

# Package ‘shp2graph’

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**Title** Convert a 'SpatialLinesDataFrame' -Class Object to an  
'igraph'-Class Object

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**Depends** R (>= 3.0.0),igraph

**Imports** methods,sp

**Description** Functions for converting and processing network data from a  
'SpatialLinesDataFrame' -Class object to an 'igraph'-Class object.

**License** GPL (>= 2)

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Degree.list	<i>Degree (In-degree and Out-degree) of nodes</i>
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### Description

A function that returns degrees of nodes from provided “[nodelist](#)” and “[edgelist](#)”; while in-degrees and out-degrees are returned if edges are directed).

### Usage

```
Degree.list(nodelist, edgelist, Directed=F)
```

### Arguments

nodelist	A “ <a href="#">nodelist</a> ” object
edgelist	An “ <a href="#">edgelist</a> ” object
Directed	TRUE if edges are directed; FALSE, otherwise

### Value

Lists of different contents are returned for undirected and directed edges respectively: For undirected graph:

DegreeL	An integer vector of degrees for each node in the given “ <a href="#">nodelist</a> ”
---------	--

For directed type:

InDegreeL	An integer vector of In-degrees for each node in the given “ <a href="#">nodelist</a> ”
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OutDegreeL	An integer vector of Out-degrees for each node in the given “ <a href="#">nodelist</a> ”
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### Note

This function returns differently for undirected and directed networks, where both In-degrees and Out-degrees are calculated for a directed network, and only degrees are returned for an undirected networks.

### Author(s)

Binbin Lu <binbinlu@whu.edu.cn>

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Directed	<i>Orientate all the edges in a given edgelist</i>
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### Description

A function to orientate each edge according to the given vector.

### Usage

```
Directed(edgelist, direction.v=rep(0,length(edgelist[,1])), eadf=NULL)
```

### Arguments

edgelist	An “ <a href="#">edgelist</a> ” object
direction.v	A vector (of the length equalling to the number of edges in the given “ <a href="#">edgelist</a> ”) with values of 1 (TRUE) or 0 (FALSE), 1 (TRUE) indicates a directed (one-way) edge, while 0 (FALSE) means an undirected (double-way) edge
eadf	A data frame of attributes corresponding to all the edges;

### Details

Within a road network, some road segments might be one-way while the rest are double-way. This situation makes it complex to define directed or undirected edges in a graph. This function is to orientate each edge according to the given vector, “direction.v”: 1 (TRUE) indicates one-way, while 0 (FALSE) represents double-way. All the double-way (undirected) edges in the given “[edgelist](#)” are redefined as two directed edges (e.g. a double-way (undirected) edge(nid1, nid2) is redefined as two one-way (directed) edges, (nid1, nid2) and (nid2, nid1)). The one-way (directed) edges are left in their directed forms. In other words, all the edges returned by this function will be directed, and used to be construct a directed graph.

### Value

A list consisted of:

newEdgelist	An “ <a href="#">edgelist</a> ” object with directed edges
newEadf	A data frame of attributes for the new “ <a href="#">edgelist</a> ”

### Author(s)

Binbin Lu <binbinlu@whu.edu.cn>

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edgelist	<i>A designed structure to denote edges from a spatial network</i>
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### Description

“edgelist” is an interchange structure of edges from a spatial network into an “igraph” object. It is a three-column matrix, of which each row is designed as [EdgeID,NodeID(from),NodeID(to)].

### Details

Both “[nodelist](#)” and “[edgelist](#)” are interchange structures of nodes and edges extracted from a spatial network in a “SpatialLines” or “SpatialLinesDataFrame” object. They are always concerned together, and returned by the function [readshpnrw](#) as initial results for the following steps.

### Note

If the parameter “Detailed” specified in [readshpnrw](#) is TRUE, all the endpoints of polyines will be extracted as nodes, then the converted graph will have the same spatial details with the transformed “SpatialLines” or “SpatialLinesDataFrame” object. To retrieve the original attributes in the “SpatialLinesDataFrame” object, the original edge ID is also kept and the row structure will be [EdgeID,eid,NodeID(from),NodeID(to)], in which EdgeID refers to the new edge id while eid represents the original edge ID.

