*smart*Glasses

The first ever gadget that benefits your eyes

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Value proposition

Almost all devices are damaging to our eyes…. until this one.
*smart*Glasses reminds users to be in eye-friendly postures, notify them to rest, provide daily usage data and encourage engagement in good activity to earn rewards.

Problem and Solution

Technology is supposed to tak10e care of people and make everyone's life better. What's lost this century is the health of our eyes. It is even forecasted that half the world would be nearsighted in 30 years*. With the ever increasing number of new gadgets, from flat screen TVs, laptops, iPhones, tablets to now VR, all those are killing our eyes without us noticing. We do not seem to care much because we cannot actually 'see' the problem. Only when our eyes are literally unable to see things would we start taking actions.
There needs to be more awareness of this epidemic. Concerned parents need a way to monitor their child's eye usage to prevent them from getting near-sighted. Hence, we came up with the idea of a wearable to detect and collect data, together with an easy-to-use app that shows eye usage and can be shared among doctors and/or parents. Moreover, our app sends a friendly reminder, just like a LINE message notification, to the user to the phone whenever he/she uses any devices for too long and/or are doing in harmful posture and offer better suggestion. After all it is called 'near'-sightedness, if we could help user get in optimal environment (ex. further away), they would be putting less stress on the eyes.

*Citation of published article: <http://www.sciencealert.com/half-the-world-s-population-will-be-short-sighted-by-2050>

Tasks and Final Interface Scenarios

1) Detect distance and light intensity:

A feature that combines wearable, glasses, with phone application.

It is nearly impossible for us lazy humans to constantly know and be in the optimal setting to use our smartphones, tablets...etc. On the flip side, we are very used to checking contents on our phones. It almost since like we are trapped to our phone, hence the inception of the name "cell" phone. Using this trait, we turned it into a positive. By detecting, with the *smart*Glasses, the brightness, and distance between eye and the book or the screen, of the surrounding and immediately sends a notification to the user's connected smartphone. The user would quickly

check the phone and realize he/she needs to be in a better posture. This has an advantage over vibration because even without physical contact, the user can still be notified.

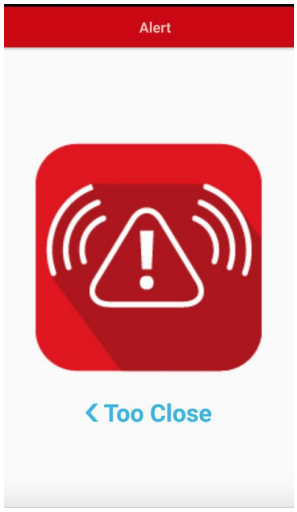


Fig. 1 UI of ‘Too Close’ reminder; working
with sensor on the wearable to offer optimal suggestion.

2) Reminder:

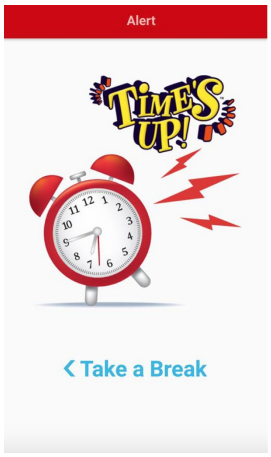


Fig. 2 UI of ‘Time’ running out, reminder to take a rest.

Every once in awhile, we would start gluing to our smartphones, computers or TV screens for too long without rest. On some occasions, we might even read too much for too long non-stop. A small action, rest after 30 minutes, can help reduce eye pressure and relieve tired eyes. Supervisors, like parents or doctors, can even set up mandatory rest periods to require the users, possibly children, to rest stand up and away from the screen/book, and rest a bit.

3) Data Collection and Summarization:

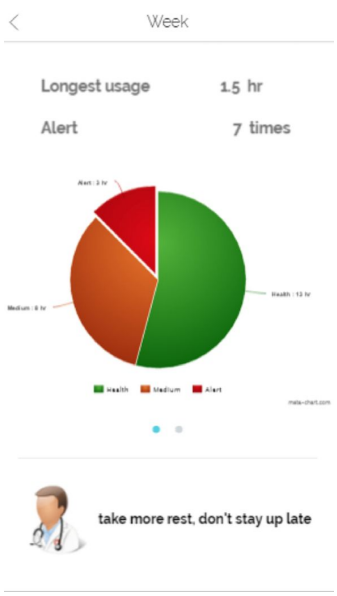


Fig. 3.1 UI page of collected data and data, which doctor's message.

