Conway's Game of Life, for RISC OS

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Contents

This manual assumes familiarity with the RISC OS system. For example, SELECT, MENU and ADJUST are the left-, middle and right button of the mouse.
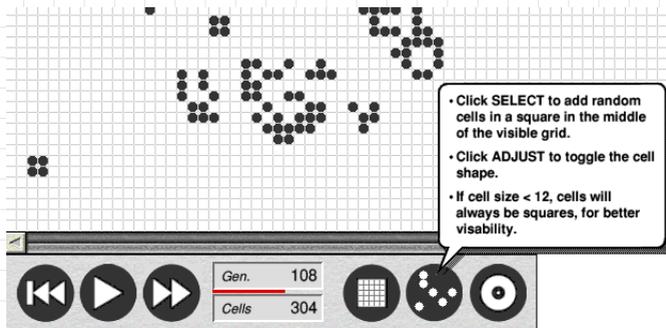
*** GoL supports the interactive help ***

Rules

Imagine an infinite grid of squares. A filled square is considered a living cell. The Game of Life is about evolution and generations. Whether cells either die, stay alive, or get born, depends on three simple rules with regard to their 8 adjacent squares:

1. If a cell has *less than 2* adjacent cells, it will die.
2. If a cell has *more than 3* adjacent cells, it will die too.
3. If an empty square has *exactly 3* adjacent cells, it becomes a living cell.

Although these rules are very simple, the way generations grow, extinct, move, oscillate or maybe stabilise after a number of iterations is often completely unpredictable, and certainly fascinating to watch.

Some shapes will extinct within a few iterations, others will evolve for hundreds, or even thousands of generations. The *f-pentomino* for example, part of this distribution, consists of 5 cells only, but won't stabilise before the 1,103rd generation! Others will evolve for tens of thousands generations, while there are many shapes that will grow infinitely. The archives that come with this program offer many examples.

Generation 1   *Generation 2*

These 2 cells each have 1 neighbour only,
and will therefore die.

The top and bottom cell will die,
The middle cell will stay alive,
while its 2 empty neighbours will come to life

(Things get hard to predict very soon)

Grid

The grid in this version isn't infinite, for obvious reasons. Currently it is limited to a maximum of 2000 × 2000 squares, which is still large enough to let most populations wildly grow.

At first run however, the program will create a grid of 1000 × 1000, with cell size 20. The visible part of the grid will depend on the current screen mode. There are two ways to increase the visible part, either by maximising the window (pressing the D-key is the easiest way), or by decrementing the cell size, for example by pressing the - (minus) key.

If a shape is larger than the visible area, you may as well ADJUST-drag a scroll bar to move freely around the entire grid. To centre the grid again, click SE-LECT on the right most button of the pane, or press the C-key.

If needed, the *Options* window (see page 5) provides the tool to enlarge the grid in steps of hundred to the current maximum. Some of the shapes that come with this program are even larger than that. They'll have to wait for a future update (although some of them have dimensions up to 20 million × 20 million – those shapes probably need an expensive mainframe to run on).

If you want to remove the grid temporarily from your screen, just click on the iconbar icon.

Creating shapes & Using the pane

Use the mouse to create shapes. Living cells are either black squares or black circles. You may choose this in the *Options* window, or by clicking ADJUST on the 'Random' button in the pane. If necessary, the shape can be precisely centred on the grid by clicking ADJUST on the right most button on the pane. The illustration on the next page shows all the possibilities of the pane.

Once a shape is finished, you may want to see how it evolves.
Press the ▶ button to single step through the evolution, or the ▶▶ button to animate the process. If animation is too fast, you may alter the speed in the *Options* window or by using the > and < keys. Alternatively, keep the space bar pressed. This will auto repeat the single step at the speed of the keyboard repeat.