### Author(s)

Binbin Lu <binbinlu@whu.edu.cn>

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ERN_OSM	<i>Estevan road network from OpenStreetMap (SpatialLinesDataFrame)</i>
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### Description

This data set is a part of Estevan road network downloaded from OpenStreetMap, and a version with topology errors corrected is also incorporated.

### Usage

```
data(ERN_OSM)
data(ERN_OSM_correct)
```

### Format

Two “SpatialLinesDataFrame” objects named “ERN\_OSM.nt” and “ERN\_OSM\_cor.nt”.

### Source

<https://www.openstreetmap.org/#map=14/49.1388/-102.9961>

## References

OpenStreetMap. 2014. Estevan road network. ed. O. community.

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LNHP

*London house price and hedonic data (SpatialPointsDataFrame)*

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## Description

This data set is sampled from a house price data set provided by the Nationwide Building Society of the UK, and combined with various hedonic variables.

## Usage

```
data(LNHP)
```

## Format

A “SpatialPointsDataFrame” object named “LN.prop”.

## Details

In this data set, attributes are interpreted as follows:

PURCHASE: sale price in GBP

FLOORSZ: floor size of the property in square metres;

BATH2: 1 if the property has 2 or more bathrooms, 0 otherwise;

BEDS2: 1 if the property has 2 or more bedrooms, 0 otherwise;

CENTHEAT: 1 if the property has central heating, 0 otherwise;

GARAGE1: 1 if the property has one or more garages, 0 otherwise;

BLDPWW1: 1 if the property was built prior to 1914, 0 otherwise;

BLDINTW: is 1 if the property was built between 1914 and 1939, 0 otherwise;

BLD60S: 1 if the property was built between 1960 and 1969, 0 otherwise;

BLD70S: 1 if the property was built between 1970 and 1979, 0 otherwise;

BLD80S: 1 if the property was built between 1980 and 1989, 0 otherwise;

BLD90S: 1 if the property was built between 1990 and 2000, 0 otherwise;

TYPEDETCH: 1 if the property is detached (i.e. it is stand-alone), 0 otherwise;

TYPETRRD: 1 if the property is in a terrace of similar houses, 0 otherwise;

TYPEFLAT: 1 if the property is a flat or apartment, 0 otherwise;

PROF: percentage of the workforce in professional or managerial occupations in the census enumeration district in which the house is located.

UNEMPLOY: percentage of unemployment in the census enumeration district in which the house is located.

X: X coordinate.

Y: Y coordinat.

## References

Lu, B., M. Charlton, P. Harris & A. S. Fotheringham (2014) Geographically weighted regression with a non-Euclidean distance metric: a case study using hedonic house price data. *International Journal of Geographical Information Science*, 28, 660-681.

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LNNT

*London Road network data (SpatialLinesDataFrame)*

---

## Description

The London Road network data set is produced by the UK Ordnance Survey (OS) in 2001.

## Usage

`data(LNNT)`

## Format

A “SpatialLinesDataFrame” object named “LN.nt”.

## Details

In this data set, roads are categorized into four types (`nt_RoadTyp`):

Mo: motorway

a: A-road

b: B-road

Mi: minor road

Speed limit for each road segment is also incorporated in the attribute “Speed” (Transport for London, 2011)

## References

Lu, B., M. Charlton, P. Harris & A. S. Fotheringham (2014) Geographically weighted regression with a non-Euclidean distance metric: a case study using hedonic house price data. *International Journal of Geographical Information Science*, 28, 660-681.

Transport for London, (2011) Intelligent Speed Adaptation [online]. [http://www.tfl.gov.uk/corporate/projectsandschemes/7893.aspx#For\\_developers](http://www.tfl.gov.uk/corporate/projectsandschemes/7893.aspx#For_developers). Available from: [http://www.tfl.gov.uk/corporate/projectsandschemes/7893.aspx#For\\_developers](http://www.tfl.gov.uk/corporate/projectsandschemes/7893.aspx#For_developers).

