CS459 Mini Project 2

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For Mini Project 2 we were given the Keyboard Brightness icon to re-design, as well as the warning "Heart Rate has exceeded allowable limit" for smartwatches to design. Our goal for both icon designs was to create a simple design to effectively identify the icons purpose. Since the Keyboard Brightness icon already exists, we were able to identify the deficiencies. This helped us think of ways to improve the icon. We improved the Keyboard Brightness icon by adding features of universality and logic which was easier to understand. We collected data from 26 respondents posing the question "What is this icon used for". Our responses reflected that the overall idea of Keyboard Brightness was not captured. More so, individual elements of the picture were picked out and interpreted, rather than being interpreted as a whole. For "Heart Rate has exceeded allowable limit", there were no deficiencies, rather challenges as this icon has yet to be implemented. We faced challenges in incorporating timeless ideas and combining pictures to create meanings. Overall, our logic and idea was widely understood. Further, we identified deficiencies in both of our icons and brainstormed further solutions. Combining and testing our solutions to our deficiencies in the future will likely produce an icon even better.

1 INTRODUCTION

Today visual elements and icons play a major role in a users ability to navigate through various interfaces. A good icon is easily identifiable and does not require users to read text explicitly stating the icons purpose. In addition, a good icon is one whose meaning does not change overtime.

For our second project in CS459, Human Computer Interaction, we were tasked with re-designing a "bad icon" and designing an icon for future technology. For Icon 1, we were tasked with redesigning the Keyboard Brightness icon. The goal was to create a better icon that allows the average user to recognize the functionality better, while determining deficiencies in icons currently being used for keyboard brightness. For Icon 2, we were tasked with designing an icon for "Heart Rate has Exceeded Allowable Limit" for the next generation of smart watches. Both icons could only be designed using visual language alone. Further, no text was allowed to maintain universal accessibility.

2 TASK 1 ICON - KEYBOARD BRIGHTNESS

The icon description we were given for our Task 1 Icon was "keyboard brightness." The purpose of this icon would be used as a replacement icon for modern keyboards of different operating systems. The following sections will discuss the challenges, analysis, and other thoughts prompted by this design process.

2.1 Implementation of Task 1 Icon

2.1.1 *Current Keyboard Brightness Icon Deficiencies.*

Before redesigning a new icon for keyboard brightness, we identified some of the issues with icons currently being used for that purpose. Figure 1 shows some of the most common icons for Keyboard Brightness. It was important to identify these deficiencies to get a sense of what our team needed to improve on, while incorporating several new design aspects in our redesign.

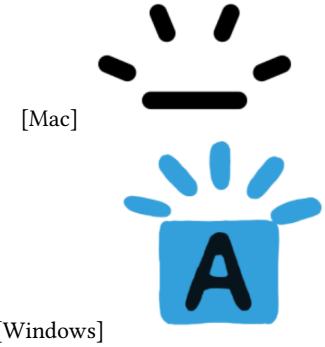

Fig. 1. Common Keyboard Brightness Icon

To start, both figures incorporate many lines with no meaning. This was especially evident for the Mac icon as shown in the top of Figure 1, as it consists of 5 lines in various orientations to create picture. For the windows icon in the bottom of Figure 1, this was also the case. As a result, for both icons, the user is forced to interpret the meaning more closely, leading to false identification.

The next problem we identified was the use of text in the Windows Keyboard Brightness icon. The use of the character 'A' makes the icon non-universal, as 'A' is not evident in every language. It is important for the icon to based purely on visual aspects solely and be accessible to everyone.

Lastly, overall both icons in Figure 1 were too generic. It is not evident to the user that the bottom element in each icon represents a key or keyboard without already knowing the icons purpose. At most, the user may be able to identify the horizontal and slanted lines as a sun, representing brightness. However, this is not enough. The user must be able to identify and interpret the icon as a whole.

