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DECUS NO.	FOCAL8-185
TITLE	LIFE
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DATE	June 21, 1971
SOURCE LANGUAGE	FOCAL

ABSTRACT

This program is a focal version of the game LIFE attributed to John Horton Conway of the Cavendish Laboratory in Cambridge, England

The computer plays with a matrix of locations, each of which may start as full or empty. Full locations are said to contain "cells", which live, multiply or die according to the following rules:-

Each location is bounded by eight neighboring locations, except at the edges of the matrix.

Each cell with two or three neighboring cells will survive.

Each cell on its own, or with only one neighbor, will die of isolation. Each cell with four or more neighbors will die of over-population.

Each empty location with three or more cells neighboring it will be filled by a new cell.

This program starts after a GO command by asking the operator to specify the size of the matrix to be used. The maximum size on a 4K machine is 4 X 4, but an 8K machine permits the use of an 11 X 11 matrix. After this, the operator must specify the X and Y coordinates of cells in the starting position, specifying zero as a coordinate results in a typeout of the starting matrix, after which the computer asks if the next "generation" of cells should be plotted.

A sample printout with user's responses in angled < > brackets:-

LIFE

Matrix size M'M ? M?: <11>

Type X + Y coordinates of occupied cells
Zero stops further entries
X:<4>   Y:<5>   X:<5>   Y:<5>   X:<6>   Y:<5>
X:<5>   Y:<6>   X:<6>   Y:<6>   X:<7>   Y:<6>
X:<6>   Y:<7>   X:<7>   Y:<7>   X:<8>   Y:<7>
X:<∅>   Y:<∅>

MATRIX IS

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...ØØØ.....
....ØØØ....
.....ØØØ...
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Next generation?: <Yes>

MATRIX IS

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....Ø......
...0..Ø....
...Ø...Ø...
....Ø..Ø...
......Ø....
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....

Next generation?: <Yes>

MATRIX IS

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...ØØ......
...ØØ.ØØ...
......ØØ...
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....

Next generation?: <Yes>

MATRIX IS

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. . . . . . . . . .
. . . . . . . . . . .
. . . . . . . . . .
. . .ØØØ. . . . .
. . .ØØØØØ. . .
. . . . .ØØØ. . .
. . . . . . . . . . .
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. . . . . . . . . .
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The next generation was identical to the second one above. This attainment of a constant cycle of structures is a very common outcome of the game.

REFERENCES

1. Barry, J. "The game of LIFE: is it just a game?" "Spectrum," the Sunday Times, PlØ, June 13, 1971

2. Scientific American, October 197Ø

3. IBID, February 1971

4. IBID, April 1971

RESTRICTIONS

A 4K PDP-8 allows a matrix of only 4 X 4 or less, but 8K FOCAL allows the ι se of an 11 X 11 matrix.

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01.01 C; LIFE
01.20 T !!!,"LIFE",!!
01.30 A "MATRIX SIZE M*M ? M ?",M
01.40 S MM=M*M;F J=1,1,MM;S C(J)=0
01.50 T !,"TYPE X & Y COORDINATES OF OCCUPIED CELLS",!
01.55 T "ZERO STOPS FURTHER ENTRIES",!
01.60 A "X",X," Y",Y
01.65 I (X)2.10,2.10;I (Y)2.10,2.10
01.70 I (M-X)1.80;I (M-Y)1.80;S J=([Y-1]*M)+X;S C(J)=1;G 1.60
01.80 T !,"OUTSIDE MATRIX ",M,"*",M;C 1.60

02.10 T %2.00,!,"MATRIX IS",!
02.20 F Y=1,1,M;D 3
02.40 T !!;A "NEXT GENERATION?",J
02.50 I (J-0YES)2.60,5.10,2.60
02.60 I (J-0NO)2.70,2.80,2.70
02.70 T "ANSWER YES OR NO",!;C 2.40
02.80 Q

03.20 T !;F X=1,1,M;D 4
03.30 R

04.20 S J=([Y-1]*M)+X;I (C(J))4.30,4.30,4.40
04.30 T ".";R
04.40 T "O";R

05.10 F Y=1,1,M;D 6
05.20 F J=1,1,MM;D 10
05.30 C 2.10

06.20 F X=1,1,M;D 7
06.30 R

07.10 S J=([Y-1]*M)+X;S P=0
07.20 I (Y-1)7.40,7.40;I (M-Y)7.30,7.30
07.24 I (X-1)7.28,7.28;I (M-X)7.29,7.29
07.25 D 8.1;D 8.2;D 8.3;D 8.4;D 8.5;D 8.6;D 8.7;D 8.8;C 7.70
07.28 D 8.6;D 8.2;D 8.5;D 8.4;D 8.8;C 7.70
07.29 D 8.7;D 8.3;D 8.8;D 8.1;D 8.6;C 7.70
07.30 I (X-1)7.33,7.33;I (M-X)7.34,7.34
07.31 D 8.8;D 8.1;D 8.6;D 8.2;D 8.5;C 7.70
07.33 D 8.6;D 8.2;D 8.5;C 7.70
07.34 D 8.8;D 8.1;D 8.6;C 7.70
07.40 I (X-1)7.50,7.50;I (M-X)7.60,7.60
07.41 D 8.3;D 8.8
07.50 D 8.5;D 8.4;D 8.7;C 7.70
07.60 D 8.7;D 8.3;D 8.8
07.70 I (C(J))7.80,7.80,7.90
07.80 I (P-3)7.82;S C(J)=-1;R
07.82 R
07.90 I (P-1)7.92,7.92;I (4-P)7.92,7.92;R
07.92 S C(J)=100
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08.10  S  TL=(J-1-M);I(C(TL))9.11,9.11,9.12
08.20  S  TR=(J+1-M);I (C(TR))9.11,9.11,9.12
08.30  S  BL=(J-1+M);I (C(BL))9.11,9.11,9.12
08.40  S  BR=(J+1+M);I (C(BR))9.11,9.11,9.12
08.50  S  R=J+1;I (C(R))9.11,9.11,9.12
08.60  S  T=J-M;I (C(TT))9.11,9.11,9.12
08.70  S  B=J+M;I (C(B))9.11,9.11,9.12
08.80  S  L=J-1;I (C(L))9.11,9.11,9.12

09.11  R
09.12  S  P=P+1;R

10.10  I  (C(J))10.40,10.60;I ((C(J)-1))10.60,10.40,10.60
10.40  S  C(J)=1;R
10.60  S  C(J)=0;R
*0000000000000000000000000000
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