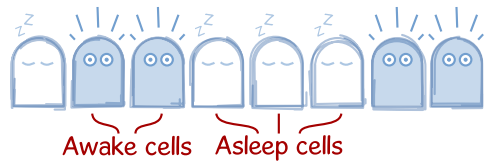# Line of Life: A 1D Cellular Automata Demo

What is this doing?

This display illustrates the interesting behaviours produced by very simple **cellular automata**. Each ultraviolet LED represents the state of a single **cell**. Cells may be awake (on) or asleep (off).
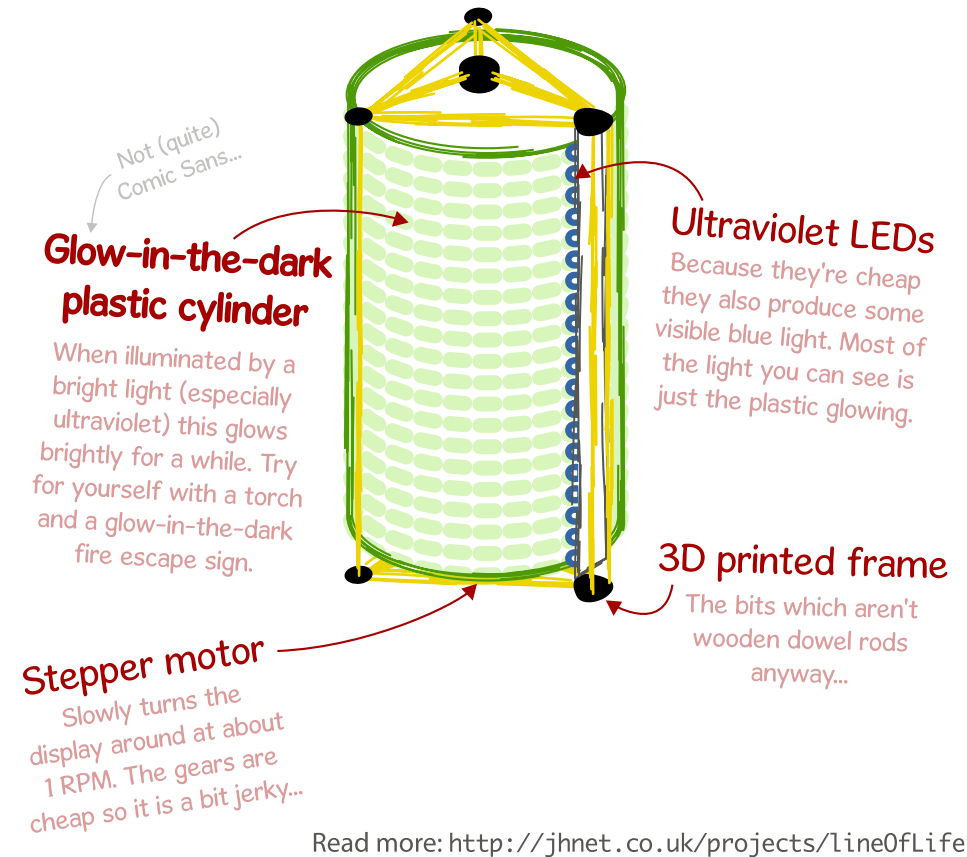
Awake cells   Asleep cells

At a regular interval, each cell uses a simple **rule** to decide whether to wake or sleep, depending what it and its two immediate neighbours are doing. For example, the rule might be:

Cell (and its neighbours') states before

Cell state afterwards
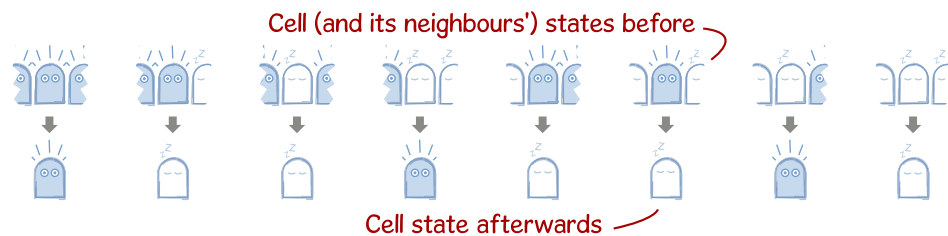
The **previous states** of the cells are recorded by the **glowing trails** left on the cylinder. The rule in the example above is known as 'rule 146' because 146_{10} is 10010010_2 (the 1s correspond with the 'awake' states in the rule). Rules 0 - 255 produce a variety of patterns.

How does it work?

Not (quite) Comic Sans...

Glow-in-the-dark plastic cylinder

When illuminated by a bright light (especially ultraviolet) this glows brightly for a while. Try for yourself with a torch and a glow-in-the-dark fire escape sign.

Ultraviolet LEDs

Because they're cheap they also produce some visible blue light. Most of the light you can see is just the plastic glowing.

3D printed frame

The bits which aren't wooden dowel rods anyway...

Stepper motor

Slowly turns the display around at about 1 RPM. The gears are cheap so it is a bit jerky...

Read more: http://jhnet.co.uk/projects/lineOfLife

Why should I care?

Cellular automata can be useful for modelling and even implementing parallel computations and also have uses in cryptography. Though the class of automata shown in this demo are very simple, 'rule 110' has been shown to be Turing complete. Other automata like Conway's Game of Life have even more interesting behaviours and finding these are a popular 'recreational mathematics' pass-time. Also, look: blinky lights!

Who did this?

Jonathan Heathcote (mail@jhnet.co.uk) while an undergrad/PhD student in Manchester (2009 - 2016). Think cellular automata are lame and have an idea for a better use of this screen? The display talks USB... Drop me an email for details!