Guardian

COS 436: Human-Computer Interface Technology
Luisa Goytia, Melana Hammel, Grace Turner, and Jerry Wei
GP3 - Low to Medium Fidelity Prototype and In Class Evaluation - December 7, 2017

Project Description

Every day millions of people commute to work or head outside for a run. But they don't feel safe. Guardian changes that. The goal of Guardian is to understand the perceptions of safety for pedestrians in an outdoor environment and design a system to increase feelings of safety. Personal security for people in an outdoor environment is an issue that many have attempted to solve over time. There are infrastructures, such as the police department or "blue light" system, or products, such as alert mobile apps, that attempt to improve security for people, but these are not foolproof. Slow response times and product functionality barriers prevent pedestrians and runners from feeling safe. Thus in order to develop an effective product, Guardian seeks to understand behaviors in all outdoor environments ranging from running to hiking to buying coffee on the way to work to walking home at night. Through user research, personal safety and traffic safety were identified as two major causes of concern for users. Guardian focuses on personal safety and the system is comprised of a mobile application and wearable component. Capabilities of the system include a discrete way for users to alert preset contacts in case of emergency, through an immediate mode and a wake up mode, as well as GPS tracking.

Requirements Summary

Our system has several requirements that are necessary for it to be functional for our users and problem space. First, people need to be able to access it quickly. The situations that our system will be designed to handle will be fast-moving scenarios that won't leave a lot of time to work with a system. Our system also needs to be able to be accessed under duress, ideally without requiring users to perform any high cognitive tasks. Again the problem space that our system is operating in could potentially be very threatening and alarming, so we need to make sure that users can use our system under these conditions. On that same note, our system needs to be able to be accessed discreetly to protect the safety of our users. Furthermore the system needs to be able to operate in an outdoor environment, where many factors such as weather, lighting, and noise can vary. Our users will frequently be outside with our system and we need to make sure it's equipped to handle any such condition. Another key requirement is that our system needs to be mobile, where it can be carried while users are commuting, exercising, or engaging in other variable activities. Similarly, our system will need to be able to be used for long periods of time as our users could be at work for eight or nine hours between commutes or could go outside to exercise for a few hours. Therefore we need to make sure that our system can handle being away from electricity for long periods of time.

Prototype Description

Overview

Our prototype consisted of two parts: a computer generated wireframe, created with software called Indigo Studio, and two Nike Fuelbands (similar to FitBit watches) to serve as stand-ins for our wearable prototype. The wireframes allow the user to interact with the settings of the system; they allow them to set up their emergency contacts, the emergency contact message, change the default timer setting, and "sync" the wearable with the application. The wearable (with a little imagination) gives the user an idea of what exactly would be syncing to the application and makes them aware of the activation and deactivation button.

Storyboard

The mobile application opens to a simple loading page containing a running woman and the name of the application (see Figure 1). After Guardian has loaded, the user is taken to the setup page (see Figure 2) which allows them to set their emergency contacts, set the alert timer, and sync with their wearable. Having the setup page as the main page specifies the available functionality of the application and intuitively guides the user through the three different options displayed as labeled buttons.

