Usability Test Plan

Team 6: Infectious Disease Cellular Automaton

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Introduction:

The application is a web-based simulation designed as a tool for middle-school students learning about infectious diseases. The main menu has three buttons: one to go to the simulation, one to display information about the application, and one to view the tutorial. Once in the simulation, the user interface consists primarily of a grid in the center where the users will build their simulation. Drop-down controls on the left side of the screen allow users to select what will be placed when they click on a grid square. The controls at the bottom of the screen allow the users to change different parameters regarding the grid and how the disease spreads. Hovering over each parameter will present the user with a tooltip explaining what it does. A legend appears on the right to inform users which symbols correspond to people and objects, and which colors designate infection.

Once the user begins the simulation by pressing the start button, they can pause, end, or reset the simulation. The grid contents controls on the left are also replaced by controls that allow the user to speed the simulation up by factors of 2. Ending the simulation takes users to a results page, where graphs are displayed. The graphs show the total viron counts and the number of infected people and objects over the duration of the simulation. The user can also download this data as a comma-separated value (csv) file. Work-in-progress screenshots can be found in the team's Final Design Presentation.

The main goals of my tests were to determine how intuitive the controls were and to determine how educational the application was. To answer these questions, my tests gave participants tasks to complete without much outside assistance. The tutorial was accessible, since it was built into the application and would be available for potential end-users to view. To determine the educational quality of the application, I wanted to test if participants were able to observe clear differences when changing parameter values in the simulation.

Test Plans:

Test Scenario 1

1. **Scenario Name**: Basic Simulation
2. **Test Goals**: The goal is to determine if the user is able to set up and run a basic simulation
3. **Required Equipment**: Zoom Conferencing software, web browser, internet connection
4. **Quantitative Measurements**:
    a. Time taken to complete tasks
    b. Number of clicks needed to complete tasks
5. **Scenario Description**: The purpose of this scenario is to determine how intuitive the application is and where additional instruction may be needed. Therefore, I will not be able to provide any instruction on how to use the application beyond the tasks that are given and what is provided within the application itself. I will also not be able to answer any questions during the course of this scenario. This is not a test of your abilities, but rather of the application. It may help us in development if you are able to speak your thought process aloud so we can recognize areas of potential confusion. If you are unable to complete the task please inform me of where you got stuck and what you have tried.

    "Please create a simulation on a 10x10 grid with 7 people, 2 of whom are infected. Place 12 objects into the world, 7 of which are contaminated. Remove 2 objects from the world. The people should wear masks and be able to die, but they do not sanitize surfaces. Run the simulation for 2 days and report how many people became infected."
6. **Task List**: The participant will likely start by viewing the tutorial, then proceed to the simulation. They will increase the grid size and then place the people followed by objects. They will then remove 2 objects and enable both masking and death. They will set the length of the simulation and let it run to completion.
7. **Qualitative Measurement**:
    a. Which steps of the process do participants express confusion on?
    b. Are the participants able to complete the set of tasks?
    c. Do the participants make any mistakes in setting up the simulation?
    d. Are the participants able to figure out how to remove objects?
8. **Test Setup Details**: The participants will need to open the application in their web browser and share their screen on Zoom. https://2021-ui.github.io/6-InfectiousDisease/

Post Scenario 1 Interview

1. On a scale from 1 to 7, where 1 is very difficult and 7 is very easy, how did you find these tasks?
    a. Which tasks caused the most difficulty?
2. Were there any interactions with the application that seemed unnatural?
3. If you were to set up the same simulation again, would you now know how to do it properly?
4. Did you know there was a tutorial page?
    a. Were you able to locate and access it?
    b. Did you find it helpful?
    c. When setting up the simulation, did you want to reference the tutorial again?
5. Do you have any other comments or suggestions?

Test Scenario 2

1. **Scenario Name**: Educational Experience
2. **Test Goals**: The goals for this test are to determine the quality of the educational content provided in the application (i.e. do the users learn something from the simulation?).
3. **Required Equipment**: Zoom Conferencing software, web browser, internet connection
4. **Quantitative Measurements**:
    a. Number of simulations run
    b. Parameters used for each simulation
    c. Number of clicks used to set up each simulation
    d. Time taken (each simulation and total)
5. **Scenario Description**: The purpose of this scenario is to give you a chance to explore the different parameters that are available. You should run several different simulations (they don't need to be long) and change the parameters each time. You should experiment to see what effect each of them has on the simulation and the number of people that become infected and potentially die. At the end of at least one of your simulations, save the results to a PDF.

6. **Task List**: Now that the participant is familiar with the application, they will likely not need to view the tutorial page, though they may need to reference it to read up on the different parameters.

    I expect that they will use a short simulation length to be able to perform multiple tries, and that they will modify a few different parameters per simulation, specifically focusing on viral threshold and production, infected period, and contamination period, since these were not modified in the previous scenario. Participants will likely download the results of their first simulation.

7. **Qualitative Measurement**:
    a. Are there any parameters that participants express confusion about?
    b. Are the participants able to complete multiple simulations?
    c. Are participants able to start a new simulation once the previous one is complete?
    d. Do participants express any signs of learning when conducting the simulations (e.g. comments about the effect of certain parameters)?
8. **Test Setup Details**: The participants will need to open the application in their web browser and share their screen on Zoom. https://2021-ui.github.io/6-InfectiousDisease/

Post Scenario 2 Interview

1. On a scale from 1 to 7, where 1 is very difficult and 7 is very easy, how did you find these tasks?
    a. Which tasks caused the most difficulty?
2. Were there any interactions with the application that seemed unnatural?
3. Were the differences in the simulation clear when you changed parameter values?
    a. What effects did you observe?
4. On a scale from 1 to 7, where 1 is not at all, and 7 is extremely, how educational did you find this simulation?
    a. What was something that you learned?
5. Do you have any other comments or suggestions?

