Package ‘SpatialPosition’

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**contourStewart**

Create a SpatialPolygonsDataFrame or a SpatialLinesDataFrame from a Stewart Raster

**Description**

`contourStewart` is deprecated. To obtain contour lines use `rasterToContour` from raster package. To obtain contour polygons use `rasterToContourPoly` from SpatialPosition package.

This function creates a SpatialPolygonsDataFrame or SpatialLinesDataFrame contour from the Stewart raster.

**Usage**

```r
contourStewart(x, breaks, mask, type = "line")
```

**Arguments**

- `x`: raster; output of the `rasterStewart` function. The raster must contain only positive values.
- `breaks`: numeric; a vector of break values.
- `mask`: SpatialPolygonsDataFrame; mask used to clip contour shapes.
- `type`: character; "poly" or "line". WARNING: the poly option is experimental (see details). It needs the rgeos package.
Details

To obtain a correct SpatialPolygonsDataFrame of potentials follow these steps:

- Step 1: Create a SpatialPointsDataFrame of potentials with the stewart function. Do not enter an unknownpts layer, set a resolution, and set a SpatialPolygonsDataFrame (spmask) as mask.
- Step 2: Create a raster from the SpatialPointsDataFrame of potentials with the rasterStewart function without using a mask.
- Step 3: Create the SpatialPolygonsDataFrame of potentials with the contourStewart function and use the same spmask SpatialPolygonsDataFrame (Step1) as mask.

See also the second example in the examples section.

Value

The output of the function is a SpatialPolygonsDataFrame (type = "poly") or a SpatialLinesDataFrame (type = "line"). The data frame of the outputed SpatialPolygonsDataFrame contains four fields: id (id of each polygon), min and max (minimum and maximum breaks of the polygon), mean (center value of the class)

See Also

rasterToContourPoly.

Examples

data("spatData")
## Not run:
#### Example with type = "line"
mystewart <- stewart(unknownpts = spatPts, varname = "Capacite",
                     typefct = "exponential", span = 1000, beta = 3,
                     resolution = 50,
                     mask = spatMask)
# Create a raster of potentials values
mystewartraster <- rasterStewart(x = mystewart, mask = spatMask)
# Display the raster and get break values
break.values <- plotStewart(x = mystewartraster)
# Create contour SpatialLinesDataFrame
mystewartcontourpoly <- contourStewart(x = mystewartraster,
                                       breaks = break.values,
                                       type = "line")
# Display the Map
plot(spatMask, add=TRUE)
plot(mystewartcontourpoly, border = "grey40", add = TRUE)
plot(spatPts, cex = 0.8, pch = 20, col = "black", add = TRUE)

#### Example with type = "poly"
mystewart <- stewart(unknownpts = spatPts, varname = "Capacite",
                     typefct = "exponential", span = 1000, beta = 3,
                     resolution = 50, longlat = FALSE,
Create a Distance Matrix Between Two Sp Objects

Description

This function creates a distance matrix between two sp objects (SpatialPointsDataFrame or SpatialPolygonsDataFrame).

Usage

CreateDistMatrix(knownpts, unknownpts, bypassctrl = FALSE, longlat = TRUE)

Arguments

- knownpts: sp object; rows of the distance matrix.
- unknownpts: sp object; columns of the distance matrix.
- bypassctrl: logical; bypass the distance matrix size control (see Details).
- longlat: logical; if FALSE, Euclidean distance, if TRUE Great Circle (WGS84 ellipsoid) distance.
Details

The function returns a full matrix of distances in meters. This is a wrapper for the \texttt{spDists} function.

If the matrix to compute is too large (more than 100,000,000 cells, more than 10,000,000 origins or more than 10,000,000 destinations) the function sends a confirmation message to warn users about the amount of RAM mobilized. Use \texttt{bypassctrl = TRUE} to skip this control.

Value

A distance matrix, row names are \texttt{knownpts} row names, column names are \texttt{unknownpts} row names.

See Also

\texttt{CreateGrid}

Examples

\begin{verbatim}
# Create a SpatialPointsDataFrame grid of spatMask extent and 200 meters
# resolution
data(spatData)
mygrid <- CreateGrid(w = spatMask, resolution = 200)
# Create a distance matrix between known spatPts and mygrid
mymat <- CreateDistMatrix(knownpts = spatPts, unknownpts = mygrid)
mymat[1:5,1:5]
nrow(spatPts)
nrow(mygrid)
dim(mymat)
\end{verbatim}

Description

This function creates a regular grid of SpatialPointsDataFrame from the extent of a given sp object and a given resolution.

