GAME OF LIFE

(Distinguishable Cells with Vital Statistics Version)

This variation of the "Game of Life" (which is listed elsewhere) was inspired by seeing Mordecai Schwartz's (233) adaptation in V3N9p35 and follows his 10X10 format. See V3N10p25-26 and 33 for a discussion and for Mike Louder's (329) and for John Rausch's (88) versions.

This version can be run on either the 67 or 97. It is especially suited for the 97 although the key codes listed are for the 67. The line-by-line display (print-out) of each generation distinguishes between new-born cells (by showing them as 1's), mature cells, i.e. carry-overs from the previous generation (displayed or printed as 2's) and cells that have died since the previous generation (which appear as 3's.)

This makes following the course of events much easier, without as much back-and-forth comparison between succeeding generations. A blooming profusion of 3's makes obvious the occurrence of a drastic population disaster and and abundance of 1's provide cause for hope that an upswing in the fortunes of the colony impends (in a way somewhat analogous to the TV Dazzler versions where cells are distinguishable by color.)

Additionally, at the end of the line-by-line display (print-out) of each generation there is a display (print-out) of vital statistics: the births, the deaths, and the total live population resulting, each appearing as a 2-digit decimal number preceded by an integer which is the generation number.

Operation is normally continuous until the occurrence of a generation in which there has been no change in the positions of live cells or until the occurrence of a generation of zero population. If Flag 0 is set manually from the keyboard, execution will halt each generation immediately after the vital statistics for that generation have been displayed (printed) with the display showing the generation and population of the generation just completed. Pressing R/S starts execution for the following generation.

To enter Generation 0, press A to initialize. Key in Line 0 of Generation 0 (e.g. as 0.011011100) and press B. The line so entered is displayed as a 5-sec. pause on the 67, printed on the 97, and execution stops showing the next line number to be entered (in this case 1). Enter Lines 1-9, one at a time, pressing B after each. Execution begins automatically. There is first a display (print-out) of the generation number and number of new cells (for Generation 0 this is the total of live cells you've entered), then the generation number and number of deaths (for Generation 0 this will always be zero), and lastly the generation number and total live population (for Generation 0, the same as the number of new cells.)

Unless you set Flag 0, execution continues and Line 0 of Generation 1 is displayed (printed) in about 7-50 secs. depending on the population and its distribution. New-born cells appears as 1's, cells living over from the previous generation as 2's, and cells which were alive in the previous generation but are now dead as 3's. Line 1 follows in 7-25 secs. and so on through Line 8, which is immediately followed by Line 9, and then in quick succession, the three vital statistics, e.g. 1.07, 1.03, 1.37--Generation 1 has 7 new cells, there have been 3 deaths since Generation 0, and the total live population is now 37.

For 67 operation, if you wish to be sure to see--and perhaps write down--each line, set Flag 1 manually from the keyboard. This causes execution to stop with the display showing the generation number and line number of the line which will be displayed (printed) as soon as you press R/S, (e.g. 2.3 = Line 3 of Generation 2 about to be displayed.)

If you intend to operate the program only on the 67, the -X- (31 84) step at 017 can be deleted. This step serves to cause the Generation 0 to be printed line by line as it is entered and slows down the entry process on the 67. Additionally, if you wish, you can substitue a 1-sec. PAUSE (35 72) step for each -X- (31 84) step at 124, 198, 202, and 206 which potentially shortens execution time about 50 secs. a generation, and of course all the SPACE steps can be removed.

On the 97, typical time for a generation is on the order of 3 minutes, although it can be as little as 40 secs. or as long as 4½ minutes, depending on the population and its distribution. On the 67, of course, the time is increased by the 13 pause displays (of whatever kind) each generation.

It is possible, with a version of this limited to running on either a 67 or a 97, to add a few steps that further slightly shorten execution time (by jumping to the next line at a point in the left-to-right cell analysis where only empty cells lie to the right) and if anyone is sufficiently interested in having these, I'll be glad to send them if you write me.

Louis Cargile, Jr. (753)

H I - L O

P/S

HP-25 PROGRAM

DON BLESSING
BALBOA, CA.

