

Package ‘GeoXp’

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Author Yves Aragon, Thibault Laurent, Lauriane Robidou, Anne Ruiz-Gazen, Christine Thomas-Agnan

Maintainer Thibault Laurent <thibault.laurent@univ-tlse1.fr>

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Description GeoXp is a tool for researchers in spatial statistics, spatial econometrics, geography, ecology etc allowing to link dynamically statistical plots with elementary maps. This coupling consists in the fact that the selection of a zone on the map results in the automatic highlighting of the corresponding points on the statistical graph or reversely the selection of a portion of the graph results in the automatic highlighting of the corresponding points on the map. GeoXp includes tools from different areas of spatial statistics including geostatistics as well as spatial econometrics and point processes. Besides elementary plots like boxplots, histograms or simple scatterplots, GeoXp also couples with maps Moran scatterplots, variogram cloud, Lorentz Curves,...In order to make the most of the multidimensionality of the data, GeoXp includes some dimension reduction techniques such as PCA.

License GPL (>= 2)

URL `\{ \}url{ http://w3.univ-tlse1.fr/GREMAQ/Statistique/SP_etheme3.pdf }`

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R topics documented:

| | |
|---------------------------|----|
| GeoXp-package | 3 |
| angleplotmap | 4 |
| barmap | 6 |
| barnbmap | 8 |
| boxplotmap | 9 |
| carte | 11 |
| choix.bubble | 13 |
| choix.couleur | 14 |
| choixvarfunc | 15 |
| clustermap | 15 |
| dbledensitymap | 18 |
| dblehistomap | 20 |
| densitymap | 22 |
| distchi2 | 24 |
| driftmap | 25 |
| genpca | 27 |
| gini | 29 |
| ginimap | 31 |
| graphique | 32 |
| histnbmap | 34 |
| histobarmap | 36 |
| histomap | 38 |
| immob | 40 |
| makeneighborsw | 41 |
| misolationmap | 43 |
| moranplotmap | 45 |
| mvvariocloudmap | 47 |
| neighbourmap | 48 |
| nonormmoran | 50 |
| normw | 52 |
| pcamap | 53 |
| plot3dmap | 55 |
| polyboxplotmap | 57 |
| polylist2list | 59 |
| rotation | 60 |
| scattermap | 61 |
| selectgraph | 63 |
| selectmap | 63 |
| selectstat | 64 |
| slider1 | 65 |
| slider2 | 66 |
| spdf2list | 67 |
| variocloudmap | 68 |

Description

GeoXp is a tool for researchers in spatial statistics, spatial econometrics, geography, ecology etc allowing to link dynamically statistical plots with elementary maps. This coupling consists in the fact that the selection of a zone on the map results in the automatic highlighting of the corresponding points on the statistical graph or reversely, the selection of a portion of the graph results in the automatic highlighting of the corresponding points on the map. GeoXp includes tools from different areas of spatial statistics including geostatistics as well as spatial econometrics and point processes. Besides elementary plots like boxplots, histograms or simple scatterplots, GeoXp also couples with maps Moran scatterplots, variogram cloud, Lorentz Curves,... In order to make the most of the multidimensionality of the data, GeoXp includes some dimension reduction techniques such as PCA.

Details

Package: GeoXp
 Type: Package
 Version: 1.4.3
 Date: 2010-03-12
 License: GPL Vesion 2 or later

The coordinates of sites are represented by two vectors `long` (for x-axis) and `lat` (for y-axis) of size `n` of numeric values. Attribute value is designed by argument `var` of size `n` and can be a vector of numeric values (function `histomap()`, `densitymap()`, ...) or a factor (function `barmap()`, ...). Some functions use both a vector of numeric values and a factor (function `histobarmap()`, `polyboxplotmap()`, ...). Few functions as `pcamap()` and `clustermmap()` use a matrix of numeric variables.

Contrary to `spdep` package (Roger Bivand), a site cannot be yet represented by `lattice/area` style. However, user can represent a spatial polygonal contour as background map with option `carte`. A spatial polygonal contour is a matrix of numeric values with 2 columns (x and y coordinates of the vertices of the polygons) where polygons are seperated from each other by 3 rows of `NaN`. We include in GeoXp 2 functions (`polylist2list()` and `spdf2list()`) which convert some spatial objects (`Polylist` and `SpatialPolygonDataFrame`) into matrix as deccribed above to draw a background map.

Among options which are common to each function, users have the possibility to give a `criteria`, vector of boolean of size `n` with `TRUE` on specific sites. These sites are then represented by a croice on the map by clicking on "non intercative selection" button.

Moreover, users have the possibility to make bubbles and add some graphs (histogram, barplot or scattermap) giving both a matrix of variables `listvar` of size $n \times p$ and a list of character of size `p` for variable names. Users can choose a proportional symbol mapping : in function `plot`, we give value $var^{0.5}$ to argument `cex`. User can choose if a legend has to appear on the map. He could choose then three values represented by bubbles of corresponding sizes.

Finally, users can choose to represent the graphical with different colors using argument `color`. In the case of factors (as function `barmap`), users could choose if a legend with corresponding colors will appear on the map. Users can also modify the representation of selected sites on map with argument `pch`.

GeoXp don't use classes yet excepted `bar.nb()` and `hist.nb()` functions which call a `nb` object (see package `spdep`). These two functions make an analysis of a neighborhood matrix.

Author(s)

Christine Thomas-Agnan, Yves Aragon, Anne Ruiz-Gazen, Thibault Laurent, Laurianne Robidou
Maintainer: Thibault Laurent <thibault.laurent@univ-tlse1.fr>

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

angleplotmap *Detection of an eventual directional trend*

Description

The function `angleplotmap()` is used to detect an eventual directional trend associated to variable `var`. It represents the absolute difference between the value of `var` at two sites as a function of the angle between vector $\vec{s}_i \vec{s}_j$ and the x-axis.

Usage

```
angleplotmap(long, lat, var, quantiles=NULL, listvar=NULL, listnomvar=NULL,
criteria=NULL, carte = NULL, label = "", cex.lab=1, pch = 16, col="blue",
xlab = "angle", ylab="absolut magnitude", lablong = "", lablat = "", axes=FALSE)
```

Arguments

| | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>var</code> | a vector of numeric values of size n |
| <code>quantiles</code> | list of values of quantile orders (the regression quantile is obtained by spline smoothing) |
| <code>listvar</code> | matrix of variables which permit to plot bubbles on map using the tk window |
| <code>listnomvar</code> | names of variables <code>listvar</code> |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |

| | |
|---------|-------------------------------------------------------|
| label | a list of character of size n with names of sites |
| cex.lab | character size of label |
| pch | 16 by default, symbol for selected points |
| col | "blue" by default, colors of points on the angle plot |
| xlab | a title for the graphic x-axis |
| ylab | a title for the graphic y-axis |
| lablong | a title for the map x-axis |
| lablat | a title for the map y-axis |
| axes | a boolean with TRUE for drawing axes on the map |

Details

For each couple of sites (s_i, s_j) , the graphic represents on the y-axis the absolute difference between var_i and var_j :

$$D_{ij} = |var_i - var_j|$$

and on the x-axis the angle θ_{ij} between $\overline{s_i s_j}$ and the x-axis. Possibility to represent a smoothing spline regression quantile g_α . For $0 < \alpha < 1$,

$$Pr[D_{ij} < g_\alpha(\theta_{ij})] = \alpha$$

If that case, only the pair of sites (s_i, s_j) verifying :

$$D_{ij} > g_{max(\alpha)}(\theta_{ij})$$

are represented.

Value

A matrix of boolean of size $n \times n$. TRUE if pair of sites was in the last selection

Author(s)

Thomas-Agnan Christine, Aragon Yves, Ruiz-Gazen Anne, Laurent Thibault, Robidou Lauriane

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[variocloudmap](#), [driftmap](#)

Examples

```
# Data afcon
data(afcon)

africa <- readShapePoly(system.file("shapes/Africa.shp", package = "GeoXp")[1])
africa.contour<-spdf2list(africa)$poly

obs<-angleplotmap(afcon$x,afcon$y,afcon$totcon,listvar=afcon,
listnomvar=names(afcon),label=afcon$name,cex.lab=0.5,quantiles=c(0.1,0.5,0.95),
criteria=(afcon$totcon>mean(afcon$totcon)),carte=africa.contour)

# Data Meuse
data(meuse)
data(meuse.riv)
obs<-angleplotmap(meuse$x,meuse$y,meuse$copper,
col="green",quantiles=0.9,
listvar=meuse,listnomvar=names(meuse),
xlab="Concentration in plomb (in ppm)",pch=7,carte=meuse.riv[c(21:65,110:153),])
```

barmap

Interactive Bar plot and map

Description

The function `barmap()` draws a bar plot (vertical bar) of the given factor variable `var` and a map with sites of coordinates (`long,lat`).

Usage

```
barmap(long,lat,var,listvar=NULL,listnomvar=NULL,criteria=NULL,carte=NULL,
label="",cex.lab=1,col="blue",pch=16,xlab="",ylab="",names.arg="",
axes=FALSE,lablong="",lablat="")
```

Arguments

| | |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>var</code> | a vector of factor of size n |
| <code>listvar</code> | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| <code>listnomvar</code> | list of character with name of variables from <code>listvar</code> |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours using the tcltk window : x and y coordinates of the vertices of the polygon |

| | |
|-----------|-----------------------------------------------------------------------------------------------------------------|
| label | a list of character of size n with name of site. Names are printed on map after a selection |
| cex.lab | character size of label |
| col | a vector of colors which must be equal to the number of group else all sites and all bars are printed in col[1] |
| pch | a vector of symbol which must be equal to the number of group else all sites are printed in pch[1] |
| xlab | a title for the graphic x-axis |
| ylab | a title for the graphic y-axis |
| names.arg | names of factors of var |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

The selection of a bar on the bar plot results in the corresponding sites coloured on the map with the corresponding colour observed on the bar. Reversely, the selection of sites on the map by "points" or "polygon" results in the drawing of the sub-barplot in red.

Value

A vector of boolean of size n. TRUE if the site was in the last selection.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Économétrie pour données géoréférencées : modèles et études de cas*

See Also

[histomap](#), [histobarmap](#), [scattermap](#), [densitymap](#)

Examples

```
# data oldcol
example(columbus)
coords <- coordinates(columbus)
cont<-spdf2list(columbus)$poly

barmap(coords[,1], coords[,2], columbus@data$NSA, listvar=columbus@data,
carte=cont, listnomvar=names(columbus@data), criteria=(columbus@data$CP==1),
col=colors()[101:102],pch=5:6,label=as.character(1:49),cex.lab=0.5)
```

```
# data eire
data(eire)
eire.contours<-polylist2list(eire.polys.utm)
barmap(eire.coords.utm$V1,eire.coords.utm$V2,eire.df$pale,carte=eire.contours,
listvar=eire.df,listnomvar=names(eire.df),
xlab="Appartenance to the region of Pale",names.arg=c("Hors Pale","Pale"),
col=c("purple","pink"))
```

barnbmap

Bar plot of the number of neighbour and map

Description

The function `barnbmap` draws the bar plot of the link number distribution for a neighbourhood structure given by a `nb` object (spdep package) and links this bar plot with a map.

Usage

```
barnbmap(object, coords = NULL, listvar=NULL, listnomvar=NULL,
carte=NULL, criteria=NULL, label="", col="blue",pch=16, xlab="",
ylab="", cex.lab=1, axes=FALSE, lablong="", lablat="")
```

Arguments

| | |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <code>object</code> | a object of class <code>nb</code> |
| <code>coords</code> | a matrix of size $n \times 2$ |
| <code>listvar</code> | matrix of variables which permit to plot bubbles using the tk window |
| <code>listnomvar</code> | names of variables <code>listvar</code> |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>label</code> | vector of character of size n with names of sites |
| <code>col</code> | a vector of colors which may be equal to the number of group else all sites and all bars are printed in <code>col[1]</code> |
| <code>pch</code> | a vector of symbol which may be equal to the number of group else all sites are printed in <code>pch[1]</code> |
| <code>xlab</code> | a title for the graphic x-axis |
| <code>ylab</code> | a title for the graphic y-axis |
| <code>cex.lab</code> | character size of label |
| <code>axes</code> | a boolean with TRUE for drawing axes on the map |
| <code>lablong</code> | name of the x-axis that will be printed on the map |
| <code>lablat</code> | name of the y-axis that will be printed on the map |

Details

For a selected site j on the map, are represented on the map its neighbours. For a selected bar on the graph, the corresponding sites are represented on the map with a link which means that two sites are neighbours.

Value

No value returned.

Note

When user select sites on the graph or on the map, he cannot add a selection by using the other graphic.