Usage

\texttt{CreateGrid(w, resolution)}

Arguments

\begin{itemize}
  \item \texttt{w} \hspace{1cm} sp object; the spatial extent of this object is used to create the regular SpatialPointsDataFrame.
  \item \texttt{resolution} \hspace{1cm} numeric; resolution of the grid (in map units). If resolution is not set, the grid will contain around 7500 points. (optional)
\end{itemize}
Value

The output of the function is a SpatialPointsDataFrame of regularly spaced points with the same extent as w.

See Also

CreateDistMatrix

Examples

```r
# Create a SpatialPointsDataFrame grid of spatMask extent and 200 meters
# resolution
data(spatData)
mygrid <- CreateGrid(w = spatMask, resolution = 200)
plot(mygrid, cex = 0.1, pch = ".")
plot(spatMask, border="red", lwd = 2, add = TRUE)
```

huff

Huff Catchment Areas

Description

This function computes the catchment areas as defined by D. Huff (1964).

Usage

```r
huff(knownpts, unknownpts = NULL, matdist = NULL, varname,
    typefct = "exponential", span, beta, resolution = NULL, mask = NULL,
    bypassctrl = FALSE, longlat = TRUE)
```

Arguments

- `knownpts`: sp object (SpatialPointsDataFrame or SpatialPolygonsDataFrame); this is the set of known observations to estimate the catchment areas from.
- `unknownpts`: sp object (SpatialPointsDataFrame or SpatialPolygonsDataFrame); this is the set of unknown units for which the function computes the estimates. Not used when `resolution` is set up. (optional)
- `matdist`: matrix; distance matrix between known observations and unknown units for which the function computes the estimates. Row names match the row names of `knownpts` and column names match the row names of `unknownpts`. `matdist` can contain any distance metric (time distance or euclidean distance for example). If `matdist` is NULL, the distance matrix is built with `CreateDistMatrix`. (optional)
- `varname`: character; name of the variable in the `knownpts` dataframe from which values are computed. Quantitative variable with no negative values.
typefct character; spatial interaction function. Options are "pareto" (means power law) or "exponential". If "pareto" the interaction is defined as: \((1 + \alpha \cdot mDistance)^{-\beta}\). If "exponential" the interaction is defined as: \(\exp(-\alpha \cdot mDistance^\beta)\). The alpha parameter is computed from parameters given by the user (beta and span).

span numeric; distance where the density of probability of the spatial interaction function equals 0.5.

beta numeric; impedance factor for the spatial interaction function.

resolution numeric; resolution of the output SpatialPointsDataFrame (in map units). If resolution is not set, the grid will contain around 7250 points. (optional)

mask sp object; the spatial extent of this object is used to create the regularly spaced SpatialPointsDataFrame output. (optional)

bypassctrl logical; bypass the distance matrix size control (see CreateDistMatrix Details).

longlat logical; if FALSE, Euclidean distance, if TRUE Great Circle (WGS84 ellipsoid) distance.

Value

SpatialPointsDataFrame with the computed catchment areas in a new field named OUTPUT.

References


See Also

huff, rasterHuff, plotHuff, CreateGrid, CreateDistMatrix.

Examples

# Create a SpatialPointsDataFrame grid of spatMask extent and 200 meters # resolution
data(spatData)
mygrid <- CreateGrid(w = spatMask, resolution = 200)
# Create a distance matrix between known points (spatPts) and mygrid
mymat <- CreateDistMatrix(knownpts = spatPts, unknownpts = mygrid)
# Compute Huff catchment areas from known points (spatPts) on a given # grid (mygrid) using a given distance matrix (mymat)
myhuff <- huff(knownpts = spatPts, unknownpts = mygrid,
               matdist = mymat, varname = "Capacite",
               typefct = "exponential", span = 1250,
               beta = 3, mask = spatMask)
# Compute Huff catchment areas from known points (spatPts) on a # grid defined by its resolution
myhuff2 <- huff(knownpts = spatPts, varname = "Capacite",
                typefct = "exponential", span = 1250, beta = 3,
                resolution = 200, mask = spatMask)
# The two methods have the same result
mcStewart

Stewart Potentials Parallel

Description

This function computes Stewart potentials using parallel computation.