DISPLAY LINE	CODE	KEY ENTRY	X
00	//////	//////	
01	24 00	RCL 0	
02	61	X	
03	14 01	f INT	
04	23 01	STO 1	
05	14 11 0	0 f F	X 0
06	14 34	f STK	
07	25	E +	
08	34	CLX	
09	74	R/S	
10	31	↑	
11	24 01	RCL 1	
12	21	X≶Y	
13	14 41	fx<Y	
14	13 22	GTO 22	
15	13 16	GTO 16	
16	14 71	fx=Y	
17	13 28	GTO 28	
18	13 19	GTO 19	
19	14 51	fx≤Y	
20	13 24	GTO 24	
21	13 13	GTO 13	
22	24 05	RCL 5	
23	13 25	GTO 25	
24	24 04	RCL 4	
25	14 74	fPz	
26	14 74	fPz	
27	13 06	GTO 06	
28	24 02	RCL 2	
29	14 74	Pz	
30	1474	Pz	
31	24 03	RCL 3	
32	14 74	Pz	
33	14 74	Pz	
34	00	0	
35	23 01	STO 1	
36	23 03	STO 3	
37	01	1	
38	23 04	STO 4	
39	32	CHS	
40	23 05	STO 5	
41	07	7	
42	23 02	STO 2	
43	34	CLX	
44			
45			
46			
47			
48			
49			

REGISTERS	
R_0	555
R_1	N
R_2	7
R_3	0
R_4	1
R_5	-1
R_6	
R_7	

INSTRUCTIONS

1.	STORE	N	555	STO 0
2.	LOAD V(SEED) V = >0< 1	V		R/S
3.	INITIALIZE			RCL 1 R/S
4.	LOAD NEW SEED	V		
5.	1ST GUESS	N		R/S
6.	ADDITIONAL GUESSES -1 GUESS TOO LOW +1 GUESS TOO HIGH 7 CORRECT GUESS FOLLOWED BY NUMBER OF TRIES			R/S
7.	FOR NEW GAME INSERT V START GUESSING			R/S

NO LIMITS YET FOR HP-65

THE HP-65HAS YET TO REACH ITS LIMITS!!
or MORE DISCOVERIES WITH NNN'S
or WHAT ARE THE LIMITS II -cont'd from V3N7P3

THOMAS CHRAPKIEWICZ (857)

In continuing the (never ending?) spirit of exploring all the capabilities of the HP-65, many more curiousities (and potential applications) have been found when working with non-normalised numbers (NNN's). Recall that a NNN is a number which is not fully represented by the display, and further has one of ten possible 'polarities' which cannot be read directly from the display.[1] To review some old notation and introduce some new notation:

A: 1p4 represents a NNN which is displayed as the number +1 and has polarity 4.

B: Define P(x) to be the 'Polarity' fcn.(The polarity fcn is listed on V3N9p16C) In the case where R9 is the 'residue' left from calculation of $TAN^{-1}(x)$:

P(x)=ABS(INT(10*FRC(1000*R9))), where FRC is f^{-1} INT.

EG: P(1P4)=4, P(2.5P3)=3, etc...

Whether any of this information is of any practical application may be questionable, BUT several of these discoveries Definitely yield further insight into the operation of the HP-65 at a level that the user is not (usually) working at!

To study the following information, key in the routine for P(x) from V3N9P16c. It is duplicated here:

LBL,E,f^{-1},TAN,CLX, RCL,9,EEX,3,x,f^{-1},INT,1,0,x,f,INT,g,ABS, RTN

1. GAME OF LIFE BY: LOUIS CARGILE, JR. (253)

2. (Distinguishable Cells with Vital Statistics Version) BY:

1 GAME OF LIFE (Distinguishable Cells with Vital Statistics) — Init | Enter Line n of Gen. 0 — 67

(67 Key Codes)

2 — 97

STEP	KEY ENTRY 1	KEY CODE
1	LBL A	31 25 11
	DSP 0	23 00
	CL REG	31 43
	1	01
5	0	00
	STO 7	33 07
	ST I	35 33
	.	83
	0	00
10	1	01
	STO E	33 15
	CL X	44
	R/S	84
	LBL B	31 25 12
15	STO (i)	33 24
	DSP 9	23 09
	-X-	31 84
	RCL 7	34 07
	CHS	42
20	X⇄I	35 24
	X⇄Y	35 52
	GSB 9	31 22 09
	R↓	35 53
	X⇄I	35 24
25	ISZ	31 34
	RCL 7	34 07
	RC I	35 34
	RCL 7	34 07
	-	51
30	DSP 0	23 00
	X ≠ Y	32 61
	R/S	84
	RCL E	34 15
	STO x 9	33 71 09
35	GTO C	22 13
	LBL E	31 25 15
	RCL 9	34 09
	STO 4	33 04
	0	00
40	STO 0	33 00
	STO 5	33 05
	STO 8	33 08
	STO 9	33 09
	STO C	33 13
45	STO D	33 14
	8	08
	ST I	35 33
	1	01
49	STO + 3	33 61 03
50	SPACE	35 84
	LBL 6	31 25 06
	CF2	35 61 02
	1	01
	STO 6	33 06
55	0	00
	STO A	33 11
	RC I	35 34
	RCL 7	34 07
	-	51
60	X< 0	31 71
	GTO 0	22 00
	GSB f a	32 22 11
	LBL 0	31 25 00
	ISZ	31 34
65	RCL 5	34 05
	STO C	33 13
	RCL 8	34 08
	STO D	33 14
	RC I	35 34
70	1	01
	9	09
	X = Y	32 51
	GTO 5	22 05
	ISZ	31 34
75	ISZ	31 34
	1	01
	STO 6	33 06
	0	00
	STO 5	33 05
80	STO 8	33 08
	RCL (i)	34 24
	DSZ	31 33
	RCL (i)	34 24
	ENTER	41
85	FRAC	32 83
	STO A	33 11
	-	51
	X = 0	31 51
	SF2	35 51 02
90	X⇄Y	35 52
	RCL (i)	34 24
	+	61
	DSZ	31 33
	RCL (i)	34 24
95	+	61
	x = 0	31 51
	GTO 6	22 06
	ENTER	41
	FRAC	32 83
100	STO B	33 12