Author(s)

Aragon Y., Thomas-Agnan C., Ruiz-Gazen A., Laurent T.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[moranplotmap](#), [makeneighborsw](#), [normw](#), [nonnormmoran](#)

Examples

```
example(columbus)
coords <- coordinates(columbus)
cont<-spdf2list(columbus)$poly

barnbmap(col.gal.nb, coords, carte=cont, listvar=columbus@data,
listnomvar=names(columbus), criteria=which(coords[,1]>mean(coords[,1])),
col=colors()[98:106], label=as.character(1:49), cex.lab=0.7, pch=1:9)
```

boxplotmap

Interactive boxplot and map

Description

The function `boxplotmap()` draws a boxplot of the given variable `var` and a map with site of coordinates (long,lat).

Usage

```
boxplotmap(long, lat, var, listvar=NULL, listnomvar=NULL, carte=NULL, criteria=NULL,
label="", cex.lab=1, pch=16, col="grey", xlab="", ylab="", axes=FALSE,
lablong="", lablat="")
```

Arguments

| | |
|------------|-------------------------------------------------------------------------------------------------------------------|
| long | a vector x of size n |
| lat | a vector y of size n |
| var | a vector of numerical values of size n |
| listvar | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| listnomvar | list of character of size p with names of variables from listvar |
| carte | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| criteria | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| label | vector of character of size n with name of site. Names are printed on map after a selection |
| cex.lab | character size of label |
| pch | 16 by default, symbol for selected points |
| col | "grey" by default, color of the boxplot |
| xlab | a title for the graphic x-axis |
| ylab | a title for the graphic y-axis |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

There is an interactivity only in one direction : the sites selected by interquartile on the boxplot are represented on the map in red.

Value

A vector of boolean of size n. TRUE if the site was in the last selection.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[histomap](#), [histobarmap](#), [scattermap](#), [densitymap](#)

Examples

```
# 1st example
example(columbus)
coords <- coordinates(columbus)
cont<-spdf2list(columbus)$poly

boxplotmap(coords[,1], coords[,2],columbus@data$CRIME,listvar=columbus@data,
carte=cont, listnomvar=names(columbus@data),criteria=(columbus@data$CP==1),
xlab="Crime",ylab="Percent",label=columbus@data$COLUMBUS.I,cex.lab=0.7)

# 2nd example
data(boston)
obs<-boxplotmap(boston.utm[,1],boston.utm[,2],boston.c$CRIM,listvar=boston.c,
listnomvar=names(boston.c),criteria=(boston.c$CHAS==1))

# 3rd example
data(eire)
eire.contours<-polylist2list(eire.polys.utm)
boxplotmap(eire.coords.utm$V1,eire.coords.utm$V2,eire.df$POPCHG,
listvar=eire.df,listnomvar=names(eire.df),carte=eire.contours,
xlab="Evolution rate of the population from 1921 to 1962",pch=7)
```

carte

Drawing a map

Description

The function `carte()` draws a map with sites of coordinates (`long,lat`) and represents sites which have been selected in `obs`. This function is called by most of the functions of `GeoXp` (this is not an interactive function).

Usage

```
carte(long, lat, obs, criteria=NULL, bubble=FALSE, cbubble=NULL, nointer=FALSE,
carte=NULL,nocart=FALSE, label="",cex.lab=NULL, symbol=16, lablong="",
lablat="", method="", W=NULL,couleurs="blue", classe=NULL, legmap=NULL,
legends=list(FALSE,FALSE),labmod="",axis=FALSE)
```

Arguments

| | |
|-------------------|--------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>obs</code> | a boolean vector of size n with TRUE on selected sites |

| | |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| criteria | a vector of size n of boolean with TRUE on specific sites (these for non interactive selection) |
| buble | a boolean with TRUE for drawing bubbles, FALSE otherwise |
| cbuble | vector of size n with size of each site depending on variable with which bubbles are constructed |
| nointer | a boolean with TRUE for drawing sites selected by criteria, FALSE otherwise |
| carte | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| nocart | a boolean with TRUE for drawing spatial contours, FALSE otherwise |
| label | vector of character of size n with name of each site |
| cex.lab | character size of label |
| symbol | a vector of symbol which must be equal to the number of group else all sites are printed in pch[1] |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |
| method | Specification for some graphics such as 'Neighbourplot1', 'Neighbourplot2', 'Cluster', 'Angleplot', 'Variocloud' |
| W | neighbourhood matrix of size $n \times n$, necessary when method='Neighbourplot' |
| couleurs | Colors of the sites |
| classe | vector of n whith class of sites |
| legmap | a list of (numeric,numeric,numeric,numeric,numeric,numeric,character) with the sizes and the corresponding values of the 3 bubbles represented in the legend and the variable name of variable choosed |
| legends | a list of c(boolean,boolean,c(numeric,numeric),c(numeric,numeric)) with TRUE for drawing legends of bubbles (1st argument) or factors (2nd argument) and the coordinates of the location of the upper left corner of the legend box |
| labmod | Name of factors |
| axis | a boolean with True for drawing axes on the map |

Details

Options permit to represent sites with different colors or symbols, with different sizes of circle ('bubble'), using a spatial contour ('carte'), printing names of sites ('label'),etc. Possibility to draw a legend giving the sizes of bubbles and colors of levels.

Value

No values, only drawing of a map

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

| | |
|--------------|--------------------------------------------------------|
| choix.bubble | <i>Selection of a variable before plotting bubbles</i> |
|--------------|--------------------------------------------------------|

Description

The function `choix.bubble()` is used in most of the GeoXp functions to initialize some parameters before plotting bubbles.

Usage

```
choix.bubble(buble, listvar, listnomvar, legends)
```

Arguments

| | |
|------------|--------------------|
| buble | boolean |
| listvar | list of variables |
| listnomvar | names of variables |
| legends | parameters of plot |

Details

This function is not an interactive function.

Value

A list of parameters which permit to use the function `carte`.

Author(s)

Laurent T.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

choix.couleur *Selection of colors before plotting map*

Description

The function `choix.couleur()` is used in most of the GeoXp functions to initialize some parameters before plotting map in the case of the use of a factor.

Usage

```
choix.couleur(graphChoice, listvar=NULL, listnomvar=NULL,  
varChoice1=NULL, legends, col, pch)
```

Arguments

| | |
|--------------------------|---------------------------------|
| <code>graphChoice</code> | kind of graphic chosen |
| <code>listvar</code> | list of variables |
| <code>listnomvar</code> | names of variables |
| <code>varChoice1</code> | the name of the chosen variable |
| <code>legends</code> | parameters of plot |
| <code>col</code> | color of plot |
| <code>pch</code> | symbols |

Details

This function is not an interactive function.

Value

A list of parameters which permit to use the function `carte`.

Author(s)

Laurent T.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2008), *Statistique et Économétrie pour données géoréférencées : modèles et études de cas*

| | |
|--------------|--------------------------------------------------------|
| choixvarfunc | <i>Selection of a variable before plotting bubbles</i> |
|--------------|--------------------------------------------------------|

Description

The function `choixvarfunc()` is used in the function `choix.bubble()`.

Usage

```
choixvarfunc(title, question, liste)
```

Arguments

| | |
|-----------------------|---------------------------------------------|
| <code>title</code> | a character as "Choice of variables" |
| <code>question</code> | a character as "Choose a variable" |
| <code>liste</code> | a list of character with names of variables |

Details

This function is not an interactive function.

Value

Name of variable chosen.

Author(s)

Laurent T.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2008), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

| | |
|------------|------------------------------------------------------------------------------------------------------------|
| clustermap | <i>Classification of dataset using kmeans or hclust algorithm and representation of clusters on a map.</i> |
|------------|------------------------------------------------------------------------------------------------------------|

Description

The function `clustermap()` performs a classification of the sites from the variables included in `$dataset$` and computes a bar plot of the clusters calculated. Classification methods comes from `hclust()` (hierarchical cluster analysis) and `kmeans()` (k-means clustering) and number of class is chosen with `clustnum`.

Usage

```
clustermap(long, lat, dataset, clustnum, method="kmeans", type=NULL,
centers=NULL, scale=FALSE, listvar=NULL, listnomvar=NULL, carte=NULL,
criteria=NULL, xlab="Cluster", ylab="Count", label="", cex.lab=1, pch=16,
col="blue", names.arg="", axes=FALSE, lablong="", lablat="")
```

Arguments

| | |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| long | a vector x of size n |
| lat | a vector y of size n |
| dataset | matrix of variables of numeric values |
| clustnum | Number of clusters |
| method | two methods : 'kmeans' by default or 'hclust' |
| type | If method='hclust', type="complete" by default (the possibilities are given in help(hclust) as 'ward', 'single', etc). If method='kmeans', type="Hartigan-Wong" by default (the possibilities are given in help(kmeans) as 'Forgy', etc) |
| centers | If method='kmeans', user can give a matrix with initial cluster centers. |
| scale | If scale=TRUE, the dataset is reduced. |
| listvar | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| listnomvar | list of character with name of variables from \$listvar\$ |
| carte | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| criteria | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| xlab | a title for the graphic x-axis |
| ylab | a title for the graphic y-axis |
| label | vector of character of size n with name of site. Names are printed on map after a selection |
| cex.lab | character size of label |
| pch | a vector of symbol which must be equal to the number of group else all sites are printed in pch[1] |
| col | a vector of colors which must be equal to the number of group else all sites and all bars are printed in col[1] |
| names.arg | names of Clusters |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

The two windows are interactive : the sites selected by a bar chosen on the bar plot are represented on the map in red and the values of sites selected on the map by 'points' or 'polygon' are represented in red on the bar plot. The dendrogram is also drawn for 'hclust' method. In option, possibility to choose the classification method.

Value

A vector of boolean of size n (TRUE if the site was in the last selection) and a vector of size n which the number of cluster for each site

Note

To use the functions hclust.r and kmeans.r, we take many arguments by default. If the user would like to modify these arguments, he should call these functions first and then use the function barmap.r to visualize the calculated clusters.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

Murtagh, F (1985). *Multidimensional Clustering Algorithms*.

Hartigan, J. A. and Wong, M. A. (1979). A K-means clustering algorithm. *Applied Statistics* 28, 100-108

See Also

[barmap](#), [pcamap](#)

Examples

```
# 1st example
example(columbus)
coords <- coordinates(columbus)
cont<-spdf2list(columbus)$poly

obs<-clustermap(coords[,1], coords[,2],columbus@data[,7:12],3,listvar=columbus@data,
listnomvar=names(columbus@data),carte=cont,criteria=(columbus@data$CP==1),
col=colors()[20:22],label=as.character(1:49),cex.lab=0.7)

obs<-clustermap(coords[,1], coords[,2],columbus@data[,7:12],3,method="hclust",
```

```
listvar=columbus@data,listnomvar=names(columbus@data),carte=cont,
criteria=(columbus@data$CP==1),col=colors()[20:22],label=as.character(1:49),
cex.lab=0.7)
```

dbledensitymap *Double Kernel density estimates and map*

Description

The function `dbledensitymap` plots two kernel density estimates from `var1` and `var2`, computed with 'bkde.R', and a map with sites of coordinates (`long`,`lat`). Each site is associated to a value of `var1` and `var2` and the two windows are interactive.

Usage

```
dbledensitymap(long, lat, var1, var2, kernel='triweight',listvar=NULL,
listnomvar=NULL, carte=NULL, criteria=NULL, label="", cex.lab=1, pch=16,
col=c("grey","blue"), xlab=c("", ""), ylab=c("density","density"), axes=FALSE,
lablong="", lablat="")
```

Arguments

| | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>var1</code> | a vector of numeric values of size n |
| <code>var2</code> | a vector of numeric values of size n |
| <code>kernel</code> | Smoothing kernel (see <code>help(bkde)</code> for list of options) |
| <code>listvar</code> | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| <code>listnomvar</code> | a list with names of variables <code>\$listvar\$</code> |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>label</code> | vector of character of size n with names of sites |
| <code>cex.lab</code> | character size of label on map |
| <code>pch</code> | 16 by default, symbol for selected points |
| <code>col</code> | c("grey","blue") by default, color of the two density curves |
| <code>xlab</code> | a list of title for the two x-axis graphics |
| <code>ylab</code> | a list of title for the two y-axis graphics |
| <code>axes</code> | a boolean with True for drawing axes on the map |
| <code>lablong</code> | name of the x-axis that will be printed on the map |
| <code>lablat</code> | name of the y-axis that will be printed on the map |

Details

The user can choose an interval on the density curve by mouse clicking on the lower and upper boundaries of the interval or by giving directly these values. The selected sites are then represented on the map in red. A selection by 'points' or 'polygon' on the map results in the drawing of the density of the corresponding sub-distribution on the density plot. Finally, the user can modify the bandwidth parameter with a cursor in the tk window (parameter α). α is the smoothing parameter for the kernel smooth : it represents the mean percentage of sample points involved in the local averaging (example : $\alpha = 20$ means that on average, $n \times 0.2$ points are in any interval of length $2h$ where h is the usual bandwidth).

