Jessie Houghton
EECS 598 - Human Computer Interaction
Assignment 4: Functional Interactive System Prototyping & Evaluation

Assignment summary

My focus continues to be the process of receiving and sending a text message with one hand while in the process of walking. As before, this focus assumes the prospective stakeholder is in a socio-economic situation in which they can afford a touch screen cell phone which may or may not have special features for inputting text with one hand. It also assumes the prospective stakeholder has the physical ability to use the mobile device with the intended controls. The specific goal I am interested in is sending a text message using one hand, without errors and without running into physical barriers.

My contextual inquiry was illuminating in a variety of ways. The user reported that the choice between using one hand versus two hands to input text is largely made in response to environmental variables such as motion, cleanliness, and body position. He related that the choice is not conscious, and it is not influenced by a desire for speed or efficiency. The user experienced frustration with existing technologies and recurring errors, and he expressed a desire for features that are easy to learn and adopt.

During my discount usability evaluation, the participants noted some important issues with the interface, specifically the slider was confusing to understand. They noted that the slider icon did not match with the real world image of a slider that has tactile grooves that indicate movement. They also noted that the send icon was too far away from the thumb. Overall, they perceived the prototype positively and appreciated that the icons were shifted to one side or the other.

In response to the user studies, it seems that a new iteration would benefit from major changes to the slider icon/resizable feature. One proposed change would make keyboard size adjustment a settings option, because it may not be something the user wants to change often. Another option would be to add the familiar three horizontal bars to the slider, so it is more easily recognized. This would help the new iteration follow requirement 4 because it would provide ease of learning. To more closely follow requirement 3, the send button should be located on the thumb side of the keyboard, to avoid an uncomfortable stretch.

User Requirements

1. The user must be as effective in sending accurate text messages while inputting text to respond to a text message with one hand as with two hands.
    - This is grounded in my interpretation that speed with one hand over two is not necessarily something he pays attention to (T01-1), but he often finds himself restricted to using one hand. For example, when walking between classes (T01-2) and needing to perform physical tasks (T01-3). He also experiences the same “general effectiveness” with either configuration; therefore, a new product should not make the effectiveness change greatly between the two configurations (T01-411).

2. The user must be able to access either the entirety of the screen or the necessary targets needed to send the message with less adjustment compared to the current method or none at all.
    - This is grounded in the interpretation that it can be difficult to reach the top of the screen and the current solutions are unwieldy, so he doesn't use them. (T01-4, T01-5, T01-6).
3. The user must not endure (report) any more pain or discomfort from using one hand than from using two with the new proposed design in comparison to the old method.
    - This is grounded in the interpretation that using one hand or two hands is not a conscious choice, and it shouldn't be a choice that is influenced by discomfort (T01-10).
4. The user must be able to learn and execute sending a text message effectively (with less or equal error to mini-QWERTY), using the new proposed design, such that they desire to use the new proposed design again.
    - This is grounded in my interpretation that existing technologies seem "clunky," and "gimmicky" and have an "initial hurdle of getting used to [the existing method]" that is "off putting." (T01-5, T01-7, T01-9).
5. The user must be able to correct errors as or more effectively as the old method, using the newly proposed method.
    - This is grounded in my interpretation that he had to go out of his way to implement keyboard shortcuts to avoid his own common typos, because of the process of correcting his errors, due to a lack of proofreading. (T01-13, T01-14, T01-15)

