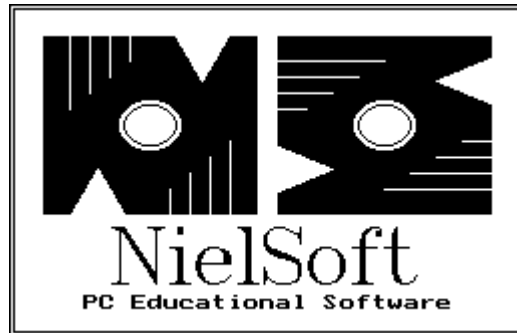


# THE GAME OF LIFE



N i e l S o f t  
(PC Educational and Business Software)

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## THE GAME OF LIFE

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Shareware Version 0.59

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- \* If you find the software of use after trying it out for yourself you are requested to register your copy. A registration form (NSLIFERG.FRM) is included with the software for your convenience.

#### BY REGISTERING:

- \* You will receive the full registered version 1.0 of the software including the compressed file SAVE and DELETE facilities.
- \* You will then be able to save your own creations and are encouraged to share these with other 'Lifenthusiasts'.
- \* You will receive the NSLIFE packaging consisting of a black A5 wallet with coloured frontspiece and containing two pockets useful to store the program disc, documentation and LIF file discs you create. (Sorry, UK registrations only for wallet).
- \* You will be supporting the concept of SHAREWARE and encouraging authors to produce quality software at reasonable prices to the benefit of all users.

# THE GAME OF LIFE

## \*\*\*\*\* THE GAME OF LIFE

\*\*\*\*\*  
LIFE is a 'game' which simulates the survival or otherwise of a colony of cells. The cells live on an infinitely large squared universe (although for computer simulation the universe is limited by the character size of the monitor). Which cells are alive at the initial LIFE state is up to you but at future times (generations) the state of the colony follows on from the previous generation by the rules of the game.

## \*\*\*\*\* LIFE HISTORY OF LIFE

\*\*\*\*\*  
LIFE was invented by John Conway, of the University of Cambridge in the late 1960s and gained a wider appeal to the public through a series of articles on mathematical games written by Martin Gardner in the Scientific American journal from October 1970. At the time the personal computer was in its infancy and many initial simulations of LIFE were performed using larger computers existing at the time, usually only available in large institutions (notably Cambridge University, UK and MIT, USA). With the increasing power and decreasing cost of personal computers the game is now having a resurgence in popularity.

## \*\*\*\*\* GLOSSARY OF LIFE TERMS

### \*\*\*\*\* CELL

A basic life unit that at any time maybe dead, alive or about to be born.

### UNIVERSE

The infinite squared grid upon which the cells exist.

### COMPUTER UNIVERSE

The universe used by a computer simulation due to the limited number of cells that can be displayed on the screen. In this program the grid is limited to:

|                  |                     |
|------------------|---------------------|
| CGA/MDA/Hercules | 78 across x 21 down |
| EGA              | 78 across x 39 down |
| VGA              | 78 across x 46 down |

### NEIGHBOUR

Each cell on the grid has 8 neighbours, horizontally, vertically and diagonally adjacent to it. For example, the cell marked 'o' has 8 neighbours marked 'x':

```
  x x x
  x o x
  x x x
```

### LIFE STATE

The state of the universe at any particular generation.

### GENERATION

Following on from the initial life state (say at time t) each subsequent time (i.e. t+1, t+2 etc) will result in a new life state according to the rules of the game. These subsequent life states are called generations.

### POPULATION

The total number of live cells in the universe for any particular generation.

### LIFE FORM

A particular configuration or pattern of live cells.

### STILL LIFE

A stable life form whose cells survive indefinitely from one generation to the next.

### LIFE CYCLE

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A life form which repeats itself after a number of generations. i.e. a life cycle of period 8 will repeat itself every 8 generations.

