

Design of Dissimilarity Measures: a New Dissimilarity between Species Distribution Areas

Christian Hennig¹ and Bernhard Hausdorf²

¹ Department of Statistical Science, University College London
Gower St, London WC1E 6BT, United Kingdom

² Zoologisches Museum der Universität Hamburg
Martin-Luther-King-Platz 3, 20146 Hamburg, Germany

Abstract. In many situations, dissimilarities between objects cannot be measured directly, but have to be constructed from some known characteristics of the objects of interest, e.g. some values on certain variables.

From a philosophical point of view, the assumption of the objective existence of a “true” but not directly observable dissimilarity value between two objects is highly questionable. Therefore we treat the dissimilarity construction problem as a problem of the choice or design of such a measure and not as an estimation problem of some existing but unknown quantities.

Therefore, subjective judgment is necessarily involved, and the main aim of the design of a dissimilarity measure is the proper representation of a subjective or intersubjective concept (usually of subject-matter experts) of similarity or dissimilarity between the objects.

We give some guidelines for the choice and design of dissimilarity measures and illustrate some of them by the construction of a new dissimilarity measure between species distribution areas in biogeography, the so-called “geco coefficient”. Species distribution data can be digitized as presences and absences in certain geographic units. As opposed to all measures already present in the literature, the gecoefficient introduced in the present paper takes the geographic distance between the units into account. The advantages of the new measure are illustrated by a study of the sensitivity against incomplete sampling and changes in the definition of the geographic units in two real data sets.

Keywords

BIOGEOGRAPHY, GECO COEFFICIENT, STABILITY, SUBJECTIVE DECISIONS