Evan May
CPSC-430

Usability Study

Imaginary Users

Dr. Brown is a biology professor involved in mouse research here at UMW. He often uses software to assist his research, but this is limited to mainly spreadsheets and software required to process large amounts of data. He has a desktop computer and a tablet at home , though he isn't experienced with programming. He's thought about doing some online tutorials on programming to simplify his analyses, though he hasn't been able to find the time to.

Alex is an undergraduate student here at UMW. She plans on double-majoring in biology and computer science. As part of her biology major, she's researching mice with Dr. Brown. Though she hasn't used software to help her analyse data she's collected, she has extensive experience with computers and programming. She's thought about writing some programs to help analyse the data she's collected with Dr. Brown, but doesn't have time to because of her other classes.

Dr. Jones is a computer science professor who works with Dr. Brown on the mouse research. As a computer scientist, she is very experienced with computers and software in general. Her part of the research includes setting up real-time tracking and analysis of the mouse movement. In order to understand general trends in how the mice behave, she needs to be able to visualise their movement in the form of heat maps and vector maps.

Software Functions/Goals

The Mice Visualization software is a desktop application intended to allow researchers to easily convert mouse tracking data into animated heat maps and vector maps. This will make it easier for them to visualize and understand the data they collect. The user will be able to load a new or previously-used dataset, which will be displayed on a grid. The software will be able to generate a heat map of the data, as well as a vector map. The user will be able to play, pause, and stop the animation of the data, as well as indicate the start and end times for the animation. The user will be able to select which mice should be displayed on the grid, as well as which mice to include when generating the heat map or vector map. In addition, the user will be able to export an image of the heat map or vector map generated.

How do you think the Generate Heat Map and Generate Vector Map functions will work? That is, how will the user indicate they wish to generate something? Where and how should the user be able to indicate which mice to display on the grid? How would you expect the heat map or vector map to look?

Responses

Person 1:
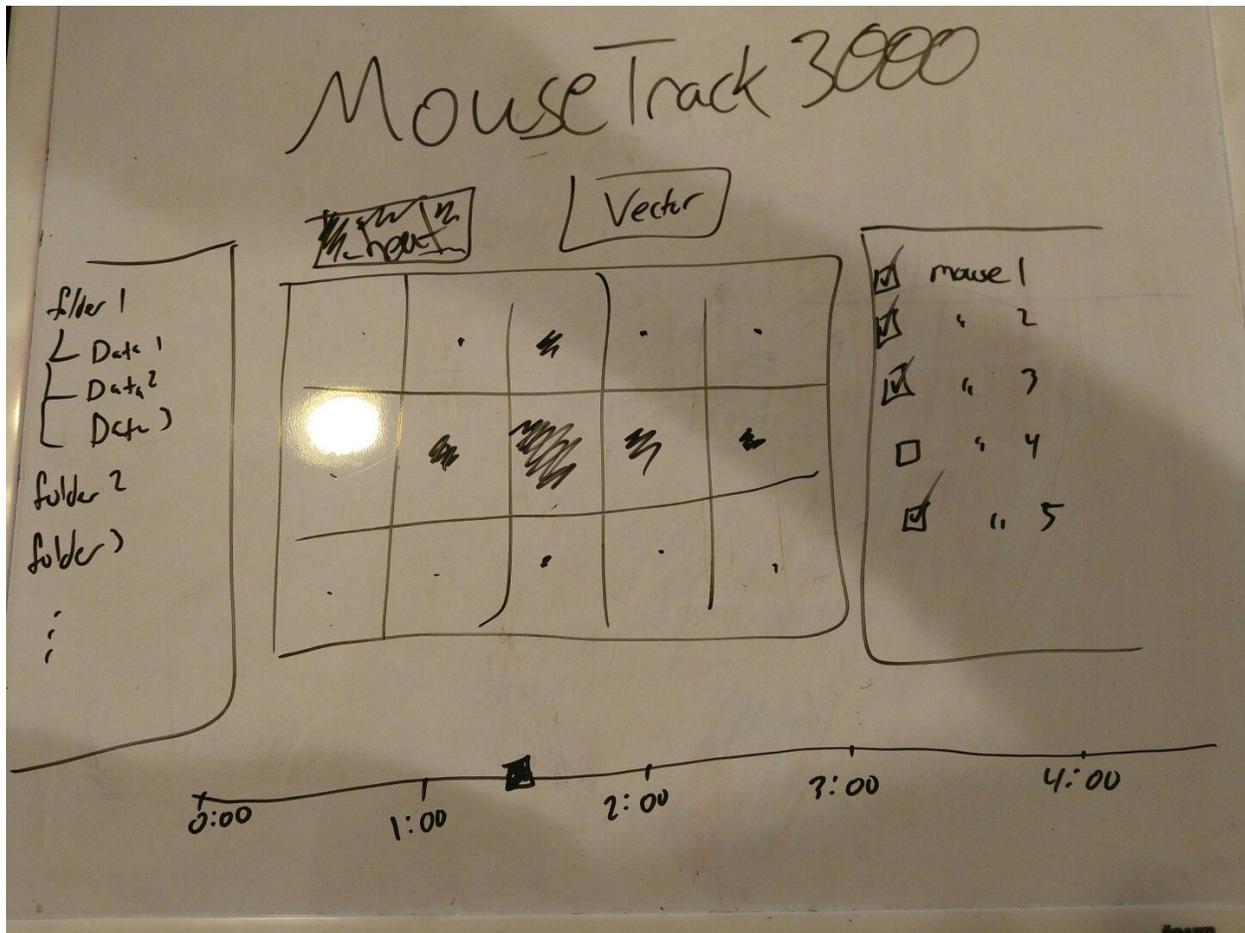
Person 2:

The user should be able to click on an option in a dropdown or hamburger menu to generate the heatmap, and the mice whose data are rendered in the heatmap should be selectable. I don't know how many mice we're dealing with but if it's on the order of a few dozen, perhaps they could be checkbox-selected or ctrl-click multiple selected from a menu of mice, with options to select all and deselect all. If the mice number in greater amounts, maybe a filter system could be implemented instead of individual selection (if that's even necessary).

Related to selecting mice, if there are multiple mouse datasets, it might be useful to have a means of combining them so as to view a conglomerate heatmap.

When the heatmap is rendered, I would expect to see a legend explaining the difference in color temperatures off to the side, with the heatmap image in the center, and the heatmap can be exported as a PNG/JPG/BMP/something with a button, which prompts the user for a directory and filename.

Person 3:

Okay, so I imagine that there's like a top menu that has different submenus, and one of these is something like GENERATE. Under GENERATE I imagine seeing a few things maybe, but one of them is Heat Map and Vector Map is on there too (if you have it). So I can select Heat Map and it will display this on the, I guess, canvas in the middle of the window. And on the right I can select/deselect mice I would like to see in this heatmap, and it would either automatically regenerate the map based on this OR I could click a button to generate the map again.

Person 4:

I would assume that the home menu would just have the options "Generate Heat Map", "Generate Vector Map", and "Exit Application" as buttons. say you click on "Generate Heat Map". The system would then ask for you to select a data set and display a list of recently used data sets, as well as having an "Upload File" button that would let you browse for a file. You click on the file and then a "Load Dataset" button. The system then asks if the user wants to display all of the data or to narrow it down by individual mice. If the user chooses to narrow it down, I think it would make sense if it displayed a list of all of the mice included in the dataset, then you could use checkboxes to indicate which ones you wanted to include, and then click "Generate Heat Map" (as opposed to "Cancel", which should be an option to take you back to the Main Menu).

I would think that it would just display the heatmap grid thing with a label across the top saying the name of the dataset, and maybe something saying how much time had elapsed in this dataset, and a button to "Export Heat Map Image". If that option were included, I would expect that to show up at the same stage as the mouse selection. Oh, and then I'd expect for there to be buttons for "Return to Main Menu" and "Generate New Heat Map" on the page. For the "Generate Vector Map" option, I'd expect the same "Choose Dataset" format as the heat map, with the options to narrow down the data by individual, and maybe a slider scale thing for the start and end times for what data to include.

I'm assuming the Vector Map would be displayed as an animation. I think it would make sense to have it color-coded with a key indicating which individual went with which path and to have the time displayed in the corner of the animation on all frames. I think it would make sense to allow the user to choose to navigate through the animation by playing it like a movie, by clicking through it a frame at a time (forward and back), or by using a slider bar thing showing the time. I think it would make sense for the user to be able to export individual frames from the animation or to export the whole thing as a video.

Person 5:

These functions should be given their own toolbars, and as in GIS programs, the user should be allowed to display multiple maps of the same subject area on the same screen simultaneously. These maps should have drag and drop borders allowing them to be resized as needed by the user.

In order to generate a map the user should only need to go to the menu bar, and select either the "vector map" or "heat map" tool bars in order to find the "generate map" and associated commands. Map generation should be able to indicate the mice they wish to display, and the time extent covered (if this is necessary, based on computing load) using a pop-up screen which appears when the user indicates they need to create a new map. This screen should also allow the user to select a save destination for the generated map if necessary. Ideally the system should support multiple screens so a user can compare heat and vector maps or maps of the same type from different periods simultaneously.

It is also important that the map screens be labeled. The above is important because a "map math" tab allowing the user to perform statistical analysis of map data should be included. This map math tab should also include an export function allowing the user to specify the save destination and file-type of mathematical outputs.