Pane

Generation counter

Single Step

Speed indicator

• Select: Create random shape
• Adjust: Toggle cell shape

| Gen. | 0 |
| Cells | 0 |

Restart shape

Cell counter

Animated evolution

• Select: Clear grid
• Adjust: Toggle grid lines

• Select: Centre grid
• Adjust: Centre shape
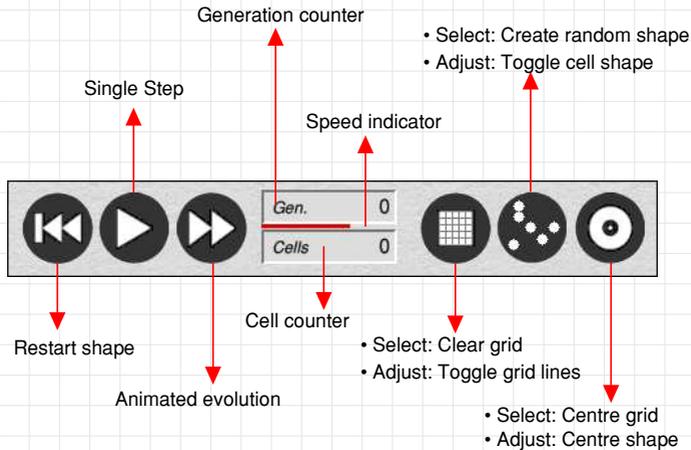
Every functionality of the pane is duplicated by keyboard keys.
Page 6 offers a list of all keys.

Loading and saving shapes

If you wish to save a pattern (don't forget to reset it to its initial shape first!), click MENU anywhere in the grid. The menu will lead to a standard save box. Enter a suitable name, and save the shape in the usual RISC OS way. Shapes are saved in the so-called RLE-format *(Run Length Encoding),* which seems to be the most used format.

Alternately, if you want to load a previously stored shape, drag the corresponding file from the filer window into the grid. GoL can read several life formats. Shape files that have comments included, will show them in a separate pane. The special *Shapes* directory can be opened from the iconbar menu.

Although some of the shapes that come with this program are too large for the current version of GoL, most of the shapes can do with a much smaller grid than the original default of 1000 × 1000. If speed is an issue, for example on older or emulated hardware, you may want to decrease the grid, using the *Options* window, or the keyboard (see page 6). The titlebar shows the dimensions of the loaded shape, which offers a hint for the minimum size of the grid.

Options

The Options window is accessible through the iconbar menu, or by clicking ADJUST on the iconbar icon. Its main purpose is to adjust the parameters of the grid.

- The CELL SHAPE is either round or square. If the cell *size* is smaller than 12, the cell *shape* will always be a square rather than a circle, for better visibility.

- When NO GRIDLINES is ticked, the gridlines will be switched off. If the cell size is smaller than 8, the grid lines will be switched off automatically.

- If FILL DESKTOP is ticked, the grid will fill the entire desktop, minus the iconbar. Otherwise, it will fill approximately ¾ of the desktop. This can be toggled more easily by pressing the D-key.

- The GRID may vary from 20 × 20 cells to a current maximum of 2000 × 2000 cells. Altering the grid size can only be done when the grid is empty. However, the deleted shape can be retrieved afterwards again by clicking on the left most button of the pane.

- CELL SIZES may vary from 1 to 60. They can be altered on the fly by pressing either the + key or the - (minus) key.

- SPEED refers to the animation speed. By default this is set to 10 (fastest), but in case of insane animation, this may be decreased in 10 steps to 1 (1 second delay), duplicated by the < and > key respectively.

- The DEFAULT button will revert to the grid that you have saved as the default one. The program comes with a default grid of 1000 × 1000, with cell size 20, round cells, grid lines, speed 10 and FILL DESKTOP unticked, but that may be changed any time.
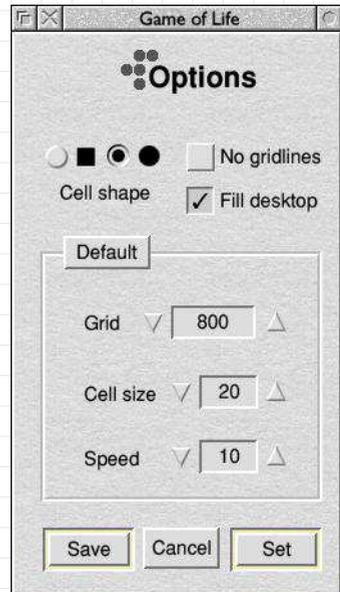
- Clicking SAVE will save your choices as the new defaults, while clicking SET will process the changes just temporarily.

