Package 'spatgraphs'

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Type Package

Title Graph Edge Computations for Spatial Point Patterns

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Description Graphs (or networks) and graph component calculations for spatial locations in 1D, 2D, 3D etc.

License GPL (>= 2)

LazyData TRUE

Imports Rcpp (>= 0.11.6), Matrix, methods

Suggests rgl

LinkingTo Rcpp

RoxygenNote 7.1.0

Encoding UTF-8

NeedsCompilation yes

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R topics documented:

`adj2sg` *sgadj to sg*

Description

sgadj to sg

Usage

```
adj2sg(x)
```

Arguments

x	sgadj object

as.sg *Class creator*

Description

Class creator

Usage

```
as.sg(edges = list(), type = "?", pars = NULL, note = NULL)
```

Arguments

edges	list of neighbourhoods
type	type
pars	parameters
note	notes

as.sgadj *Creator for sgadj-class*

Description

Creator for sgadj-class

Usage

```
as.sgadj(edges = NULL, type = "?", pars = NULL, other = "")
```

Arguments

edges	edge list-of-lists
type	of the graph
pars	parameters for the graph
other	other comments

as.sgc *Creator for sgc*

Description

Creator for sgc

Usage

```
as.sgc(clusters, type = "?", pars = NULL, note = NULL)
```

Arguments

clusters	list of clusters as point indices
type	type
pars	parameters
note	notes

cut.sg *cut edges*

Description

cut edges

Usage

```
## S3 method for class 'sg'
cut(x, data, R, ...)
```

Arguments

x	sg graph object
data	point pattern used for computing g
R	cutting length
...	ignored
	Removes edges with length > R.

edgeLengths *Edge lengths*

Description

Edge lengths

Usage

```
edgeLengths(g, x, ...)
```

Arguments

g	sg-object
x	point pattern
...	ignored

is_sg *verify class sg*

Description

verify class sg

Usage

```
is_sg(x)
```

Arguments

x	object to check

plot.sg *Plot a spatial graph*

Description

Rudimentary plotting.

Usage

```
## S3 method for class 'sg'
plot(
  x,
  data,
  which = NULL,
  add = FALSE,
  addPoints = FALSE,
  points.pch = 1,
  points.col = 1,
  points.cex = 1,
  max.edges = 10000,
  ...
)
```

Arguments

x	an 'sg' graph object
data	The point pattern object, same as for computing the 'g'
which	Indices of which out-edges to plot. Default: all
add	Add to existing plot? (default: FALSE)
addPoints	Add points? Will be added if add=FALSE
points.pch	point styling
points.col	point styling
points.cex	point styling
max.edges	limit of edges to try to plot, gets very slow at high count. default 1e4
...	passed to 'lines' function

plot.sgadj *plot sgadj*

Description

plot sgadj

Usage

```
## S3 method for class 'sgadj'
plot(x, ...)
```

Arguments

x	sgadj object
...	passed to plot.sg converts to sg and plots that.

plot.sgc *plot clusters*

Description

plot clusters

Usage

```
## S3 method for class 'sgc'
plot(x, data, atleast = 2, add = FALSE, col, ...)
```

Arguments

x	spatcluster-cluster object
data	point pattern object used for computing the graph
atleast	plot only cluster with 'atleast' points in them
add	add or plot new
col	colors for clusters, chosen randomly if missing.
...	passed to points

plot.sgspectral *plot spectral clustering results*

Description

plot spectral clustering results

Usage

```
## S3 method for class 'sgspectral'
plot(x, data, ...)
```

Arguments

x	spectral_sg result
data	point pattern
...	ignored

plot3_sg *Plot 3d graph*

Description

Plot 3d graph

Usage

```
plot3_sg(x, data, which, ...)
```

Arguments

x	sg object
data	coordinates
which	points of which out-edges will be plotted
...	passed to rgl.lines

print.sg *Print method for sg*

Description

Print sg class.