Usage

mcStewart(knownpts, unknownpts = NULL, varname, typefct = "exponential", span, beta, resolution = NULL, mask = NULL, cl = NULL, size = 1000, longlat = TRUE)

Arguments

knownpts  sp object (SpatialPointsDataFrame or SpatialPolygonsDataFrame); this is the set of known observations to estimate the potentials from.
unknownpts  sp object (SpatialPointsDataFrame or SpatialPolygonsDataFrame); this is the set of unknown units for which the function computes the estimates. Not used when resolution is set up. (optional)
varname  character; name of the variable in the knownpts dataframe from which potentials are computed. Quantitative variable with no negative values.
typefct  character; spatial interaction function. Options are "pareto" (means power law) or "exponential". If "pareto" the interaction is defined as: (1 + alpha * mDistance) ^ (-beta). If "exponential" the interaction is defined as: exp(- alpha * mDistance ^ beta). The alpha parameter is computed from parameters given by the user (beta and span).
span  numeric; distance where the density of probability of the spatial interaction function equals 0.5.
beta  numeric; impedance factor for the spatial interaction function.
resolution  numeric; resolution of the output SpatialPointsDataFrame (in map units). If resolution is not set, the grid will contain around 7250 points. (optional)
mask  sp object; the spatial extent of this object is used to create the regularly spaced SpatialPointsDataFrame output. (optional)
cl  numeric; number of clusters. By default cl is determined using parallel::detectCores().
size  numeric; mcStewart splits unknownpts in chunks, size indicates the size of each chunks.
longlat  logical; if FALSE, Euclidean distance, if TRUE Great Circle (WGS84 ellipsoid) distance.
mcStewart

Details

The parallel implementation splits potentials computations along chunks of unknownpts (or chunks of the grid defined using resolution). It only uses Great Cercle distances (with CreateDistMatrix).

Value

A Spatial*DataFrame with the computed potentials in a new field named OUTPUT is returned.

See Also

stewart.

Examples

```r
## Not run:
if(require(cartography)){
  nuts3.spdf@data <- nuts3.df
t1 <- system.time(
    s1 <- stewart(knownpts = nuts3.spdf, resolution = 40000,
    varname = "pop2008",
    typefct = "exponential", span = 100000,
    beta = 3, mask = nuts3.spdf)
  )
  t2 <- system.time(
    s2 <- mcStewart(knownpts = nuts3.spdf, resolution = 40000,
      varname = "pop2008",
      typefct = "exponential", span = 100000,
      beta = 3, mask = nuts3.spdf, cl = 3, size = 500)
  )
  identical(s1, s2)
cat("Elapsed time\n", "stewart: ", t1[3], \\
  "\n parStewart:", t2[3])
  r2 <- rasterStewart(s2)
c2 <- rasterToContourPoly(r = r2, breaks = c(0,1000000,2000000, 5000000,
    10000000, 20000000, 200000000),
    mask = nuts3.spdf)
  # cartography
  opar <- par(mar = c(0,0,1.2,0))
bks <- sort(unique(c(c2$min, c2$max)))
  choroLayer(spdf = c2, var = "center", breaks = bks, border = NA,
    legend.title.txt = "pop")
  layoutLayer("potential population", ",","", scale = NULL)
  par(opar)
}
## End(Not run)
```
plotHuff

Plot a Huff Raster

Description
This function plots the raster produced by the `rasterHuff` function.

Usage
```
plotHuff(x, add = FALSE)
```

Arguments
- `x` raster; output of the `rasterHuff` function.
- `add` logical; if TRUE the raster is added to the current plot, if FALSE the raster is displayed in a new plot.

Value
Display the raster nicely.

See Also
- `huff`, `rasterHuff`, `plotHuff`, `CreateGrid`, `CreateDistMatrix`.

Examples
```
data(spatData)
# Compute Huff catchment areas from known points (spatPts) on a
# grid defined by its resolution
myhuff <- huff(knownPts = spatPts, varname = "Capacite",
               typefct = "exponential", span = 750, beta = 2,
               resolution = 100, mask = spatMask)
# Create a raster of huff values
myhuffraster <- rasterHuff(x = myhuff, mask = spatMask)
plotHuff(myhuffraster)
```

plotReilly

Plot a Reilly Raster

Description
This function plots the raster produced by the `rasterReilly` function.

Usage
```
plotReilly(x, add = FALSE, col = rainbow)
```
Arguments

x raster; output of the `rasterReilly` function.
add logical; if TRUE the raster is added to the current plot, if FALSE the raster is displayed in a new plot.
col function; color ramp function, such as `colorRampPalette`.

