

Ultra Banner

Back in January, we ran an article about the Boston Computer Society and its 15-year-old president, Jonathan Rotenberg. We said we'd be bringing you his banner program. Here it is.

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Banner programs fall in between being a game and a practical application. They print large letters on paper and may be used to make signs, messages or, as the title suggests, banners. Banner has appeared in many forms on many computers, printing letters of all shapes and sizes. The program presented herein, "Ultra Banner," is what I consider the ultimate—a program that prints letters of any reasonable size, horizontally or vertically, and gives the user the flexibility to define new letters or symbols.

Different Techniques

Many of the larger banner programs that print the most beautiful letters are quite

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PRINT"      A"
PRINT"     AAA"
PRINT"    AA AA"
PRINT"   AAAAAA"
PRINT"  AA    AA"
PRINT" AA    AA"
    
```

Fig. 1. The direct approach used by many large-banner programs.

straightforward. If the user entered an "A" on such a program, for instance, it might have a corresponding series of PRINT statements, as in Fig. 1. Although this type of program can produce elegant character sets, such as script and italic, it is generally very long and lacks the flexibility to print different character sizes.

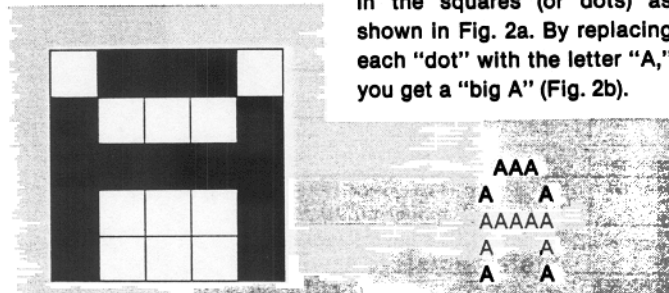
A largely used technique is to have a series of subroutines, each one defining a segment of a letter. For instance, an "O" can be thought of as a square that can be broken down into a vertical line, two horizontal lines and a second vertical line. If you square off a "C," it can be thought of as a single vertical line and two horizontal lines.

Thus, all that would be necessary to print a big "O" or "C" would be a short program containing two subroutines: one to print a vertical line, the second to print two horizontal lines. When the user enters an "O,"

the first subroutine is called, then the second, then the first again. For a "C" the first subroutine is called only once, followed by the second.

This technique, although simple with "O"s and "C"s, gets very complicated with letters like "K" and "Z." The "segment definition" technique does produce a fairly nice character set and allows the user to select different character sizes; however, it is generally quite lengthy and still lacks the flexibility to easily define new letters or symbols.

The method I use in "Ultra Banner" is called dot matrix—the same used by many impact and all thermal printers. Essentially, it generates all of the characters on a five by five matrix. By filling in dots on this matrix, the alphabet, numbers and punctuation, plus other symbols, may be produced. For instance, to make an "A" on a five by five matrix, you might fill in the squares (or dots) as shown in Fig. 2a. By replacing each "dot" with the letter "A," you get a "big A" (Fig. 2b).



Figs. 2a and 2b. The letter "A" on a five by five matrix.

Some of the advantages of dot matrix over other methods are: dots may be any size (to produce any sized letter); the matrix may be turned to sit on the paper in any direction; new matrices may be easily specified (or defined); and the final program is relatively short.

The Program

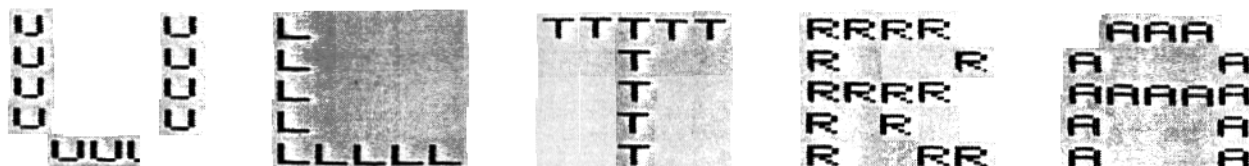