Value

A vector of boolean of size n . TRUE if the site was in the last selection.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

Venables, W. N. and Ripley, B. D. (2002) *Modern Applied Statistics with S*. New York: Springer.

Wand M.P. et Jones M.C. (1995), *Kernel Smoothing*, Chapman & Hall.

See Also

[histomap](#), [histobarmap](#), [scattermap](#), [densitymap](#)

Examples

```
# data auckland
data(auckland)
contours.auckland<-polylist2list(auckpolys)
dbledensitymap(auckland$Easting, auckland$Northing, var1=auckland$Deaths.1977.85,
var2=auckland$Under.5.1981, carte=contours.auckland,
listvar=cbind(auckland, as.numeric(auckland$Deaths.1977.85>mean(auckland$Deaths.1977.85))),
listnomvar=c(names(auckland), "sup to mean"),
xlab=c("Deaths.1977.85", "Under.5.1981"),
criteria=(auckland$Deaths.1977.85>mean(auckland$Deaths.1977.85)))

# data columbus
x <- readShapePoly(system.file("shapes/columbus.shp", package="maptools")[1])
columbus.contours<-spdf2list(x)$poly
coords <- coordinates(x)
columbus<-x@data
```

```

obs<-dbledensitymap(coords[,1],coords[,2],colombus$HOVAL,
colombus$CRIME,label=colombus$NEIGNO,carte=colombus.contours,
cex.lab=0.7,listvar=colombus,listnomvar=names(colombus),
col=c("purple","pink"),xlab=c("hoval","crime"),pch=14)

# data eire
data(eire)
eire.contours<-polylist2list(eire.polys.utm)
dbledensitymap(eire.coords.utm$V1,eire.coords.utm$V2,eire.df$A,eire.df$towns,
xlab=c("Individuals rate of blood type A",
"Surface urbaine"),carte=eire.contours,kernel="normal",
listvar=eire.df,listnomvar=names(eire.df))

```

dblehistomap

Double Interactive Histogram and map

Description

The function `dblehistomap()` draws two histograms of the given variables `var1` and `var2` and a map with sites of coordinates (`long,lat`). Each site is associated to a value of `var1` and `var2` and there is interactivity between the two windows created.

Usage

```

dblehistomap(long, lat, var1, var2,listvar=NULL, listnomvar=NULL, nbcou=c(10,10),
carte = NULL,criteria=NULL, pch = 16, col=c("grey","blue"), xlab = c("", ""),
ylab=c("count","count"), label = "",cex.lab=1,axes=FALSE, lablong="", lablat="")

```

Arguments

| | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>var1</code> | a vector of numeric values of size n |
| <code>var2</code> | a vector of numeric values of size n |
| <code>listvar</code> | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| <code>listnomvar</code> | a list with names of variables <code>listvar</code> |
| <code>nbcou</code> | a list of number of cells for histogram 1 and histogram 2 (10 by default) |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>pch</code> | 16 by default, symbol for selected points |

| | |
|---------|---------------------------------------------------------------------------------------------|
| col | a list of colors for the bars on the histogram 1 and histogram 2 |
| xlab | a list of title for the two x-axis graphics |
| ylab | a list of title for the two y-axis graphics |
| label | a list of character of size n with name of site. Names are printed on map after a selection |
| cex.lab | character size of label |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

The selection of sites by ‘points’ or ‘polygons’ on the map results in the drawing of the red histograms of the subdistributions corresponding to this subset of sites.

Value

A vector of boolean of size n. TRUE if the site was in the last selection.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Économétrie pour données géoréférencées : modèles et études de cas*

See Also

[dblehistomap](#), [histobarmap](#), [scattermap](#), [densitymap](#)

Examples

```
# data on price indices of real estate in France
data(immob)
midiP <- readShapePoly(system.file("shapes/region.shp", package="GeoXp")[1])
cont_midiP<-spdf2list(midiP)$poly
dblehistomap(immob$longitude,immob$latitude,immob$prix.vente,
immob$prix.location,carte= cont_midiP,listvar=immob,
listnomvar=names(immob),label=immob$Nom,cex.lab=0.7,xlab=c("vente","location"),
col=colors()[99:100])

# data auckland
data(auckland)
contours.auckland<-polylist2list(auckland$polys)
dblehistomap(auckland$Easting,auckland$Northing,var1=auckland$Deaths.1977.85,
var2=auckland$Under.5.1981,carte=contours.auckland,
listvar=cbind(auckland,as.numeric(auckland$Deaths.1977.85>mean(auckland$Deaths.1977.85))),
```

```

listnomvar=c(names(auckland),"sup to mean"),
xlab=c("Deaths.1977.85","Under.5.1981"),
criteria=(auckland$Deaths.1977.85>mean(auckland$Deaths.1977.85))

# data colombus
x <- readShapePoly(system.file("shapes/columbus.shp", package="mapproj")[1])
colombus.contours<-spdf2list(x)$poly
coords <- coordinates(x)
colombus<-x@data

dblehistomap(coords[,1],coords[,2],
colombus$HOVAL,colombus$CRIME,xlab=c("hoval","crime"),
label=colombus$NEIGNO, cex.lab=0.7, carte=colombus.contours,
listvar=colombus,listnomvar=names(colombus))

```

densitymap

Kernel density estimates and map

Description

The function `densitymap` draws kernel density estimates of the variable `var` with 'bkde.R' and a map with sites of coordinate (long,lat). Each site is associated to a value of `var` and there is interactivity between the two windows.

Usage

```

densitymap(long, lat, var, kernel='triweight',listvar=NULL, listnomvar=NULL,
carte=NULL, criteria=NULL,label="",cex.lab=1, pch=16, col="blue", xlab="",
ylab="", axes=FALSE, lablong="", lablat="")

```

Arguments

| | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>var</code> | a vector of numeric values of size n |
| <code>kernel</code> | Smoothing kernel (see <code>help(bkde)</code> for list of options) |
| <code>listvar</code> | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| <code>listnomvar</code> | a list with names of variables <code>listvar</code> |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>label</code> | vector of character of size n with names of sites |
| <code>cex.lab</code> | character size of label on map |

| | |
|---------|----------------------------------------------------|
| pch | 16 by default, symbol for selected points |
| col | "blue" by default, color of the density curve |
| xlab | a title for the graphic x-axis |
| ylab | a title for the graphic y-axis |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

The user can choose an interval on the density curve by mouse clicking on the graph on the extremities of interval or by specifying directly values. The sites selected by an interval are then represented on the map in red. The selection of sites on the map by 'points' or 'polygon' results in the drawing of the kernel densities of the subdistributions corresponding to this subset of sites. Finally, the user can modify the bandwidth parameter with a cursor in the tcltk window (parameter α). α is the smoothing parameter for the kernel smooth : it represents the mean percentage of sample points involved in the local averaging (example : $\alpha = 20$ means that on average, $n \times 0.2$ points are in any interval of length $2h$ where h is the usual bandwidth).

Value

A vector of boolean of size n . TRUE if the site was in the last selection.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

Venables, W. N. and Ripley, B. D. (2002) *Modern Applied Statistics with S*. New York: Springer.

Wand M.P. et Jones M.C. (1995), *Kernel Smoothing*, Chapman & Hall.

See Also

[histomap](#), [histobarmap](#), [scattermap](#), [densitymap](#)

Examples

```

# data on price indices of real estate in France
data(immob)
midiP <- readShapePoly(system.file("shapes/region.shp", package="GeoXp")[1])
cont_midiP<-spdf2list(midiP)$poly
densitymap(immob$longitude,immob$latitude,immob$prix.vente,
carte=cont_midiP,listvar=immob,listnomvar=names(immob),
xlab="Average price per square meter",label=immob$Nom,cex.lab=0.7,col='purple',pch=15)

# data olcol
example(columbus)
coords <- coordinates(columbus)
cont<-spdf2list(columbus)$poly

densitymap(coords[,1], coords[,2],columbus@data$CRIME,listvar=columbus@data,
carte=cont, listnomvar=names(columbus@data),
criteria=(columbus@data$CRIME>mean(columbus@data$CRIME)))

# data eire
data(eire)
eire.contours<-polylist2list(eire.polys.utm)
densitymap(eire.coords.utm$V1,eire.coords.utm$V2,eire.df$A,
carte=eire.contours,listvar=eire.df,listnomvar=names(eire.df),
xlab="Individuals rate of blood A",ylab="density")

```

distchi2

It gives an euclidian distance matrix for factors using metric of chi2.

Description

The function `distchi2` calculates an euclidian distance matrix for factors using metric of χ^2 .

Usage

```
distchi2(mat)
```

Arguments

`mat` A matrix of factors given as numeric values

Details

The euclidian distance between two individuals i and k using the metric of χ^2 is given by :

$$d_{\chi^2}^2 = \frac{n}{p} \sum_j \sum_l^{m_j} \delta_{ik}^{jl} \frac{1}{n_j^l}$$

with n , number of individuals, p number of variables, m_j is the number of possibilities for variable Y^j , n_i^j is the number of individuals where i has been observed for Y^j and $\delta_{ik}^{jl} = 1$ if there is a discordance between i and k for i and 0 otherwise. It is not an interactive function.

Value

It returns a `dist` object (see `help(dist)`).

Author(s)

Thibault LAURENT

References

Besse Philippe, *Data mining 2 : Modélisation statistique et apprentissage*.

See Also

[clustermap](#)

driftmap

Interactive driftplot and map

Description

The function `driftmap()` creates two devices : a device with the map of coord (`long, lat`) which permits to make selection of sites and a device divided into 2 rows and 2 columns which contains : (cell 1) the selected sites divided into m rows and q columns (m and q are selected with the tk window), (cell 2) a scatter plot with `lat` in x-axis and the mean and median of `var` calculated for the m rows in y-axis, (cell 3) a scatter plot with the mean and median of `var` calculated for the q columns in x-axis and `long` in y-axis and (cell 4) a legend indicating the direction of the North, the variable used, etc.

Usage

```
driftmap(long, lat, var, interpol=TRUE, nuage=FALSE,
listvar=NULL, listnomvar=NULL, carte=NULL, xlab="", col=c("blue", "red", "blue", "pink"),
pch=c(16,16,16,16), lty=c(1,2), cex=0.7, label=NULL,
cex.lab=1, axes=FALSE)
```

Arguments

| | |
|-----------------------|-------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>var</code> | a vector of numeric values of size n |
| <code>interpol</code> | if TRUE, the mean and median calculated are linearly interpolated |

| | |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>nuage</code> | if TRUE, the values taken by <code>var</code> are also represented on right plot and on the left plot |
| <code>listvar</code> | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| <code>listnomvar</code> | a list with names of variables <code>listvar</code> |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>xlab</code> | name of var printed with the legend plot |
| <code>col</code> | c("blue","red","blue","pink") by default, list of colors for (1) the mean points, (2) the median points, (3) the sites selected on the map and (4) the values of var on the left and on the right plot |
| <code>pch</code> | c(16,16,16,16) by default, list of symbols for (1) the mean points, (2) the median points, (3) the sites selected on the map and (4) the values of var on the left and on the right plot |
| <code>lty</code> | the line type for mean and median in the case of <code>interpol=TRUE</code> |
| <code>cex</code> | the amount by which plotting symbols on the cell 1 and in the case of <code>nuage=TRUE</code> cell 2 and cell 3 |
| <code>label</code> | a list of character of size n with name of site. Names are printed on map after a selection |
| <code>cex.lab</code> | character size of label |
| <code>axes</code> | a boolean with TRUE for drawing axes on the map |

Details

Possibility to change the number of cells in the grid with the tk window, to interpolate the means and medians calculated (by default), to work on a rotated map. At the beginning, all sites have been selected to the map : users have to deselect sites that they have choosen.

Value

No values returned, only drawing of a graphic.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[angleplotmap](#), [variocloudmap](#), [rotation](#)

Examples

```
# data on price indices of real estate in France
data(immob)
midiP <- readShapePoly(system.file("shapes/region.shp", package="GeoXp")[1])
cont_midiP<-spdf2list(midiP)$poly
driftmap(immob$longitude, immob$latitude, immob$prix.vente,
carte= cont_midiP, col=colors()[35:38], lty=c(3,4), cex.lab=0.7,
xlab="Price of sell", nuage=TRUE, pch=c(1,3,5,7), listvar=immob,
listnomvar=names(immob))

# Data on conflicts in Africa
data(afcon)
africa <- readShapePoly(system.file("shapes/Africa.shp", package = "GeoXp")[1])
africa.contour<-spdf2list(africa)$poly
driftmap(afcon$x, afcon$y, afcon$totcon, interpol=TRUE, nuage=TRUE,
xlab="Number of conflicts", carte=africa.contour, pch=c(4,5,16,16))

# data meuse
data(meuse)
data(meuse.riv)
driftmap(meuse$x, meuse$y, meuse$copper,
nuage=TRUE, interpol=TRUE, xlab="Concentration in cuivre (in ppm)",
carte=meuse.riv)
```

genpca

Generalized Principal Component Analysis (PCA)

Description

The function `genpca` computes a generalized Principal Component Analysis (PCA). It calculates the principal components, the coordinates of the variables and in these principals components axes and the inertia of these principal components.

