Dynamical Systems Theory:
Cool Things Done in Interesting Ways

Daniel S. Schloesser

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The state variables for a Lorenz attractor are the X, Y, and Z which create the state space, as well as time (t). The parameters of this type of system are σ, ρ, and β.

$$\begin{aligned} dx &= \sigma * (y - x) \\ dy &= x * (\rho - z) - y \\ dz &= x * y - \beta * z \end{aligned}$$

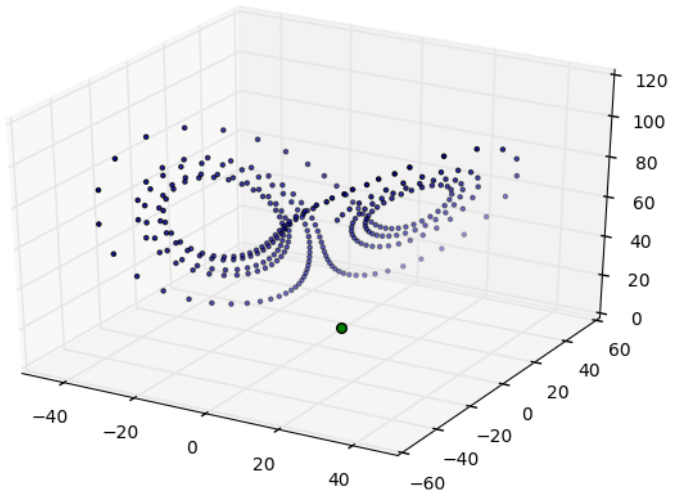

Figure 1: Depiction of the state space for this Lorenz Attractor system.

What can be seen in figure 1 is that there are two clear attractors around which the system cycles. The attractor appearing on the right in figure 1 has a tighter orbit to its center than that of the attractor appearing on the left.

When manipulating the parameter values of this Lorenz attractor, as the sigma (σ) value increased the system appeared to increase the steepness of the orbits on the y-axis. Additionally, rho (ρ) appeared to focus the system's orbit towards the system's origin as rho increased. Finally, as the ratio for the beta (β) value became smaller, the system's orbit appeared to increase in distance from the center of the attractor basins.