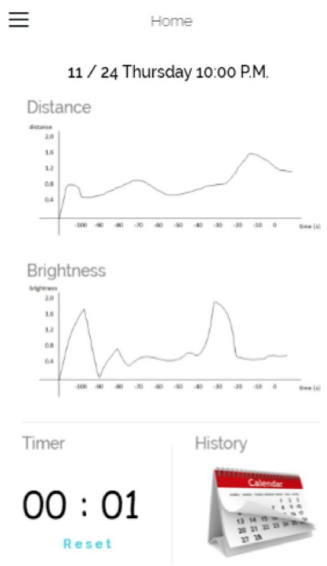


Fig. 3.2 Mid-fi prototype of the 'Home' page with (too) many charts depicting activity.

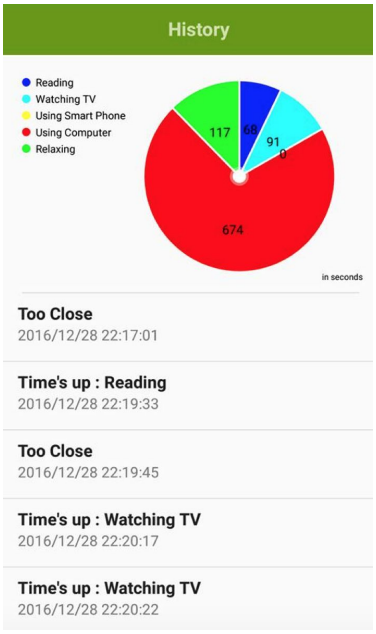


Fig. 3.3 Final UI of the collected is summarized into a pie chart. As shown, it's too red and the user must relax more (green)

With the data collected from the sensors on the wearable, we process them on the smartphone and determine which activity, whether it is reading, watching TV, scrolling smartphones by image processing and machine learning, as well as the duration of the activities. These data can be used to show the user how serious the eye usage is and take appropriate actions. They could also be viewed by parents to see in which timeframe their children are killing their eyes. Furthermore, if they purposely remove the glasses, the sensors on the weable would take notice, and the graph would show a straight line demonstrating the user's cheating.

Design Evolution

a) Low-Fi User Testing

Initially, we have to come up with the best method to notify user and let them know the seriousness of their action hurting their eyes. We took into account the professor's advice that, to lose weight, people usually start tracking calories intake and calories burned from excercises. We took the similar approach, to provide data and present them in a way that people would start taking actions or at the very least, be concerned. Furthermore, the data need to be intuite enough and relatable. Firstly, we come up with charts, because we believe people can interpret charts, with higher peaks being too much, intuitively. And when they see mountains of high peaks, they would know they are in trouble. We also included messages from the supervisors, mom and doctor, to let them know the professional's opinion. However, we found out that that is easily ignored by the user. Still they do not take it seriously enough. That is when we decided to include a letter grade, from A to F, depicting monthly performance of the user. If they used devices for too long and in terrible posture they would get an F. If they start

improving, and taking more rest, they could see the grade go up and possibly A+. We would love to get some partners, like corporate sponsors or government, to provide a monthly raffle. Users with certain grade or higher could enter to win prize.

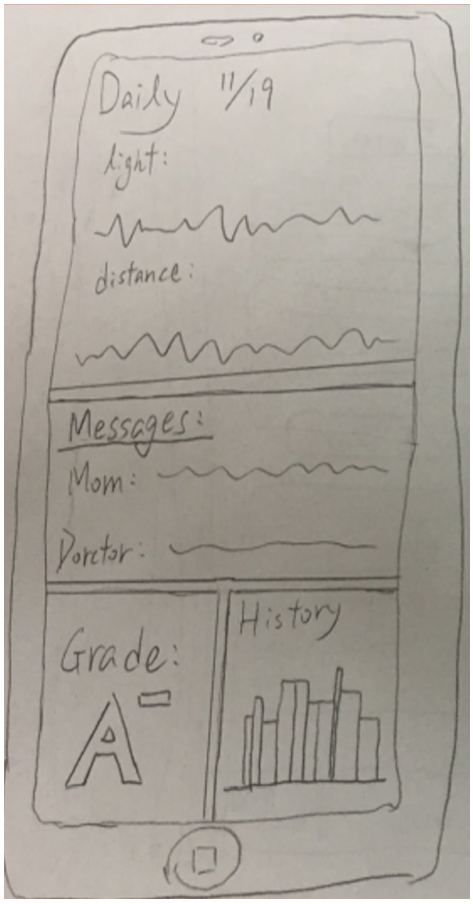


Fig. 4.1 Low-fi prototype of the 'Home' page, showing grade to encourage user to work towards A+.