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ME.simplification      *Simplify multiple edges in a network*

---

### Description

A function to simplify multiple-edge into one representative edge, where a multiple-edge structure refers to a set of edges sharing with the same pair of nodes.

### Usage

```
ME.simplification(nodelist, edgelist, eadf=NULL, ea.prop=NULL, Directed=F,
                 DegreeL=NULL, InDegreeL=NULL, OutDegreeL=NULL, Nexception=NULL,
                 Eexception=NULL)
```

### Arguments

nodelist	A “ <a href="#">nodelist</a> ” object;
edgelist	An “ <a href="#">edgelist</a> ” object
eadf	A data frame of attributes corresponding to all the edges;
ea.prop	A vector (of the length equalling to the number of edge attributes in “eadf”) with values of 1, 2, 3 or 4, and each specific value represent a function to assign the attributes of the edited edges, see also <a href="#">Redef.functions</a> : 1->sum(v) 2->min(v) 3->max(v) 4->mean(v)
Directed	TRUE if edges are directed, FALSE otherwise;
DegreeL	An integer vector of degrees for each node in the given “ <a href="#">nodelist</a> ”, and it could be ignored if edges are directed
InDegreeL	An integer vector of In-degrees for each node in the given “ <a href="#">nodelist</a> ”, and it could be ignored if edges are undirected
OutDegreeL	An integer vector of Out-degrees for each node in the given “ <a href="#">nodelist</a> ”, and it could be ignored if edges are undirected
Nexception	A vector of node IDs concerned as exceptions, and all the edges with these nodes included won’t be processed;
Eexception	A vector of edge IDs concerned as exceptions, and all these edges won’t be processed;

### Value

Two types of list returned for undirected and directed edges, respectively:

For “undirected” edges:

newNodelist      New node list with multiple-edges simplified;

newEdgelist      New edge list with multiple-edges simplified;  
 newEadf          New attribute data frame for the returned edgelist;  
 DegreeL          New degree vector coresponding to the newly returned node list;

For “directed” network:

newNodelist      New node list with multiple-edges simplified;  
 newEdgelist      New edgelist with multiple-edges simplified;  
 newEadf          Data frame of attributes for the newly returned edge list;  
 InDegreeL        New In-degree vector coresponding to the newly returned node list;  
 OutDegreeL       New Out-degree vector coresponding to the newly returned node list;

### Note

Edges are recognised as a structure of multiple-edge when they share the same pair of nodes. Note that the order of the nodes should be also the same when edges are directed.

### Author(s)

Binbin Lu <binbinlu@whu.edu.cn>

### See Also

[SL.extraction](#), [PN.amalgamation](#)

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nel2igraph	<i>Produce an “igraph” object</i>
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---

### Description

A function to produce an “igraph” object with the “[nodelist](#)” and “[edgelist](#)”, which could be returned by the function [readshpnw](#).

### Usage

```
nel2igraph(nodelist, edgelist, weight = NULL, eadf = NULL, Directed = FALSE)
```

### Arguments

nodelist          A “[nodelist](#)” object  
 edgelist          An “[edgelist](#)” object  
 weight            A numeric vector to weight all the edges in the “[edgelist](#)”, of which the length equals to the number of edges;  
 eadf              A data frame of attributes corresponding to all the edges;  
 Directed          TRUE if edges are directed, FALSE otherwise;



**Details**

1. The weighting vector, “weight”, will be used as default for any weighted calculations with edges in the “igraph” object.
2. The coordinate of each node is attached as attributes “X” and “Y”, which could be retrived via the function “get.vertex.attribute” from the package **igraph**.

**Value**

`gr` An “igraph” object

**Author(s)**

Binbin Lu <binbinlu@whu.edu.cn>

**Examples**

```
data(ORN)
rtNEL<-readshpnw(ORN.nt, ELComputed=TRUE)
#Add the edge length as the weight for graph
igr<-nel2igraph(rtNEL[[2]],rtNEL[[3]],weight=rtNEL[[4]])
plot(igr, vertex.label=NA, vertex.size=2,vertex.size2=2)
#plot(ORN.nt)
```

---

nodelist

*A designed structure to denote nodes from a spatial network*

---

**Description**

“nodelist” is an interchange structure of nodes from a spatial network into an “igraph” object. It is a two-column data frame, of which each row is designed as [NodeID,coordinate(X,Y)].