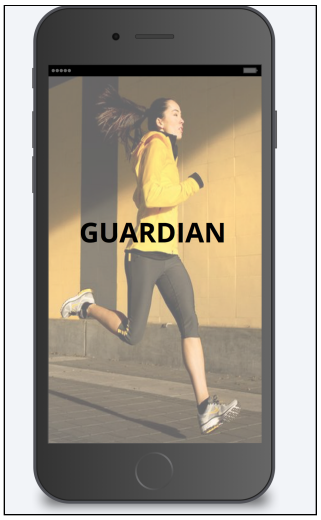


Figure 1

Figure 2

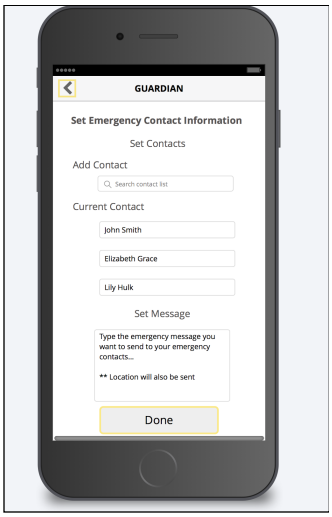


Figure 3

Figure 4

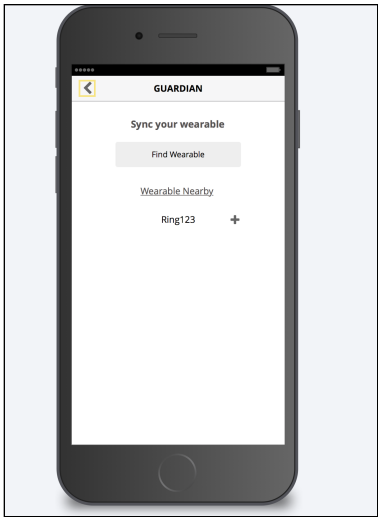


Figure 5

Set Emergency Contact: The first button is labeled "Set Emergency Contacts" and it allows the user to select up to six emergency contacts that will be messaged when an SOS alert is sent. As Figure 3 shows, "Set Emergency Contacts" contains a search bar at the top of the page that provides easy access to the device's phonebook facilitating the selection of contacts. The user can type the full name of the desired contact or a part of it to obtain a list of possible matches. Contact setup can only be done through the phonebook as it assumes that the information of a potential emergency contact is already stored in the device. In addition, we decided to have 6 emergency contacts to begin with, with the possibility of upgrading to 10 contacts later on. Once a contact is selected through the search bar, the contact's name will be displayed below the title "Current Contact". The last component of this page is the emergency message which can be edited through the text box at the bottom of the page. There is placeholder text explaining to "Type the emergency message you want to send to your emergency contacts" and informing the user that their current location will also be shared. Pressing the "Done" button saves the edited information that will be sent if the SOS protocol is initiated and sends the user back to the main page.

Set Alarm Timer: Guardian has an immediate mode and a wake up mode that are triggered by different press patterns of the wristband SOS button and can be used in different types of situations. The immediate mode is activated when the user presses the SOS button on his/her wearable by using the designated press pattern. As the name suggests, when this mode is initiated, the SOS protocol is fully activated and the app reaches out immediately to the emergency contacts and sends them the location and emergency message. This mode was designed for highly dangerous situations where the user requires immediate help such as being followed by a person or being attacked (or other perilous situations). The disadvantage of an immediate call through the wearable in this initial prototype is that it sends a limited amount of information to the emergency contacts and cannot update the status of the emergency.

The second button on the main page is "Set Alarm Timer" which configures the wake up mode. In this mode, the immediate SOS alert will only be sent after the preselected amount of time after activation has passed or upon a second activation press that initiates the immediate mode (Figure 4). This protocol functions as a one-time dead man switch where, in a threatening situation, the user can wake up Guardian but not send an SOS call immediately. This allows the user to deactivate Guardian if the danger has passed or if it was a false alarm.

If the wake up call is not deactivated before the timer reaches 0, the SOS call will be sent to all emergency contacts. On the other hand, if the risk level escalates, the user can press the activation button again and the mode will switch from wake up to immediate. The disadvantage of the alarm model is that the threatening situation might extend for more than the preselected alarm time which would potentially send false alarms to the emergency contacts. Changing this protocol to be exactly like a dead man switch would reduce false alarms and improve the protection of the user. The "Done" button saves the timer information and returns the user to the main page.

Sync Your Wearable: The third button on the main page, labeled "Sync with Wearable", connects the Guardian mobile application to the user's wearable, which can come in different designs. The top button on the page labeled "Find Wearable" uses Bluetooth to look for devices nearby that can be paired with the Guardian app (Figure 5). The results of this search are listed below "Wearables Nearby" and allows the user to press the "+" sign for the wearable they can to sync with. Syncing with the device downloads the relevant settings to the hardware which means that the wearable does not need to be paired to the device for it to function nor does it need to be nearby. This allows runners to leave their phones behind while carrying their wearable during their workout.

