Disease Lab

Laboratory Experiences in Mathematical Biology

Lesson Outline: The outlined expectations and agenda are geared for classes consisting of mathematics, statistics, biology, natural resources and biological engineering students with calculus and differential equations experience. See Pedagogical Resources for teaching and scaffolding suggestions.

Expectations

Teams are expected to:

1. Parameterize the proposed model for the basic zombie disease
2. Create a model for the team's adjusted disease.
3. Estimate parameters using data and model hypotheses.

Teams are also expected to produce a short paper containing:

1. An **introduction** describing their disease and its similarities to other diseases,
2. A **methods** section that contains a description and justification of their proposed model and a clear explanation of how parameters were estimated,
3. A **results** section that describes how well the their model performed with as well as a "picture" of the predicted populations plotted with their data for a visual reference,
4. A **discussion and conclusion** section detailing model implications.

Lab Agenda

A general outline for the Disease Lab is:

- Lecture: Introduction to the Disease Lab and basic zombie disease (15 min)
- Group Time: Designate roles for basic zombie disease and play game at least 2 times. Parameterize and solve proposed model (25 min)
- Class Discussion: Teams plot and compare given model to data and share ideas on how to improve the model (10 minutes)
- Group Work: Teams create their own adjusted disease and play game at least 2 times (15 min)
- Group Work: Teams create, develop and parameterize models for their adjusted disease (15 min)
- Class Discussion: Groups present models for their adjusted disease data including description of units parameters (40 minutes)

This schedule can be tightened (e.g. parameters for the given model can be calculated as a class, groups hand in reports instead of presentations) as the instructor needs and is aimed to be accomplished over the span of multiple class periods. Between class days, students are expected to meet regularly as groups to further develop their models and compare with data.