than length(object) the first color in col will be applied to all objects in the list
visibility if set to 1 or TRUE specifies that the KML polygon should be visible after loading
lwd        the stroke (polygon's border line) width for the KML polygon
border     the stroke color (see also Color Specification) for the KML polygon
kmlname    the name of the KML layer
kmldescription the description of the KML layer (HTML tags allowed)

Details

The function is used to convert a given Polygons object (a list of Polygon objects) or the Polygons object listed in a passed SpatialPolygonsDataFrame object into KML polygon. If kmlfile is not NULL the result will be written into that file. If kmlfile is NULL the generated KML lines will be returned (see also value).

The conversion can also handle polygons which are marked as holes inside of the Polygons object if these holes are listed right after that polygon in which these holes appear. That implies that a given plot order set in the Polygons object will not be considered.

For a passed Polygons object the function generates a <Style> tag whereby its id attribute is set to the passed object's ID.

Note that the geometries should be in geographical coordinates with datum WGS84.

The resulting KML polygon will be embedded in <Placemark><MultiGeometry><Polygon>.

Value

x is a list with the elements style and content containing the generated lines of the KML file as character vectors if kmlfile is NULL.

y is a list with the elements header and footer representing the KML file' header resp. footer if obj is NULL (see second example).

Color Specification

The following color specifications are allowed: 'red', 2, or as hex code '#RRGGBB' resp. '#RRGGBBAA' for passing the alpha value.

Author(s)

Hans-J. Bibiko, Jon Callihan, Steven Brey

See Also

kmlPolygon, kmlLines, SpatialPolygons, kmlPoints
Examples

data(wrld_simpl)
td <- tempdir()
kmlfile <- paste(td, "worldPolitical.kml", sep="/")
## creates a KML file containing the polygons of a political world map
kmlPolygons(wrld_simpl, kmlfile = kmlfile, name = "KML Polygons",
description = "the world", col = "red",
visibility = 1, lwd = 1, border = "white", kmlname = "R Test",
kmldescription = "This is <b>only</b> a <a href="http://www.r-project.org">R</a> test.")

data(wrld_simpl)
## create a KML file containing the polygons of Brazil, Uganda, and Canada
regions <- c("Brazil","Canada","Uganda")
wrld_simpl_subset <- wrld_simpl[wrld_simpl$NAME %in% regions,]
kmlfile <- paste(td, "worldPoliticalSubset.kml", sep="/")
kmlPolygons(wrld_simpl_subset, kmlfile = kmlfile,
name = "KML Polygons subset", description = "three countries", col = "blue",
visibility = 1, lwd = 1, border = "white", kmlname = "R Test 2",
kmldescription = "This is <b>only</b> a <a href="http://www.r-project.org">R</a> test.")
## combine to make a list of polygon objects to plot
polList <- c(regions, wrld_simpl)
kmlfile <- paste(td, "worldPoliticalandSubset.kml", sep="/")
kmlPolygons(wrld_simpl_subset, kmlfile = kmlfile,
name = "KML Polygons subset", description = "three countries highlighted in world",
col = sample(colours(), length(polList)), visibility = 1, lwd = 1, border = "white",
kmlname = "R Test 2",
kmldescription = "This is <b>only</b> a <a href="http://www.r-project.org">R</a> test.")

---

leglabs

Make legend labels

Description

leglabs makes character strings from the same break points. The plot.polylist() function may be used as a generic S3 method.

Usage

leglabs(vec, under="under", over="over", between="-", reverse=FALSE)

Arguments

vec vector of break values
under character value for under
over character value for over
between character value for between
reverse flag to reverse order of values, you will also need to reorder colours, see example
lineLabel

Line label placement with spplot and lattice.

Description

The lineLabel function produces and draws text grobs following the paths defined by a list of Line objects. The sp.lineLabel methods use this function to work easily with spplot.

Usage

lineLabel(line, label,
  spar=.6, position = c('above', 'below'),
  textloc = 'constantSlope',
  col = add.text$col,
  alpha = add.text$alpha,
  cex = add.text$cex,
  lineheight = add.text$lineheight,
  font = add.text$font,
  fontfamily = add.text$fontfamily,
  fontface = add.text$fontface,
  lty = add.line$lty,
  lwd = add.line$lwd,
\begin{verbatim}
col.line = add.line$col,
identifier = 'lineLabel',
...

sp.lineLabel(object, labels, byid=TRUE,...)

label(object, text, ...)
\end{verbatim}

**Arguments**

- `line` a list of Lines.
- `object` A Lines or SpatialLines object.
- `label, labels, text` a string or expression to be printed following the path of `line`. The names of `labels` should match the values of the ID slot of the lines to label. If `labels` is missing, the ID slot is used instead. The `label` method is a wrapper function to extract the ID slots and create a suitable character object with the correct names values.
- `byid` If TRUE (default) only the longest line of each unique ID value will be labelled.
- `textloc` a character or a numeric. It may be ’constantSlope’, ’minSlope’ or ’maxDepth’, or the numeric index of the location. If it is a numeric, its length must coincide with the number of Lines.
- `spar` smoothing parameter. With values near zero, the label will closely follow the line. Default value is .6. See smooth.spline for details.
- `position` character string (’above’ or ’below’) to define where the text must be placed.
- `col, alpha, cex, lineheight, font, fontfamily, fontface` graphical arguments for the text. See gpar for details.
- `lty, lwd, col.line` graphical parameters for the line. See gpar for details.
- `identifier` A character string to identify the grob to be created.
- `...` other arguments

**Details**

Part of the label location code is adapted from panel.levelplot. smooth.spline is used to re-sample the segment of the line where the label is placed.

**Author(s)**

Oscar Perpiñán Lamigueiro.

**See Also**

spplot sp.pointLabel pointLabel panel.levelplot smooth.spline
Examples

```r
data(meuse.grid)
coordinates(meuse.grid) = ~x+y
proj4string(meuse.grid) <- CRS("+init=epsg:28992")
gridded(meuse.grid) = TRUE

data(meuse)
coordinates(meuse) = ~x+y
data(meuse.riv)
meuse.sl <- SpatialLines(list(Lines(list(Line(meuse.riv)), "1")))

library(RColorBrewer)
myCols <- adjustcolor(colorRampPalette(brewer.pal(n=9, 'Reds'))(100), .85)
labs <- label(meuse.sl, 'Meuse River')

## Maximum depth
sl1 <- list('sp.lineLabel', meuse.sl, label=labs,
position='below', textloc='maxDepth',
spar=.2,
col='darkblue', cex=1,
fontfamily='Palatino',
fontface=2)
spplot(meuse.grid["dist"],
       col.regions=myCols,
       sp.layout = sl1)

## Constant slope
sl2 <- modifyList(sl1, list(textloc = 'constantSlope')) ## Default
spplot(meuse.grid["dist"],
       col.regions=myCols,
       sp.layout = sl2)

## Location defined by its numeric index
sl3 <- modifyList(sl1, list(textloc = 140, position='above'))
spplot(meuse.grid["dist"],
       col.regions=myCols,
       sp.layout = sl3)
```

map2SpatialPolygons  
Convert map objects to sp classes

Description

These functions may be used to convert map objects returned by the map function in the maps package to suitable objects defined in the sp package. In the examples below, arguments are shown for retrieving first polygons by name, then lines by window.
map2SpatialPolygons

Usage

map2SpatialPolygons(map, IDs, proj4string = CRS(as.character(NA)), checkHoles=FALSE)
map2SpatialLines(map, IDs=NULL, proj4string = CRS(as.character(NA)))
pruneMap(map, xlim=NULL, ylim=NULL)

Arguments

map a map object defined in the maps package and returned by the map function
IDs Unique character ID values for each output Polygons object; the input IDs can
be an integer or character vector with duplicates, where the duplicates will be
combined as a single output Polygons object
proj4string Object of class "CRS"; holding a valid proj4 string
checkHoles default=FALSE, if TRUE call checkPolygonsHoles internally to check hole as-
signment, (by default no polygon objects are holes)
xlim,ylim limits for pruning a map object - should only be used for lines, because polygons
will not be closed

Details

Any zero area output geometries are dropped, and warnings are issued.

Value

map2SpatialPolygons returns a SpatialPolygons object and map2SpatialLines returns a Spa-
tialLines object (objects defined in the sp package); pruneMap returns a modified map object defined
in the maps package

Note

As the examples show, retrieval by name should be checked to see whether a window is not also
needed: the "norway" polygons include "Norway:Bouvet Island", which is in the South Atlantic.
Here, the IDs argument is set uniformly to "Norway" for all the component polygons, so that the
output object contains a single Polygons object with multiple component Polygon objects. When
retrieving by window, pruning may be needed on lines which are included because they begin within
the window; interior=FALSE is used to remove country boundaries in this case.