**Details**

Both “[nodelist](#)” and “[edgelist](#)” are interchange structures of nodes and edges extracted from a spatial network in a “SpatialLines” or “SpatialLinesDataFrame” object. They are always concerned together, and returned by the function [readshpnw](#) as initial results for the following steps.

**Author(s)**

Binbin Lu <binbinlu@whu.edu.cn>

---

Nodes.coordinates	<i>Return the coordinates of nodes in a “<a href="#">nodelist</a>”</i>
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---

### Description

A function that returns the coordinates of nodes in a two-column matrix (X,Y) from a “[nodelist](#)”

### Usage

```
Nodes.coordinates(nodelist)
```

### Arguments

nodelist	A “ <a href="#">nodelist</a> ” object
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### Value

Nodesxy	A two-column matrix (X, Y)
---------	----------------------------

### Author(s)

Binbin Lu <[binbinlu@whu.edu.cn](mailto:binbinlu@whu.edu.cn)>

---

nt.connect	<i>Check the connectivity of a given network</i>
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---

### Description

A function to check the connectivity of a given network.

### Usage

```
nt.connect(nt)
```

### Arguments

nt	A “SpatialLines” or “SpatialLinesDataFrame” object.
----	---

### Details

In this function, all the nodes are traversed, and classified dynamically via a rule, that any pair of different nodes fall into a same category if they could be reached from each other. A map will be plotted spontaneously with different categories (i.e. self-connected parts) in distinct colors. Finally, the self-connected part with the most nodes will be returned as a new “SpatialLinesDataFrame” object.

**Author(s)**

Binbin Lu <binbinlu@whu.edu.cn>

---

ORN

*Ontario road network data (SpatialLinesDataFrame)*

---

**Description**

This data set is a part of Ontario road network data set downloaded from Ontario Ministry of Natural Resources.

**Usage**

data(ORN)

**Format**

A “SpatialLinesDataFrame” object named “ORN.nt”.

**Source**

<https://www.geographynetwork.ca/website/orn/viewer.htm>

**References**

Peterborough, ON: Ontario Ministry of Natural Resources, Ontario Road Network. Available: <https://www.geographynetwork.ca/website/orn/viewer.htm>, 2006, (Accessed Dec. 4, 2009)

---

PN.amalgamation

*Amalgamate edges connected by a pseudo-node*

---

**Description**

A function to amalgamate edges connected by a pseudo-node.

**Usage**

```
PN.amalgamation(nodelist, edgelist, eadf=NULL, ea.prop=NULL, Directed=F,  
DegreeL=NULL, InDegreeL=NULL, OutDegreeL=NULL, Nexception=NULL,  
Eexception=NULL)
```

**Arguments**

nodelist	A “nodelist” object;
edgelist	An “edgelist” object
eadf	A data frame of attributes corresponding to all the edges;
ea.prop	A vector (of the length equalling to the number of edge attributes in “eadf”) with values of 1, 2, 3 or 4, and each specific value represent a function to assign the attributes of the edited edges, see also <a href="#">Redef.functions</a> : 1->sum(v) 2->min(v) 3->max(v) 4->mean(v)
Directed	TRUE if edges are directed, FALSE otherwise;
DegreeL	An integer vector of degrees for each node in the given “nodelist”, and it could be ignored if edges are directed
InDegreeL	An integer vector of In-degrees for each node in the given “nodelist”, and it could be ignored if edges are undirected
OutDegreeL	An integer vector of Out-degrees for each node in the given “nodelist”, and it could be ignored if edges are undirected
Nexception	A vector of node IDs concerned as exceptions, and all the edges with these nodes included won’t be processed;
Eexception	A vector of edge IDs concerned as exceptions, and all these edges won’t be processed;

**Value**

Two types of list returned for undirected and directed edges, respectively:

For “undirected” edges:

newNodelist	New node list with pseudo-nodes removed;
newEdgelist	New edge list with pseudo-nodes removed;
newEadf	New attribute data frame for the returned edgelist;
DegreeL	New degree vector cooresponding to the newly returned node list;

For “directed” network:

newNodelist	New node list with pseudo-nodes removed;
newEdgelist	New edgelist with pseudo-nodes removed;
newEadf	Data frame of attributes for the newly returned edge list;
InDegreeL	New In-degree vector cooresponding to the newly returned node list;
OutDegreeL	New Out-degree vector cooresponding to the newly returned node list;

**Note**

Node in a directed network is recognised a a pseudo-node with in-degree and out-degree equalling to 1; while it could be a pseudo-node with degree equalling to 2 in a undirected network.

