Package ‘mpmcorrelogram’

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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 ................................................................. 1
mpmcorrelogram ............................................................ 2

Index 6

example.data Assemblage similarity and geographic distance matrices

1
Description

Artificial 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
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, ...)
```

References


Examples

```r
data(S)
data(D)
data(Zd)
```
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 `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=`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 `rM` 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 Mantel 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

# 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, 1
*Topic multivariate
  mpmcorrelogram, 2
*Topic spatial
  mpmcorrelogram, 2

as.dist, 3

cor, 3

D (example.data), 1

e xample.data, 1

mantel, 3, 4
mantel.correlog, 5
mantel.partial, 3, 4
mpmcorrelogram, 2

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

S (example.data), 1
Zd (example.data), 1