"Ultra Banner" prints all of the printable characters of the 64 character ASCII subset (uppercase, numbers and punctuation) from a five by five matrix. It will print "big" letters horizontally of regular or double width, "big" letters vertically of any size, messages (standard-sized letters) of normal or double width, and it will allow you to specify matrix patterns for new characters or symbols.

Horizontal printing is accomplished by directly assigning a single letter to each dot on the matrix. For instance, printing a horizontal "A" would produce output identical to Fig. 2b. Double-width characters may also be specified, assuming your printer is capable of printing them. For an 80-column printer, the maximum number of horizontal double-width characters is five; the maximum number of regular characters is 11.

Vertical printing is accomplished by turning the matrix on

ULTRA BANNER IS FLEXIBLE

IS FLEXIBLE



Sample from Fig. 4 at full size.

its side and making the "dots" any square or rectangular formation of letters. The size of these dots is determined by the program; you merely enter the size, in inches, of the characters. The program will also print a left-hand margin of selectable size, in inches. Because the letters are printed vertically down the page in this mode, the size of the message is limited only to the maximum variable length in your BASIC and how much paper you have left.

Defining new characters has two modes: the matrix mode and the user mode. The matrix mode allows you to enter a matrix pattern (like Fig. 2a) that the computer will code for later use. The user mode allows you to tell the computer with which character the defined pattern will be printed. Whenever the

computer encounters the character defined in user mode, it will ask for the matrix code supplied by the matrix mode. At this point the code is entered and the matrix will be enlarged or turned appropriately to match the other letters.

The message option of "Ultra Banner" will print a message horizontally of normal-sized letters. Double-width letters may also be specified with this option.

How to Use It

After you have entered the program, made appropriate changes (see the Making Changes section) and typed 'RUN' the computer will give you a choice of five options: Horizontal, Vertical, Define, Message or Stop. To select an option, type *only* its first letter

(e.g., V for Vertical).

If you request Horizontal, the computer will ask if the message should be printed in wide or regular print. If your printer is not capable of printing wide letters, type R. Remember to type only the first letter of the desired option (i.e., W or R). The computer will now request the word you want printed. You may enter as many words, punctuation marks or numbers as desired if the total length does not exceed 11 characters for regular print or five for wide. Longer horizontal messages

will be split up over two or more lines.

Requesting Vertical printing will cause the computer to first ask for the dimensions, in inches, of the desired letters in your message. Enter the height, a comma and the width. The computer will now ask for the left-hand margin in inches. If no margin is desired, enter 0 (zero). Finally, the computer will ask for the message which is to be printed. "Ultra Banner" will not check the length of this message.

Because the computer must