2.1.2 *Design Concept.*

After brainstorming the deficiencies with the current keyboard brightness icon, we further set goals and limitations in design. Our goal for Task 1 was to create a simple design to effectively identify the icons purpose. We specifically added the word "simple" because the Keyboard Brightness icon is commonly printed on the keyboard, which means its scaled down to be smaller. When scaled down an intricate design loses meaning and looks distorted. So, we put this in place to make our icon clearer. Further, we set limitations to not include color and text. No color in the icon was implemented because keyboard icons aren't typically colored. In addition, no text was added to maintain universality.

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In relation to the deficiencies of the current icons, we strove to make our redesigned icon better by addressing the various issues. To address the use of non-universal text, we rid away with text entirely. Further, we used symbols to create meaning for the user. More specifically, we used already existing common universal symbols, while incorporating a clear meaning that does not require as much interpretation as prior.

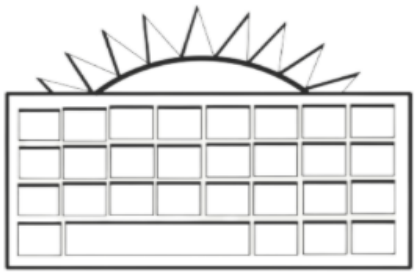

Fig. 2. Keyboard Brightness First Modification

The redesign of the keyboard brightness icon consists of two main elements. The overall design is shown in both Figure 2 and Figure 3. The first element is a keyboard and the second is the sun. The sun was used as it is universally used to denote brightness. Our logic was Keyboard + Sun = Keyboard Brightness. The element of the sun was placed above the keyboard icon to add a representation of adding light to the below icon, the keyboard. We also mixed different line thicknesses to draw the users eyes to the main elements of the icon. On the keys of the keyboard, the top line of each button and sun was made thicker to draw the user to those specific elements illustrating the idea that the "sun" comes from the square, which is the keys.

Figure 2 was our original redesign. However, we soon realized that it went against the goal we set for ourselves. We made it a point to keep the design simple and Figure 2 was perhaps too intricate. More specifically, the keyboard had too many keys. This was a simple fix to meet our goal. We tried to maintain the concept of a keyboard while removing many of the keys. The space bar was kept on the keyboard, as it is one of the most commonly identifiable and used key. Our final model created was Figure 3, which was used in the google forms we distributed out for testing.

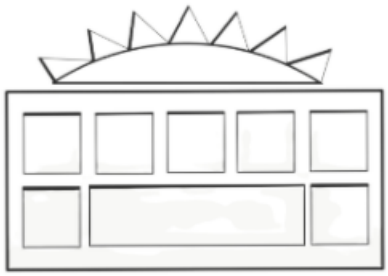

Fig. 3. Keyboard Brightness Final Modification before Testing

2.2 Analyzing Keyboard Brightness Icon Responses

To test the modified Keyboard Brightness Icon, we sent out a google form to 26 respondents. We simply showed the picture in Figure 3 and asked "What is this icon used for". It was important for us to ask for the icons purpose very broadly to allow the user to fully integrate it by themselves, eliminating response bias. The responses to the form were automatically recorded and transferred into excel.

Possibly Keyboard backlight?	Calendar
Bullentin Board	Sunrise
Operating Hours	Parking Garage
Sunrise	Breakfast Store
Brightness Settings	Open New Window
5 Day Weather Forescast/Weather	Sun Blocked by Buildings
Sunny Keyboard	A Calendar App
Sunny Building	Sunny Hotel
Solar Panel	Turn up Brightness
Opening time	To Indicate Sunrise?
Weather	Brightness
Window and Sun?	Hotel
Sunrise	Daytime Mode

Fig. 4. Keyboard Brightness Icon Responses

Figure 4 shows all 26 responses we received, with the colored responses being the top responses. The responses for the Keyboard Brightness icon varied a lot with 19 unique responses. The top response was sunrise with 4 people answering it. The second most common response was brightness, which 3 people stated. The last top responses was Calendar and Weather, each answered by 2 people. While these may indirectly or directly relate to interfaces, the remaining responses did not. There were many responses that did not relate to interfaces such as "Parking Garage", "Breakfast Store", and "Sunny Hotel".