Details

Display the raster nicely.

See Also

`reilly`, `rasterReilly`, `plotReilly`, `CreateGrid`, `CreateDistMatrix`.

Examples

data(spatData)
row.names(spatPts) <- spatPts$CodHop
# Compute Reilly catchment areas from known points (spatPts) on a
# grid defined by its resolution
myreilly <- reilly(knownpts = spatPts, varname = "Capacite",
            typefct = "exponential", span = 750, beta = 2,
            resolution = 100, mask = spatMask)
# Create a raster of reilly values
myreillyraster <- rasterReilly(x = myreilly, mask = spatMask)
# Plot the raster nicely
plotReilly(x = myreillyraster)
QuickStewart

Description

This function is a wrapper around stewart, rasterStewart and rasterToContourPoly functions. Providing only the main parameters of these functions, it simplifies a lot the computation of potentials. This function creates a SpatialPolygonsDataFrame of potential values. It also allows to compute directly the ratio between the potentials of two variables.

Usage

quickStewart(spdf, df, spdfid = NULL, dfid = NULL, var, var2 = NULL, typefct = "exponential", span, beta, resolution = NULL, mask = NULL, nclass = 8, breaks = NULL, bypassctrl = FALSE)

Value

Display the raster nicely and return the list of break values (invisible).

See Also

stewart, rasterStewart, quickStewart, rasterToContourPoly, CreateGrid, CreateDistMatrix.

Examples

data(spatData)
# Compute Stewart potentials from known points (spatPts) on a
# grid defined by its resolution
mystewart <- stewart(knowmpnts = spatPts, varname = "Capacite",
                     typefct = "exponential", span = 1000, beta = 3,
                     resolution = 100, mask = spatMask)
# Create a raster of potentials values
mystewartraster <- rasterStewart(x = mystewart, mask = spatMask)
# Plot stewart potentials nicely
plotStewart(x = mystewartraster, add = FALSE, nclass = 5)
# Can be used to obtain break values
break.values <- plotStewart(x = mystewartraster, add = FALSE, nclass = 5)
break.values

quickStewart Create a SpatialPolygonsDataFrame of Potentials Contours
Arguments

- **spdf**: a SpatialPolygonsDataFrame.
- **df**: a data frame that contains the values to compute.
- **spdfid**: name of the identifier field in spdf, default to the first column of the spdf data frame. (optional)
- **dfid**: name of the identifier field in df, default to the first column of df. (optional)
- **var**: name of the numeric field in df used to compute potentials. This field is used for ratio computation (see Details).
- **var2**: name of the numeric field in df used to compute potentials.
- **typefct**: character; spatial interaction function. Options are "pareto" (means power law) or "exponential". If "pareto" the interaction is defined as: \((1 + \alpha \times \text{mDistance})^{-\beta}\). If "exponential" the interaction is defined as: \(\exp(- \alpha \times \text{mDistance} ^ \beta)\). The alpha parameter is computed from parameters given by the user (beta and span).
- **span**: numeric; distance where the density of probability of the spatial interaction function equals 0.5.
- **beta**: numeric; impedance factor for the spatial interaction function.
- **resolution**: numeric; resolution of the output SpatialPointsDataFrame (in map units). If resolution is not set, the grid will contain around 7250 points. (optional)
- **mask**: SpatialPolygonsDataFrame; mask used to clip contours of potentials.
- **nclass**: numeric; a targeted number of classes (default to 8). Not used if breaks is set.
- **breaks**: numeric; a vector of values used to discretize the potentials.
- **bypassctrl**: logical; bypass the distance matrix size control (see createDistMatrix Details).

Details

If var2 is provided the ratio between the potentials of var (numerator) and var2 (denominator) is computed.

Value

A SpatialPolygonsDataFrame is returned (see rasterToContourPoly Value).

See Also

stewart, rasterStewart, plotStewart, rasterToContourPoly, CreateGrid, CreateDistMatrix.

Examples

```r
# load data
data("spatData")
# Compute a SpatialPolygonsDataFrame of potentials
pot.spdf <- quickStewart(spdf = spatPts, 
    df = spatPts$data,
```
rasterHuff

Create a Raster from a Huff SpatialPointsDataFrame

Description

This function creates a raster from a regularly spaced Huff SpatialPointsDataFrame (output of the huff function).