## GARDEN OF EDEN (or ORPHAN)

A life state or form which has no ancestors (or parent) and can only exist in its initial state. (Only of interest to the mathematicians amongst you!).

## RULES OF THE GAME

Starting from an initial life state (time =  $t$ ), the status of each cell for the next generation (time =  $t+1$ ) is calculated using the following rules:

### BIRTH

A cell that is dead at time  $t$  becomes alive at time  $t+1$  only if exactly 3 of its eight neighbours were alive at time  $t$ .

### DEATH (Overcrowding)

A cell that is alive at time  $t$  and has 4 or more of its 8 neighbours alive at time  $t$  will be dead by time  $t+1$ .

### DEATH (Exposure)

A cell that is alive at time  $t$  and has only 1 live neighbour or none at all at time  $t$  will be dead at time  $t+1$ .

## SUMMARY TABLE

| Current Generation | No of neighbours | Next Generation     |
|--------------------|------------------|---------------------|
| ALIVE              | 0,1              | DEAD (Exposure)     |
| ALIVE              | 2,3              | SURVIVES            |
| ALIVE              | 4 to 8           | DEAD (Overcrowding) |
| DEAD               | Exactly 3        | ALIVE (Born)        |

## FEATURES OF THIS PROGRAM

- \* Life states may be saved to file and read from file (LIF files). Files may also be deleted if no longer required. File compression is used to save disc space. (REGISTERED VERSION 1.0 IS REQUIRED FOR SAVE/DELETE).
- \* A number of files are provided with the program containing some interesting life forms (both traditional and original to the author) for immediate use.
- \* Some common life forms are 'hard-wired' into the program together with their traditional names for reference.
- \* A fully functional editor to create or alter any life state, operating on both individual cells and blocks of cells up to the size of the computer universe. Blocks of cells may be moved, pasted or deleted as required.
- \* The characters and colours (attributes) used to represent the live and dead cells on the screen may be selected from the full IBM character and colour set.
- \* The simulation will cease when the population reduces to zero (i.e. all cells are dead) or when a predetermined number of generations has been reached.
- \* The speed of the computer simulation may be selected in increments from 0 (no delay) to 9 (delay approx 1 second). In addition, the display can be single-stepped from one generation to the next.  
All delays are machine independent except for no delay which runs the simulation at the fastest speed of your processor. 8088/8086 machines

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workable, 286 just right, 386/486 don't blink !!

- \* A tutor mode is included which shows clearly which cells will survive, die or be born in the next generation to assist with your own creations.

\*\*\*\*\*

## USING THE PROGRAM MENUS

\*\*\*\*\*

The program is fully menu-driven with the menu titles being displayed at the top of the screen as follows:

File      Edit      Gen      Life      Colour      Quit      Delay      SPACE Stop/Go

The menus are selected by pressing the initial letter (e.g. 'F' for File) or by pressing the LEFT/RIGHT cursor keys to move to adjacent menus. Some items in the menus are selected by 'Point and Shoot', use the UP/DOWN cursor keys to move to the required selection and press RETURN. Other menu items are TOGGLES which, for example, select either ON or OFF. Press ESC to leave a menu and return to the game simulation.

### IMPORTANT NOTE:

As the editor uses the cursor keys for moving around the computer universe, this menu operates slightly differently from the others. See below for details.

The F, E and G selections will always STOP the game simulation.

The L, C and D selections will allow the game simulation to continue in the STOP or GO state as you left it.

The menus are now fully described:

## ----- FILE MENU (F) -----

All NSLIFE files are saved using the extension LIF. (e.g. XMASTREE.LIF).

