University of Zurich - HS 2013

Computational Science I
Exercise notes: Lotka-Volterra

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Exercise 1

The following code solves the Lotka-Volterra equations with the Python built-in integrator `odeint`:

```
from scipy.integrate import odeint

alpha = 3

def func(y, t):
    return [alpha * y[0] - y[0]*y[1], y[0]*y[1] - y[1]]

t = arange(0, 20, 0.01)
y0 = [2, 1]

y = odeint(func, y0, t)

plot(t, y)
```

The following figures are plots for the model for different values of α and different initial conditions:

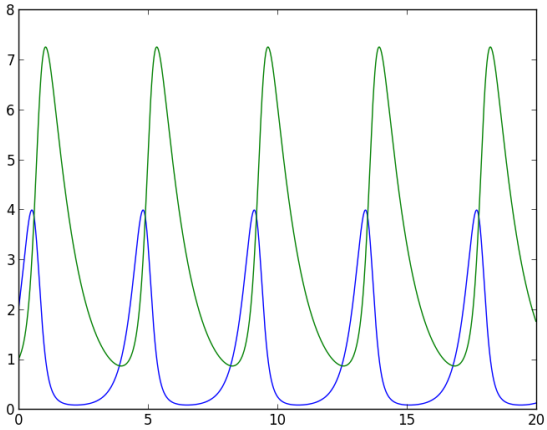

Figure 1: Lotka-Volterra model with $\alpha = 3$, $x_0 = 2$, $y_0 = 1$

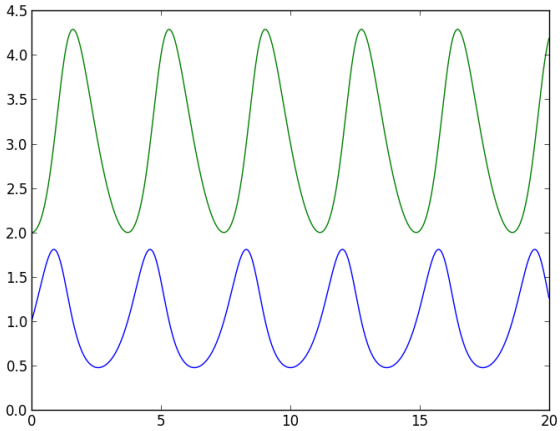

