Package 'spatclus'

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Title Arbitrarily Shaped Multiple Spatial Cluster Detection for Case Event Data.

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Depends spatstat, mgcv

Description Multiple cluster location and detection for 2D and 3D spatial point patterns (case event data). The methodology of this package is based on an original method that allows the detection of multiple clusters of any shape. A selection order and the distance from its nearest neighbour once pre-selected points have been taken into account are attributed at each point. This distance is weighted by the expected distance under the uniform distribution hypothesis. Potential clusters are located by modelling the multiple structural change of the distances on the selection order. Their presence is tested using the double maximum test and a Monte Carlo procedure. The main function of this R package is "clus".

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R topics documented:

`airegrille3d` *Volume computation in 3D*

Description

This function is the 3D version of the airegrille function which is described hereafter.

Usage

```
airegrille3d(pop, x, y, z, r)
```

Arguments

`pop`	The underlying population with "1" if point has not yet been included in the trajectory, "0" else.
`x`	X-coordinate of the center of the sphere.
`y`	Y-coordinate of the center of the sphere.
`z`	Z-coordinate of the center of the sphere.
`r`	Radius of the sphere.

Value

The computed volume.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

See Also

`dist2p3d` `airegrille`

airegrille *Surface computation in 2D*

Description

Computes the surface of the area with "1" on the grid and out of the circle with (x,y) as center coordinates and r as ray.

Usage

```
airegrille(pop, x, y, r)
```

Arguments

pop	The underlying population with "1" if point has not yet been included in the trajectory, "0" else.
x	X-coordinate of the center of the circle.
y	Y-coordinate of the center of the circle.
r	Radius of the circle.

Value

The computed surface.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

See Also

dist2p

cercle *Circle plot*

Description

Plots a circle in 2D from its center coordinates and its radius.

Usage

```
cercle(cx, cy, r, pas)
```

Arguments

cx	X-coordinate of the center
cy	Y-coordinate of the center
r	Radius
pas	Makes possible to choose the precision of the circle plot. $\frac{2\pi}{pas}$ is the number of points from wich the circle is drawn.

Details

This function allows to draw the Kulldorff circular zone.

Value

The circle plot.

Author(s)

Christophe Demattei ⟨demattei@iurc.montp.inserm.fr⟩

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chemist *Coordinates of chemist shops in Montpellier, France.*

Description

This data set gives the X and Y coordinates of the 99 chemist shops in Montpellier, France.

Usage

```
data(chemist)
```

Format

A data frame containing 99 coordinates

Source

GPS location by Christophe Demattei

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clus *Cluster location and detection*

Description

Locates and detects multiple spatial clusters in 2D and 3D and determines the Kulldorff's circular zone in 2D (without detection).

Usage

```
clus(data, pop, dataincyn = "n", rndm = NaN, m = 9, eps = 0.1, limx, limy,
   limz, method = 1, methk = 3, start = 1, export = "n", repexport)
```

Arguments

data	Data frame with 2 or 3 colums (x and y, and z in 3D) giving coordinates of case data points.
pop	Matrix with 2 or 3 columns (depending on wether 2D or 3D data) giving coordinates of underlying population data points.
dataincyn	"y" means that cases are included in the grid, "n" that they are not.
rndm	Vector giving the number of the rows containing cases coordinates in the grid (only if datainc="y").
m	Maximum number of breaks.
eps	Minimum size of cluster (ratio of the total number of cases).
limx	2 element vector containing the study area bounds of the X-axis.
limy	2 element vector containing the study area bounds of the Y-axis.
limz	In 3D, 2 element vector containing the study area bounds of the Z-axis.
method	1 for multiple break clusters, 2 for Kulldorff localization, 3 for the 2 methods.
methk	In the Kulldorff localization, 1 for Bernoulli model, 2 for Poisson model.
start	Indicates the rank of the first trajectory point in term of distance from the area edges. 1 means that the first point of the trajectory is the nearest from the edge.
export	If method = 2 or method = 3, and if export = "y", the data will be exported in "repexport" directory in SatScan software format.
repexport	If export = "y", defines the directory in which data in SatScan software format will be exported.

Details

The "clus" function is the main function. It uses all other functions described below, except "plot" functions. Thus, generally, only the clus function is necessary since others are implicitely called. However, they can be usefull for other purposes, such as when one wants to determine the breaks from a serie, not only in the spatial field. Its main arguments are "data" (case locations) and "pop" (underlying population locations). The function determines the trajectory giving a selection order to each point, computes the weighting of the distance, determines the potential clusters through the computation of the breaks by a regression of this weighted distance on the selection order, and finally tests the significativity of those potential clusters.