Author(s)

Roger Bivand

See Also

map
Examples

```r
run <- FALSE
if(require(maps)) run <- TRUE
if (run) {
  nor_coast_poly <- map("world", "norway", fill=TRUE, col="transparent",
    plot=FALSE)
  range(nor_coast_poly$x, na.rm=TRUE)
}
if (run) {
  range(nor_coast_poly$y, na.rm=TRUE)
}
if (run) {
  nor_coast_poly <- map("world", "norway", fill=TRUE, col="transparent",
    plot=FALSE, ylim=c(58,72))
  nor_coast_poly$names
}
if (run) {
  IDs <- sapply(strsplit(nor_coast_poly$names, ":"), function(x) x[1])
}
if (run) {
  nor_coast_poly_sp <- map2SpatialPolygons(nor_coast_poly, IDs=IDs,
    proj4string=CRS("+proj=longlat +datum=WGS84"))
  sapply(slot(nor_coast_poly_sp, "polygons"),
    function(x) length(slot(x, "Polygons")))
}
if (run) {
  plot(nor_coast_poly_sp, col="grey", axes=TRUE)
}
if (run) {
  nor_coast_lines <- map("world", interior=FALSE, plot=FALSE, xlim=c(4,32),
    ylim=c(58,72))
  plot(nor_coast_lines, type="l")
}
if (run) {
  nor_coast_lines <- pruneMap(nor_coast_lines, xlim=c(4,32), ylim=c(58,72))
  lines(nor_coast_lines, col="red")
  nor_coast_lines_sp <- map2SpatialLines(nor_coast_lines,
    proj4string=CRS("+proj=longlat +datum=WGS84"))
  plot(nor_coast_poly_sp, col="grey", axes=TRUE)
}
if (run) {
  plot(nor_coast_lines_sp, col="blue", add=TRUE)
}
if (run) {
  worldmap <- map("world", fill=TRUE, plot=FALSE)
  worldmapPolys <- map2SpatialPolygons(worldmap,
    IDs=sapply(strsplit(worldmap$names, ":"), 
    function(x) x[1]), proj4string=CRS("+proj=longlat +datum=WGS84"))
  if (rgeosStatus()) {
    require(rgeos)
    vals <- rgeos::gIsValid(worldmapPolys, byid=TRUE, reason=TRUE)
    print(table(sapply(strsplit(vals, "\"\""), 
      function(x) x[1])))
  }
}
```

nearestPointOnLine

Get the nearest point on a line to a given point

Description

This function calculates the coordinates of the nearest point on a line to a given point. This function does not work with geographic coordinates.

Usage

nearestPointOnLine(coordsLine, coordsPoint)

Arguments

coordsLine    Matrix with coordinates of line vertices. Each row represents a vertex.
coordsPoint   A vector representing the X and Y coordinates of the point.

Value

Vector with the X and Y coordinates of the nearest point on a line to the given point.

Author(s)

German Carrillo

See Also

nearestPointOnSegment, snapPointsToLines

Examples

coordsLine = cbind(c(1,2,3),c(3,2,2))
coordsPoint = c(1.2,1.5)
nearestPointOnLine(coordsLine, coordsPoint)
nearestPointOnSegment  Get the nearest point on a segment to a given point

Description

This function calculates the coordinates of and the distance to the nearest point on a segment to a given point. This function does not work with geographic coordinates.

Usage

nearestPointOnSegment(s, p)

Arguments

s  A matrix representing the coordinates of the segment. The matrix has 2x2 dimension where each row represents one of the end points.
p  A vector representing the X and Y coordinates of the point.

Value

A vector with three numeric values representing X and Y coordinates of the nearest point on a segment to a given point as well as the distance between both points.

Author(s)

German Carrillo

References

The function was ported to R based on this code: http://pastebin.com/n9rUuGRh

See Also

nearestPointOnLine, snapPointsToLines

Examples

segment = cbind(c(1,2),c(1,1.5))
point = c(1.2,1.5)
nearestPointOnSegment(segment, point)
Description

When recentering a world map, say to change an "Atlantic" view with longitude range -180 to 180, to a "Pacific" view, with longitude range 0 to 360, polygons crossed by the new offset, here 0/360, need to be clipped into left and right sub.polygons to avoid horizontal scratches across the map. The `nowrapSpatialPolygons` function performs this operation using polygon intersection, and `nowrapRecenter` recenters the output `SpatialPolygons` object.

Usage

```r
nowrapRecenter(obj, offset = 0, eps = rep(.Machine$double.eps^(1/2.5), 2), avoidGEOS = FALSE)

nowrapSpatialPolygons(obj, offset = 0, eps = rep(.Machine$double.eps^(1/2.5), 2), avoidGEOS = FALSE)
```

Arguments

- `obj`: A `SpatialPolygons` object
- `offset`: offset from the Greenwich meridian
- `eps`: vector of two (left and right) fuzz factors to retract the ring from the offset (2.5 root to accommodate `rgeos` precision rules)
- `avoidGEOS`: default FALSE; use `polyclip` or `gpclib` code even if `rgeos` is available

Value

A `SpatialPolygons` object

Author(s)

Roger Bivand

See Also

`recenter-methods`, `nowrapSpatialLines`

Examples

```r
run <- FALSE
if (require(maps)) run <- TRUE
## Not run:
if (run) {
  world <- map("world", fill=TRUE, col="transparent", plot=FALSE)
  worldSpP <- map2SpatialPolygons(world, world$names, CRS("+proj=longlat +ellps=WGS84"))
  worldSpP <- worldSpP[-grep("Antarctica", row.names(worldSpP)),]
```
# incomplete polygons
worldSpP <- worldSpP[-grep("Ghana", row.names(worldSpP)),]
# self-intersection mouth of Volta
worldSpP <- worldSpP[-grep("UK:Great Britain", row.names(worldSpP)),]
# self-intersection Humber estuary
worldSpPr <- recenter(worldSpP)
plot(worldSpPr)
title("Pacific view without polygon splitting")
}
if (run) {
worldSpPnr <- nowrapRecenter(worldSpP)
plot(worldSpPnr)
title("Pacific view with polygon splitting")
}

## End(Not run)
if (!rgeosStatus()) run <- FALSE
if (run) {
crds <- matrix(c(-1, 1, 1, -1, 50, 50, 52, 52), ncol=2)
rcrds <- rbind(crds, crds[1,])
SR <- SpatialPolygons(list(Polygons(list(Polygon(rcrds)), ID="r1"),
    proj4string=CRS("+proj=longlat +ellps=WGS84"))
bbox(SR)
}
if (run) {
SRr <- recenter(SR)
bbox(SRr)
}
if (run) {
SRnr <- nowrapRecenter(SR)
bbox(SRnr)
}

nowrapSpatialLines Split SpatialLines components at offset

Description
When recentering a world map, most often from the "Atlantic" view with longitudes with range -180 to 180, to the "pacific" view with longitudes with range 0 to 360, lines crossing the offset (0 for this conversion) get stretched horizontally. This function breaks Line objects at the offset (usually Greenwich), inserting a very small gap, and reassembling the Line objects created as Lines. The rgeos package is required to use this function.

Usage
nowrapSpatialLines(obj, offset = 0, eps = rep(.Machine$double.eps^(1/2.5), 2))
Arguments

obj A Spatial Lines object
offset default 0, untried for other values
eps vector of two fuzz values, both default 2.5 root of double eps

Value

A Spatial Lines object

Author(s)

Roger Bivand

See Also

recenter-methods, nowrapSpatialPolygons

Examples

Sl <- SpatialLines(list(Lines(list(Line(cbind(sin(seq(-4,4,0.4)),
seq(1,21,1))), "1")), proj4string=CRS("+proj=longlat +ellps=WGS84"))
summary(Sl)
if (require(rgeos)) {
  nwSL <- nowrapSpatialLines(Sl)
  summary(nwSL)
  if(require(maps)) {
    worldmap <- map("world", plot=FALSE)
    worldmapLines <- map2SpatialLines(worldmap, proj4string=CRS("+proj=longlat +datum=WGS84"))
    bbox(worldmapLines)
    t0 <- nowrapSpatialLines(worldmapLines, offset=180)
    bbox(t0)
  }
}
pal2SpatialPolygons

Arguments

IDs Unique character ID values for each output Polygons object; the input IDs can be an integer or character vector with duplicates, where the duplicates will be combined as a single output Polygons object.

proj4string Object of class "CRS"; holding a valid proj4 string.

arc Object returned by get.arcdata.

pal Object returned by get.paldata.

dropPoly1 Should the first polygon in the AVC or e00 data be dropped; the first polygon is typically the compound boundary of the whole dataset, and can be detected by looking at the relative lengths of the list components in the second component of pal, which are the numbers of arcs making up the boundary of each polygon.

Value

The functions return a SpatialPolygons object.

Author(s)

Roger Bivand.

Examples

```r
nc1 <- readShapePoly(system.file("shapes/sids.shp", package="maptools")[[1]], ID="FIPS")
plot(nc1)
text(coordinates(nc1), labels=row.names(nc1), cex=0.6)
if(require(maps)){
  ncmap <- map("county", "north carolina", fill=TRUE, col="transparent", plot=FALSE)
  IDs <- sapply(strsplit(ncmap$names, "\,[\:]"), function(x) x[2])
  nc2 <- map2SpatialPolygons(ncmap, IDs)
  plot(nc2)
text(coordinates(nc2), labels=row.names(nc2), cex=0.6)
}
# if(require(RArcInfo)) {
#  td <- tempdir()
#  tmpcover <- paste(td, "nc", sep="/"")
#  if (!file.exists(tmpcover)) e00toavc(system.file("share/co37_d90.e00", # package="maptools")[[1]], tmpcover)
#  arc <- get.arcdata(td, "nc")
#  pal <- get.paldata(td, "nc")
#  pat <- get.tabledata(paste(td, "info", sep="/"), "NC.PAT")
#  sapply(pal[[2]], function(x) length(x[[1]]))
#  IDs <- paste(pat$ST[[-1], pat$CO[[-1], sep=""")
#  nc3 <- pal2SpatialPolygons(arc, pal, IDs=IDs)
#  plot(nc3)
#  text(coordinates(nc3), labels=row.names(nc3), cex=0.6)
#}
```
panel.pointLabel

Label placement with spplot and lattice.

Description

Use optimization routines to find good locations for point labels without overlaps.

Usage

panel.pointLabel(x, y = NULL, 
labels = seq(along = x), 
method = c("SANN", "GA"), 
allowSmallOverlap = FALSE, 
col = add.text$col, 
alpha = add.text$alpha, 
cex = add.text$cex, 
lineheight = add.text$lineheight, 
font = add.text$font, 
fontfamily = add.text$fontfamily, 
fontface = add.text$fontface, 
fill = 'transparent', 
...)

sp.pointLabel(object, labels, ...)