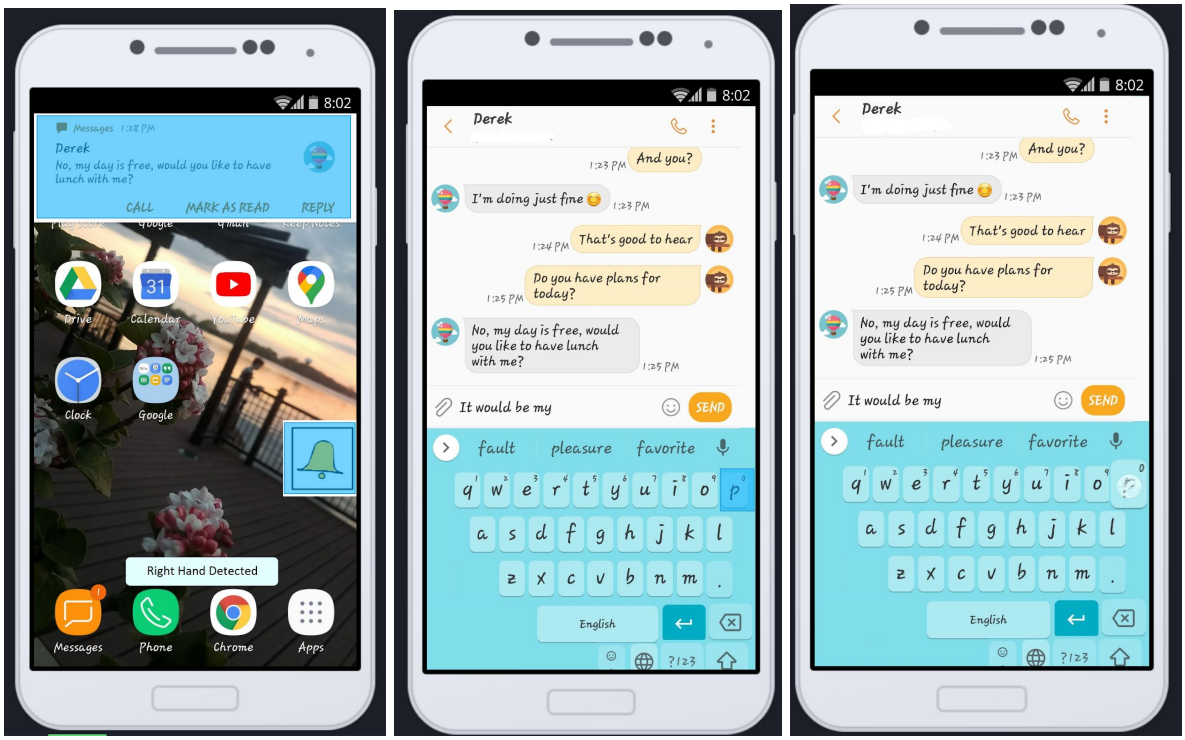
Description

Handedness Sensitive Keyboard (HSK)

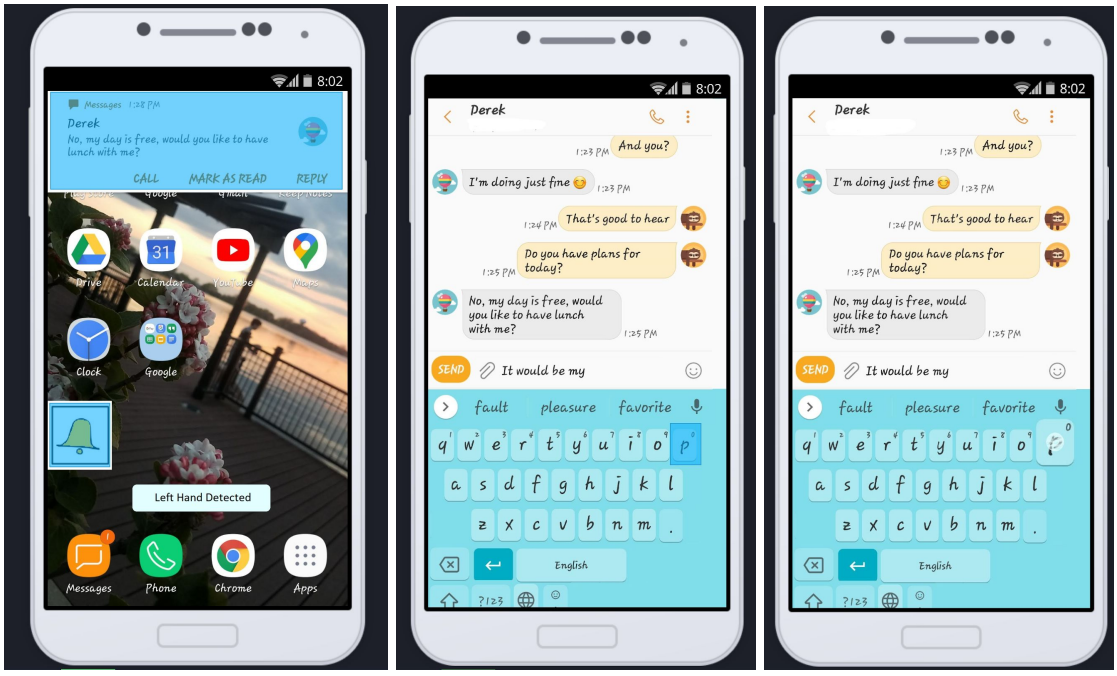
My current functional prototype exhibits several new features to address the major concerns raised in my contextual inquiry and discount evaluation. The design focuses on making it easy to reach all of the buttons which addresses requirement 2 directly, and requirement 3 indirectly. This is under the assumption that the user will primarily use their thumb. In pursuit of this focus, the keyboard is hand-sensitive, meaning it shifts all of the icons to the side closest to the user's thumb. The icons momentarily increase in size when they are tapped, so the user knows which character they tapped, the keyboard is resizable, and there is an additional notification bell on the home screen that is closer to the user's thumb. The keyboard layout and special characters are very similar to the existing technology which addresses requirements 4 and 5. Because the design is not very different, it should be no more difficult to learn than the existing technology, and because it integrates the erase button and autocorrect, it contains familiar ways to correct typos.