Usage

```
genpca(data, w=rep(1/nrow(data), length=nrow(data)),
m=diag(ncol(data)), center=NULL, reduc=TRUE)
```

Arguments

| | |
|---------------------|----------------------------------------------------------------------------|
| <code>data</code> | matrix $n \times p$ |
| <code>w</code> | vector of size n of weight (by default : $weight = t(1/n, \dots, 1/n)$) |
| <code>m</code> | matrix $p \times p$ (by default : metric=Identity matrix) |
| <code>center</code> | boolean. if TRUE, centered PCA (by default : center=TRUE) |
| <code>reduc</code> | boolean. if TRUE, reduced PCA (by default : reduce=TRUE) |

Details

Let

$$W = \text{diag}(w)$$

$$x = \text{data} = (x'_1, \dots, x'_n)'$$

with

$$x_i = (x_i^1, \dots, x_i^p)$$

Let

$$1_n = (1, \dots, 1)'$$

with n rows and :

$$1_p = (1, \dots, 1)'$$

with p rows. Normalization of weight :

$$w_i = \frac{w_i}{\sum_i w_i}$$

Vector of means :

$$\bar{x} = (\bar{x}^1, \dots, \bar{x}^p)'$$

with:

$$\bar{x}^j = \sum_i w_i x_i^j$$

If center=True,

$$x_c = x - 1_n \bar{x}'$$

Standart deviation :

$$(\sigma^j)^2 = \sum_i w_i (x_i^j)^2 - (\bar{x}^j)^2$$

$$\Sigma = \text{diag}((\sigma^1)^2, \dots, (\sigma^p)^2)'$$

If reduc=True :

$$x_{cr} = x_c \times \Sigma^{-1/2}$$

Variance-Covariance matrix:

$$C = x'_{cr} W x_{cr}$$

Cholesky decomposition : $M = LL'$ where $M=m$

Let

$$C_i = LCL'$$

Let U and D as :

$$C_i U = U D$$

with $D = \text{diag}(\lambda_1, \dots, \lambda_p)$

Let

$$V = L'U$$

Then :
Coordinates of individuals in the principals components basis :

$$CC = x_{cr}V$$

Coordinates of variables in principals components :

$$VC = CVD^{-1/2}$$

Inertia :

$$I = D1_p$$

Value

Returns ‘inertia’ vector of size p with percent of inertia of each component (corresponding to I), ‘casecoord’ matrix $n \times p$ (corresponding to matrix CC), ‘varcoord’ matrix $p \times n$ (corresponding to matrix VC).

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

Caussinus H., Fekri M., Hakam S., Ruiz-Gazen A. (2003) , *A monitoring display of Multivariate Outliers*, Computational Statistics and Data Analysis, vol. 44, 1-2, 237-252.

See Also

[clustermap](#), [pcamap](#)

gini

Calculates a Gini Index

Description

The function `gini()` calculates the Gini Index associated to the variable `var`.

Usage

`gini(var)`

Arguments

`var` a vector of numerical values of size `n`

Details

Let $x_k, k=1, \dots, K$ be the distinct values taken by `var`. For each site, `Gini.r` returns two pairs of frequencies. The pair (f, g) where f represents

$$f_k = \frac{1}{n} \sum_i 1(\text{Var}_i = x_k)$$

(n is the length of `var`) and g represents

$$g_k = \frac{x_k}{\bar{x}} f_k$$

The pair (F, G) represents the corresponding cumulative frequencies.
The Gini Index is calculated as :

$$I_G = \frac{1}{2\bar{x}} \sum_{i=1}^K \sum_{j=1}^K |x_i - x_j|$$

Value

$(f, F, g, G, \text{gini})$ where f, F, g and G are vectors of size K and `gini` a numeric value.

Note

This function is used in `ginimap.R` but it is not an interactive function.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[ginimap](#)

ginimap *Lorentz curve and map*

Description

The function `ginimap()` computes a Lorentz curve from `var` and calculates the Gini Index associated to `var`.

Usage

```
ginimap(long,lat,var,listvar=NULL, listnomvar=NULL, carte=NULL, criteria=NULL,
label="", cex.lab=1, pch=5, col="green", xlab="", ylab="", axes=FALSE,
lablong="", lablat="")
```

Arguments

| | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>var</code> | a vector of numeric values of size n |
| <code>listvar</code> | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| <code>listnomvar</code> | a list with names of variables <code>listvar</code> |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>label</code> | a list of character of size n with name of site. Names are printed on map after a selection |
| <code>cex.lab</code> | character size of label |
| <code>pch</code> | 16 by default, symbol for selected points |
| <code>col</code> | "blue" by default, color of bars on the histogram |
| <code>xlab</code> | a title for the graphic x-axis |
| <code>ylab</code> | a title for the graphic y-axis |
| <code>axes</code> | a boolean with TRUE for drawing axes on the map |
| <code>lablong</code> | name of the x-axis that will be printed on the map |
| <code>lablat</code> | name of the y-axis that will be printed on the map |

Details

Users have the possibility to choose a threshold by mouse clicking on the Lorentz curve or by specifying it in the menu. The corresponding pair (F,G) and the value of 'var' are then printed on the graph and the sites with a value of `var` lower or equal to the threshold are then selected on the map.

Note

The Gini Index is given in the tcltk window (see function `gini.r` for the formula used to calculate it).

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[gini](#)

Examples

```
# data eire
data(eire)
eire.contours<-polylist2list(eire.polys.utm)
obs<-ginimap(eire.coords.utm$V1,eire.coords.utm$V2,eire.df$INCOME,
listvar=eire.df,listnomvar=names(eire.df),carte=eire.contours,col="orange",
label=as.character(1:26),cex.lab=0.7,xlab="Income",ylab="Total Income")
```

graphique

Drawing a graphic

Description

The function 'graphique' draws a specific graphic. Possibility to draw one of these graphics : Histogram, Barplot, Boxplot, Polyboxplot, Scatterplot, Densityplot, Neighbourplot, Lorentz, Moran, Angleplot, Variocloud, Cluster and PCA (graphics of individuals and variables). This function is called in most of the functions of GeoXp (this is not an interactive function).

Usage

```
graphique(var1, var2, var3, obs, num, graph = "", couleurs = "",
symbol = 16, labvar = "", nbcouleur = 10, alpha, W,
Xpoly, Ypoly, F, G, opt1 = 1, opt2 = 1, quantiles = 0,
labmod = "", direct, inertie, label = 0, kernel, obsq, locmoran = FALSE,
bin = NULL, cex.lab=1, bubble=FALSE, cbubble=NULL, legmap=NULL,
legends=list(FALSE,FALSE), xlim, ylim)
```

Arguments

| | |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| var1 | 1st variable of size n |
| var2 | 2nd variable of size n |
| var3 | 3rd variable of size n (used for variocloudmap) |
| obs | a vector of boolean of size n with sites selected |
| num | number of windows which must be activated (3 ou 4) |
| graph | name of graphic which must be drawn : Histogram, Barplot, Boxplot, Polybox-plot, Scatterplot, Densityplot1, Densityplot2, Neighbourplot, Lorentz, Moran, Quadrant, Angleplot, Variocloud, Cluster, Acp1, Acp2 |
| couleurs | Possibility to change colors on the graphic |
| symbol | choice of representation of selected sites |
| labvar | name(s) of variable(s) studied |
| nbcol | number of cells if the graphic choosen is the histogram (10 by default) |
| alpha1 | regression smoothing paramater |
| W | Spatial weight matrix |
| Xpoly | x-coordinates of the vertices of selected polygon |
| Ypoly | y-coordinates of the vertices of selected polygon |
| F | Used for Ginimap |
| G | Used for Ginimap |
| opt1 | Option for adding a curve (regression line or conditionnal quantile depending on the function) |
| opt2 | Option for drawing robust empirical variogram |
| quantiles | vector which contains the values of α for conditionnal quantile |
| labmod | names of factor if the graphic choosed is a barplot |
| direct | Used for PCA |
| inertie | Used for PCA |
| label | Name of sites |
| kernel | Name of the kernel choosed in densitymap |
| obsq | Used for clustermap and barmap |
| locmoran | Print local moran for each site |
| bin | The bins chosen to calculate empirical variogram |
| cex.lab | character size of label |
| buble | For Local Moran plot only : a boolean with TRUE for drawing bubbles, FALSE otherwise |
| cbuble | For Local Moran plot only : vector of size n with size of each site depending on variable with which bubbles are constructed |
| legmap | For Local Moran plot only : a list of (numeric,numeric,numeric,numeric,numeric,numeric,character) with the sizes and the corresponding values of the 3 bubbles represented in the legend and the variable name of variable choosed |

| | |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| legends | For Local Moran plot only : a list of c(boolean,boolean,c(numeric,numeric),c(numeric,numeric)) with TRUE for drawing legends of bubbles (1st argument) or factors (2nd argument) and the coordinates of the location of the upper left corner of the legend box |
| xlim | the x limits of the plot |
| ylim | the y limits of the plot |

Details

This function is called by any function which draws a graphic. A lot of options are considered because of the large number of graphics proposed

Value

No values, only drawing of a graphic

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

| | |
|-----------|--------------------------------------------------------------------------------------------|
| histnbmap | <i>Interactive histogram of the distances between two neighbors of a nb object and map</i> |
|-----------|--------------------------------------------------------------------------------------------|

Description

The function `histnbmap()` draws the histogram of the distances between two neighbors for a neighbourhood structure given by a `nb` object and calculated by `nbdists` function (see `spdep` package), and links the graphic with a map.

Usage

```
histnbmap(object, coords = NULL, longlat = NULL, sup=FALSE, nbcol=10,
listvar=NULL, listnomvar=NULL, carte=NULL, criteria=NULL, label="", col="grey", pch=16,
xlab="", ylab="", cex.lab=1, axes=FALSE, lablong="", lablat="")
```

Arguments

| | |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| object | a object of class nb |
| coords | a matrix of size $n \times 2$ |
| longlat | TRUE if point coordinates are longitude-latitude decimal degrees, in which case distances are measured in kilometers; if coords is a SpatialPoints object, the value is taken from the object itself |
| sup | if TRUE, it keeps only the distance of the neighbor the farest |
| nbcol | number of cells for histogram (10 by default) |
| listvar | matrix of variables which permit to plot bubbles using the tk window |
| listnomvar | names of variables listvar |
| carte | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| criteria | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| label | vector of character of size n with names of sites |
| col | color associated to the color of the histogram |
| pch | 16 by default, symbol for selected points |
| xlab | a title for the graphic x-axis |
| ylab | a title for the graphic y-axis |
| cex.lab | character size of label |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

For a selected site j on the map, are represented on the map its neighbours. For a selected bar on the graph, the corresponding sites are represented on the map with a link which means that two sites are neighbours.

Value

No value returned.

Note

When user select sites on the graph or on the map, he cannot add a selection by using the other graphic.

Author(s)

Aragon Y., Thomas-Agnan C., Ruiz-Gazen A., Laurent T.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[moranplotmap](#), [makeneighborsw](#), [normw](#), [nonnormmoran](#)

Examples

```
example(columbus)
coords <- coordinates(columbus)
cont<-spdf2list(columbus)$poly

histnbmap(col.gal.nb, coords ,carte=cont,listvar=columbus@data,
listnomvar=names(columbus@data),criteria=which(coords[,1]>mean(coords[,1])),
label=as.character(1:49),cex.lab=0.7,xlab="distance of the neighbor the farest",
col='violet')
```

histobarmap *Histogram, barplot and map*

Description

The function `histobarmap()` draws a bar plot (vertical bar) of the given variable `var1`, a histogram of the given variable `var2` and a map with sites of coordinates (`long, lat`).

Usage

```
histobarmap(long, lat, var1, var2, criteria=NULL, carte=NULL, label = "", cex.lab=1,
pch = 16, col= "grey", nbcoll = 10, names.arg="", xlab=c("", ""), ylab=c("", ""),
listvar=NULL, listnomvar=NULL, axes=FALSE, lablong="", lablat="")
```

Arguments

| | |
|-----------------------|-------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>var1</code> | a vector of factor of size n |
| <code>var2</code> | a vector of numerical values of size n |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>label</code> | a list of character of size n with name of site. Names are printed on map after a selection |
| <code>cex.lab</code> | character size of label |

| | |
|------------|----------------------------------------------------------------------------------------------|
| pch | 16 by default, symbol for selected points |
| col | "grey" by default, color of bars on the histogram |
| nbcol | number of cells for histogram (10 by default) |
| names.arg | names of factors of var1 |
| xlab | a list of title for the two x-axis graphics |
| ylab | a list of title for the two y-axis graphics |
| listvar | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| listnomvar | a list with names of variables listvar |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

Each site is associated to a factor of `var1` and to a value of `var2`. There is interactivity between the three windows created : the sites selected by a bar on the bar plot or on the histogram are represented on the map in red and the value and factor of sites selected on the map are represented in red on the bar plot and on the histogram.

