Genetic Park Report

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Introduction/ background

The Genetic Algorithm is depending on the 'Natural Selection'. Also, for the Genetic Algorithm, we need to add

- Initialize
- **Selection**
- **Crossover**
- **Mutation**
- **Replace**
- Loop

Selection / Replace

In this section, I will deal with 'Selection', 'Crossover', 'Mutation', 'Replace'.

For the selection and replace, we need to put **Fitness Function**. In my project, I picked **Survival Time**. The oldest surviving creators produce children.

Same as real creature, I added energy in the body. Depending on the body organs, there will be total energy consumption for every creature. Creatures will keep spending energy until they are dead.

Crossover

For crossover, I picked Meiosis, same as real creatures in real life. Child receive half the genes from each parent and genes combine to form their own genes

Mutation

There are also mutations in my project. You can control the probability by using UI. The rate is applied when children are created, and when they occur, they reverse genetic information.

Creatures have various organs such as the eyes, legs, body, skin, brain, and digestive system. For the organs, there are genetic information with Boolean array, and they calculate a lot of information from those genes.

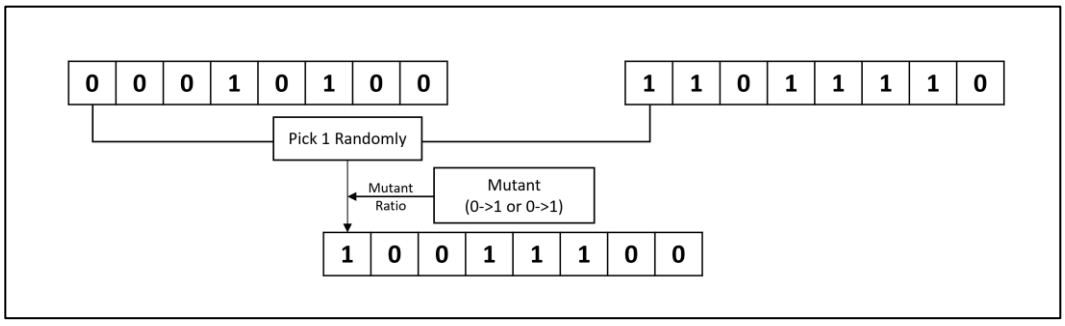


Figure 1 Genetic process

There are two kinds of creatures, carnivores and herbivores. Carnivores hunt the herbivores when they are hungry, and herbivores will be run away from the carnivores. Herbivores eat fruits on the tree. If a carnivore gets close to a herbivore while hunting, the herbivore can fight back and kill the carnivore. However, it allows herbivores to survive. It is okay to make only carnivores and herbivores, but don't forget to make trees for the survival of herbivores. Trees can be made using the 'Food Generate' button.

Method

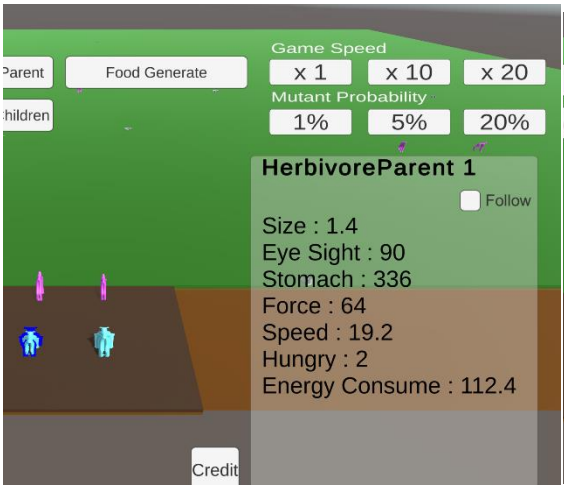
You can generate the parents by clicking the buttons. After that, you can generate the children from them. You must generate parents first before generating the children.