Value

A list of objects :

res	A result matrix giving, for each point ordered by its rank in the trajectory, its distance to the nearest neighbourg, the expentancy of this distance, and its weighted distance.
pop	The matrix with 2 or 3 columns giving coordinates of underlying population data points without cases.
bc	A list of vectors. The kth element of the list gives the estimated breaks for the model with k breaks.
stat	A list of non corrected statistic values (F), corrected statistic value (wdm), threshold value for the WDM statistic (wdms) and significativity (signif).

`kulld.p` A vector giving the results of the Kulldorff method with the Poisson model. lambda is the value of the spatial scan test statistic, loglambda is its logarithm, cx and cy are the coordinates of the circle center and rayon is its ray.

`kulld.b` A vector giving the results of the Kulldorff method with the Bernouilli model. lambda is the value of the spatial scan test statistic, loglambda is its logarithm, cx and cy are the coordinates of the circle center and rayon is its ray.

Note

Only arguments "data", "pop", "limx" and "limy" are essential (and "limz" in 3D) but the others have default values. So do not forget to adapt them at your special case.

Author(s)

Christophe Dematteï⟨dematteï@iurc.montp.inserm.fr⟩

References

Bai J. and Perron P. (1998), Estimating and testing linear models with multiple structural changes. *Econometrica*, **66**, 47–78.

Bai J. and Perron P. (2003), Critical values for multiple structural change tests. *Econometrics Journal*, **6**, 72–78.

Bai J. and Perron P. (2003), Computation and analysis of multiple structural change models. *Journal of Applied Econometrics*, **18**, 1–22.

Bickel P. and Breiman L. (1983), Sum of functions of nearest neighbourg distances, moment bounds, limit theorems and a goodness of fit test. *Annals of Probability*, **11**, 185–214.

Dematteï C., Molinari N. and Daurès J.P. (2006), Arbitrarily shaped multiple spatial cluster detection for case event data. *Accepted in Computational Statistics and Data Analysis*. Corrected proof available online via the DOI link http://dx.doi.org/10.1016/j.csda.2006.03.011.

Kulldorff M. and Nagarwalla N. (1995), Spatial disease clusters : Detection and Inference. *Statistics in Medicine*, **14**, 799–810.

Kulldorff M. (1997), A spatial scan statistic. *Communications in Statistics - Theory and Methods*, **26**, 1481–1496.

See Also

`datainc` `regdist` `fstat` `kulld` `delai`

Examples

```
library(spatstat)

data(chemist)
data(grille)
data(irislist)

# plot of the chemist shop locations
for (i in 1:30){
plot(irislist[[i]],xlim=c(-6,8),ylim=c(-7,7),main="Chemist shop locations",lty=3)
par(new=TRUE)
}
```

```
points(chemist$x,chemist$y,pch="+",xlim=c(-6,8),ylim=c(-7,7),asp=1)

# location and detection of spatial clusters
# adjusted for an inhomogeneous population density
RES <- clus(chemist,grille,limx=c(-6,8),limy=c(-7,7))

# plot of the trajectory
x11()
for (i in 1:30){
plot(irislist[[i]],xlim=c(-6,8),ylim=c(-7,7),main="Trajectory",lty=3)
par(new=TRUE)
}
points(chemist$x,chemist$y,pch="+",xlim=c(-6,8),ylim=c(-7,7),asp=1)
for (i in 1:(length(RES$res$x)-1)){
segments(RES$res$x[i],RES$res$y[i],RES$res$x[i+1],RES$res$y[i+1])
}
#entoure d'un carrÃl' le premier point de la trajectoire
points(RES$res$x[1],RES$res$y[1],pch=7,col=4)

# plot of the regression
x11()
plotreg(RES,RES$stat$kmax)

# plot of the cluster located
x11()
for (i in 1:30){
plot(irislist[[i]],xlim=c(-6,8),ylim=c(-7,7),main=" ",lty=3)
par(new=TRUE)
}
plotclus(RES,m=2,limx=c(-6,8),limy=c(-7,7),rcex=11.5,pop=grille)
```

`critval` *Threshold sup F-statistic computation*

Description

Computes the sup F-statistic threshold.

