# 343 Assignment2 Report

## My simulation settings:

The environment is a 30\*30 grid.

Number of Strawberries = 50.

Number of Mushrooms = 20.

Number of Creatures = 50.

Number of Monsters = 30.

Crossover cut Chromosone index randomly from 1 to 5

Each creature has 5% chance to mutate, randomly happened from index 0 to 12.

Each creature and monster can detect its neighbor area consisted of **8** cells around it.

When there the time steps count down to zero and there is no survivor on the grid. It will restart the simulation process and the count of generation reset to 0.

The chromosone is an array index from 0 to 12.

The action value associated with chromosone[m] is begin from 0, such as

For chromosone index 5 which is action on nearest monster has possible action:

towards/away from/random/ignore

then the associated value for chromosone [5] will be

0/1/2/3/

## The description

Every time step, the Creature move base on their chromosones. The monsters have 80% chance to move, means averagely they stops moving for every 5 steps. Each creature has energy level = 100. Each move will consume 1 energy and if it eats a bit of strawberry, it will gain 4 energy units. In each round of evolution, the time step set to 99 which count down every time. So usually when creature’s energy reduced to 1(If it didn’t eat anything and alive), the round of simulation ends and ready to produce the next generation using crossover.

During the process of producing next generation, I selected the chromosones (index 0 -- 12) based on the survivors’ fitness: I first normalize all their fitness, then choose the parents base on the probability from the normalized value. When do the crossover, I choose randomly to cut the parents’ chromosone index ranges from 1-5, denoted as c. So After the crossover, the offspring will have the exchanged chromosone from combining parent A (index 0 -- c) with parent B (index c+1 -- 12). At last, the chromosone has a 5% chance to mutate. This process will be repeated 50 times to produce 50 creatures chromosones and use them to generate new creatures.

## The observation

At the beginning of experiment, the chromosones is randomly generated. During the process of evolution, the chromosones has been shaped. The biggest impact come from the index 1 which is the action on eating strawberry. It is reasonable because those one who eat will have fitness value 100 while other just have 1, that makes it has much bigger chance to be chosen to produce offspring.

The second main factor which shapes the chromosone is the index 5, which tells the creature how to action on when there is a Monster nearby. With reasonable expectation, the value in index 5 should be 1 which means away from.

The third major factor to shape the chromosone is the index 0, which tells the creatures eat or ignore when there is a Mushroom present. Again, we expected the value in index 0 should be 1 which means ignore.

Those main factors’ weights also have improved during evolution. The weight associated with each action is a reflection about how important each action is. They link directly to how the creature behaves. If the action is not important at all, then random action is not bad. So higher weight link to certain behaviour, it requires the creature to take certain action, not random action when it senses something. For example, for a reasonable creature, it should have max weight on action away monster and second high weight on action eat present mushroom.

An interesting part of is index 6, which is is random move if the chromosone [6] = 0; during the evolution, this value also changed very quickly. It makes the creature to move to a certain direction so it will not wander around. The creatures move to the edge of the environment, because in the central arear of gird have higher chances to meet monster.

Notice, the total fitness is increasing. At first, the good fitted(“smart”) creature’s number is small, but as the evolution continue, the population of those “smart one” increases.

## The changes of chromosone from this experiment:

At first, the chromosone is generated randomly:

0 1 3 1 1 1 0 6 4 2 5 1 3

0 1 3 0 2 3 1 3 1 5 2 4 6

0 1 0 0 3 2 1 5 4 1 6 3 2

0 1 2 0 3 0 4 5 3 1 2 4 6

1 1 1 3 2 0 1 3 6 5 4 1 2

0 1 3 1 3 3 2 2 4 5 6 3 1

1 0 3 2 3 0 4 1 6 4 5 2 3

0 1 0 1 0 0 3 6 1 2 5 3 4

1 0 2 0 3 1 3 5 4 6 1 3 2

1 0 2 3 1 1 2 4 6 3 1 5 2

…

As new generation produced:

0 0 1 0 3 3 3 2 6 4 3 5 1

0 0 1 0 3 3 3 2 6 4 3 5 1

0 0 1 0 3 3 3 2 6 4 3 5 1

0 0 1 0 3 3 3 2 6 4 3 5 1

0 0 1 0 3 3 3 2 6 4 3 5 1

0 0 1 0 3 3 3 2 6 4 3 5 1

0 0 1 0 3 3 3 2 6 4 3 5 1

0 0 1 0 3 3 3 2 6 4 3 5 1

0 0 1 0 3 3 3 2 6 4 1 5 3

0 0 1 0 3 3 3 2 6 4 3 5 1

0 0 1 0 3 3 3 2 6 4 3 5 1

0 0 1 0 3 3 3 2 6 4 3 5 1

0 0 1 0 3 3 3 2 6 4 3 5 1

….

It improves, at the last generation:

1 0 1 0 1 1 3 1 5 2 4 3 6

1 0 1 0 1 1 3 1 5 3 4 2 6

1 0 1 0 1 1 3 1 5 3 4 2 6

1 0 1 0 1 1 3 1 5 2 4 3 6

1 0 1 0 1 1 3 1 5 2 4 3 6

1 0 1 0 1 1 3 1 5 3 4 2 6

1 0 1 0 1 1 3 1 5 3 4 2 6

1 0 1 0 1 1 3 1 5 2 4 3 6

1 0 1 0 1 1 3 1 5 3 4 2 6

1 0 1 0 1 1 3 1 5 3 4 2 6

1 0 1 0 1 1 3 1 5 2 4 3 6

1 0 1 0 1 1 3 1 5 3 4 2 6

The reason why I choose Java to do this simulation assignment is because it is the only language I am familiar with. I took the course COMP160 in summer school and it is the only option I have.

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