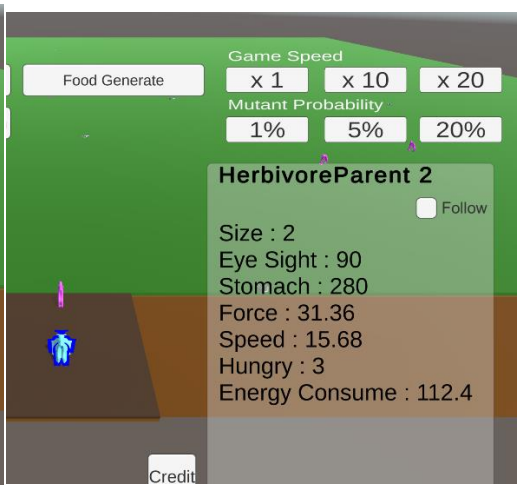
Data / Data Analysis

As a result of this project, many creations can be created, and this is one of the examples for illustration. I will analyze and explain the results of this example to help you understand this project.

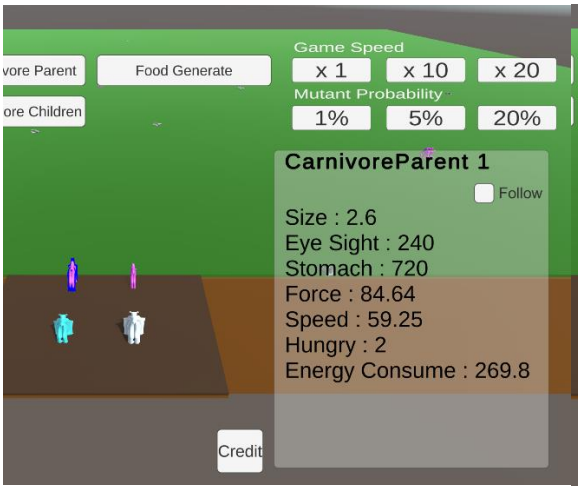
Initial state

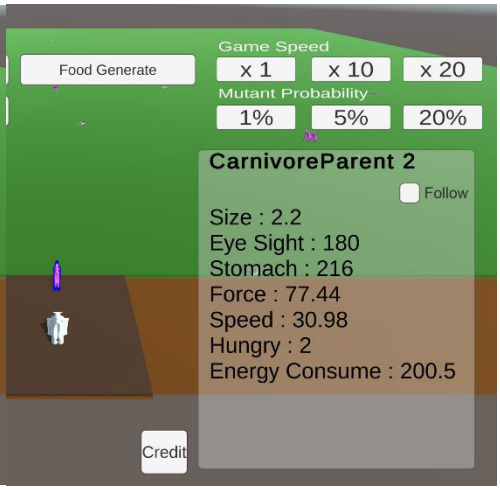
Herbivore (1st Parent)





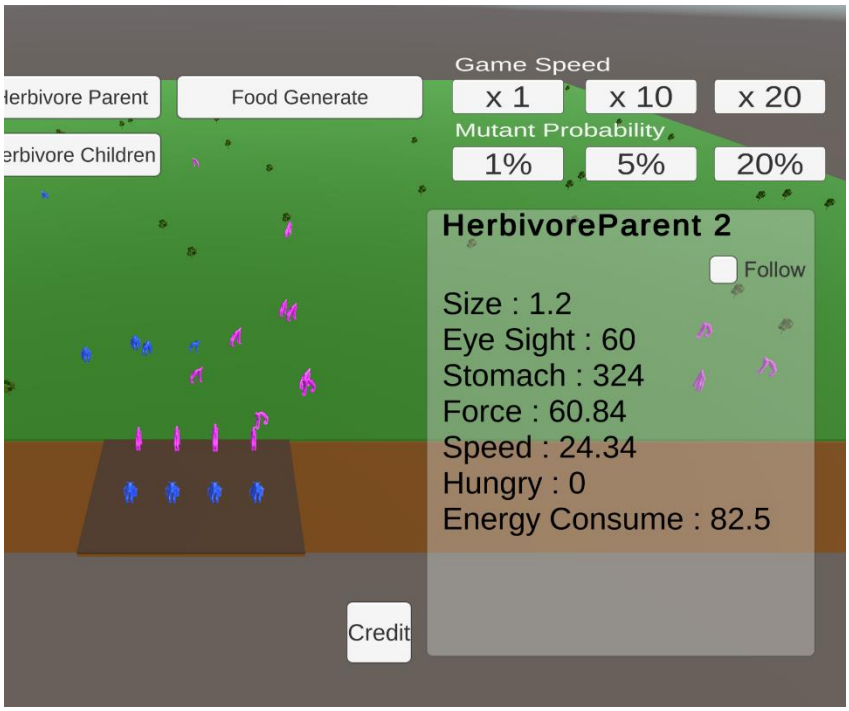
Carnivore (1st Parent)





Current result after 10 min running

Herbivores



Analysis

In my result, the carnivores evolved so strongly that many herbivores died so quickly that their evolution progressed very quickly. Therefore, almost all herbivore parents were maintained as a result.