**Author(s)**

Binbin Lu <binbinlu@whu.edu.cn>

**See Also**

[SL.extraction](#), [ME.simplification](#)

**Examples**

```
data(ORN)
rtNEL<-readshpnw(ORN.nt, ELComputed=TRUE)
res.sl<-SL.extraction(rtNEL[[2]],rtNEL[[3]])
res.me<-ME.simplification(res.sl[[1]],res.sl[[2]],DegreeL=res.sl[[4]])
res.pn<-PN.amalgamation(res.me[[1]],res.me[[2]],DegreeL=res.me[[4]])
ptcoords<-Nodes.coordinates(res.pn[[1]])
#plot(ORN.nt)
#points(ptcoords, col="green")
#plot(ORN.nt)
#points(Nodes.coordinates(rtNEL[[2]]), col="red")
```

---

points2network

*Integrate a point data set into a network*

---

**Description**

A function to integrate an individual point data set into a network under different rules (see details below).

**Usage**

```
points2network(ntdata,pointscopy,approach=1,ELComputed=FALSE,longlat=F,
              Detailed=F, ea.prop=NULL)
```

**Arguments**

ntdata	A “SpatialLinesDataFrame” or “SpatialLines” object
pointscopy	A two-column matrix of point coordinates (X, Y)
approach	specified by an integer ranging from 1 to 4 to define the approach for integration: 1: Mapping each point to the nearest node in the network/graph 2: Mapping each point to the nearest point (add them as nodes if they are not on the network) 3: Add a new edge(virtual edge) between each point and the nearest node 4: Add a new edge(virtual edge) between each point and the nearest point
ELComputed	If TRUE, the length of each edge will be calculated and returned
longlat	If TRUE, distances on an ellipse with WGS84 parameters will be returned

Detailed	If TRUE, all the vertices within the polylines of a spatial network will be recognised as nodes; if FALSE, only two endpoints of each polyline are treated as nodes
ea.prop	A vector (of the length equalling to the number of edge attributes in in the network “ntdata”) with values of 1 or 0: 1: the corresponding column in the data frame will be kept for the new network; 0: the corresponding column in the data frame will not be kept.

### Value

A list consisted of:

nodelist	A “ <a href="#">nodelist</a> ” object
edgelist	An “ <a href="#">edgelist</a> ” object
CoorespondIDs	A vector of the cooresponding node ID for each point in “pointsxy”
nodexlist	A vector contains X-coordinates of all the nodes
nodeylist	A vector contains Y-coordinates of all the nodes
Eadf	A data frame of attributes of the returned edges, of which the structure is a data frame with [EdgeID,(attributes inherited from the input network data)]
VElist	A list of virtual edges if added, i.e. approaches 3 and 4 are used
Edgelengeth	If “ELComputed” is TRUE, lengths of all the edges will be returned as a numeric vector; otherwise it will be NULL.

### Author(s)

Binbin Lu <binbinlu@whu.edu.cn>

### See Also

[ptsinnt.view](#)

