4CCS1PPA 2017/18

Assignment 3: Predator/Prey Simulation

The Deep Ocean  
  
Horia Pavel Simon Tudor – 1731038  
Anton Luca-Dorin – 1710700

1. Description and Features:

Our project revolves around the simulation of a vertical section of the ocean: it shows an area starting from the ocean surface to the bottom. In this area there are many different species of maritime animals, each with its own habitat. The main features of our simulation are:

* Six species of animals: three types of predators and three types of prey. The predators are the seagull, the shark and the killer whale. They hunt mackerels, anchovies and cods.
* Each animal has a different habitat: seagulls can fly through the sky and can dive to a certain level below the ocean surface. The cod can only live in the depths of the ocean and the killer whale can rise only to a certain depth.
* Two different kinds of plants: algae and plankton. Algae start growing from the bottom of the ocean while plankton floats in the water and constantly grows. The fish need to consume plants in order to survive and reproduce.
* Interesting visual effects: the ocean gets darker the deeper you look. Also, the time of day is dynamically animated.
* The predators use Lee’s algorithm to track down their prey. This helps with keeping the population numbers under control.
* All animals distinguish between male and female individuals. Besides this, they can only procreate if they have eaten enough (this is in order to prevent self-sustaining populations which thrive without the need of food).
* Time of day determines if the plants grow. Plants don’t grow at night. Also, fish have a chance not to move during the night.
* Three types of weather: normal, dry and raining. The weather determines the level of the ocean surface.
* Improved GUI with visual indicators for each population type and with buttons for controlling the simulation.
* Intuitive and easily extendable design: All animal classes have a similar structure and are relatively short. Therefore, adding new types of animals to the simulation is fairly straight-forward.

II. Behavior and Interactions:

After implementing our simulation and tuning the parameters to the best of our ability, we have observed that some interesting behavior patterns emerged:

* The fish, which were programmed to randomly move around the ocean in search for food and mates, quickly started to form schools which followed the location of the plants and tried to avoid the predators.
* In turn, the predators, equipped with tracking capabilities, kept the population of the fish under control and sometimes forced them in a certain direction. This meant that the plants could grow unobstructed, until the fish returned.
* The predators, especially the seagulls, also closely followed the movement patterns of the fish. If there were no fish in a particular area, it was very likely that there would be no seagulls above the surface of the water at that level as well.
* It was possible for the predators to hunt down the fish to the point of extinction, which in turn meant their own demise because of lack of food.
* The overall balance of the ecosystem was precarious: some simulations ended with the destruction of almost all live forms, while others saw an explosion of fish population emerge as their outcome.

\*Note: We decided to model our simulation in this way not with the goal of making an accurate depiction of reality, but in order to test and improve our programming, design and communication skills. We acknowledge the fact that our simulation is in no way an accurate depiction of a real life marine eco-system.