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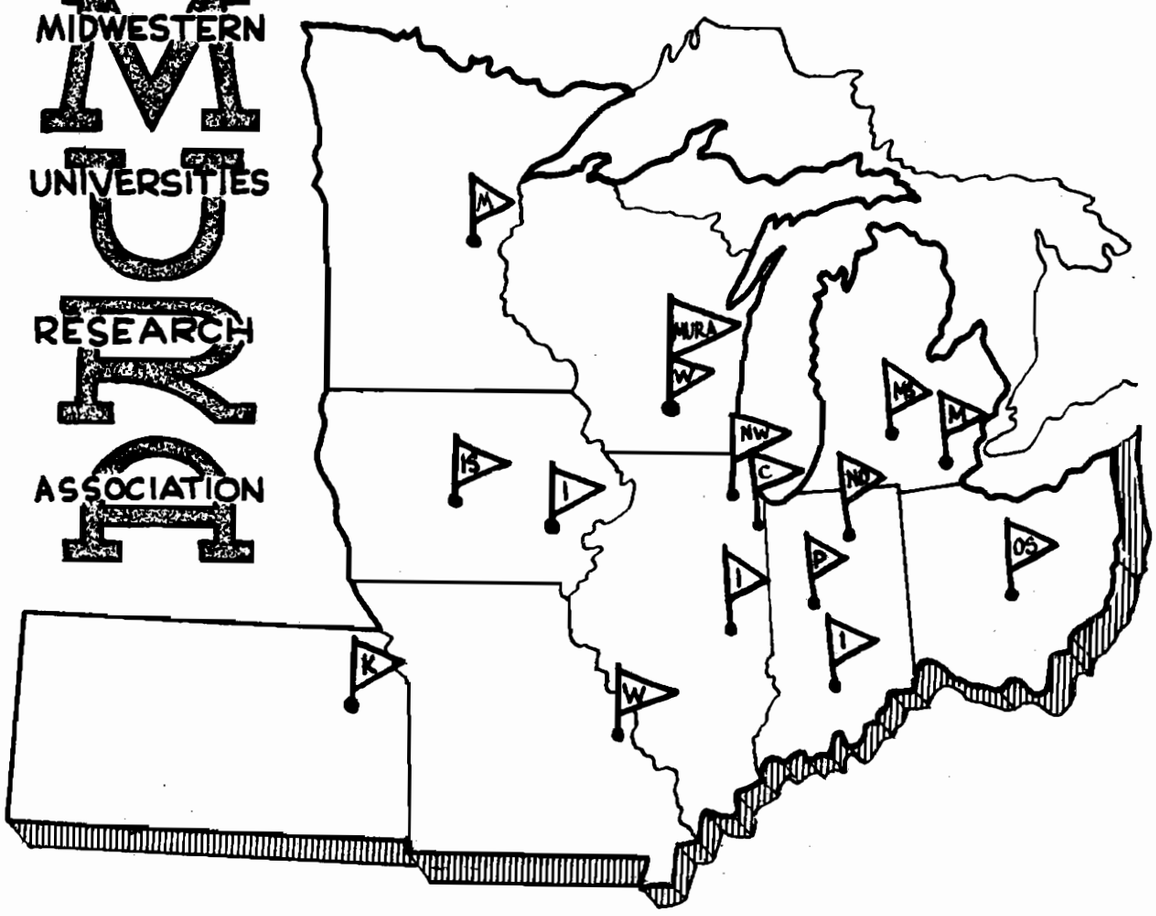


**REPORT** ALGYTEE SCOPE
(Program 121)
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# ALGYTEE SCOPE
(Program 121)

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This program supplements the present ALGYTEE (Program 58) with several cathode ray tube display features. None of the original properties of the earlier program are disturbed by this augmentation and the programs differ only in their mode of output.

The conventional output on the IBM 716 printer is simultaneously available with the film displays or it may be suppressed in a limited number of cases by setting the parameter $N_{po} > N_E$ on the original ALGYTEE Agendum Sheet. Those cases for which the above statement is not true will be enumerated later.

The type of figure displayed is determined from a parameter, called SCOPE WORD 1, entered on the Scope Agendum Sheet. This parameter, hereafter called SW1, is a signed integer whose values range from -6 to +5. If SW1 is identically zero, then no scope output will be made. In fact, the program will then produce the very same results as Program 58.

For positive values of SW1 there is a choice of plotting either points or integers. This feature is controlled by another SCOPE WORD, SW2. If SW2 = 0 the display will be a series of points. Any other value of SW2 will produce a display of integers starting with 0, 1, 2, etc. The position of an integer will be such that the center of its right-most digit is the coordinates of the point in question.

The figure resulting for each of the twelve values of SW1 is described below:

SW1 = -1: x is plotted against N appearing as bright spots. N is taken as the abscissa in all cases and is advanced by unity after each plotted point. This allows for a total of 1024 subdivisions along the horizontal axis. If for any reason some other scale is more desirable, one should consult the author of this program. The ordinate is plotted as the integer part of $\frac{x}{x_{SF}}$, where $x_{SF}$ is a scale factor which must be entered on the Agendum Sheet as a floating point number.

SW1 = -2: y is plotted against N appearing as dim spots. The ordinate, again, is plotted as the integer part of $\frac{y}{y_{SF}}$, where $y_{SF}$ is the corresponding scale factor.

SW1 = -3: Both the figures for SW1 = -1 and -2 are combined onto a single frame.

SW1 = -4: $k_x$ (the x invariant) is plotted against N as bright spots. $(k_x)_{SF}$ is the corresponding scale factor.