Usage

rasterHuff(x, mask = NULL)

Arguments

x  
sp object (SpatialPointsDataFrame); output of the huff function.

mask  
sp object (SpatialPolygonsDataFrame); this object is used to clip the raster. (optional)
Value

Raster of catchment areas values.

See Also

huff, rasterHuff, plotHuff, CreateGrid, CreateDistMatrix.

Examples

data(spatData)
# Compute Huff catchment areas from known points (spatPts) on a
# grid defined by its resolution
myhuff <- huff(knownpts = spatPts, varname = "Capacite",
               typefct = "exponential", span = 750, beta = 2,
               resolution = 100, mask = spatMask)
# Create a raster of huff values
myhuffraster <- rasterHuff(x = myhuff, mask = spatMask)
plot(myhuffraster)

---

rasterReilly

Create a Raster from a Reilly SpatialPointsDataFrame

Description

This function creates a raster from a regularly spaced Reilly SpatialPointsDataFrame (output of the
reilly function).

Usage

rasterReilly(x, mask = NULL)

Arguments

x
sp object (SpatialPointsDataFrame); output of the reilly function.

mask
sp object (SpatialPolygonsDataFrame); this object is used to clip the raster. (optional)

Value

Raster of catchment areas values. The raster uses a RAT (ratify) that contains the correspondance
between raster values and catchement areas values. Use unique(levels(rasterName)[[1]]) to
see the correspondance table.

See Also

reilly, rasterReilly, plotReilly, CreateGrid, CreateDistMatrix.
Examples

```r
data(spatData)
row.names(spatPts) <- spatPts$CodHop
# Compute Reilly catchment areas from known points (spatPts) on a
# grid defined by its resolution
myreilly <- reilly(knownpts = spatPts, varname = "Capacite",
                    typefct = "exponential", span = 750, beta = 2,
                    resolution = 100, mask = spatMask)
# Create a raster of reilly values
myreillyraster <- rasterReilly(x = myreilly, mask = spatMask)
plot(myreillyraster, col = rainbow(18))
# Correspondance between raster values and reilly areas
head(unique(levels(myreillyraster)[[1]]))
```

---

`rasterStewart`  
*Create a Raster from a Stewart SpatialPointsDataFrame*

**Description**

This function creates a raster from a regularly spaced Stewart SpatialPointsDataFrame (output of the `stewart` function).

**Usage**

```r
rasterStewart(x, mask = NULL)
```

**Arguments**

- `x`  
  sp object (SpatialPointsDataFrame); output of the `stewart` function.

- `mask`  
  sp object (SpatialPolygonsDataFrame); this object is used to clip the raster. (optional)

**Value**

Raster of potential values.

**See Also**

`stewart`, `quickStewart`, `plotStewart`, `rasterToContourPoly`, `CreateGrid`, `CreateDistMatrix`.

**Examples**

```r
data(spatData)
# Compute Stewart potentials from known points (spatPts) on a
# grid defined by its resolution
mystewart <- stewart(knownpts = spatPts, varname = "Capacite",
                      typefct = "exponential", span = 1000, beta = 3,
                      resolution = 100, mask = spatMask)
```
rasterToContourPoly

# Create a raster of potentials values
mystewartraster <- rasterStewart(x = mystewart, mask = spatMask)
plot(mystewartraster)

rasterToContourPoly Create a SpatialPolygonsDataFrame from a Raster

Description
This function creates a contour SpatialPolygonsDataFrame from a raster.

Usage
rasterToContourPoly(r, nclass = 8, breaks = NULL, mask = NULL)

Arguments
r raster; the raster must contain only positive values.
nclass numeric; a number of class.
breaks numeric; a vector of break values.
mask SpatialPolygonsDataFrame; mask used to clip contour shapes. The mask should
have a smaller extent than r.

Details
This function uses the rgeos package.

Value
The output of the function is a SpatialPolygonsDataFrame. The data frame of the outputed SpatialPolygonsDataFrame contains four fields: id (id of each polygon), min and max (minimum and maximum breaks of the polygon), center (central values of classes)

See Also
stewart, rasterStewart, plotStewart, quickStewart, CreateGrid, CreateDistMatrix.

