SmartRest Pillow 🥱 🛏️ 💤

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Problem Statement & Context

➔ Poor sleep quality due to stress, discomfort, and other factors, impacts daily life and health. A study made in 2014 showed, the pillow temperature, pillow shape, and pillow content play a crucial role in the quality of sleep (Pubmed, 2014).

➔ Traditional pillows provide limited solutions, thus there was a need for a smart pillow that addresses individual comfort and improves sleep quality.

➔ The SmartRest pillow would be designed to improve sleep quality and enhance restful sleep being accessible to anyone. The smart pillow will incorporate different sensors and technologies to monitor sleep and adjust settings to customer's preferences.

Target domain & context and problem statement

➔ Target alternative-capability
   ◆ <u>Set the temperature of pillow</u>
   ◆ <u>Set alarm</u> -> will ring at assigned time/ can set movement of pillow
   ◆ <u>Adjust pillow firmness</u> depending on user's preference
➔ Core value / How is it used
   ◆ Improve sleep quality of anyone (sleep is important factor of recovery from any injury)
   ◆ Can adjust pillow using app on phone (compatible with Siri)
➔ Visualization of situated inaccessibility: How to create viable constraints?
   ◆ Being in a dim environment/ Having hard time to view phone because of eye surgery like lasik / Having vision disability
      ● Glow in the dark buttons for users to easily see it
      ● Pillow connected to app on phone -> can set alarm, temperature etc. through Siri on phone
   ◆ Having ear plugs on / Having hearing disability / Physical Injury
      ● Movement of pillow to wake the user up who can't hear the alarm
      ● Why not just put phone inside the pillow for movement?
         ○ Making the pillow itself to vibrate will allow users to fall asleep more easily while using their phone instead of not being able to use their phone when they go to bed.
➔ Resource: <u>The effects of sleep based on Pillows</u>

Target product/system ideas
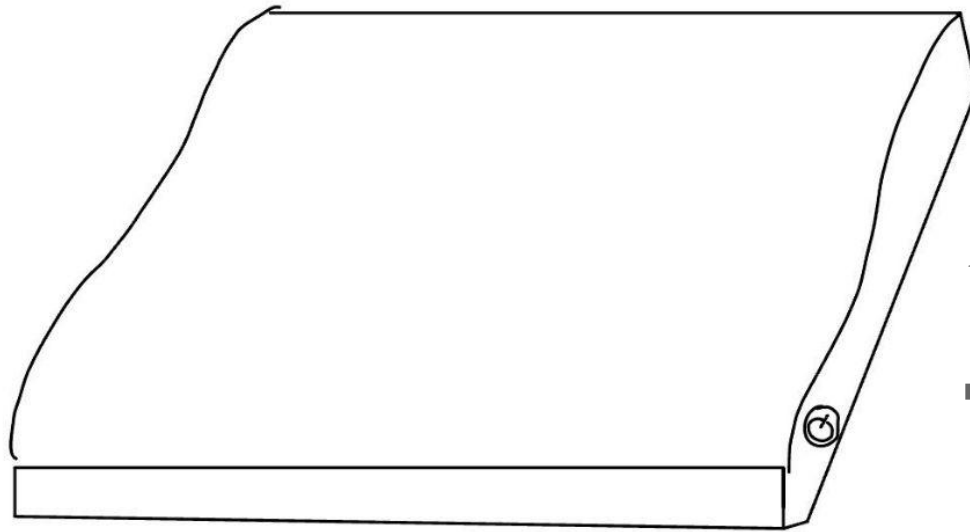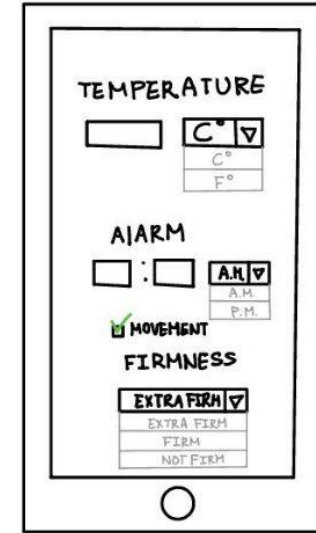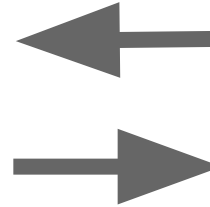
SmarRest pillow   Mobile Device for Control

What is our current setting?: Will be used at the night time in your bedroom with desired temperature, alarm, and firmness.

