

# Lorenz Attractor Experiment

## Parametric study using the Euler approach

Experiment conducted on Thursday, the 29th of July 2021, at 12:41:40

The following parameters were selected for the experiment:

1. Constants:

$$\sigma = (10, 10, 10, 14, 14)$$

$$\beta = (8/3, 8/3, 8/3, 8/3, 13/3)$$

$$\rho = (6, 16, 28, 28, 28)$$

2. Initial Conditions:

$$x_0 = 0.1$$

$$y_0 = 1.4000000000000001$$

$$z_0 = 1.0$$

3. Sampling:

Number of samples:  $N = 40000$

Sampling frequency:  $\Delta t = 0.0023$

Experiment conducted using a computer with:

Python version: 3.8.5

Python build: Sep 3 2020 21:29:08

Operating system: Windows

Operating platform: Windows-10-10.0.18362-SP0

Processor: Intel64 Family 6 Model 142 Stepping 12, GenuineIntel

RAM installed: 16.98 GB

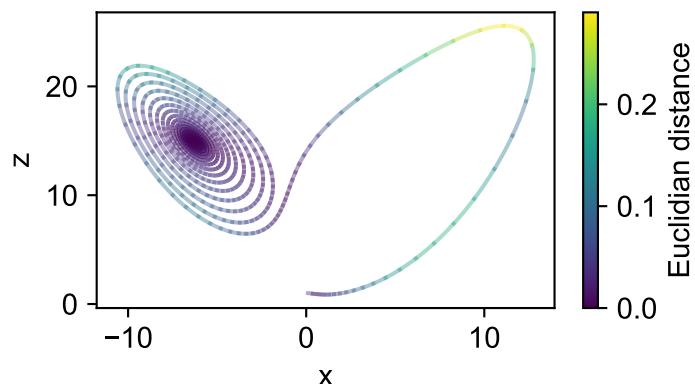
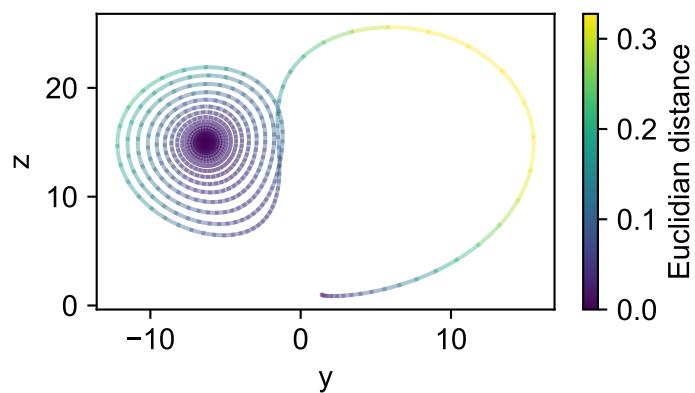
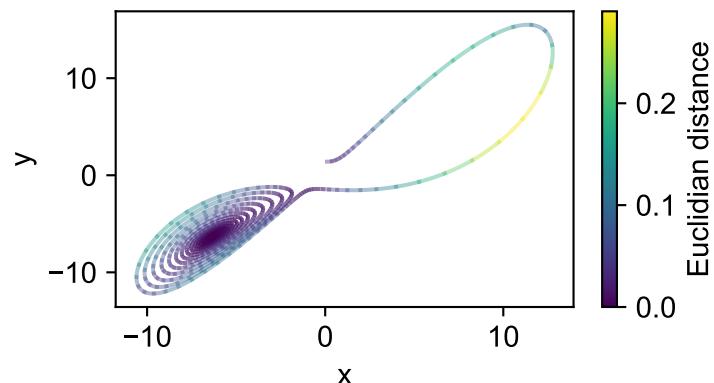
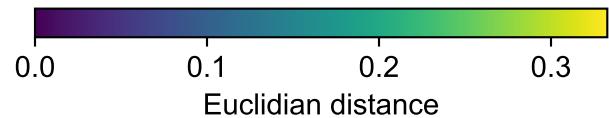
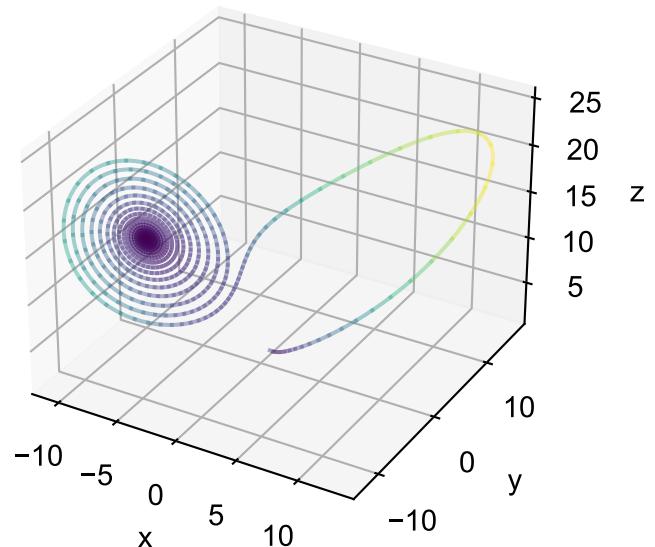
Total experiment elapsed time: 3.676804000000004