Arguments

object A SpatialPoints object.
x, y coordinates for the point labels. See xy.coords for details.
labels a character vector or expression.
method the optimization method, either SANN for simulated annealing (the default) or GA for a genetic algorithm.
allowSmallOverlap logical; if TRUE, labels are allowed a small overlap. The overlap allowed is 2% of the diagonal distance of the plot area.
col, alpha, cex, lineheight, font, fontfamily, fontface, fill Graphical arguments. See gpar for details
... Additional arguments (currently not processed).

Author(s)

Tom Short wrote pointLabel for base graphics. Oscar Perpiñán Lamigueiro modified this function for lattice and spplot.
See Also

`spplot`
`pointLabel`

Examples

n <- 15
x <- rnorm(n)*10
y <- rnorm(n)*10
labels <- as.character(round(x, 5))

myTheme <- list(add.text=list(
  cex=0.7,
  col='midnightblue',
  fontface=2,
  fontfamily='mono'))

library(lattice)

xyplot(y~x,
   labels=labels,
   par.settings=myTheme,
   panel=function(x, y, labels, ...){
     panel.xyplot(x, y, ...)
     panel.pointLabel(x, y, labels=labels, ...)
   })

data(meuse.grid)
coordinates(meuse.grid) = ~x+y
proj4string(meuse.grid) <- CRS("+init=epsg:28992")
gridded(meuse.grid) = TRUE

library(RColorBrewer)

myCols <- adjustcolor(colorRampPalette(brewer.pal(n=9, 'Reds'))(100), .85)

pts <- spsample(meuse.grid, n=15, type="random")

Rauthors <- readLines(file.path(R.home("doc"), "AUTHORS"))[9:28]
someAuthors <- Rauthors[seq_along(pts)]

sl1 <- list('sp.points', pts, pch=19, cex=.8, col='midnightblue')
sl2 <- list('sp.pointLabel', pts, label=someAuthors,
            cex=0.7, col='midnightblue',
            fontfamily='Palatino')

spplot(meuse.grid["dist"], col.regions=myCols, sp.layout=list(sl1, sl2))
Usage

pointLabel(x, y = NULL, labels = seq(along = x), cex = 1,
    method = c("SANN", "GA"),
    allowSmallOverlap = FALSE,
    trace = FALSE,
    doPlot = TRUE,
    ...)  

Arguments

x, y as with plot.default, these provide the x and y coordinates for the point labels. Any reasonable way of defining the coordinates is acceptable. See the function xy.coords for details.

labels as with text, a character vector or expression specifying the text to be written. An attempt is made to coerce other language objects (names and calls) to expressions, and vectors and other classed objects to character vectors by as.character.

cex numeric character expansion factor as with text.

method the optimization method, either “SANN” for simulated annealing (the default) or “GA” for a genetic algorithm.

allowSmallOverlap logical; if TRUE, labels are allowed a small overlap. The overlap allowed is 2% of the diagonal distance of the plot area.

trace logical; if TRUE, status updates are given as the optimization algorithms progress.

doPlot logical; if TRUE, the labels are plotted on the existing graph with text.

... arguments passed along to text to specify labeling parameters such as col.

Details

Eight positions are candidates for label placement, either horizontally, vertically, or diagonally offset from the points. The default position for labels is the top right diagonal relative to the point (considered the preferred label position).

With the default settings, simulating annealing solves faster than the genetic algorithm. It is an open question as to which settles into a global optimum the best (both algorithms have parameters that may be tweaked).
The label positioning problem is NP-hard (nondeterministic polynomial-time hard). Placement becomes difficult and slows considerably with large numbers of points. This function places all labels, whether overlaps occur or not. Some placement algorithms remove labels that overlap.

Note that only cex is used to calculate string width and height (using strwidth and strheight), so passing a different font may corrupt the label dimensions. You could get around this by adjusting the font parameters with par prior to running this function.

Value

An xy list giving the x and y positions of the label as would be placed by text(xy,labels).

Author(s)

Tom Short, EPRI, <tshort@epri.com>

References

http://en.wikipedia.org/wiki/Automatic_label_placement
http://i11www.iti.uni-karlsruhe.de/map-labeling/bibliography/
http://www.eecs.harvard.edu/~shieber/Projects/Carto/carto.html
http://www.szoraster.com/Cartography/PracticalExperience.htm

The genetic algorithm code was adapted from the python code at
http://meta.wikimedia.org/wiki/Map_generator.

The simulated annealing code follows the algorithm and guidelines in:


See Also

text, thigmophobe.labels in package plotrix

Examples

n <- 50
x <- rnorm(n)*10
y <- rnorm(n)*10
plot(x, y, col = "red", pch = 20)
pointLabel(x, y, as.character(round(x,5)), offset = 0, cex = .7)

plot(x, y, col = "red", pch = 20)
pointLabel(x, y, expression(over(alpha, beta[123])), offset = 0, cex = .8)
**ppp-class**

Virtual class "ppp"

**Description**

Virtual S4 class definition for S3 classes in the spatstat package to allow S4-style coercion to these classes.

**Objects from the Class**

A virtual Class: No objects may be created from it.

**Author(s)**

Edzer J. Pebesma

---

**readAsciiGrid**

*read/write to/from (ESRI) asciigrid format*

**Description**

read/write to/from ESRI asciigrid format; a fuzz factor has been added to writeAsciiGrid to force cell resolution to equality if the difference is less than the square root of machine precision.

**Usage**

```r
readAsciiGrid(fname, as.image = FALSE, plot.image = FALSE, 
              colname = basename(fname), proj4string = CRS(as.character(NA)), 
              dec=options()$OutDec)
writeAsciiGrid(x, fname, attr = 1, na.value = -9999, dec=options()$OutDec, ...)
```

**Arguments**

- `fname` file name
- `as.image` logical; if TRUE, a list is returned, ready to be shown with the `image` command; if FALSE an object of class `SpatialGridDataFrame-class` is returned
- `plot.image` logical; if TRUE, an image of the map is plotted
- `colname` alternative name for data column if not file basename
- `proj4string` A CRS object setting the projection arguments of the Spatial Grid returned
- `dec` decimal point character. This should be a character string containing just one single-byte character — see note below.
- `x` object of class `SpatialGridDataFrame`
readAsciiGrid

attr attribute column; if missing, the first column is taken; a name or a column number may be given

na.value numeric; value given to missing valued cells in the resulting map

... arguments passed to write.table, which is used to write the numeric data

Value

readAsciiGrid returns the grid map read; either as an object of class SpatialGridDataFrame-class or, if as.image is TRUE, as list with components x, y and z.

Note

In ArcGIS 8, it was not in general necessary to set the dec argument; it is not necessary in a mixed environment with ArcView 3.2 (R writes and ArcView reads ","), but inter-operation with ArcGIS 9 requires care because the defaults used by ArcGIS seem to be misleading, and it may be necessary to override what appear to be platform defaults by setting the argument.

Author(s)

Edzer Pebesma, edzer.pebesma@uni-muenster.de

See Also

image, image

Examples

x <- readAsciiGrid(system.file("grids/test.ag", package="maptools")[[1]])
summary(x)
image(x)
xp <- as(x, "SpatialPixelsDataFrame")
abline(h=332000, lwd=3)
xpS <- xp[coordinates(xp)[,2] < 332000,]
summary(xpS)
xS <- as(xpS, "SpatialGridDataFrame")
summary(xS)
tmpfl <- paste(tempdir(), "testS.ag", sep="/")
writeAsciiGrid(xS, tmpfl)
axS <- readAsciiGrid(tmpfl)
par <- par(mfrow=c(1,2))
image(xS, main="before export")
image(axS, main="after import")
par(opar)
unlink(tmpfl)
readGPS

**GPSbabel read interface**

**Description**

The function reads a data frame from an attached GPS using the external program gpsbabel. The columns of the data frame need to be identified by hand because different GPS order NMEA data in different ways, and the columns should be converted to the correct classes by hand. Once the specifics of a particular GPS are identified, and ways of cleaning erroneous locations are found, the conversion of the output data frame into a usable one may be automated.

**Usage**

```r
readGPS(i = "garmin", f = "usb:", type="w", invisible=TRUE, ...)
```

**Arguments**

- `i` INTYPE: a supported file type, default "garmin"
- `f` INFILE: the appropriate device interface, default "usb:", on Windows for serial interfaces commonly "com4:" or similar
- `type` "w" waypoints, or "t" track, or others provided in gpsbabel
- `invisible` Under Windows, do not open an extra window
- `...` arguments passed through to `read.table`

**Details**

The function just wraps: `gpsbabel -i INTYPE -f INFILE -o tabsep -F -` in `system()`, and reads the returned character vector of lines into a data frame. On some systems, INFILE may not be readable by ordinary users without extra configuration. The gpsbabel program must be present and on the user’s PATH for the function to work. Typically, for a given GPS, the user will have to experiment first to find a set of data-cleaning tricks that work, but from then on they should be repeatable.