### Examples

```
## Not run:
data(ORN)
pts<-spsample(ORN.nt, 100, type="random")
ptsxy<-coordinates(pts)[,1:2]
ptsxy<-cbind(ptsxy[,1]+0.008,ptsxy[,2]+0.008)
#Mapping each point to the nearest node in the network/graph
res<-points2network(ntdata=ORN.nt,pointsxy=ptsxy, approach=1)
ptsinnt.view(ntdata=rn, nodelist=res[[1]], pointsxy=ptsxy,
             CoorespondIDs=res[[3]])
#Mapping each point to the nearest point (add them as nodes if they are not) on
#the network
res<-points2network(ntdata=ORN.nt,pointsxy=ptsxy, approach=2,ea.prop=rep(0,37))
ptsinnt.view(ntdata=ORN.nt, nodelist=res[[1]], pointsxy=ptsxy, CoorespondIDs=res[[3]])
#Add a new edge(Virtual edge) between each point and the nearest node
res<-points2network(ntdata=ORN.nt,pointsxy=ptsxy, approach=3,ea.prop=rep(0,37))
```

```

VElist<-res[[7]]
ptsinnt.view(ntdata=ORN.nt, nodelist=res[[1]], pointsxy=ptsxy, CoorespondIDs=res[[3]],
            VElist=VElist)
#Add a new edge(Virtual edge) between each point and the nearest point
res<-points2network(ntdata=ORN.nt,pointsxy=ptsxy, approach=4,ea.prop=rep(0,37))
VElist<-res[[7]]
ptsinnt.view(ntdata=ORN.nt, nodelist=res[[1]], pointsxy=ptsxy, CoorespondIDs=res[[3]],
            VElist=VElist)

## End(Not run)

```

---

ptsinnt.view

*Visualize the integration between a point data set and spatila network*


---

## Description

A specific function to visualize the integration between a point data set and spatila network, i.e. results returned by the function [points2network](#)

## Usage

```
ptsinnt.view(ntdata, nodelist, pointsxy, CoorespondIDs, VElist=NULL)
```

## Arguments

ntdata	A “SpatialLinesDataFrame” or “SpatialLines” object
nodelist	A “ <a href="#">nodelist</a> ” object
pointsxy	A two-column matrix of point coordinates (X, Y)
CoorespondIDs	A vector of the cooresponding node ID for each point in “pointsxy”
VElist	A list of virtual edges if added, i.e. approaches 3 and 4 are used

## Author(s)

Binbin Lu <[binbinlu@whu.edu.cn](mailto:binbinlu@whu.edu.cn)>

## See Also

[points2network](#)

## Examples

```

data(ORN)
#pts<-spsample(ORN.nt, 100, type="random")
#ptsxy<-coordinates(pts)[,1:2]
#ptsxy<-cbind(ptsxy[,1]+0.008,ptsxy[,2]+0.008)
#Mapping each point to the nearest node in the network/graph
#res<-points2network(ntdata=ORN.nt,pointsxy=ptsxy, mapping.method=1)
#Visualize the results without virtual edges

```

```
#ptsinnt.view(ntdata=ORN.nt, nodelist=res[[1]], pointsxy=ptsxy,
#             CoorespondIDs=res[[3]])
#Visualize the results with virtual edges
#res<-points2network(ntdata=ORN.nt,pointsxy=ptsxy, mapping.method=3,
#                   ea.prop=rep(0,37))
#Velist<-res[[7]]
#ptsinnt.view(ntdata=ORN.nt, nodelist=res[[1]], pointsxy=ptsxy,
#             CoorespondIDs=res[[3]], Velist=Velist)
```

---

readshpnw	<i>Read a network from a “SpatialLines” or “SpatialLinesDataFrame” object</i>
-----------	---

---

### Description

A function to read a spatial network from a “SpatialLines” or “SpatialLinesDataFrame” object, and resolve it into a “[nodelist](#)” and “[edgelist](#)” for the following conversion.

### Usage

```
readshpnw(ntdata, ELComputed=FALSE, longlat=FALSE, Detailed=FALSE, ea.prop=NULL)
```

### Arguments

ntdata	A “SpatialLinesDataFrame” or “SpatialLines” object
ELComputed	If TRUE, the length of each edge will be calculated and returned
longlat	If TRUE, distances on an ellipse with WGS84 parameters will be returned
Detailed	If TRUE, all the vertices within the polylines of a spatial network will be recognised as nodes; if FALSE, only two endpoints of each polyline are treated as nodes
ea.prop	A vector (of the length equalling to the number of edge attributes in in the network “ntdata”) with values of 1 or 0: 1: the corresponding column in the data frame will be kept for the new network; 0: the corresponding column in the data frame will not be kept.