Results:

The first aspect of the testing I examined was how many of the participants viewed the tutorial to figure out how to use the application. As shown in the table below, only 2 of the 6 participants viewed the tutorial, though all 6 noticed that it was there and could have accessed it if they wanted to.

Participant	Viewed Tutorial	Noticed Tutorial
1	Yes	Yes
2	No	Yes
3	No	Yes
4	No	Yes
5	Yes	Yes
6	No	Yes
Total	**2**	**6**

In the post-scenario interview after participants completed the first scenario, I asked participants to rate the difficulty of the tasks on a 7-point Likert scale, where 1 was very difficult and 7 was very easy. The mean response was 4.92. As a follow-up, I asked participants which tasks caused the most difficulty. Responses can be seen below:

Participant	Rating	Which tasks caused the most difficulty?
1	5 or 6	Figuring out how to place the people and objects onto the grid.
2	6	Little bit of not knowing if people were infected or not - no one was orange Running for 2 days, expected it to autostop - Noticed the days parameter after scenario
3	5	A little confusing if the people/objects were clean or infected
4	4 or 5	Making people infected and placing people onto the grid Confusion on why people weren't changing to infected state
5	4 or 5	The dropdown was difficult to figure out The viral threshold
6	4	Setting contaminated things - couldn't tell the difference Didn't know what the parameters did, didn't notice tooltips

The most common recurring challenges were that participants had difficulty placing people and objects onto the grid, and that they were unaware of the effect of the viral amount, which controlled whether people and objects appeared as infected or clean. All but one participant stated that they would be able to complete the tasks better after completing the first test scenario. The remaining participant cited that there was nothing that could help them understand the problems they were facing, specifically what the viral amount was.

In the second scenario, participants were asked to experiment with a few different parameters to determine if they were able to discern a difference. In general, participants had an easier time performing the tasks in this scenario, reporting a mean of 6.33 on the same 7-point Likert scale of difficulty. I conjecture that this is due mainly to their prior experience with the application in the first scenario. Interestingly, several participants reported observing differences in viral spread when they changed parameters such as sanitization and masking, but these parameters were not yet implemented.

Some additional miscellaneous feedback from participants can be found in the following table:

Participant	Comment / Observation
1	Frequently reset simulation without viewing results page
1	When resetting simulation, had to change parameters back each time
2	Did not set the number of days - suggested moving this parameter to be grouped with the other simulation controls
3	"How can I tell if something has died?"
4	"Not sure how long a day takes"
4	"Include more information on the simulation screen"
5	Have to go back to menu from results page to start a new simulation
5	Thought infected period was incubation period
5	Wanted to be able to end the simulation and reset to initial state (instead of clearing entirely)
6	Suggested a 'Remove' option instead of placing air

Conclusions:

The core problems that I identified through the course of this usability testing were with the placing of people and objects on the grid and with the way the viral amount was implemented. To better allow users to immediately see how to place items on the grid, I suggest changing the dropdown menus to radio buttons, so that all options are displayed at once. There are not enough options to warrant the use of a dropdown menu. I also suggest forcing users to view the tutorial. My results showed that the majority of users opted to ignore the tutorial when they were not forced to view it. If they had viewed the tutorial, they may have had less trouble placing people.

I also recommend setting the default viral amount of an infected person or object to the current value of the viral threshold. Several participants placed "infected" people with 0 viral amount, since that was the default, and these placed people were not actually infected. An added feature that could have helped users determine partial infections is a tooltip on each grid item that displays the current viral amount. This also plays into the "visibility of system status" usability heuristic.

A few of the miscellaneous participant comments revolved around the resetting of the simulation. Participants wanted to reset the simulation to the state it was in before they ran the simulation instead of the blank state. The main benefit of this is that it is more conducive to an experimental procedure. It allows users to better control variables and test changing a single parameter at a time to see how it affects the spread of the virus. This will also aid the educational quality of the application.

My final suggestion is to add visibility of hours when the simulation is running. Participant 4 noted that they were unsure how long a day was supposed to take since the grid was updating and the time counter was not going up. This will also aid visibility of system status.

Appendix A: Team Members in Attendance

Session	Member 1	Member 2
1	Devin Stewart	Jared Perttunen
2	Calvin Voss	Devin Stewart
3	Alexander Martin	Alec Rospierski
4	Alec Rospierski	N/A
5	Alexander Martin	Alec Rospierski
6	Calvin Voss	Jared Perttunen

Appendix B: Bug Reports

Bug Number	Name	Description
1*	Wrong Cell	Person or object appeared in a different cell from the one that was clicked by the user.
2*	Mislabeled	The second graph title reads "Contanimation" instead of "Contamination"
3	Wrong Cell	
4*	Nonsensical Tooltip	The tooltip provided when users hover over Viral Production is nonsensical. The words do not form a complete sentence or coherent thought.
5	Wrong Cell	
6*	UI Scaling	Some UI elements did not scale properly. The title of the results page overlapped with the title of the first graph. Some control elements extended beyond the boundaries of the control box.
7*	Surface Infection	A person was unable to be infected from a surface. Occurred when there was an object with 100 virons and an object with 90 virons. An uninfected person obtained 90 virons but did not obtain the full 100 through frequent contact with the fully contaminated object.

Appendix C: Testing Challenges

No significant testing challenges outside of the application were encountered during the course of this project.