Background research

➔ Some of the State-of-the-art Technologies we plan on incorporating:
  ● Advanced Sensors
    ○ Sensors that will be able to track users sleep patterns, snoring, and breathing
  ● Phone-Bluetooth Connection
    ○ The smart pillow's functionalities will be able to be controlled via mobile device to adjust various settings
  ● Button Interface
    ○ Pillow will be adjustable via physical buttons
  ● Temperature Control
    ○ The smart pillow will use advanced technologies to provide users with heating and cooling features

Potential Challenges

➔ Firmness
  ◆ As previously mentioned, a goal of the pillow would be to provide users with the ability to change the firmness of their pillow. This could be a challenge later on down the to both implement and demonstrate
➔ Size with Functionality
  ◆ Since the product is providing many different features to users. Being able to keep the pillow at a reasonable size maybe a potential challenge with development
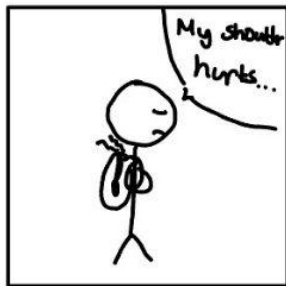
Product Prototype - Storyboard

Need finding study

- How did you create the situated accessibility?
  - Target disability
    - Users with sleep apnea
    - Users with insomnia
    - Users with neck/muscle ache
    - Users with Arthritis
    - Users with Fibromyalgia
    - Users with hearing impairments
  - Contextual/situational inaccessibility
    - Pregnant women
    - Traveling/camping
    - Staying at medical facilities/hospitals
    - Aging that causes body to be sore

Need finding study (example 1)

● How did you create the situated accessibility?

Traveling in a plane   vs.   People with Arthritis

Need finding study (example 2)

- How did you create the situated accessibility?

People with full body paralysis   vs.   Pregnant Women

Need finding study (example 3)

- how did you create the situated accessibility?

Sleeping at the club   vs.   Deaf people sleeping

Need Finding Study
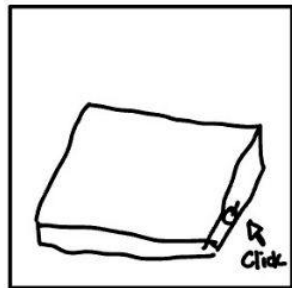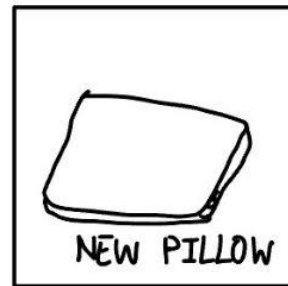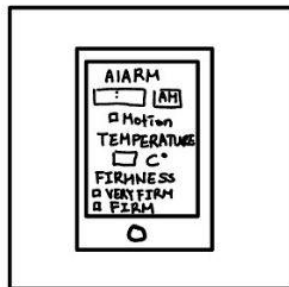
- How did you **measure** the user perception of situated accessibility?
  - Interview with 15 people
  - Gather information about participants: Gender, age, potential disabilities, and their needs
  - Pre and post surveys after showing users a diagram of the pillow

Need Finding Study – Interview Questions

1) Please provide your age, gender, and any potential disabilities?
2) Do you use any sort of physical sleep-oriented products to enhance or assist your sleep? Y/N
3) Is the following product viable? Y/N
4) Do you think the product's design is accessible? Y/N
5) Would you make any changes to the product? Y/N
6) Have you ever thought that the product would be difficult to use? Y/N
7) Do you think anybody would experience discomfort when using this product? Y/N

