A graph-theoretical analysis of Kelly's repertory grid

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Kelley's (1955) repertory grid is an innovative psychological test designed to reveal the way in which a person uses concepts to view important individuals in his life. Although there are many different forms and methods of administering the grid (see Bannister & Mair, 1968), the basic technique is simple. The individual being tested is given a form with a set of role categories across the top and is asked to fill in the names of specific people for each role. The examiner then picks successive sets of three individuals and asks the subject how, in some important way, two of the individuals are alike and different from the third. In answering, the subject has generated a conceptual dimension (a "bipolar construct" in Kelly's terminology) and can then rate at which end of the dimension the other individuals fall. Each time this is done, a row of the form is filled in. Thus, at the end of the test, one has a binary matrix.

The completed grid is rich in information, and a variety of methods have been devised for analyzing it. Natural questions one might ask are: which conceptual dimensions are used analogously and which individuals are viewed as being similar. A method to answer these questions, based on a graph-theoretical analysis of the grid data, has been formulated and a computer program to perform the analysis has been implemented. It is necessary to introduce a few concepts from graph theory before describing the method and associated program.

Graph-theoretical formulation. A graph, $G = (V, E)$, consists of a finite nonempty set, V , of "points" and a set, E , of pairs of points termed "edges." Given the data from a completed grid, two types of graphs can be formed. The first type is a *person-graph*, in which each individual is associated with a point of the graph and there is an edge between a pair of points just in case the pairs of individuals are viewed to be suitably similar. The second type of graph is a *construct-graph*, in which each construct is associated with a point of the graph and there is an edge between a pair of points just in

case the associated constructs are used in a suitably similar fashion. A threshold can be used to determine if a given pair of points are "suitably similar." The threshold is compared to the number of matches in the grid between a pair of items to determine if an edge should be specified in the graph. Thus, by varying the threshold, a whole family of graphs can be induced from a given grid.

Given any construct-graph, one can identify those constructs which are used similarly by finding the cliques of the graph. A *clique* of a graph, G , is a maximal complete subgraph. A *complete subgraph* of G is a *subgraph* of G , a graph whose point set and edge set are contained within those of G , in which every pair of points has an edge between them. It is a *maximal complete subgraph* if it is not contained within any other complete subgraph. Given any person-graph, one can identify the individuals who are viewed similarly by finding the cliques of the person-graph.

The program: Input and output. The program accepts as input the thresholds for inducing person- and construct-graphs and the grids of a set of subjects. For each subject, the output includes, among other things, the grid, a matrix of the number of matches of each row with every other row, a similar matrix of column matches, the adjacency matrices of the person- and construct-graphs, and the cliques associated with each graph.

Computer and language. The program is written in PL/1 and makes use of a sophisticated and very efficient clique detection algorithm (Osteen, 1974). The program has been tested on an IBM 370/165 running OS/MVT/HASP.

Availability. Further information concerning the program can be obtained from the author, c/o Clarkson College of Technology, Potsdam, New York 13676. Information about some recent applications of the program can be obtained from Franz Epting, Department of Psychology, University of Florida, Gainesville, Florida 32601.

REFERENCES

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