Adjusting the settings is fully dependent on the app since the wearable has very limited functionality so the app is the brain of our protocol while the wearable is the executing body. Constraining the functionality of the hardware prevents accidental changing of the settings while wearable is in use. However, this also means that the wearable is useless as a standalone as the user requires having access to a phone to setup and manage the wearable.

Scenario

To illustrate the reasoning behind the selected functionality, let's introduce Lily, a new user of the Guardian, who set it up upon purchase. She is an avid runner who routinely runs around the park near her safe neighborhood alone in the early morning and late at night. Her runs consist of three or more laps around the park while incorporating other methods of exercising in between. As usual, she starts by running around the lake, next to the orchid garden, and then making a stop every mile to do a core workout. One night, as she is passing the orchid garden, she perceives a shadow behind her and gets nervous. She immediately turns on the wake up call on Guardian through the specific pattern and starts running faster

towards home. She knows her alert timer is set up to 30 minutes, which should allow her to get back home before then to deactivate it. As she speeds up, the shadow becomes clear. It is a tall man who is now running towards her. As the risk has become real, she presses her wristband again and all of her preset emergency contacts obtain her SOS message and her location. Since the emergency contacts get an update of Lily's location every minute after the SOS call is sent, they are able to call the police and get Lily immediate help. Alternatively, in the scenario where the threat was imagined, Lily would have gotten back home safely before the 30 minutes passed and would have deactivated the wake up call by pressing the wristband deactivation button. These two protocols can be similarly applied to car accidents, the witnessing of someone else's attacks, or even a workout injury.

Design Rationale

We chose to create this prototype because it combined the advantages of two of our preliminary stage prototypes and avoided some of the disadvantages. The two main advantages of the prototype are the portability and the discretion of the device. Using the wearable, a typical user can quickly alert their loved ones of any risk to their person. Using the phone app, a typical user can also set alerts. Even if the user forgets one of the two parts, the likelihood is that they will have at least one of them at hand during an emergency. These advantages help us achieve our goals of providing a quick and discreet way to alert emergency contacts during a threatening situation. The main disadvantages of the prototype include needing cell or internet reception in order to work and the possibility of false alarms. As we later found during the results from our prototyping demonstration, it also lacks some flexibility users might want. For example, it has only one generic message to send to its users. It is unable to send a different message depending on if the user broke their leg or if they are assaulted.