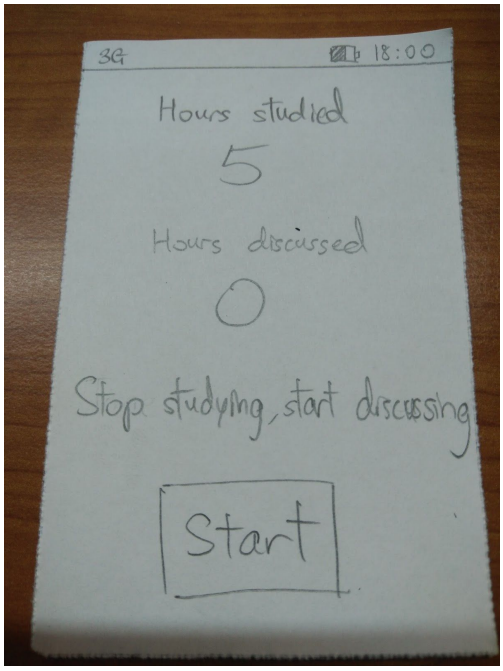


Fig. 4.2 Low-fi prototype concept of showing user for how long have they been doing an activity and encourage rest.

b) Mid-Fi Prototypes:

We made some major changes in the UI front page based on the user testing and the feedbacks from initial studio presentations. First, we switched the messages from the doctor from frontpage to the 'History' page of the user's, children, UI . This is because the effectiveness of the message is not enough from the feedbacks and importantly, the very first page has expensive real estate so we needed to place more effective feature. Second, we placed the countdown timer in the frontpage. This is because we found that people react more to the clock ticking down and the lesser the time, the more they know the need to rest. This is major because we observed that when users open the app, we need to show them urgency. The best way of doing so is to show clock, just like the function of an alarm. We also added a 'reset' button. We also added a 'connection' page for the user to connect the wearable to the smartphone. We initially did not think of this UI page's importance and thought an automatic connection, like bluetooth earphone, is suffice. We were proven dead wrong. Because not only

do users need a manual on how to use them, sometimes the connection may be weakened and re-connection would be required.

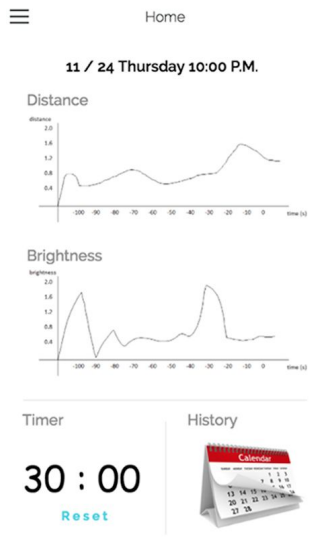


Fig. 5.1 Mid-fi prototype of home page

Fig. 5.2 Mid-fi's added page for wearable connection and walkthrough.

c) Final Design (High-Fi):

Finally, we decided to make the frontpage clean and leave more space. It was determined that the mid-fi design was too much like a scientific app not user-friendly enough. We still leave the important timer there because the "urgency to rest" aspect is still much more important. Other than that, we opted to give user big, clear icons to click on to see more details. We found from the evaluations and feedbacks that a simple, quick tab on the icon does not make user less likely to check the information. So we have also moved the charts to the 'History' page. The icons are clear and very reliable. Here, it is worth to say that our previous icon of for 'History' is unclear and users got confused of what history that is. So we changed it into a cloud with the label "Data." We believe this is a good design because most people nowadays know about cloud such as Google drive, Dropbox, iCloud and they could relate that with storing data. Also in 'History', we added a pie chart of all activities, violations (using eyes for too long) as well as records of notifications. This could demonstrate for how short the user rest (by only a small portion of a pie) and for how long did the user do a particular activity or two that are extremely harmful.