Usage

```
critval(q = 1, k = 2, e = eps)
```

Arguments

`q`	An unused argument fixed to 1.
`k`	The number of breaks.
`e`	The ϵ parameter value.

Value

The threshold value.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

References

Bai J. and Perron P. (2003), Critical values for multiple structural change tests. *Econometrics Journal*, **6**, 72–78.

`critvalwdm` *Threshold of the WD sup F-statistic computation*

Description

Computes the WD sup F-statistic threshold.

Usage

```
critvalwdm(q = 1, e = eps)
```

Arguments

`q`	An unused argument fixed to 1.
`e`	The ϵ parameter value.

Value

The threshold value.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

References

Bai J. and Perron P. (2003), Critical values for multiple structural change tests. *Econometrics Journal*, **6**, 72–78.

datainc *Inclusion of cases in the grid*

Description

If this is not yet done, the cases are included in the point grid.

Usage

```
datainc(data, pop)
```

Arguments

data	Data frame with 2 columns (x and y) or 3 colums (x, y and z) giving coordinates of case data points.
pop	Matrix with 3 or 4 columns giving coordinates of underlying population data points in the first 2 or 3 colums. Last is a column of 1's.

Value

The underlying population coordinate matrix including cases.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

delai *Time computation between two dates*

Description

Computes the time between two dates.

Usage

```
delai(date1, date2)
```

Arguments

date1	The first date, obtained by the function date().
date2	The second date, also obtained by the function date().

Value

An output giving the date in hh:mm:ss format.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

dist2p3d — *Euclidian distance computation in 3D*

Description

Computes the euclidian distance between two 3D point coordinates or between one point and a vector of points.

Usage

```
dist2p3d(x, y, z, x0, y0, z0)
```

Arguments

x	X-coordinate of the second point or the vector of point
y	Y-coordinate of the second point or the vector of point
z	Z-coordinate of the second point or the vector of point
x0	X-coordinate of the first point
y0	Y-coordinate of the first point
z0	Z-coordinate of the first point

Value

dist	The distance computed

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

dist2p — *Euclidian distance computation in 2D*

Description

Computes the euclidian distance between two 2D point coordinates or between one point and a vector of points.

Usage

```
dist2p(x, y, x0, y0)
```

Arguments

x	X-coordinate of the second point or the vector of point
y	Y-coordinate of the second point or the vector of point
x0	X-coordinate of the first point
y0	Y-coordinate of the first point

Value

dist	The distance computed

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

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espdist3d *Distance weighting in 3D*

Description

This function is the 3D version of the espdist function which is described hereafter.

Usage

```
espdist3d(data, pop)
```

Arguments

data	Data frame with 3 colums (x, y and z) giving coordinates of case data points. The first row must be the first trajectory point.
pop	Matrix with 4 columns giving coordinates of underlying population data points in the first 3 colums. Last is a column of 1's. This grid must include the cases of the "data" object.

Details

Value

A list of objects :

res	A result matrix giving, for each point ordered by its rank in the trajectory, its distance to the nearest neighbourg, the expentancy of this distance, and its weighted distance. The last point of the trajectory is not included in the res matrix.
derpoint	A vector containing the last trajectory point coordinates.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

References

See Also

dist2p3d integre3d delai

`espdist` *Distance weighting in 2D*

Description

The distances to the nearest neighbourg are weighted by the expectancy of this distance in the uniform case. This allows first to avoid distance to be higher for the latest selected points, due to the elimination process of pre-selected points, and second to adjust for inhomogeneity in the underlying population density.

Usage

```
espdist(data, pop)
```

Arguments

`data`	Data frame with 2 colums (x and y) giving coordinates of case data points. The first row must be the first trajectory point.
`pop`	Matrix with 3 columns giving coordinates of underlying population data points in the first 2 colums. Last is a column of 1's. This grid must include the cases of the "data" object.

Details

The theory used in this function is based on works of Bickel P. and Breiman L.

Value

A list of objects :

`res`	A result matrix giving, for each point ordered by its rank in the trajectory, its distance to the nearest neighbourg, the expentancy of this distance, and its weighted distance. The last point of the trajectory is not included in the res matrix.
`derpoint`	A vector containing the last trajectory point coordinates.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

References

Bickel P. and Breiman L. (1983), Sum of functions of nearest neighbourg distances, moment bounds, limit theorems and a goodness of fit test. *Annals of Probability*, **11**, 185–214.