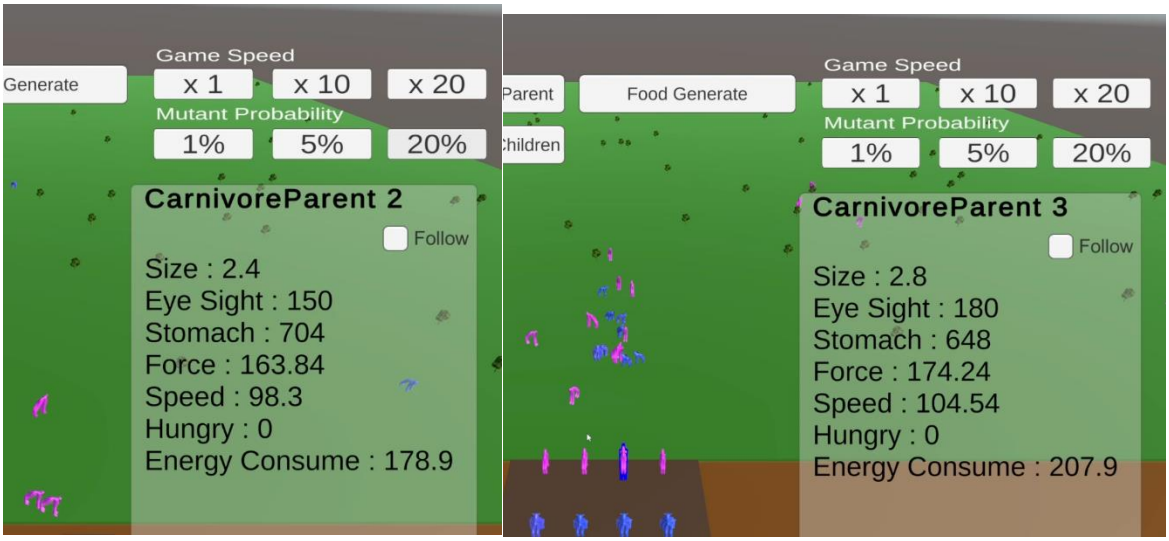
Eyesight: Max 90 -> 60 because carnivores are so fast to avoid, they reduce the sight to reduce the energy consume.

Stomach: Not that much changed. They are satisfied with their stomach size.

Speed: Min 15 -> 24 because they want to run away from the carnivores

Force: Min 31 -> Min 60 because if they fight back strongly when you are eaten, the survival rate increases.

Carnivores



Analysis

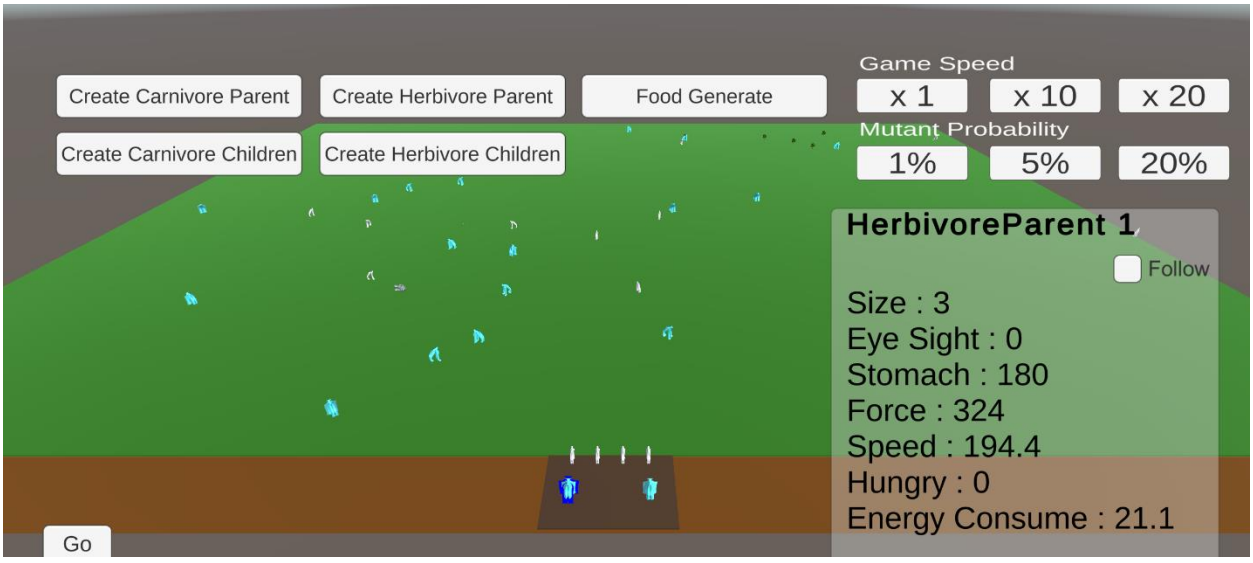
Eyesight: Max 240 -> 180 because they still need to find food/herbivores to hunt.