Further analysis provided a clearer insight to the icon's effectiveness. The concept of "brightness" was understood by 11.5% of surveyors. In addition, the concept of "keyboard" was directly mentioned by 7.7 % of surveyors. Although the concept of brightness was low, 50% of surveyors directly or indirectly mentioned the sun. Given a device feature context, it is possible that more respondents could be able to attribute the sun to brightness.

In total, 3.85% of respondents correctly identified the icon in its entirely. It is clear from the responses that the sun element in our design was more widely understood than the keyboard. Because both of the elements were not equally understood, our logic that keyboard + sun = keyboard brightness did not work out. To understand why our logic and the effectiveness was so low, we identified some of our issues and solutions to those issues.

2.3 Identifying Issues of Modified Task 1 Icon

Although our modified icon addressed several issues with the current versions of Keyboard Brightness, there are still some issues

to address in the future. As previously mentioned, some respondents gave answers that were not in the context of a device feature. Responses like “Parking Garage”, “Breakfast Store”, “Sunny Building”, and "Hotel" may have been a result of the keyboard looking like an architectural structure. Perhaps this specific keyboard element is too ambiguous. To resolve this, we could implement changes to that specific element. However, if the respondents continue to interpret the keys of the keyboard as windows and anything other than keys, we may still receive those kinds of responses. Giving a simple description such as “this is an icon for a computer” could benefit the results. Even better, to maintain universality in testing, we could directly show the icon in context with it being shown on a keyboard or computer. With these new ways of testing, the respondents may be able to interpret it better and understand that responses such as “Breakfast Store” do not relate to interfaces specifically. As a result, the responses may narrow down and our initial logic may perform better.

In addition, as previously mentioned the keyboard icon had issues. These issues are attributed to the lack of buttons. The deficiency of buttons could make the element harder to decipher. However, simply adding a full picture of a keyboard would not suffice. We only included a space bar and 7 buttons in the design because the icon is meant for a smaller scale. A full keyboard when scaled down would look too distorted and the keys would blend in all together. Thus, we took some of the main elements from the keyboard. However, we could have made it clearer without adding all the buttons. These issues were crucial to identify to determine future modifications.

2.4 Future Modifications to New Task 1 Icon

Based on the issues we discovered with our modified Keyboard Brightness icon, there were several possibilities for improvements in future work. First, we could modify the keyboard element further to include more keys. In the future, we would like to find a middle ground between Figure 2 and Figure 3. This may help the user more easily identify the element with the fine details, such as the keys still seen. In addition, we could even add some common and universal icons (i.e. volume button and play button) to the keys themselves. This would allow the user to connect keyboard functionality to the keys, further representing that it is a keyboard.

Secondly, we would like to change the line thickness to be consistent throughout. In other words, no areas would be bold. This will allow the user to look at the icon as a whole, instead of being drawn to specific parts. It is possible that the different line thickness also attributed to it looking like a calendar or a building, as the user was drawn to the top side of each rectangle shown, among other elements.

In future works we think our logic that (keyboard + another element = keyboard brightness) will still hold, however, it is evident those individual elements need to be modified. It is important for us to keep the keyboard element in Keyboard Brightness, as it relates directly to a keyboard. Though our logic originally stated the other element was the sun, it is possible to explore different universal symbols for brightness. Other symbols depicted could be a keyboard + an illuminating light bulb, as the concept of illumination represents brightness. Nevertheless, the sun and an illuminating light bulb are equally understandable and age well. In other words, all our ideas for Keyboard Brightness most likely will hold the same meaning many years from now and be universally accessible.

3 TASK 2 ICON - HEART RATE HAS EXCEEDED ALLOWABLE LIMIT

The icon description we were given for our Task 2 icon was "heart rate has exceeded the allowable limit". The purpose of this icon would be used for the next generation smartwatch technology. The following sections will discuss the challenges, analysis, and other thoughts prompted by this design process.

3.1 Implementation of Task 2 Icon

3.1.1 Identifying Challenges in Creating Icon for Future Technology.

Smart watch technologies, while already existent, still possess room to grow. Due to this, there are many possible challenges that can arise in creating an icon specifically for a future technology.