See Also

`dist2p` `integre` `delai`

`fstat` *Test statistic*

Description

Computes the F-statistics for each model with k breaks for $k \in 1, \ldots, m$, and the WD max F-statistic that allows to select the number of breaks and determines if the cluster(s) is significant.

Usage

```
fstat(reslst,bc,m,T,eps)
```

Arguments

`reslst`	A matrix giving, for each point ordered by its rank in the trajectory, its distance to the nearest neighbourg, the expentancy of this distance, and its weighted distance.
`bc`	A list. The element k of the list is a vector containing the estimated breaks for the k-breaks model.
`m`	The maximum number of breaks.
`T`	The size of the weighted serie.
`eps`	Minimum size of cluster (ratio of the total number of cases).

Details

The theory used in this function is based on works of J. Bai and P. Perron.

Value

A list of objects :

`F`	A F-statistics matrix giving in the first row the F-statistic value for each of the m models, and the corresponding weighted F-statistics in the second row.
`wdm`	The WD max F-statistic value.
`wdms`	The WD max F-statistic threshold at 5%.
`signif`	A boolean. If True, the cluster(s) located is significant.
`kmax`	The number of breaks of the model maximizing the WD max F-statistic.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

References

Bai J. and Perron P. (1998), Estimating and testing linear models with multiple structural changes. *Econometrica*, **66**, 47–78.

Bai J. and Perron P. (2003), Critical values for multiple structural change tests. *Econometrics Journal*, **6**, 72–78.

See Also

supf critval critvalwdm

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grille *Underlying population coordinates*

Description

This data set gives the X and Y coordinates of 2251 underlying population individuals. It takes the Montpellier density into account. Each point represents 100 inhabitants.

Usage

```
data(grille)
```

Format

A 2 column matrix containing 2251 coordinates

Source

French 1999 population census, INSEE data.

References

Pallez, D. 2000. Recensement de la population 1999 - Quartiers de Montpellier. *Repères pour l'Economie du Languedoc-Roussillon, Synthèse, INSEE Languedoc-Roussilon*, **4**, 1–6.

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integre3d *Distance expectation computation in 3D*

Description

This function is the 3D version of the integre function which is described hereafter.

Usage

```
integre3d(pop, x, y, z, rmax, n, k, pas)
```

Arguments

pop	The grid with "1" if the point has not been yet included in the trajectory, "0" else.
x	X-coordinate of the point from wich we want to compute the expectancy of the distance.
y	Y-coordinate of the point from wich we want to compute the expectancy of the distance.
z	Z-coordinate of the point from wich we want to compute the expectancy of the distance.

rmax	The maximal distance from the (x,y) point to the study area border.
n	The total number of points (cases).
k	The number of points already selected in the trajectory.
pas	Makes possible to choose the precision of the integral calculation.

Value

Value of the computed expectation.

Author(s)

Christophe Dematteï ⟨dematteï@iurc.montp.inserm.fr⟩

See Also

airegrille3d integre

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integre *Distance expectation computation in 2D*

Description

Computes the expectation of the distance from a point to its nearest neighbourg.

Usage

```
integre(pop, x, y, rmax, n, k, pas)
```

Arguments

pop	The grid with "1" if the point has not been yet included in the trajectory, "0" else.
x	X-coordinate of the point from wich we want to compute the expectancy of the distance.
y	Y-coordinate of the point from wich we want to compute the expectancy of the distance.
rmax	The maximal distance from the (x,y) point to the study area border.
n	The total number of points (cases).
k	The number of points already selected in the trajectory.
pas	Makes possible to choose the precision of the integral calculation.

Value

Value of the computed expectation.

Author(s)

Christophe Dematteï ⟨dematteï@iurc.montp.inserm.fr⟩

See Also

airegrille

irislist *List of the* 30 *Montpellier IRIS bounds.*

Description

Montpellier is divided in 30 quarters, called IRIS. This data sets is a list in wich each objects is an object of class "owin" giving the IRIS bounds. The "owin" class is defined in the "spatstat" R package.

Usage

```
data(irislist)
```

Format

A list of 30 objects of class "owin".

Source

GPS location by Christophe Dematteï

References

CDrom INSEE - Réf TABILOIRI. Correspondances IRIS-îlots, Recensement de la population 1999. 14/11/2000.

kulld *Kulldorff circular zone determination*

Description

The spatial scan statistic of Kulldorff is computed using the Poisson or Bernoulli model for each point of the grid, and the circular zone maximizing this statistic is located.

