Assignment M4

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Abstract—The Method assignments concentrate on the redesign on the MacBook Pro Touch Bar interface to better accommodate user needs and preferences. The Touch Bar is home to a set of primary controls for the laptop, which include brightness, volume, and music, in addition to application-specific controls that change depending on the app in use. The gesture-based Touch Bar is located above the laptop's keyboard and also features Siri and Touch ID buttons.

1 QUALITATIVE EVALUATION

For the qualitative evaluation, I will be conducting a survey to evaluate the textual prototype designed in Assignment M3 (Cousin, 2021b). The raw textual prototype is shown in *Appendix 6.1: Textual prototype*.

1.1 Evaluation plan

The survey participants will include Georgia Tech classmates, friends, family and coworkers who are familiar with the MacBook Pro Touch Bar interface. I will recruit classmate participants through the participant recruitment thread on Ed Discussion. I will recruit coworkers through a Slack message in my company's workspace and recruit friends and family by word of mouth. The survey evaluation will take place online through the Peer Survey interface. Results will be recorded automatically through the Peer Survey interface. I will target 25 survey responses for the evaluation.

1.2 Evaluation content

The textual prototype will be displayed at the top of the survey. An image of the existing Touch Bar can also be displayed for the participants' reference. The following survey questions will be included for the textual prototype evaluation:

- What is your age?
- What is your gender?
- Have you used a MacBook Pro with Touch Bar?
- What is your experience level with MacOS computers?

- How satisfied are you with the current MacBook Pro Touch Bar interface?
- Do you prefer the Siri and Keyboard Brightness buttons are included or excluded by default?
- Do you like the Control Strip expanded or collapsed by default?
- The updated Touch Bar prototype includes buttons for Spotlight and Finder. Are these valuable additions?
- Should the Touch Bar include a customization button by default?
- Would you use a customization menu that allows for creating buttons/widgets?
- Would you like to receive suggestions for adding/removing Touch Bar buttons based on app usage (within the customization menu)?
- Any other features you'd like to see in the customization menu?
- Would you like the option to receive tactile feedback on Touch Bar button presses?
- Would you like Touch Bar swipe gestures for opening and closing menus?
- How do you feel about requiring more precise button presses; for example, requiring the touch action to take place in the center of the button or cover a minimal part of the button real estate in order to activate the press?
- Overall, do you prefer the original interface or the new prototype?
- Do you have any other suggestions or features you'd like to see added or removed from the Touch Bar?

1.3 Evaluation discussion

This evaluation will address the requirements in the data inventory by looking at the "power users" audience of people who primarily use their MacBook Pro for school or work purposes. These users are most concerned with completing their tasks efficiently. This evaluation will also address the following requirements (Cousin, 2021a):

- Touch Bar should have an initial customization prompt to inform the user of customization options and encourage them to set up the interface to meet their preferences.
    - Customization menu should include pre-designed options from which the user can select.
- Touch Bar should have the Siri button removed by default.

- Touch Bar should be less sensitive so as to not be pressed accidentally.
- Built-in Touch Bar customization options should allow button creation and programmable buttons through AppleScript.

Changes in the prototype are mapped to requirements. The evaluation will help gauge whether the prototype actually met the requirements by asking the survey participants if they have positive or negative feelings regarding each change.

2 EMPIRICAL EVALUATION

For the empirical evaluation, I will be conducting a comparison of the paper prototype designed in Assignment M3 with a similar paper model of the current Touch Bar interface (Cousin, 2021b). The paper prototype is shown in *Appendix 6.2: Paper prototype*. I will draw a paper model in the same format for the existing Touch Bar interface, which can be used in a comparison.

2.1 Control and experimental conditions

What I'll be testing is the redesign of the MacBook Pro Touch Bar interface, as shown in a paper prototype. Changes in the redesign include button additions and removals, swipe-based gestures, and a new customization menu. As a point of comparison, I will use a similar paper prototype of the existing Touch Bar interface, which I will draw in the same style. These will serve as the control and experimental conditions.

2.2 Null and alternative hypotheses

The null hypothesis, or what is assumed true unless conclusive evidence is found for the alternative hypothesis, is that the redesigned Touch Bar interface is a better user interface for most users. We will determine user opinions of each piece of the redesign by evaluating the button additions/removals, swipe-based gestures, the new customization menu, and the interface as a whole. The alternative hypothesis is that the original Touch Bar interface is the better experience for most users.

2.3 Experimental method

The experimental method I will use is within-subjects design, where I will conduct a comparison within one group of users experiencing multiple treatments (our two designs). Subjects will be assigned to groups randomly—after I compile a list of participants, I will shuffle names, then assign

names to groups alternately. By randomly assigning, less weight will be placed on the interface that the user sees first. Subjects will view a paper prototype, then subsequently answer questions about it, followed by the second paper prototype and another set of questions. With both designs drawn in a similar style, the design that is the "control" will be obfuscated. In order to alternate which interface is shown first, I will create an A survey and B survey to distribute among subjects with the same questions but different ordering. The subjects will complete the survey as part of their condition after review of the two interfaces. The data they will generate is survey results elaborating on likes and dislikes of each interface, especially in regard to buttons available, touch gestures, customization, and overall satisfaction. I will conduct hypothesis testing through a paired t-test in order to analyze this data. The data is paired because subjects are seeing both sets of data (both interfaces).

