

Package: spemd (via r-universe)

September 15, 2024

Title A Bi-Dimensional Implementation of the Empirical Mode Decomposition for Spatial Data

Version 0.1-1

Description This implementation of the Empirical Mode Decomposition (EMD) works in 2 dimensions simultaneously, and can be applied on spatial data. It can handle both gridded or un-gridded datasets.

URL <https://github.com/pierreroudier/spemd>

BugReports <https://github.com/pierreroudier/spemd/issues>

Depends R (>= 3.2.3)

License GPL-3

LazyData true

Collate 'create_neig.r' 'extract_extrema.r' 'extrema_irr.r'
'mean_enveloppe.r' 'spemd.r'

Imports sp, spdep, MBA

Suggests gstat

RoxygenNote 6.0.1

Repository <https://pierreroudier.r-universe.dev>

RemoteUrl <https://github.com/pierreroudier/spemd>

RemoteRef HEAD

RemoteSha 8c193baded359fd25db8d3556701c2ce9623cd6e

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|-------------|--------------------|
| create.neig | <i>create.neig</i> |
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Description

Internal function, initiates the neighbourhood relationships between the points in the processed data set.

Usage

```
create.neig(data.set, nb.nn = 4, duplicate = "remove", verbose = FALSE)
```

Arguments

| | |
|-----------|--|
| data.set | Data set to create neighbourhood from. |
| nb.nn | Number of nearest neighbours. Defaults to 4. |
| duplicate | Ignored. |
| verbose | Prints progress information messages. Defaults to FALSE. |

Author(s)

Pierre Roudier

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|-----------------|------------------------|
| extract.extrema | <i>extract.extrema</i> |
|-----------------|------------------------|

Description

Internal function, explicitly returns a list with the tri objects of the extrema.

Usage

```
extract.extrema(tri.obj, n.extrema.min = 1)
```

Arguments

| | |
|---------------|---|
| tri.obj | . |
| n.extrema.min | . |

Author(s)

Pierre Roudier

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|-------------|--------------------|
| extrema.irr | <i>extrema.irr</i> |
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Description

Internal function, finds regional extrema on a irregularly sampled data set

Usage

```
extrema.irr(data.set, gridded.data, neig = NULL, zcol = "z",  
duplicate = "remove", nb.nn = 4, thresh.extrema = 1, verbose = FALSE)
```

Arguments

| | |
|----------------|--|
| data.set | . |
| gridded.data | . |
| neig | Neighbourhood object. |
| zcol | Name of the column containing the data. |
| duplicate | What to do with duplicates. Defaults to 'remove'. |
| nb.nn | Number of nearest neighbours to take into account if data is on a grid. Defaults to 4. |
| thresh.extrema | Significative threshold for the extrema. Defaults to 1. |
| verbose | Prints progress information messages. Defaults to FALSE. |

Author(s)

Pierre Roudier

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| return.mean.enveloppe | <i>return.mean.enveloppe</i> |
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Description

Internal function, returns the mean envelope of a spatial dataset.

Usage

```
return.mean.enveloppe(extrema, data, zcol = "z", method = "splines",  
n.pts.spline = 3, verbose = TRUE)
```

Arguments

| | |
|--------------|--|
| extrema | . |
| data | . |
| zcol | Name of the column containing the data. |
| method | Interpolation method. Currently only 'splines' is supported. |
| n.pts.spline | . |
| verbose | Prints progress information messages. Defaults to TRUE. |

Author(s)

Pierre Roudier

spEMD

spEMD

Description

2D EMD for spatial objects

Usage

```
spEMD(data, zcol = "z", method = "splines", n.imf.max = 10,
       n.sp.max = 5, n.extrema.min = 1, stoprule = "mean.imf",
       stoprule.extrema = TRUE, thresh.extrema = 1, tol = 0,
       diff.nb.extrema = 0.05, abs.nb.extrema = 5, nb.nn = 4,
       n.pts.spline = 4, neig = NULL, save_neig = TRUE, verbose = TRUE)
```

Arguments

| | |
|------------------|---|
| data | Input dataset, either a 'data.frame' or a 'Spatial*DataFrame' |
| zcol | Name of the column containing the attribute of interest. |
| method | Interpolation method. Currently only 'splines' is supported. |
| n.imf.max | Maximum depth of decomposition (maximum number of IMF). |
| n.sp.max | Number of iterations in the sifting process. |
| n.extrema.min | Minimum number of extrema. |
| stoprule | Rule used to stop the EMD process. Currently only 'mean.imf' is implemented. |
| stoprule.extrema | Should 'spEMD' checks for the number of extrema to be similar? Defaults to 'TRUE'. |
| thresh.extrema | Significative threshold for the extrema. Defaults to 1. |
| tol | Value that the average of the IMF candidate need to reach so to be considered as a valid IMF. |

| | |
|-----------------|--|
| diff.nb.extrema | Percentage limit difference maxima/minima. If smaller, more permissive on the mean of the IMF candidate. |
| abs.nb.extrema | Absolute difference between number of extrema. |
| nb.nn | Number of nearest neighbours to take into account (when data is on a regular grid). |
| n.pts.spline | Number of points to locally interpolate IMFs. |
| neig | Option the re-use a formerly existing neig object in order to save time. |
| save_neig | Option to save the neig object as a .RData file once created. |
| verbose | Prints progress information messages. Defaults to TRUE. |

Value

.

Author(s)

Pierre Roudier

Examples

```
# Getting sample data from the gstat package
if (require(gstat)) {
  library(sp)

  # Example for gridded data
  data(ncp.grid, package = 'gstat')
  coordinates(ncp.grid) <- ~x+y
  gridded(ncp.grid) <- TRUE
  res.ncp <- spEMD(ncp.grid, zcol = "depth", thresh.extrema = 0.1, verbose = FALSE)

  # Plot results
  spplot(res.ncp[, c('imf1', "imf2", "imf3")])
}

#
```

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