Usage

```
kulld(pop,rndm,methk,export,repexport)
```

Arguments

pop	Matrix with 3 columns giving coordinates of underlying population data points in the first 2 colums. Last is a column of 1's. This population must include the cases of the "data" object.
rndm	A vector giving the row number of the cases.
methk	If 1, the Bernouilli model is used. If 2, the Poisson model is used. If 3, the two models are successively used.
export	If "y", the data will be exported in "repexport" directory in SatScan software format.
repexport	If export = "y", defines the directory in which data in SatScan software format will be exported.

Details

The theory used in this function is based on works of M. Kulldorff.

Value

A list of objects :

`$pois`	A vector giving the results of the Kulldorff method with the Poisson model. lambda is the value of the spatial scan test statistic, loglambda is its logarithm, cx and cy are the coordinates of the circle center and rayon is its ray.
`$bern`	A vector giving the results of the Kulldorff method with the Bernouilli model. lambda is the value of the spatial scan test statistic, loglambda is its logarithm, cx and cy are the coordinates of the circle center and rayon is its ray.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

References

Kulldorff M. (1997), A spatial scan statistic. *Communications in Statistics - Theory and Methods*, **26**, 1481–1496.

Kulldorff M. and Nagarwalla N. (1995), Spatial disease clusters : Detection and Inference. *Statistics in Medicine*, **14**, 799–810.

See Also

`dist2p` `delai`

`multbreak` *Multiple breaks determination*

Description

Determines the breaks by the resolution of the least square problem in the weighted distance regression on the selection order.

Usage

```
multbreak(res,m,h,T)
```

Arguments

`res`	a matrix giving, for each point ordered by its rank in the trajectory, its distance to the nearest neighbourg, the expentancy of this distance, and its weighted distance. The last point of the trajectory is not included in the res matrix.
`m`	The number of breaks.
`h`	The minimal cluster size.
`T`	The size of the weighted distance serie.

Details

This function programming and the underlying method are based on works of J. Bai and P. Perron.

Value

The m breaks vector.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

References

Bai J. and Perron P. (1998), Estimating and testing linear models with multiple structural changes. *Econometrica*, **66**, 47–78.

Bai J. and Perron P. (2003), Critical values for multiple structural change tests. *Econometrics Journal*, **6**, 72–78.

Bai J. and Perron P. (2003), Computation and analysis of multiple structural change models. *Journal of Applied Econometrics*, **18**, 1–22.

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nincdepart3d *First trajectory point determination in 3D*

Description

This function is the 3D version of the nincdepart function which is described hereafter.

Usage

```
nincdepart3d(data, ordre, limx, limy, limz)
```

Arguments

data	Data frame with 3 colums (x, y and z) giving coordinates of case data points.
ordre	The rank of the first trajectory point in term of distance from the edge.
limx	2 element vector containing the study area bounds of the X-axis.
limy	2 element vector containing the study area bounds of the Y-axis.
limz	2 element vector containing the study area bounds of the Z-axis.

Value

The data frame "data" with the first trajectory point on the first row.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

See Also

nincdepart

nincdepart *First trajectory point determination in 2D*

Description

The choice of the first point of the trajectory is given by the rank of the point in term of distance from the edge of the study area. Generally, the point nearest from the edge is chosen (rank = 1).

Usage

```
nincdepart(data, ordre, limx, limy)
```

Arguments

data	Data frame with 2 colums (x and y) giving coordinates of case data points.
ordre	The rank of the first trajectory point in term of distance from the edge.
limx	2 element vector containing the study area bounds of the X-axis.
limy	2 element vector containing the study area bounds of the Y-axis.

Value

The data frame "data" with the first trajectory point on the first row.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

plotclus *Cluster plot*

Description

Plots the data points and a representation of the cluster located.

Usage

```
plotclus(nomlst, m, limx = c(0, 100), limy = c(0, 100), col1 = 225,
        rcex = 0.68, pop, k=floor((m+1)/2))
```

Arguments

nomlst	A list corresponding to the "clus" function's return value.
m	The number of breaks of the model to be plotted.
limx	2 element vector containing the study area bounds of the X-axis.
limy	2 element vector containing the study area bounds of the Y-axis.
col1	The color to be used for the cluster representation.
rcex	The size to be used for the disc surrounding the points localized in cluster.
pop	A 2 column matrix containing the underlying population coordinates.
k	The number of clusters to be displayed.

Details

A cluster groups together the points between two breaks with a low mean distance. The plotreg function allow to choose the number of clusters.

