



# DECUS

## PROGRAM LIBRARY

DECUS NO.	FOCAL8-55
TITLE	MULTICHANNEL ANALYZER
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SOURCE LANGUAGE	FOCAL



## MULTICHANNEL ANALYZER

DECUS Program Library Write-up

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### ABSTRACT

This general program, Multichannel Analyzer, also includes a specialized version for the reduction of raw grades from the teacher's rank book to the letter grades specified for report cards. The method of visualizing scores is entirely the work of Kenneth L. Russell of Sam Houston State Teachers College, and quite adequately described in his publication 'Visual Grading' available from Educational Filmstrips, also of Huntsville, Texas.

Features of the program follow.

1. A straightforward summation, averaging, and computation of the mean, variance, and standard deviation is accomplished, which leaves the averages stored as subscripted variables.
2. A variety of histograms are plotted based on the idea of
  - a) Windows of variable width, or
  - b) Channels of variable width, or
  - c) Sieves of variable dimension, etc.
3. The starting point for each histogram is based upon the programmed selection of the lowest stored average using a preliminary pass through the stored averages.
4. The window width is the only required user input after the data is in, and this is required before each histogram.
5. Stored averages are examined to count those that will pass through each window position.
6. The window position is incremented by the window width.
7. The stored averages are examined again for each new position of the window.
8. A counter determines how many averages have passed through each window, and another counter when all have passed through some window. Double counts are detected if they should occur.
9. The plot is made immediately of the count in each window to cut down on storage requirements, making any histogram possible once the averages have been determined.

10. Whole sets of data can be entered after plotting begins without having to reenter all previous data.
11. While 19 functional variables are required in the program, only 11 symbols are used by reassigning these up to 3 times.
12. Data input is formatted to receive up to ten entries per line (or 11) across the page, and the carriage-return is then generated to shorten the printout.
13. Changing but a few key words makes the program suitable for spectrum analysis, frequency distribution plotting, or the special case of 'Visual Grading.'
14. In addition to the histogram output, window coordinates are given, starting from the lowest stored average, as well as the count that occurred in that window position.
15. The plotting symbol "H" and the count enumeration are suppressed if the count in a particular window is zero.
16. The program will operate in 4K with the extended functions retained (they are not used) for at least 32 sets of data.

TABLE OF VARIABLES:

N	SETS OR STUDENTS
M 1	DATA/SET OR GRADES/STUDENT
X	SUM OF AVERAGES
U 1	$\sum [A(I) - M]^2$
I	SET OR STUDENT NUMBER
M 2	MEAN
K 1	DATUM OR GRADE
P 1	VARIANCE
D 1	HISTOGRAM
D 2	LATE SETS OR LATE STUDENTS
P 2	OPEN THE WINDOW (INITIALIZED AT LOWEST A(I) )
U 2	WINDOW WIDTH
Q 2	CLOSE THE WINDOW (THIS VALUE EXCLUDED)
J 1	DATA OR GRADE COUNTER
K 2	TOTAL COUNTER
Q 1	DATA OR GRADE SUM
J 2	WINDOW COUNTER
A(I)	SET OR STUDENT AVERAGE
P 3	FORMAT COUNTER

THE FOCAL PROGRAM IN GENERAL FORM:

C[FOCAL-'69@WMRHS]

```
01.02 T "MULTICHANNEL ANALYZER [SPECTRUM ANALYSIS]"!  
01.04 T "THIS PROGRAM WILL ACCEPT YOUR RAW DATA, AVERAGE THEM!"  
01.06 T "GIVE SOME STATISTICAL INFORMATION, AND THEN PLOT A!"  
01.08 T "VARIETY OF HISTOGRAMS FOR YOUR INTERPRETATION"!!  
01.10 T "<GO> AGAIN FOR THE PROGRAM"!!!E 1  
  
02.10 A "HOW MANY SETS",N,"DATA/SET",M,!  
02.20 S X=0;S U=0;F I=1,N;T !!,%3,"SET NO. ",I;D 3  
02.30 S M=X/N;F I=1,N;S U=U+[A(I)-M]*2  
02.40 S P=U/N;T !!"MEAN ",M,! "VARIANCE ",P,! "STAND. DEV. "  
02.50 T FSQT(P)," FOR 'NORMAL' DISTRIBUTION"!!  
02.60 S P=A(I);F I=2,N;I (P-A(I))2.61;S P=A(I)  
02.61 C  
02.65 A !!! "HISTOGRAM SPACING",U;S K=0;S Q=P+U;T !  
02.70 S J=0;F I=1,N;D 8  
02.72 G 6.02  
02.75 I (K-N)2.9,2.8;T ! "ERRORS",K-N  
02.80 G 2.60  
02.90 S P=P+U;S Q=Q+U;G 2.7  
  
03.10 S P=0;S Q=0;T " DATA:"!;F J=1,M;A K;S P=P+1;S Q=Q+K;D 3.4  
03.30 S A(I)=Q/M;S X=X+A(I);T %3.01,! "AVERAGE ",A(I);R  
03.40 I (P-11)8.5;S P=0;T !;R  
  
06.02 T %5.01,P,Q;D 7;I (J)6.04,6.04;T %3," " ,J  
06.04 T !;G 2.75  
  
07.06 T " :";I (J)8.5,8.5;F D=1,J;T "H"  
  
08.10 I (A(I)-P)8.5;I (A(I)-Q)8.3;R  
08.30 S J=J+1;S K=K+1  
08.50 R;C 9.1 FOR LATE ENTRY D SETS OF M DATA EACH  
  
09.10 A ?D M?;S U=0;F I=N+1,N+D;S N=N+1;T %3,! "LATE NO. ",N;D 3  
09.20 G 2.3  
*
```