The first of these challenges is that one must think about what present-day ideas would still be relevant in the future. For example, many video software apps tend to use a camcorder device as the icon image. While most generations understand what that image represents and can therefore conclude that it must be associated with some type of video app, the newer generations could start to lose this association. This is a key point of discussion when thinking about a future-oriented icon, as we must be able to predict what future generations would still be able to reference versus what they lost understandings of. Since our icon focuses on heart rate, the ideal focus point of the icon should center around the heart. Using a typical cartoon heart for the purpose of representing the human organ of the same name would likely not "go out of style" as generations progress (since there is not newer technology that could necessarily take it’s place), so we felt that it would be a safe idea to incorporate into our future technology icon.

The second challenge we faced is that we had to find the right keywords to represent each part of the icon description, as well as having to think about possible areas that could cause confusion and address them in advance before introducing the icon to others. It is one thing to have a majority of users understand the major concept of a design, but it is another to have them understand the specific point that the icon could be trying to get across. For example, if our users looked at our potential icon and could only infer "heart" from it and not "heart rate has exceeded the allowable limit", then that makes it successful to only a certain degree. To ensure that we convey as much information as possible, it is imperative that we breakdown the icon description and identify all individual pieces that would make the icon whole. We also must ensure that we use symbols that convey a clear message, and not ones that could be interpreted differently based on the scenarios that they are placed in. While symbols like those could potentially be beneficial, they also could lead to some users understanding the message while others are left confused. Therefore, as we brainstorm potential icon designs, we must constantly keep in mind the importance of each piece that will be incorporated.

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3.1.2 Design Concept.

When focusing on creating a design concept, our team first wanted to lay out some specific boundaries. We wanted to create a simple design that would effectively identify the icon's purpose despite any scaling, such as being shrunk to the size of a typical smart watch icon. This means that we would not be able to have in-depth details, as, while it may make the icon more identifiable as a mock-up image or in a presentation, it would be too cluttered when it is implemented to fit inside a small smart watch. For simplicity, we also wanted it to be both colorless and use only universal symbols as a way to hopefully limit any confusion from users. In order to make a successful icon it is always important to stray away from using any type of text, but as shown in Figure 1, some designers believe that text could be useful for some icons. Nonetheless, ensuring that an icon continues to be relevant and understood despite any time, age, or geographical differences is of the utmost importance.

During the design process, we also made sure to address the challenges that were discussed in Section 3.1.1. While understanding what present-day icons would be relevant in the future, as well as figuring out a breakdown of each piece of the icon description, our team came up with an icon with three distinct elements. The first of these elements was an "up arrow", which is commonly known to represent an increase of something. The next element was a "heart", which represents the organ of the same name. The last element included were "waves", that, when shown together with a heart, commonly represents a heart rate, with the high spike in the waves representing the exceeding of a limit. Taking the elements into consideration, the team designed the icon shown in Figure 5 as the Task 2 Icon that would be shown in the Google Form.

Fig. 5. Heart Rate has Exceeded Allowable Limit Icon

3.2 Analysis of Keyboard Brightness Icon Responses

After receiving responses from our CS459 class on their thoughts on our Task 2 Icon, the team was able to being to analyze the results. From our data, we saw that there were 25 survey responses that mentioned "heart rate", with only one user deviating from that and saying blood pressure instead. Figure 6 displays all responses given, with the most similar answers being color-coded together to be more visible. Of the heart rate responses, we had a variation of 11 users suggesting "high heart rate", and 7 suggesting that the "heart rate is increasing." This was an important take away, as the keywords of high/increasing represent that, to a large degree, users are able to understand idea behind the icon's description.

To further look at the data, we can see that 96.2% of the surveyors understood the heart rate concept, and only 3.9% believed the icon to represent high blood pressure instead. 80.8% of surveyors also directly mentioned the concept of "high/increased heart rate." While going through this evaluation, the team was pleased to see that there was not a large range of responses. This means that, regardless of what the exact description we were trying to convey is, the icon we designed is able to be reliably identified with a high success rate. From this, we can infer that the individual pieces that we incorporated into our final icon were combined in such a way that the users were able to understand what message it was trying to convey.