Value

A vector of boolean of size n. TRUE if the site was in the last selection.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[dblehistomap](#), [histobarmap](#), [scattermap](#), [dbledensitymap](#)

Examples

```
# Data Colombus
example(columbus)
coords <- coordinates(columbus)
cont <- spdf2list(columbus)$poly
obs <- histobarmap(coords[,1], coords[,2], columbus@data$CP,
columbus@data$HOVAL, label=columbus@data$NEIGNO, carte=cont,
listvar=columbus@data, listnomvar=names(columbus@data), col=colors()[100:101],
xlab=c("CP", "Hoval"), ylab=c("Count", "Count"), names.arg=c("A", "B"), pch=2)
```

```
# Data eire
data(eire)
eire.contours<-polylist2list(eire.polys.utm)
histobarmap(eire.coords.utm$V1,eire.coords.utm$V2,eire.df$pale,eire.df$A, carte=eire.contours,
listvar=eire.df,listnomvar=names(eire.df),
xlab=c("Appartenance to the region of Pale","Average number of people with blood A"),
names.arg=c("Hors Pale","Pale"),
col=colors()[101:102],label=as.character(1:26),cex.lab=0.7,pch=c(3,7))
```

 histomap

Interactive Histogram and map

Description

The function `histomap()` draws a histogram of the given variable `var` and a map with sites of coordinates (`long,lat`). Each site is associated to a value of `var` and there is interactivity between the two windows.

Usage

```
histomap(long,lat,var,nbcol=10, listvar=NULL, listnomvar=NULL, criteria=NULL,
carte=NULL, label="",cex.lab=1, pch=16, col="blue", xlab="",ylab="",axes=FALSE,
lablong="",lablat="")
```

Arguments

| | |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector <code>x</code> of size <code>n</code> |
| <code>lat</code> | a vector <code>y</code> of size <code>n</code> |
| <code>var</code> | a vector of numeric values of size <code>n</code> |
| <code>nbcol</code> | number of cells for histogram (10 by default) |
| <code>listvar</code> | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| <code>listnomvar</code> | a list with names of variables <code>listvar</code> |
| <code>criteria</code> | a vector of size <code>n</code> of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : <code>x</code> and <code>y</code> coordinates of the vertices of the polygon |
| <code>label</code> | a list of character of size <code>n</code> with name of site. Names are printed on map after a selection |
| <code>cex.lab</code> | character size of label |
| <code>pch</code> | 16 by default, symbol for selected points |
| <code>col</code> | "blue" by default, color of bars on the histogram |
| <code>xlab</code> | a title for the graphic x-axis |

| | |
|---------|----------------------------------------------------|
| ylab | a title for the graphic y-axis |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

Sites selected by a bar on the histogram are represented on the map in red and the values of sites selected on the map by 'points' or 'polygon' are represented in red as a sub-histogram on the histogram.

Value

A vector of boolean of size n. TRUE if the site was in the last selection.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Économétrie pour données géoréférencées : modèles et études de cas*

See Also

[histomap](#), [histobarmap](#), [scattermap](#), [densitymap](#)

Examples

```
# data on price indices of real estate in France
data(immob)
midiP <- readShapePoly(system.file("shapes/region.shp", package="GeoXp")[1])
cont_midiP<-spdf2list(midiP)$poly
histomap(immob$longitude,immob$latitude,immob$prix.vente,
carte= cont_midiP,listvar=immob, col='grey',
listnomvar=names(immob),label=immob$Nom,cex.lab=0.6)

# data oldcol
example(columbus)
coords <- coordinates(columbus)
cont<-spdf2list(columbus)$poly

histomap(coords[,1], coords[,2],columbus@data$CRIME,listvar=columbus@data,
listnomvar=names(columbus@data),criteria=(columbus@data$CRIME>mean(columbus@data$CRIME)),
carte=cont,col="grey")

# data afcon
data(afcon)
africa <- readShapePoly(system.file("shapes/Africa.shp", package = "GeoXp")[1])
africa.contour<-spdf2list(africa)$poly
```

```

histomap(afcon$x, afcon$y, afcon$totcon, listvar=afcon,
listnomvar=names(afcon), criteria=(afcon$totcon>mean(afcon$totcon)),
label=afcon$name, cex.lab=0.6, pch=14, carte=africa.contour)

# data eire
data(eire)
eire.contours<-polylist2list(eire.polys.utm)

histomap(eire.coords.utm$V1, eire.coords.utm$V2, eire.df$A, carte=eire.contours, listvar=eire.df$A,
listnomvar=names(eire.df), xlab="Rate of individuals with groupe sanguin A", pch=5)

```

immob

Some price indices of real estate from biggest cities in France

Description

This data frame contains price indices of real estate from biggest cities in France.

Usage

```
data(immob)
```

Format

A data frame with 94 observations on the following 10 variables.

Nom Name of the city

Code.INSEE Code Insee of the city

Code.region Code of the 'region' area of the city

longitude A vector x of size n

latitude A vector y of size n

prix.vente Average selling price at square metres

variation.vente Rates of change in the average selling price for a quarter year

prix.location Average price of rental square metres

variation.location Rates of change in the average price of rent for a quarter

rentabilite Rentability

Source

Prepared by Thibault LAURENT.

References

<http://www.fnaim.fr/>

Examples

```
data(immob)
```

makeneighborsw *Spatial weight matrix*

Description

The function `makeneighborsw()` create a spatial weight matrix based on a given number of nearest neighbors (option "neighbor" by default), based on a threshold distance (option `method="distance"`) or both these 2 methods.

Usage

```
makeneighborsw(xc, yc, method="neighbor", m=1, d, cum=TRUE)
```

Arguments

| | |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>xc</code> | a vector x of size n |
| <code>yc</code> | a vector y of size n |
| <code>method</code> | "neighbor" by default, "distance" or "both" |
| <code>m</code> | number of nearest neighbors |
| <code>d</code> | threshold point |
| <code>cum</code> | if <code>cum=TRUE</code> , W is the sum of spatial weight matrix based on k nearest neighbours (for $k \leq m$; if <code>FALSE</code> W is the spatial weight matrix based only on m^{th} nearest neighbours |

Details

In the case of `method="neighbor"`, for each site, we order the other sites by their distance from this site. If `cum=TRUE`, for i, if j is among the m^{th} nearest sites, then :

$$W_{ij} = 1$$

else

$$W_{ij} = 0$$

If `cum=FALSE`, for

$$s_i$$

, if

$$s_j$$

is the m^{th} nearest site, then :

$$W_{ij} = 1$$

else

$$W_{ij} = 0$$

In case of ties, the nearest neighbour is randomly chosen.

In the case of method="distance", if site i is separated from j by a distance lower or equal to a given threshold :

$$W_{ij} = 1$$

else

$$W_{ij} = 0$$

In the case of method="both" W must verify the two first conditions.

Value

A spatial weight matrix of size $n \times n$

Author(s)

Aragon Y., Thomas-Agnan C., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[moranplotmap](#), [normw](#)

Examples

```
# data auckland
data(auckland)
x.ext <- auckland$Easting[1:10]
y.ext <- auckland$Northing[1:10]
#plot(x.ext,y.ext,type='p')
#text(x.ext,y.ext,as.character(1:10))

# matrix based on 5 nearest neighbors
W<-makeneighborsw(x.ext,y.ext,method="neighbor",m=3)

# matrix based on a threshold distance
W1<-makeneighborsw(x.ext,y.ext,method="distance",d=20)

# matrix based on the two methods
W2<-makeneighborsw(x.ext,y.ext,method="both",m=3,d=20)
```

misolationmap *Interactive multivariate isolation plot and map*

Description

The function `misolationmap` draws a scatterplot with the pairwise Mahalanobis distances between the observations and their neighbors on the y-axis and the "degree of isolation" of the observations on the x-axis and a map

Usage

```
misolationmap(long, lat, object, propneighb=0.4, chisqu=0.975, listvar=NULL, listnomvar=NULL,
  carte = NULL, label = "", cex.lab=1, pch = 16, col="blue", xlab = "degree of isolation",
  ylab="Pairwise Mahalanobis distances", lablong = "", lablat = "", axes=FALSE)
```

Arguments

| | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>object</code> | a spatial weight matrix of class nb |
| <code>propneighb</code> | proportion of neighbors included in ellipsoid |
| <code>chisqu</code> | value of alpha for the definition of global outliers |
| <code>listvar</code> | matrix of variables which permit to add graphics such as histogram, etc. and plot bubbles on map using the tcltk window |
| <code>listnomvar</code> | names of variables from <code>listvar</code> |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>label</code> | a list of character of size n with name of site. Names are printed on map after a selection |
| <code>cex.lab</code> | character size of label |
| <code>pch</code> | 16 by default, symbol for selected points |
| <code>col</code> | "blue" by default, color of the points on the two graphics |
| <code>xlab</code> | a title for the graphic x-axis |
| <code>ylab</code> | a title for the graphic y-axis |
| <code>lablong</code> | name of the x-axis that will be printed on the map |
| <code>lablat</code> | name of the y-axis that will be printed on the map |
| <code>axes</code> | TRUE for drawing axes on the map |

Details

The pairwise Mahalanobis distances are calculated using the robust Minimum Covariance Determinant (MCD) estimator associated with 75% of observations (function `covMcd` in the `robustbase` package). For each observation, the degree of isolation is a chi-square quantile of the conditional distribution of the pairwise Mahalanobis distances associated with the ellipsoid containing the proportion `propneighb` of neighbors. The parameter `propneighb` gives the proportion of neighbors that is expected to be quite similar to the observation in order to conclude that the observation is not a local outlier. Under independence and normality conditions, the user can expect a degree of isolation close by the parameter `propneighb` (vertical line on the scatterplot). An observation with a high degree of isolation is suspected to be a local outlier. Users have also the possibility to plot bubbles on the map which size depends on the robust Mahalanobis distance of each observation to the center of the distribution (function `arw` in the package `mvoutlier`).

Value

A matrix of boolean of size $n \times n$

Author(s)

Fizmoser P., Thomas-Agnan C., Ruiz-Gazen A., Laurent T.,

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[mvariocloudmap](#)

Examples

```
data(moss)
data(kola.background)
xy <- moss[,c("XCOO", "YCOO")]
xy.knn <- knearneigh(as.matrix(xy), k=15)
#xy.knn <- dnearneigh(as.matrix(xy), 0, 50000 )

nb.kola <- knn2nb(xy.knn)
dat.kola <- log10(moss[, c("Ag", "As", "Bi", "Cd", "Co", "Cu", "Ni")])

obs<-misolationmap(xy$XCOO, xy$YCOO, nb.kola, propneighb=0.40, chisqu=0.975, dat.kola, names(dat.kola),
carte= kola.background, cex.lab=0.7)
```

moranplotmap *Moran scatterplot and map*

Description

The function `moranplotmap()` draws a moran plot, used to detect spatial autocorrelation in the variable `var`. On the x-axis, is represented $var - \bar{var}$ and on the y-axis $W(var - \bar{var})$, where W is the spatial weight matrix. It also calculates Moran's I statistic (see `nonnormoran.r`) and give a p-value associated to the autocorrelation test (gaussian version and permutation version).

Usage

```
moranplotmap(long, lat, var, W, flower=FALSE, locmoran=FALSE, listvar=NULL, listnomvar=NULL,
carte=NULL, criteria=NULL, label="", cex.lab=1, col="blue", pch=16, xlab=expression(W(X-bar(X))),
ylab=expression(W(X-bar(X))), axes=FALSE, lablong="", lablat="",
names.arg=c("H.-H.", "L.-H.", "L.-L.", "H.-L."))
```

Arguments

| | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>var</code> | a vector of numeric values of size n |
| <code>W</code> | A spatial weight matrix of size $n \times n$ |
| <code>flower</code> | if TRUE, link neighbouring sites |
| <code>locmoran</code> | if TRUE, print local Moran's I statistic on the Moran plot |
| <code>listvar</code> | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| <code>listnomvar</code> | a list with names of variables listvar |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>label</code> | a list of character of size n with name of site. Names are printed on map after a selection |
| <code>cex.lab</code> | character size of label |
| <code>col</code> | "blue" by default, color of bars on the histogram |
| <code>pch</code> | 16 by default, symbol for selected points |
| <code>xlab</code> | a title for the graphic x-axis |
| <code>ylab</code> | a title for the graphic y-axis |
| <code>axes</code> | a boolean with TRUE for drawing axes on the map |
| <code>lablong</code> | name of the x-axis that will be printed on the map |
| <code>lablat</code> | name of the y-axis that will be printed on the map |
| <code>names.arg</code> | names of quadrants of the Moran plot |

Details

For the permutation test, for each drawing the values of the variable \$var\$ are randomly assigned to the sites. We then calculate Moran'I statistic associated to each drawing and we give the frequency of drawings when Moran'I statistic is lower or equal to the observed Moran'I statistic. Moreover, the function gives the opportunity to link neighbouring sites and gives Local Moran's I statistic. For a site i:

$$I_i = (var_i - \bar{var}) \sum_j W_{ij} (var_j - \bar{var})$$

with j not equal to i.