- |                   |                                                                                                                                                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| L)oad file        | To load a LIF file from disc.                                                                                                                                                                    |
| S)ave file        | To save a life state to a LIF file on disc. You are required to enter a name for the file to be saved.                                                                                           |
| D)elete file      | To delete a LIF file.                                                                                                                                                                            |
| C)hange directory | To change the disc/directory from which future files may be loaded or to which files may be saved/deleted. (Useful for hard discs users who may wish to use floppy discs for storing LIF files). |
| 1) Random life    | Produces a random pattern of live cells on the computer universe.                                                                                                                                |
| 2) Still life     | Some common still life forms and their traditional names.                                                                                                                                        |
| 3) Life cycles 1  | Some common life cycles of varying periods and their traditional names.                                                                                                                          |
| 4) Life cycles 2  | Some more life cycles.                                                                                                                                                                           |
| 5) Horiz lines    | Produces horizontal lines of live cells.                                                                                                                                                         |
| 6) Vert lines     | Produces vertical lines of live cells.                                                                                                                                                           |
| 7) X-hatch lines  | Produces a cross-hatch pattern of live cells.                                                                                                                                                    |
| O)perating system | Allows you to suspend the program temporarily to execute a DOS shell.                                                                                                                            |

## ----- EDIT MENU (E) -----

Unlike the other menus the editor menu window is not automatically displayed on the screen to prevent unwanted detail during editing. Press 'E' to enter

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editing mode from which you can invoke the editor menu window by using the key combination Alt+E. The edit window will then allow you to enter edit commands from the menu. (The key strokes in square brackets can perform their function directly without having to enter the full menu window). During editing, the current position of the cursor is indicated on the bottom right of the screen in X (across) and Y (down) coordinates.

## General keys (Not available from the menu)

Cursor keys LEFT/RIGHT, UP/DOWN, PGUP/PGDN, HOME/END all perform in the normal way to move the editing cursor (represented by the 'happy face' character).

Pressing SHIFT in addition to the LEFT/RIGHT/UP/DOWN keys will move the cursor 5 cells in the chosen direction (see Ruler below).

### I)nsert cell [INS/Rtn]

To insert a live cell at the cursor position.

### D)elete cell [DEL]

To delete (kill) a live cell at the cursor position.

### S)tart block [F7]

To define the upper left hand corner for a block. (This character will flash to indicate start of block).

### E)nd block [F8]

To define the bottom right hand corner of the block. (Complete block will now flash on the screen).

### P)aste block [Alt+P]

Will duplicate the block at the cursor position representing the top left hand corner.

### M)ove block [Alt+M]

Moves the block and deletes all cells in the original block position.

### C)lear block [Alt+C]

Deletes all cells in the marked block.

### Z)ap pop [Alt+Z]

To delete the whole population. (You will be given a chance to override this command to prevent unwanted errors).

### R)uler [Alt+R]

A TOGGLE selection of ON/OFF.

Allows a ruler to be displayed along the borders of the computer universe at 5 cell intervals. Useful for easier positioning of the editor cursor.

---

## GENERATION MENU (G)

---

### R)eset to zero

Reset the generation count to zero.

### M)ax generation

Allows you to set the maximum number of generations to be counted (up to 99999).

---

## LIFE MENU (L)

---

### C)har Set

A TOGGLE selection between:

DEFAULT - Original characters used by the program.

SELECT - Enables use of L and D options to select your own characters for the live and dead cells.

### L)ive cell char

Displays the full IBM character set for 'point and shoot' selection of the live cell character. (NB The default live cell character is the solid block character '█' - ASCII code 219).

### D)ead cell char

For selection of the dead cell character. (NB The default dead cell

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character is a centred dot character '.' - ASCII code 250).

## T)utor

A TOGGLE selection of ON/OFF.

The tutor mode allows you to see clearly which cells will survive, die or be born at the next generation to assist with your own creations.

The 'happy face' character (ASCII code 2) represents the surviving cells.

The 'ghost happy face' character (ASCII code 3) represents the dying cells.

A highlighted 'dot' character (ASCII code 249) represents the cells about to be born.

The default dead cell character (ASCII code 250) is used for all other dead cells.

