Armor Evolution Educational Activity
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Overview

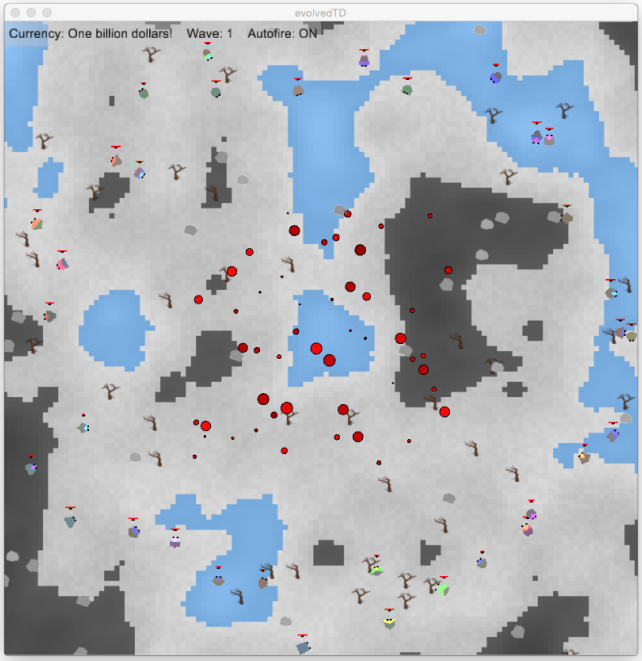
The goal of this educational activity is to introduce students to the concept of evolution and the effect that change in environment can have on a population over time. For this activity, we will focus on the armor trait of the creatures we will be studying. In order to do this, you will play the Tower Defense game, EvolveTD, created by University of Idaho faculty and students. Before following the instructions, answer the following question by making an inference on the outcome of the armor value.

Pre-Gameplay Question

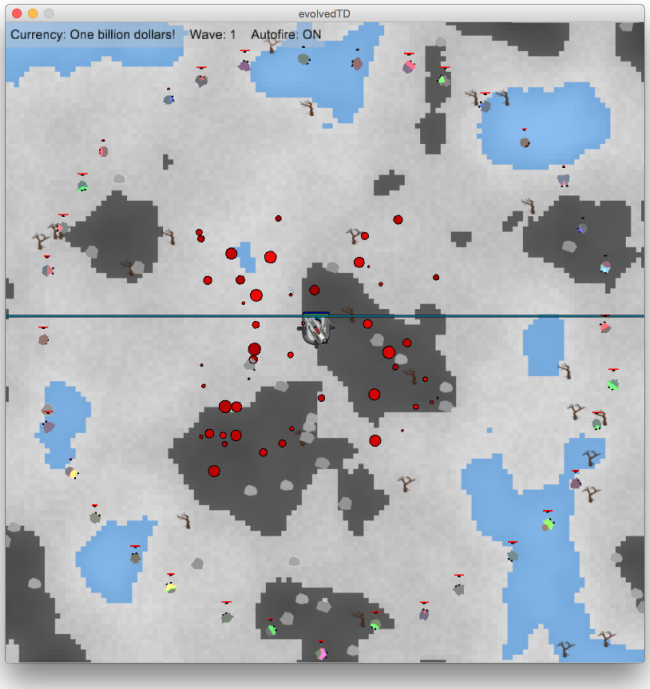
The creatures in EvolveTD have one goal - to collect as much food as possible without being destroyed by bullets from the tower(s). The towers in EvolveTD also have one goal - to destroy the creatures so that food resources may be preserved. What do you think will happen to the armor value as more towers are placed on the map? Will armor increase or decrease?

Instructions

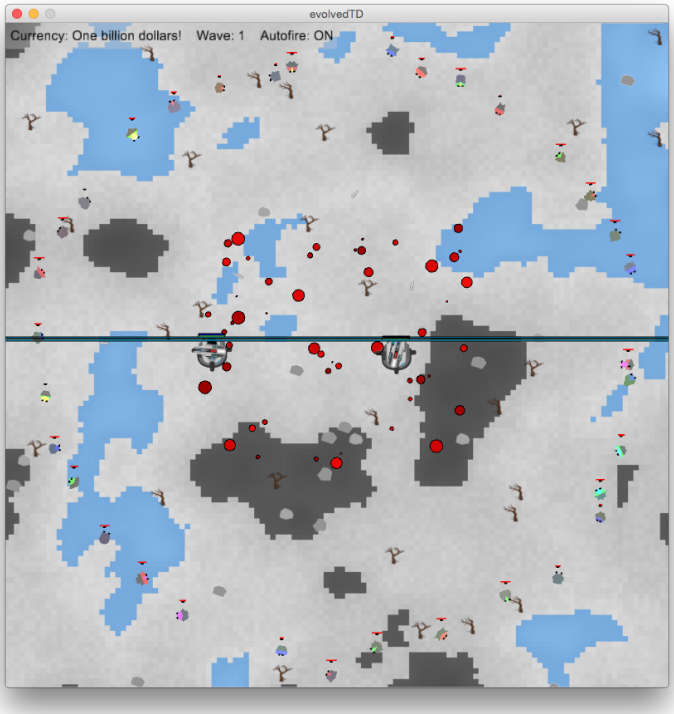
1. From Processing open up the EvolveTD.pde folder and click the play button (triangle) in the upper left hand corner. The game should start playing in another window and look something like this:



