A Multidimensional Scaling Procedure for Analyzing Symbolic Proximity Data of Interval Type

Oldemar Rodriguez¹, Suzanne Winsberg², and Edwin Diday³

¹ University Of Costa Rica, San Jose, Costa Rica
oldemar,odriguez@yahoo.com

² IRCAM
1 Place Igor Stravinsky, Paris 75004, France
winsberg@ircam.fr

³ LISE-CEREMADE, Université Paris IX Dauphine,
Place du Maréchal de Lattre-de-Tassigny,75775, Paris, France
diday@ceremade.dauphine.fr

Abstract. Traditional techniques of multidimensional scaling often used for perceptual mapping, hypothesize that the objects under consideration are differentiated in a common space of attributes. In addition standard or classical multidimensional scaling takes as input a single value for the dissimilarity rating between each pair of objects. In this paper we input an interval of dissimilarity for each object pair. The interval of dissimilarity might result from combining data from N judges or sources, or it might be a region of dissimilarity proposed by a single judge/source. We postulate that the objects are differentiated, not only in a common space but also a unique space consisting of as many dimensions as the number of objects. As output instead of representing each object under study by a point, as in standard multidimensional scaling methods, in our method each object is visualized by a rectangle in the factorial space representing dissimilarity variation among different judges or sources. The value of the object along each unique dimension is also represented by an interval. So both the input and output of our procedure consist of symbolic data. The procedure can be used in the special case when only common dimensions are postulated. For this special case, the algorithm generalizes the classical scaling method seeking a method that produces results similar to those obtained by Tops Principal Components Analysis. The Extended INTERSCAL algorithm combines the approach we developed for the special case of only common dimensions with the decomposition approach used by Chaturvedi and Carroll, (1998), in their Mexscal algorithm for classical proximity data. Examples of artificial and real data are presented.

Keywords: symbolic objects, multidimensional scaling, interval-type data, common and specific dimensions, proximity data.