Examples
data("spatData")
## Not run:
mystewart <- stewart(knownpts = spatPts, varname = "Capacite",
  typefct = "exponential", span = 1000, beta = 3,
  resolution = 50, mask = spatMask)
# Create a raster of potentials values
mystewartraster <- rasterStewart(x = mystewart)
# Create contour SpatialLinesDataFrame
contourpoly <- rasterToContourPoly(r = mystewartraster,
```
nclass = 6,
mask = spatMask)

# Created breaks
bks <- sort(unique(c(contourpoly$min, contourpoly$max)))

# Display the map
library(cartography)
par <- par(mar = c(0,0,1.2,0))
choroLayer(spdf = contourpoly,
  df = contourpoly$data,
  var = "center", legend.pos = "topleft",
  breaks = bks, border = "grey90",
  lwd = 0.2,
  legend.title.txt = "Potential number\nof beds in the\neighbourhood",
  legend.values.rnd = 0)
plot(spatMask, add = TRUE)
propSymbolsLayer(spdf = spatPts, df = spatPts$data, var = "Capacite",
  legend.title.txt = "Number of beds",
  col = "#ff000020")
layoutLayer(title = "Global Accessibility to Public Hospitals",
  south = TRUE, sources = "", author = "")
par(opar)

## End(Not run)
```

---

**reilly**

### Reilly Catchment Areas

**Description**

This function computes the catchment areas as defined by W.J. Reilly (1931).

**Usage**

```r
reilly(knownpts, unknownpts = NULL, matdist = NULL, varname,
  typefct = "exponential", span, beta, resolution = NULL, mask = NULL,
  bypassctrl = FALSE, longlat = TRUE)
```

**Arguments**

- **knownpts** sp object (SpatialPointsDataFrame or SpatialPolygonsDataFrame); this is the set of known observations to estimate the catchment areas from.
- **unknownpts** sp object (SpatialPointsDataFrame or SpatialPolygonsDataFrame); this is the set of unknown units for which the function computes the estimates. Not used when `resolution` is set up. (optional)
- **matdist** matrix; distance matrix between known observations and unknown units for which the function computes the estimates. Row names match the row names of `knownpts` and column names match the row names of `unknownpts`. `matdist` can contain any distance metric (time distance or euclidean distance for example). If `matdist` is NULL, the distance matrix is built with `CreateDistMatrix`. (optional)
 variName character; name of the variable in the knownpts dataframe from which values are computed. Quantitative variable with no negative values.

typeFct character; spatial interaction function. Options are "pareto" (means power law) or "exponential". If "pareto" the interaction is defined as: \((1 + \alpha \times m\text{Distance})^{-\beta}\). If "exponential" the interaction is defined as: \(\exp(- \alpha \times m\text{Distance} ^ \beta)\). The alpha parameter is computed from parameters given by the user (beta and span).

span numeric; distance where the density of probability of the spatial interaction function equals 0.5.

beta numeric; impedance factor for the spatial interaction function.

resolution numeric; resolution of the output SpatialPointsDataFrame (in map units). If resolution is not set, the grid will contain around 7250 points. (optional)

mask sp object; the spatial extent of this object is used to create the regularly spaced SpatialPointsDataFrame output. (optional)

bypassCtrl logical; bypass the distance matrix size control (see CreateDistMatrix Details).

longLat logical; if FALSE, Euclidean distance, if TRUE Great Circle (WGS84 ellipsoid) distance.

Value

SpatialPointsDataFrame with the computed catchment areas in a new field named OUTPUT. Values match the row names of knownpts.

References

REILLY, W. J. (1931) The law of retail gravitation, W. J. Reilly, New York.

See Also

reilly, rasterReilly, plotReilly, CreateGrid, CreateDistMatrix.

Examples

# Create a SpatialPointsDataFrame grid of spatMask extent and 200 meters resolution
data(spatData)
mygrid <- CreateGrid(w = spatMask, resolution = 200)
# Create a distance matrix between known points (spatPts) and mygrid
mymat <- CreateDistMatrix(knownpts = spatPts, unknownpts = mygrid)
# Compute Reilly catchment areas from known points (spatPts) on a given grid (mygrid) using a given distance matrix (mymat)
myreilly2 <- reilly(knownpts = spatPts, unknownpts = mygrid,
  matdist = mymat, variName = "Capacite",
  typefct = "exponential", span = 1250,
  beta = 3, mask = spatMask)
row.names(spatPts) <- spatPts$CODHop
# Compute Reilly catchment areas from known points (spatPts) on a
# grid defined by its resolution
myreilly <- reilly(knownpts = spatPts, varname = "Capacite",
                   typefct = "exponential", span = 1250, beta = 3,
                   resolution = 200, mask = spatMask)

# The function output a SpatialPointsDataFrame
class(myreilly)

# The OUTPUT field values match knownpts row names
head(unique(myreilly$OUTPUT))

smoothy  
Stewart Smooth

Description
This function computes a distance weighted mean. It offers the same parameters as stewart: user defined distance matrix, user defined impedance function (power or exponential), user defined exponent.

