

UNIVERSITY OF ILLINOIS
DIGITAL COMPUTER

LIBRARY ROUTINE 07-245

TITLE: Linear Interpolation For The Cathode Ray Tube (DOI or SADOI)

TYPE: Closed subroutine using library routine 02 as an auxiliary routine.

NUMBER OF WORDS: 43

TEMPORARY STORAGE: 0, 1

PRESET PARAMETERS: S4, S5, S6

4	00F	00aF	x,y are in locations a, a+1
5	00F	00bF	x',y', are in locations b, b+1
6	00F	00cF	Routine 02 is in location c

ACCURACY: Same as 02

DURATION: 16.3 + 2.6 k msec.

DESCRIPTION: This routine always plots first the point P, whose coordinates are (x,y) with extra intensity (four "hits") to distinguish it from the interpolated points. It then plots k points (ξ, η) that are linearly interpolated between (x, y) and (x', y'). It does not plot the point (x', y').

The following rules govern the interpolation process and the value of k. Let Δ_1 be the larger of (x'-x), (y'-y), in absolute value, and let Δ_2 be the smaller of the two.

1. If $2^{-5} \geq |\Delta_1|$ - No interpolation.
2. If $2^{-5} < |\Delta_1|$ - The increments $\alpha = 2^{-6} \Delta_1 / |\Delta_1|$ and $\beta = 2^{-6} \Delta_2 / |\Delta_1|$ are computed and used to plot as many interpolated points as will fit within the given intervals.

The number of times the point P is hit and the numbers 2^{-5} and 2^{-6} controlling the interpolation process can, of course, be easily changed by changing the words at 43L, 12L, and 14L, respectively.

USE: This routine will be useful when it is desired that the final data output by a program be in the form of an almost continuous curve on the CRO screen, but the time required by the program in computing the $\sim 2^7$ points

needed for the curve is prohibitively large. This routine will save time if

$$T > (14/k) \text{ msec.}$$

where T is the time taken by the program to compute the coordinates (x, y) of one point, and k is the number of points interpolated between pairs of points computed by the program. The user should recognize the limitations imposed both by the linear interpolation and by the finite accuracy of O2.

Date November 18, 1958

Coded by B. L. Hicks

Approved by J. Snyder

LOCATION	ORDER	NOTES
0	00 K(07) K5 OF 42 13L	Set link
1	41 42L 15 134	Hit first point four times
2	J0 S4 50 2L	
3	26 36 F5 42L	
4	40 42L 10 43L	save $\Delta x, \Delta y, \Delta x - \Delta y = \delta$
5	32 1L 41 39L	
6	15 35 10 S4	
7	40 36L 15 135	
8	10 134 40 37L	
9	L7 36L 12 37L	
10	40 42L 36 33L	choose α, β
11	L7 37L 40 OF	
12	41 38L 19 4F	
13	10 OF 32 OF	out if no interpolation needed
14	19 5F 40 1F	form $\alpha, \beta; k\alpha$
15	50 37L 7J 1F	
16	66 OF 85 OF	

LOCATION	ORDER	NOTES	PAGE 2	07
17	40 41L 50 36L			
18	7J 1F 66 OF			
19	S5 F 40 40L			
20	L5 38L L4 40L			
21	40 38L L7 38L			
22	L2 36L 32 13L	out if interpolation completed		
23	L5 39L L4 41L	form $\xi, \eta (\delta < 0)$		
24	40 39L L5 42L			
25	32 28L L5 84			
26	L4 38L 40 37L			
27	L5 184 L4 39L			
28	26 31L L5 84	form $\xi, \eta (\delta \geq 0)$		
29	L4 39L 40 37L			
30	L5 184 L4 38L			
31	J0 37L 50 31L	plot interpolated point		
32	26 S6 26 20L			
33	50 36L L5 37L	interchange $\Delta x, \Delta y$		

LOCATION	ORDER		NOTES
34	40 36L 85 F		
35	40 37L 26 11L		
36	00 F 00 F		internal store
37	00 F 00 F		
38	00 F 00 F		
39	00 F 00 F		
40	00 F 00 F		
41	00 F 00 F		
42	00 F 00 F		
43	80 F 00 4F		end constant