**Value**

A data frame of waypoint values

**Author(s)**

Patrick Giraudoux and Roger Bivand

**References**

[http://www.gpsbabel.org](http://www.gpsbabel.org)
## Not run:
#b1 <- readGPS(f="usb:"
#str(b1)
#b2 <- b1[1:172,
#wp0 <- b2[,c(2,3,4,8,9,19)]
#str(wp0)
#wp0$long <- wp0$V9
#wp0$lat <- as.numeric(as.character(wp0$V8))
#wp0$id <- as.character(wp0$V2)
#wp0$alt <- as.numeric(substring(as.character(wp0$V19), 1,
# (nchar(as.character(wp0$V19))-1))
#wp0$time <- as.POSIXct(strptime(paste(as.character(wp0$V3),
# as.character(wp0$V4)), format="%d-%b-%y %H:%M:%S"))
#str(wp0)
#wp1 <- wp0[-(1:6)]
#str(wp1)
#summary(wp1)
## End(Not run)

readShapeLines  

### Examples

```r
# Not run:
#b1 <- readGPS(f="usb:"
#str(b1)
#b2 <- b1[1:172,
#wp0 <- b2[,c(2,3,4,8,9,19)]
#str(wp0)
#wp0$long <- wp0$V9
#wp0$lat <- as.numeric(as.character(wp0$V8))
#wp0$id <- as.character(wp0$V2)
#wp0$alt <- as.numeric(substring(as.character(wp0$V19), 1,
# (nchar(as.character(wp0$V19))-1))
#wp0$time <- as.POSIXct(strptime(paste(as.character(wp0$V3),
# as.character(wp0$V4)), format="%d-%b-%y %H:%M:%S"))
#str(wp0)
#wp1 <- wp0[-(1:6)]
#str(wp1)
#summary(wp1)
```

readShapeLines  

### Read arc shape files into SpatialLinesDataFrame objects

#### Description

The use of this function is deprecated and it is not being maintained. Use `rgdal::readOGR()` or `sf::st_read()` instead - both of these read the coordinate reference system from the input file, while this deprecated function does not. For writing, use `rgdal::writeOGR()` or `sf::st_write()` instead.

The `readShapeLines` function reads data from an arc/line shapefile into a `SpatialLinesDataFrame` object; the shapefile may be of type polygon, but for just plotting for example coastlines, a `SpatialLines` object is sufficient. The `writeLinesShape` function writes data from a `SpatialLinesDataFrame` object to a shapefile. Note DBF file restrictions in `write.dbf`.

#### Usage

```r
readShapeLines(fn, proj4string=CRS(as.character(NA)), verbose=FALSE,
repair=FALSE, delete_null_obj=FALSE)
writeLinesShape(x, fn, factor2char = TRUE, max_nchar=254)
```

#### Arguments

- **fn**: shapefile layer name, when writing omitting the extensions *.shp, *.shx and *.dbf, which are added in the function
- **proj4string**: Object of class CRS; holding a valid proj4 string
- **verbose**: default FALSE - report type of shapefile and number of shapes
- **repair**: default FALSE - report type of shapefile and number of shapes
- **delete_null_obj**: default FALSE - report type of shapefile and number of shapes
- **factor2char**: default TRUE - report type of shapefile and number of shapes
- **max_nchar**: default 254 - report type of shapefile and number of shapes
default FALSE: some shapefiles provided by Geolytics Inc. have values of object sizes stored in the *.shx index file that are eight bytes too large, leading the function to try to read past the end of file. If repair=TRUE, an attempt is made to repair the internal values, permitting such files to be read.

if TRUE, null geometries will be removed together with their data.frame rows

a SpatialLinesDataFrame object

logical, default TRUE, convert factor columns to character

default 254, may be set to a higher limit and passed through to the DBF writer, please see Details in write.dbf

The shpID values of the shapefile will be used as Lines ID values; when writing shapefiles, the object data slot row.names are added to the DBF file as column SL_ID.

a SpatialLinesDataFrame object

Roger Bivand

write.dbf

xx <- readShapeLines(system.file("shapes/fylk-val.shp", package="maptools")[1],
                   proj4string=CRS("+proj=utm +zone=33 +datum=WGS84"))
plot(xx, col="blue")
summary(xx)
xxx <- xx[xx$LENGTH > 30000,]
plot(xxx, col="red", add=TRUE)
tmpfl <- paste(tempdir(), "xxline", sep="/"
writeLinesShape(xxx, tmpfl)
getinfo.shape(paste(tmpfl, ".shp", sep=""))
axx <- readShapeLines(tmpfl, proj4string=CRS("+proj=utm +zone=33 +datum=WGS84"))
plot(axx, col="black", lwd=4)
plot(axx, col="yellow", lwd=1, add=TRUE)
unlink(paste(tmpfl, ".*", sep=""))
xx <- readShapeLines(system.file("shapes/sids.shp", package="maptools")[1],
                   proj4string=CRS("+proj=longlat +datum=NAD27"))
plot(xx, col="blue")
readShapePoints

Read points shape files into SpatialPointsDataFrame objects

Description

The use of this function is deprecated and it is not being maintained. Use rgdal::readOGR() or sf::st_read() instead - both of these read the coordinate reference system from the input file, while this deprecated function does not. For writing, use rgdal::writeOGR() or sf::st_write() instead.

The readShapePoints reads data from a points shapefile into a SpatialPointsDataFrame object. The writePointsShape function writes data from a SpatialPointsDataFrame object to a shapefile. Both reading and writing can be carried out for 2D and 3D point coordinates. Note DBF file restrictions in write.dbf.

Usage

readShapePoints(fn, proj4string = CRS(as.character(NA)), verbose = FALSE, repair = FALSE)
writePointsShape(x, fn, factor2char = TRUE, max_nchar = 254)

Arguments

fn       shapefile layer name, when writing omitting the extensions *.shp, *.shx and *.dbf, which are added in the function
proj4string Object of class CRS; holding a valid proj4 string
verbose   default FALSE - report type of shapefile and number of shapes
repair    default FALSE: some shapefiles provided by Geolytics Inc have values of object sizes stored in the *.shx index file that are eight bytes too large, leading the function to try to read past the end of file. If repair=TRUE, an attempt is made to repair the internal values, permitting such files to be read.
x        a SpatialPointsDataFrame object
factor2char logical, default TRUE, convert factor columns to character
max_nchar default 254, may be set to a higher limit and passed through to the DBF writer, please see Details in write.dbf

Value

a SpatialPointsDataFrame object

Author(s)

Roger Bivand

See Also

write.dbf
**readShapePoly**

**Read polygon shape files into SpatialPolygonsDataFrame objects**

**Description**

The use of this function is deprecated and it is not being maintained. Use `rgdal::readOGR()` or `sf::st_read()` instead - both of these read the coordinate reference system from the input file, while this deprecated function does not. For writing, use `rgdal::writeOGR()` or `sf::st_write()` instead.

The `readShapePoly` reads data from a polygon shapefile into a `SpatialPolygonsDataFrame` object. The `writePolyShape` function writes data from a `SpatialPolygonsDataFrame` object to a shapefile. Note DBF file restrictions in `write.dbf`.

**Usage**

```r
readShapePoly(fn, IDvar=NULL, proj4string=CRS(as.character(NA)), verbose=FALSE, repair=FALSE, force_ring=FALSE, delete_null_obj=FALSE, retrieve_ABS_null=FALSE)
writePolyShape(x, fn, factor2char = TRUE, max_nchar=254)
```

**Arguments**

- **fn** shapefile layer name, when writing omitting the extensions *.shp, *.shx and *.dbf, which are added in the function
- **IDvar** a character string: the name of a column in the shapefile DBF containing the ID values of the shapes - the values will be converted to a character vector
- **proj4string** Object of class CRS; holding a valid proj4 string
- **verbose** default FALSE - report type of shapefile and number of shapes
- **repair**
- **force_ring**
- **delete_null_obj**
- **retrieve_ABS_null**

**Examples**

```r
library(maptools)
xx <- readShapePoints(system.file("shapes/baltim.shp", package="maptools")[[1]])
plot(xx)
summary(xx)
xxx <- xx[xx$PRICE < 40,]
tmpfl <- paste(tempdir(), "xxpts", sep="/"
writePointsShape(xxx, tmpfl)
getinfo.shape(paste(tmpfl, ".shp", sep=""))
axx <- readShapePoints(tmpfl)
plot(axx, col="red", add=TRUE)
unlink(paste(tmpfl, ".", sep=""))
xx <- readShapePoints(system.file("shapes/pointZ.shp", package="maptools")[[1]])
dimensions(xx)
plot(xx)
summary(xx)
```
repair default FALSE: some shapefiles provided by Geolytics Inc. have values of object sizes stored in the *.shx index file that are eight bytes too large, leading the function to try to read past the end of file. If repair=TRUE, an attempt is made to repair the internal values, permitting such files to be read.

force_ring if TRUE, close unclosed input rings

delete_null_obj if TRUE, null geometries will be removed together with their data.frame rows

retrieve_ABS_null default FALSE, if TRUE and delete_null_obj also TRUE, the function will return a data frame containing the data from any null geometries inserted by ABS

x a SpatialPolygonsDataFrame object

factor2char logical, default TRUE, convert factor columns to character

max_nchar default 254, may be set to a higher limit and passed through to the DBF writer, please see Details in write.dbf

Details

If no IDvar argument is given, the shpID values of the shapefile will be used as Polygons ID values; when writing shapefiles, the object data slot row.names are added to the DBF file as column SP_ID.

Value

a SpatialPolygonsDataFrame object

Author(s)

Roger Bivand

See Also

write.dbf

Examples

library(maptools)
xx <- readShapePoly(system.file("shapes/sids.shp", package="maptools")[1],
  IDvar="FIPSNO", proj4string=CRS("+proj=longlat +ellps=clrk66"))
plot(xx, border="blue", axes=TRUE, las=1)
text(coordinates(xx), labels=row.names(xx), cex=0.6)
as(xx, "data.frame")[1:5, 1:6]
xxx <- xx[xx$SID74 < 2,]
plot(xxx, border="red", add=TRUE)
tmpf1 <- paste(tempdir(), "xxpoly", sep="/")
writePolyShape(xxx, tmpf1)
getinfo.shape(paste(tmpf1, ".shp", sep=""))
axx <- readShapePoly(tmpf1, proj4string=CRS("+proj=longlat +ellps=clrk66"))
plot(axx, border="black", lwd=4)
plot(axx, border="yellow", lwd=1, add=TRUE)
unlink(paste(tmpf1, ".x", sep=""))
**readShapeSpatial**  
*Read shape files into Spatial*DataFrame objects*

**Description**

The use of this function is deprecated and it is not being maintained. Use `rgdal::readOGR()` or `sf::st_read()` instead - both of these read the coordinate reference system from the input file, while this deprecated function does not. For writing, use `rgdal::writeOGR()` or `sf::st_write()` instead.