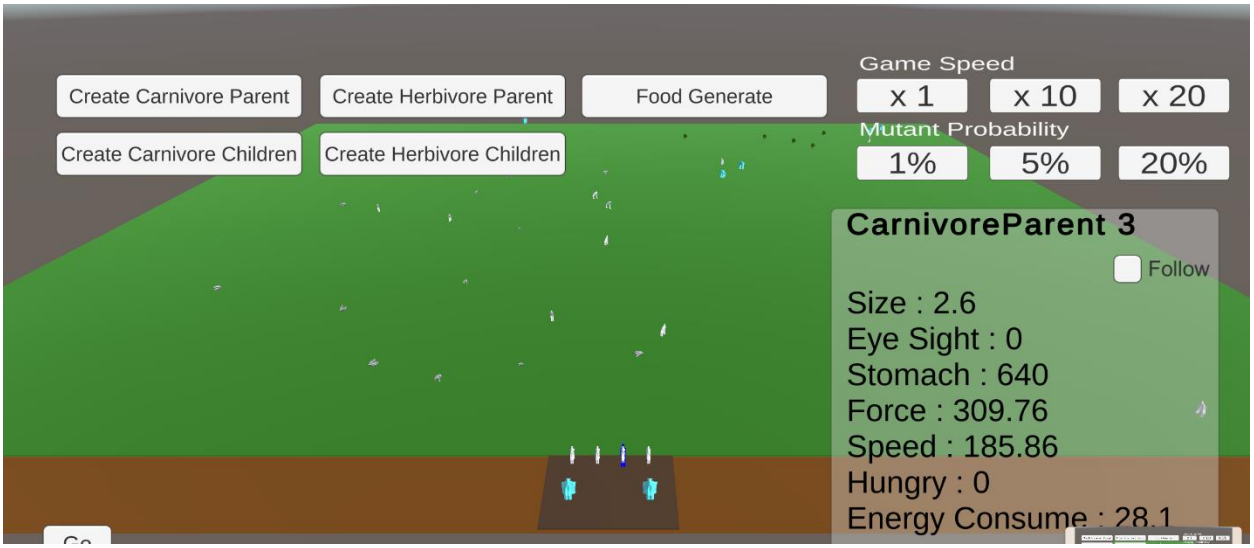
Stomach: Min 216 -> 648 because when stomach is big, they can stay longer without food. They may don't want to fight because they could die when they are hunting.

Speed: Min 30 -> 98 because they must chase the herbivore as soon as possible when they are hungry

Force: Min 77 -> Min 163 because they have to hunt fast because if they slow, herbivore can attack them!

Fun Results





These are the result from another state. I run this about 2 hours long. After that, most of the trees disappeared because they were eaten. What's interesting about this result is that there's no vision of creatures anymore. So, they're no longer looking for food. There are different reasons for this.

First, herbivores have no food around them. So, because the presence of field of vision is just increasing energy consumption, the value has changed to zero.

Second, carnivores cannot hunt. Now that herbivores have a very strong force, they were very likely to die in the process of hunting. So as a result, carnivores also decided not to eat food and only to survive for a long time.

This result can be seen around us. It's a cell. They don't feed, they simply aim to survive long.

Comments

This project can have a lot of results. Therefore, you can get different results each time you run it.