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| DECUS NO. | 8-90 |
| TITLE | HISTOGRAM ON TELETYPE SUBROUTINE |
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| COMPANY | University of Arizona Tucson, Arizona |
| DATE | August 1967 |
| SOURCE LANGUAGE | |

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HISTOGRAM ON TELETYPE SUBROUTINE

Use of Subroutine

The subroutine requires one page of core storage for program, a temporary storage area as long as the longest table to be plotted, and four parameters on the zero page.

The source tape supplied contains no origin or dollar sign. It includes a subroutine labelled TYPE which uses the sequence

```
TSF
JMP .-1
TLS
CLA
```

This may be removed if a subroutine labelled TYPE is put on the zero page. All tags defined within the subroutine (except TYPE and GRAPH) begin with GG, to prevent duplicate tags. These four input parameters (described below) must be defined by the programmer on the zero page: MSIZE, ADRTAB, ADRLIN, VSF. Entry to the program is through one instruction:

```
JMS GRAPH (effective)
```

The major input to the routine is the table to be plotted: a table of one or more unsigned numbers (one word each) from which the histogram will be made. The length of this table is limited only by the teletype print line--i.e., about 75₁₀ words.

The four control parameters used (but not destroyed by the subroutine are as follows:

MSIZE: Two's complement of the number of words in the table.

ADRTAB: The starting address minus one (as if for use in an auto-index register) of the table to be plotted.

ADRLIN: Starting address of the temporary storage area minus one.

VSF: The vertical scaling factor. A VSF of 1 implies that each row of the histogram represents one unit; a VSF of 4 implies four units per row, so that one star in a column means 1-4 units in that entry of the table; 2 stars means 5-8 units, etc.

The output consists of a histogram of the table, one column per entry, with a maximum height equal to the largest number in the table divided by the VSF.

Method of Operation

The subroutine determines the largest number in the table, and divides it (by repeated subtraction) by the VSF. This is then multiplied by the VSF to determine a multiple of the VSF greater than any entry of the table, which becomes the reference value.

Each number in the table is compared to the reference value one by one. If it is greater than the reference value, the value 251₈ is stored in the corresponding position of the temporary storage table. Otherwise, 237₈ is stored. When the table is exhausted, the temporary table is examined word by word from the back (i.e., last word first). If the word contains 237₈, it is replaced by 7777₈ and the program moves to the next word. The purpose of this is to prevent unnecessary typing of spaces at the end of a line. If the word contains 251₈, it is unchanged and the program leaves the loop. When this happens, or when this table is exhausted, the routine starts at the beginning of the temporary table. The value is added to the AC and indexed by one. If the result is not zero it is typed, so that 237₈ becomes a space and 251₈ a star. If indexing the AC results in zero, the program stops typing, and subtracts the VSF from the reference value to form a new value. If this is zero or less, the subroutine types the last line of + signs and returns control to the calling program. Otherwise, it returns to compare the new reference value with the table.

mh



*7000

/ HISTOGRAM ON TELETYPE SUBROUTINE
/ REQUIRES SCALING FACTOR IN 'VSF'
/ 2'S COMPLEMENT OF TABLE SIZE IN 'MSIZE'
/ TABLE ADDRESS - 1 IN 'ADRTAB'
/ ADDRESS - 1 OF TEMP TABLE IN 'ADRLIN'

| | | |
|------|------|---------------|
| 7200 | 0000 | GRAPH,0 |
| 7201 | 1007 | TAD ADRTAB |
| 7202 | 7001 | IAC |
| 7203 | 3363 | DCA GGA |
| 7204 | 1004 | TAD MSIZE |
| 7205 | 7001 | IAC |
| 7206 | 3364 | DCA GGB |
| 7207 | 1763 | TAD I GGA |
| 7210 | 3365 | DCA GGC |
| 7211 | 2363 | GGI,ISZ GGA |
| 7212 | 1763 | TAD I GGA |
| 7213 | 7140 | CLL CMA |
| 7214 | 1365 | TAD GGC |
| 7215 | 7630 | SZL CLA |
| 7216 | 5221 | JMP .+3 |
| 7217 | 1763 | TAD I GGA |
| 7220 | 3365 | DCA GGC |
| 7221 | 2364 | ISZ GGB |
| 7222 | 5211 | JMP GGI |
| 7223 | 1005 | TAD VSF |
| 7224 | 7041 | CIA |
| 7225 | 3363 | DCA GGA |
| 7226 | 3364 | DCA GGB |
| 7227 | 7100 | CLL |
| 7230 | 1365 | TAD GGC |
| 7231 | 1363 | TAD GGA |
| 7232 | 3365 | DCA GGC |
| 7233 | 2364 | ISZ GGB |
| 7234 | 7430 | SZL |
| 7235 | 5227 | JMP .-6 |
| 7236 | 1364 | TAD GGB |
| 7237 | 7041 | CIA |
| 7240 | 3364 | DCA GGB |
| 7241 | 1005 | TAD VSF |
| 7242 | 2364 | ISZ GGP |
| 7243 | 5241 | JMP .-2 |
| 7244 | 3365 | DCA GGC |
| 7245 | 1004 | GG2,TAD MSIZE |
| 7246 | 3364 | DCA GGB |
| 7247 | 1007 | TAD ADRTAB |
| 7250 | 3366 | DCA GGD |
| 7251 | 1371 | TAD GGP215 |
| 7252 | 4355 | JMS TYPE |
| 7253 | 1372 | TAD GGP212 |
| 7254 | 4355 | JMS TYPE |
| 7255 | 1006 | TAD ADRLIN |
| 7256 | 3367 | DCA GGE |
| 7257 | 1370 | TAD GGP336 |
| 7260 | 4355 | JMS TYPE |