Results of In Class Evaluation

Participant Feedback

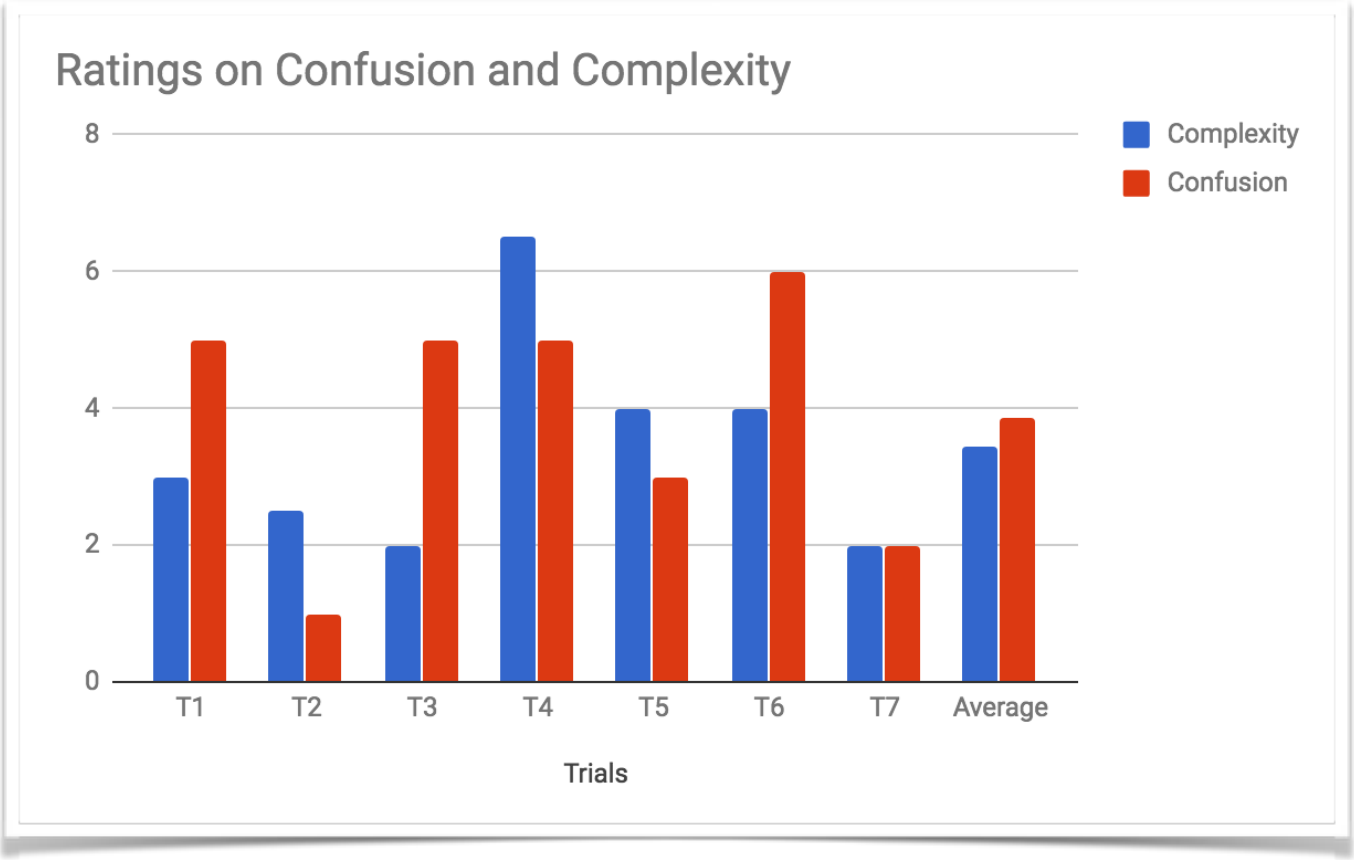
For our first round of feedback, we wanted to get a sense of how simple our design interface was and how quickly it was to use. This is because in a dangerous situation the user will need to quickly be able to use the product even under high stress. We think it is important to focus on ease-of-use and ease-of-understanding from the very initial design. In order to do so, we gave users a minimal overview of how the product works and then asked them to interact with the prototyping materials without interference. They were asked to talk of what they liked, disliked, and what they found confusing. At the end, we asked them to rate from 1-10 the complexity of the application design and how confusing it was to learn (lower numbers being better). After recording their responses through video and shorthand notes, we processed our results to get a sense of what we did well and where we can improve.

Participant Results

There was pretty high variation in ratings between users. However, on average we received a 3.42 in complexity and a 3.85 in confusion on a scale of 1 to 10 (lower is better), as seen in Graph 1. High raters on complexity stated they found the naming of different features confusing. Interestingly, even users that liked the simple interface would rarely rate lower than a two. High confusion ratings were almost always because they had difficulty building a mental model about the product without assistance, especially around the delayed action SOS timer mechanism or wake up mode.