For each set of constants, 3D and 2D plots are given below:

# Lorenz Attractor

$(x, y, z) = (0.1, 1.4000000000000001, 1.0)$   
 $(\sigma, \beta, \rho) = (10.0, 8/3, 16.0)$   
 $(dt, N) = (0.0023, 40000)$

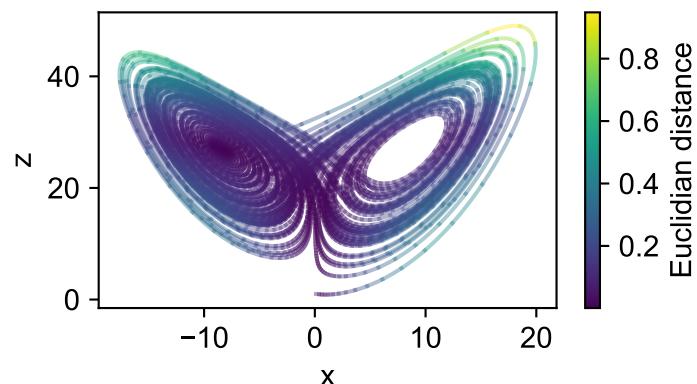
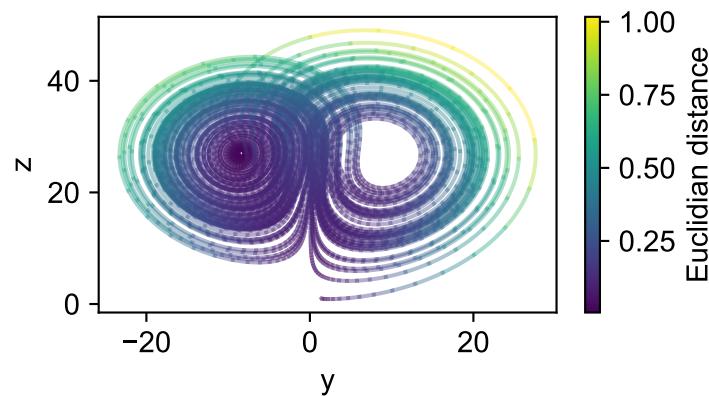
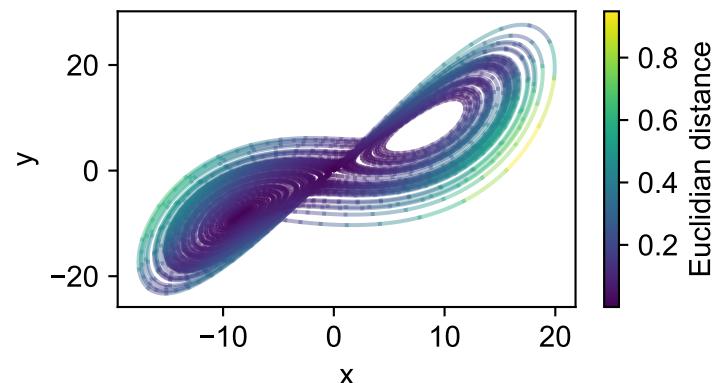
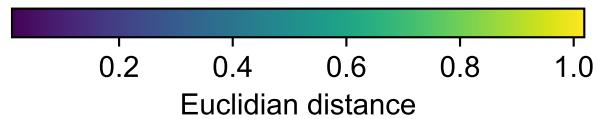
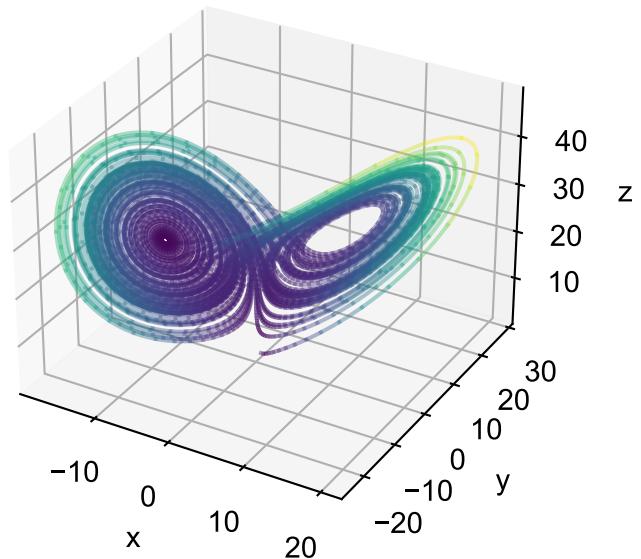
Elapsed coordinates computation time: 0.6580883999999969