The `readShapeSpatial` reads data from a shapefile into a Spatial*DataFrame* object. The `writeSpatialShape` function writes data from a Spatial*DataFrame* object to a shapefile. Note DBF file restrictions in `write.dbf`.

**Usage**

```r
readShapeSpatial(fn, proj4string=CRS(as.character(NA)), verbose=FALSE, repair=FALSE, IDvar=NULL, force_ring=FALSE, delete_null_obj=FALSE, retrieve_ABS_null=FALSE)
writeSpatialShape(x, fn, factor2char = TRUE, max_nchar=254)
```

**Arguments**

- **fn**  
  shapefile layer name, when writing omitting the extensions *.shp, *.shx and *.dbf, which are added in the function

- **proj4string**  
  Object of class CRS; holding a valid proj4 string

- **verbose**  
  default FALSE - report type of shapefile and number of shapes

- **repair**  
  default FALSE: some shapefiles provided by Geolytics Inc. have values of object sizes stored in the *.shx index file that are eight bytes too large, leading the function to try to read past the end of file. If repair=TRUE, an attempt is made to repair the internal values, permitting such files to be read.

- **IDvar**  
  a character string: the name of a column in the shapefile DBF containing the ID values of the shapes - the values will be converted to a character vector (Polygons only)

- **force_ring**  
  if TRUE, close unclosed input rings (Polygons only)

- **delete_null_obj**  
  if TRUE, null geometries inserted by ABS will be removed together with their data.frame rows (Polygons and Lines)

- **retrieve_ABS_null**  
  default FALSE, if TRUE and delete\_null\_obj also TRUE, the function will return a data frame containing the data from any null geometries inserted by ABS (Polygons only)

- **x**  
  a vector data Spatial*DataFrame* object

- **factor2char**  
  logical, default TRUE, convert factor columns to character

- **max_nchar**  
  default 254, may be set to a higher limit and passed through to the DBF writer, please see Details in `write.dbf`
readShapeSpatial

Details

If no IDvar argument is given, the shpID values of the shapefile will be used as Polygons ID values; when writing shapefiles, the object data slot row.names are added to the DBF file as column SP\_ID.

Value

a Spatial*DataFrame object of a class corresponding to the input shapefile

Author(s)

Roger Bivand

See Also

write.dbf

Examples

library(maptools)
x <- readShapeSpatial(system.file("shapes/sids.shp", package="maptools")[[1]],
   IDvar="FIPSNO", proj4string=CRS("+proj=longlat +ellps=clrk66"))
summary(xx)
x <- xx[xx$SID74 < 2,]
tmpfl <- paste(tempdir(), "xxpoly", sep="/")
writeSpatialShape(xxx, tmpfl)
getinfo.shape(paste(tmpfl, ".shp", sep=""))
unlink(paste(tmpfl, ".x", sep=""))
x <- readShapeSpatial(system.file("shapes/fylk-val.shp",
   package="maptools")[[1]], proj4string=CRS("+proj=utm +zone=33 +datum=WGS84"))
summary(xx)
x <- xx[xx$LENGTH > 30000,]
plot(xxx, col="red", add=TRUE)
tmpfl <- paste(tempdir(), "xxline", sep="/")
writeSpatialShape(xxx, tmpfl)
getinfo.shape(paste(tmpfl, ".shp", sep=""))
unlink(paste(tmpfl, ".x", sep=""))
x <- readShapeSpatial(system.file("shapes/baltim.shp", package="maptools")[[1]])
summary(xx)
x <- xx[xx$PRICE < 40,]
tmpfl <- paste(tempdir(), "xxpts", sep="/")
writeSpatialShape(xxx, tmpfl)
getinfo.shape(paste(tmpfl, ".shp", sep=""))
unlink(paste(tmpfl, ".x", sep=""))
readSplus  
*Read exported WinBUGS maps*

**Description**

The function permits an exported WinBUGS map to be read into an `sp` package class `SpatialPolygons` object.

**Usage**

```r
readSplus(file, proj4string = CRS(as.character(NA)))
```

**Arguments**

- `file`  
  name of file

- `proj4string`  
  Object of class "CRS": holding a valid proj4 string

**Value**

`readSplus` returns a `SpatialPolygons` object

**Note**

In the example, taken from the GeoBUGS manual, the smaller part of area1 has a counter-clockwise ring direction in the data, while other rings are clockwise. This implies that it is a hole, and does not get filled. Errant holes may be filled using `checkPolygonsHoles`. The region labels are stored in the ID slots of the Polygons objects.

**Author(s)**

Virgilio Gomez Rubio <Virgilio.Gomez@uclm.es>

**References**


**See Also**

`map2SpatialPolygons`

**Examples**

```r
if (rgeosStatus()) {
  geobugs <- readSplus(system.file("share/Splus.map", package="maptools"))
  plot(geobugs, axes=TRUE, col=1:3)
  row.names(geobugs)
  pls <- slot(geobugs, "polygons")
  sapply(pls, function(i) sapply(slot(i, "Polygons"), slot, "hole"))
}
Rgshhs <- lapply(pls, checkPolygonsHoles)
sapply(pls1, function(i) sapply(slot(i, "Polygons"), slot, "hole"))
plot(SpatialPolygons(pls1), axes=TRUE, col=1:3)
}

Description

If the data are polygon data, the function will read GSHHS polygons into SpatialPolygons object for
a chosen region, using binary shorelines from Global Self-consistant Hierarchical High-resolution
(Shorelines) Geography, release 2.3.0 of February 1, 2014 (http://www.soest.hawaii.edu/pwessel/
gshhg/gshhg-bin-2.3.0.zip).

The getRgshhsMap function calls Rgshhs internally to simplify the interface by returning only a
SpatialPolygons object rather than a more complex list, and by calling Rgshhs twice either side of
longitude 0 degrees for values of “xlim” straddling 0, then merging the polygons retrieved.

If the data are line data, the borders or river lines will be read into a SpatialLines object. The data
are provided in integer form as millionths of decimal degrees. Reading of much earlier versions of
the GSHHS binary files will fail with an error message. The netCDF GSHHS files distributed with
GMT >= 4.2 cannot be read as they are in a very different format.

Usage

Rgshhs(fn, xlim = NULL, ylim = NULL, level = 4, minarea = 0, shift = FALSE,
verbose = TRUE, no.clip = FALSE, properly=FALSE, avoidGEOS=FALSE,
checkPolygons=FALSE)

getRgshhsMap(fn = system.file("share/gshhs_c.b", package="maptools"),
xlim, ylim, level = 1, shift = TRUE, verbose = TRUE, no.clip = FALSE,
properly=FALSE, avoidGEOS=FALSE, checkPolygons=FALSE)

Arguments

fn filename or full path to GSHHS 2.3.0 file to be read
xlim longitude limits within 0-360 in most cases, negative longitudes are also found
east of the Atlantic, but the Americas are recorded as positive values
ylim latitude limits
level maximum GSHHS level to include, defaults to 4 (everything), setting 1 will only
retrieve land, no lakes
minarea minimum area in square km to retrieve, default 0
shift default FALSE, can be used to shift longitudes > 180 degrees to below zero,
beware of artefacts involving unhandled polygon splitting at 180 degrees
verbose default TRUE, print progress reports
no.clip default FALSE, if TRUE, do not clip output polygons to bounding box
properly default FALSE, if TRUE use `gContainsProperly` rather than `gContains`, here FALSE because clip rectangle touches clipped objects, so they are not properly contained

avoidGEOS default FALSE; if TRUE force use of `gpclib` even when `rgeos` is available

checkPolygons default FALSE, if TRUE, check using GEOS, which may re-order the member Polygon objects with respect to the returned polydata data frame rows

Details

The package is distributed with the coarse version of the shoreline data, and much more detailed versions may be downloaded from the referenced websites. The data is of high quality, matching the accuracy of SRTM shorelines for the full dataset (but not for inland waterbodies). In general, users will construct study region SpatialPolygons objects, which can then be exported (for example as a shapefile), or used in other R packages (such as PBSmapping). The largest land polygons take considerable time to clip to the study region, certainly many minutes for an extract from the full resolution data file including Eurasia (with Africa) or the Americas. For this reason, do not give up if nothing seems to be happening after the (verbose) message: "Rgshhs: clipping <m> of <n> polygons ..." appears. Clipping the largest polygons in full resolution also needs a good deal of memory.

Value

for polygon data, a list with the following components:

polydata data from the headers of the selected GSHHS polygons

belongs a matrix showing which polygon belongs to (is included in) which polygon, going from the highest level among the selected polygons down to 1 (land); levels are: 1 land, 2 lake, 3 island\_\_in\_\_lake, 4 pond\_\_in\_\_island\_\_in\_\_lake.

new_belongs a ragged list of polygon inclusion used for making SP

SP a SpatialPolygons object; this is the principal output object, and will become the only output object as the package matures

the `getRgshhsMap` returns only a SpatialPolygons object; for line data, a list with the following component:

SP a SpatialLines object

Note

A number of steps are taken in this implementation that are unexpected, print messages, and so require explanation. Following the extraction of polygons intersecting the required region, a check is made to see if Antarctica is present. If it is, a new southern border is imposed at the southern ylim value or -90 if no ylim value is given. When clipping polygons seeming to intersect the required region boundary, it can happen that no polygon is left within the region (for example when the boundaries are overlaid, but also because the min/max polygon values in the header may not agree with the polygon itself (one case observed for a lake west of Groningen). The function then reports a null polygon. Another problem occurs when closed polygons are cut up during the finding of intersections between polygons and the required region boundary.

By default, if the rgeos package is available, it is used for topology operations. If it is not available, the gpclib package may be used. Please also note that gpclib has a restricted licence.
Author(s)
Roger Bivand

References

Examples
if (rgeosStatus()) {
  gshhs.c.b <- system.file("share/gshhs_c.b", package="maptools")
  WEx <- c(-12, 3)
  WEy <- c(48, 59)
  WE <- getRgshhsMap(gshhs.c.b, xlim=WEx, ylim=WEy)
  plot(WE, col="khaki", xlim=WEx, ylim=WEy, xaxs="i", yaxs="i", axes=TRUE)
  NZx <- c(160,180)
  NZy <- c(-50,-30)
  NZ <- Rgshhs(gshhs.c.b, xlim=NZx, ylim=NZy)
  plot(NZ$SP, col="khaki", xlim=NZx, ylim=NZy, xaxs="i", yaxs="i", axes=TRUE)
  GLx <- c(265,285)
  GLy <- c(40,50)
  GL <- Rgshhs(gshhs.c.b, xlim=GLx, ylim=GLy)
  plot(GL$SP, col="khaki", xlim=GLx, ylim=GLy, xaxs="i", yaxs="i", axes=TRUE)
  BNllx <- c(2,8)
  BNLly <- c(49,54)
  wdb_lines <- system.file("share/wdb_borders_c.b", package="maptools")
  BNLp <- Rgshhs(gshhs.c.b, xlim=BNllx, ylim=BNlly)
  BNll <- Rgshhs(wdb_lines, xlim=BNllx, ylim=BNlly)
  plot(BNLp$SP, col="khaki", xlim=BNllx, ylim=BNlly, xaxs="i", yaxs="i", axes=TRUE)
  lines(BNll$SP)
  xlims <- c(0,360)
  ylims <- c(-90,90)
  world <- Rgshhs(gshhs.c.b, xlim=xlims, ylim=ylims, level=1, checkPolygons=TRUE)
}