Need Finding Study - Measuring Perception

Pre demonstration
- Provides us with current user's perception of pillow's and how accessible they are to the average individual

Post demonstration
- Number of changes from "No" to "Yes" will measure whether our proof of concept has changed user's perception

Results and Findings (Yes-Ratio out of 15)

Question Number	Pre-demonstration	Post-demonstration
#2	11/15	11/15
#3	11/15	14/15
#4	9/15	13/15
#5	11/15	13/15
#6	8/15	6/15
#7	3/15	14/15

- For the most parts our survey shows that our product could be helpful and accessible for people with different demographics and disabilities.
- However, we also noticed that our participants think our product could be more complicated and difficult to use due to its modifications on the typical pillow.

Prototype

- how did you deploy your hardware prototype if you used in the initial study?
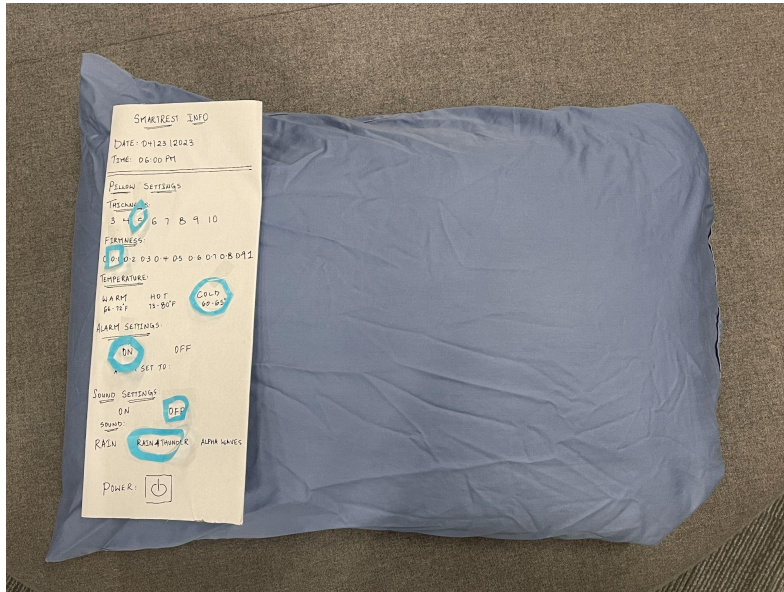
Made real life prototype so that users can see whether if it is a good design or not during the survey.
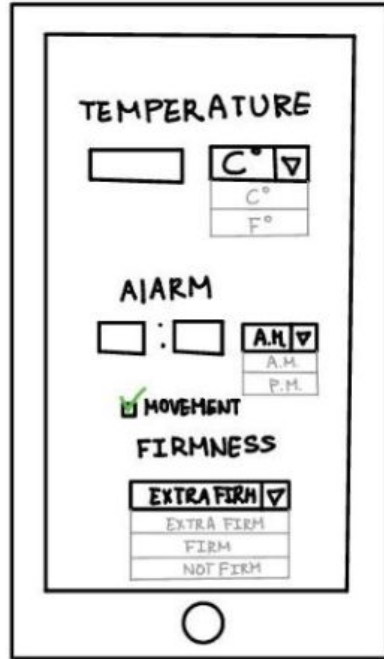
Product Prototype - Hardware Oriented
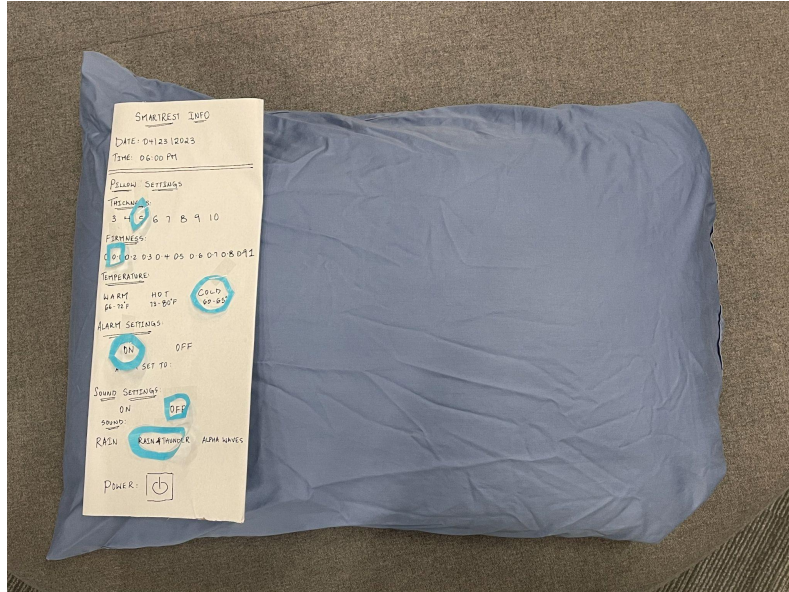
SmartRest Pillow Feature