Keyboard control

Most of the operations can be done by special hot keys, which is often faster than using the mouse. Shifting the shape around the grid can only be done by keys. Here's the complete list:

← →	Move the shape left / right, one square at a time
	• 10 squares at a time when SHIFT is hold down
	• 100 squares at a time when CTRL is hold down.
↑ ↓	Move the shape up / down, one square at a time
	• 10 squares at a time when SHIFT is hold down
	• 100 squares at a time when CTRL is hold down.
SPACE	See next generation.
TAB	Animated generations.
BACKSPACE	Reset shape.
RETURN	Clear grid.
C	Centre grid.
S	Toggle cell shape.
G	Toggle grid lines.
R	Create random cells in a square in the middle of the grid.
X	Enlarge the grid in steps of 100 (or 10 if smaller than 100) *
Z	Diminish the grid in steps of 100 (or 10 if smaller than 100) *
D	Toggles the FILL DESKTOP option.
+	Increments the cell size by 4.
-	Decrements the cell size by 4.
< / ,	Decrements the animation speed.
> / .	Increments the animation speed.

Changing the size of the grid can only be done when the grid is empty. If there's a shape, the x and z keys won't work.

Mouse wheel control

If your hardware supports mouse wheel control, some of the operations may be done with that wheel:

- Scrolling vertically will move the grid 10 rows up or down.
- Scrolling horizontally (with the SHIFT-key held down) will move the grid 10 columns left or right.
- Scrolling with the CTRL-key held down will increase or decrease the cell size on the fly, which effectively feels like zooming in or out.
- Scrolling with the ALT-key held down will increase or decrease the animation speed.

Archives

GoL comes with 4 archives:

- *~Jason's life:* 16 shapes only, but all very attractive.

- *~MacroLife:* These are the 72 shapes that come with Chris Taylor's superior !Macrolife, divided in 5 different categories.

- *~RadicalEye:* 150 Patterns from the RadicalEye Library, with some really stunning oscillators.

- *~All:* Over 2,500 patterns from www.conwaylife.com.
  This database is fairly comprehensive and contains shapes from a single cell (that will die immediately) to the complete *Turing machine* that needs the maximum grid size to run.
  Some of the shapes are really big (one of them needs nearly 4 *trillion* squares!) that will never make it to GoL (or to any other home computer program), but that are nevertheless kept for integrality.

Last but not least, there is the *MyShapes* directory, in which you may save your own patterns. Some of mine are already included. The archives can be opened directly from the program, by clicking on the appropriate entry of the iconbar menu.

Trouble shooting

- *Animation goes slower and slower while evolving...*
  The program will only calculate the squares within the rectangle of the shape – reason why a shape usually starts evolving very fast, no matter how large the grid is. However, the more a shape expands, the more squares have to be calculated. Even on my *4té* computer, the *Turing machine* for example evolves at 2 or 3 generations per second only.
  Also, when a shape remains relatively small, but spits out gliders or spaceships in all four directions, the rectangle of the squares to be calculated is expanding rapidly. Starting with a smaller grid may then help.

- *Changing the cell size sometimes causes ugly traces in the grid...*
  This is a matter of rounding errors. The size of the squares or circles is the result of a quotient that is rounded to the nearest pixel. Sometimes squares, or circles, therefore overlap. I haven't yet found a way to avoid this. However, toggling the grid lines will delete the traces. (Speaking of it, in some grids the squares or circles in the even columns are larger than those in the odd ones – really no idea where that comes from...).
  In my experience, cell sizes that are a multiple of 4 give the best results, reason why the program skips the intermediate sizes, unless they're smaller than 4.

- *The shapes created in a former version don't show up when loading...*
  They probably do show up, albeit in the upper left corner, outside the visible area. You may centre them by ADJUST-clicking the right most button of the pane, or just save them back again. The new RLE-format will load all shapes automatically in the middle of the grid.

- *How do I add comments to my shape?*
  Comments should be added manually. Open the shape file in a text editor and add the comments at the top of the file, preceded by #C (followed by a space). For example:
  ```
  #C This is my shape.
  #C It does nothing special.
  ```
  Up to 30 comment lines may be added to the shape file, but lines should never be longer than 100 bytes.

- *My hardware supports the scroll wheel, but GoL doesn't react properly...*
  Do you happen to have !HID installed? If so, you might try to kill the
  WimpScroll module, which interferes with WindowScroll. Open a Task
  window (or press F12) and type: `RMKill WimpScroll`.

Contact

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