THE SPECIALIZED PROGRAM AND A REPRESENTATIVE RUN ON FICTICIOUS DATA ARE GIVEN BELOW:

```
02.10 A "HOW MANY STUDENTS",N,"GRADES/STUDENT",M,!
02.20 S X=0;S U=0;F I=1,N;T !!,%3,"STUDENT NO. ",I;D 3
02.30 S M=X/N;F I=1,N;S U=U+[A(I)-M]*2
02.40 S P=U/N;T !! "MEAN ",M,! "VARIANCE ",P,! "STAND. DEV. "
02.50 T FSOT(P)," FOR 'NORMAL' DISTRIBUTION"!!
02.60 S P=A(I);F I=2,N;I (P-A(I))2.61;S P=A(I)
02.61 C
02.65 A !!! "HISTOGRAM SPACING",U;S K=0;S Q=P+U;T !
02.70 S J=0;F I=1,N;D 8
02.72 G 6.02
02.75 I (K-N)2.9,2.8;T ! "ERRORS",K-N
02.80 G 2.60
02.90 S P=P+U;S Q=Q+U;G 2.7

03.10 S P=0;S Q=0;T " GRADES"!!;F J=1,M;A K;S P=P+1;S Q=Q+K;D 3.4
03.30 S A(I)=Q/M;D 4;T %3.01,! "AVERAGE ",A(I)," GRADE [  ]";R
03.40 I (P-11)8.5;S P=0;T !;R

04.01 S X=X+A(I)

06.02 T %5.01,P,Q;D 7;I (J)6.04,6.04;T %3," " ,J
06.04 T !;G 2.75

07.06 T " :";I (J)8.5,8.5;F D=1,J;T "H"

08.10 I (A(I)-P)8.5;I (A(I)-Q)8.3;R
08.30 S J=J+1;S K=K+1
08.50 R;C 9.1 FOR LATE ENTRY D STUDENTS OF M GRADES EACH

09.10 A ?D M?;S U=0;F I=N+1,N+D;S N=N+1;T %3,!! "LATE NO. ",N;D 3
09.20 G 2.3
```

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HOW MANY STUDENTS:32 GRADES/STUDENT:5

STUDENT NO. = 1 GRADES  
:51 :36 :66 :42 :60  
AVERAGE = 51.0 GRADE [ ]

STUDENT NO. = 2 GRADES  
:56 :36 :76 :42 :70  
AVERAGE = 56.0 GRADE [ ]

STUDENT NO. = 3 GRADES  
:86 :36 :136 :42 :130  
AVERAGE = 86.0 GRADE [ ]

STUDENT NO. = 4 GRADES  
:88 :36 :140 :42 :134  
AVERAGE = 88.0 GRADE [ ]

STUDENT NO. = 5 GRADES  
:69 :36 :102 :42 :96  
AVERAGE = 69.0 GRADE [ ]

STUDENT NO. = 6 GRADES  
:69 :36 :102 :42 :96  
AVERAGE = 69.0 GRADE [ ]

STUDENT NO. = 7 GRADES  
:76 :36 :116 :42 :110  
AVERAGE = 76.0 GRADE [ ]

STUDENT NO. = 8 GRADES  
:76 :36 :116 :42 :110  
AVERAGE = 76.0 GRADE [ ]

STUDENT NO. = 9 GRADES  
:75 :36 :114 :42 :108  
AVERAGE = 75.0 GRADE [ ]

STUDENT NO. = 10 GRADES  
:75 :36 :114 :42 :108  
AVERAGE = 75.0 GRADE [ ]



STUDENT NO. = 11 GRADES  
:75 :36 :114 :42 :108  
AVERAGE = 75.0 GRADE [ ]

STUDENT NO. = 12 GRADES  
:70 :36 :104 :42 :98  
AVERAGE = 70.0 GRADE [ ]

STUDENT NO. = 13 GRADES  
:71 :36 :106 :42 :100  
AVERAGE = 71.0 GRADE [ ]

STUDENT NO. = 14 GRADES  
:72 :36 :108 :42 :102  
AVERAGE = 72.0 GRADE [ ]

STUDENT NO. = 15 GRADES  
:72 :36 :108 :42 :102  
AVERAGE = 72.0 GRADE [ ]

