Package ‘mpmcorrelogram’

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Type Package

Title Multivariate Partial Mantel Correlogram

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Description Functions to compute and plot multivariate (partial) Mantel correlograms.

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R topics documented:

example.data . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 2
mpmcorrelogram . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 2

Index 7
Example data matrices used by Legendre and Legendre (1998) to exemplify the computation of multivariate Mantel correlograms. S is assumed to represent a similarity matrix computed from assemblage data among 10 sampling sites within a 1-km² sampling area (Legendre and Legendre 1998: 737). D is the matrix of euclidean distances among the sampling localities (Legendre and Legendre 1998: 718). Zd is another distance matrix, assumed to represent some other multivariate difference among sites (e.g., environmental differences) that are more accentuated for distances greater than 0.28 km.

Usage

```r
data(S)
data(D)
data(Zd)
```

References


Examples

```r
data(S)
data(Zd)
```

**Description**

Function `mpmcorrelogram` computes both multivariate and multivariate partial Mantel correlograms. Multivariate Mantel correlograms were proposed by Sokal (1986) and Oden and Sokal (1986) and popularized among ecologists by Legendre and Legendre (1998, pp. 736-738). Multivariate partial Mantel correlograms are described and employed by Matesanz et al. (2011).
**Usage**

```r
mpmcorrelogram(xdis, geodis, zdis = NULL, method = "pearson",
    alfa = 0.05, nclass = NULL, breaks = NULL,
    permutations = 999, strata, simil = FALSE,
    plot = TRUE, print = TRUE)
```

```r
# S3 method for class 'mpmcorrelogram'
plot(x, pch = c(15, 22), xlim = NULL, ylim = NULL,
    ylab = NULL, xlab = NULL, alfa = 0.05, ...)
```

**Arguments**

- `xdis, geodis, zdis` 
  Multivariate distance (or similarity) matrices or their `as.dist` representation
- `method` 
  Correlation method, as accepted by `cor`: "pearson", "spearman" or "kendall".
- `alfa` 
  Significance level for the points drawn with black symbols in the correlogram. By default `alpha = 0.05`.
- `nclass` 
  Number of distance classes. Default is `null`, causes Sturge’s law being used to determine the number of classes unless break points are provided.
- `breaks` 
  Vector with break points of the distance classes.
- `permutations` 
  Number of permutations for the tests of significance.
- `strata` 
  An integer vector or factor specifying the strata for permutation. If supplied, observations are permuted only within the specified strata.
- `simil` 
  Logical. Is the first matrix a similarity matrix? Default is `FALSE`.
- `plot` 
  Logical. Should the correlogram be plotted?
- `print` 
  Logical. Should the results be printed?
- `x` 
  An object of class `mpmcorrelogram`, i.e. resulting from function `mpmcorrelogram`.
- `pch` 
  Vector with two integers (or two single characters) specifying the symbols (or characters) to plot respectively the significant and non-significant Mantel values. See `points` for possible values and their interpretation.
- `xlim` 
  Vector with the limits for the x-axis.
- `ylim` 
  Vector with the limits for the y-axis.
- `ylab` 
  Label for the y-axis.
- `xlab` 
  Label for the x-axis.
- ... Other parameters passed to print and plot methods.

**Details**

The function `mpmcorrelogram` computes both Mantel correlograms and partial Mantel correlograms. A correlogram is a graph in which spatial correlation values are plotted, on the ordinate, as a function of the geographic distance classes among the study units along the abscissa. In a "classical" Mantel correlogram, a Mantel correlation (Mantel 1967) is computed between a multivariate (e.g. ...
multi-species or multi-locus) distance or similarity matrix and a design matrix representing each of the geographic distance classes in turn. The Mantel statistic is tested through a permutational Mantel test performed by **vegan**’s **mantel** function.

In a partial Mantel correlogram, a partial correlation conditioned on a third matrix is computed between the focal matrix and the design matrix representing each of the geographic distance classes. In this case, the partial Mantel statistic is tested through a permutational test performed by **vegan**’s **mantel.partial** function.

A practical application of the use of the partial Mantel correlogram can be seen in Matesanz et al. (2011).

**Value**

If the arguments `plot` and `print` are both `TRUE`, **mpmcorrelogram** by default will draw a correlogram where solid squares indicate significant `rM` values and void squares indicate non-significant ones. It will also print the results as a table. In any case, **mpmcorrelogram** will return an object of class `mpmcorrelogram`, i.e. a list with the following elements:

- **breaks**: Vector with the break points of the distance classes considered.
- **rM**: Vector with the computed Mantel correlations for each distance class.
- **signif**: The value of the selected `alfa`.
- **pvalues**: Vector with the p-values computed for each distance class.
- **pval.Bonferroni**: Vector with the p-values after a progressive Bonferroni correction.
- **clases**: Alphanumeric vector with the range of each distance class.

**Acknowledgements**

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**Note**

The implementation of the Mantel correlogram computation in the function `mpmcorrelogram` (and that of Mantel correlation performed by **vegan**’s `mantel.partial` and `mantel` functions) are based on the description of Legendre and Legendre (1998). Following these approaches, positive Mantel statistics correspond to positive autocorrelation when the focal matrix (i.e. `xdis`) is a similarity matrix and to negative values when it is a distance matrix. As most of the designed tools in R for summarizing relationships between the rows of data matrices return distance objects, the argument `simil` in `mpmcorrelogram` is set by default to `FALSE`. See the examples for the use with a similarity matrix.

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References


See Also

vegan’s `mantel.correlog` for another implementation of (non-partial) Mantel correlograms.

Examples

```r
# Example from Figure 13.12 of Legendre and Legendre (1998):

# Get similarity matrix based on assemblage composition.

data(S)

# Get euclidean distance between sites.

data(D)

# Compute Multivariate Mantel Correlogram
# as in Fig. 13.12 of Legendre and Legendre

## Not run:
result <- mpmcorrelogram(S, D, simil=TRUE)

## End(Not run)

# A Multivariate Partial examle.
# Get distance matrix of "covariate" attributes

data(Zd)

# Compute multivariate partial Mantel correlogram

## Not run:
result <- mpmcorrelogram(S, D, Zd, simil=TRUE)

## End(Not run)
```
# Change the appearance of the plot

## Not run:
plot(result, pch=c(17,24))

## End(Not run)
Index

*Topic datasets
   example.data, 2
*Topic multivariate
   mpmcorrelogram, 2
*Topic spatial
   mpmcorrelogram, 2

as.dist, 3

cor, 3

D(example.data), 2

eexample.data, 2

mantel, 4
mantel.correlog, 5
mantel.partial, 4
mpmcorrelogram, 2

plot.mpmcorrelogram(mpmcorrelogram), 2
points, 3
print.mpmcorrelogram(mpmcorrelogram), 2

S(example.data), 2

Zd(example.data), 2