Final Usability Test Report

Team 6: Quaranteam

Cellular Automata - Infectious Disease Simulation

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Introduction. This simulation was designed to teach middle school age students about the spread of infectious disease over a period of days. It is meant to be similar to Conway's Game of Life. However, instead of simulating life, the app simulates infectious disease by having more than two states and objects, air, and people can contract the disease. Infectious people and items can infect other people and items. Players will also be able to set their own rules and parameters, as well as play out different scenarios and export their results to a .csv file.

As this simulation was meant for middle school students the two main goals for the testing phase of the development project were determining intuitiveness and average time taken. Intuitiveness is important to the simulation because the object of this entire project is to teach. To help students learn. It would be a significant hindrance to the student's learning experience if they struggle to use the simulation meant to teach them. Additionally, while we expect teachers to be very skilled at using this simulation when they instruct students we do not expect the students to be overly skilled with technology in general.

Time taken is another important factor to know as teachers will only have a limited amount of time to instruct students on how to use the simulation. For example, a lesson using this simulation may begin with a lesson on the spread of viral infections. Then the instructors might give a lesson on how to use the simulation. After the students know how to use the simulation then they will likely be asked to go through an assignment using the simulation before their limited class time is up.

The tests used to determine the above factors involved two different scenarios. The first scenario restricted use of the included tutorial to determine how easy it was to learn the simulation controls blind. The second scenario had an incomplete set of instructions to determine if access to the simulation tutorial helped make up for the lack of instructions.

Test Scenario 1

1. Test Scenario Name: No Tutorial Use
2. Goals: See how participants respond to the software without reading the tutorials.
3. Required Equipment and Software: Zoom Conferencing Software, web browser, internet connection, and the Cellular Automata Infectious Disease Simulation
4. Quantitative Measurements
   a. How quickly the participant becomes familiar with the program.
   b. How long the participant takes to complete the training scenario.
   c. How many errors participants make.
      i. Errors being defined as "miss-clicks".
5. Scenario Description:
   a. The purpose of this scenario is to see how you will react to our program without prior knowledge of it. You will not consult the tutorial at any time and I will not be providing any background information on the program for the duration of the testing scenario. Do not get discouraged if you run into difficulties during this scenario. This scenario is designed to test how intuitive the program is. You are encouraged to talk through your process while learning the different controls. You are welcome to ask questions.
   b. Please create a 7 x 7 grid configuration and place two people (one infected with a viral amount of 40+, one clean) and 3 objects (one infected with a viral amount of 50+, two clean) on the board. One person should be masked the other unmasked. It is your choice if the infected person is marked as masked. Then please start the simulation and determine how many days it takes for all non air tiles to become infected. After completion of the scenario please save the results to a PDF and email that PDF to lmonroe@mtu.edu.
6. Task List
   a. Participants will skip the tutorial after the landing page and proceed directly to the simulation. Participants will then likely immediately attempt to click on the grid. When the simulation loads the "Set Grid Tile" pop up, the participants will likely begin their selection with either a person or an object and then choose a subcategory for that placement. Next, the participant will either attempt to increase the grid size or add another person or object. After a few minutes of clicking around to learn more about the controls, the participant will run the simulation and proceed through the test scenario and then save the results to a PDF.
7. Qualitative Measurements
   a. What steps of the scenario give the participants difficulty?
   b. What mistakes do the participants make?
   c. What questions do the participants ask?
   d. Are the participants able to successfully complete the scenario?

8. Test Setup Details: The participants will need to open the simulation in their browser and share their screen on Zoom. https://2021-ui.github.io/6-InfectiousDisease/

Post "No Tutorial Use" Scenario Interview
1. One a scale of 1 to 10, with 1 being the easiest thing you have ever done and 10 being the hardest, how would you rate the difficulty of this simulation?
2. Which aspect of the simulation did you find the most difficult?
3. The least?
4. If you attempted the scenario again, would you be able to complete the simulation successfully with no errors?
5. Any comments or suggestions?

Test Scenario 2
1. Test Scenario Name: Incomplete Instructions
2. Test Goals: The purpose of this scenario is to determine how well participants complete the simulation goals with an incomplete set of instructions. Participants will be encouraged to refer to the tutorial before attempting the scenario.
3. Required Equipment and Software: Zoom Conferencing Software, web browser, internet connection, and the Cellular Automata Infectious Disease Simulation
4. Quantitative Measurements
   a. How quickly the participant becomes familiar with the program.
   b. How long the participant spends looking at the tutorial page.
   c. How long the participant takes to complete the training scenario.
   d. How many errors participants make.
      i. Errors being defined as "miss-clicks".
5. Scenario Description
   a. The purpose of this scenario is to test your ability to complete this simulation while using an incomplete set of instructions. You are encouraged to thoroughly review the tutorial before attempting any interaction with the simulation. Due to your access to the tutorial, you are discouraged from asking questions, but if you truly get stuck please present your issue and we help you work through the problem.
   b. You will create a grid with height ?? and width ??. On this grid you will place 10 objects, ? clean and 3 infected. You may place the objects in any position of your choice. After placing the objects you will then place ? people, 1 infected with a mask, 1 infected without a mask and ? clean with a mask and 2 clean without a mask. Each person must be placed at least 1 tile away from each other and other objects in every direction. Run the simulation for and record how many days it takes to infect each clean person.