Elevated Heart Rate	Increase in Heart Rate
High Heart Rate	Heart Rate is Increasing
Heart Rate is High	High Hear Rate
Your Hear Rate is Rising	Heart Rate Tracking
Heart Rate is Rising	Heart Monitor Home Menu
High Heart Rate	Spike in Heart Rate
Heart Rate is Increasing Dangerously	Your Heart Rate is Increasing
Elevated Heart Rate	A Heart Rate Monitor
Increasing Heart Rate	Heart Rate Warning
Heart Rate Increasing	Increased Heart Rate
Elevated Heart Rate	Heart Rate is too High
Vitals like Heart Rate	High Blood Pressure
Heart Rate is Up	Higher Heart Rate

Fig. 6. Heart Rate has Exceeded Allowable Limit Icon Responses

3.3 Interesting Remarks and Issues Identified of Modified Task 2 Icon

While looking over our results, we did have a few interesting remarks. The first being that the team found ourselves asking whether this "high/increase in heart rate" notification would be the same as receiving one for the "heart rate is exceeding the allowable limit". Furthermore, would the limit be set by a global standard, or would it be monitored based on the user's demographics? Having a high or increasing heart rate does not necessarily have to insinuate that it is automatically too high, but at the same time, the two variations of interpretations could go hand in hand, as by the time one would receive a notification of their heart rate getting too high, it would normally be after a specific number had been crossed. Regardless, these type of questions could have an impact on the overall design of the icon to ensure it as correctly portrayed and understood as possible.

Continuing that discussion, we found that a possible issue arose when we interpreted the "heart rate has exceeded the allowable limit" as "the heart rate is high and increasing." The team designed the icon with this interpretation in mind, and depending on how the limit was supposed to be explained, we felt that, while our design was accurately identified based on our interpretation, our interpretation could have been not fully correct.

3.4 Future Modifications to New Task 2 Icon

Based on the possible issue that we discussed, we felt that in the future we could modify our existing Task 2 icon to have a clearly defined limit. As shown in Figure 7, we could add a yellow line with an exclamation point to further incorporate a threshold that the heart rate line is clearly going over. This way, not only does the icon indicate an increase/high heart rate, but that there is a boundary that the heart rate has clearly surpassed.

Another modification could also be to add color, to help better distinguish between the shapes. Since there would potentially be four elements to the redesigned icon, it is important that the user would still be able to distinguish between each part and not get confused with the lines and shapes instead.

However, it is also worth mentioning that by including a clearly defined limit as a part of our icon, the message may be able to be conveyed without the use of the existing "up arrow". This arrow was used to show that something was being increased, but the combination between the waves already increasing upwards, as well as the waves crossing over a line before continuing to go up, could be enough to get this message across without the need of a fourth element. Therefore, it may be worthwhile to present some surveyors with a new version of Figure 7, with some including or not including this arrow. By having two sets of data regarding the reaction to the same icon with and without one particular element, we would be able to better gauge how effective or necessary it is to fully understanding of the icon.

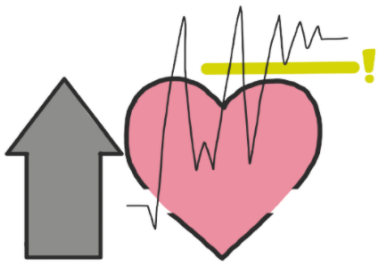

Fig. 7. Future Implementation of Task 2 Icon

We feel that with these future additions in mind, the icon may cater more towards the “exceeded the limit” aspect to help further identification. We believe the icon displayed in Figure 5 received promising results when surveyed (as all but one identified a high/increasing heart rate icon), but with further additions it is likely that the users would be able to identify the icon with a more specific and better-fitting description. In the future, work could be done to conduct more rounds of surveys with different modifications of the Task 2 Icon until there is a very high success rate of correctly identifying the icon with the description "heart rate has exceeded the allowable limit." Testing and redesigns are imperative in any situation, but it would be especially important while implementing a new icon, as a smart watch icon should be able to be identifiable to users of any demographic.