User Model

To generate a map, users expect to navigate to a "Generate Heat Map" or "Generate Vector Map" option, either in a dropdown menu or as an independent button. Users expect to be able to choose which mice are involved in a generated map by using a separate menu that displays possible mice. Users also expect to be able to export an image of the generated map, which will prompt the user for a destination and filename. They expect the animation start and end times to be set using a slider (though the requirements document ask for text boxes).

Priorities

The essential items include:

- Loading a dataset
- Generating a heat map
- Generating a vector map
- Exporting generated maps
- Animating the map with settable start and stop times
- Selecting mice to be displayed

These items are considered essential as they are both the basic requirements detailed in the requirements documents, as well as the most commonly-expected features by the users surveyed. In order to have a functioning product, these items must be included. These items therefore comprise the basic functionality of the software and are thus the most essential.

The less essential items include:

- Exporting animations
- Automatic map regeneration
- Map generation using multiple concurrent datasets
- Animation slider

These items are less essential as fewer users expected them in their responses. In addition, these functions are not required by the client. As such, they are not very high priority compared to the items in the previous list. The animation slider was mentioned by several of the surveyed users, though the requirements documents specifically mention using text boxes for start and end times. Because of this, having a slider for animation start and stop times is not considered especially important. If possible, it'd be great to be able to have both a slider and text boxes for start and stop times, as it would appease both groups.

Prototype
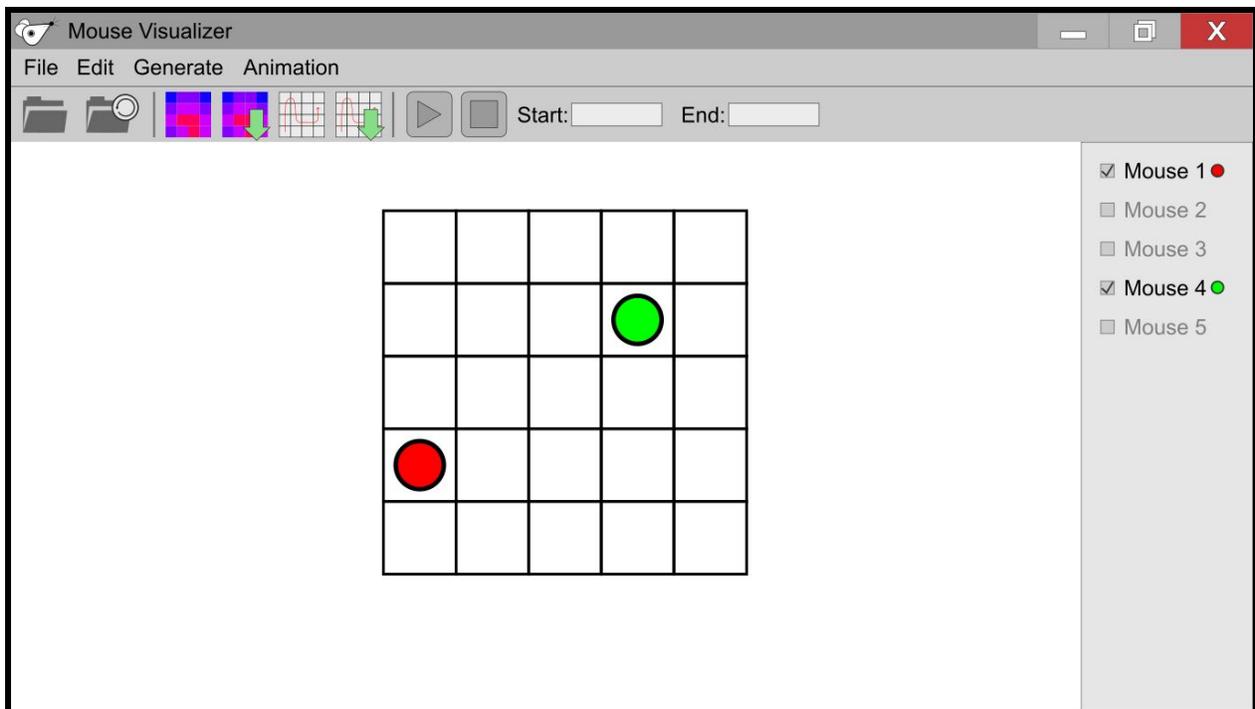
Responses

Person 1:

So I'd go to the first folder icon to choose my data set for analysis. Then if I want a heatmap of it, I'd press the magenta button, whereas the grid looking button would be the vector map. I don't know what the down arrows signify, or what the loop arrow folder means. From there I can check or uncheck my mice of interest, play/pause, and select time slices. Similarly I assume the menu buttons at the top just correspond to the available icons.