```
HORZ., VERT., DEFINE, MESSAGE OR STOP (H/V/D/M/S)? D
DEFINE USER CHARACTER OR DEFINE MATRIX (U/M)? U
WHAT IS THE CHARACTER? *
HORZ., VERT., DEFINE, MESSAGE OR STOP (H/V/D/M/S)? D
DEFINE USER CHARACTER OR DEFINE MATRIX (U/M)? M
ENTER MATRIX USING 1s AND 0s
? 00100
? 01010
? 10001
? 01010
? 00100
MATRIX CODE IS ?..?
HORZ., VERT., DEFINE, MESSAGE OR STOP (H/V/D/M/S)? H
WIDE OR REG.? R
WORD? *
MATRIX CODE? ?..?
.
.
.
.
HORZ., VERT., DEFINE, MESSAGE OR STOP (H/V/D/M/S)?
```

Fig. 3. The procedure for defining a new character: Define the user character, then the matrix. The computer supplies the matrix code. Use the horizontal or vertical modes. When the user character is encountered, the matrix code is requested by the computer.

ULTRA BANNER PROGRAM LISTING

```
10 DIM H$(11),H(5),D$(7),LWIDTH:GOTO 20:ES=CHR$(0)
20 D$(1)=" "
30 D$(2)="5*7+555755 # 1 ? ##!R$(0,359$.5$.16(?,1&1.
40 D$(3)="*?AR?0!)/0!/?A$$$ 1.1./1/!/, ,.58&1&8 ? ? *
50 D$(4)="#.0.#.1& $77777.17117171D.101.7111770?07000.031.
60 D$(5)="11711?55577554(12C21000071;5511953171117)100.112-
70 D$(6)=">1)43.0.1.??5551111.1***$1155*1$*11*555?R$(?111?
80 D$(7)="0($R!000?5*1 "
90 INPUT"HORZ., VERT., DEFINE, MESSAGE OR STOP (H/V/D/M/S)";Q$
100 IF Q$="V" THEN 260 ELSE IF Q$="D" THEN 450
110 IF Q$="S" THEN END
120 INPUT"WIDE OR REG. (W/R)";Q1$:IF Q1$="W" THEN C=5 ELSE C=11
130 IF Q$="M" THEN 430 ELSE IF Q$="V" THEN 260
140 INPUT"WORD";H$:IF LEN(H$)>C THEN 140
150 FOR X=1 TO LEN(H$):T=ASC(MID$(H$,X,1))-31
160 IF T=ASC(E$)-31 THEN INPUT"MATRIX CODE";H$(X):GOTO 180
170 S=INT((T-1)/10):H$(X)=MID$(D$(S+1),5*T-5*50-4,5)
180 NEXT X:LPRINT:LPRINT CHR$(C-4)
190 FOR X=1 TO 5:FOR Z=1 TO LEN(H$)
200 B=ASC(MID$(H$(Z),X,1))-32:IF B=33 THEN B=2
210 FOR W=1 TO 5:IF B<2(5-W) THEN LPRINT" ";:GOTO 230
220 LPRINTMID$(H$(Z,1):B=2-2(5-W):GOTO 230
230 NEXT W:LPRINT" ";:NEXT Z:LPRINT
240 FOR Z=4 TO 0 STEP -1
250 LPRINT CHR$(C-4):NEXT X:LPRINT:GOTO 90
260 INPUT"HEIGHT, WIDTH (IN INCHES)";G,H:G=2
270 FOR X=1 TO 5:H(X)=0:NEXT X
280 INPUT"LEFT HAND MARGIN (IN INCHES)";M:H=M*10
290 PRINT"ENTER MESSAGE":INPUT M$
300 FOR X=1 TO LEN(M$):T=ASC(MID$(M$,X,1))-31
310 IF T=ASC(E$)-31 THEN INPUT"MATRIX CODE";I$:GOTO 330
320 S=INT((T-1)/10):I$=MID$(D$(S+1),5*T-5*50-4,5)
330 H(1)=0:H(2)=0:H(3)=0:H(4)=0:H(5)=0:FOR V=1 TO 5
340 D=ASC(MID$(I$,V,1))-32:IF D=33 THEN D=2
350 FOR Z=4 TO 0 STEP -1
360 IF D>2+Z THEN H(Z+1)=H(Z+1)+2+(V-1):D=D-2+Z
370 NEXT Z:NEXT V:FOR V=5 TO 1 STEP -1:FOR Z=1 TO H:D=H(V)
380 LPRINTTAB(M):FOR U=4 TO 0 STEP -1:IF D>2+U THEN 400
390 FOR V=1 TO D:LPRINT" ";:NEXT:GOTO 410
400 FOR V=1 TO D:LPRINT MID$(M$,X,1):NEXT:D=D-2+U
410 NEXT U:LPRINT:NEXT Z:NEXT V
420 FOR V=1 TO W:LPRINT:NEXT V:NEXT X:GOTO 90
430 PRINT"MESSAGE":INPUT M$:IF LEN(M$)>INT(C/5)*40 THEN 430
440 LPRINT CHR$(C-4):M$:GOTO 90
450 INPUT"DEFINE USER CHARACTER OR DEFINE MATRIX (U/M)";Q$
460 IF Q$="M" THEN 480
470 INPUT"WHAT IS THE CHARACTER";E$:GOTO 90
480 PRINT"ENTER MATRIX USING 1'S AND 0'S"
490 FOR X=1 TO 5:INPUT H$(X):NEXT X
500 INPUT"MATRIX CODE IS ";:FOR X=1 TO 5:C=0:FOR V=1 TO 5
510 IF MID$(H$(X),V,1)="1" THEN C=C+2+(5-V)
520 NEXT V:IF C=2 THEN C=33
530 PRINT CHR$(C+32):NEXT X:PRINT:GOTO 90
```


To stop the program, the Stop option should be selected. This option will return you to the BASIC command mode.

Making Changes