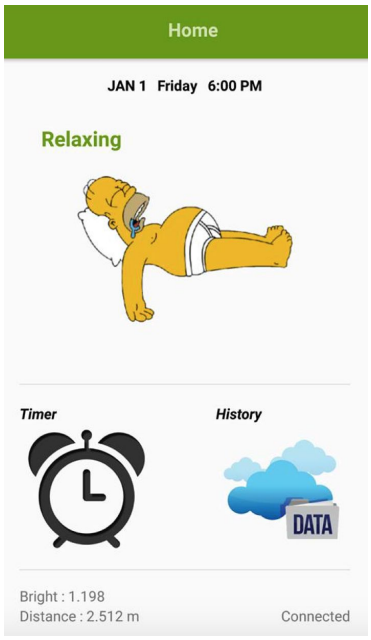


Fig. 6.1 Final UI of clean ‘Home’ page. User can easily understand the icons and find more details by clicking them.

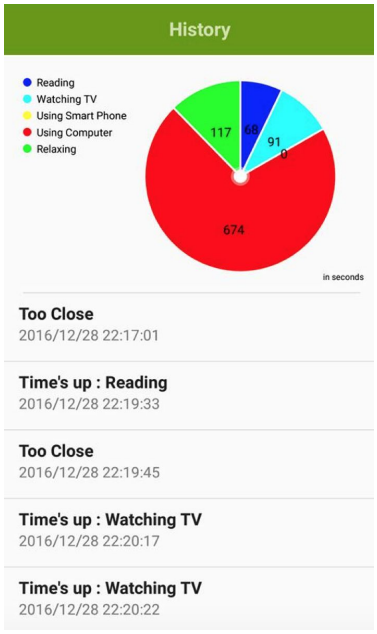


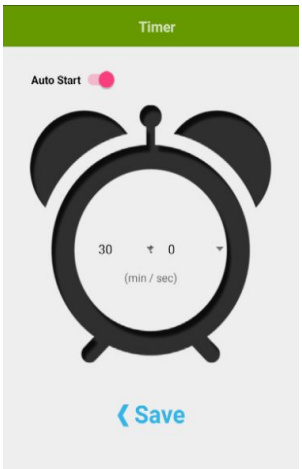
Fig. 6.2 ‘History’ data page is moved into a new, separate page for cleaner look and more details.

Major Usability Problems Addressed

1. [H2-10: Help & Documentation] [Severity 3]

The “Auto Start” for the Timer is not exactly clear as to what it is supposed to do. It is stated that it is supposed to autostart the moment the user starts using an electronic device, but most timers only consist of a Start, Pause, Reset, and Set Time function.

Before

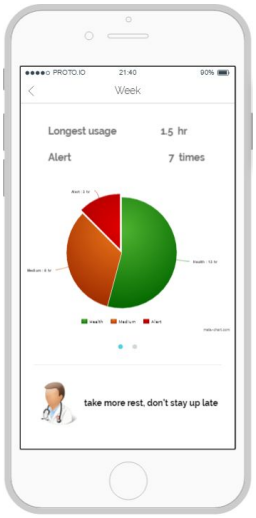


After

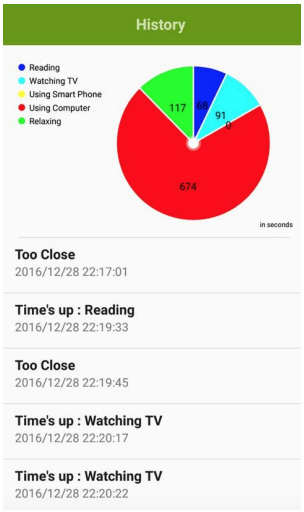
Changes: Remove the on-off button since the functions of the two button in the mid-fi prototype are identical.

2. [H2-7: Flexibility & Efficiency of Use] [Severity 3]

Text size is too small and text colour is not contrasting enough with the background, making text difficult to read.



Before



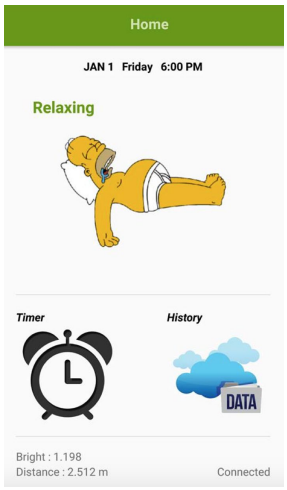
After

Changes: Made text clearer and colour more contrasting with background.

3. [H2-10: Help & Documentation] [Severity 3]

The time line in both Distance and Brightness is not easy to understand. Not clear what the time range of the displayed history is.

