

Lab 5 (Allison James, Max Auborn, Caroline Cutter, and Maggie Swanson)

Biology: Ants

- In this project, a colony of ants forages for food. Though each ant follows a set of simple rules, the colony as a whole acts in a sophisticated way. The ants will start with the food closest to the nest. The ants will release a chemical trail once it acquires food so other ants can follow the trail and acquire food as well. The chemical trail is controlled by the diffusion and evaporate parameters.
- If you turn the forever checkbox off, the ants only move one step at a time.
- The sliders control the chemical trail. It decides the rate at which the chemical trail evaporates or diffuses.
- Abstractions could be the ants behavior of foraging food. Or the piles of food and the priority in which the ants get the food.
- The chemicals are represented by instance variables within patches and updated in the setup procedure

Biology: Flocking

- Represents the tendency of birds to flock together by moving in the same direction and moving towards each other without the presence of any particular “leader” bird
- When the minimum separation is lowered, they flock in a line, when it is increased they are very spread out and don’t flock together
- Increasing the maximum alignment turn radius allows them to group up much faster, but increasing the maximum cohesion and separation makes them more aimless
- Increasing max-cohere-turn makes the birds turn sharply and more erratically while decreasing it makes them move more smoothly
- Emergent behavior is that birds tend to form flocks
- Abstractions: weather or obstacles, some species do have leader birds
- There are many different ways the birds turn, but one way to align is by setting the heading to the average heading of all the birds

Biology: Wolf Sheep Predation

- Similar interface to ants model, but more options for both the sheep (food source) and wolves (predator), as well as an option to include grass
- Extremely difficult to create a stable system without the scarcity of grass to help the wolves keep the sheep population in check
- The wolves cannot overpower the sheep or else the sheep go extinct, then the wolves will inevitably go extinct also
- When the system is stable, all three populations exhibit harmonic motion that is slightly offset from the other populations
- Just sheep and grass model is easy to remain stable, perhaps because there are fewer variables in the model to account for
- Abstractions: absence of outside forces

Earth Science: Continental Divide

- Basic goal is to model the continental divide of North America

- Turtles model the waterline, whereas patches model the elevation and whether a specific patch is underwater or not
- Sprout is a command that creates turtles in a specific patch
 - Turtle is sprouted on a specific patch to represent the water's level
- The raindrop can check all patches around it and move towards the smaller elevation, keep going until the minimum elevation patch is reached or until more water is reached (aka a flood)

Earth Science: Climate Change

- Models light entering the surface of the earth and either being reflected or absorbed as heat, warming the earth
- Breeds are used to implement sun rays, infrared radiation, heat, CO2 molecules and clouds
- "Watch a ray" button creates a link that follows the light ray or IR around its path
- One way we could improve is to add trees to remove carbon dioxide
- The CO2 blocks the heat rays from exiting the earth

Social Science: Traffic Grid

- Solely implemented with patches and turtles (no breeds) and many global variables
- Power turned off causes complete gridlock, as cars can't cross intersections safely
- To improve the traffic, the model could take into consideration the number of cars at each stoplight, if there are more cars then they should have a longer greenlight (while still avoiding collisions)

Social Science: Team Assembly

- Rather than using breeds for different types of workers and links, turtles and links just have instance variables to determine their identity
- The links represent connections between workers, the links start to spread between small groups of workers to form a larger network of workers
- Each incumbent stores its previous collaborators, so when increasing the probability of choosing a previous collaborator, it picks from that pool of agents
 - Color of the link corresponds with the type of connection
- Increasing probability of working with an incumbent increases the repeat connections since there are fewer incumbents

EpiDEM: epiDEM Travel and Control

- A more complex extension of the basic model for epiDem. Modeled using the Kermack-mCKendrick model. Simulates the spread of infectious disease in a semi-closed population while taking into account travel and control variables.
- Turtles represent those infected, cured, inoculated, and hospitalized, as well as ambulances to transport people to the hospital
- One way to improve the model is to have an option for one side without the virus and one side with the virus, that way we can see how travel affect the other side (can mimic travel between countries in a real pandemic)