Scientific computing portfolio

# 1st assignment: Cannon ball

Program:

Changes:

Observations:

Flowchart:

# 2nd assignment: Animal kingdom (bears, fish and plants)

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Program:

The program should build a functioning eco system. The ecosystem is built in a grid world, meaning everything happens in cells. Each cell can have one of four states. It can either be a plant, fish, bear or empty and depending on what state the cell is it reacts differently. The bears and fish are also colored accordingly to weather they’re starving, of age or not

Rules for plants:

1. if there is more than 1 empty space next to the plant, then it makes a new plant on an empty space
2. if there are more than 4 plants next to the plant, then it dies.

Rules for fish:

1. If the fish is of age, there is room and the fish is not hungry, then it breeds
2. If there is a plant next to the fish, then it eats the plant
3. If the fish hunger reaches 0, then it dies
4. If there are 3 or more fish next to the fish, then it dies.
5. If there is empty space next to the fish, then it moves

Rules for bears:

1. If there is a fish next to the bear and the bear is hungry, then it eats the bear
2. If the bears hunger reaches 0, then it dies.
3. The bear always has a chance of dying and the chance of death grows by 0.5% per stage the bear has lived.
4. The bear can breed, if it of age, there is room, a neighboring bear and the bear is not hungry.
5. The bear can move to an empty space or a space with a plant.

Changes:

There has been added plants and a death chance

Observations:

The update of the grid moves from left upper corner to the lower right corner, meaning that things that can move (bears and fish) can move multiple times in one screen update. You can test for this by setting the update rate of the program down. You should see the fish and bears sometimes jumping more than one tile.

Question:

There is a PDF in the rar file called “*Questions for the 2nd assignment*” which holds the questions for this segment.

Q1: The first, make a third “animal type”, and the second, add a probability to the life of the bears, extension has been added.

Q2: correctness in this program would be if there would be a stable ecosystem. This ecosystem would include brown tiles (bears), blue tiles (fish), and green tiles (plants). Each tile has a set of rules that they must follow, which has been stated above in the functions segment. This program has not achieved balance just yet, a couple of things can happen which always results in the map being filled with only plants, or all the plants will be eaten or trampled ending with an empty map. A third and most common ending is the bears end up breeding more than they die and swallow up all of the map.

Q3: yes, yes and the way the correctness of everything was tested by isolating every rule to see if the rule applied. For instance, the bears should be next to another bear before I could breed. this was tested by removing all the plants and all the fish. If the bears would multiply without being next to a bear, there was an error.

Q5: yes. There is a short description of every function in the segment called functions.

Q6: the balancing part. When making the program, the rules were set in place rather quickly, but to stabilize the eco system took time, I have not been able to stabilize the eco system although its “just” trial and error.

Flowchart: