Simulating Predator-Prey Models With Artificial Intelligence

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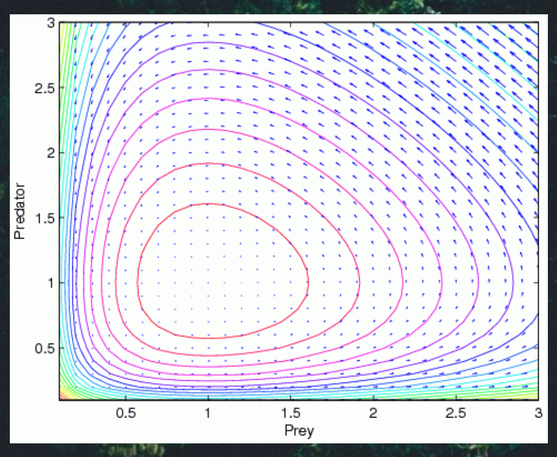
Aim

To investigate to what extent that the theory and mathematics behind Predator-Prey models can be replicated using Artificial Intelligence (AI).

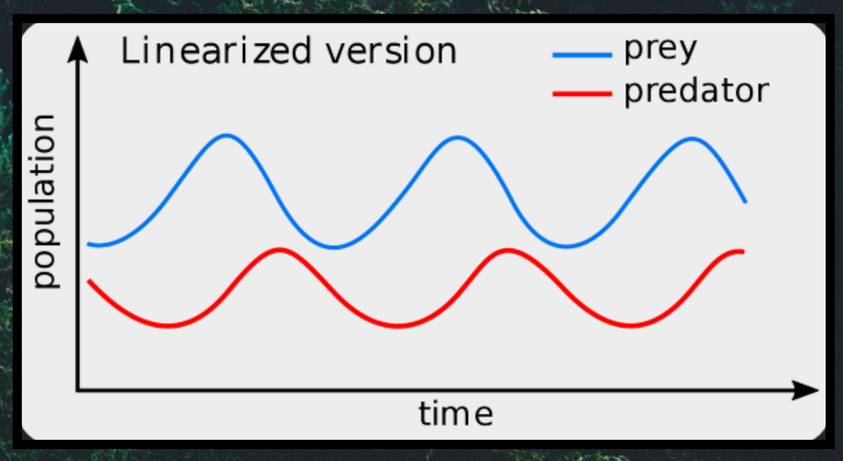
Motivation

A video game will often implement animals using simple AI, allowing them to move around and have various interactions with the player, but rarely will any two animals exhibit an accurate predator-prey relationship. Although the choice to exclude realistic relationships like this might be ideal for some games, who's focus is not on the accuracy of their animal behaviour, there are many games out there that should provide more attention to the realism of their systems.



Technologies

- Unity
- C#
- Visual Studio Code

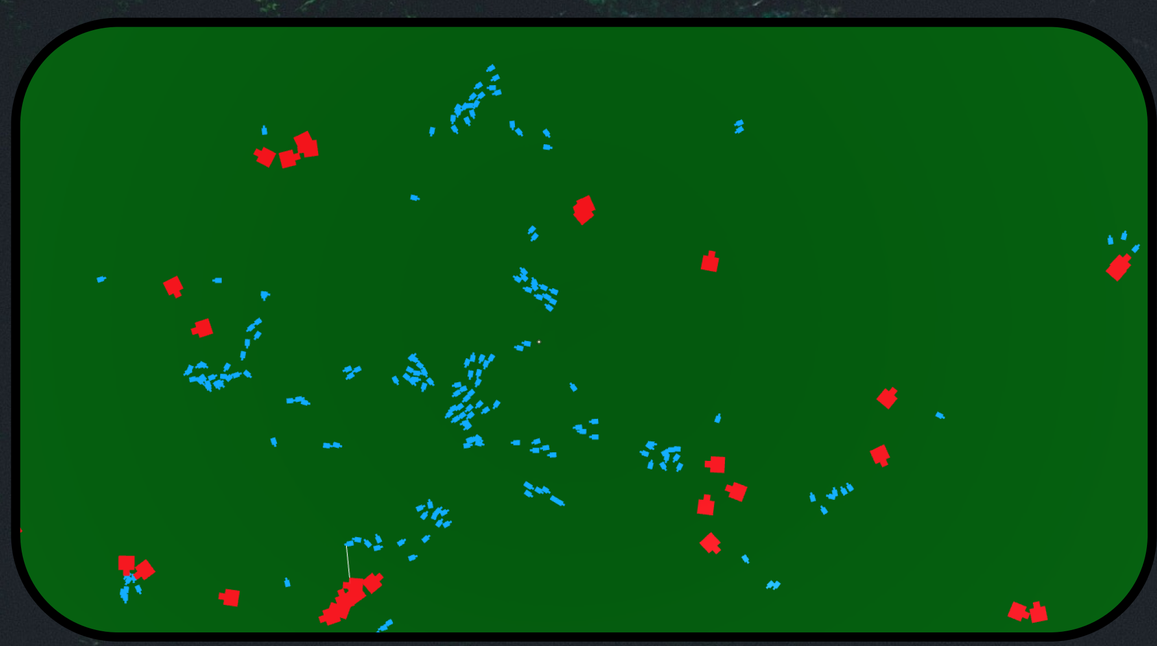


Solution

- Using flocking techniques to provide realistic simulation of prey movement.
- Predators chase and eat prey upon catching them.
- Prey reproduce at random intervals.
- Predators reproduce upon eating prey.
- Each prey has a superiority value, for each flock the prey with the highest superiority chooses the destination.
- Each predator has a superiority value, the most superior predators become an alpha and are immune to starvation.
- Prey hibernate during Winter, during which most predators will die due to lack of food.

Result

The system successfully depicts a predator prey model. As the prey population falls due to predation, the predator population will also fall due to lack of food. A low predator population allows the prey population to rise, which in-turn allows the predator population to rise due to ample food supply. This process is able to repeat itself.



Future Work

- Better graphical representation for predator and prey.
- Implementation of third dimension to represent airborne animals.
- Improvement of flocking algorithms and predator controls.
- Presets for different predator/prey relationships.
- Inclusion of multiple species to represent a complete food chain.

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