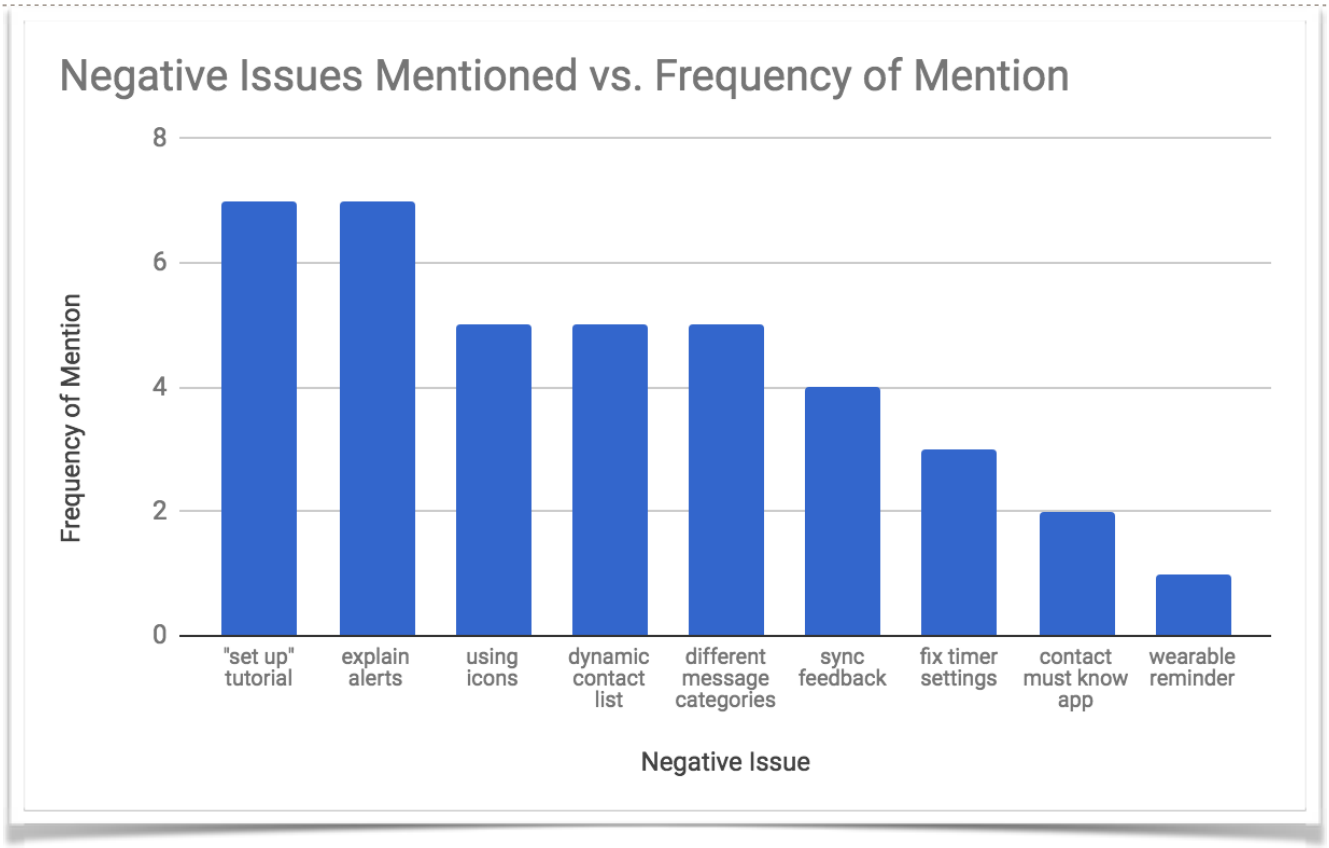
All seven of our potential users mentioned needing a “set up” tutorial explaining the basic features of the wearable and phone application, as seen in Graph 2. Also, all users found the distinction between wake up mode and immediate mode confusing -- many had different ideas of use cases. Other recommendations included using icons over text and making the contact list dynamic. A feature that people asked for was the ability to send different messages to different contacts depending on the type of emergency. We think people needed the tutorial because the scope of the design is not clear from the user interface. One can change the settings, but it is unclear what the settings allow and don’t allow. Most users understood that the SOS message gets sent to the contact list, but they had trouble

understanding the delayed action and immediate action timer settings. This is something that we will need to experiment with the design - it might be because the "wearable" we used was a simple bracelet and so its features are not readily apparent to the user. During the Hi-Fi prototyping, we will likely focus on creating a tutorial as well as making a wearable with clear wake up and immediate modes.