Value

Returns obs, vector of size n of boolean with selected sites, and Moran'I statistic MORAN.

Note

In the case of the spatial weight matrix is not normalized, the Moran'I statistic is not equal to β used in regression line for model $W(X - \bar{X}) = \beta(X - \bar{X}) + u$. That is why the regression line is only drawn in the case of W normalized.

Author(s)

Aragon Y., Thomas-Agnan C., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

Jim Lesage, "Spatial Econometrics Toolbox", <http://www.spatial-econometrics.com/>

See Also

[neighbourmap](#), [makeneighborsw](#), [normw](#), [nonnormmoran](#)

Examples

```
# data baltimore
data(baltimore)
W <- makeneighborsw(baltimore$X, baltimore$Y, method="neighbor", 4)
moranplotmap(baltimore$X, baltimore$Y, baltimore$PRICE, W, label=baltimore$STATION,
criteria=(baltimore$PRICE>mean(baltimore$PRICE)), listvar=baltimore,
listnomvar=names(baltimore), flower=TRUE, locmoran=TRUE, cex.lab=0.7, pch=5)
```

mvariocloudmap *Interactive multivariate variocloud and map*

Description

The function `mvariocloudmap()` draws a scatterplot of pairwise Mahalanobis distances and spatial distances with a map. It is a multivariate version of the `variocloud`. The number of couples of sites plotted can be reduced by considering couples above a quantile regression curve.

Usage

```
mvariocloudmap(long, lat, object, listvar=NULL, listnomvar=NULL, quantiles=NULL, cri
carte = NULL, label = "", cex.lab=1, pch = 16, col="blue", xlab = "Pairwise spatial di
ylab="Pairwise Mahalanobis distances", lablong = "", lablat = "", axes=FALSE)
```

Arguments

| | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>object</code> | a spatial weight matrix of class nb |
| <code>listvar</code> | matrix of variables which permit to add graphics such as histogram, etc. and plot bubbles on map using the tcltk window |
| <code>listnomvar</code> | names of variables from <code>listvar</code> |
| <code>quantiles</code> | the value of alpha for representing alpha-quantile regression |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>label</code> | a list of character of size n with name of site. Names are printed on map after a selection |
| <code>cex.lab</code> | character size of label |
| <code>pch</code> | 16 by default, symbol for selected points |
| <code>col</code> | "blue" by default, color of points on the two graphics |
| <code>xlab</code> | a title for the graphic x-axis |
| <code>ylab</code> | a title for the graphic y-axis |
| <code>lablong</code> | name of the x-axis that will be printed on the map |
| <code>lablat</code> | name of the y-axis that will be printed on the map |
| <code>axes</code> | TRUE for drawing axes on the map |

Details

The pairwise Mahalanobis distances are calculated using the Minimum Covariance Determinant (MCD) estimator associated with 75% of observations (function `covMcd` in the `robustbase` package). Users have the possibility to select some couples of sites on the scatterplot that are also highlighted on the map. Selection of observations on the map is also possible and leads to the selection of all the couples which contain the selected observations on the scatterplot.

Value

A matrix of boolean of size $n \times n$

Author(s)

Fizmoser P., Thomas-Agnan C., Ruiz-Gazen A., Laurent T.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Économétrie pour données géoréférencées : modèles et études de cas*

See Also

[misolationmap](#)

Examples

```
data(meuse)
data(meuse.riv)

dat.meuse<-log(1+meuse[,3:7])

# matrice des plus proches voisins
coords <- coordinates(cbind(meuse$x,meuse$y))
col.knn <- knearneigh(coords, k=7)
nb.meuse <- knn2nb(col.knn)

obs<-mvariocloudmap(meuse$x,meuse$y,nb.meuse,dat.meuse,names(dat.meuse),quantiles=0.95,col='
carte=meuse.riv[-c(1:20,73:98,156:176),],label=as.character(1:155),cex.lab=0.7)
```

neighbourmap

Neighbour plot and map

Description

The function `neighbourmap()` identifies spatial outliers by comparing a variable value for a particular site with these of its neighbouring sites. It draws a scatterplot of the values of the variable at neighbouring sites for a neighbourhood structure given by a binary weight matrix `W` and links this scatterplot with a map.

Usage

```
neighbourmap(long, lat, var, W, id=FALSE, listvar=NULL, listnomvar=NULL, carte=NULL,
criteria=NULL, label="", cex.lab=1, pch=16, col="blue", xlab="", ylab="",
axes=FALSE, lablong="", lablat="")
```

Arguments

| | |
|------------|-------------------------------------------------------------------------------------------------------------------|
| long | a vector x of size n |
| lat | a vector y of size n |
| var | a vector of numeric values of size n |
| W | A spatial weight matrix of size $n \times n$ |
| id | If TRUE, drawing the linear curve $y=x$ |
| listvar | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| listnomvar | a list with names of variables listvar |
| carte | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| criteria | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| label | a list of character of size n with name of site. Names are printed on map after a selection |
| cex.lab | character size of label |
| pch | 16 by default, symbol for selected points |
| col | "blue" by default, color of the points on the neighbor plot |
| xlab | a title for the graphic x-axis |
| ylab | a title for the graphic y-axis |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

For a selected site j on the map, are represented on the map its neighbors, and on the graph, on the x-axis the value of `var` for this site, and in y-axis, the values of `var` for the neighbouring sites of j . For a selected point on the graph, the corresponding pair of sites is represented on the map with a link.

Value

Returns a matrix of size $n \times n$ of boolean with TRUE if pair (i,j) was in the last selection.

Note

When user selects sites on the graph or on the map, he cannot add a selection by using the other graphic.

Author(s)

Aragon Y., Thomas-Agnan C., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[moranplotmap](#), [makeneighborsw](#), [normw](#), [nonormmoran](#)

Examples

```
# data oldcol

columbus <- readShapePoly(system.file("etc/shapes/columbus.shp",
package="spdep")[1])

list.OLD <- spdf2list(columbus)
contours.OLD <- list.OLD$poly
x.OLD <- list.OLD$X
y.OLD <- list.OLD$Y

W <- makeneighborsw(x.OLD , y.OLD,method="neighbor",4)
obs<-neighbourmap(x.OLD , y.OLD,columbus@data$CRIME, W, carte=contours.OLD,
criteria=(columbus@data$CRIME>mean(columbus@data$CRIME)), listvar=columbus@data,
listnomvar=names(columbus@data), id=TRUE, col="grey", pch=4)
```

nonormmoran

Detection of spatial autocorrelation

Description

The function ‘nonormmoran’ is used to detect spatial autocorrelation in the residuals u from the least squares model $Y = \beta \times X + u$. It calculates Moran’s I statistic of the residuals based on the gaussian asymptotic distribution and give a p-value associated to the test of spatial autocorrelation (gaussian version).

Usage

```
nonormmoran(y, x, W)
```

Arguments

| | |
|---|------------------------------------------------------|
| y | vector of size n of dependent variable |
| x | matrix $n \times p$ containing explanatory variables |
| W | spatial weight matrix |

Details

W is supposed standardized :

$$I = (n/s) \frac{u'Wu}{u'u}$$

$$I \sim N(E(I), \text{var}(I))$$

let $M = (I - X(X'X)^{-1}X')$

$$E(I) = (n/s) \frac{\text{tr}(MW)}{n - k}$$

$$d = \frac{n - p}{n + p + 2}$$

$$V(I) = (n/s)^2 [\text{tr}(MWMW') + \text{tr}(MW)^2 + (\text{tr}(MW))^2] / d - E(I)^2$$

$$Z_I = \frac{I - E(I)}{v(I)^{1/2}}$$

In the case of W is normed, $s=n$ else s is the number of nonzero links

Value

(nobs,nvar,morani,imean,istat,ivar,prob) where 'nobs' is the number of observations, 'nvar', the number of explanatory variables, 'morani' is the Moran's I statistic estimate, 'imean' is E(I), ivar is var(I), istat is the normalized Moran's I statistic (corresponding to Z_I), and prob the associated p-value.

Author(s)

Translated into R from Jim Lesage's *Spatial Econometrics Toolbox*, <http://www.spatial-econometrics.com/>

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[moranplotmap](#), [neighbourmap](#), [makeneighborsw](#), [normw](#)

Examples

```
# data baltimore
data(baltimore)
W <- makeneighborsw(baltimore$X, baltimore$Y, method="neighbor", 4)
# W is not normed
nonormmoran(baltimore$PRICE, baltimore[,14:15], W)
# W is normed
nonormmoran(baltimore$PRICE, baltimore[,14:15], normw(W))
```

normw

*Normalize a spatial weight matrix***Description**

The function `normw()` normalizes a spatial weight matrix

Usage

```
normw(w)
```

Arguments

`w` A spatial weight matrix of size $n \times n$

Details

$$W_{ij} = \frac{W_{ij}}{\sum_k W_{ik}}$$

Value

A matrix of size $n \times n$

Author(s)

Aragon Y., Thomas-Agnan C., Ruiz-Gazen A., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[neighbourmap](#), [moranplotmap](#), [makeneighborsw](#)

Examples

```
# data auckland
data(auckland)
x.ext <- auckland$Easting[1:10]
y.ext <- auckland$Northing[1:10]
#plot(x.ext,y.ext,type='p')
#text(x.ext,y.ext,as.character(1:10))

# matrix based on 5 nearest neighbors
W<-makeneighborsw(x.ext,y.ext,method="neighbor",m=3)
W2<-normw(W)
```

Description

The function `pcamap()` draws the plots summarizing a generalized Principal Component Analysis (PCA), made with 'genpca.r'. It draws the scatterplot of the individuals projected on a chosen principal component plane (with their percentage of inertia), together with the scatterplot of the variables projected into the same plane with the quality of representation in order to interpret the principal component axes. The individuals scatterplot interacts with the map.

Usage

```
pcamap(long, lat, dataset, name.dataset=NULL, direct=c(1, 2), weight=rep(1/nrow(dataset),
metric=diag(ncol(dataset)), center=NULL, reduce=TRUE, qualproj=FALSE,
listvar=NULL, listnomvar=NULL, criteria=NULL, carte=NULL, label="", cex.lab=1, pch=16,
axes=FALSE, xlab=as.character(direct[1]), ylab=as.character(direct[2]), lablong="")
```

Arguments

| | |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>dataset</code> | matrix $n \times p$ of variables |
| <code>name.dataset</code> | List of Names of dataset |
| <code>direct</code> | Two-dimension vector containing the numbers of principal axes to plot |
| <code>weight</code> | vector of size n of weight (by default : $\text{weight}=\text{t}(1/n, \dots, 1/n)$) |
| <code>metric</code> | matrix $p \times p$ (by default : $\text{metric}=\text{Identity matrix}$) |
| <code>center</code> | A vector of size p of the gravity center which by default is equal to \bar{X} |
| <code>reduce</code> | if TRUE, reduced PCA |
| <code>qualproj</code> | if TRUE, print the quality of representation of individuals |
| <code>listvar</code> | matrix of variables which permit to add graphics such as histogram, etc. and plot bubbles on map using the tcltk window |
| <code>listnomvar</code> | names of variables from <code>listvar</code> |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>label</code> | a list of character of size n with name of site. Names are printed on map after a selection |
| <code>cex.lab</code> | character size of label |
| <code>pch</code> | 16 by default, symbol for selected points |
| <code>col</code> | "grey" by default, color of the two graphics |

| | |
|---------|----------------------------------------------------|
| axes | TRUE for drawing axes on the map |
| xlab | a title for the two graphics x-axis |
| ylab | a title for the two graphics y-axis |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

Let

$$D = \text{diag}(\lambda_1, \dots, \lambda_p)$$

$$1_p = (1, \dots, 1)'$$

Let the coordinates of individuals in the principals components

$$CC = (C'_1, \dots, C'_n)'$$

with $C_i = (C_i^1, \dots, C_i^p)$

Let the coordinates of variables in the principals components

$$CC = (V'_1, \dots, V'_p)'$$

with $V_i = (V_i^1, \dots, V_i^p)$

Part of inertia :

$$\left(\frac{\lambda_1}{\sum_i \lambda_i}, \dots, \frac{\lambda_p}{\sum_i \lambda_i} \right)'$$

Quality of representation of individual k projected on plane (i,j):

$$Qu = \sqrt{\frac{(C_k^i)^2 + (C_k^j)^2}{\sum_l (C_k^l)^2}}$$

Quality of representation of variable k projected on plane (i,j):

$$VQu = \sqrt{\frac{(V_k^i)^2 + (V_k^j)^2}{\sum_l (V_k^l)^2}}$$

Value

Return 'obs', vector of size n of boolean with sites selected, 'inertia' vector of size p with percent of inertia of each component, 'casecoord' matrix $n \times p$ of individuals, 'varcoord' matrix $n \times p$ of principal components.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

Caussinus H., Fekri M., Hakam S., Ruiz-Gazen A. (2003) , *A monitoring display of Multivariate Outliers*, Computational Statistics and Data Analysis, vol. 44, 1-2, 237-252.

