A FORTRAN IV program for presenting optimally ordered paired comparison stimuli

BOBBY J. CALDER and KENDRITH M. ROWLAND

*Department of Business Administration
University of Illinois, Urbana, Illinois 61801*

The presentation of paired comparison stimuli has long been a popular research technique. The program described herein provides a convenient system for generating paired comparison stimuli and for recording certain data.

Output. The program performs two functions: (1) It generates a *balanced* set of paired comparison stimuli where each pair is punched on a card. When these cards are interpreted, they may be presented directly to Ss as stimuli. (2) Next, if rank order data are being collected, the cards may be resubmitted to the program after they have been sorted by Ss. A lower triangular matrix of stimulus pair ranks is generated. Each card is assigned a code that may be suppressed when the cards are interpreted for use as stimulus decks, but can be used to record the ranks of the paired comparisons in the sorted decks.

An important feature of the program is that the stimulus decks are balanced for optimal presentation order according to a method developed by Ross (1934). The purpose of this ordering is to avoid presentation effects by arranging the pairs so that they are balanced to minimize space and time errors, by avoiding systematic repetitions which might have suggestion effects, and by maintaining maximum space between pairs having common members. The presentation order for five stimuli, for instance, is as follows: 1-2, 5-3, 4-1, 3-2, 4-5, 1-3, 2-4, 5-1, 3-4, 2-5.

The lower triangular matrix of stimulus pair ranks is, of course, a distance matrix and may be analyzed by means of multidimensional scaling or cluster analysis techniques. The program thus supplies direct card input to other programs such as Young's (1973) POLYCON or Johnson's (1967) hierarchical clustering analysis.

Program Restriction and Language. The program generates a balanced paired comparison stimulus deck for up to 45 stimuli. It is written in FORTRAN IV, Level G, language for the IBM 360.

Availability. A writeup and listing of the program along with example output may be obtained without cost from Bobby J. Calder, Organizational Behavior Program, Department of Business Administration, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801.

REFERENCES

- Johnson, S. C. Hierarchical clustering schemes. *Psychometrika*, 1967, 32, 241-254.
Ross, R. T. Optimum orders for the presentation of pairs in the method of paired comparisons. *Journal of Educational Psychology*, 1934, 25, 375-382.
Young, F. POLYCON: A program for multidimensional scaling one-, two- or three-way data in additive, difference, or multiplicative spaces. *Behavioral Science*, 1973, 18, 152-155.

CONSTEL: A FORTRAN IV program for factor and cluster analysis of mixed data

J. A. MEYER

*Institut National de la Santé et de la Recherche Médicale
Groupe de Recherches U.123
44 Chemin de Ronde, 78110 Le Vesinet, France*

This program uses Gower's (1971) coefficient to calculate the similarity matrix between units on which p quantitative, multicategory, or simply binary variables have been measured. It is thus possible not to take into account certain variables in certain matches between units, notably when the corresponding information is missing.

Redundancy of the p considered variables is studied by calculation of the information transmitted between each pair of variables (Estabrook, 1968), and, when this information is greater than a given limit, the corresponding table of contingency is printed.

The principal coordinates (Gower, 1966) of the N units are then obtained, while the number of the extracted latent vectors or the corresponding minimum value of the latent roots can be predetermined.

To make the interpretation of these factors easier, the information transmitted between variables and factors, as well as the most significant tables of contingencies, are printed.

The program recalculates at least the similarities between units from their Euclidean distances in the space of the extracted factors. These similarities—which take into account the redundancy between the initial variables—enable one to look for homogeneous classes by Carlson's (1972) method. Such classes are defined by the fact that the units of one class are more similar within themselves than to units belonging to other classes, within an error coefficient fixed by the user (e.g., 5%).

A summary table shows which units belong to which class, gives the coordinates of the corresponding centroids, and prints out the units which have not been clustered because they get similarities within themselves that are lower than a predetermined limit.

Limitations. With a central memory core of 250K, it is possible to treat up to 220 units and 52 variables. A peripheral storage unit is needed.

Availability. Listings of the CONSTEL source program and supporting documentation (in French) may be obtained from the author.

REFERENCES

- Carlson, K. A. A method for identifying homogeneous classes. *Multivariate Behavioral Research*, 1972, 7, 483-488.
Estabrook, G. F. An information theory model for character analysis. *Taxon* 1698, 16, 86-96.
Gower, J. C. Some distance properties of latent root and vector methods used in multivariate analysis. *Biometrika*, 1966, 53, 325-338.
Gower, J. C. A general coefficient of similarity and some of its properties. *Biometrics*, 1971, 27, 857-874.