Usage

```
## S3 method for class 'sg'
print(x, ...)
```

Arguments

x	sg object
...	ignored

Details

Print basic info.

print.sgadj *print method for sgadj*

Description

print method for sgadj

Usage

```
## S3 method for class 'sgadj'
print(x, ...)
```

Arguments

x	sgadj object
...	ignored

print.sgc *sgc print method*

Description

sgc print method

Usage

```
## S3 method for class 'sgc'
print(x, ...)
```

Arguments

x	sgc object
...	ignored

prune_sg *Prune a graph*

Description

Prune a graph

Usage

```
prune_sg(g, level = 1, verbose = FALSE)
```

Arguments

g	sg object
level	pruning level
verbose	verbosity

Details

Remove edges from a graph by their path connectivity.

Examples

```
x <- matrix(runif(50*2), ncol=2)
g <- spatgraph(x, "MST")
gp <- prune_sg(g, level = 2)
plot(g, x, lty=2)
plot(gp, x, add=TRUE, col=2)
```

`remove_nodes` *Remove edges connected to certain nodes*

Description

Remove the existence of particular nodes from the graph.

Usage

```
remove_nodes(g, i, fuse = FALSE, verb = FALSE)
```

Arguments

`g`	sg object
`i`	indices of nodes for which to remove the edges
`fuse`	Should the neighours of removed nodes be connected?
`verb`	verbose?

Details

Basically, just clear the neighbourhood of selected indices. If fuse=TRUE, connect neighbours together (excluding i's). Should work over several remove nodes along a path.

Note: g should be symmetric. use sg2sym to force symmetry, it is not checked.

Warning: In development.

Examples

```
x <- matrix(runif(200), ncol=2)
g <- spatgraph(x, "RST", c(1,0))
g <- sg2sym(g)
i <- sample(100, 50)
k <- setdiff(1:100, i)
gs <- remove_nodes(g, i, fuse=TRUE)
plot(g,x, add=FALSE)
points(x[k,], pch=19, col=4)
plot(gs, x, add=TRUE, lty=2, col=3)
```

sg2adj *sg to sgadj*

Description

sg to sgadj

Usage

```
sg2adj(x)
```

Arguments

x	sg object

sg2dxf *sg to dxf format*

Description

sg to dxf format

Usage

```
sg2dxf(g, x, file)
```

Arguments

g	sg object
x	pattern object used for computing g
file	filename for output

sg2igraph *sg to igraph*

Description

sg to igraph

Usage

```
sg2igraph(x)
```

Arguments

x	sg object

sg2sparse — *Make a sparse adjacency matrix from sg-object*

Description

Make a sparse adjacency matrix from sg-object

Usage

```
sg2sparse(x)
```

Arguments

x	sg-object

sg2sym — *Symmetrisation of sg adjacency matrix wrapper for 1way and 2way symmetrisation*

Description

Symmetrisation of sg adjacency matrix wrapper for 1way and 2way symmetrisation

Usage

```
sg2sym(x, way = 1)
```

Arguments

x	sg object
way	1: OR rule, 2: AND rule for keeping edges.

sg2wadj — *weighted sg to weighted adjacency matrix*

Description

weighted sg to weighted adjacency matrix

Usage

```
sg2wadj(x)
```

Arguments

x	weighted sg object

sg_parse_coordinates *Parse input for coordinates*

Description

Extract the coordinate locations from the input object.

Usage

```
sg_parse_coordinates(x, verbose = FALSE)
```

Arguments

x	Input object containing the coordinates in some format.
verbose	Print out info of the coordinates.

sg_verify_parameters *Verify input parameters for the graph*

Description

Mainly for internal use.

Usage

```
sg_verify_parameters(coord, type, par, maxR, doDists, preGraph)
```

Arguments

coord	Coordinates of the locations
type	Type of graph
par	Parameter(s) for the graph
maxR	Maximum range for edges, helps in large patterns.
doDists	Precompute distances? Speeds up some graphs, takes up memory.
preGraph	Precomputed graph, taken as a super-graph

shortestPath *shortest path on the graph*

Description

Djikstra's algorithm

Usage

```
shortestPath(i, j, g, x = NULL, dbg = FALSE)
```

Arguments

i	index from
j	index to
g	sg object
x	optional point pattern from which g was computed
dbg	verbose

sparse2sg *Make an sg-object from adjacency matrix*

Description

Make an sg-object from adjacency matrix

Usage

```
sparse2sg(x)
```

Arguments

x	square matrix. non-0 elements are taken as edge presence.

