Modeling Zombies and Infection

Ricky Marske and Steven Rosendahl

A Simple Model

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  - Left with the system

$$\begin{cases} S' = -\beta(t)SI \\ I' = \beta(t)SI - vI \\ R' = vI \end{cases}$$

Adding Complexity

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  We will look at each one of these additional features individually

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$$Z(x,t) = \frac{Z_0}{L} + \sum_{n=1}^{\infty} \frac{2Z_0}{n\pi}\sin\left(\frac{n\pi}{L}\right)\cos\left(\frac{n\pi}{L}x\right)e^{\left(-\left(\frac{n\pi}{L}\right)^2 Dt\right)}$$

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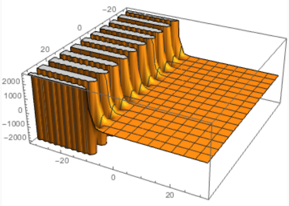

$n = 1$

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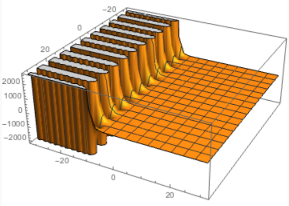

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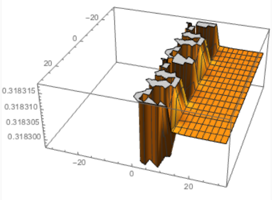

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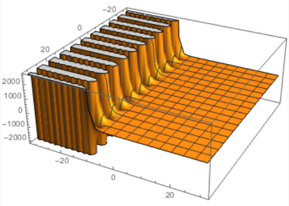

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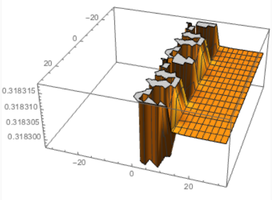

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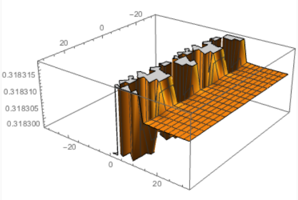

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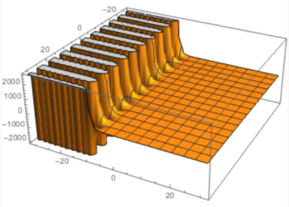

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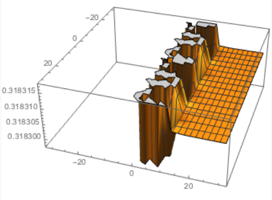

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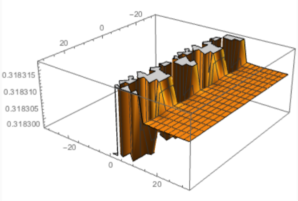

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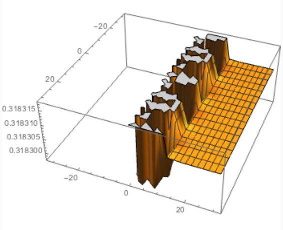

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- This behavior can be modeled using NetLogo

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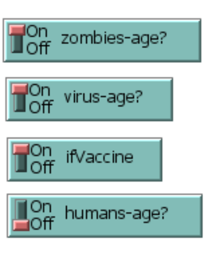

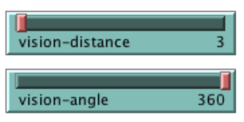

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$$y = 3122.33 + 0.580e^{x}$$

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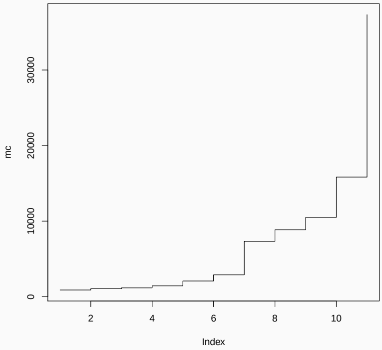
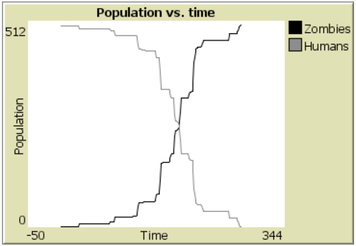
Data From Twitch



Data From NetLogo



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- This yields the solution

$$u(x,t) = \zeta + \sum_{n=1}^{\infty} (k_1 \sin t + k_2 \cos t) \sin n\pi x$$

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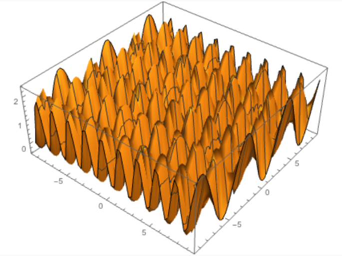

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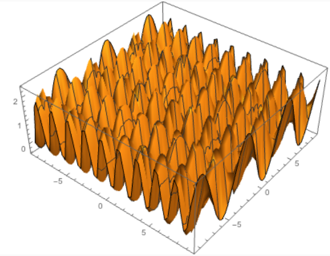

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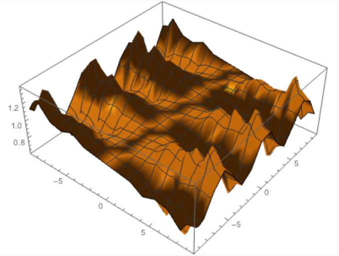

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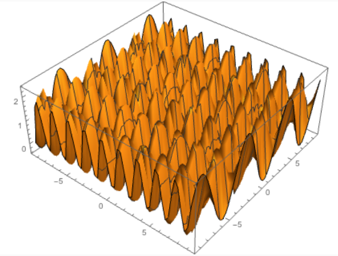

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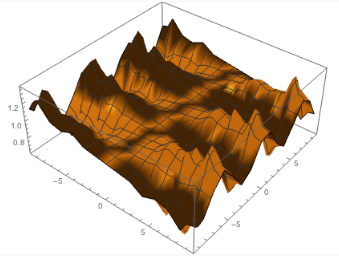

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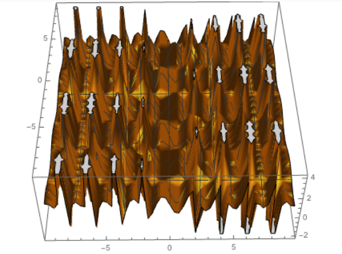

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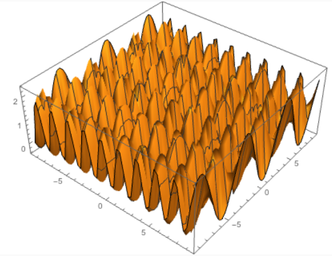

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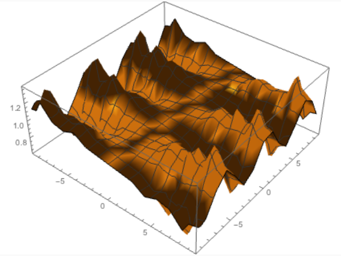

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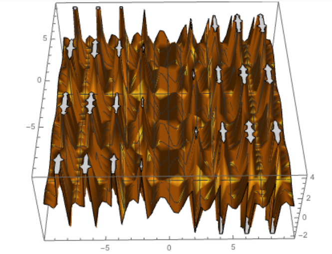

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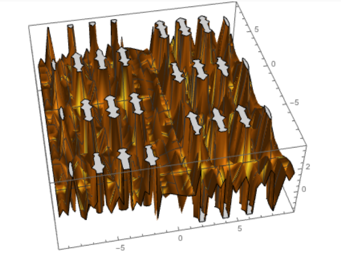

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- The system will move towards the saddle no matter what

References