Usage
smoothy(knownpts, unknownpts = NULL, matdist = NULL, varname,
         typefct = "exponential", span, beta, resolution = NULL, mask = NULL,
         bypassctrl = FALSE, longlat = TRUE)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>knownpts</td>
<td>sp object (SpatialPointsDataFrame or SpatialPolygonsDataFrame); this is the</td>
</tr>
<tr>
<td></td>
<td>set of known observations to estimate the potentials from.</td>
</tr>
<tr>
<td>unknownpts</td>
<td>sp object (SpatialPointsDataFrame or SpatialPolygonsDataFrame); this is the</td>
</tr>
<tr>
<td></td>
<td>set of unknown units for which the function computes the estimates. Not used</td>
</tr>
<tr>
<td></td>
<td>when resolution is set up. (optional)</td>
</tr>
<tr>
<td>matdist</td>
<td>matrix; distance matrix between known observations and unknown units for</td>
</tr>
<tr>
<td></td>
<td>which the function computes the estimates. Row names match the row names</td>
</tr>
<tr>
<td></td>
<td>of knownpts and column names match the row names of unknownpts. matdist can</td>
</tr>
<tr>
<td></td>
<td>contain any distance metric (time distance or euclidean distance for example).</td>
</tr>
<tr>
<td></td>
<td>If matdist is NULL, the distance matrix is built with CreateDistMatrix.</td>
</tr>
<tr>
<td></td>
<td>(optional)</td>
</tr>
<tr>
<td>varname</td>
<td>character; name of the variable in the knownpts dataframe from which potentials</td>
</tr>
<tr>
<td></td>
<td>are computed. Quantitative variable with no negative values.</td>
</tr>
<tr>
<td>typefct</td>
<td>character; spatial interaction function. Options are &quot;pareto&quot; (means power law)</td>
</tr>
<tr>
<td></td>
<td>or &quot;exponential&quot;. If &quot;pareto&quot; the interaction is defined as: (1 + alpha * mDistance) ^ (-beta). If &quot;exponential&quot; the interaction is defined as: exp(- alpha * mDistance ^ beta). The alpha parameter is computed from parameters given by the user (beta and span).</td>
</tr>
<tr>
<td>span</td>
<td>numeric; distance where the density of probability of the spatial interaction function equals 0.5.</td>
</tr>
</tbody>
</table>
smoothy

beta numeric; impedance factor for the spatial interaction function.
resolution numeric; resolution of the output SpatialPointsDataFrame (in map units). If resolution is not set, the grid will contain around 7250 points. (optional)
mask sp object; the spatial extent of this object is used to create the regularly spaced SpatialPointsDataFrame output. (optional)
bypassctrl logical; bypass the distance matrix size control (see CreateDistMatrix Details).
longlat logical; if FALSE, Euclidean distance, if TRUE Great Circle (WGS84 ellipsoid) distance.

Value
SpatialPointsDataFrame with the computed potentials in a new field named OUTPUT

See Also
stewart.

Examples

# Create a SpatialPointsDataFrame grid of spatMask extent and 200 meters resolution data(spatData)
mygrid <- CreateGrid(w = spatMask, resolution = 200)
# Create a distance matrix between known points (spatPts) and mygrid mymat <- CreateDistMatrix(knownpts = spatPts, unknownpts = mygrid)
# Compute Stewart potentials from known points (spatPts) on a given grid (mygrid) using a given distance matrix (mymat)
mystewart <- smoothy(knownpts = spatPts, unknownpts = mygrid,
matdist = mymat, varname = "Capacite",
typefct = "exponential", span = 1250,
beta = 3, mask = spatMask)
# Compute Stewart potentials from known points (spatPts) on a grid defined by its resolution
mystewart2 <- smoothy(knownpts = spatPts, varname = "Capacite",
typefct = "exponential", span = 1250, beta = 3,
resolution = 200, mask = spatMask)
# The two methods have the same result identical(mystewart, mystewart2)
# the function output a SpatialPointsDataFrame class(mystewart)
# Computed values
summary(mystewart$OUTPUT)
SpatialPosition  

*Spatial Position Package*

**Description**

Computes spatial position models:

- Stewart potentials,
- Reilly catchment areas,
- Huff catchment areas.