## S)creen

For EGA/VGA systems only. Allows selection of the higher resolution screens available on these systems for a bigger computer universe. (i.e. EGA 43 line mode, VGA 50 line mode).

## B)order

A TOGGLE selection between:

DEAD - The border of the computer universe consists of dead cells at all times OUTSIDE OF THE RULES OF THE GAME.

WRAP - Allows the rules to be continued over the borders of the computer universe (i.e. WRAP AROUND effect). Useful to compensate for the limited computer universe but may cause interference with other cells.

## G)ame rules

A summary table of the rules of life.

## A)bout LIFE...

Invokes this document file for reading within the program.

## V)ersion details

The current version of the program you are using.

## COLOUR MENU (C)

### A)utomatic

A TOGGLE selection:

ON - Initial program selection whereby colours are used dependent upon the number of neighbours each cell has.

These are:

| NEIGHBOURS | COLOUR  | MONOCHROME |
|------------|---------|------------|
| 0          | Grey    | Grey       |
| 1          | Blue    | Grey       |
| 2          | Green   | White      |
| 3          | Cyan    | White      |
| 4          | Red     | Grey       |
| 5          | Magenta | Grey       |
| 6          | Brown   | Grey       |
| 7          | Yellow  | Grey       |
| 8          | White   | Grey       |

OFF - Enables use of L and D options to select your own single colour combinations for the live and dead cells.

### L)ive cell colour

Allows you to select the required colour for the live cells.

### D)ead cell colour

Allows selection of the dead cell colour.

### S)how colour set

Displays the current selections for both live/dead cell characters and colours.

### M)onochrome

A TOGGLE selection of ON/OFF.

Allows the use of monochrome only attributes when using colour. Useful

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when a colour graphics card is available but run with a monochrome monitor - avoids clash of 'colours' and may give a clearer display.

---

## QUIT MENU (Q)

---

Asks you select No/Yes to confirm quit and exit the program.

---

## DELAY MENU (D)

---

Selectable delay between each generation or single-step mode. Press 0 to 9 for delay required or S to use single step mode.

N.B. The number keys 0 to 9 may also be used directly when a simulation is running.

---

## SPACE STOP/GO (S)

---

Same action as the SPACEBAR.

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## \*\*\*\*\* HINTS, TIPS, EXTRA FEATURES

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\* Use the SPACE STOP/GO menu if you need to alter the game simulation state before returning from a menu.  
N.B. The F, E and G menu selections will always STOP the game simulation.

\* Be careful not to press the spacebar if you want to save your creations to file !!

\* The background colour for the cells is always BLACK. To produce a single colour for the background universe change the dead cell character to a block character 'û' and select the colour required. To set a plain BLACK background select a null or space character (ASCII codes 0, 255 or 32) for the dead cells.

\* To reposition a menu box, press the SCROLL LOCK on, move the box to selected position and press SCROLL LOCK off. (Useful to move the DELAY menu window when using single step mode). The menu will remain in the new position until this procedure is repeated.

\* The left and right of the screen is marked with the limits of the computer universe for 25, 43 or 50 line operation.

'1' is the first line of the universe.

'c' is the limit for CGA/MDA/Hercules 25 line mode.

'e' is the limit for EGA 43 line mode.

'v' is the limit for VGA 50 line mode.

Use these to study progress of your LIFE creations should you wish to check that the simulations will run on particular display systems.

\* Children may find the editor useful to create simple block character pictures which can be saved to file or printed using the PrtScr (Print Screen) facility. (You may need to set up your printer to be able to print block characters and all other ASCII characters with codes greater than 127). See files ALPHABET.LIF, BOOBOO.LIF, HOUSE.LIF, NSLOGO.LIF for examples.

N.B. You will be unable to print ASCII characters 0 to 31 as these are used for printer control, although the IBM characters that use these codes can be selected for screen display (e.g. the program uses codes 1 and 2 for the

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little men characters in tutor mode).

