KrackPlot 3.0:
An Improved Network Drawing Program

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1. Introduction

A new version of KrackPlot, graph layout software for social networks, has recently been completed. The new version is written in C++ and will run on a PC with 386 chip or better.

2. New features in KrackPlot 3.0

KrackPlot 3.0 contains a number of new features and improvements over previous versions of the software. It can:

- Use a mouse to: create and delete nodes, move individual nodes or groups of nodes, and create or delete lines

- Scroll over large graphs and zoom in on a smaller subset of a graph

- Display node attributes visually

- Calculate Krackhardt's (1994) graph theoretical dimensions of informal organizations

Important note: some features require a mouse.

2.1 Displaying node attributes with color and shape

KrackPlot 3.0 allows the user to display a node's attribute using colors and/or shapes. With a click of the mouse, the user can display in a small window information about the node such as gender, departmental affiliation or any other characteristic.

Mitchell (1994) used data from the Manchester Homeless Women study to demonstrate the utility of circular network diagrams to communicate the results of social network studies. We use the same data to communicate the advantages of KrackPlot 3.0. Figures 1 and 2 use colors to differentiate four categories of people: the respondent, the respondent's family, her husband's family and the residents of the shelter. This allows us to see the patterns of relationships within

and between the groups very clearly. The particular shapes and colors assigned to different types are fully under user control.

2.2 Better layouts through simulated annealing

The insights that can be gained from inspection of sociograms are heavily dependent on the way they are drawn. This can be seen from the two different layouts of Mitchell's data. In the second, drawn by simulated annealing, the different groups are clearly separated and the centrality of the respondent can be seen. Simulated annealing is a combinatorial optimization strategy pioneered by Metropolis et al (1953), who used it to "solve" the traveling salesman problem. Simulated annealing was used for laying out graphs by Davidson and Harel (1989) and Chung and Borgatti (1994), and we have found the technique to be relatively successful at drawing sociograms. KrackPlot 3.0 also permits the user to change the parameters of the simulated annealing function.

2.3 Graph theoretical dimensions of informal organizations

KrackPlot 3.0 calculates four dimensions of informal organizations that are described in Krackhardt (1994a; 1994b). Each of the four dimensions measures an independent feature of overall structure on a 0 to 1 scale. When all four dimensions are equal to 1, they constitute a necessary and sufficient set of conditions for the existence of an outtree (such as observed in a traditional formal organizational chart). These four dimensions together comprise a CoSHiR model of informal organizations and are defined as follows:

1) **Common Deferent:** the extent to which every pair of points in each weak component has a common deferent (or "upper bound" in graph theory).

2) **Sparseness:** the extent to which each weak component has only the N-1 lines necessary to keep it weakly connected (called "graph efficiency" in Krackhardt, 1994a).

3) **Hierarchy:** the extent to which the transitive closure of the digraph lacks symmetric ties.

4) **Reachability:** the extent to which every pair of points is mutually reachable in the underlying graph.