### Details

This function plays the first step to convert a spatial network (in a “SpatialLines” or “SpatialLinesDataFrame” object) into an “igraph” object by returning a “[nodelist](#)” and “[edgelist](#)”.

### Value

A list consisted of:

Detailed	TRUE if the output is under a “Detailed” mode;
nodelist	A “ <a href="#">nodelist</a> ” object



edgelist	An “ <a href="#">edgelist</a> ” object
Edgelenlength	If “ELComputed” is TRUE, lengths of all the edges will be returned as a numeric vector; otherwise it will be NULL.
Eadf	A data frame of attributes of the returned edges, of which the structure is a data frame with [EdgeID,(attributes inherited from the input network data)]
nodexlist	A vector contains X-coordinates of all the nodes
nodeylist	A vector contains Y-coordinates of all the nodes

**Author(s)**

Binbin Lu <binbinlu@whu.edu.cn>

**Examples**

```
data(ORN)
rtNEL<-readshpnw(ORN.nt)
n1<-rtNEL[[2]]
e1<-rtNEL[[3]]
#Compute edge length
rtNEL<-readshpnw(ORN.nt, ELComputed=TRUE)
edgelenlength<-rtNEL[[4]]
eadf<-rtNEL[[5]]
```

---

Redef.functions      *A collection of functions for redefining attributes of edited edges*

---

**Description**

A function to provide a collection of functions to redefine attributes of edited edges in the functions [PN.amalgamation](#) and [ME.simplification](#).

**Usage**

```
Redef.functions(v, typ=1)
```

**Arguments**

v	An input vector for the specified function;
typ	A value equalling to 1, 2, 3 or 4 to specify a redefinition function: 1->sum(v) 2->min(v) 3->max(v) 4->mean(v)

**Note**

It is easy to include more specific methods for attribute redefinition via incorporating the corresponding functions. In other words, you can define more methods by numbering them with 5, 6, etc.

**Author(s)**

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SL.extraction	<i>Extract self-loops form given network</i>
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**Description**

A function to extract self-loops away in given network.

**Usage**

```
SL.extraction(nodelist, edgelist, eadf=NULL, Directed=F, DegreeL=NULL,
              InDegreeL=NULL, OutDegreeL=NULL, Nexception=NULL, Eexception=NULL)
```

**Arguments**

nodelist	A “ <a href="#">nodelist</a> ” object;
edgelist	An “ <a href="#">edgelist</a> ” object
eadf	A data frame of attributes corresponding to all the edges;
Directed	TRUE if edges are directed, FALSE otherwise;
DegreeL	An integer vector of degrees for each node in the given “ <a href="#">nodelist</a> ”, and it could be ignored if edges are directed
InDegreeL	An integer vector of In-degrees for each node in the given “ <a href="#">nodelist</a> ”, and it could be ignored if edges are undirected
OutDegreeL	An integer vector of Out-degrees for each node in the given “ <a href="#">nodelist</a> ”, and it could be ignored if edges are undirected
Nexception	A vector of node IDs concerned as exceptions, and all the edges with these nodes included won’t be processed;
Eexception	A vector of edge IDs concerned as exceptions, and all these edges won’t be processed;

**Value**

Two types of list returned for undirected and directed edges, respectively:

For “undirected” edges:

<code>newNodeList</code>	New node list with self-loops removed;
<code>newEdgeList</code>	New edge list with self-loops removed;
<code>newEadf</code>	New attribute data frame for the returned edgelist;
<code>DegreeL</code>	New degree vector coresponding to the newly returned node list;

For “directed” network:

<code>newNodeList</code>	New node list with self-loops removed;
<code>newEdgeList</code>	New edgelist with self-loops removed;
<code>newEadf</code>	Data frame of attributes for the newly returned edge list;
<code>InDegreeL</code>	New In-degree vector coresponding to the newly returned node list;
<code>OutDegreeL</code>	New Out-degree vector coresponding to the newly returned node list;

**Note**

An edge is recognised as a structure of self-loop when it starts and ends at the same point (location).

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**See Also**

[PN.amalgamation](#), [ME.simplification](#)

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