- Alarm features that allows users to add alarm
- Temperature feature allowing users to make the pillow hot/cold
- Firmness button which controls the level of firmness
- Thickness button which controls the level of thickness

Product Prototype - Software oriented: low-Fidelity

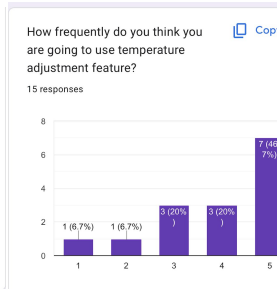SmartRest Pillow App

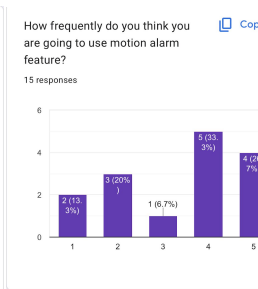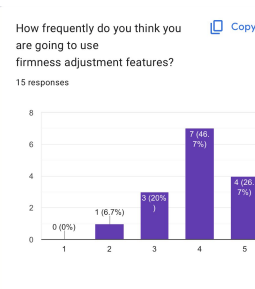An IOS and android compatible app which has:
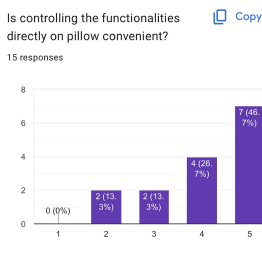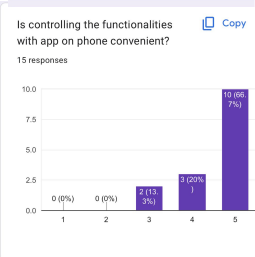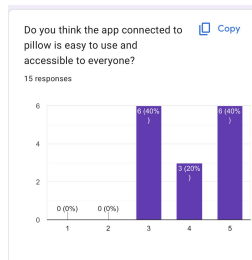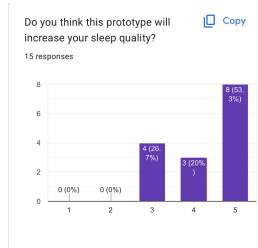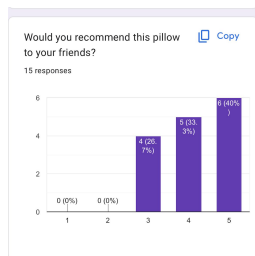
- Temperature selection
- Firmness selection
- Setting alarms
- Soothing sound selection