2.4 Other features

KrackPlot 3.0 has a menu-driven interface coupled with a large set of hot-keys, making it easy to load data files, save files, create printer files, and toggle arrowheads on and off. All the colors used to distinguish nodes, lines, background and menus can be altered within KrackPlot 3.0. KrackPlot 3.0 can also display small adjacency matrices in a manner similar to that suggested by George and Allen (1993).
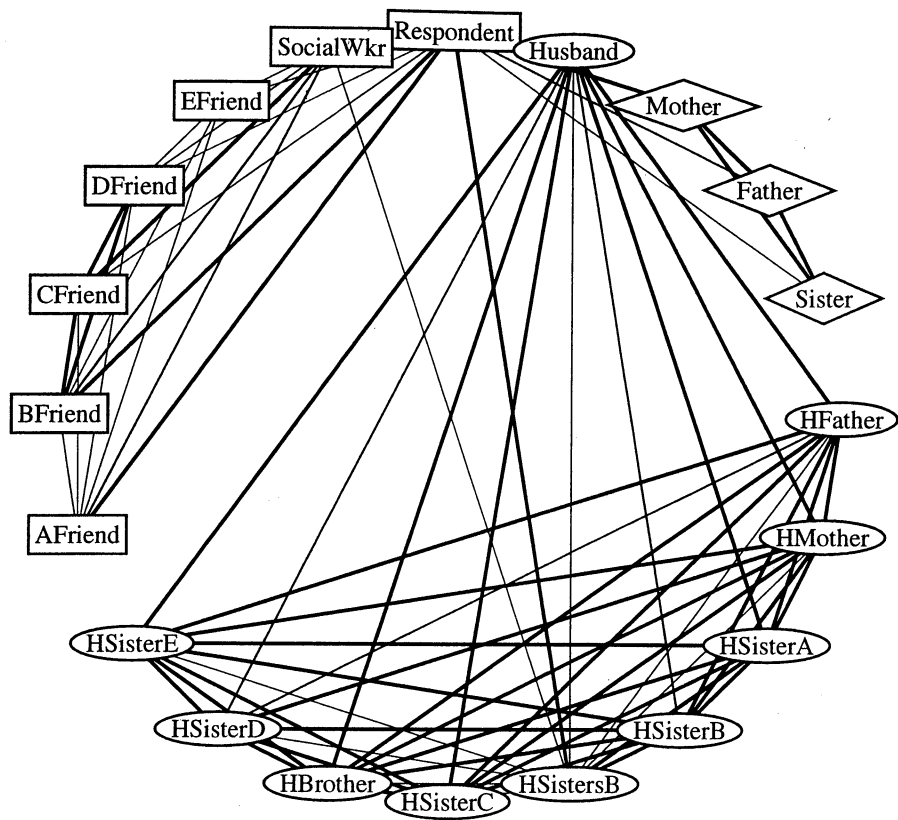
Figure 1: Mitchell's data laid out, as Mitchell did, in a circle. The different shapes represent different groups of individuals.
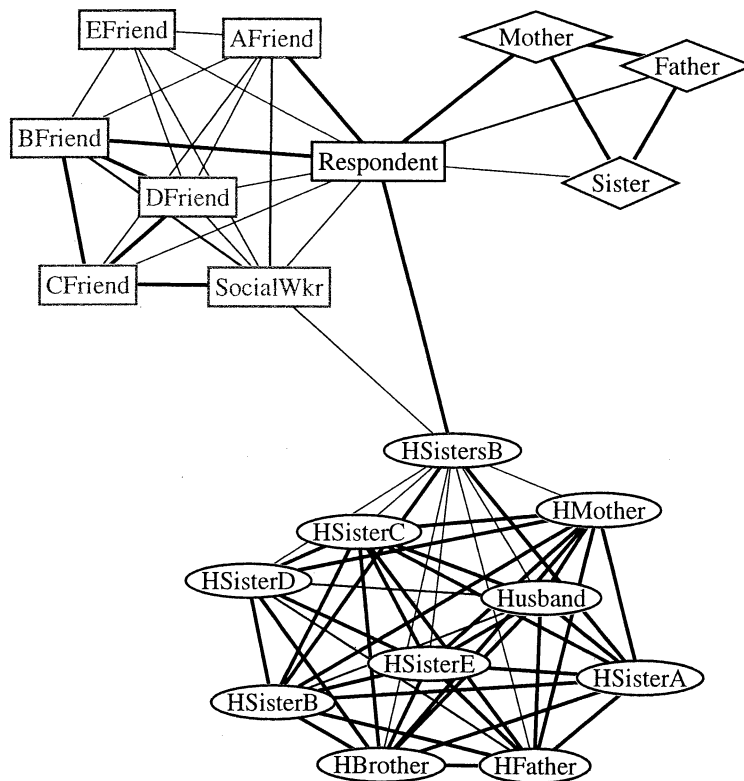

Figure 2: Mitchell's data laid out by simulated annealing.

KrackPlot 3.0 will also optionally draw loops from a node to itself to represent reflexive ties.

KrackPlot 3.0 is compatible with UCINET IV (Borgatti, Everett and Freeman 1992) and with KrackPlot 2.0. Moreover, files can be read into and saved from KrackPlot 3.0 in one of two formats: (a) the format used in KrackPlot 2.0, and (b) a linked-list format suggested by Eades and Kelly (1987), which allows files to be input directly into Mathematica and Combinatorica.

KrackPlot 3.0 produces PostScript files, understood by a wide variety of printers, and can also generate color PostScript output. A free software package called Ghostscript is available that can convert postscript files to files that can be printed on almost any printer, including laserjet, inkjet and dot matrix printers.

2.4 Availability

To obtain KrackPlot 3.0, contact Analytic Technologies, 6616 Christie Rd., Columbia, SC 29209. Tel. (803) 783-0603. Fax (803) 783-1416. The price is $50 for academics, $200 for corporate purchasers, and $25 for students. Owners of KrackPlot 2.0 are entitled to a $20 discount. KrackPlot 3.0 is available as of December 1, 1994.

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