# Lorenz Attractor

$(x, y, z) = (0.1, 1.4000000000000001, 1.0)$   
 $(\sigma, \beta, \rho) = (10.0, 8/3, 28.0)$   
 $(dt, N) = (0.0023, 40000)$

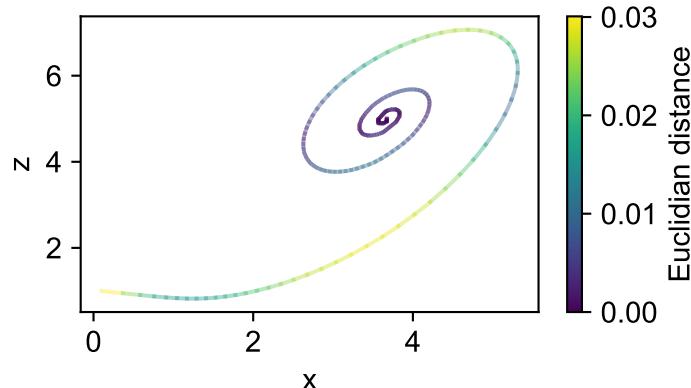
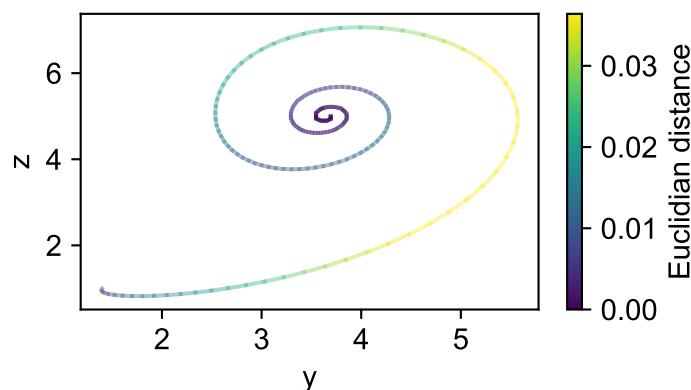
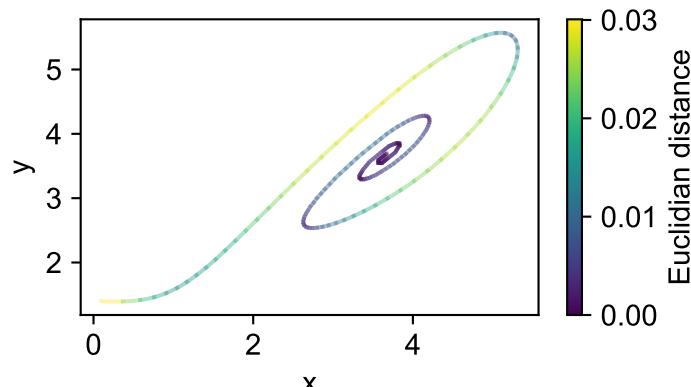
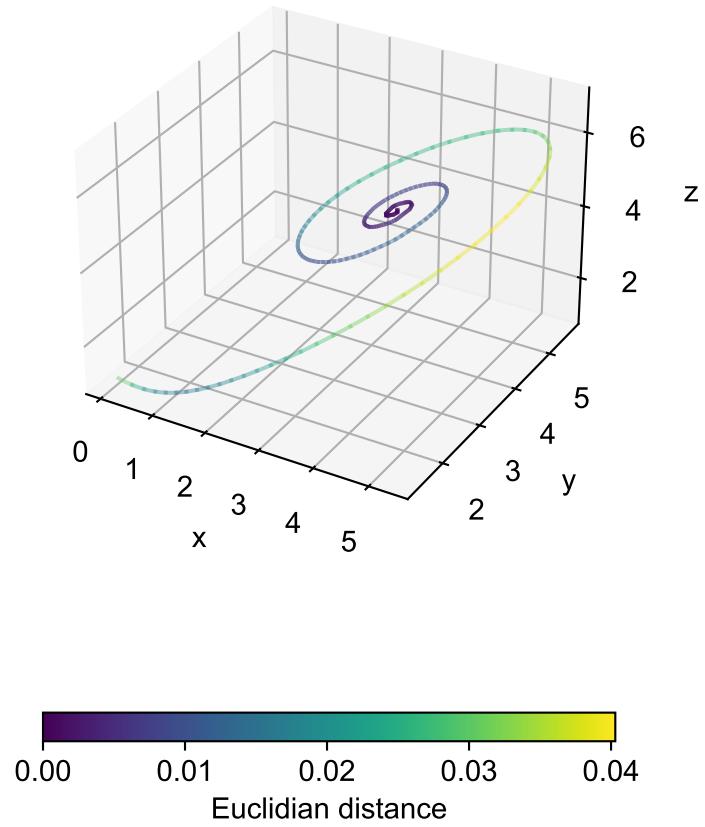
Elapsed coordinates computation time: 0.7912709000000007



# Lorenz Attractor

$(x, y, z) = (0.1, 1.4000000000000001, 1.0)$   
 $(\sigma, \beta, \rho) = (10.0, 8/3, 6.0)$   
 $(dt, N) = (0.0023, 40000)$