Software Oriented : High-Fidelity

- how did you deploy your software prototype if you used in the initial study?
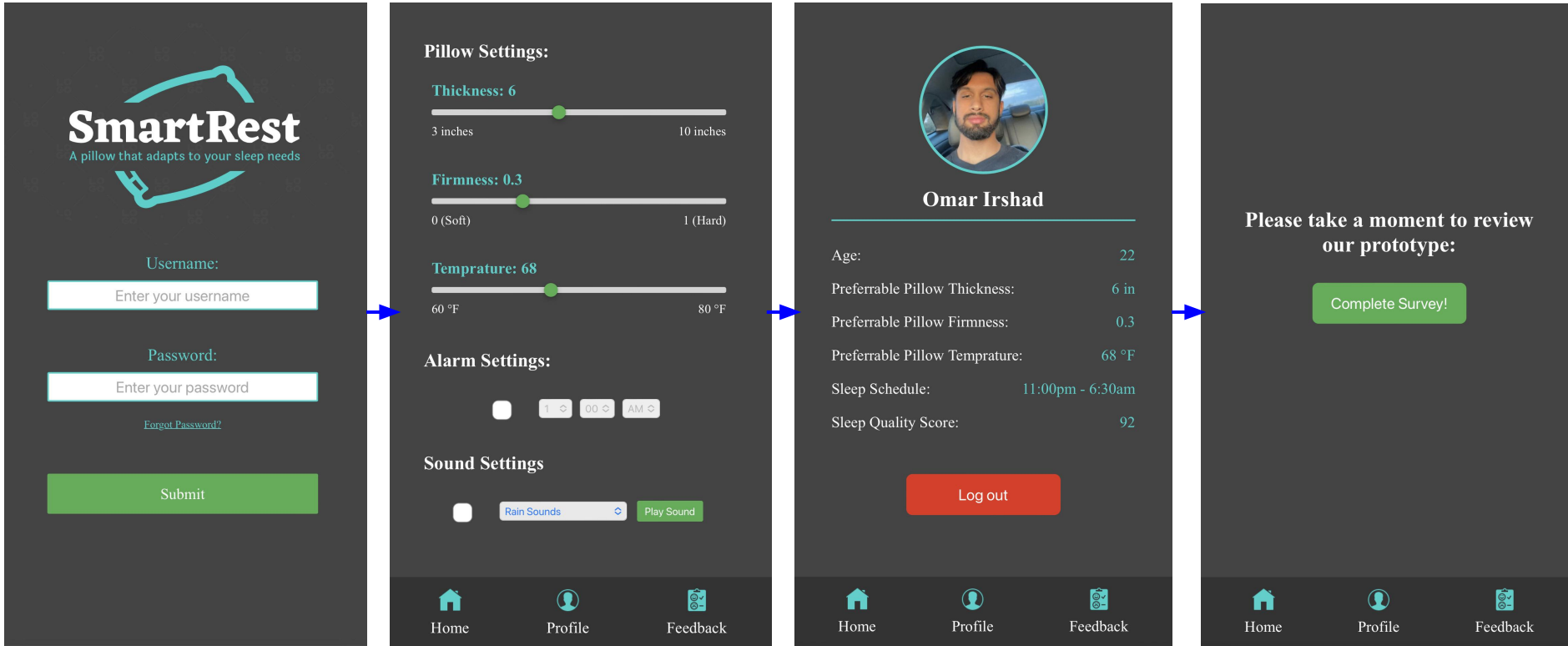
Survey Findings & Insight

● Finding
   ○ Most of participants prefer temperature adjustment than firmness adjustment or motion alarm features
   ○ Since all of our participants are college students who are used to smartphones, they tend to prefer controlling functionalities through phone app
   ○ We can also see that most of the answer for asking whether our prototype is accessible to everyone, they tend to give high points (3-5)

Insights
   ○ We can tell that we need more features related to motion alarms to convince the users to choose our smartrest pillow than normal pillow they already have.
   ○ We should improve the accessibility of using mobile app to control the functionalities as we have to consider users who cannot or are not used to using smartphones.

PROTOTYPE VIDEO: https://youtu.be/bBLLWOj2JG4

PROTOTYPE USER TESTING: https://youtu.be/ug6VjUxtlM8

Source:

- https://pubmed.ncbi.nlm.nih.gov/25008402/
- Images:
- https://southernpainclinic.com/blog/how-does-arthritis-pain-affect-sleep/
- https://www.nichd.nih.gov/newsroom/news/092019-pregnancy-sleep-position
- https://www.citizen.co.za/entertainment/celebrity-news/nota-sleeping-couch-nightclub/
- https://www.istockphoto.com/photo/senior-woman-sleeping-gm1029339524-275862002