

# Package ‘SGCS’

September 18, 2009

**Type** Package

**Title** Spatial Graph based Clustering Summaries for spatial point patterns

**Version** 1.3

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**Depends** spatstat

**Description** Graph based clustering summaries for spatial point patterns. Includes 4 functions: Connectivity function, Cumulative connectivity function and clustering function, plus the triplet intensity function T.

**License** GPL (>= 2)

**Repository** CRAN

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SGCS-package                    *Spatial point process statistics based on a geometric graph.*

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## Description

Three statistical spatial point pattern measures, based on a graph structure over the point pattern data.

Date: 2009-09-08  
License: GPL v2 or later

#### Functions

```
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confun      - Connectivity function
cumconfun   - Cumulative connectivity function
clustfun    - Clustering function
Tfun        - Triplet intensity function T
```

The connectivity function estimates the probability that two points distance  $r$ -apart share a graph component. Cumulative connectivity function is like Ripley's  $K$ -function but conditioned on the points sharing a graph component. Clustering function is a functional form of the non-spatial graph index, clustering coefficient. Tfun is the intensity of  $r$ -triplets.

The package currently supports only geometric graph, but such graphs as  $k$ -nearest neighbours graph can be easily included if somebody is interested.

#### Author(s)

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#### References

Rajala, Penttinen: Spatial clustering and graph feature statistics (working title). Schladitz, Baddeley: A Third order point process characteristic, SJS, vol 27, 657-671, 2000.

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SGCS-funs

*Connectivity function, Cumulative Connectivity function and Clustering Function.*

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#### Description

Statistical measures based on edges of a geometric graph structure over a given point pattern data.

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The graph structure is in this version geometric graph, meaning points  $x$  and  $y$  are connected if  $\|x-y\| < R$  for the given range parameter  $R$ . Notice that in clustering function, the  $R$  equals to the parameter  $r$ .

The main function is `spatial.graph.cluster.Fun`, but the use of shortcuts `confun`, `cumconfun` and `clustfun` is highly encouraged.

In addition, the triplet intensity function  $T$  (Schladitz & Baddeley 2000) is also included for now:

The Tfun.

## Usage

```
confun(X, r=NULL, R=NULL, h=NULL, ...)
cumconfun(X, r=NULL, R=NULL, ...)
clustfun(X, r=NULL, ...)
Tfun(X, r=NULL, ...)
spatial.graph.cluster.Fun(X, r=NULL, funtype=1, funpars=0,
                           minusRange=NULL, toroidal=FALSE,
                           doDists=FALSE, doWeights=FALSE,
                           prepRange=0, prepGraph=NULL, dbg=
```

## Arguments

X	All: Point pattern object of class <code>ppp</code> from package <code>spatstat</code> .
r	Vector of the range parameters in which to calculate the function value. If <code>NULL</code> , a range from 0 to 1/3 of window length is used.
R	<code>confun</code> , <code>cumconfun</code> : Clustering radius of the graph. If <code>NULL</code> , $R=1/\sqrt{\lambda}$ .
h	<code>confun</code> : Smoothing parameter in kernel-estimation. Box kernel width = $2h$ . <code>NULL</code> -> $h=0.15*R$
...	Parameters for the function <code>art1Fun</code> :
funtype	(shortcuts handle) Which function to calculate. <code>confun=1</code> , <code>cumconfun=2</code> , <code>clustfun=3</code> , <code>Tfun=4</code> .
funpars	(shortcuts handle) Additional function parameter(s): <code>confun</code> <code>fpar=c(R,h)</code> , <code>cumconfun</code> <code>fpar=R</code> .
minusRange	<code>clustfun</code> , <code>Tfun</code> : Minus-correction parameter. Rectangular window required, <code>NULL</code> means no correction.
toroidal	<code>clustfun</code> , <code>Tfun</code> : Toroidal correction of rectangular window.
doDists	Precalculate distances for faster computation. Be aware of memory consumption $n*(n-1)$ .
doWeights	<code>confun</code> , <code>cumconfun</code> : Precalculate translation correction weights for faster computation. Be aware of memory consumption $O(n \times \text{circum}^2)$ .
prepRange	Preparation distance: If $>0$ , precalculate a graph, from which it is easier to find needed connections. Useful with more complicated neighbourhoods than just the geometric (Maybe added in the future).
prepGraph	An optional graph-object from <code>spatgraphs</code> to be used as basis for finding connections between points. Good for big datasets.
dbg	Print additional messages.

## Value

Object of class `fv`, see `spatstat` for details. Has `plot`, `envelope` etc. nice methods.

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**References**

Rajala, Penttinen: Spatial clustering and graph feature statistics (working title). Schladitz, Baddeley: A Third order point process characteristic, SJS, vol 27, 657-671, 2000.

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