

Location-Based Games:

StarLogo Simulations with Mobile Physical Agents

Background

StarLogo is a development environment for building models of decentralized systems.¹ A simulation may have dozens or even thousands of independent agents following a simple set of rules and often interacting with their surroundings and other agents. These simulations are used to teach students important lessons about emergent phenomena found in ecology, economics, biology, and chemistry, to name just a few. Additionally, the upcoming version, StarLogo TNG, is currently in beta and boasts OpenGL visualization and a blocks-based programming language. TNG introduces game programming as modeling to StarLogo users, allowing users to control agents using a keyboard, game pad, or joystick.

Concept – MobileStarLogo

Introduce the ability to control an agent remotely with a location-aware device that senses the user's movement and updates a running simulation on a computer with that model. The device only provides as much feedback as the agent would actually perceive. The games are not only fun but also provide an opportunity for students to become part of an agent-based simulation and discover effective strategies for thriving as the fittest agent.

Examples

*Flocking:*² The user is an animal that must follow its virtual flock to avoid becoming a stray easily picked off by a predator. Like a primitive flocking animal, the user cannot see the entire flock but can only perceive limited feedback from the animal's immediate surroundings. As a multiplayer variant, another user in a different room plays the predator, trying to discern which agent the prey user plays.

Epidemic: In the Epidemic model, many agents wander around colliding with each other. A few are infected with a disease and transmit the disease when they come in contact with other agents. A recovery rate determines how quickly agents become healthy again. Users can play the part of agents trying to avoid becoming sick, or some could play as viruses trying to infect other agents.

Rabbits and Grass: In the Rabbits and Grass model, many rabbit agents feed off of slowly regenerative grass. They gain energy as they eat and lose energy as time passes. If an agent loses all of its energy it dies, and if it reaches a specified threshold, it produces an offspring rabbit. A user can play the part of a rabbit, traversing a field in search of virtual grass to eat without being able to see the whole playing field at once. In a multiplayer environment, users must balance competition for energy sources with cooperation to maintain a viable food source.

Of course, these are just a few examples based on existing sample models. The opportunities for students to design and program their own location-based agent games with StarLogo are endless.

¹ See <http://education.mit.edu/starlogo/> and <http://education.mit.edu/starlogo-tng/> for more information.

² My research advisor Prof. Eric Klopfer suggested this game.