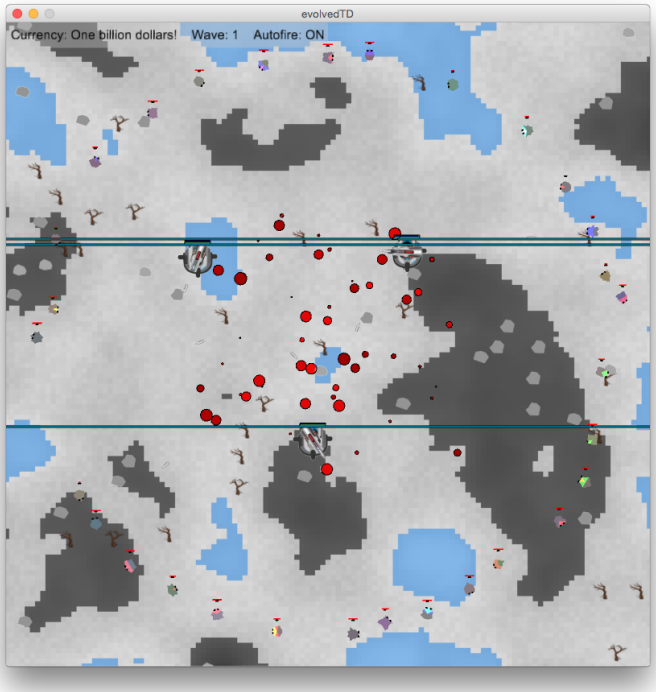
2. Now allow the game to run 30 generations without placing any turrets.
3. At the end of the 30 generations exit the game and open the Data.xlsx spreadsheet in the EvolveTD file.
4. From the spreadsheet select the tab called “Creature Averages” and record the armor value for the 10th, 20th, and 30th generations in the tables below.
5. Now repeat steps 1-4 except now you will place a turret following these steps:
    a. With the game running position the pointer at the bottom of the EvolveTD window. A menu will slide up with the different types of turrets you can place. Left click on the left most turret (railgun) and place it in the center of the map as shown below:



6. Now repeat step 5 with the following conditions:
    a. Two Towers in the positions as shown below:



b. Three Towers in the positions as shown below:



Data Observation Worksheet

On this worksheet, fill in each table by recording the data for placement of one, two and three towers on the map, as specified in the instructions above. When filling in the sections, *Additional Observations*, note the creature shape, color and/or movement pattern across the map for that specific generation.

Observations: No Towers (Control)

Number of Generations	Armor Value	Additional Observations
10		
20		
30		

Observations: One Tower

Number of Generations	Armor Value	Additional Observations
10		
20		
30		

Observations: Two Towers

Number of Generations	Armor Value	Additional Observations
10		
20		
30		

Observations: Three Towers

Number of Generations	Armor Value	Additional Observations
10		
20		
30		

Post-Gameplay Questions

1) Compare and contrast the data sheets for all four groups (control, one, two and three towers). What changes in the data do you observe between groups? Is the armor value the highest when 0 towers are on the map or when 3 towers are on the map? Why?
2) What other aspects of the creatures might change as you place more towers?
3) Repeat the listed instructions with a different tower type. Do you see any differences in the data between the two tower types?

Answers and Explanation/Science

1) Students should see a steady increase in armor value, both between generations for each tower and as the number of towers increases. Armor values will increase as evolution occurs from one generation to the next, and values will increase more quickly with a greater number of towers (the creatures are forced to evolve faster in order to ensure their survival).
2) Observations may be slightly different, but all students should see a difference in appearance of the creatures between each group. This is due to differences in evolution rates.
3) Data collected and compared between different tower types, while possibly numerically different, will have similar outcomes as far as evolutionary principles. The group of creatures with three towers will always evolve a higher armor value than the group with one tower.

Adding more science explanations tomorrow