```
snapPointsToLines

Snap a set of points to a set of lines

Description
This function snaps a set of points to a set of lines based on the minimum distance of each point to any of the lines. This function does not work with geographic coordinates.

Usage

snapPointsToLines(points, lines, maxDist=NA, withAttrs = TRUE, idField=NA)
```
snapPointsToLines

Arguments

points
An object of the class SpatialPoints or SpatialPointsDataFrame.

lines
An object of the class SpatialLines or SpatialLinesDataFrame.

maxDist
Numeric value for establishing a maximum distance to avoid snapping points that are farther apart; its default value is NA.

withAttrs
Boolean value for preserving (TRUE) or getting rid (FALSE) of the original point attributes. Default: TRUE. This parameter is optional.

idField
A string specifying the field which contains each line’s id. This id will be transferred to the snapped points data set to distinguish the line which each point was snapped to.

Value

SpatialPointsDataFrame object as defined by the R package 'sp'. This object contains the snapped points, therefore all of them lie on the lines.

Author(s)

German Carrillo and Ethan Plunkett

See Also

nearestPointOnSegment, nearestPointOnLine, sp

Examples

# From the sp vignette
l1 = cbind(c(1,2,3),c(3,2,2))
l1a = cbind(l1[,1]+.05,l1[,2]+.05)
l2 = cbind(c(1,2,3),c(1,1.5,1))
S1l = Line(l1)
S1la = Line(l1a)
S12 = Line(l2)
S1 = Lines(list(S1l, S1la), ID="a")
S2 = Lines(list(S12), ID="b")
S1 = SpatialLines(list(S1,S2))
df = data.frame(z = c(1,2), row.names=sapply(slot(S1, "lines"), function(x) slot(x, "ID")))
Sldf = SpatialLinesDataFrame(S1, data = df)

xc = c(1.2,1.5,2.5)
yc = c(1.5,2.2,1.6)
Spoints = SpatialPoints(cbind(xc, yc))

if (rgeosStatus()) snapPointsToLines(Spoints, Sldf, maxDist=0.4)
Description

The function outputs a SpatialPolygonsDataFrame object to be used by Mondrian.

Usage

sp2Mondrian(SP, file, new_format=TRUE)

Arguments

SP a SpatialPolygonsDataFrame object
file file where output is written
new_format default TRUE, creates a text data file and a separate map file; the old format put both data sets in a single file - the map file is named by inserting "MAP\_" into the file= argument after the rightmost directory separator (if any)

Note

At this release, the function writes out a text file with both data and polygon(s) identified as belonging to each row of data.

Author(s)

Patrick Hausmann and Roger Bivand

References

http://www.theusrus.de/Mondrian/

Examples

## Not run:
td <- tempdir()
xx <- readShapePoly(system.file("shapes/columbus.shp", package="maptools")[[1]])
sp2Mondrian(xx, file=file.path(td, "columbus1.txt"))
xx <- readShapePoly(system.file("shapes/sids.shp", package="maptools")[[1]])
sp2Mondrian(xx, file=file.path(td, "sids1.txt"))

## End(Not run)
sp2tmap

Convert SpatialPolygons object for Stata tmap command

Description
The function converts a SpatialPolygons object for use with the Stata tmap command, by creating a
data frame with the required columns.

Usage
sp2tmap(SP)

Arguments
SP       a SpatialPolygons object

Value
a data frame with three columns:
\_ID       an integer vector of polygon identifiers in numeric order
\_X       numeric x coordinate
\_Y       numeric y coordinate
and an ID_n attribute with the named polygon identifiers

Author(s)
Roger Bivand

References
http://www.stata.com/search.cgi?query=tmap

See Also
write.dta

Examples
## Not run:
xx <- readShapePoly(system.file("shapes/sids.shp", package="maptools")[1],
  IDvar="FIPSNO", proj4string=CRS("+proj=longlat +ellps=clrk66"))
plot(xx, border="blue", axes=TRUE, las=1)
tmapdf <- sp2tmap(as(xx, "SpatialPolygons"))
if (require(foreign)) {
  td <- tempdir()
  write.dta(tmapdf, file=file.path(td, "NCmap.dta"), version=7)
  NCdf <- as(xx, "data.frame")
}
sp2WB

Export SpatialPolygons object as S-Plus map for WinBUGS

Description

The function exports an sp SpatialPolygons object into a S-Plus map format to be import by WinBUGS.

Usage

sp2WB(map, filename, Xscale = 1, Yscale = Xscale, plotorder = FALSE)

Arguments

map a SpatialPolygons object
filename file where output is written
Xscale, Yscale scales to be written in the output file
plotorder default=FALSE, if TRUE, export polygons in plotting order

Author(s)

Virgilio Gómez Rubio, partly derived from earlier code by Thomas Jagger

References


Examples

xx <- readShapePoly(system.file("shapes/sids.shp", package="maptools")[[1]],
    IDvar="FIPSNO", proj4string=CRS("+proj=longlat +ellps=clrk66"))
plot(xx, border="blue", axes=TRUE, las=1)
tf <- tempfile()
sp2WB(as(xx, "SpatialPolygons"), filename=tf)
xxx <- readSplus(tf, proj4string=CRS("+proj=longlat +ellps=clrk66"))
all.equal(xxx, as(xx, "SpatialPolygons"), tolerance=.Machine$double.eps^(1/4),
    check.attributes=FALSE)
## Not run:
x <- readAsciiGrid(system.file("grids/test.ag", package="maptools")[[1]])
xp <- as(x, "SpatialPixelsDataFrame")
pp <- as(xp, "SpatialPolygons")
td <- tempdir()
SpatialLines2PolySet

Convert sp line and polygon objects to PBSmapping PolySet objects

Description

Functions SpatialLines2PolySet and SpatialPolygons2PolySet convert objects of sp classes to PolySet class objects as defined in the PBSmapping package, and PolySet2SpatialLines and PolySet2SpatialPolygons convert in the opposite direction.

Usage

SpatialLines2PolySet(SL)
SpatialPolygons2PolySet(SpP)
PolySet2SpatialLines(PS)
PolySet2SpatialPolygons(PS, close_polys=TRUE)

Arguments

SL a SpatialLines object as defined in the sp package
SpP a SpatialPolygons object as defined in the sp package
PS a PolySet object
close_polys should polygons be closed if open

Value

PolySet objects as defined in the PBSmapping package

Author(s)

Roger Bivand and Andrew Niccolai

See Also

PolySet, MapGen2SL

Examples

if(require(PBSmapping) & require(maps)) {
  nor_coast_lines <- map("world", interior=FALSE, plot=FALSE, xlim=c(4,32), ylim=c(58,72))
  nor_coast_lines <- pruneMap(nor_coast_lines, xlim=c(4,32), ylim=c(58,72))
  nor_coast_lines_sp <- map2SpatialLines(nor_coast_lines, proj4string=CRS("+proj=longlat +datum=WGS84 +ellps=WGS84"))
  nor_coast_lines_PS <- SpatialLines2PolySet(nor_coast_lines_sp)
SpatialLinesMidPoints

**Line midpoints**

**Description**

The function onverts SpatialLinesDataFrame to SpatialPointsDataFrame with points at the midpoints of the line segments.

**Usage**

SpatialLinesMidPoints(sldf)

**Arguments**

- sldf: A SpatialLines or SpatialLinesDataFrame object

**Details**

The function builds a SpatialPointsDataFrame from the midpoints of Line objects belonging to Lines objects in an object inheriting from a Spatial Lines object. The output data slot contains an index variable showing which Lines object the midpoints belong to.

**Value**

A SpatialPointsDataFrame object created from the input object.

**Author(s)**

Jonathan Callahan, modified by Roger Bivand
spCbind-methods

Examples

    xx <- readShapeLines(system.file("shapes/fylk-val.shp", package="maptools")[[1]],
                        proj4string=CRS("+proj=utm +zone=33 +datum=WGS84"))
    plot(xx, col="blue")
    spdf <- SpatialLinesMidPoints(xx)
    plot(spdf, col="orange", add=TRUE)

Description

spCbind provides cbind-like methods for Spatial*DataFrame objects in addition to the $, [<- and [[<- methods already available.

Methods

    obj = "SpatialPointsDataFrame", x = "data.frame"  cbind a data frame to the data slot of a SpatialPointsDataFrame object
    obj = "SpatialPointsDataFrame", x = "vector"    cbind a vector to the data slot of a SpatialPointsDataFrame object
    obj = "SpatialLinesDataFrame", x = "data.frame"  cbind a data frame to the data slot of a SpatialLinesDataFrame object; the data frame argument must have row names set to the Lines ID values, and should be re-ordered first by matching against a shared key column
    obj = "SpatialLinesDataFrame", x = "vector"    cbind a vector to the data slot of a SpatialLinesDataFrame object
    obj = "SpatialPolygonsDataFrame", x = "data.frame"  cbind a data frame to the data slot of a SpatialPolygonsDataFrame object; the data frame argument must have row names set to the Polygons ID values, and should be re-ordered first by matching against a shared key column
    obj = "SpatialPolygonsDataFrame", x = "vector"    cbind a vector to the data slot of a SpatialPolygonsDataFrame object

Author(s)

Roger Bivand

See Also

spChFIDs-methods, spRbind-methods
Examples