Before

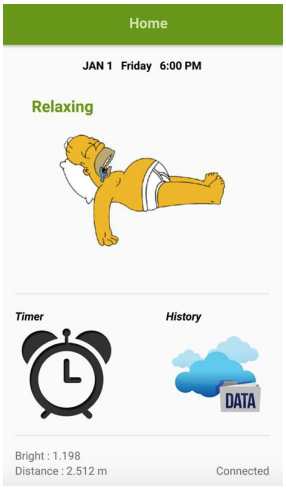


After

Changes: We removed the charts from our main page because it is not useful for most of the users. Instead, we print a text and a image on the screen to show what the user is doing.

4. [H2-10: Help & Documentation] [Severity 3]
Not clear which distance the app is referring to.

Before

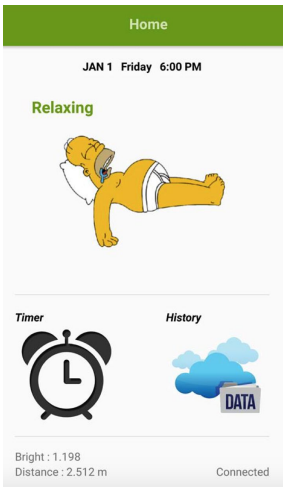


After

Changes: Remove the charts.

5. [H2-10: Help & Documentation] [Severity 3]
Not clear which light the app is referring to.

Before



After

Changes: Print a text and a image on the screen to show what the user is doing.

Prototype Implementation

*smart*Glasses was designed to be used conjointly with a wearable on mobile devices, so we made our mid-prototype using proto.io in iOS look. Since the TAs taught us how to program in Android, we made it a native Android application using IDE Android Studio.

Android Studio is a well known IDE to develop apps on android platform and java coding ability is required. It is my first time to use this IDE and code in java also. Luckily, there are some java experts in CSIE, so I can implement everything I want to put in the app easily. There are man advantage of this tool. First of all, it can do all the thing we can do on the proto.io, the interface can also be simple to design. Second, it can use many cellphone natural function such as phone vibration. Last and the most important thing is that it can deal with socket, which is needed for our apps to transfer data with our *smart*Glasses.

We were able to connect the smartphone to an external device and for demo purposes, we made it connect with a laptop through Internet. The conjointly of networking between the two devices, transferring data, is also implemented. We demoed this by setting up the TCP server on the server of CSIE first by using the “nc” command to listen on a specific port. Then we made our smartphone be a TCP client which can receive everything enter in the terminal on our laptop. It is really similar to our ideal product. The terminal can be considered as the *smart*glasses and it keep transferring the data to the smart phone.

We hardcoded some variable sent from the laptop to the smartphone that would trigger the phone to a) show Time’s Up, b) Too Close and record those data in a pie chart. Users are able to see how many hours they spent what activity how they are performing thus far from the colored pie chart. The most difficult thing in this part is to draw the char. Android Studio did not release any tools to the developer about chart drawing, which troubled us very much. Finally, we found a third-part library, “MPAndroidChart”, which help us solve this big problem.

Summary

In the mid-fi prototype phase, we did not really understand what the user prefers to see on the app, so we designed the UI interface more like a science statistics application. It was very useless to general users, as it was difficult for them interpret the raw data. However, in the later design stages, we realized the main problem and thought up a great solution. Instead of only printing pure data on the screen, we show what user is doing currently by analyzing the data. Nowadays, many techniques can help us, such as digital image processing, machine learning and many precise instruments/sensors. We should combine the advantages of many other things rather than analyze by ourselves. Finally, at the project demo night, many users were impressed by our app and thought it could actually be a useful tool to those who want to improve their eyes health. Furthermore, they easily found out the light objective of our app and what we want to provide to the users. This is the result of a result of design exploration, especially for us (every member only has engineering background). Testing and getting

feedbacks in order for us to transform the app from too engineering-like to more handy, intuitive, and user-friendly. As the designer of this app, we were very glad to see that.

Final Thoughts (Summary 2.0)

With *smart*Glasses, we tackled the challenge of notifying the user the seriousness of eye-damaging activities and tried to find the most friendly and accept way of sending reminder. We took the approach of regular phone notification, because we are already very used to living according to what the phone tells us. Start solving the problem by actually identifying it with the app and work towards an A+ by letting the sensors help you to always engage in the posture and setting that are least damaging to our eyes. For future work, the app could potentially add a “Lock the Phone” option, activated by supervisor, to those naughty, uncooperative users. To dream big, we would love to see cooperation with the government to offer a monthly lottery for A+ users for more incentive and motivation.