

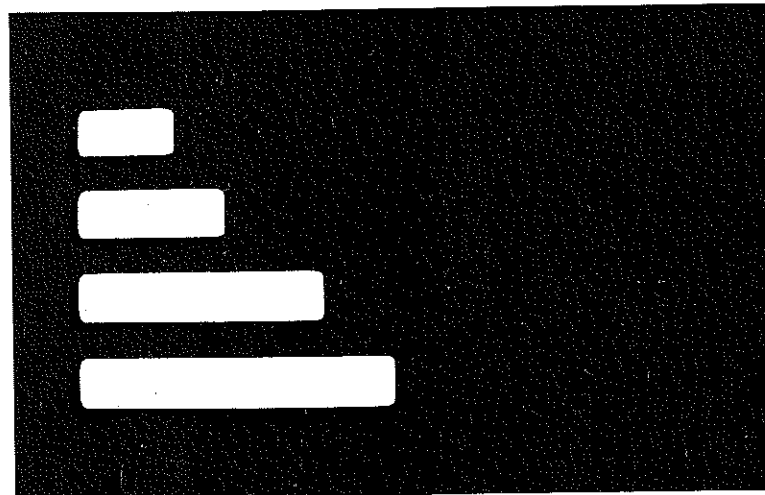
# PROGRAMMER'S NOTEBOOK

## Drawing Bar Graphs

ONE of the more common methods of showing data in graph form on a video monitor is by extending bars from a predetermined base line to a plotted data point.

Let's take a close look at how such a bar-graph routine can be incorporated in a program. We will give programs for the TRS-80 and the Apple II, but they can be modified to run with almost any BASIC in a machine having memory-mapped video or a terminal having cursor control.

To modify these programs, compare the functions of each portion of the program which are defined in the REM statements with similar functions found in your BASIC. For example, consider a bar-graph program that "draws" a bar graph from left to right on the screen (Table I). Throughout this program, the REM statements will explain what is tak-



Horizontal bar graph drawn with program in Table I.

TABLE I—PROGRAM FOR HORIZONTAL GRAPH

<pre> TRS-80 10 REM CLEAR THE SCREEN 20 CLS 30 REM ASK FOR FOUR DATA POINTS 40 INPUT "FOUR VALUES"; A, B, C, D 41 REM CLEAR THE SCREEN 42 CLS 50 REM ADD THE FOUR DATA POINTS 60 F = A + B + C + D 70 REM DETERMINE THE DECIMAL   EACH DATA POINT IS OF THE   TOTAL. 80 AA = A/F 90 BB = B/F 100 CC = C/F 110 DD = D/F 120 REM DETERMINE THE ROUNDED   OFF PORTION OF THE BAR GRAPH   TO BE DISPLAYED. THE NUMBER IN   THE BRACKETS REPRESENTS THE   POKE POSITIONS OF THE DISPLAY   SCREEN. 130 AW% = AA * (15742 - 15680) 140 BW% = BB * (15780 - 15728) 150 CW% = CC * (15998 - 15936) 160 DW% = DD * (16126 - 16064) 170 REM THE FOLLOWING DRAWS THE   BAR GRAPH THAT WILL START AT   THE FIRST POKE POSITION AND   STOP AT THE FIRST. POKE POSI- </pre>	<pre> TION PLUS THE PERCENTAGE VAL- UE OF THE DATA POINT. 180 FOR AS = 15680 TO   (15680 + AW%) 190 POKE AS, 191 200 NEXT AS 210 FOR BS = 15808 TO   (15808 + BW%) 220 POKE BS, 191 230 NEXT BS 240 FOR CS = 15936 TO   (15936 + CW%) 250 POKE CS, 191 260 NEXT CS 270 FOR DS = 16064 TO   (16064 + DW%) 280 POKE DS, 191 290 NEXT DS 300 REM THE NEXT STATEMENT PRE-   VENTS THE COMPUTER FROM DIS-   PLAYING THE WORD 'READY'. 310 GOTO 310 </pre>	<pre> 50 REM ADD THE FOUR DATA POINTS 60 F = A + B + C + D 70 REM DETERMINE THE DECIMAL   EACH DATA POINT IS OF THE   TOTAL. 80 AA = A/F 90 BB = B/F 100 CC = C/F 110 DD = D/F 120 REM DETERMINE THE ROUNDED   OFF PORTION OF THE BAR GRAPH   TO BE DISPLAYED. THE NUMBER 30   REPRESENTS THE VALUE OF 100%   OF THE BAR GRAPH 130 AW = INT (AA * 30) 140 BW = INT (BB * 30) 150 CW = INT (CC * 30) 160 DW = INT (DD * 30) 161 REM TURN ON THE GRAPHIC FUNC-   TION AND DRAW RED BARS. 162 GR: COLOR = 1 170 REM DRAW THE BAR GRAPH 180 HLIN 0, (AW) AT 10 190 HLIN 0, (BW) AT 15 200 HLIN 0, (CW) AT 20 210 HLIN 0, (DW) AT 25 300 REM THE NEXT STATEMENT PRE-   VENTS THE COMPUTER FROM DIS-   PLAYING THE 'READY' STATE-   MENT. 310 GOTO 310 </pre>
<pre> APPLE II 10 REM CLEAR THE SCREEN 20 CALL -936 30 REM ASK FOR FOUR DATA POINTS 40 INPUT "FOUR VALUES"; A, B, C, D 41 REM CLEAR THE SCREEN 42 CALL -936 </pre>		

