The Chen attractor

This short application note deals with the CHEN attractor which is described in detail in [AUGUSTOVÁ et al. 2013] and [JASIM et al. 2011]. The attractor is defined by

$$\begin{aligned}\dot{x} &= a(y-x)\\ \dot{y} &= (c-a)x + cy - xz\\ \dot{z} &= -bz + xy\end{aligned}$$

with parameters $a = 35$, $b = 3$, and $c = 28$. A quick numerical experiment shows that suitable (and simple) scaling factors are $\lambda_x = \lambda_y = \frac{1}{50}$ and $\lambda_z = \frac{1}{100}$, yielding

$$\begin{aligned}\dot{x} &= 0.35y - 0.35x\\ \dot{y} &= -0.07x + 0.28y - xz\\ \dot{z} &= -0.03z + 0.25xy.\end{aligned}$$

These equations can be directly implemented on THE ANALOG THING as shown in the schematic in figure 1.

The resulting x, z phase space plot is shown in figure 2. The picture was taken from the screen of a Hameg HM203-6 oscilloscope with the rare blue phosphor option using a Canon EOS 50D digital camera set to ISO 200 with an exposure time of six seconds.

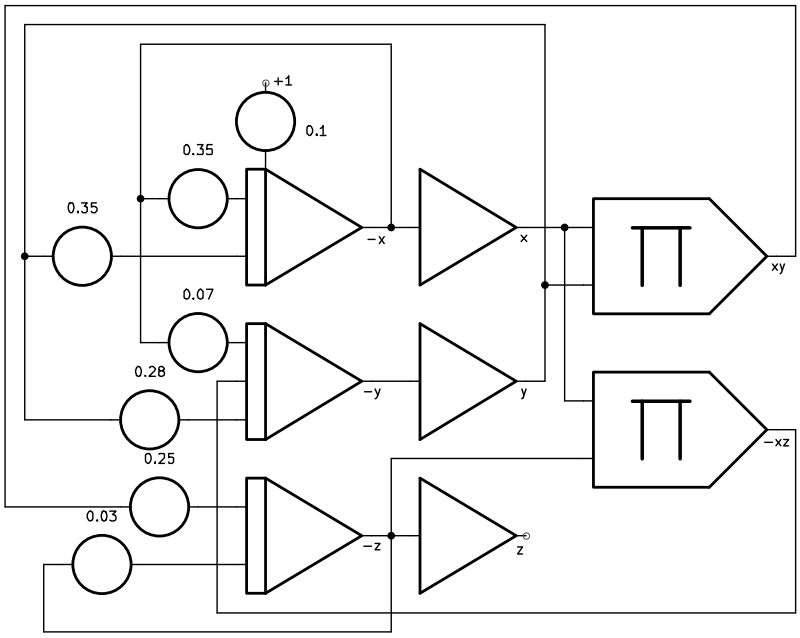

Figure 1: Analog computer setup for the Chen attractor

References

[Augustová et al. 2013] Petra Augustová, Zdeněk, "Characteristics of the Chen Attractor", in [Zelinka et al. 2013, pp. 305–132]

[Jasim et al. 2011] Saad F. Jasim, Karam A. Abed, "Using Δ-Discriminate Method to Determine the Stability and Bifurcation of Chen Chaotic System", in *Raf. J. of Comp. & Math's*, Vol. 8, No. 2, 2011, pp. 111–122

[Zelinka et al. 2013] Ivan Zelinka, Guanrong Chen, Otto E. Rössler, Vaclav Snasel, Ajith Abraham (eds.), *Nostradamus 2013: Prediction, Modeling and Analysis of Complex Systems*, Springer, 2013

think hybrid

Analog Computer Applications

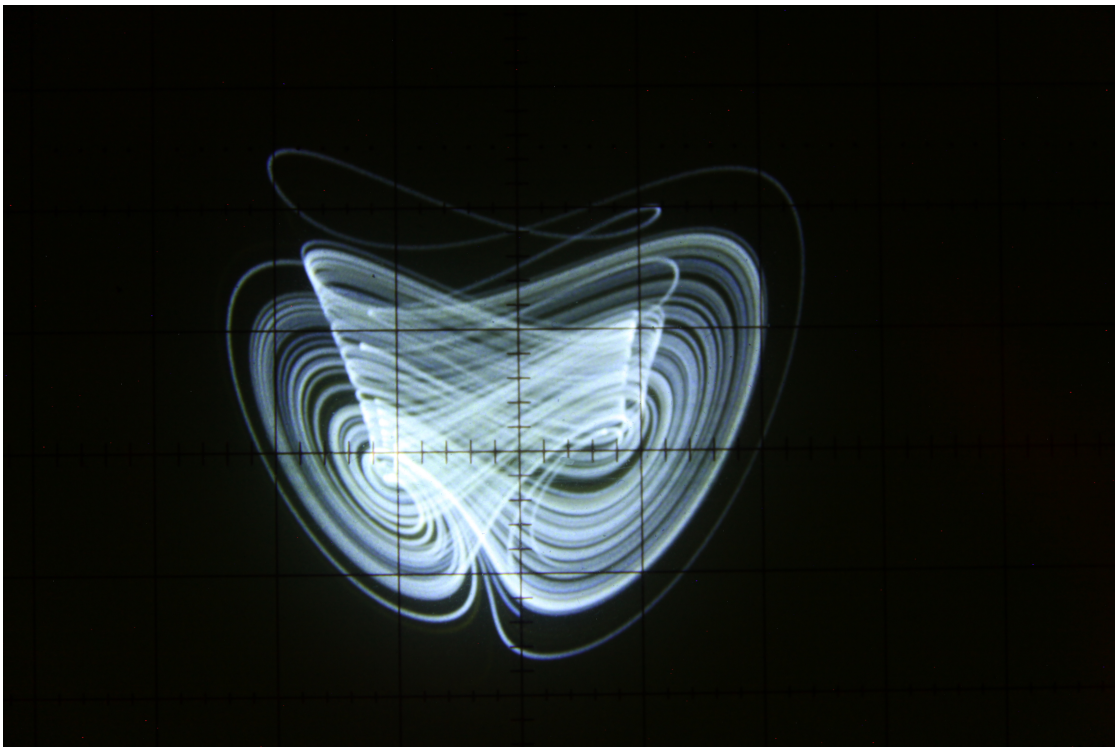

Figure 2: CHEN attractor