

DECUS

PROGRAM LIBRARY

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| DECUS NO. | FOCAL8-106 |
| TITLE | FOCAL TRAVELING-WAVE SKETCHES |
| AUTHOR | Arthur L. Pike |
| COMPANY | Tufts University Department of Electrical Engineering Medford Massachusetts |
| DATE | February 9, 1970 |
| SOURCE LANGUAGE | FOCAL, 1969 |

FOCAL TRAVELING-WAVE SKETCHES

DECUS Program Library Write-up

DECUS NO. FOCAL8-106

This program sketches graphs of the following wave expressions:

$$i(y, t) = A e^{ay} \sin(10\pi t - \beta y) = \text{Im}(A e^{(a + i\beta)y} e^{i10\pi t})$$

In this equation, angular frequency $\omega = 10\pi$ radians per second, and propagation constant $\underline{r} = a + i\beta$; the components of \underline{r} are positive for an incident wave, with negative values for a reflected wave. Phase constant β is fixed by the program at $\pi/2$, thereby fixing the phase wavelength at:

$$L = \frac{2\pi}{\beta} = 4 \text{ units}$$

Thus, a value of $t = 0.1$ corresponds to π radians in the phase angle. Hence, with $t = 0.05$, the corresponding angle is 90° . Amplitude A is scaled by the program so that the maximum amplitude of any wave will lie in the sketch space.

The program permits selection of either the incident wave or the reflected wave. A magnitude of attenuation constant a lying between 0 and 1 is also chosen by the user. Finally, a tabulation of ordinates (evaluated every 30° of space wavelength) is produced with a sketch on the teletype when the user designates a value of time t . The program loops to request a new time input. If return to the FOCAL direct-command system is desired, the time value may be given as QUIT. A sample execution with FOCAL, 1969 is shown on the next page. The program listing is on page 4.

CONGRATULATIONS!!
YOU HAVE SUCCESSFULLY LOADED 'FOCAL,1969' ON A PDP-8/I COMPUTER.

SHALL I RETAIN LOG, EXP, ATN?:YES

PROCEED.

*C - USE HIGH-SPEED READER

**

***GO

FOCAL TRAVELING-WAVE SKETCHES

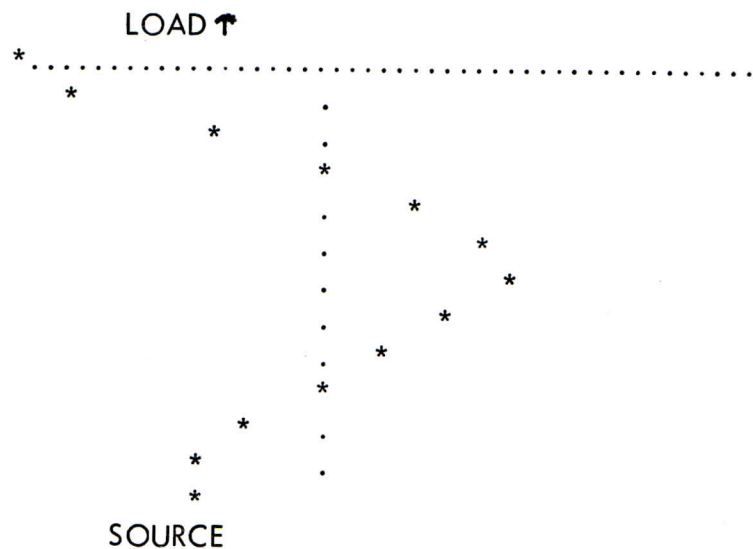
ENTER I OR R (INCIDENT OR REFLECTED):R

ENTER ALPHA ($0 < \text{ALPHA} < 1$):0.2

ENTER NEW TIME :0.05

FOR ALPHA = 0.2 REFLECTED WAVE AT T = 0.050

| | |
|----------|-------------|
| Y = 0.00 | AMP = 10.0 |
| Y = 0.33 | AMP = 8.10 |
| Y = 0.67 | AMP = 4.38 |
| Y = 1.00 | AMP = 0.00 |
| Y = 1.33 | AMP = -3.83 |
| Y = 1.67 | AMP = -6.21 |
| Y = 2.00 | AMP = -6.70 |
| Y = 2.33 | AMP = -5.43 |
| Y = 2.67 | AMP = -2.93 |
| Y = 3.00 | AMP = -0.00 |
| Y = 3.33 | AMP = 2.57 |
| Y = 3.67 | AMP = 4.16 |
| Y = 4.00 | AMP = 4.49 |



