Introduction to Agent-Based Modeling

Fall 2023

Final Project Proposal Form

Use the questions below to help guide your model design process. Note that **your model must be dynamic** (it must change over time and/or space).

For more information on the final project, see Lecture 13.

*For the following problems, choose one of the questions from Problem 3 on your Topic Review and Selection Form as an example to work with. If you decide to change to a different question or topic later, that’s fine! You are not beholden to what you write here, we just want you to go through these exercises to ensure that you’re familiar with the process of conceptualizing a model.*

1. Choose one of the research questions from Problem 3 on your Topic Review and Selection Form, or formulate a new question. Restate the question, then **briefly** describe a modellable process that you think could be helpful in addressing this question. You will refine your idea in subsequent problems.

YOUR ANSWER HERE

1. Will your model be a cellular automata (1D or 2D), grid-based non-cellular automata (1D or 2D), free-motion, network, or a combination?

YOUR ANSWER HERE

1. What will the agents in your model represent?

YOUR ANSWER HERE

1. If applicable, describe in detail the environment and/or layout that the agents operate in. For this question, the environment consists of any elements of your model that are not agents. Spatial constraints (ex. terrain), pathways, and connections are a small subset of the many types of elements that you could include in the environment.

YOUR ANSWER HERE

1. What information can agents in your system access/sense? This could be information about an agent’s environment (global or local), states of neighboring agents, states of all agents, global averages, local averages, etc.

YOUR ANSWER HERE

1. Do agents in your system interact with each other? Do they interact with their environment or vice-versa? If so, how does this interaction occur? Is it direct or indirect?
   * Example of direct interaction: wolves eat sheep when they come into contact
   * Example of indirect interaction: deciding not to go to a bar/restaurant because it is too crowded

YOUR ANSWER HERE

1. What is the initial state of your model? To answer this question fully, you’ll need to answer the following sub-questions:

* What is the starting state of the environment (if any)?
* What is the starting state of agents (initial location, initial preferences, initial type, etc.)?
* Is your initial condition always exactly the same or does it vary between runs?

YOUR ANSWER HERE

1. If applicable, is the environment/layout of your model fixed or dynamic (does it change)?

YOUR ANSWER HERE

1. Is randomness built into your model? If so, what aspects of your model are designed to be random? Why is randomness used? If not, a simple “no” will suffice.

*Some common justifications for the use of randomness:*

* To reproduce variability
* To cause model events/behaviors to occur with a specified frequency

YOUR ANSWER HERE

1. Does your model feature agents or environments that adapt/learn over time? If so, explain below. If not, a simple “no” is sufficient here.

YOUR ANSWER HERE

1. In your model, is there a realistic concept of time? If so, how much time does one timestep represent? If your model doesn’t have a realistic concept of time (which is an equally valid design choice), explain why this isn’t a necessary/desirable feature in the context of your model.

YOUR ANSWER HERE

1. In your model, is there a realistic concept of distance/space? If so, how much distance does one unit represent? If your model doesn’t have a realistic concept of distance/space (which is an equally valid design choice), explain why this isn’t a necessary/desirable feature in the context of your model.

YOUR ANSWER HERE

1. Do the agents in your model update synchronously (all at once), or asynchronously (one at a time)?

*For example, agents (land plots) in the forest fires model update all at once, while agents (individuals) in the Schelling model move one at a time.*

YOUR ANSWER HERE

1. In order of occurrence, detail exactly what happens in a single timestep of your model. In other words, how does your model update? Answer in the form of a numbered list.

YOUR ANSWER HERE

1. What parameters will be present in your model? Which ones would you need to adjust to design an experiment that’s relevant to your chosen question from Problem 1? How does varying these parameters address your question? Recall that in the context of your experiment, the input parameters are the independent variables.

*Note that in addition to numerical parameters like the ones we explored on the Labs, things like underlying model structure can be treated like a parameter and changed in your experiment.*

YOUR ANSWER HERE

1. What specific quantity/quantities will your experiment measure? In other words, what are the dependent variables in your experiment? How will you measure the dependent variable/variables? How are the dependent variables related to your question?

YOUR ANSWER HERE