

# Homework 3

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Write a program in any OOP language a simple two-dimensional predator-prey simulation. For the simulation, you will have the prey be some number ( $r$ ) of roadrunners and the predators are some number of coyotes ( $c$ ). The agents (both prey and predator) exist in a bound  $n \times m$  uniformly space grid environment. Only one agent may occupy a cell of the grid at any given time. The environment is bounded, thus agents cannot move outside of the grid area.

For every time step in the simulation, every agent will make an action based on its current state, and the states of various cells near the agent.

## Roadrunners

- Move If no coyote is in an adjacent cell, move in a random direction by 1 cell. If there is at least one adjacent coyote, move in a direction (1 to 2 cells) that will minimize the number of coyotes adjacent to the agent in the next time step.
- Breed If at the end of a 3rd consecutive time step, there is a free adjacent cell, a new roadrunner is created.
- Die If at any time a coyote occupies the same cell as a roadrunner, the roadrunner dies.

## Coyotees

- Move Every time step, if there is an adjacent roadrunner, then move to that cell. If that cell is still occupied after the move, then eat the roadrunner. If no roadrunner is in an adjacent cell, move in a random direction by 1 cell.
- Breed After the 8th time step, spawn a new coyote as we do roadrunners.
- Die If a coyote goes 4 steps without eating a roadrunner, it dies before the start of the next step.

During the execution of a simulation, the agents move in a random order each time. Thus, a roadrunner may move to a cell and then get eaten by a coyote it did not sense. Your program should take in various configurations for the simulations. I am leaving the ultimate design of this assignment to you, but I will expect it to be well designed as discussed in class. Additionally, you must use some degree of inheritance.

More on the submission requirements will come in class.