SW1 = -5: $k_y$ (the y invariant) is plotted against N as dim spots. $(k_y)_{SF}$ is its scale factor.

SW1 = -6: Combines SW1 = -4 and SW1 = -5 onto a single frame.

The vertical axis for all the above figures appears at the extreme left and the horizontal axis passes through the center of the scope.

SW1 = 0: All scope output is suppressed.

In the following figures the variables x, y, and $k_x$ are the abscissa, except in the case of x against y where y becomes the ordinate. $P_x$, $P_y$, and $k_y$ are always ordinates.

SW1 = 1: Plots x against $P_x$ as bright spots.

SW1 = 2: Plots y against $P_y$ as dim spots.

SW1 = 3: Combines the above onto a single frame.

SW1 = 4: Plots x against y.

SW1 = 5: Plots $k_x$ against $k_y$.

On all scope figures SW1 = 1 through 5 the origin of the coordinate system is the center of the scope. Both the vertical and horizontal axes are displayed passing through this point.

If the integer part of any of the quantities $\left|\frac{x}{x_{SF}}\right|$, $\left|\frac{y}{y_{SF}}\right|$, $\left|\frac{P_x}{(P_x)_{SF}}\right|$, $\left|\frac{P_y}{(P_y)_{SF}}\right|$, $\left|\frac{k_x}{(k_x)_{SF}}\right|$, or $\left|\frac{k_y}{(k_y)_{SF}}\right|$ is equal to or greater than 512, then the point will appear on one of the four outer boundaries of the scope. Which boundary is determined obviously by the coordinate which did not exceed 512. In the event that both coordinates exceed the limit of 512, then the point appears precisely at one of the four corners.

In order, therefore, to insure that all numbers remain in scale it is necessary that the six quantities $\left|\frac{x}{x_{SF}}\right|$, $\left|\frac{y}{y_{SF}}\right|$, $\left|\frac{P_x}{(P_x)_{SF}}\right|$, $\left|\frac{P_y}{(P_y)_{SF}}\right|$, $\left|\frac{k_x}{(k_x)_{SF}}\right|$, and $\left|\frac{k_y}{(k_y)_{SF}}\right|$ are less than 512 at all times.

The frequency of plotting points is handled in the very same manner that printing is accomplished by the original ALGYTEE. To this end three parameters are necessary whose values are entered on the Scope Agendum Sheet as integers.

They are the following:

$M_p$ = A point will be plotted every $(M_p)^{th}$ transformation step provided the $M_{po}$ condition does not exist.

$M_{po}$ = The number of transformation steps for which no scoping shall take place.

$M_{pp}$ = The number of transformation steps for which scoping shall occur and before imposing the $M_{po}$ condition again.

There is an exception to the above, that is in the case of the invariants $k_x$ and $k_y$. Since both quantities are calculated only at printing time, the scoping of them is also controlled by the printing parameters $N_p$, $N_{po}$, and $N_{pp}$. For displaying any figures involving $k_x$ and $k_y$, printing and scoping will always operate in unison and no deviation from this rule is possible.

All parameters are held from run to run. Only those which change need to be specified on subsequent runs. The ALGYTEE Scope Agendum (Program 121) should be attached to and before the ALGYTEE Agendum Sheets.

The film is automatically advanced one frame before each run. In the upper right-hand corner of each frame will appear three numbers which are the problem number 121, the ID number, and SW1. The following is a sample of this display at the top of the film.


For the figures which involve N, there is also an automatic film advance to the next frame if $N \geq 1024$. N is again reset to 1 and this frame serves as a continuation of the previous one.

This program has been set up in an easily expandable form so that any additional figures can be incorporated with a minimum of effort.

A sample agendum sheet is attached.

Algytee Scope Agendum Sheet
(Program 121)

This agendum sheet must be attached by staples before the associated Algytee, Algytee Invariants, and Algytee Bumps agenda.

| Parameter | Address | Value | | Remark | |
|---|---|---|---|---|---|
| SW1 | 4075 | | | Scope Word (figure) | INTEGERS |
| SW2 | 4076 | | | Scope Word (points or integers) | |
| $M_p$ | 4080 | | | No. of steps between plots | |
| $M_{po}$ | 4081 | | | No. of steps before any plotting occurs | |
| $M_{pp}$ | 4082 | | | No. of steps during which plotting occurs | |
| | | n | EXP | | FLOATING POINT NUMBERS |
| $(P_x)_{SF}$ | 1825 | | | $P_x$ scale factor | |
| $x_{SF}$ | 1826 | | | x scale factor | |
| $(P_y)_{SF}$ | 1856 | | | $P_y$ scale factor | |
| $y_{SF}$ | 1857 | | | y scale factor | |
| $(k_y)_{SF}$ | 1878 | | | $k_y$ scale factor | |
| $(k_x)_{SF}$ | 1879 | | | $k_x$ scale factor | |

NOTE: The following figures are representative for values of SW1:

SW1 = 0; nothing
= 1; x vs. $P_x$
= 2; y vs. $P_y$
= 3; x vs. $P_x$ and y vs. $P_y$
= 4; x vs. y
= 5; $k_x$ vs. $k_y$

SW1 = -1; x vs. N
= -2; y vs. N
= -3; x vs. N and y vs. N
= -4; $k_x$ vs. N
= -5; $k_y$ vs. N
= -6; $k_x$ vs. N and $k_y$ vs. N

SW2 = 0 means plot points; SW2 $\neq$ 0 means plot integers.