spatcluster *Compute the connected components of a graph*

Description

Compute the connected components of a graph

Usage

```
spatcluster(x, verbose = TRUE, sym = FALSE)
```

Arguments

x	sg-object
verbose	print info
sym	force symmetry of edges

spatgraph *Compute the edges of a spatial graph*

Description

Given a spatial point pattern, we compute the edges of a graph (network) for a specified type of edge relationship.

Usage

```
spatgraph(
  x,
  type = "geometric",
  par = NULL,
  verbose = FALSE,
  maxR = 0,
  doDists = FALSE,
  preGraph = NULL
)
```

Arguments

x	Input point pattern object
type	Type of the graph
par	Parameter(s) for the graph
verbose	Print details
maxR	Maximum range for edges, helps in large patterns.
doDists	Precompute distances? Speeds up some graphs, takes up memory.
preGraph	Precomputed graph, taken as a super-graph

Details

Several edge definitions are supported:

geometric par=numeric>0. Geometric graph, par = connection radius.

knn par=integer>0. k-nearest neighbours graph, par = k.

mass_geometric Connect two points if ||x-y||<m(x). par=vector giving the m(x_i)'s

markcross Connect two points if ||x-y||<m(x)+m(y). par = vector giving the m(x_i)'s

gabriel Gabriel graph. Additional parameter for allowing `par=k` instead of 0 points in the circle.

MST Minimal spanning tree.

SIG Spheres of Influence.

RST Radial spanning tree, par=origin of radiation, coordinate vector

RNG Relative neighbourhood graph

CCC Class-Cover-Catch, par=factor vector of point types. The factor vector is converted to integers according to R's internal representation of factors, and the points with type 1 will be the target. Use relevel to change the target.

The parameter 'maxR' can be given to bring n^3 graphs closer to n^2. k-nearest neighbours will warn if maxR is too small (<k neighbours for some points), others, like RNG, don't so be careful.

Voronoi diagram aka Delaunay triangulation is not supported as other R-packages can do it, see. e.g. package 'deldir'.

Examples

```
# basic example
x <- matrix(runif(50*2), ncol=2)
g <- spatgraph(x, "knn", par=3)
plot(g, x)

# bigger example
xb <- matrix(runif(5000*2), ncol=2)
gb <- spatgraph(xb, "RNG", maxR=0.1)
```

`spectral_sg` *spectral clustering*

Description

spectral clustering

Usage

```
spectral_sg(g, m = 2, K = 3)
```

Arguments

g	sg object. Should be weighted (with weight_sg-function)
m	levels to consider
K	number of assumed clusters

---

summary.sg *sg summary*

Description

sg summary

Usage

```
## S3 method for class 'sg'
summary(object, ...)
```

Arguments

object	sg object
...	ignored

---

summary.sgc *sgc summary*

Description

sgc summary

Usage

```
## S3 method for class 'sgc'
summary(object, ...)
```

Arguments

object	sgc object
...	ignored

t.sg *Transpose sg object*

Description

This will transpose the adjacency matrix underlying the graph. Will transform to and from sgadj-object (see 'sg2adj')

Usage

```
## S3 method for class 'sg'
t(x)
```

Arguments

x	sg-object.

t.sgadj *Transpose sgadj object*

Description

This will transpose the adjacency matrix underlying the graph.

Usage

```
## S3 method for class 'sgadj'
t(x)
```

Arguments

x	sgadj object

`weight_sg` *Set weights to edges of sg*

Description

For each edge e(i,j) between points i,j, set the weight f(||x_i-x_j||)

Usage

```
weight_sg(g, x, f = function(x) exp(-x^2/scale), scale = 1, ...)
```

Arguments

`g`	sg object
`x`	point pattern used in g
`f`	function for the weight
`scale`	additional scale parameter for the default f
`...`	ignored

Details

Default f(x) = exp(-x^2/scale)

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