Glioblastoma

New Mexico SuperComputing Challenge
Final Report
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Team 20
Jackson Middle School

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1.1

Purpose

As Middle Schoolers we were challenged in a lot of aspects to be able to do this project. We wanted to make it something relatable, and something we all go through, or more scientific, and technological. In my opinion, we did both because cancer is something that may happen in our life through family, or friends. Yet, there a lot of science, and technology behind it that can be explored and understood. We not only wanted to do this, but we were also influenced by the project that we did our first year in the SuperComputing Challenge. It was also focused on the same cancer, but we took a completely different spin on it. We wanted to explore the nanobot idea we had.

1.2

Background

We wanted to take this time to get a background on the project, and us. Cancer comes from a mishap in cell division. The cell cycle is a four-stage process in which the cell increases in size (gap 1, or G1, stage), copies its DNA (synthesis, or S, stage), prepares to divide (gap 2, or G2, stage), and divides (mitosis, or M, stage). The stages G1, S, and G2 make up interphase, which accounts for the span

between cell divisions, This should be in your citation list not here. During mitosis, instead of dividing once cells divide more, and never stop. This can, of course, lead to cancerous tumors. Glioblastoma comes from the glial cells that are abundant cell types in the central nervous system. Because of this, the tumor starts in the Brain Stem.

Executive Summary.

Brain cancer is one of the most frightening, and daunting diseases, Glioblastoma is known to be one of the most deadly types of cancerous tumors in the world. Since it's in the brainstem it can damage the brain is tumors that target, and grow in the brainstem, and brain. Our project is focused on the way to stop it from growing, by injecting nanobots into the brain to change the alert status the tumor cells send to the immune system of cancers, and the danger they cause to the human body. We think this would work because to defeat cancer we have to work fast and to be precautious. We're working with a very fast spreading cancerous tumor, we indeed have to create precaution.

2.1

Code Explanation

I would explain our code as a turtle-turtle interaction. We have a moving turtle that collides with another cell by sensing the presence of the cell by either its proximity by radius or whether its ahead of the other cell. We first drew a grid that is the playground of turtle 0 which is the nanobot. Then we have about 600 small red dots that are the cancer cells. The cancer cell will change from red to green in the spray area of the chemical signature. We have three functions, first, convert-same-patch which only sprays the red dots on the patch, second we have convert-circle-radius which sprays the chemical signature in a circle radius, and then last we have convert-radius-cone which sprays the chemical signature in radius in front. *Main Question:* We wanted to find the most reliable, and fast way of spraying a whole area. To convert the same patch would just not work, because of the radius is too small, so we only tested convert-circle-radius and convert-cone-radius. To get the most accurate results we changed the radius of both to 5.

2.2

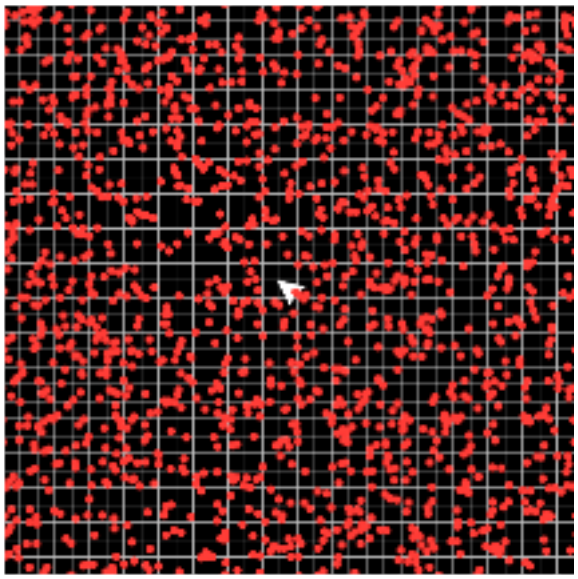
Code/Model

Figure 1

```
To setup
 ca  crt 1 [set size 2 set color white]
 crt 600 [
  setxy random-xcor random-ycor  set color red
 set size .5  set shape "circle"
 ]  draw-grid
End
to draw-grid  ask patches [
   sprout 1 [      set color gray
     set heading 0      fd .5      rt 90      pd
   repeat 4 [fd .5 rt 90 fd .5]
     die    ]  ]
end
to convert-same-patch  if mouse-inside? and mouse-down? [    ask turtle 0 [facexy mouse-xcor mouse-ycor
 setxy mouse-xcor mouse-ycor
     ask other turtles-here [ set color green + 2 ]  ]  ]
end
to convert-redius  if mouse-inside? and mouse-down? [    ask turtle 0 [
facexy mouse-xcor mouse-ycor
  setxy mouse-xcor mouse-ycor      ask other turtles in-radius 5 [ set color green + 2 ]
  ]  ]end
to spray-paint
 if mouse-inside? and mouse-down? [    ask turtle 0 [
     if distancexy mouse-xcor mouse-ycor > .1 [
       facexy mouse-xcor mouse-ycor        setxy mouse-xcor mouse-ycor
       ask other turtles in-cone 5 10 [set color green + 2]      ]    ]   ]end
```

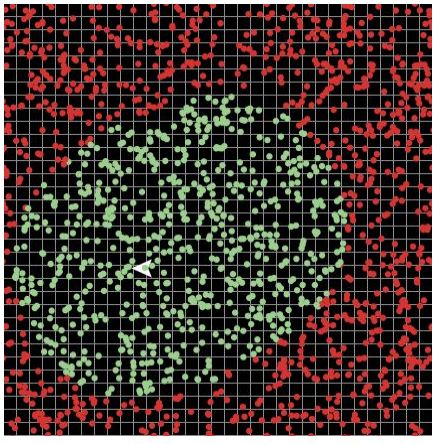
This is our code. It's a basic grid with turtle to turtle collision. With a change of color when they interact.