I developed "Ultra Banner" using TDL 8K BASIC, Version 1.1. With this BASIC, the program and variables occupy less than 2K bytes of memory. I took advantage of several TDL features that are not available on all BASICs. Most of these are minor, though, and should be fairly easy to convert for compatibility.

LWIDTH in line 10 specifies the width of the printer line. This statement was necessary because TDL BASIC assumes a printer width of 72 columns. In most cases this statement may be omitted.

Many INPUT statements have messages in quotations. With some versions of BASIC, statements such as INPUT "MARGIN"; M would have to be changed to PRINT "MARGIN"; INPUT M.

The ELSE statement is used

at lines 100, 120 and 130. If your BASIC is not equipped with this statement, replace it at lines 100 and 130 with colons (;) and change the end of line 120 to: THEN C=5: GOTO 90. It will also be necessary to add a new line: 125 C=11.

LPRINT is used whenever banner output (versus a question) is printed. With TDL BASIC, this statement diverts output from the CRT to the printer. Some versions of BASIC use statements such as SELECT, SWITCH or LPRINTER to perform this function. Check your BASIC user manual.

If you are using the program from a teletypewriter-type terminal with no CRT, change all of the LPRINTs to PRINTs. When "Ultra Banner" asks a question, roll the paper down so that all of the questions and answers will be at the top. Roll the paper up for banner output so that questions won't mess it up.

Expanded (or wide) print is accomplished in a rather sneaky way in "Ultra Banner." I

use the program with a Practical Automation DMTP-6 uP printer (the same used by The Digital Group), which expands the current line of print upon receiving an ASCII 1 (SOH). When you select wide or regular print, the computer determines the maximum number of horizontal characters that may be printed (five for wide print, 11 for regular). It will always start a line by printing the ASCII value of this number minus four. Since the printer ignores ASCII 6 (ACK), this technique works efficiently. If your printer handles expanded printing in a different way, changes must be made at lines 180, 250 and 440.

To separate multiline statements, some BASICs use the backslash (\) rather than the colon (;). Unlike some banner programs, "Ultra Banner" was designed to be usable with a minimum amount of effort with versions of BASIC that don't offer multiline statements. To do this, divide all of the multiline statements as you type them in. For instance, line 380

presently reads: 380 LPRINT TAB(M);:FOR U=4 TO 0 STEP -1:IF D>=2*U THEN 400. This line would have to be changed to:

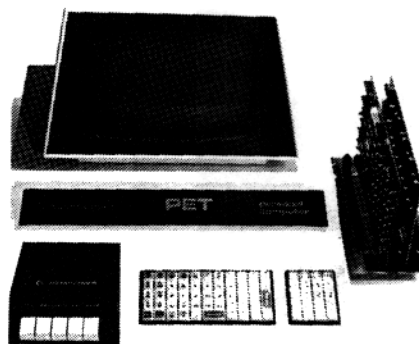
```
380 LPRINT TAB(M);
383 FOR U=4 TO 0 STEP -1
386 IF D>=2*U THEN 400
```

Conclusion

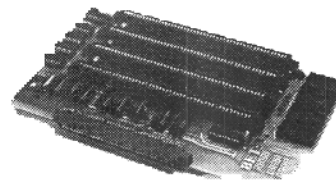
"Ultra Banner" offers an extremely high degree of flexibility. As you use it, you will discover interesting ways to combine the different character sizes to produce output like that in Fig. 4. You should also find many applications for this all-purpose program.

If you don't have access to a machine with BASIC, but do have access to a Texas Instruments SR-52, you can still enjoy a banner program. "Banner for the PC-100" is a shortened version of "Ultra Banner" available from Professional Program Exchange 52, PO Box 53, Lubbock TX 79408, for \$3. Order number 900052. A similar program is also available for the TI-59. ■

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