# A chaotic Sprott system

A dark and rainy Sunday – what could be better than staying at home where it is warm and cosy and playing with an analog computer like THE ANALOG THING. This application shows the implementation of a simple chaotic Sprott system[1]:

$$\begin{aligned}\dot{x} &= yz\\ \dot{y} &= x - y\\ \dot{z} &= 1 - xy\end{aligned}$$

This system is easy to scale, as all variables are well within the interval $[-10, 10]$ yielding the scaled system

$$\begin{aligned}\dot{x} &= 10yz\\ \dot{y} &= x - y\\ \dot{z} &= \frac{1}{10} - 10xy,\end{aligned}$$

which can be implemented directly as shown in figure 1.

## References

[Guillén-Fernández et al. 2019] Omar Guillén-Fernández, Ashley Meléndez-Cano, Esteban Tlelo-Cuautle, Jose Cruz Núñez-Pérez, Jose de Jesus Rangel-Magdaleno, "On the synchronization techniques of chaotic oscillators and their FPGA-based implementation for secure image transmission", in *PLOS ONE*, February 6, 2019, https://doi.org/10.1371/journal.pone.0209618

[1] See [Guillén-Fernández et al. 2019], case B in table 1.

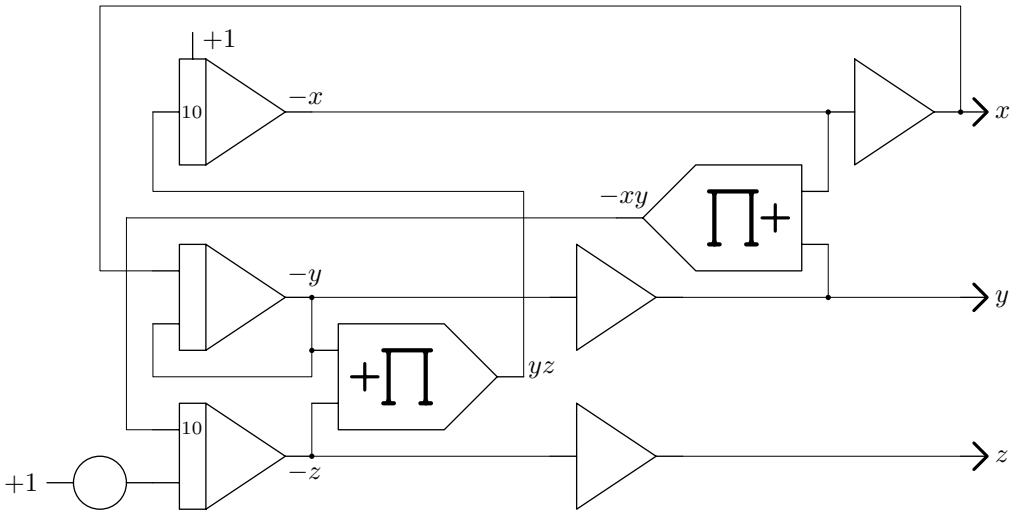


Figure 1: Analog computer setup for the chaotic SPROTT system

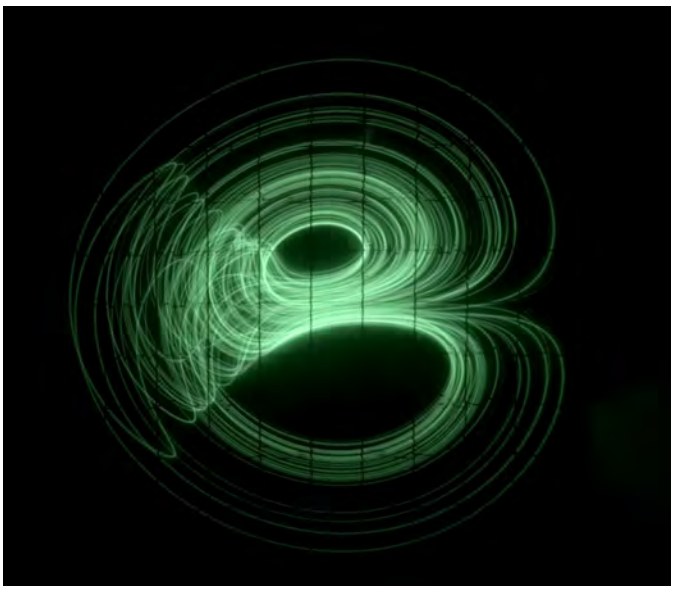

Figure 2: $xz$ phase space plot of the chaotic SPROTT system

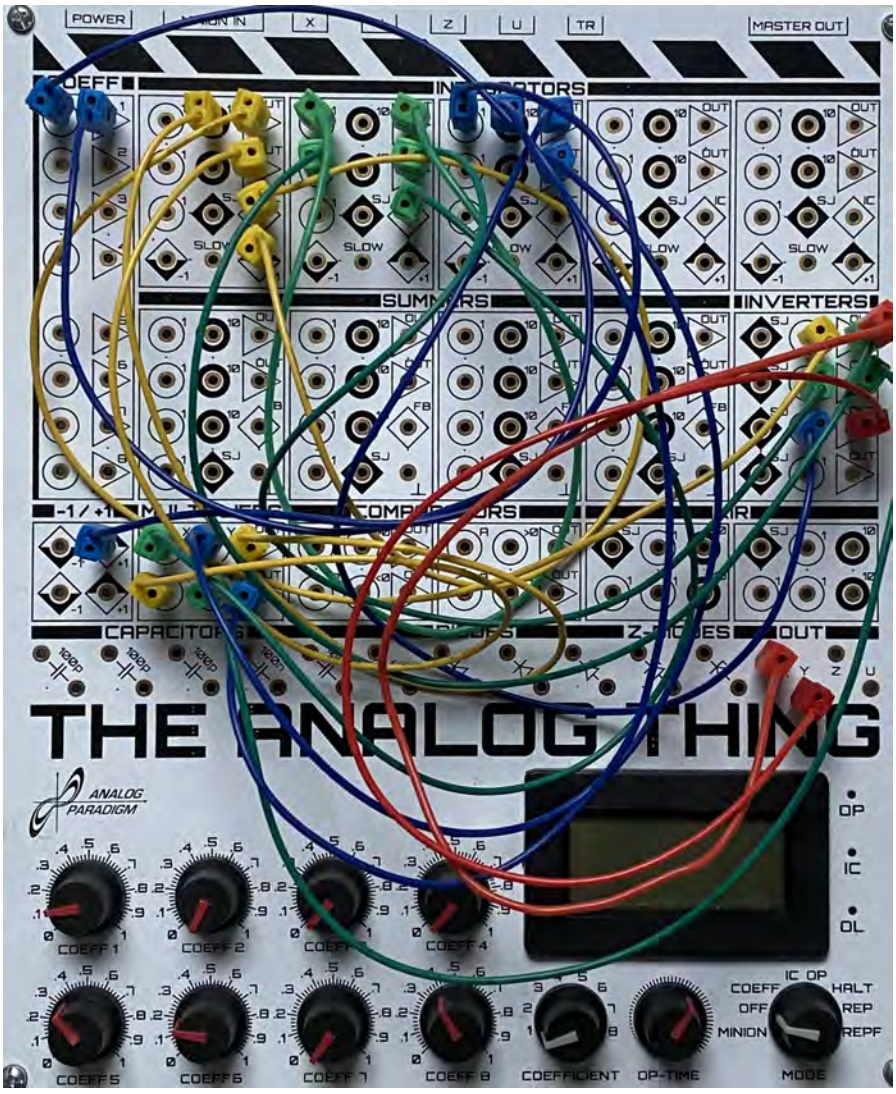


Figure 3: Setup of THE ANALOG THING for the chaotic SPROTT system