Coursework 3: Predator/Prey Simulation

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REPORT

This is a savannah simulation consisting of buffalo (dark grey), elephant (light grey), human (red), grass (green), lion (yellow) and zebra (magenta) entities. Buffaloes, zebras and elephants all compete for the same grass food source that grows randomly. Lions eat zebras and elephants, and humans eat zebras and buffaloes. There is a maximum constraint for the food level for the animals so that they are not able to aimlessly eat everything that encounters them. Night and day change every 10 steps and the animals are only able to move, eat and give birth when they are awake. Some animals are nocturnal meaning they only act in the night and not in the daytime such as the lion. All the animals have a random sex that they are assigned to and can breed if there is a male and female in a surrounding location. All animals can die from age, hunger or by being eaten by a predator.

The GUI of this simulation has been modified to have the statistics of the simulation on the bottom side of the stage and some live information about the simulation on its top. It has also been resized to have bigger default dimensions and three buttons have been added on the left of the stage: Start/Pause; One Step; Reset.

Grass is unable to move and can spread only if there is an existing free surrounding location. The grass class inherits from the plant class which makes the code more maintainable as it is easier to add any more plant entities to the simulation in the future. All the animals inherit indirectly from the animal class, via the predator and prey classes, as they all have similar methods which removes unnecessary duplicated code. An entity superclass was then created for the plant class and animal class to inherit from, hence avoiding even more code duplication.

The weather can be any combination of three states: wind, rain and fog. Initially, the weather starts at a random state and changes randomly. Plants grow two times faster when it is rainy and are more likely to spread when it is windy. Predators are unable to hunt when it is foggy which limits the actions of the humans and lions.

A model of diseases has also been implemented in the simulation. Animals contract disease randomly at initialization and then the disease is spread. There can be any amount of diseases, each disease has two parameters: its virality and its virulence. The virality is the rate at which the virus is spread from the animal infected to others, and the virulence is a quantitative variable that translates the

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harmfulness of the disease. Currently, only one disease is implemented in the simulation. The virulence of the current disease is 10 which means that if an animal contracts it, it will have only 10 more steps remaining to live before dying.

In purple are written all the extension tasks added to the simulation. All the base and challenge tasks have been implemented successfully.