

Predator-Prey Model Based on Lotka-Volterra Equations

Fluxion Example Description

1 Background

The Lotka-Volterra equations are an important model in theoretical biology. They describe the interaction of animal and prey populations. The equations are:

$$N_1' = N_1 \cdot (Br_{N_1} - \alpha \cdot N_2) \quad (1)$$

$$N_2' = -N_2 \cdot (Dr_{N_2} - \beta \cdot N_1) \quad (2)$$

The variables are defined as follows:

- N_1 : Number of prey animals
- N_2 : Number of predator animals
- Br_{N_1} : Birth rate of prey animals
- Dr_{N_2} : Death rate of the predators
- α : Feeding rate of the predators per prey animal = Death rate of the prey animals per predator
- β : Reproduction rate of the predator per prey animal

The Lotka-Volterra model makes some assumptions regarding the environment and behavior of the predator and prey animals:

- The prey animals always find enough food
- The predators feed exclusively on the prey
- The rate of change of the population is proportional to the size of the population
- Nature (i.e., the environment) is static and is favorable to neither prey nor predator
- The predators have a restricted feeding behavior