```r
xx <- readShapePoly(system.file("shapes/sids.shp", package="maptools")[[1]],
  IDvar="FIPSNO", proj4string=CRS("+proj=longlat +ellps=clrk66"))
library(foreign)
xtra <- read.dbf(system.file("share/nc_xtra.dbf", package="maptools")[[1]])
o <- match(xx$_CNTY_ID, xtra$_CNTY_ID)
xtra1 <- xtra[o,]
row.names(xtra1) <- xx$FIPSNO
xx1 <- spCbind(xx, xtra1)
names(xx1)
identical(xx1$CNTY_ID, xx1$_CNTY_ID.1)
```

---

**SplashDams**

### Data for Splash Dams in western Oregon

**Description**

Data for Splash Dams in western Oregon

**Usage**

```r
data(SplashDams)
```

**Format**

The format is: Formal class 'SpatialPointsDataFrame' [package "sp"] with 5 slots .@ data .`data.frame`: 232 obs. of 6 variables: ..$ streamName : Factor w/ 104 levels "Abiqua Creek",..: 12 12 60 60 49 49 9 9 18 .. ..$ locationCode: Factor w/ 3 levels "h","l","m": 1 1 1 1 1 1 1 1 1 .. ..$ height : int [1:232] 4 4 NA NA NA NA 10 NA NA NA ... ..$ lastDate : int [1:232] 1956 1956 1957 1936 1936 1929 1919 1919 ... ..$ owner : Factor w/ 106 levels "A. Stefani","A.H.
Blakesley",...: 42 42 42 42 42 42 42 42 92 92 ... ..$ datesUsed : Factor w/ 118 levels ","-1870s-1899-?,:..: 92 92 93 91 91 72 61 94 94 94 ... ..$ coords.nrs : num(0) .. ..- attr(*, "dimnames")=List of 2 .. ..$ : NULL .. ..$ : chr [1:3] "coords.x1" "coords.x2" "coords.x3" ..@ bbox : num [1:3, 1:2] -124.2 42.9 42.9 42.9 42.9 42.9 42.9 42.9 42.9 ... ..- attr(*, "dimnames")=List of 2 .. ..$ : chr [1:3] "coords.x1" "coords.x2" "coords.x3" ..@ proj4string:Formal class 'CRS' [package "sp"] with 1 slots .. ..@ projargs: chr "+proj=longlat +ellps=WGS84"

**Source**


**References**

Examples

data(SplashDams)
plot(SplashDams, axes=TRUE)

Description

spRbind provides rbind-like methods for Spatial*DataFrame objects

Methods

obj = "SpatialPoints", x = "SpatialPoints"  rbind two SpatialPoints objects

obj = "SpatialPointsDataFrame", x = "SpatialPointsDataFrame"  rbind two SpatialPointsDataFrame objects

obj = "SpatialLines", x = "SpatialLines"  rbind two SpatialLines objects

obj = "SpatialLinesDataFrame", x = "SpatialLinesDataFrame"  rbind two SpatialLinesDataFrame objects

obj = "SpatialPolygons", x = "SpatialPolygons"  rbind two SpatialPolygons objects

obj = "SpatialPolygonsDataFrame", x = "SpatialPolygonsDataFrame"  rbind two SpatialPolygonsDataFrame objects

Note

In addition to the spRbind-methods, there are also rbind-methods for Spatial* objects. The differences are:

1. spRbind-methods can bind 2 objects, whereas rbind-methods can bind multiple objects

2. some rbind can accept objects with duplicated IDs, for all spRbind-methods these have to be modified explicitly, e.g. by calling spChFIDs-methods

Author(s)

Roger Bivand

See Also

spChFIDs-methods, spCbind-methods
Examples

xx <- readShapePoly(system.file("shapes/sids.shp", package="maptools")[[1]],
    IDvar="FIPSNO", proj4string=CRS("+proj=longlat +ellps=clrk66"))
summary(xx)
xx$FIPSNO
xx1 <- xx[xx$CNTY_ID < 1982,]
xx2 <- xx[xx$CNTY_ID >= 1982,]
xx3 <- spRbind(xx2, xx1)
summary(xx3)
xx3$FIPSNO

state.vbm

US State Visibility Based Map

Description

A SpatialPolygonsDataFrame object (for use with the maptools package) to plot a Visibility Based Map.

Usage

data(state.vbm)

Details

A SpatialPolygonsDataFrame object (for use with the maptools package) to plot a map of the US states where the sizes of the states have been adjusted to be more equal.

This map can be useful for plotting state data using colors patterns without the larger states dominating and the smallest states being lost.

The original map is copyrighted by Mark Monmonier. Official publications based on this map should acknowledge him. Comercial publications of maps based on this probably need permission from him to use.

Author(s)

Greg Snow <greg.snow@imail.org> (of this compilation)

Source

The data was converted from the maps library for S-PLUS. S-PLUS uses the map with permission from the author. This version of the data has not received permission from the author (no attempt made, not that it was refused), most of my uses I feel fall under fair use and do not violate copyright, but you will need to decide for yourself and your applications.

References

sun-methods

Examples

```r
data(state.vbm)
plot(state.vbm)

tmp <- state.x77[, 'HS Grad']
tmp2 <- cut(tmp, seq(min(tmp), max(tmp), length.out=11), include.lowest=TRUE)
plot(state.vbm, col=cm.colors(10)[tmp2])
```

sun-methods

Methods for sun ephemerides calculations

Description

Functions for calculating sunrise, sunset, and times of dawn and dusk, with flexibility for the various formal definitions. They use algorithms provided by the National Oceanic & Atmospheric Administration (NOAA).

Usage

```r
## S4 method for signature 'SpatialPoints,POSIXct'
crepuscule(crds, dateTime, solarDep, direction=c("dawn", "dusk"), POSIXct.out=FALSE)
## S4 method for signature 'matrix,POSIXct'
crepuscule(crds, dateTime, proj4string=CRS("+proj=longlat +datum=WGS84"), solarDep, direction=c("dawn", "dusk"), POSIXct.out=FALSE)
## S4 method for signature 'SpatialPoints,POSIXct'
sunriset(crds, dateTime, direction=c("sunrise", "sunset"), POSIXct.out=FALSE)
## S4 method for signature 'matrix,POSIXct'
sunriset(crds, dateTime, proj4string=CRS("+proj=longlat +datum=WGS84"), direction=c("sunrise", "sunset"), POSIXct.out=FALSE)
## S4 method for signature 'SpatialPoints,POSIXct'
solarnoon(crds, dateTime, POSIXct.out=FALSE)
## S4 method for signature 'matrix,POSIXct'
solarnoon(crds, dateTime, proj4string=CRS("+proj=longlat +datum=WGS84"), POSIXct.out=FALSE)
## S4 method for signature 'SpatialPoints,POSIXct'
solarpos(crds, dateTime, ...)  
## S4 method for signature 'matrix,POSIXct'
solarpos(crds, dateTime, proj4string=CRS("+proj=longlat +datum=WGS84"), ...)
```
**Arguments**

- **crds**: a `SpatialPoints` or `matrix` object, containing x and y coordinates (in that order).
- **dateTime**: a `POSIXct` object with the date and time associated to calculate ephemerides for points given in `crds`.
- **solarDep**: numeric vector with the angle of the sun below the horizon in degrees.
- **direction**: one of "dawn", "dusk", "sunrise", or "sunset", indicating which ephemerides should be calculated.
- **POSIXct.out**: logical indicating whether `POSIXct` output should be included.
- **proj4string**: string with valid projection string describing the projection of data in `crds`.
- **...**: other arguments passed through.

**Details**

NOAA used the reference below to develop their Sunrise/Sunset:

http://www.srrb.noaa.gov/highlights/sunrise/sunrise.html and Solar Position

http://www.srrb.noaa.gov/highlights/sunrise/azel.html Calculators. The algorithms include corrections for atmospheric refraction effects.

Input can consist of one location and at least one `POSIXct` times, or one `POSIXct` time and at least one location. `solarDep` is recycled as needed.

Do not use the daylight savings time zone string for supplying `dateTime`, as many OS will not be able to properly set it to standard time when needed.

**Value**

- `crepuscule`, `sunriset`, and `solarnoon` return a numeric vector with the time of day at which the event occurs, expressed as a fraction, if `POSIXct.out` is `FALSE`; otherwise they return a data frame with both the fraction and the corresponding `POSIXct` date and time.
- `solarpos` returns a matrix with the solar azimuth (in degrees from North), and elevation.

**Warning**

Compared to NOAA's original Javascript code, the sunrise and sunset estimates from this translation may differ by +/- 1 minute, based on tests using selected locations spanning the globe. This translation does not include calculation of prior or next sunrises/sunsets for locations above the Arctic Circle or below the Antarctic Circle.

**Note**

NOAA notes that “for latitudes greater than 72 degrees N and S, calculations are accurate to within 10 minutes. For latitudes less than +/- 72 degrees accuracy is approximately one minute.”
Author(s)

Sebastian P. Luque <spluque@gmail.com>, translated from Greg Pelletier’s <gpel461@ecy.wa.gov>
VBA code (available from http://www.ecy.wa.gov/programs/eap/models.html), who in turn
translated it from original Javascript code by NOAA (see Details). Roger Bivand <roger.bivand@nhh.no>
adapted the code to work with sp classes.

References


Examples

