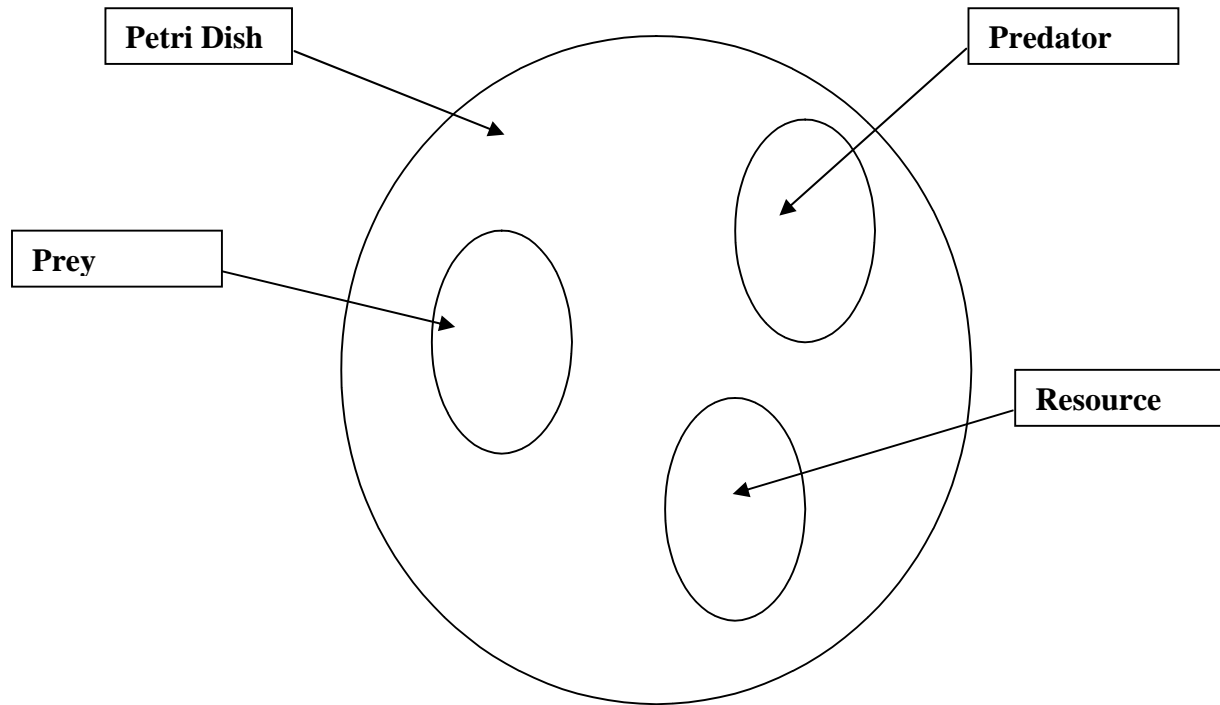


Predator Prey Microbial Simulation

Objective

The objective of this model is to predict the behavior of three types of particles in a Petri dish. The particles interrelate with each other like the resource, predator, and prey behavior present in real life.



Equations for model

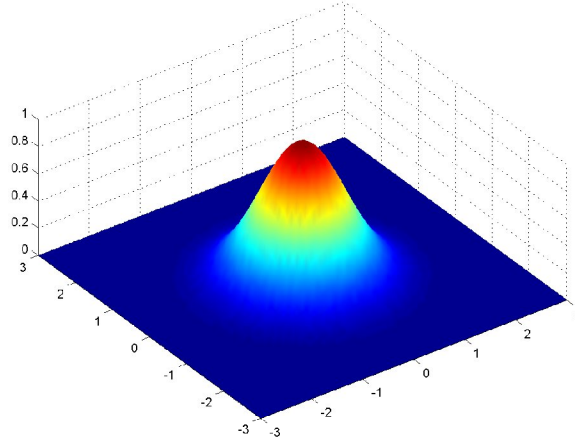
$$\frac{dN_1}{dt} = g_1 N_1 - N_1 (p_{12} N_2) - r_1 \frac{N_1^2}{N_3}$$

$$\frac{dN_2}{dt} = g_2 N_2 - N_2 (p_{21} N_1) - r_2 \frac{N_2^2}{N_3}$$

$$\frac{dN_3}{dt} = G - N_3 (p_{31} N_1 + p_{32} N_2)$$

Model Weighting Function

$$f(x, y) = Ae^{-\left(\frac{(x-x_0)^2}{2\sigma_x^2}\right) - \left(\frac{(y-y_0)^2}{2\sigma_y^2}\right)}$$



| | | | | |
|-----------|---------|-----------|---------|-----------|
| 0.000001 | 0.00021 | 0.0009213 | 0.00021 | 0.000001 |
| 0.000212 | 0.02474 | 0.1073921 | 0.02474 | 0.000212 |
| 0.0009213 | 0.10739 | 0.466 | 0.10739 | 0.0009213 |
| 0.000212 | 0.02474 | 0.1073921 | 0.02474 | 0.000212 |
| 0.000001 | 0.00021 | 0.0009213 | 0.00021 | 0.000001 |

Boundary Conditions

| | | | | |
|-------------|-------------|-------------|-------------|-----------------|
| ... | ... | ... | ... | $w_{i+2,j-2}^*$ |
| ... | ... | $w_{i,j-1}$ | ... | $w_{i+2,j-1}^*$ |
| $w_{i-2,j}$ | $w_{i-1,j}$ | $w_{i,j}$ | $w_{i+1,j}$ | $w_{i+2,j}^*$ |
| ... | ... | $w_{i,j+1}$ | ... | $w_{i+2,j+1}^*$ |
| ... | ... | ... | ... | $w_{i+2,j+2}^*$ |

Flowchart