See Also

[clustermap](#), [genpca](#)

Examples

```
# Data Colombus
example(columbus)
coords <- coordinates(columbus)
cont<-spdf2list(columbus)$poly

obs<-pcamap(coords[,1], coords[,2],columbus@data[,6:12],
label=columbus@data$NEIGNO, carte=cont,listvar=columbus@data,
qualproj=TRUE,listnomvar=names(columbus@data),name.dataset=names(columbus@data[,6:12]),
cex.lab=0.7, pch=6, col="purple")

# data boston
data(boston)
obs<-pcamap(boston.utm[,1],boston.utm[,2],boston.c[,12:15],label=boston.c$TOWN,
listvar=boston.c,listnomvar=names(boston.c),name.dataset=names(boston.c[,12:15]),
cex.lab=0.3,center=c(0,0,0,0))
```

plot3dmap

Interactive Plot3d and map

Description

The function `histomap()` draws a histogram of the given variable `var` and a map with sites of coordinates (`long,lat`). Each site is associated to a value of `var` and there is interactivity between the two windows.

Usage

```
plot3dmap(long,lat,var1,var2,var3,box=TRUE, listvar=NULL, listnomvar=NULL,
criteria=NULL, carte=NULL, label="",cex.lab=1, pch=16, col="blue", xlab="",
ylab="",zlab="", axes=FALSE,lablong="", lablat="")
```

Arguments

| | |
|------------|-------------------------------------------------------------------------------------------------------------------|
| long | a vector x of size n |
| lat | a vector y of size n |
| var1 | a vector of numeric values of size n |
| var2 | a vector of numeric values of size n |
| var3 | a vector of numeric values of size n |
| box | a boolean with TRUE for drawing a box on the scatterplot 3d |
| listvar | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| listnomvar | a list with names of variables listvar |
| criteria | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| carte | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| label | a list of character of size n with name of site. Names are printed on map after a selection |
| cex.lab | character size of label |
| pch | 16 by default, symbol for selected points |
| col | "blue" by default, color of points on the scatterplot 3d |
| xlab | a title for the graphic x-axis |
| ylab | a title for the graphic y-axis |
| zlab | a title for the graphic z-axis |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

Sites selected by a bar on the histogram are represented on the map in red and the values of sites selected on the map by 'points' or 'polygon' are represented in red as a sub-histogram on the histogram.

Value

A vector of boolean of size n. TRUE if the site was in the last selection.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[histomap](#), [histobarmap](#), [scattermap](#), [densitymap](#)

Examples

```
# data on price indices of real estate in France
data(immob)
midiP <- readShapePoly(system.file("shapes/region.shp", package="GeoXp")[1])
cont_midiP<-spdf2list(midiP)$poly
plot3dmap(immob$longitude,immob$latitude,immob$prix.vente,immob$prix.location,
immob$variation.vente,box=FALSE, carte= cont_midiP,listvar=immob, col='purple',
listnomvar=names(immob),label=immob$Nom,cex.lab=0.6,xlab="prix.vente",
ylab="prix.location",zlab="variation.vente")

# data oldcol
example(columbus)
coords <- coordinates(columbus)
cont<-spdf2list(columbus)$poly

plot3dmap(coords[,1], coords[,2],columbus@data$CRIME,columbus@data$HOVAL,
columbus@data$INC, xlab='Crime',ylab='Hoval',zlab='Income',listvar=columbus@data,
listnomvar=names(columbus@data),criteria=(columbus@data$CRIME>mean(columbus@data$CRIME)),
carte=cont,col="grey", label=as.character(1:length(columbus@data$X)),cex.lab=0.7)

# data eire
data(eire)
eire.contours<-polylist2list(eire.polys.utm)

plot3dmap(eire.coords.utm$V1,eire.coords.utm$V2,eire.df$A,eire.df$RETSALE,
eire.df$INCOME,carte=eire.contours,listvar=eire.df,
listnomvar=names(eire.df),xlab="A",ylab="RETSALE",zlab="INCOME")
```

polyboxplotmap

Interactive polyboxplot and map

Description

Parallel Boxplots of a numerical variable by levels of a factor. It interacts with a map.

Usage

```
polyboxplotmap(long, lat, var1, var2, varwidth=FALSE,listvar = NULL, listnomvar = N
carte = NULL, criteria = NULL, label = "", cex.lab=1, names.arg = "", xlab = "",
ylab= "count", pch = 16, col = "grey", axes = FALSE, lablong = "", lablat = "")
```

Arguments

| | |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| long | a vector x of size n |
| lat | a vector y of size n |
| var1 | a vector of factor of size n |
| var2 | a vector of numerical values of size n |
| varwidth | if <code>varwidth</code> is TRUE, the boxes are drawn with widths proportional to the square-roots of the number of observations in the groups |
| listvar | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| listnomvar | a list with names of variables <code>listvar</code> |
| carte | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| criteria | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| label | a list of character of size n with name of site. Names are printed on map after a selection |
| cex.lab | character size of label |
| names.arg | names of factors of var1 |
| xlab | a title for the graphic x-axis |
| ylab | a title for the graphic y-axis |
| pch | 16 by default, symbol for selected points |
| col | "grey" by default, color of the points of the scatter plot |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |

Details

Each site is associated to a value of a level of \$var1\$ and of a value of \$var2\$. There is an interactivity only in one direction : the sites selected by quartile-intervals on one of the boxplots are then represented on the map in red (or colors according to the options).

Value

A vector of boolean of size \$n\$. TRUE if the site was in the last selection.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[dblehistomap](#), [histobarmap](#), [scattermap](#), [dbledensitymap](#)

Examples

```
# Data eire
data(eire)
eire.contours<-polylist2list(eire.polys.utm)

polyboxplotmap(eire.coords.utm$V1,eire.coords.utm$V2,eire.df$pale,
eire.df$POPCHG, listvar=eire.df, listnomvar=names(eire.df), carte=eire.contours,
xlab="Appartenance to the region of Pale", names.arg=c("Hors Pale", "Pale"),
col=c("purple", "violet"))
```

`polylist2list` *Extract from a polylist object the vertices of the polygons*

Description

The function `polylist2list()` extracts the vertices of the polygons from a `polylist` object, separating polygons from each other by 3 rows of NaN.

Usage

```
polylist2list(data)
```

Arguments

`data` A `polylist` object

Details

The user can then represent the coordinates of sites of a `polylist` object as background map, using the option `carte` included in all interactive functions of GeoXp.

Value

It returns a matrix of numeric values with 2 columns (x and y coordinates of the vertices of the polygons) where polygons are separated from each other by 3 rows of NaN.

Author(s)

Thibault Laurent

References

Bivand R. et al. (2009), *Applied Spatial Data Analysis with R*, Springer.

See Also[spdf2list](#)**Examples**

```
data(eire)
eire.contours<-polylist2list(eire.polys.utm)
```

`rotation`*Transform coordinates of sites using a rotation*

Description

The function `rotation()` is used to modify coordinates of sites by a rotation with an angle equal to `angle`.

Usage

```
rotation(coords, angle)
```

Arguments

| | |
|---------------------|---------------------------------------------|
| <code>coords</code> | matrix $n \times 2$ of coordinates |
| <code>angle</code> | value of angle to use in rotation in degree |

Details

Let:

$$\begin{aligned}x &= (\cos(\theta), -\sin(\theta)) \\y &= (\sin(\theta), \cos(\theta)) \\nlecoord &= coords \times cbind(x, y)\end{aligned}$$

Value

matrix $n \times 2$ of new coordinates.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also[angleplotmap](#), [variocloudmap](#)

 scattermap

Interactive scatterplot and map

Description

The function `scattermap` draws a scatterplot of the given variables (`var1, var2`) and a map with sites of coordinates (`long, lat`). Boxplots of each variable `var1` and `var2` are represented below the x-axis and y-axis.

Usage

```
scattermap(long, lat, var1, var2, listvar=NULL, listnomvar=NULL, reg.line=TRUE, quantiles=
criteria=NULL, carte=NULL, label="", cex.lab=1, pch=16, xlab="", ylab="", col="grey",
axes=FALSE, lablong="", lablat="")
```

Arguments

| | |
|-------------------------|-------------------------------------------------------------------------------------------------------------------|
| <code>long</code> | a vector x of size n |
| <code>lat</code> | a vector y of size n |
| <code>var1</code> | a vector of numeric values of size n |
| <code>var2</code> | a vector of numeric values of size n |
| <code>listvar</code> | matrix of variables which permit to plot bubbles on map or add a graphic using the tk window |
| <code>listnomvar</code> | a list with names of variables <code>listvar</code> |
| <code>reg.line</code> | If TRUE, drawing of the linear predictor for 'response' in linear model |
| <code>quantiles</code> | a list of order of conditionnal quantile regression spline |
| <code>criteria</code> | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| <code>carte</code> | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| <code>label</code> | a list of character of size n with name of site. Names are printed on map after a selection |
| <code>cex.lab</code> | character size of label |
| <code>pch</code> | 16 by default, symbol for selected points |
| <code>xlab</code> | a title for the graphic x-axis |
| <code>ylab</code> | a title for the graphic y-axis |
| <code>col</code> | "grey" by default, color of the points of the scatter plot |
| <code>axes</code> | a boolean with True for drawing axes on the map |
| <code>lablong</code> | name of the x-axis that will be printed on the map |
| <code>lablat</code> | name of the y-axis that will be printed on the map |

Details

Each site is associated to a value of `var1` and a value of `var2`. There is an interactivity between the two windows: the sites selected by 'point' or 'polygon' on the scatterplot are represented on the map in red; sites selected on the map are then represented in red on the scatterplot. Users have the possibility to draw linear predictor for 'response' in linear model (option `reg.line`) or conditional quantile regression spline (option `quantiles`).

Value

A vector of boolean of size `n`. TRUE if the site was in the last selection.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[dblehistomap](#), [histobarmap](#), [scattermap](#), [densitymap](#)

Examples

```
# data on price indices of real estate in France
data(immob)
midiP <- readShapePoly(system.file("shapes/region.shp", package="GeoXp")[1])
cont_midiP<-spdf2list(midiP)$poly
scattermap(immob$longitude,immob$latitude,immob$prix.vente,
immob$prix.location,carte= cont_midiP,listvar=immob,
listnomvar=names(immob),pch=5,xlab="Prix de vente",ylab="Prix de location",
col="purple",quantiles=0.5)

# data baltimore
data(baltimore)
scattermap(baltimore$X,baltimore$Y,baltimore$PRICE,baltimore$SQFT,
listvar=baltimore, listnomvar=names(baltimore),xlab="SQFT",ylab="PRICE",
criteria=(baltimore$CITCOU=1),axes=TRUE,lablong="X",lablat="Y",
reg.line=TRUE)

# Data Eire
data(eire)
eire.contours<-polylist2list(eire.polys.utm)

scattermap(eire.coords.utm$V1,eire.coords.utm$V2,eire.df$ROADACC,
eire.df$OWNCONS, listvar=eire.df,listnomvar=names(eire.df),carte=eire.contours,
xlab="Routes",ylab="Taux de consommation",reg.line=TRUE,quantiles=0.95)
```

| | |
|-------------|------------------------------------------|
| selectgraph | <i>Selection of an additionnal graph</i> |
|-------------|------------------------------------------|

Description

The function `selectgraph()` is used in most of the GeoXp functions to choose an additional graph and the variables associated to this graph.

Usage

```
selectgraph(listnomvar, listgraph)
```

Arguments

| | |
|-------------------------|----------------------------------|
| <code>listnomvar</code> | list of names of variables given |
| <code>listgraph</code> | kind of graphics |

Details

This function is not an interactive function.

Value

Names of variables and graph chosen.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

| | |
|-----------|---------------------------------------------------------|
| selectmap | <i>Selection of a point or polygon on a scatterplot</i> |
|-----------|---------------------------------------------------------|

Description

The function `selectmap()` is used to select a point or a polygon on the map or on a scatterplot. Called by any function which draws a scatterplot.