Figure 1.



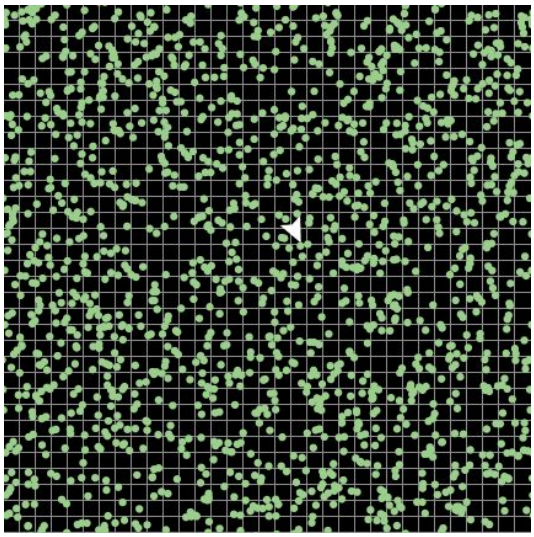
This is an example of the Grid with all of the small red dots that are the cancerous cells, and the turtle in the middle, which represents the nanobot. That will then move.

Figure 2.



This is what happens when it moves around the grid changing the color of all the small dots. From Red to Green simulating that the chemical makeup has been sprayed on.

Figure 3.



This is what it would look when the nanobot circled the whole entire grid.

2.3

Method

We plan on surfing the nanobot through the Grid and recording the time it takes us to complete it. To limit bias we tested on ourselves, but also tested on my friends, and family. Each person was tested five times to reach results. We then solved to find the average of everyone added that to give us the overall average. We thought this would be the only way to accurately record this to reduce bias.

2.4

Hypothesis

For the hypothesis, I believe that the convert-circle-redius would be the fastest, and most reliable, to spraying the surface area in our model. We think it's the fastest because it covers the most surface area. Yet, many people are saying that convert-cone-redius is a lot more realistic and practical because they think it's weird of having it spray in a circle. We believe this because for example if the surrounding area is really fragile, shooting in a circle radius, might make it easier to spray some non-cancerous area. We could then hurt some other part of the brain, which can in-change cause more damage to the person's body.

2.5

Results

A steadier hand can easily change that problem that we had, which was that if the real nanobot sprayed in a circle would it spray past the cancerous cells, plus any doctor can easily learn how to better control The results are here this is the time of everyone we tested.

Convert-circle-redius: Facing SW. Time: 00:49.67 Test 1.

Convert-circle-redius: Facing SW. Time: 00:52.98 Test 2.

Convert-circle-redius: Facing SW. Time: 00:42.43 Test 3.

Convert-circle-redius: Facing SW. Time: 00:47.29 Test 4.

Convert-circle-redius: Facing SW. Time: 00:49.76 Test 5.

Convert-circle-redius: Facing SW. Time: 00:53.85 Test 6.

Convert-circle-redius: Facing SW. Time: 00:51.63 Test 7.

Convert-circle-redius: Facing SW. Time: 00:49.49 Test 8.

Convert-circle-redius: Facing SW. Time: 00:49.45 Test 9.

Convert-circle-redius: Facing SW. Time: 00:47.79 Test 10.

Convert-circle-redius: Facing SW. Time: 00:51.27 Test 11.

Convert-circle-redius: Facing SW. Time: 00:49.34 Test 12.

Around 50 to 51 seconds

Convert-cone-redius: Facing SW. Time: 1:28.54 Test 1.

Convert-cone-redius: Facing SW. Time: 1:23.72 Test 2.

Convert-cone-redius: Facing SW. Time: 1:21.87 Test 3.

Convert-cone-redius: Facing SW. Time: 1:19.63 Test 4.

Convert-cone-redius: Facing SW. Time: 1:24.57 Test 5.

Convert-cone-redius: Facing SW. Time: 1:21.35 Test 6.

Convert-cone-redius: Facing SW. Time: 1:30.42 Test 7.

Convert-cone-redius: Facing SW. Time: 1:23.74 Test 8.

Convert-cone-redius: Facing SW. Time: 1:29.93 Test 9.

Convert-cone-redius: Facing SW. Time: 1:21.58 Test 10.

Convert-cone-redius: Facing SW. Time: 1:23.12 Test 11.

Convert-cone-redius: Facing SW. Time: 1:19.62 Test 12.

Around 1:24 to 1:26 minutes

This shows all the test we ran on each other, friends, and family. We plan to add other other variables (Creating a time limit, to try and increase pressure.) to it.

3.1

Significant Achievement

Santiago Herrera: I went to kickoff by myself I thought I was going to do bad, but I did well in my explanations of nanobots, and how they can help to kill cancer cells by using one of two methods. By spraying chemicals to alert the immune system.

Israel Chirino: I believe that the greatest achievement that I have done this year would definitely be to actually attend the challenge. My busy schedule at the beginning of the year did not let me go to Kick-off which I believe is a very important part of the whole SuperComputing experience. Yet, I still got the opportunity to talk about kickoff with my partner, and others in Supercomputing.

3.2

Acknowledgments

We would like to acknowledge Karen Glennon for always helping us out. She would be constantly checking on us making sure they are doing what we need to if not then she will put us in check. We would also like to acknowledge Sharee Lunsford. For always helping us on our papers with our grammar and everything we do. We would also like to acknowledge Patty Meyer for helping us with our resources and sometimes our code. We would also like to acknowledge Neil for helping with our code all the time.

3.3

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