```r
## Location of Helsinki, Finland, in decimal degrees,
## as listed in NOAA’s website
hels <- matrix(c(24.97, 60.17), nrow=1)
Hels <- SpatialPoints(hels, proj4string=CRS("+proj=longlat +datum=WGS84"))
d041224 <- as.POSIXct("2004-12-24", tz="EET")
## Astronomical dawn
crepuscule(hels, d041224, solarDep=18, direction="dawn", POSIXct.out=TRUE)
crepuscule(Hels, d041224, solarDep=18, direction="dawn", POSIXct.out=TRUE)
## Nautical dawn
crepuscule(hels, d041224, solarDep=12, direction="dawn", POSIXct.out=TRUE)
crepuscule(Hels, d041224, solarDep=12, direction="dawn", POSIXct.out=TRUE)
## Civil dawn
crepuscule(hels, d041224, solarDep=6, direction="dawn", POSIXct.out=TRUE)
crepuscule(Hels, d041224, solarDep=6, direction="dawn", POSIXct.out=TRUE)
solarnoon(hels, d041224, POSIXct.out=TRUE)
solarnoon(Hels, d041224, POSIXct.out=TRUE)
solarpun(hels, as.POSIXct(Sys.time(), tz="EET"))
solarpun(Hels, as.POSIXct(Sys.time(), tz="EET"))
sunriset(hels, d041224, direction="sunrise", POSIXct.out=TRUE)
sunriset(Hels, d041224, direction="sunrise", POSIXct.out=TRUE)
## Using a sequence of dates
Hels_seq <- seq(from=d041224, length.out=365, by="days")
up <- sunriset(Hels, Hels_seq, direction="sunrise", POSIXct.out=TRUE)
down <- sunriset(Hels, Hels_seq, direction="sunset", POSIXct.out=TRUE)
day_length <- down$time - up$time
plot(Hels_seq, day_length, type="l")
## Using a grid of spatial points for the same point in time
## Not run:
grd <- GridTopology(c(-179,-89), c(1,1), c(359,179))
SP <- SpatialPoints(coordinates(grd),
                    proj4string=CRS("+proj=longlat +datum=WGS84"))
wint <- as.POSIXct("2004-12-21", tz="GMT")
win <- crepuscule(SP, wint, solarDep=6, direction="dawn")
SPDF <- SpatialGridDataFrame(grd, proj4string=CRS("+proj=longlat +datum=WGS84"),
data=data.frame(winter=win))
image(SPDF, axes=TRUE, col=cm.colors(40))
## End(Not run)
```
symbolsInPolys  

**Place grids of points over polygons**

Description

Place grids of points over polygons with chosen density and/or symbols (suggested by Michael Wolf).

Usage

```r
symbolsInPolys(pl, dens, symb = "+", compatible = FALSE)
```

Arguments

- **pl**: an object of class SpatialPolygons or SpatialPolygonsDataFrame
- **dens**: number of symbol plotting points per unit area; either a single numerical value for all polygons, or a numeric vector the same length as pl with values for each polygon
- **symb**: plotting symbol; either a single value for all polygons, or a vector the same length as pl with values for each polygon
- **compatible**: what to return, if TRUE a list of matrices of point coordinates, one matrix for each member of pl, with a `symb` attribute, if false a SpatialPointsDataFrame with a `symb` column

Details

The dots are placed in a grid pattern with the number of points per polygon being polygon area times density (number of dots not guaranteed to be the same as the count). When the polygon is made up of more than one part, the dots will be placed in proportion to the relative areas of the clockwise rings (anticlockwise are taken as holes). From maptools release 0.5-2, correction is made for holes in the placing of the dots, but depends on hole values being correctly set, which they often are not.

Value

The function returns a list of matrices of point coordinates, one matrix for each member of pl; each matrix has a `symb` attribute that can be used for setting the `pch` argument for plotting. If the count of points for the given density and polygon area is zero, the list element is NULL, and can be tested when plotting - see the examples.

Note

Extension to plot pixmaps at the plotting points using `addlogo()` from the pixmap package is left as an exercise for the user.

Author(s)

Roger Bivand <Roger.Bivand@nhh.no>
thinnedSpatialPoly

Douglas-Peuker line generalization for Spatial Polygons

Description

The function applies the implementation of the Douglas-Peuker algorithm for line generalization or simplification (originally from shapefiles) to objects inheriting from Spatial Polygons. It does not preserve topology, so is suitable for visualisation, but not for the subsequent analysis of the polygon boundaries, as artefacts may be created, and boundaries of neighbouring entities may be generalized differently. If the rgeos package is available, thinnedSpatialPolyGEOS will be used with partial topology preservation instead of the R implementation here by passing arguments through.

Usage

thinnedSpatialPoly(SP, tolerance, minarea=0, topologyPreserve = FALSE, avoidGEOS = FALSE)

Arguments

SP
an object inheriting from the SpatialPolygons class

tolerance
the tolerance value in the metric of the input object

minarea
the smallest area of Polygon objects to be retained, ignored if rgeos used

topologyPreserve
choose between two rgeos options: logical determining if the algorithm should attempt to preserve the topology (nodes not complete edges) of the original geometry

avoidGEOS
use R DP code even if rgeos is available

See Also

spsample

Examples

nc_SP <- readShapePoly(system.file("shapes/sids.shp", package="maptools")[[1]],
proj4string=CRS("+proj=longlat +ellps=clrk66"))
## Not run:
pls <- slot(nc_SP, "polygons")
pls_new <- lapply(pls, checkPolygonsHoles)
nc_SP <- SpatialPolygonsDataFrame(SpatialPolygons(pls_new,
proj4string=CRS(proj4string(nc_SP))), data=as(nc_SP, "data.frame"))
## End(Not run)
symbs <- c("-", "+", "x")
np <- sapply(slot(nc_SP, "polygons"), function(x) length(slot(x, "Polygons")))
try1 <- symbolsInPolys(nc_SP, 100, symb=symbs[np])
plot(nc_SP, axes=TRUE)
plot(try1, add=TRUE, pch=as.character(try1$symb))
unionSpatialPolygons

Aggregate Polygons in a SpatialPolygons object

Description

The function aggregates Polygons in a SpatialPolygons object, according to the IDs vector specifying which input Polygons belong to which output Polygons; internal boundaries are dissolved using the rgeos package `gUnaryUnion` function. If the rgeos package is not available, and if the gpclib package is available and the user confirms that its restrictive license conditions are met, its `union` function will be used.

Usage

`unionSpatialPolygons(SpP, IDs, threshold=NULL, avoidGEOS=FALSE, avoidUnaryUnion=FALSE)`
**Arguments**

SpP A SpatialPolygons object as defined in package sp

IDs A vector defining the output Polygons objects, equal in length to the length of the polygons slot of SpRs; it may be character, integer, or factor (try table(factor(IDs)) for a sanity check). It may contain NA values for input objects not included in the union

threshold if not NULL, an area measure below which slivers will be discarded (some polygons have non-identical boundaries, for instance along rivers, generating slivers on union which are artefacts, not real sub-polygons)

avoidGEOS default FALSE; if TRUE force use of gpclib even when GEOS is available

avoidUnaryUnion avoid gUnaryUnion if it is available; not relevant before GEOS 3.3.0

**Value**

Returns an aggregated SpatialPolygons object named with the aggregated IDs values in their sorting order; see the ID values of the output object to view the order.

**Warning**

When using GEOS Unary Union, it has been found that some polygons are not dissolved correctly when the absolute values of the coordinates are very small. No work-around is available at present.

**Author(s)**

Roger Bivand

**Examples**

```r
if (rgeosStatus()) {
nc1 <- readShapePoly(system.file("shapes/sids.shp", package="maptools")[[1]],
  proj4string=CRS("+proj=longlat +datum=NAD27"))
lps <- coordinates(nc1)
ID <- cut(lps[,1], quantile(lps[,1]), include.lowest=TRUE)
reg4 <- unionSpatialPolygons(nc1, ID)
row.names(reg4)
}
```

**Description**

The object loaded is a SpatialPolygonsDataFrame object containing a slightly modified version of Bjoern Sandvik’s improved version of world_borders.zip - TM_WORLD_BORDERS_SIMPL-0.2.zip dataset from the Mapping Hacks geodata site. The country Polygons objects and the data slot data frame row numbers have been set to the ISO 3166 three letter codes.
Usage

data(wrld_simpl)

Format

The format is: Formal class 'SpatialPolygonsDataFrame' [package "sp"] with 5 slots; the data clot contains a data.frame with 246 obs. of 11 variables:

- **FIPS** factor of FIPS country codes
- **ISO2** factor of ISO 2 character country codes
- **ISO3** factor of ISO 3 character country codes
- **UN** integer vector of UN country codes
- **NAME** Factor of country names
- **AREA** integer vector of area values
- **POP2005** integer vector of population in 2005
- **REGION** integer vector of region values
- **SUBREGION** integer vector of subregion values
- **LON** numeric vector of longitude label points
- **LAT** numeric vector of latitude label points

The object is in geographical coordinates using the WGS84 datum.

Source

Originally "http://mappinghacks.com/data/TM_WORLD_BORDERS_SIMPL-0.2.zip", now available from https://github.com/nasa/World-Wind-Java/tree/master/WorldWind/testData/shapefiles

Examples

data(wrld_simpl)
plot(wrld_simpl)
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