2.4 Lurking variables

One lurking variable that might confound our data is the treatment that the participant sees first, which is an issue in within subjects design. Although we are combating this by randomly assigning the order in which the subject views each interface through two separate surveys, it's possible some users create a subconscious preference based on which one they view first. Random assignment should also prevent instances where the most punctual subjects are assigned to survey groups first, potentially grouping them all together. Another lurking variable could be that the existing interface looks better because it has a real, polished design already. We combat that by drawing the existing interface in the hand-drawn paper prototype style.

3 PREDICTIVE EVALUATION

For the predictive evaluation I will perform a cognitive walkthrough of my verbal prototype of the Touch Bar interface (Cousin, 2021b). The verbal prototype can be viewed in *Appendix 6.3: Verbal prototype*.

3.1 Predictive evaluation plan

I will be performing a cognitive walkthrough because this interface redesign will benefit from seeing how a user makes decisions and branches through workflows as they use the interface.

3.2 Task description

The tasks I will be addressing during the cognitive walkthrough are interacting with buttons, interacting with the control strip, performing touch-based gestures, and interfacing with the customization menu. More specific tasks include:

- Turn volume up
- Open Spotlight menu
- Swipe to open control strip
- Add a custom button to the Touch Bar

The user's goal will be to efficiently perform each of those tasks. Our goal as the user performing predictive evaluation is to find cases where the user might struggle when interacting with the interface, or to identify inefficiencies in the interface, The operators available to the user include the control strip and its corresponding buttons, Touch ID button, escape key, Spotlight button, Finder button, Customization button, and swipe-based gestures. There may also be custom buttons that are unique to the program that is open available to the user. I will be evaluating both the user accomplishing a single goal they know how to do already, as well as a user's navigation around the interface in order to figure out how to accomplish their goal. The user may have numerous goals based on the flexibility of the Touch Bar interface. Therefore, we want to ensure the experience is good overall, whether the user is exploring the Touch Bar or performing a targeted task. Targeted tasks may include items in the bulleted list above; for example, "turn volume up."

4 PREPARING TO EXECUTE

The two evaluations I plan to complete for the next assignment are the qualitative evaluation of the textual prototype and the empirical evaluation of the paper prototype. I chose these two because I value feedback from actual users. As we learned in the lectures, predictive evaluation is generally best as a fallback when other types of evaluation aren't available. I strongly prefer the other two methods so I can garner new feedback from users during the evaluation stage.

The qualitative evaluation will provide valuable feedback because it obtains data from a larger subset of users (25). It will address likes, dislikes, and potential improvements in the interface.

The empirical evaluation will provide valuable feedback because it gets real user opinions on a low-fidelity visual design. I also value the feedback of comparing the prototype with a version of the real interface.

Overall, I find obtaining feedback from real users highly valuable in improving my prototype and value it over the feedback I might gather through predictive evaluation.

5 REFERENCES

1. Cousin, L. (2021a). Assignment M2 [Unpublished manuscript]. Georgia Institute of Technology.
2. Cousin, L. (2021b). Assignment M3 [Unpublished manuscript]. Georgia Institute of Technology.

