Nickolas Diaz

COP 4934 Senior Design 1

Assignment: Iterative-Challenge

9-09-2025

Review Your Previous Prototype:

This report is about refining/developing a new prototype based on the previous one. This new prototype will also be tested and provide feedback on what works and doesn't. Lastly this report will end with a brief report summarizing the key changes, testing results, further improvements and visual documentation. This iterative process should refine the product over time though brainstorming improvements, prototyping, testing and receiving feedback.

Reflecting on the feedback of the sleeping mask where it solves the problem of the night owl and the early bird. Where two roommates have different sleeping times. The person who wakes up early by having an alarm wakes up the late nigher, who wants to sleep in. The late owl also disturbs the early bird by making noise. Both problems are fixed though my sleeping mask design. The smart mask consists of a layer of cloth wrapping around the face to block out all light and an electronic device embedded within the mask to act as a vibration device for the alarm, in addition to a Bluetooth interface card to be able to set and stop the alarm.

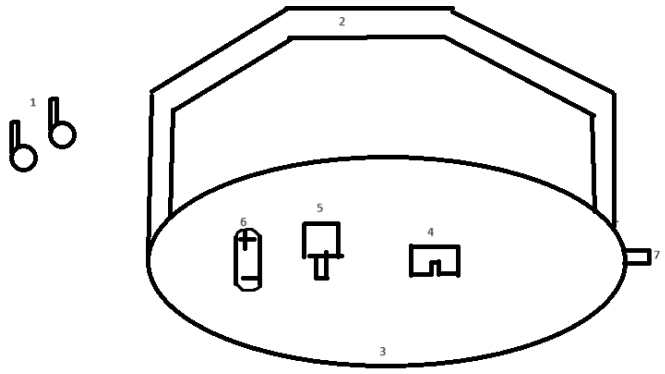
Refine the Prototype:

The feedback from the previous assignment includes the user cannot sleep on their stomach or side as the electronic would press on their face. There is no way to quickly turn the device off, currently the user would have to user their phone in the app to stop it from vibrating. The device is too clunky; it won't fit a person very well if one side is too heavy. There are no straps to adjust the mask, currently it is just one size that fits all. Lastly the design covers the nose.

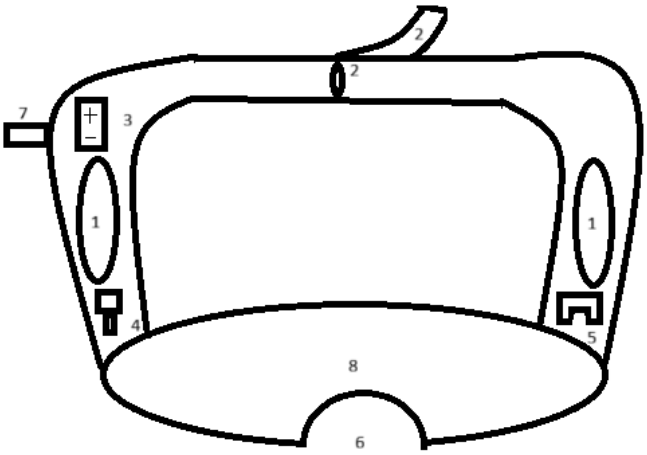
Improvements with the improved smart mask are: moving the vibrator to the left side of the mask, and the Bluetooth interface card to the right of the mask to avoid pressing on face problem and the heavy side problem. Compacting the electronic device and having an extra cushion to make it comfortable. Add a feature to stop the device from vibrating after 30 seconds to fix the app to turn it off problem. Adding a strap to the back of the mask to allow everyone to wear it. The cloth is modified to prevent covering of the nose. Lastly splitting the mask around the ears would make it a tighter fit to wear as it won't move at all.

Design Process:

Original Version



Improved Version 2



1. Holes for the ears for better fitting
2. Straps for one size that fits all
3. Smaller batteries
4. Vibrator
5. Bluetooth interface card
6. Cutout for the nose
7. Charger port
8. Extra cushioned fabric for blocking light

Some difficulties I had modifying the device was where to put the electronics, as they are clunky, I had multiple options to choose from such as putting it in the front which had the drawback of uncomfortable being on the stomach, second option was to put it in the back, however it was problematic as the mask as too side heavy, last but best option was the side which

had the best comfortability and not side heavy, but it's drawback was the components would be scattered and a wire would have to connect to the other side.

Compared with the previous prototype, overall, the design is much more convenient and useful to users, the improvements include better fit, weight distribution, once size that fits for all, ability to lay on the stomach, automatic turning off, doesn't cover the nose and more cushioning. The disadvantage is that it is easier to build the electronics as they are bigger, and they are all in one spot, and there are no complicated cloth cutting required.

Analyzing and Document Feedback:

Although the physical design does not exist, the computer drawing was shown to some testers, impressions include thinking it was a creative design to a unique problem, some though it was unnecessary or the problem did not exist, and last impression said already market existence whether once full device that does more or similar functionality or multiple devices that do similar functionality. In addition, the device is not able to be washed because of the electronics in them.

Test the New Prototype:

Another round of testing gave a lot of positive feedback and less negative feedback. Positive feedback includes much better comfort, very usable etc... Negative feedback includes not needing it as they don't have any problems with their roommates, "just ask your roommate to negotiate wake/sleep times", having an inconvenient app to download, and annoying to recharge every x amount of times, charger port is too clunky, and lastly using non-standard charging port as a custom charger is needed to recharge.

Further Improvements and Next Steps:

Potential enhancements from version 2 of the smart mask includes better/smaller charging port could be the Micro-USB and USB-C which would be a lot better than just a big port sticking out. In addition, the device could be improved by having better app functionality, such as managing the schedule of the user or analyzing sleep patterns to find their optimal sleep patterns. Another potential improvement would be removeable electronics or wash friendly/waterproof electronics.

Feasibility of production would include electronics that are more compact and better placement of them such that there would not need a wire going around to the other side. The cloth layout could be improved as the nose section is just half-circle removed from the cloth a better approach would be cutting an area around the nose. The choices for batteries could be Lithium-Ion or Nickel-Metal Hydride as they have the capacity to be small and rechargeable. There is also an option of not having a rechargeable battery such as Alkaline which would remove the need for a recharger, but the user would have to replace them x amount of times.

Conclusion:

Summary of what was learned, sums up to having a better idea on how projects come from ideas, started, reiterated, improved and prototyped. It showed me how to brainstorm ideas, in such a way that finds multiple solutions to a problem and collapse/combine the best option. In addition, the cycle of reiterating, improving, prototyping and feedback makes me understand how projects like these are built, they start with a simple idea that gets more in depth every round until it can be marketed to the public. It reminds me of the Spiral and Agile models in software engineering where a similar approach to the capstone class is taken.

To sum up the smart mask, the overall improvements were the better fitting/comfort, a lightweight design for the electronics. The potential improvements include better battery/charging port, better app functionality, and compacter/washable electronics.