\*\*\*\*\*

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## LIST OF FILES

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NSLIFE.EXE The game of Life program

NSLIFE.DOC This document

NSLIFEDC.COM Program to display the NSLIFE.DOC document.

NSLIFERG.FRM Registration form

plus 37 LIF files:- (Those marked \*\* will require EGA/VGA to see full screen)

- 1 \*\* ALPHABET.LIF Life form letters (for fun).
- 2 BAKERY.LIF 2 life forms creating 2 and 4 Loaves.
- 3 BEACON.LIF Life form resulting in a Beacon.
- 4 \*\* BLINKERS.LIF Full screen of Blinkers.
- 5 BOATFACT.LIF Boat factory - forms 4 Boats.
- 6 BOOBOO.LIF For fun.
- 7 BUILDER.LIF Builds a Gosper Gun.
- 8 C1C2C3.LIF ) Life forms created from 5-in-a-line.  
) C1 disappears.

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```

) C2 disappears.
) C3 becomes 4 sets of Traffic Lights.
9  ** C4C5.LIF ) C4 becomes 8 Blinkers.
) C5 becomes a Cambridge Pulsar.
10  CANDLE.LIF The Candelabra life cycle. (By Charles Trawick).
11  COMB.LIF Set border to WRAP to see comb roll over the universe.
12  CYCLE1.LIF File dump of Life Cycle 1 option in File menu.
              (Includes Cambridge Pulsar CP 48-56-72 from Cambridge
              University).
13  CYCLE2.LIF File dump of Life Cycle 2 option in File menu.
              (Includes Mathematician by David Buckingham).
14  ** DOZEN.LIF Creates 12 Gliders before becoming stable with 4
              Blocks, 8 Blinkers and 4 Beehives.
15  EATER.LIF Gliders collide to form Eater which devours a meal of
              2 further Gliders.
16  FUSES.LIF 3 Fuses. 1st disappears, 2nd forms Blinker and Block,
              3rd disappears. (Try editing to see effect for
              different fuse lengths).
17  GLIDER1.LIF )
18  GLIDER2.LIF )
19  GLIDER3.LIF ) Glider generator life forms.
20  GLIDER4.LIF )
21  GLIDER5.LIF )
22  GOSPER.LIF Gosper's Glider Gun. Emits a Glider every 30
              generations. (By R.W.Gosper working at MIT, USA).
23  HARVEST.LIF Harvester. Harvests the fuse to form Blocks.
24  HERTZOSC.LIF The Hertz Oscillator. Life cycle of period 8.
25  HOUSE.LIF Life form picture (for fun).
26  LIFE.LIF 'The game of Life' letters (for fun).
27  ** NIELSOFT.LIF The NielSoft logo and text (for advertising !).
28  NSLOGO.LIF The NielSoft logo only.
29  OVERWSPC.LIF Overweight Spaceship escorted by 2 smaller Spaceships.
30  S&GLIDER.LIF Forms an S stable life form and a Glider. (From MIT,
              USA).
31  SPACEGEN.LIF Generates 2 lightweight Spaceships (Also known as
              'Puffers').
32  SPACESHIP.LIF Lightweight, Middleweight and Heavyweight Spaceships.
              (Try setting Border to WRAP to see them scan across
              the screen).
33  SPCCRASH.LIF Spaceships crashing. Lightweights form 2 Gliders.
              Middleweights form Cambridge Pulsar.
34  STILL.LIF File dump of Still life option in File menu.
35  ** THUNDER.LIF Thunderbird. An example of a simple life form creating
              an interesting display.
36  ** XMAS.LIF Christmas tree with text (See below).
37  XMASTREE.LIF Christmas tree. Forms 2 Gliders and 2 Loaves which
              crash to become 2 Cambridge Pulsars.

```

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*****
END OF DOCUMENT
*****

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