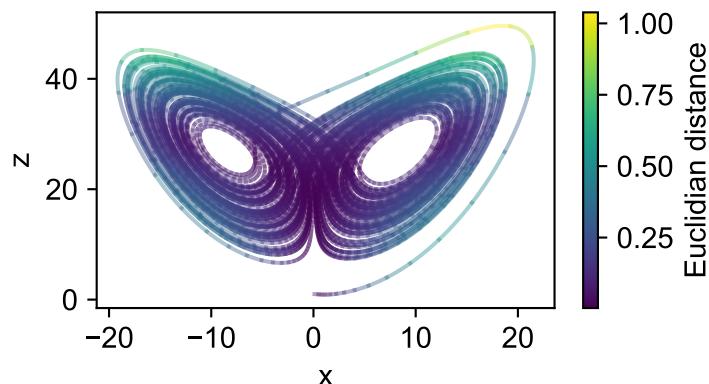
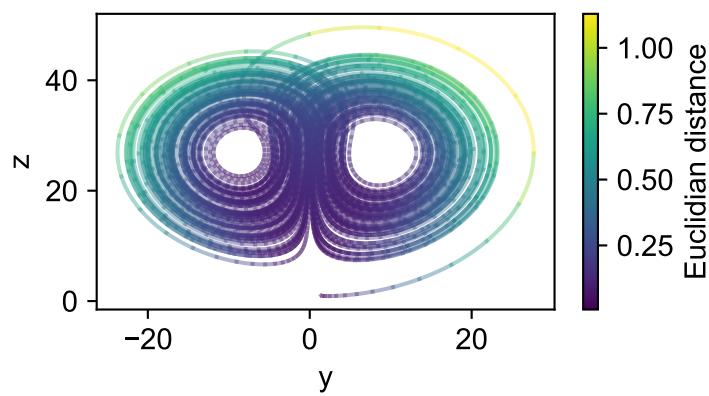
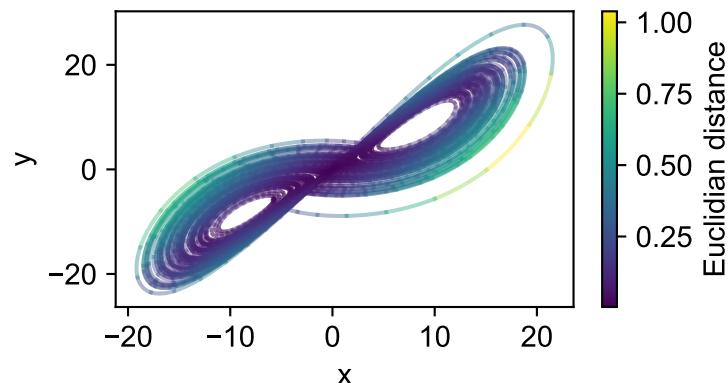
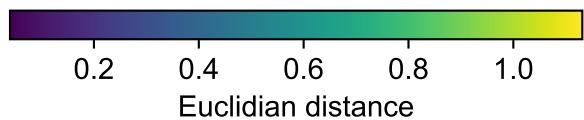
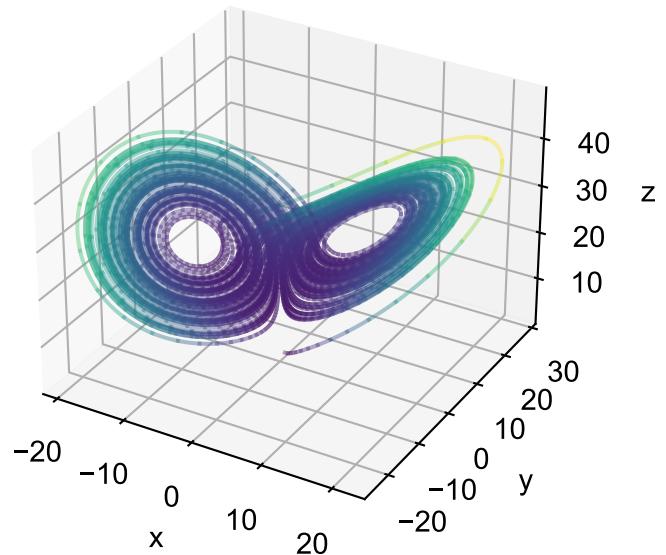
Elapsed coordinates computation time: 0.6570427999999993



# Lorenz Attractor

$(x, y, z) = (0.1, 1.4000000000000001, 1.0)$   
 $(\sigma, \beta, \rho) = (14.0, 8/3, 28.0)$   
 $(dt, N) = (0.0023, 40000)$

Elapsed coordinates computation time: 0.7971875000000068



# Lorenz Attractor

$(x, y, z) = (0.1, 1.4000000000000001, 1.0)$   
 $(\sigma, \beta, \rho) = (14.0, 13/3, 28.0)$   
 $(dt, N) = (0.0023, 40000)$

Elapsed coordinates computation time: 0.7731410000000096