By Jim Keogh

TABLE II—PROGRAM FOR VERTICAL GRAPH

<pre> TRS-80 10 REM CLEAR THE SCREEN 20 CLS 30 REM ASK FOR FOUR DATA POINTS 40 INPUT "FOUR VALUES"; A, B, C, D 41 REM CLEAR THE SCREEN 42 CLS 50 REM ADD THE FOUR DATA POINTS 60 F = A + B + C + D 70 REM DETERMINE THE DECIMAL   EACH DATA POINT IS OF THE   TOTAL 80 AA = A/F 90 BB = B/F 100 CC = C/F 110 DD = D/F 120 REM DETERMINE THE ROUNDED   OFF PORTION OF THE BAR GRAPH   TO BE DISPLAYED. THE NUMBER IN   THE BRACKETS REPRESENTS THE   POKE POSITIONS OF THE DISPLAY   SCREEN. 130 AW% = AA * (16336 - 15663) 140 BW% = BB * (16346 - 15673) 150 CW% = CC * (16356 - 15683) 160 DW% = DD * (16366 - 15693) 170 REM THIS DRAWS THE BAR GRAPH.   IT WILL START AT THE FIRST POKE   POSITION AND STOP AT THE FIRST   POKE POSITION MINUS THE PER-   CENTAGE VALUE OF THE DATA   POINT. 180 FOR AS = 16336 TO   (16336 - AW%) STEP -64 190 POKE AS, 191 200 NEXT AS 210 FOR BS = 16346 TO   (16346 - BW%) STEP -64 220 POKE BS, 191 230 NEXT BS 240 FOR CS = 16356 TO   (16356 - CW%) STEP -64 250 POKE CS, 191 260 NEXT CS 270 FOR DS = 16366 TO   (16366 - DW%) STEP -64 </pre>	<pre> 280 POKE DS, 191 290 NEXT DS 300 REM THE NEXT STATEMENT PRE-   VENTS THE COMPUTER FROM DIS-   PLAYING THE WORD 'READY'. 310 GOTO 310 </pre>	<pre> APPLE II 10 REM CLEAR THE SCREEN 20 CALL -936 30 REM ASK FOR FOUR DATA POINTS 40 INPUT "FOUR VALUES"; A, B, C, D 41 REM CLEAR THE SCREEN 42 CALL -936 50 REM ADD THE FOUR DATA POINTS 60 F = A + B + C + D 70 REM DETERMINE THE DECIMAL   EACH DATA POINT IS OF THE   TOTAL 80 AA = A/F 90 BB = B/F 100 CC = C/F 110 DD = D/F 120 REM DETERMINE THE ROUNDED   OFF PORTION OF THE BAR GRAPH   TO BE DISPLAYED., THE NUMBER   35 REPRESENTS THE VALUE OF   100% OF THE BAR GRAPH. 130 AW = INT (AA * 35) 140 BW = INT (BB * 35) 150 CW = INT (CC * 35) 160 DW = INT (DD * 35) 161 REM TURN ON THE GRAPHIC FUNC-   TION AND DRAW RED BARS. 162 GR: COLOR = 1 170 REM DRAW THE BAR GRAPH. 180 VLIN (AW), 35 AT 10 190 VLIN (BW), 35 AT 15 200 VLIN (CW), 35 AT 20 210 VLIN (DW), 35 AT 25 300 REM THE NEXT STATEMENT PRE-   VENTS THE COMPUTER FROM DIS-   PLAYING THE WORD 'READY'. 310 GOTO 310 </pre>
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ing place at that particular point in the program. To get things started, the computer will request that you INPUT four values representing the data points to be plotted. Once the last piece of data is keyed in, the video display will "draw" four bar graphs, each bar representing one piece of data.

You can easily expand the number of data points as required. However, before you begin to make any modifications, you should understand the programming approach.

The program starts by causing the computer to set aside a certain area on the screen for each bar graph. This is done without knowing the values of the data points. The computer "assumes" that the amount of space set aside is equal to a bar graph of maximum amplitude (100%).

When the final INPUT data point is ENTERED, the computer adds the values of the data points, with the numeric sum of all data points becoming the "100%"

value. This establishes what percentage each data point represents of the total.

Finally, the computer illuminates that portion of the bar graph which represents the percentage the data point is of the total. The computer is able to represent all the data in a neatly prepared bar graph since the program operates on a percentage basis and not directly with the actual value of each data point.

The second program (Table II) example is very similar, except that the bar graphs are "drawn" from bottom to top, rather than from left to right on the screen. (Table II). As before, the program calls for four data points.

These bar-graph programs can be used as a subroutine (with appropriate line-number changes) in your own software. For example, the results of an analysis can be displayed in several ways, such as in a table or a bar graph. The routines illustrated in this column use data points INPUT from the main program and display them as a bar graph. ◇

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