Prisoner's Dilemma Simulator

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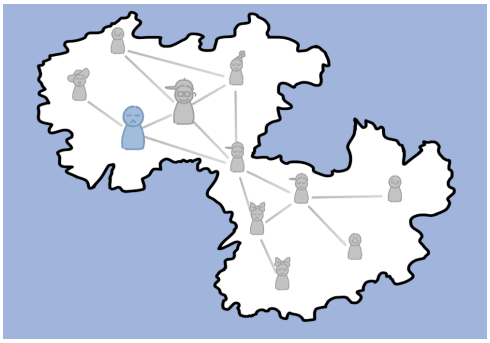
Topic Area

Following the theme of Instrumented Simulation, I would like to create a 2D biologically inspired simulation based on the Prisoner's Dilemma. In the prisoner's dilemma, two individuals are under arrest, but the police do not have enough information to fully convict either person. If both individuals stay silent, both get 1 year of prison time. Each person has the opportunity to betray the other and testify against them. If they do so, that individual will go free while their partner goes to jail for 3 years. However, if both individuals testify against each other, they both will go to jail for 2 years each. This is a classic game theory problem, and I'm interested in simulating it.

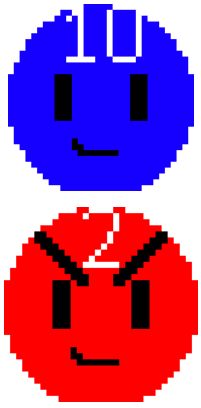


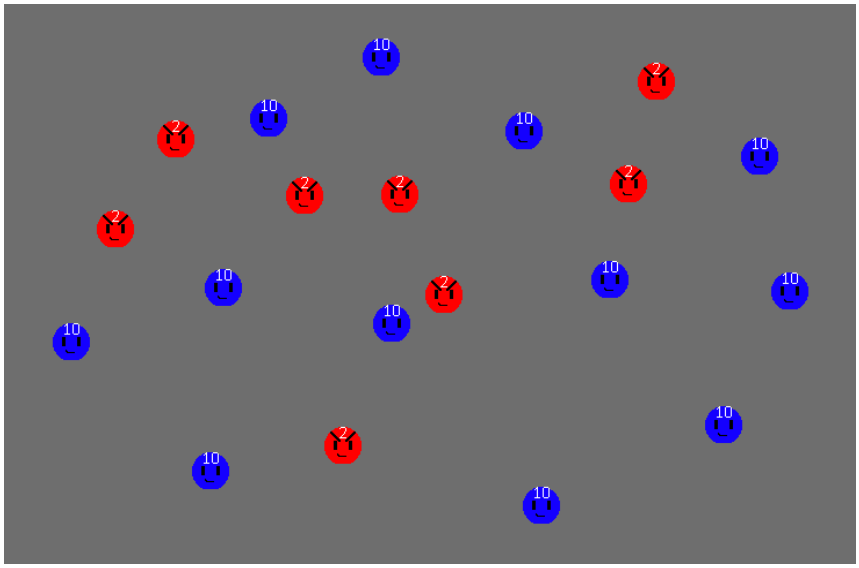
This project was partially inspired by a capstone project that I helped develop, called the Isle of Trust, managed by Professor Moshe Rachmuth of PSU. In the game, a group of people survives on an island by either working together or working by themselves for food, the game's version of staying silent and testifying. If a character runs out of food, they die. I want to apply this core idea to a real-time game that simulates that in a simplified manner.

Specific Project Vision

The program will be developed using the Bevy game engine using the Rust programming language. It should give me enough tools to develop the entire scope of this project.

The premise of the simulation will be set in a simple environment. It will be randomly populated by little round spheres called bugsters. There are two variants: red bugsters and blue bugsters. Each with a number on their head that represents the current amount of food they have. These bugsters will randomly wander around the area and bump into each other. When they do, they will either try to work together or sabotage each other, depending on their type, with reds sabotaging and blues working together. When they do, depending on the choices of the two interacting bugsters, they will either gain or lose food. If the food count of the bugster drops to 0, they will die.





Additional Features

Modifying variables:

I would like to be able to implement the ability for the player to modify the variables of the simulation, be that the spawn count of the red/blue bugsters or the rewards for sabotage and working together. This should make the game much more interesting, and you can play around with the simulation variables and see how that changes the simulation.

Other entity types:

If given enough time, I would also like to experiment with more complex bugster types. A bugster that has chances to either work together or sabotage would be interesting. The Isle of Trust has many different character archetypes that were implemented into the game. It might be interesting to see how those character types would work in this simulation, if at all.

Potential Issues

Bevy is a new game engine for me, so developing in it might take a bit of trial and error. More than that, it's the first game engine I have used that does not have a bit in the editor. I am unsure if I will need to use a plugin for an editor, but since this is a Rust programming class, it would be preferable to find out as far as I can go without one.

Additionally, I'm unsure how I want to implement the collision system, whether I want to design them to literally bounce off each other using physics or some other method.