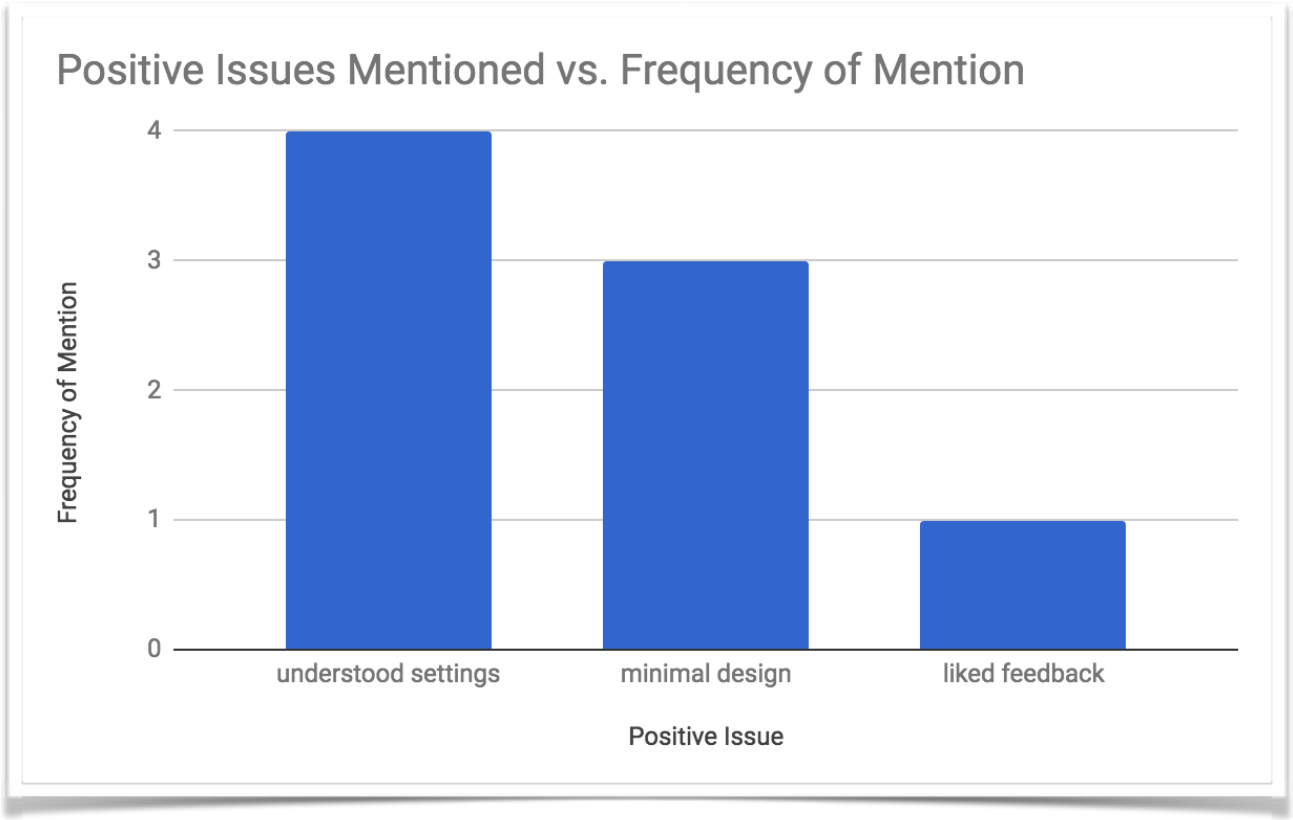


Graph 1: Ratings on Confusion and Complexity

Most users understood how to open and change the settings and liked the minimalist design of the interface, as seen in Graph 3. Typically the only setting they had significant trouble with was the mode setting. In general, the users liked the minimalist design of the interface but had a little trouble at first creating a mental model of the product. In future iterations, we will need to focus on making the mental model more intuitive, especially the immediate vs. wake up mode.



