Assignment Report

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**1.A description of simulator.**

The simulator contains 6 species: Wolf ,Snake ,Tiger ,Deer ,Cow ,Grass.

Wolf`s behaviours:

Catch Deer and Cow as their food. Breed in the morning, sleep at night. Hard to find the prey when the weather is foggy. Not always succeed to kill the prey even if it finds it. Will feel ill if it eats the prey which contains a disease. The disease will result in fast senescence.

Snake`s behaviours:

Catch Deer as their food. Breed in the morning, sleep at night. Hard to find the prey when the weather is foggy. Not always succeed to kill the prey even if it finds it. Will feel ill if it eats the prey which contains a disease. The disease will result in fast senescence.

Tiger`s behaviours:

Catch Deer and Cow as their food. Breed in the morning, sleep at night. Hard to find the prey when the weather is foggy. Not always succeed to kill the prey even if it finds it. Will feel ill if it eats the prey which contains a disease. The disease will result in fast senescence.

Both three predators fight for deers. Tiger and wolf also fight for cows. For large predator, deer will provide only half foodlevel.(Tiger and Wolf)

Large predators will hunt when their foodlevels are below a threshold.(Now is 70% of foodlevel).

Deer`s behaviours:

Eat grass. Breed in the morning, sleep at night. When the father deer finds the food, he will share the food with the children deer which has the smallest age. Will feel ill if it eats the grass which is toxic and the toxic grass will only provide little amount of foodlevel. The disease will result in fast senescence.

Cow`s behaviours:

Eat grass. Breed in the morning, sleep at night. When the father cow finds the food, he will share the food with the children cow which has the smallest age. Will feel ill if it eats the grass which is toxic and the toxic grass will only provide little amount of foodlevel. The disease will result in fast senescence.

All animals will become a virus container if they feel ill.

The herbivore who eats the toxic grass will be infected, the predator who eats the ill herbivore will be infected.The virus will be inherited to the descendants when animal breeds.

Grass`s behaviours:

Grows at foggy and sunny days, stop growing at raining days. Only when the waterlevel of grass is greater than a threshold, grass will be able to grow.( 40% of waterlevel ) The grass will become eatable when it grows up. (Eatable age)The rainy day will provide water for grass.

The source of the disease is the grass.

For grass, the probability of becoming toxic is 1/100 every time when it breeds. The toxic grass cant breed, it will only grow and die.

The weather system:

There are three weathers in simulator: Rainy, Sunny and Foggy.

Sunny day is the ordinary day, All creatures grow normally.

Rainy day will influence grass. The grass stops growing in rainy day and get water supply.

Foggy day will influence predators. Its harder for them to find the food. (50% of chance)

The day & night system:

We consider 2 steps as a day. The first step is AM, and the second step is PM.

All animals sleep at night.

The food sharing & hunt system:

Animal will share food with their descendants, lower the probability of that the child animal dies in early years.

For predators, only the maturity and old animals can hunt. They wont share food with their children. But for herbivores, child animal can eat grass and grown animal will share food.

**2. extension tasks**

**①Share food：**

For herbivore, if a parent of children finds grass. He/Her will share the food with his/her child who has the lowest age.

How to find the child who has the lowest age:

We create a <Animal> typed list called children in Animal class, it stores the children of a pair of animal. Then in method ” get\_lowest\_Age()”, we create a <Integer, Animal> typed HashMap. By using for loop twice, I put the age of child animal and child animal into HashMap and then compute their ages. Then return the animal typed object which has the lowest key value.

If there are more than one animal which have the same age, the food will be shared to all of them.

**②Labels：**

The label of current weather/ current time are displayed on the screen of the simulator.

It changes while steps increasing. We referenced to the population label at the bottom of the screen.

**③YearStage：**

There are 3 yearstages for all animals : “Young” (<=0.3\*MAX\_AGE) ,”Maturity” (>0.3\*MAX\_AGE&&<=0.7\*MAX\_AGE) and ”Old” (>0.7\*MAX\_AGE).Every animal will reach their corresponding yearstage when they growing up. Yearstage and breeding age are independent to each other. Yearstage mainly controls the method “findfood()”.

**3.Known Bugs & Unfinished tasks.**

**①Family:**

At first we want to create a complete structure for family, hence we create few variables: father, mother, couple and children. Every time when a animal breeds, he/she will have a partner and children. The child will have their father and mother.

Once the members of the family are confirmed, it will be much more easy to control their movements. In our unfinished codes(at the bottom of the Deer class), the children moving around the mother while their yearstage is ”Young” , and the range of the movement is a 4x4 blocks which considers the mother`s location as the central.

The father will go out hunt and the mother stays with the children. The couple variable makes sure that a pair of animals always live together. In the initial version of simulator, the predators will keep chasing herbivores, which means they will move a very long distance and move back. The only reason for animals to move is food. If the concept of family exists, the location of the habitat of a type of animal will be very stable. They will hunt and take the food back to their habitat instead of keep moving towards food.

Actually we already finished the code, it successfully compiled but has some runtime errors.

It seems that simulator failed to return the location of father&mother. The final location which returns to Field class is Null. I tried a lot of solutions but still can`t solve it. We really don’t want to give up this task but unfortunately I don’t have much time so we write it into “known bugs& unfinished task”

**②Multiple spouses**

This may not be a bug, we didn’t fix it because its more realistic.

In natural world a animal won`t have only one partner, they just breed when estrus comes.

In our simulator, every time when method “giveBirth()” is used, the couple variable will be changed. The animal wills only consider the animal who currently mates with them as their couple.

Its not hard to fix this but in the end we decided not to change it.

**③How to balance:**

This is the most difficult task from my perspective. As the type of the animals increases, (6 creatures in our simulator) it`s very hard to find a balanced point which can run 4000 steps on simulator.

We tired to follow the rules of the food chain:

For Plant: highest breeding probability, highest max litter size, highest initial population, lowest age.

For Herbivore: (consider deer as small herbivore, cow as large herbivore)

small herbivore: second high breeding probability, medium max litter size, high initial population, second lowest age, lowest food level.

Large herbivore: medium breeding probability, lowest max litter size, medium population, medium age, medium foodlevel.

For predator: (consider snake as small predator, tiger and wolf as large predator)

Small predator: low breeding probability, medium max litter size, low population, medium age, large foodlevel.

Large predator: low breeding probability, lowest max litter size, low population, longest age, largest foodlevel.

This will only maintain about 500-1000 steps, as the predator has no natural enemy and the breed of grass only requires water. Usually the in the end the simulator will only contains garss or one of the large predator.

But its enough to show the trend of the animals and how creatures live.