Screenshots

Right Hand Mode



Left Hand Mode



Quantitative User Study

To better understand how the handedness sensitive keyboard (HSK) affects mobile device user's ability to respond to a message using one hand, I designed a quantitative user study that utilizes the above functional prototype. The focus of this particular study was to evaluate against user requirement 3: The user must not endure (report) any more pain or discomfort from using one hand than from using two with the new proposed design in comparison to the old method.

Statistical Test

The design of the study is within-subject, as I would collect the mean discomfort (as reported on a 5 point likert scale), for both the mini-QWERTY keyboard and the HSK, for each participant. My null hypothesis is the population mean of the differences in the discomfort experienced using the mini-QWERTY and the HSK is less than zero. This means that if I observe statistically significant variation, either positive or negative, I can determine whether HSK significantly affects mobile phone users positively or negatively in terms of comfort. I assume that my 30 participants are a random sample from the normal population of mobile phone users from age 18 to 25. With a sample size of at least 30, even if my underlying population distribution is not normal, I can rely on the Central Limit Theorem to say the mean of my sample approaches the mean of the population. I can also rely on the robustness of paired t-procedures to adjust for violations of normality.

Proposed procedure, based off the chosen Statistical Test

Each participant executes a standardized transcription task using two hands on the mini-QWERTY, then using one hand on the HSK keyboard on their mobile device. The messages will range from 30-160 characters to emulate the length of a text. After each execution of the task, the participants will rank their comfort experience from 1 (experienced constant discomfort, strain, or awkwardness) to 5 (experienced no discomfort, strain, or awkwardness) on each keyboard.

Response

Due to COVID-19 circumstances, the limitations of my functional prototype, and the strict nature of the statistical test that would best evaluate HSK, I was not able to fully execute the experiment. However, if I found my corresponding p-value to be small, I'd be able to reject the null hypothesis and say that I have sufficient evidence to conclude the population mean differences in discomfort differ positively between using mini-QWERTY and HSK or do not differ. This type of result would be encouraging to the current placement of the design elements, and it would address concerns related to the usability value of producing technology that is pleasant to interact with. On the other hand, if I found my corresponding p-value to be large, I wouldn't be able to reject the null hypothesis, and I would not be able to make any statements about HSK's comfort ratings over mini-QWERTY. This type of result would be discouraging to the current placement of the design elements, and possible design change would be to realign the keys to be closer to the position of mini-QWERTY.