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Plugging in the Euler-Maruyama approximations, and through substitution and algebra…

We will simulate for $t \in \{3 : 500\}$ with

$$\begin{bmatrix} x_t \\ y_t \end{bmatrix} = (2-\beta)\begin{bmatrix} x_{t-1} \\ y_{t-1} \end{bmatrix} + (\beta - 1 - 2k\beta)\begin{bmatrix} x_{t-2} \\ y_{t-2} \end{bmatrix} + \sigma N\left(\mathbf{0}, I_2\right)$$

where $\beta = 0.4$, $k = 0.2$, and $\sigma = 0.5$

Let $\begin{bmatrix} x_1 \\ y_1 \end{bmatrix} = \begin{bmatrix} x_2 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$.

Plugging in the Euler-Maruyama approximations, and through substitution and algebra…

Let $\begin{bmatrix} x_1 \\ y_1 \end{bmatrix} = \begin{bmatrix} x_2 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$.

We will simulate for $t \in \{3 : 500\}$ with

$$\begin{bmatrix} x_t \\ y_t \end{bmatrix} = (2 - \beta)\begin{bmatrix} x_{t-1} \\ y_{t-1} \end{bmatrix} + (\beta - 1 - 2k\beta)\begin{bmatrix} x_{t-2} \\ y_{t-2} \end{bmatrix} + \sigma N\left(\mathbf{0}, I_2\right)$$

where $\beta = 0.4$, $k = 0.2$, and $\sigma = 0.5$

Simulated animal movement over 500 time steps

(One individual with single attraction point in red)