6 APPENDICES

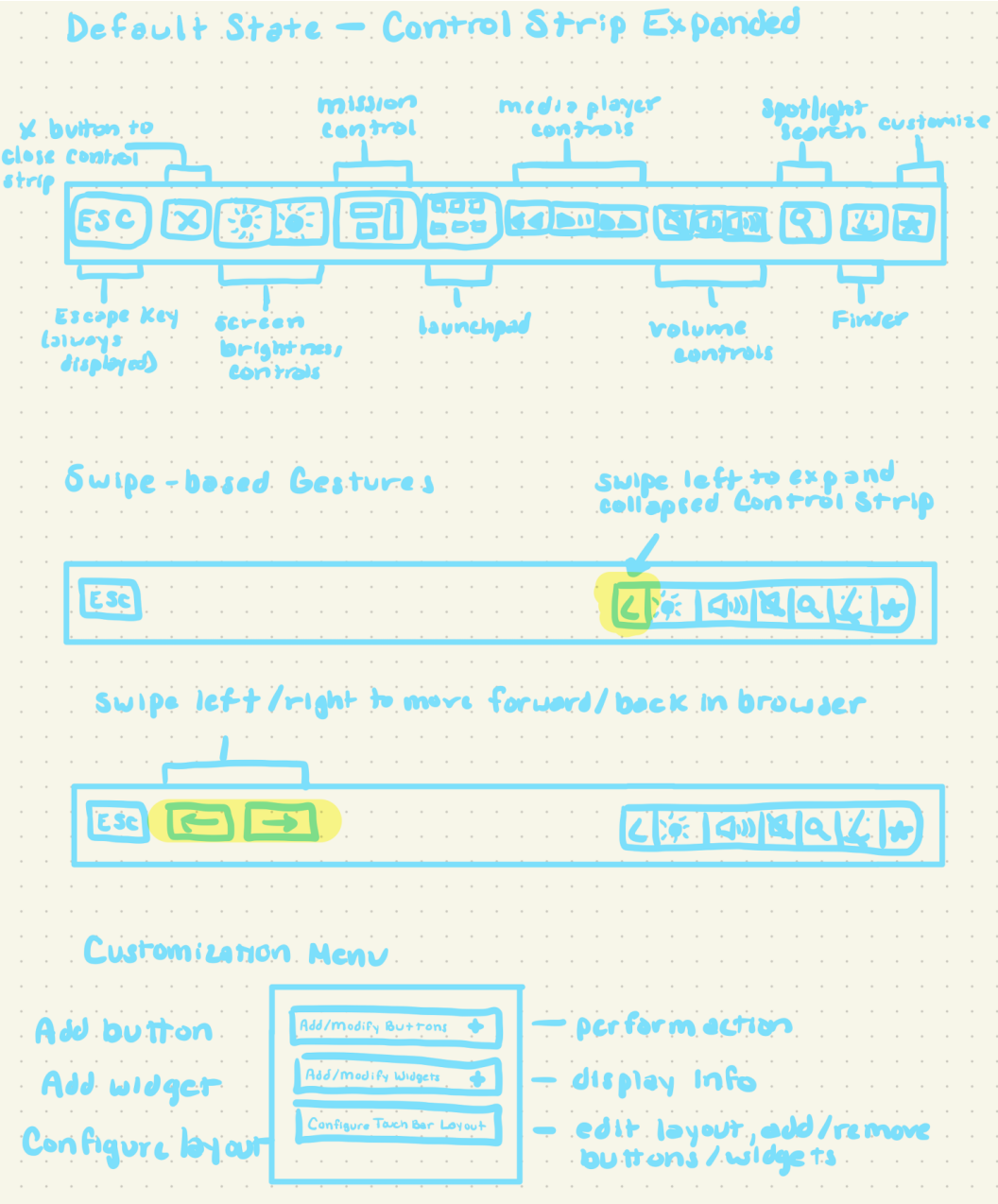
Appendix 6.1: Textual prototype

The Touch Bar will be modified to have a new default configuration for all users out of the box. The Siri button and keyboard brightness button will be removed and instead be options that can be added during customization. These were the two most commonly removed buttons discovered during needfinding. The Control Strip will be expanded by default when no other apps have an active Touch Bar control display. Spotlight and the Finder button will also be integrated into the Touch Bar default display. The Touch Bar will also feature a customize button that links to the existing customization menu for the Touch Bar. Two additions we'll include with this prototype are the ability for the user to create custom buttons and widgets for various applications, and provided suggestions for button additions and removals based on app or shortcut usage.

In addition to the design-based changes, we will also incorporate tactile feedback into the Touch Bar interface. This will include haptic feedback upon button press by default (although this could be customized to disable in the customization menu). This will provide the user the feeling of being more in control of the button interface and give it a more physical keyboard-like feeling. We will also integrate additional swipe-based gestures, such as swipe to open and close the Control Strip, and swipe to move forward and back in browser tabs. Finally, we'll include more precise touch recognition so that it's harder to accidentally press

buttons—for example, the touch action must take place in the center of the button or cover a minimal part of the button real estate in order to activate the press.

Appendix 6.2: Paper prototype



Appendix 6.3: Verbal prototype

Imagine an interface that's like a mini touch screen strip above your laptop's keyboard—that's the MacBook Pro Touch Bar. This prototype seeks to make it act more like a typical touch screen by integrating swipe-based gestures such as forward and back in the browser, and opening and closing menus by swiping left and right. Other branches we want to explore include how to make the Touch Bar feel more natural, akin to a physical keyboard, through the use of haptic feedback; and addressing the layout, configuration, and customization.

Conversational questions we might ask during verbal prototyping:

- Would gestures enhance your interactions with the Touch Bar?
- Would haptic feedback from buttons improve your experience?
- Do you prefer buttons that require more targeted presses?
- What would you change about the default configuration of the Touch Bar? Would you add, remove, or rearrange any items?
- What customization options would you like to see implemented?
- Would you like to see the Siri and keyboard brightness buttons removed?
- Would you like to see Finder, Spotlight, and customize buttons added?
- Would you like the Control Strip menu open or closed by default?

I expect to see answers leaning toward enhanced customizability and adding haptic feedback and gestures. Users might have various preferences regarding default configurations. We can cater to the majority and provide the best possible default layout, but we can cater to everyone else through customizability. Based on answers, we can ask more followup questions regarding the default configuration or the customizability to determine what best fits the user.