Suggestion: Use a floppy disk for "Save" (I can't believe I forgot this).

Person 2:

Looks to me like the heatmap view is toggled by the colorful button without the arrow, and the image can be saved with the colorful button with the arrow. Mice can be toggled along the left side, and are color coded. (The color coding might need to be switched to shape coding or have customizable colors for colorblind users.) I assume that settings regarding heatmap generation can be altered in the Generate dropdown.

Suggestion: Use shape coding or alter the color scheme to accommodate colorblind users.

Person 3:

I would go to generate, select heatmap, and then select the mice I want, but I see I can also pick a heatmap from the quick menu there as indicated by that cool and flashy symbol. So I could do either I think.

*Suggestion:* None.

Person 4:

I'd load using the file folder button. I'd use the plain icons (meaning 'without green down arrows') to generate heat maps and vector maps. The green arrow ones would export.

Suggestion: It would be helpful if it had some sort of title area describing what it was currently displaying (the dataset, etc.).

Reflection

The prototype I made was pretty well-received by the people I surveyed. They were all able to figure out how to generate heat maps and vector maps easily, though they did have a question or two about what a few of the things meant. I figure the people who will actually use the software might have an even easier time, since they have a better idea of what the software's supposed to do. They did have a couple of suggestions that I think are worth implementing, like changing the green arrow into a floppy disk for "Save Image". Person 2's suggestion about making the software more accessible to colorblind people sounds like a great idea, but I'll have to talk to the client to see if it's worth implementing for this project.

Refined Prototype
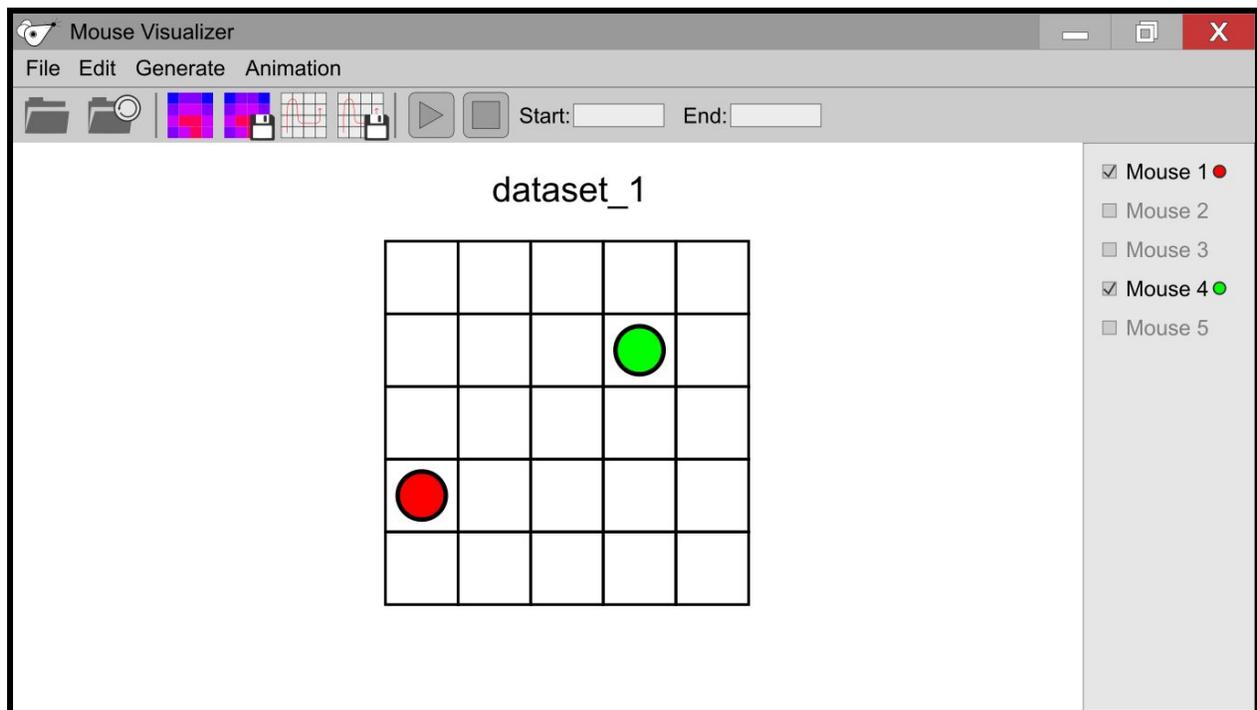
My modifications weren't drastic, as all the surveyed people seemed to be able to find their way around my original prototype well enough. I did modify the "Export Heat Map" and "Export Vector Map" icons to use a floppy disk instead of a green arrow. I also added a title above the grid so users can easily tell which dataset they're currently viewing. Other than that, the refined prototype is pretty much the same as the original.