

## COMPUTING ANNOUNCEMENT

### A SAS MACRO FOR CALCULATING THE LINE-OF SIGHT MEASURE OF INTEROBJECT DISSIMILARITY

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This announcement describes a SAS program for calculating the line-of-sight (LOS) measure of interobject dissimilarity. The procedure uses the approach developed by Rabinowitz (1976) to rank-order pairs of stimulus objects. The resultant ordering can then be interpreted as proximities data, suitable for input to a nonmetric multidimensional scaling algorithm.

The line-of-sight method is particularly useful for data obtained from survey research, where direct measures of interobject proximity are frequently unavailable. Analysts are then forced to rely on indirect proximity measures, such as correlations and dissimilarity profiles. The problem is that such measures may be theoretically questionable, and prone to distortions caused by measurement errors. In contrast, the line-of-sight approach uses rating scale responses, which are commonly available in survey research contexts. It is also firmly grounded in unfolding theory, and it is quite robust—that is, it produces reliable object rankings—in the face of error-laden data.

The line-of-sight procedure begins with an  $n$  by  $k$ , two-way, two-mode data matrix. The cell entries are commonly interpreted as  $n$  individuals' preference ratings for each of  $k$  stimuli. Consistent with the standard unfolding assumptions, the ratings are taken to be a monotonic function of the distances between ideal points and stimulus points within a joint space. The ideal points are assumed to be widely dispersed throughout the space. For each individual, pairwise sums and absolute differences are calculated for all  $k(k - 1)/2$  stimulus pairs. Rabinowitz shows that the smallest of these sums and the largest absolute differences can be used to rank-order the distances between the stimulus pairs. Thus, the first part of the LOS algorithm calculates the pairwise sums and absolute differences within the rows of the original  $n$  by  $k$  data matrix, creating two separate  $n$  by  $k(k - 1)/2$  matrices (one for the sums and one for the absolute differences). The columns of these new matrices are sorted, with the sums arrayed from smallest to largest, and the absolute differences arranged from largest to smallest. The sorted sums matrix and the sorted absolute differences matrix are added together, and the initial ranking of the stimulus pairs is obtained from the first row of the combined matrix. Rabinowitz' empirical procedure then iterates through several rows, in order to minimize the effects of idiosyncratic responses and uneven densities of ideal points within the joint space. If the unfolding assumptions and the point dispersion assumption are met, then the line-of-sight procedure will provide an ordinal measure of the dissimilarities between the stimulus objects. Readers are referred to Rabinowitz (1976) for the formal derivation and a more complete explanation of the empirical procedure.

The LOS program is written as a SAS macro. This approach admittedly sacrifices a great deal of computational efficiency, relative to a compiled executable module in a more basic programming language. Still, the macro is very convenient and easy to use. There are several input, output, and algorithmic options, which can be specified with keywords or left at default values. The basic input for the program is a rectangular  $n$  by  $k$  data matrix, taken from a SAS dataset. The program prints an iteration history, along with several summary statistics from the LOS routine. The main output is a SAS dataset (default name: DISSIM) containing the ordinal dissimilarities data. These are arranged in a  $k$  by  $k$  symmetric matrix. This matrix is printed out, and it can also be stored in a SAS database or passed along for further analysis.

### Availability

The LOS program is available from the author: William G. Jacoby, De-ment of Government and International Studies, University of South Carolina, Columbia, SC 29208, (803) 777-2675. Bitnet: N350085@UNIVSCVM. Internet: N350085@UNIVSCVM.CSD.SCAROLINA.EDU. Note that this program is primarily intended for use on the SAS System for Personal Computers. It requires the base SAS and SAS/IML products.

### Reference

Rabinowitz, G. B. (1976). A Procedure for ordering object pairs consistent with the multidimensional unfolding model. *Psychometrika*, 41, 349–373.