STEP	KEY ENTRY 2	KEY CODE
1	-	51
	0	00
	X⇄Y	35 52
	GTO 8	22 08
5	LBL a	32 25 11
	DSP 1	23 01
	RCL 7	34 07
	÷	81
	RCL 3	34 03
10	+	61
	F?1	35 71 01
	R/S	84
	DSP 9	23 09
	RCL (i)	34 24
15	RCL C	34 13
	X ≠ Y	32 61
	SF3	35 51 03
	STO (i)	33 24
	+	61
20	RCL D	34 14
	2	02
	X	71
	+	61
	-X-	31 84
25	RTN	35 22
	LBL 1	31 25 01
	3	03
	X ≠ Y	32 61
	GTO 4	22 04
30	LBL 2	31 25 02
	RCL E	34 15
	STO + 9	33 61 09
	RCL 6	34 06
	STO + 5	33 61 05
35	GTO 4	22 04
	LBL 3	31 25 03
	RCL E	34 15
	STO + 0	33 61 00
	RCL 6	34 06
40	STO + 8	33 61 08
	LBL 4	31 25 04
	EEX	43
	CHS	42
	9	09
45	RCL 6	34 06
	X = Y	32 51
	GTO 6	22 06
	RCL 1	34 01
49	RCL 2	34 02
50	RCL A	34 11
	RCL 7	34 07
	STO ÷ 6	33 81 06
	X	71
	ENTER	41
55	FRAC	32 83
	STO A	33 11
	-	51
	X = 0	31 51
	SF2	35 51 02
60	R↓	35 53
	LBL 8	31 25 08
	RCL B	34 12
	RCL 7	34 07
	X	71
65	ENTER	41
	FRAC	32 83
	STO B	33 12
	-	51
	STO 2	33 02
70	X⇄Y	35 52
	STO 1	33 01
	+	61
	+	61
	F?2	35 71 02
75	GTO 1	22 01
	3	03
	X > Y	32 81
	GTO 3	22 03
	2	02
80	+	61
	X≤Y	32 71
	GTO 3	22 03
	GTO 2	22 02
	LBL 5	31 25 05
85	RCL 7	34 07
	-	51
	GSB f a	32 22 11
	LBL C	31 25 13
	SPACE	35 84
90	DSP 2	23 02
	RCL 3	34 03
	RCL 0	34 00
	+	61
	RCL 9	34 09
95	+	61
	RCL 4	34 04
	-	51
	-X-	31 84
	RCL 3	34 03
100	RCL 0	34 00

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	Initialize		A	
2	Key in Line 0 of Generation 0			
	(e.g. 0.011011100)		B	Line no. of next Line.
3	Repeat for Lines 1-9, one at			
	a time		B	"
	Execution begins automatic-			
	ally.			
	(See detailed instructions			
	and description elsewhere.)			

STEP	KEY ENTRY	KEY CODE
201	+	61
	-X-	31 84
	RCL 3	34 03
	RCL 9	34 09
205	+	61
	-X-	31 84
	SPACE	35 84
	F?3	35 71 03
	F?0	35 71 00
210	R/S	84
	GTO E	22 15
	LBL 9	31 25 09
	X = 0	31 51
	RTN	35 22
215	ENTER	41
	FRAC	32 83
	-	51
	STO + 9	33 61 09
	CL X	44
220	LST X	35 82
	RCL 7	34 07
	X	71
	GTO (i)	22 24
224	R/S	84