(C)

(b)

(b)

| | | |
|------|------|----------------|
| 7261 | 2366 | GG3, ISZ GGD |
| 7262 | 2367 | ISZ GGE |
| 7263 | 1766 | TAD I GGD |
| 7264 | 7541 | CIA |
| 7265 | 7100 | CLL |
| 7266 | 1365 | TAD GGC |
| 7267 | 7710 | SPA CLA |
| 7270 | 1376 | TAD GGP12 |
| 7271 | 1374 | TAD GGP237 |
| 7272 | 3767 | DCA I GGE |
| 7273 | 2364 | ISZ GGE |
| 7274 | 5261 | JMP GG3 |
| 7275 | 1004 | TAD MSIZE |
| 7276 | 3364 | DCA GGB |
| 7277 | 1767 | GG4, TAD I GGE |
| 7300 | 1375 | TAD GGP237 |
| 7301 | 7540 | S7A CLA |
| 7302 | 5312 | JMP GG5 |
| 7303 | 7040 | CMA |
| 7304 | 3767 | DCA I GGE |
| 7305 | 7040 | CMA |
| 7306 | 1367 | TAD GGE |
| 7307 | 3367 | DCA GGE |
| 7310 | 2364 | ISZ GGE |
| 7311 | 5277 | JMP GG4 |
| 7312 | 1004 | GG5, TAD MSIZE |
| 7313 | 3364 | DCA GGB |
| 7314 | 1006 | TAD ADRLIN |
| 7315 | 3365 | DCA GGD |
| 7316 | 2366 | ISZ GGD |
| 7317 | 1766 | TAD I GGD |
| 7320 | 7001 | IAC |
| 7321 | 7450 | SNA |
| 7322 | 5326 | JMP GG6 |
| 7323 | 4355 | JMS TYPE |
| 7324 | 2364 | ISZ GGE |
| 7325 | 5316 | JMP .-7 |
| 7326 | 7300 | GG6, CLA CLL |
| 7327 | 1365 | TAD GGC |
| 7330 | 1363 | TAD GGA |
| 7331 | 3365 | DCA GGC |
| 7332 | 7630 | SZL CLA |
| 7333 | 5245 | JMP GG2 |
| 7334 | 1371 | TAD GGP215 |
| 7335 | 4355 | JMS TYPE |
| 7336 | 1370 | TAD GGP212 |
| 7337 | 4355 | JMS TYPE |
| 7340 | 1370 | TAD GGP336 |
| 7341 | 4355 | JMS TYPE |
| 7342 | 1004 | TAD MSIZE |
| 7343 | 3364 | DCA GGB |
| 7344 | 1373 | TAD GGP253 |
| 7345 | 4355 | JMS TYPE |
| 7346 | 2364 | ISZ GCB |
| 7347 | 5344 | JMP .-3 |
| 7350 | 1371 | TAD GGP215 |
| 7351 | 4355 | JMS TYPE |
| 7352 | 1370 | TAD GGP212 |
| 7353 | 4355 | JMS TYPE |
| 7354 | 5600 | JMP I GRAPH |


```

7355 0000 TYPE,0
7356 6041 TSF
7357 5356 JMP .-1
7360 6046 TLS
7361 7220 CLA
7362 5755 JMP 1 TYPE
7363 0000 GGA,0
7364 0000 GGB,0
7365 0000 GGC,0
7366 0000 GGD,0
7367 0000 GGE,0
7370 0336 GGP336,336
7371 0215 GGP215,215
7372 0212 GGP212,212
7373 0253 GGP253,253
7374 0237 GGP237,237
7375 7541 GGM237,-237
7376 0012 GGP12,12

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ADRLIN=6
ADRTAF=7
VSF=5
MSIZE=4

```

```

ADRLIN 0006
ADRTAF 0007
GGA 7363
GGF 7364
GGC 7365
GGD 7366
GGE 7367
GGM237 7375
GGP12 7376
GGP212 7372
GGP215 7371
GGP237 7374
GGP253 7373
GGP336 7370
GG1 7211
GG2 7245
GG3 7261
GG4 7277
GG5 7310
GG6 7326
GRAPH 7000
MSIZE 0004
TYPE 7355
VSF 0005

```

100

100

100

10/15/20

(1)

(1)

(1)