Figure 2: Lotka-Volterra model with $\alpha = 3$, $x_0 = 1$, $y_0 = 2$

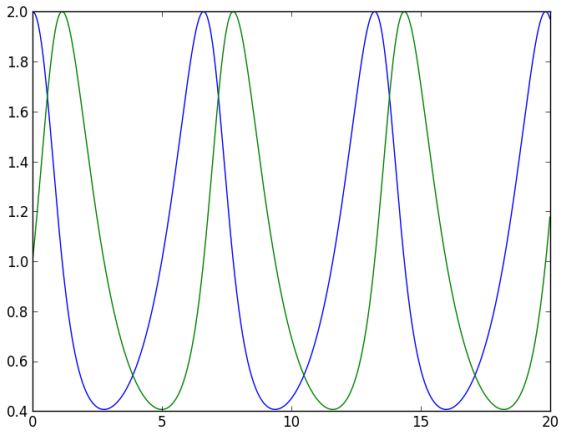

Figure 3: Lotka-Volterra model with $\alpha = 1$, $x_0 = 2$, $y_0 = 1$

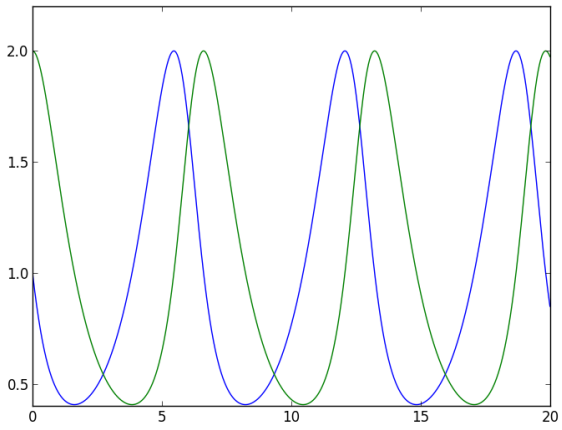

Figure 4: Lotka-Volterra model with $\alpha = 1$, $x_0 = 1$, $y_0 = 2$

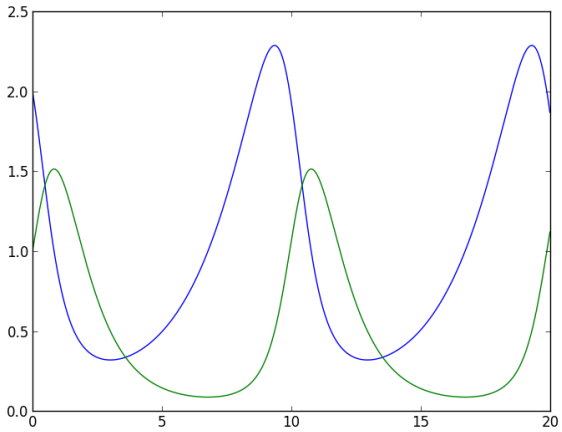

Figure 5: Lotka-Volterra model with $\alpha = 0.5$, $x_0 = 2$, $y_0 = 1$

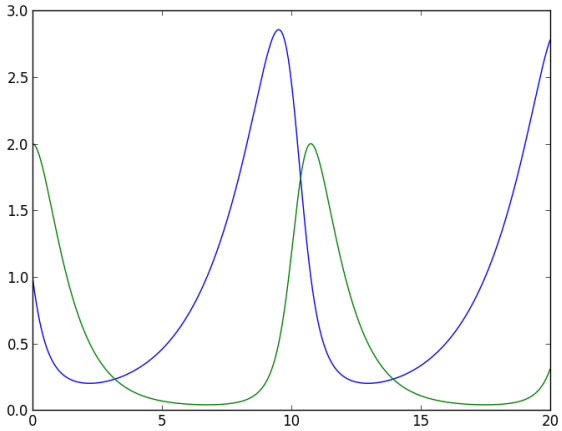

Figure 6: Lotka-Volterra model with $\alpha = 0.5$, $x_0 = 1$, $y_0 = 2$

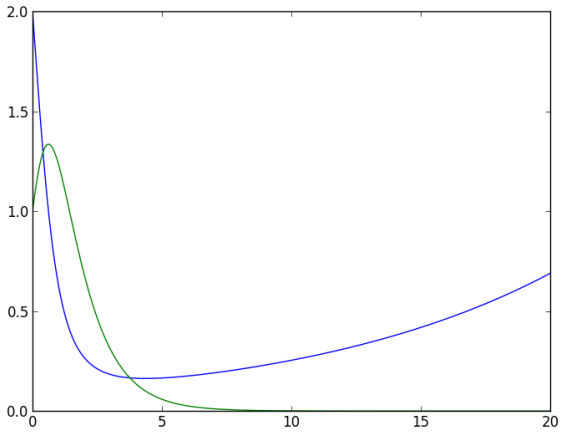

Figure 7: Lotka-Volterra model with $\alpha = 0.1$, $x_0 = 2$, $y_0 = 1$

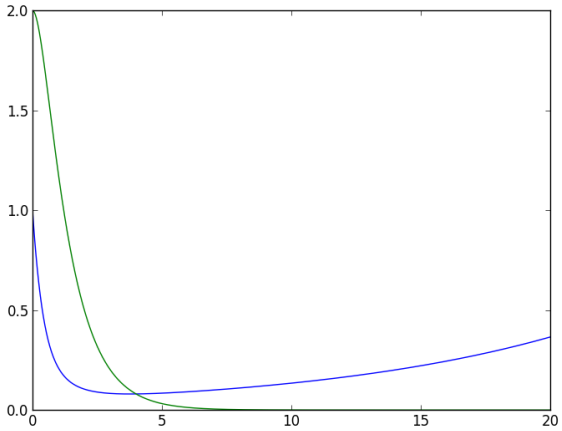

Figure 8: Lotka-Volterra model with $\alpha = 0.1$, $x_0 = 1$, $y_0 = 2$