Registers

0	1	2	3	4
5	6	7	8	9

0	1	2	3	4
5	6	7	8	9

A	B	C	D	E	I

Labels

A	B	C	D	E
a	b	c	d	e
0	1	2	3	4
5	6	7	8	9

Flag Set Status

0 off	1 off	2 off	3 off

	Generation 0	Generation 1	Generation 2	Generation 3	Generation 4
0.	0.011011100	0.032033200	0.003000300	0.000000000	0.000000000
1.	0.000111010	0.000333031	0.010000003	0.030000000	0.000000000
2.	0.101011111	0.202033333	0.303000000	0.010000000	0.020000000
3.	0.110011011	0.231033033	0.202000000	0.202000000	0.202000000
4.	0.001001001	0.013003002	0.121000003	0.233100000	0.310200000
5.	0.000001101	0.010002302	0.021003003	0.033010000	0.000120000
6.	0.110000111	0.220010333	0.221121000	0.233323000	0.300031000
7.	0.110011111	0.331023332	0.102030003	0.203000100	0.201100300
8.	0.010001100	0.021003301	0.022011012	0.022133033	0.022300000
9.	0.100101110	0.300312320	0.000033030	0.000000000	0.001000000
		Birth's = 1.09	Births = 2.11	Births = 3.05	Births = 4.06
		Deaths = 1.33	Deaths = 2.13	Deaths = 3.14	Deaths = 4.05
	Cells = 48	Cells = 1.24	Cells = 2.22	Cells = 3.13	Cells = 4.14

	Generation 5	Generation 6	Generation 7	Generation 8	Generation 9
0.	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
1.	0.000000000	0.000000000	0.000000000	0.000000000	0.001000000
2.	0.020000000	0.020000000	0.021000000	0.022100000	0.022200000
3.	0.202000000	0.202100000	0.202200000	0.203200000	0.210210000
4.	0.020210000	0.020320000	0.120020000	0.133003100	3.000013000
5.	0.001220000	0.013320000	0.121121000	0.333332000	0.000003000
6.	0.001003000	0.013010000	0.020020000	0.030030000	0.000010000
7.	0.302200000	0.002200000	0.013210000	0.030220000	0.001320000
8.	0.033000000	0.010100000	0.030200000	0.001210000	0.002320000
9.	0.012000000	0.033000000	0.000000000	0.000000000	0.000100000
	Births = 5.04	Births = 6.06	Births = 7.08	Births = 8.05	Births = 9.07
	Deaths = 5.04	Deaths = 6.06	Deaths = 7.02	Deaths = 8.12	Deaths = 9.05
	Cells = 5.14	Cells = 6.14	Cells = 7.20	Cells = 8.13	Cells = 9.15

	Generation 10	Generation 11	Generation 12	Generation 13	Generation 14
0.	0.000000000	0.001000000	0.012100000	0.023200000	0.030300000
1.	0.012100000	0.022200000	0.022200000	0.133300000	0.211100000
2.	0.133310000	0.200020000	0.200021000	0.200122000	0.200232000
3.	0.220320000	0.220021000	0.220032000	0.220012000	0.221132000
4.	0.000120000	0.000220000	0.001330000	0.013000000	0.120000000
5.	0.000000000	0.000110000	0.000331000	0.000003000	0.000000000
6.	0.000130000	0.000310000	0.000030000	0.000000000	0.000000000
7.	0.003021000	0.000022000	0.000133000	0.000310000	0.000030000
8.	0.002020000	0.003021000	0.000132000	0.000203000	0.000210000
9.	0.000200000	0.000200000	0.000310000	0.000020000	0.000030000
	Births = 10.07	Births = 11.06	Births = 12.08	Births = 13.05	Births = 14.08
	Deaths = 10.06	Deaths = 11.02	Deaths = 12.10	Deaths = 13.08	Deaths = 14 06
	Cells = 10.16	Cells = 11.20	Cells = 12.18	Cells = 13.15	Cells = 14.17

	Generation 15	Generation 16	Generation 17	Generation 18	Generation 19
0.	0.011000000	0.033000000	0.000000000	0.000000000	0.000000000
1.	1.222210000	2.333230000	3.100300000	0.300000000	0.000000000
2.	2.300303000	2.010010000	3.130030000	0.300000000	0.000000000
3.	0.333203000	0.000300000	0.000000000	0.000000000	0.000000000
4.	0.230000000	0.300000000	0.000000000	0.000000000	0.000000000
5.	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
6.	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
7.	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
8.	0.000330000	0.000000000	0.000000000	0.000000000	0.000000000
9.	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
Births =	15.04	16.02	17.02	18.00	19.00
Deaths =	15.10	16.08	17.05	18.02	19.00
Cells =	15.11	16.05	17.02	18.00	19.00