6. Task List
    a. After the landing page the participant will proceed to the tutorial and review it thoroughly. After they feel comfortable enough to proceed they will likely begin testing out different grid sizes in order to meet the scenario criteria. It is unlikely that they will successfully make the correct grid size on the first few attempts. The participant will then attempt to lay down the object and people tiles while following the scenario criteria. It is expected that the participant makes several errors while attempting to lay down the tiles.
7. Qualitative Measurements
    a. What steps of the scenario give the participants difficulty?
    b. What mistakes do the participants make?
    c. Do the participants resort to asking questions?
        i. What questions?
    d. Are the participants able to successfully complete the scenario?
8. Test Setup Details: The participants will need to open the simulation in their browser and share their screen on Zoom. https://2021-ui.github.io/6-InfectiousDisease/

Post "Missing Instructions" Scenario Interview
1. One a scale of 1 to 10, with 1 being the easiest thing you have ever done and 10 being the hardest, how would you rate the difficulty of this simulation?
2. Which aspect of the simulation did you find the most difficult?
3. The least?
4. Do you believe that you could have successfully completed the scenario the first time with no errors, had you been given the complete set of instructions?
5. Any comments or suggestions?

Results.

Testing Overview

Session #	Time Taken	# of Errors Made
2	6:58	4
4	27:02	10+
5	12:53	10+
6	8:10	3

7	4:25	5

Scenario 1 Interviews

Interview Question	Test Session 2	Test Session 7
1	3	3-4
2	Didn't understand why objects weren't getting infected (bug 1)	Placing infected tiles
3	Grid Adjustment	Placing clean tiles
4	Yes	Yes
5	Should have a real time counter of viral amounts on objects and persons and show a live alert when a new person or object gets infected.	No

Scenario 2 Interviews

Interview Question	Test Session 4	Test Session 5	Test Session 6
1	3	2-3	3
2	Measuring and understanding the thresholds.	Creating grid glitched out - changing grid size deletes progress	How to save the file was the hardest, border around diagram for scale
3	The grid size adjustments	Placing tiles	Toggle buttons, masks, death, etc
4	No	Yes	Very few misclicks
5	No	No	Let user know that

			masks are a global variable Placing objects wasn't difficult but properties were convoluted. Select grid tile and change properties or have a drag and drop for items and people legend

Conclusions. A handful of students were unable to successfully place an infected tile on the board as there seems to be a disconnect between viral amount and viral threshold. Students do not appear to see the toolbar that will change the viral amount of the item tile or person tile from clean to "infected".

The most glaring usability issue I found was the lack of viral informational material on display in both the main simulation page as well as the results page. The purpose of this simulation is to teach middle school students about cellular automata and to do that there should be ways to track viral count changes as well as changes in level of infection. As of the testing phase there was no way for users to pause the simulation and see the viral count on any person or item tile. Additionally, since the gradient does not work (and was removed from the final design) I find it doubly important for users to have access to that information.

Another issue with the UI design is that the gradient is too complex. There does not need to be six different gradient steps. There does not need to be even four gradient steps. I believe

that a gradient step at 50% infection will show the students that there is a viral count present but no infection present.

The results page does not include any information other than the graphs. I believe that the results should include a table that shows the starting viral count for all people and item tiles as well as the final viral count. Additionally, there should be information regarding how many people tiles "died" as well as what surfaces were sanitized when. This should allow the students to see the effect the different parameters have on the simulation progression. The help page should include a FAQ including questions such as, "How do I clear the grid?", and maybe some troubleshooting information. Overall the simulation is well done and professional looking as well as successfully demonstrates the information presented and is ready for additional testing. A few changes have already been made based on the suggestions made in this report.

Appendix A

Testing Schedules

Session #	Scenario Used	Time and Date	Development Team
1	1	4/11/2021 3:00 PM	Devin Stewart & Alec Rospierski
2	1	4/11/2021 4:00 PM	Devin Stewart & Calvin Voss
3	1	4/11/2021 5:00 PM	Calvin Voss & Jared Perttunen
4	2	4/12/2021 3:00 PM	Ben Vigna & Jared Perttunen
5	2	4/12/2021 4:00 PM	Ben Vigna & Jared Perttunen
6	2	4/12/2021 5:00 PM	Alexander Martin & Calvin Voss
6	1	4/14/2021 1:00 PM	Calvin Voss & Ben Vigna

Appendix B

Bug Report Form

Bug Number:__1 - Urgent_____

Bug Name:_Person - Item interaction not working___

Bug Description: While the simulation is running, infected people tiles can infect other people tiles, but can not infect item tiles. Additionally, infected item tiles cannot infect people tiles.

Bug Number:__2 - Urgent_____

Bug Name:_Unable to place item/person over an air tile

Bug Description: If the user has placed an air tile then no other tile type can be placed over it. There will be a tile placed in a random location on the grid instead of the air tile location. As air tiles are indistinguishable from an empty tile the user does not know there is an air tile placed unless they run into this bug.

Bug Number: __3 - Not Urgent_____

Bug Name:_Help button not working_____

Bug Description: When a user clicks the "Help" button nothing occurs.

Bug Number:__4 - Not Urgent_____

Bug Name:_Gradient not working_____

Bug Description: The six color gradient designed to demonstrate the various stages of contagion between clean and fully infected does not work. All tiles go from the fully clean blue to the fully infected brown.

Appendix C

Testing Challenges

Challenge Number	Challenge Name	Description
1	No Show	The 1st testing session did not happen as the student did not attend.
2	No Show	The 3rd testing session did not happen as the student did not attend.
3	Speed Multiplier	Students do not seem to notice the speed multiplier on the left side of the page. Without using the multiplier the scenario takes a long time.
4	Reading Issues	Students do not seem to read the scenario and thus do not complete the required steps to fully test the simulation.