

Program for transformation of frequency data

User's notes

Pierre Legendre

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Five transformations for frequency data, including species abundances, have been described by Legendre and Gallagher (submitted).

The program (distribution: see below) converts a matrix of species abundances in such a way that the Euclidean distance among rows of the transformed matrix is equal to one of the following distances among rows of the original data matrix:

1. Chord distance
2. Chi-square metric
3. Chi-square distance
4. Distance between species profiles
5. Hellinger distance

Input file: Rectangular table of frequencies where the rows correspond to objects (e.g., sites) and the columns to variables (e.g., species). There are no row (= site) or column (= species) identifiers. It is recommended to add a carriage return at the end of the last row of data.

Output file: Rectangular table of transformed frequencies where the rows correspond to the same objects and the columns to the same variables. This table can now be used as input to programs of data analysis that, normally, preserve the Euclidean distance among rows, i.e., principal component analysis (PCA), redundancy analysis (RDA), or *K*-means partitioning of data sets; they will now preserve the selected distance among objects.

Example

Input file: Frequency data for 3 species (columns) at 3 sites (rows), from Legendre and Legendre (1998, p. 457):

10	10	20
10	15	10
15	5	5

Output file: Transformation such that Euclidean distances computed among rows of transformed data are equal to Chord distances among the original sites:

0.40825	0.40825	0.81650
0.48507	0.72761	0.48507
0.90453	0.30151	0.30151

Output file: Transformation such that Euclidean distances computed among rows of transformed data are equal to Chi-square distances among the original sites:

0.42258	0.45644	0.84515
0.48295	0.78246	0.48295
1.01419	0.36515	0.33806

Output file: Transformation such that Euclidean distances computed among rows of transformed data are equal to Hellinger distances among the original sites:

0.50000	0.50000	0.70711
0.53452	0.65465	0.53452
0.77460	0.44721	0.44721

Program distribution

Computer programs to carry out these transformations are available from the following WWWeb sites:

- FORTRAN source code (Transformation.f) and compiled versions, written by P. Legendre: <<http://www.fas.umontreal.ca/biol/legendre/>>
- MATLAB code, written by E. Gallagher: <<http://www.es.umb.edu/edgwebp.htm>>

References

Legendre, P. and E. Gallagher. Ecologically meaningful transformations for ordination biplots of species data. *Ecology* (submitted).

Legendre, P. and L. Legendre. 1998. *Numerical ecology. 2nd English edition*. Elsevier Science BV, Amsterdam. xv + 853 pages.