Graph 2: Negative Issues Mentioned vs. Frequency of Mention



Graph 3: Positive Issues Mentioned vs. Frequency of Mention

Evaluation of Tools and Techniques

Prototyping Tools: We chose to use Indigo Studios, a prototyping tool on the computer that allowed us to design and construct the layout for a mobile application. The prototyping tool provided many benefits that made it appropriate for this stage of the design process. At the implementation level, the tool did not require the team to develop code and implement the features. Rather, it allowed the team to devote more time and resources towards thinking about user needs, and building a product to best realize user requirements. Another advantage of the prototyping tool was that it created an environment for the prototype that simulated using a mobile application in real life. The application responded to user actions by switching to different pages when the appropriate button was pressed, simulating how the application would notify contacts, and asking for user input. This allowed the team to deliver a prototype that was as close to the intended usage setting for users as possible, as opposed to using hand-drawn note cards or any other prototyping medium. Rather than asking testers to imagine using a mobile application, they could press on buttons and tabs as if they were on a smartphone. This also enabled users to give feedback that was more pertinent to our user experience on a mobile device, and also gave researchers access to more authentic responses from users. Finally, our prototyping tool did not require constant input or interaction between user and researchers (as is the case with note cards), which gave us the ability to document user reactions to the interface and gauge how they would respond when they were met with ambiguousness or did not know how to proceed. This was a valuable way for the team to collect user data on affordance, and whether our signage and layout was conducive to a smooth and intuitive user experience.

While the prototyping tool successfully let users test our product, the tool was not without its weaknesses. For one, since it was installed on a researcher's computer, it compelled testers to use a device foreign to them. One issue during testing was difficulties caused by users not knowing where certain keys were located on the computer, or how to activate a particular gesture, such as a long hold. Another drawback of the prototyping suite Indigo Studio was that some features were unavailable in the free version, and required paying for the software suite to activate. For example, we had a time limit of how long we could host our product online, restricting the amount of remote testing we could have done with users that were not physically next to us. Had this feature been available, the team would have tested our product on a wider variety of users other than students in the classroom, and garnered more user feedback from other target demographics.

Future Changes: Based on the in class feedback from the evaluation session, the team proposes three main changes in the design and evaluation techniques for future iterations. In addition to creating a more intuitive mental model to distinguish between the immediate and wake up modes, a tutorial of the application is needed at the outset of the prototype in order for users to better understand the features and functionalities of Guardian. The tutorial can be initiated at different critical moments, such as the first time a user begins to use Guardian, the first time of usage after making changes to the appearance or layout, or immediately after a large software update.

Looking to evaluation techniques, one proposal is to record on-screen activity, using a monitor recorder, and users' facial reactions, using the front-facing camera of the test device. This is to gather user reactions and responses while they are using our product (with their consent), and helps the team better identify the problem areas in the application, or the steps that causes the most issues for our users. The motivation behind this change is to detect instances where users faced difficulties but did not reveal these issues or notify researchers for help. This passive data collection method presents a non-distracting and unobtrusive way to help the team collect more feedback to improve on the user experience.

Another change in evaluation technique we propose, in similar fashion to the tutorial, is to provide users with a brief introduction and blurb prior to them using or testing Guardian. The goal of this change is to better simulate the process by which a mobile application or wearable is procured. In the case of the mobile application, users first access a product page on the app store, where they are able to read an abstract or overview of the application before downloading it to their smartphones. For a wearable, there are also product pages or instructions that users would read before buying the device. The blurb we provide would serve the same function as the app store page or product instructions; we envision that reading a brief introduction to Guardian will allow users to start using and testing the product by themselves. The blurb, coupled with the aforementioned tutorial, would minimize the amount of intervention necessary from team members during the user testing session. This would allow users to move through and interact with Guardian independently, thereby providing a more realistic simulation of downloading an app and using it in the real world.