An introduction to the package conceptual background and usage:

- vignette(topic = "SpatialPosition")
- vignette(topic = "StewartExample").

**References**


**See Also**

`stewart, rasterStewart, plotStewart, quickStewart, mcStewart, smoothy, rasterToContourPoly, huff, rasterHuff, plotHuff, reilly, rasterReilly, plotReilly, CreateGrid, CreateDistMatrix`.

spatMask  

*Paris Perimeter*

**Description**

A SpatialPolygonsDataFrame of the Paris perimeter.

spatPts  

*Public Hospitals*

**Description**

A SpatialPointsDataFrame of 18 public hospitals with their capacity (Capacite field = number of beds).
spatUnits  

*Spatial Units of Paris*

**Description**

A SpatialPolygonsDataFrame of the 20 spatial arrondissements of the Paris.

stewart  

*Stewart Potentials*

**Description**

This function computes the potentials as defined by J.Q. Stewart (1942).

**Usage**

```r
stewart(knownpts, unknownpts = NULL, matdist = NULL, varname, typefct = "exponential", span, beta, resolution = NULL, mask = NULL, bypassctrl = FALSE, longlat = TRUE)
```

**Arguments**

- **knownpts**
  sp object (SpatialPointsDataFrame or SpatialPolygonsDataFrame); this is the set of known observations to estimate the potentials from.

- **unknownpts**
  sp object (SpatialPointsDataFrame or SpatialPolygonsDataFrame); this is the set of unknown units for which the function computes the estimates. Not used when resolution is set up. (optional)

- **matdist**
  matrix; distance matrix between known observations and unknown units for which the function computes the estimates. Row names match the row names of `knownpts` and column names match the row names of `unknownpts`. `matdist` can contain any distance metric (time distance or euclidean distance for example). If `matdist` is NULL, the distance matrix is built with `CreateDistMatrix`. (optional)

- **varname**
  character; name of the variable in the `knownpts` dataframe from which potentials are computed. Quantitative variable with no negative values.

- **typefct**
  character; spatial interaction function. Options are "pareto" (means power law) or "exponential". If "pareto" the interaction is defined as: `(1 + alpha * mDistance) ^ (-beta)`. If "exponential" the interaction is defined as: `exp(- alpha * mDistance ^ beta)`. The alpha parameter is computed from parameters given by the user (beta and span).

- **span**
  numeric; distance where the density of probability of the spatial interaction function equals 0.5.

- **beta**
  numeric; impedance factor for the spatial interaction function.
resolution numeric; resolution of the output SpatialPointsDataFrame (in map units). If resolution is not set, the grid will contain around 7250 points. (optional)

mask sp object; the spatial extent of this object is used to create the regularly spaced SpatialPointsDataFrame output. (optional)

bypassctrl logical; bypass the distance matrix size control (see CreateDistMatrix Details).

longlat logical; if FALSE, Euclidean distance, if TRUE Great Circle (WGS84 ellipsoid) distance.

Value

SpatialPointsDataFrame with the computed potentials in a new field named OUTPUT

References


See Also

rasterStewart, plotStewart, quickStewart, rasterToContourPoly, CreateGrid, CreateDistMatrix.

Examples

# Create a SpatialPointsDataFrame grid of spatMask extent and 200 meters
# resolution
data(spatData)
mygrid <- CreateGrid(w = spatMask, resolution = 200)
# Create a distance matrix between known points (spatPts) and mygrid
mymat <- CreateDistMatrix(knownpts = spatPts, unknownpts = mygrid)
# Compute Stewart potentials from known points (spatPts) on a given
# grid (mygrid) using a given distance matrix (mymat)
mystewart <- stewart(knownpts = spatPts, unknownpts = mygrid,
   matdist = mymat, varname = "Capacite",
   typefct = "exponential", span = 1250,
   beta = 3, mask = spatMask)

# Compute Stewart potentials from known points (spatPts) on a
# grid defined by its resolution
mystewart2 <- stewart(knownpts = spatPts, varname = "Capacite",
   typefct = "exponential", span = 1250, beta = 3,
   resolution = 200, mask = spatMask)

# The two methods have the same result
identical(mystewart, mystewart2)
# the function output a SpatialPointsDataFrame
class(mystewart)
# Computed values
summary(mystewart$OUTPUT)
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