Usage

```
selectmap(var1, var2, obs, Xpoly, Ypoly, method = "")
```

Arguments

| | |
|--------|-----------------------------------------------------------------------------------|
| var1 | a vector x of size n |
| var2 | a vector y of size n |
| obs | a boolean vector of size n : TRUE if a site is already selected, FALSE otherwise. |
| Xpoly | X-coordinates of the vertices of selected polygon |
| Ypoly | Y-coordinates of the vertices of selected polygon |
| method | 'point' if the selected area is a point; 'poly' if the selected area is a polygon |

Details

This function is called by all the functions which draw a scatterplot such as scattermap.r, moran-plotmap.r,... This is not an interactive function.

Value

A vector of boolean of size n. TRUE if a site has been selected, FALSE otherwise.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

| | |
|------------|-----------------------------------------|
| selectstat | <i>Selection of values on a graphic</i> |
|------------|-----------------------------------------|

Description

The function `selectstat()` is used to select sites on a graphic such as Histogram, Barplot, Boxplot, Polyboxplot, Scatterplot, Densityplot, Neighbourplot, Lorentz, Moran, Angleplot, Variocloud, Cluster, or PCA. Most of the GeoXp functions call `selectstat.r`.

Usage

```
selectstat(var1, var2, obs, Xpoly, Ypoly, method,
           nbcol, W, F, long, lat)
```

Arguments

| | |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| var1 | 1st variable of size n |
| var2 | 2nd variable of size n |
| obs | a boolean vector of size n : TRUE if a site is already selectioned, FALSE otherwise. |
| Xpoly | X-coordinates of the vertices of selected polygon |
| Ypoly | Y-coordinates of the vertices of selected polygon |
| method | name of the graph wich must be drawn among Histogram, Barplot, Boxplot, Polyboxplot, Densityplot, Neighbourplot, Lorentz, Anglepoint, Variopoint |
| nbcol | nbcol : number of cells for the histogram (10 by default) |
| W | A spatial weight matrix of size $n \times n$ |
| F | a numerical vector |
| long | a vector of x-axis of size n |
| lat | a vector of y-axis of size n |

Details

This function is not an interactive function.

Value

Return a vector of boolean of size n with TRUE if sites have been selected on a graph

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

 slider1

Scroll bar

Description

Creates a scroll bar for modifying the value of a parameter.

Usage

```
slider1(fenetre, refresh.code, names, minima, maxima,
        resolutions, starts, no = 0)
```

Arguments

| | |
|---------------------------|------------------------------------------------------------------|
| <code>fenetre</code> | number of windows |
| <code>refresh.code</code> | name of function called after modifying the value of a parameter |
| <code>names</code> | title for scroll bar |
| <code>minima</code> | minimum value of parameter |
| <code>maxima</code> | maximum value of parameter |
| <code>resolutions</code> | scale |
| <code>starts</code> | Initial Value |
| <code>no</code> | number of scroll bar |

Details

This function is used in the functions which draw a curve to modify the smoothing parameter. This is not an interactive function

Value

Draws a tcltk window.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[densitymap](#), [dbledensitymap](#)

slider2

Scroll bar

Description

Creates a scroll bar for modifying the value of a parameter (same as slider1.r).

Usage

```
slider2(fenetre, refresh.code, names, minima, maxima,  
resolutions, starts, no = 0)
```

Arguments

| | |
|---------------------------|------------------------------------------------------------------|
| <code>fenetre</code> | number of windows |
| <code>refresh.code</code> | name of function called after modifying the value of a parameter |
| <code>names</code> | title for scroll bar |
| <code>minima</code> | minimum value of parameter |
| <code>maxima</code> | maximum value of parameter |
| <code>resolutions</code> | scale |
| <code>starts</code> | Initial Value |
| <code>no</code> | number of scroll bar |

Details

This function is used in the functions which draw a curve to modify the smoothing parameter. This is not an interactive function.

Value

Drawing of a tcltk window.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

See Also

[densitymap](#), [dbledensitymap](#)

`spdf2list`

Extract from a 'SpatialPolygonsDataFrame' object the middle coordinates of boundary box and the vertices of the polygons (in the case where polygons are given)

Description

The function `spdf2list()` calculates the middle coordinates of boundary box and in the case where polygons are included into a `SpatialPolygonsDataFrame` object, it extracts the vertices of the polygons, separating polygons from each other by 3 rows of `NaN`.

Usage

`spdf2list(data)`

Arguments

`data` A `SpatialPolygonsDataFrame` object

Details

The user can then represent the coordinates of sites of a `SpatialPolygonsDataFrame` object as background map, using the option ‘`carte`’ included in all interactive functions.

Value

It returns two vectors of middle coordinates for x-axis and y-axis corresponding to middle of each boundary box. It returns a matrix of numeric values with 2 columns (x and y coordinates of the vertices of the polygons) where polygons are separated from each other by 3 rows of NaN.

Note

The data of a `SpatialPolygonsDataFrame` object can be directly extract using `@data`

Author(s)

Thibault Laurent

See Also

[polylist2list](#)

Examples

```
africa <- readShapePoly(system.file("shapes/Africa.shp", package = "GeoXp")[1])
africa.contour<-spdf2list(africa)$poly
```

variocloudmap

Interactive variocloud and map

Description

The function `variocloudmap()` draws a semi-variocloud (directional or omnidirectional) and a map. It is used to detect spatial autocorrelation. Possibility to draw the empirical semi-variogram and a robust empirical semi-variogram.

Usage

```
variocloudmap(long, lat, var, bin=NULL, quantiles=NULL, listvar=NULL, listnomvar=NULL,
criteria=NULL, carte = NULL, label = "", cex.lab=1, pch = 16, col="grey", xlab = "",
ylab="", axes=FALSE, lablong = "", lablat = "", xlim=NULL, ylim=NULL)
```

Arguments

| | |
|------------|-------------------------------------------------------------------------------------------------------------------|
| long | a vector x of size n |
| lat | a vector y of size n |
| var | a vector of numeric values of size n |
| bin | list of values where empirical variogram is evaluated |
| quantiles | list of values of quantile orders (the regression quantile is obtained by spline smoothing) |
| listvar | matrix of variables |
| listnomvar | names of variables listvar |
| criteria | a vector of size n of boolean which permit to represent preselected sites with a cross, using the tcltk window |
| carte | matrix with 2 columns for drawing spatial polygonal contours : x and y coordinates of the vertices of the polygon |
| label | a list of character of size n with names of sites |
| cex.lab | character size of label |
| pch | 16 by default, symbol for selected points |
| col | "grey" by default, colors of points on the angle plot |
| xlab | a title for the graphic x-axis |
| ylab | a title for the graphic y-axis |
| axes | a boolean with TRUE for drawing axes on the map |
| lablong | name of the x-axis that will be printed on the map |
| lablat | name of the y-axis that will be printed on the map |
| xlim | the x limits of the plot |
| ylim | the y limits of the plot |

Details

For some couple of sites (s_i, s_j) , the graph represents on the y-axis the semi squared difference between var_i and var_j :

$$\gamma_{ij} = \frac{1}{2}(var_i - var_j)^2$$

and on the x-axis the distance h_{ij} between s_i and s_j . The semi Empirical variogram has been calculated as :

$$\gamma(h) = \frac{1}{2|N(h)|} \sum_{N(h)} (Z(s_i) - Z(s_j))^2$$

where

$$N(h) = \{(s_i, s_j) : s_i - s_j = h; i, j = 1, \dots, n\}$$

and the robust version :

$$\gamma(h) = \frac{1}{2(0.457 + \frac{0.494}{|N(h)|})} \left(\frac{1}{|N(h)|} \sum_{N(h)} |Z(s_i) - Z(s_j)|^{1/2} \right)^4$$

The number N of points to evaluate the empirical variogram and the distance ϵ between points are set as follows :

$$N = \frac{1}{\max(30/n^2, 0.08, d/D)}$$

and :

$$\epsilon = \frac{D}{N}$$

with :

$$D = \max(h_{ij}) - \min(h_{ij})$$

and :

$$d = \max(h_{ij}^{(l)} - h_{ij}^{(l+1)}),$$

where $h^{(l)}$ is the vector of sorted distances. In options, possibility to represent a regression quantile smoothing spline g_α (in that case the points below this quantile curve are not drawn).

Value

A matrix of boolean of size $n \times n$. TRUE if the couple of site was in the last selection of points.

Author(s)

Thomas-Agnan C., Aragon Y., Ruiz-Gazen A., Laurent T., Robidou L.

References

Aragon Yves, Perrin Olivier, Ruiz-Gazen Anne, Thomas-Agnan Christine (2009), *Statistique et Econométrie pour données géoréférencées : modèles et études de cas*

Cressie N. and Hawkins D. (1980), *Robust estimation of the variogram*, in Journal of the international association for mathematical geology, 13, 115-125.

See Also

[angleplotmap](#), [driftmap](#)

Examples

```
# data meuse
data(meuse)
data(meuse.riv)
obs<-variocloudmap(meuse$x,meuse$y,meuse$zinc,
quantiles=0.75,listvar=meuse,listnomvar=names(meuse),
xlim=c(0,2000),ylim=c(0,500000),pch=2,carte=meuse.riv[c(21:65,110:153),])
#bin=c(0,50,100,250,500,750,1000,1250,1500,1750,2000) )
#points(meuse.riv, type = "l", asp = 1)
```

Index

*Topic **datasets**

immob, 39

*Topic **manip**

distchi2, 23

polylist2list, 58

spdf2list, 66

*Topic **multivariate**

clustermap, 14

dbleshistomap, 19

densitymap, 21

genpca, 26

histobarmap, 35

misolationmap, 42

mvariocloudmap, 46

pcamap, 52

polyboxplotmap, 56

scattermap, 60

*Topic **regression**

scattermap, 60

*Topic **smooth**

dbledensitymap, 17

densitymap, 21

*Topic **spatial**

angleplotmap, 3

barmap, 5

barnbmap, 7

boxplotmap, 8

carte, 10

choix.bubble, 12

choix.couleur, 13

choixvarfunc, 14

clustermap, 14

dbledensitymap, 17

dbleshistomap, 19

densitymap, 21

driftmap, 24

genpca, 26

GeoXp-package, 2

gini, 28

ginimap, 30

graphique, 31

histnbmap, 33

histobarmap, 35

histomap, 37

makeneighborsw, 40

misolationmap, 42

moranplotmap, 44

mvariocloudmap, 46

neighbourmap, 47

nonnormmor, 49

normw, 51

pcamap, 52

plot3dmap, 54

polyboxplotmap, 56

rotation, 59

scattermap, 60

selectgraph, 62

selectmap, 62

selectstat, 63

slider1, 64

slider2, 65

variocloudmap, 67

*Topic **univar**

barmap, 5

boxplotmap, 8

densitymap, 21

ginimap, 30

histomap, 37

plot3dmap, 54

*Topic **utilities**

carte, 10

choix.bubble, 12

choix.couleur, 13

choixvarfunc, 14

graphique, 31

rotation, 59

selectgraph, 62

selectmap, 62

- selectstat, 63
- angleplotmap, 3, 25, 59, 69
- barmap, 5, 16
- barnbmap, 7
- boxplotmap, 8
- carte, 10
- choix.bubble, 12
- choix.couleur, 13
- choix.couleur (*choix.couleur*), 13
- choixvarfunc, 14
- clustermap, 14, 24, 28, 54
- dbledensitymap, 17, 36, 58, 65, 66
- dblehistomap, 19, 20, 36, 58, 61
- densitymap, 6, 10, 18, 20, 21, 22, 38, 56, 61, 65, 66
- distchi2, 23
- driftmap, 4, 24, 69
- genpca, 26, 54
- GeoXp (*GeoXp-package*), 2
- GeoXp-package, 2
- gini, 28, 31
- ginimap, 29, 30
- graphique, 31
- histnbmap, 33
- histobarmap, 6, 10, 18, 20, 22, 35, 36, 38, 56, 58, 61
- histomap, 6, 10, 18, 22, 37, 38, 56
- immob, 39
- makeneighborsw, 8, 35, 40, 45, 49–51
- misolationmap, 42, 47
- moranplotmap, 8, 35, 41, 44, 49–51
- mvariocloudmap, 43, 46
- neighbourmap, 45, 47, 50, 51
- nonormmoran, 8, 35, 45, 49, 49
- normw, 8, 35, 41, 45, 49, 50, 51
- pcamap, 16, 28, 52
- plot3dmap, 54
- polyboxplotmap, 56
- polylist2list, 58, 67
- rotation, 25, 59
- scattermap, 6, 10, 18, 20, 22, 36, 38, 56, 58, 60, 61
- selectgraph, 62
- selectmap, 62
- selectstat, 63
- slider1, 64
- slider2, 65
- spdf2list, 59, 66
- variocloudmap, 4, 25, 59, 67