ENTER NEW TIME :QUIT

*C - ASK FOR SYMBOL TABLE

*TYPE %, \$

AM (00) = 0.100000E+02

K@ (00) = -0.200010E+00

PT (00) = -0.100000E+01

AF (00) = 0.200000E+00

T@ (00) = 0.192100E+05

Y@ (00) = 0.433333E+01

IA (00) = 0.449329E+01

IB (00) = 0.999996E+00

I@ (00) = 0.449327E+01

LC (00) = 0.120000E+02

J@ (00) = 0.420000E+02

*C - GET CORE USAGE

*LOCATIONS

3206

4312

4401

4617

C-PROGRAM FOR SKETCHING TRAVELING WAVES - MOD 4 - 1/31/70 - PIKE, A L

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01.05 T      !, "FOCAL TRAVELING-WAVE SKETCHES";S AM=10.0
01.10 A      !:!, "ENTER T OR R(INCIDENT OR REFLECTED)", K
01.15 I      (K-01)1.10, 1.30
01.20 I      (K-0R)1.10, 1.25, 1.10
01.25 S      PT=-1;G 1.35
01.30 S      PT=+1
01.35 A      !:, "ENTER ALPHA (0<ALPHA<1)", AF
01.40 I      (AF)1.35;
01.45 I      (AF-1)1.50, 1.50, 1.35
01.50 I      (PT)1.55;S AM=AM*FEXP(-4*AF)
01.55 A      !:, "ENTER NEW TIME", T
01.60 I      (T-0QUIT)1.65, 1.99, 1.65
01.65 S      K=PT*(0.00001+AF);T !:, "FOR ALPHA ", %3.02, K, " "
01.66 I      (PT)1.67;T " INCIDENT";G 1.68
01.67 T      "REFLECTED"
01.68 T      " WAVE AT T ", %8.03, T, !
01.69 T      !, "                                LOAD ↑ "
01.70 F      Y=0, 1/3, 4;D 2
01.72 T      !, "                                SOURCE"
01.75 G      1.55
01.99 T      !;QUIT

02.10 S      IA=AM*FEXP(PT*AF*Y)
02.20 S      IB=FSIN(3.141593*(10*H+(PT*Y/2) ) )
02.30 S      I=IA*IB
02.40 T      !, %3.02, "Y ", Y, "  AMP ", I, " "
02.50 D      3
02.60 R

03.10 S      LC=FITR(21-2*1)
03.20 I      (Y-0.1)3.50, 3.50;
03.30 F      J=1, 41;D 5
03.40 R
03.50 F      J=1, 41;D 4
03.60 G      2.60

04.10 I      (J-LC)4.20, 4.30, 4.20
04.20 T      ". ";R
04.30 T      "* ";R

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| | | |
|-------|---|------------------------|
| Ø5.1Ø | I | (J-LC)5.2Ø, 5.4Ø; |
| Ø5.2Ø | I | (J-21)5.3Ø, 5.5Ø, 5.6Ø |
| Ø5.3Ø | T | " ";R |
| Ø5.4Ø | D | 4.3Ø;R |
| Ø5.5Ø | D | 4.2Ø;R |
| Ø5.6Ø | I | (J-LC)5.7Ø, 5.8Ø, 2.6Ø |
| Ø5.7Ø | D | 5.3Ø;R |
| Ø5.8Ø | D | 4.3Ø;G 2.6Ø |

TYPE :

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