STUDENT NO. = 16 GRADES  
:72 :36 :108 :42 :102  
AVERAGE = 72.0 GRADE [ ]

STUDENT NO. = 17 GRADES  
:72 :36 :108 :42 :102  
AVERAGE = 72.0 GRADE [ ]

STUDENT NO. = 18 GRADES  
:72 :36 :108 :42 :102  
AVERAGE = 72.0 GRADE [ ]

STUDENT NO. = 19 GRADES  
:61 :36 :86 :42 :80  
AVERAGE = 61.0 GRADE [ ]

STUDENT NO. = 20 GRADES  
:79 :36 :122 :42 :116  
AVERAGE = 79.0 GRADE [ ]

STUDENT NO. = 21 GRADES  
:62 :36 :88 :42 :82  
AVERAGE = 62.0 GRADE [ ]

STUDENT NO. = 22 GRADES  
:83 :36 :130 :42 :124  
AVERAGE = 83.0 GRADE [ ]

STUDENT NO. = 23 GRADES  
:74 :36 :112 :42 :106  
AVERAGE = 74.0 GRADE [ ]

STUDENT NO. = 24 GRADES  
:64 :36 :92 :42 :86  
AVERAGE = 64.0 GRADE [ ]

STUDENT NO. = 25 GRADES  
:82 :36 :128 :42 :122  
AVERAGE = 82.0 GRADE [ ]

STUDENT NO. = 26 GRADES  
:74 :36 :112 :42 :106  
AVERAGE = 74.0 GRADE [ ]

STUDENT NO. = 27 GRADES  
:80 :36 :124 :42 :118  
AVERAGE = 80.0 GRADE [ ]

STUDENT NO. = 28 GRADES  
:83 :36 :130 :42 :124  
AVERAGE = 83.0 GRADE [ ]

STUDENT NO. = 29 GRADES  
:73 :36 :110 :42 :104  
AVERAGE = 73.0 GRADE [ ]

STUDENT NO. = 30 GRADES  
:82 :36 :128 :42 :122  
AVERAGE = 82.0 GRADE [ ]

STUDENT NO. = 31 GRADES  
:80 :36 :124 :42 :118  
AVERAGE = 80.0 GRADE [ ]

STUDENT NO. = 32 GRADES  
:63 :36 :90 :42 :84  
AVERAGE = 63.0 GRADE [ ]

MEAN = 73.0  
VARIANCE = 68.5  
STAND. DEV. = 8.3 FOR 'NORMAL' DISTRIBUTION

HISTOGRAM SPACING:10  
= 51.0= 61.0 :HH = 2  
= 61.0= 71.0 :HHHHHHH = 7  
= 71.0= 81.0 :HHHHHHHHHHHHHHHHHHH = 17  
= 81.0= 91.0 :HHHHHH = 6

HISTOGRAM SPACING:5  
= 51.0= 56.0 :H = 1  
= 56.0= 61.0 :H = 1  
= 61.0= 66.0 :HHHH = 4  
= 66.0= 71.0 :HHH = 3  
= 71.0= 76.0 :HHHHHHHHHHHHH = 12  
= 76.0= 81.0 :HHHHH = 5  
= 81.0= 86.0 :HHHH = 4  
= 86.0= 91.0 :HH = 2

HISTOGRAM SPACING:1

=	51.0	=	52.0	:	H	=	1
=	52.0	=	53.0	:			
=	53.0	=	54.0	:			
=	54.0	=	55.0	:			
=	55.0	=	56.0	:			
=	56.0	=	57.0	:	H	=	1
=	57.0	=	58.0	:			
=	58.0	=	59.0	:			
=	59.0	=	60.0	:			
=	60.0	=	61.0	:			
=	61.0	=	62.0	:	H	=	1
=	62.0	=	63.0	:	H	=	1
=	63.0	=	64.0	:	H	=	1
=	64.0	=	65.0	:	H	=	1
=	65.0	=	66.0	:			
=	66.0	=	67.0	:			
=	67.0	=	68.0	:			
=	68.0	=	69.0	:			
=	69.0	=	70.0	:	HH	=	2
=	70.0	=	71.0	:	H	=	1
=	71.0	=	72.0	:	H	=	1
=	72.0	=	73.0	:	HHHHH	=	5
=	73.0	=	74.0	:	H	=	1
=	74.0	=	75.0	:	HH	=	2
=	75.0	=	76.0	:	HHH	=	3
=	76.0	=	77.0	:	HH	=	2
=	77.0	=	78.0	:			
=	78.0	=	79.0	:			
=	79.0	=	80.0	:	H	=	1
=	80.0	=	81.0	:	HH	=	2
=	81.0	=	82.0	:			
=	82.0	=	83.0	:	HH	=	2
=	83.0	=	84.0	:	HH	=	2
=	84.0	=	85.0	:			
=	85.0	=	86.0	:			
=	86.0	=	87.0	:	H	=	1
=	87.0	=	88.0	:			
=	88.0	=	89.0	:	H	=	1