Value

A R-graphic window containing the plot.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

Examples

```
library(spatstat)

data(chemist)
data(grille)
data(irislist)

# location and detection of spatial clusters
# adjusted for an inhomogeneous population density
RES <- clus(chemist,grille,limx=c(-6,8),limy=c(-7,7))

# plot of the cluster located
for (i in 1:30){
plot(irislist[[i]],xlim=c(-6,8),ylim=c(-7,7),main=" ",lty=3)
par(new=TRUE)
}
plotclus(RES,m=2,limx=c(-6,8),limy=c(-7,7),rcex=11.5,pop=grille)
```

---

plotreg *Regression plot*

Description

Plots the ordered distance serie and the regression function.

Usage

```
plotreg(nomlst, m)
```

Arguments

nomlst	A list corresponding to the "clus" function's return value.
m	The number of breaks of the model to be plotted.

Value

A R-graphic window containing the plot.

Note

To plot the regression function with the number of breaks that maximizes the WD max F-statistic, one can use "RES$stat$kmax" as value for the parameter "m" in wich RES is the list returned by the "clus" function.

Author(s)

Christophe Dematteï ⟨demattei@iurc.montp.inserm.fr⟩

Examples

```
library(spatstat)

data(chemist)
data(grille)
data(irislist)

# location and detection of spatial clusters
# adjusted for an inhomogeneous population density
RES <- clus(chemist,grille,limx=c(-6,8),limy=c(-7,7))

# plot of the regression
x11()
plotreg(RES,RES$stat$kmax)
```

---

regdist3d — *Distance weighting and breaks determination in 3D*

Description

This function is the 3D version of the regdist function which is described hereafter.

Usage

```
regdist3d(data, pop, start, m, h, T, limx, limy, limz)
```

Arguments

data	Data frame with 3 colums (x, y and z) giving coordinates of case data points.
pop	Matrix with 4 columns giving coordinates of underlying populations individuals in the first 3 colums. Last is a column of 1's.
start	Indicates the rank of the first trajectory point in term of distance from the area edges. 1 means that the first point of the trajectory is the nearest from the edge.
m	The maximal number of breaks.
h	The minimal cluster size.
T	The size of the weighted distance serie.
limx	2 element vector containing the study area bounds of the X-axis.
limy	2 element vector containing the study area bounds of the Y-axis.
limz	2 element vector containing the study area bounds of the Z-axis.

Value

A list of objects :

res	A result matrix giving, for each point ordered by its rank in the trajectory, its distance to the nearest neighbourg, the expentancy of this distance, and its weighted distance.
bc	A list of vectors. The k^{th} element of the list gives the estimated breaks for the model with k breaks.

Author(s)

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See Also

nincdepart3d espdist3d multbreak regdist

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regdist *Distance weighting and breaks determination in 2D*

Description

Determination of the trajectory, weighting of the distance and determination of the breaks by a regression of the distance on the selection order.

Usage

```
regdist(data, pop, start, m, h, T, limx, limy)
```

Arguments

data	Data frame with 2 colums (x and y) giving coordinates of case data points.
pop	Matrix with 3 columns giving coordinates of underlying populations individuals in the first 2 colums. Last is a column of 1's.
start	Indicates the rank of the first trajectory point in term of distance from the area edges. 1 means that the first point of the trajectory is the nearest from the edge.
m	The maximal number of breaks.
h	The minimal cluster size.
T	The size of the weighted distance serie.
limx	2 element vector containing the study area bounds of the X-axis.
limy	2 element vector containing the study area bounds of the Y-axis.

Value

A list of objects :

res	A result matrix giving, for each point ordered by its rank in the trajectory, its distance to the nearest neighbourg, the expentancy of this distance, and its weighted distance.
bc	A list of vectors. The k^{th} element of the list gives the estimated breaks for the model with k breaks.

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See Also

`nincdepart` `espdist` `multbreak`

`supf` *F-statistic computation*

Description

Computes the F-statistic.

Usage

```
supf(reslst, bc, k, T)
```

Arguments

`reslst`	A matrix giving, for each point ordered by its rank in the trajectory, its distance to the nearest neighbourg, the expentancy of this distance, and its weighted distance.
`bc`	A list. The element k of the list is a vector containing the estimated breaks for the k-break model.
`k`	The number of breaks.
`T`	The size of the weighted distance serie.

Value

`Fdiff`	The F-statistic value

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