

# **CANE GUIDE NAVIGATOR**

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# Abstract

## What is it?

A revolutionary smart walking cane designed to enhance users mobility and safety using ubiquitous computing to seamlessly integrate cutting-edge technology into your daily routine. This cane goes beyond traditional aids by connecting to a user-friendly app that transforms your walking experience.

## Why do we need this?

It's already hard enough for blind people on a day to day basis, the idea of this app is to make as much change as a simple app could possibly make. Helping users know the location of their loved ones instantly and vice versa ensuring a sense of security and connection wherever they go, helping the user stay ahead of weather with real-time forecasts delivered directly to the users ears and handy clothing recommendations depending on the occasion and weather prediction. Helping them engage in friendly conversations with our AI chat feature, providing companionship with new technology that helps AI read emotions and react accordingly. Our AI system uses your phone camera to tell you the colour of clothes, what are the items you may not be able to identify such as differentiation a deodorant can from a cleaning product or different types of food at the supermarket, gaining valuable insights while on the go.

# Abstract



**Image:** Blind person crossing the street with a cane and a companion.

**Source:** <https://www.cabvi.org/articles/what-are-the-different-types-of-white-canes/>

## Research statements

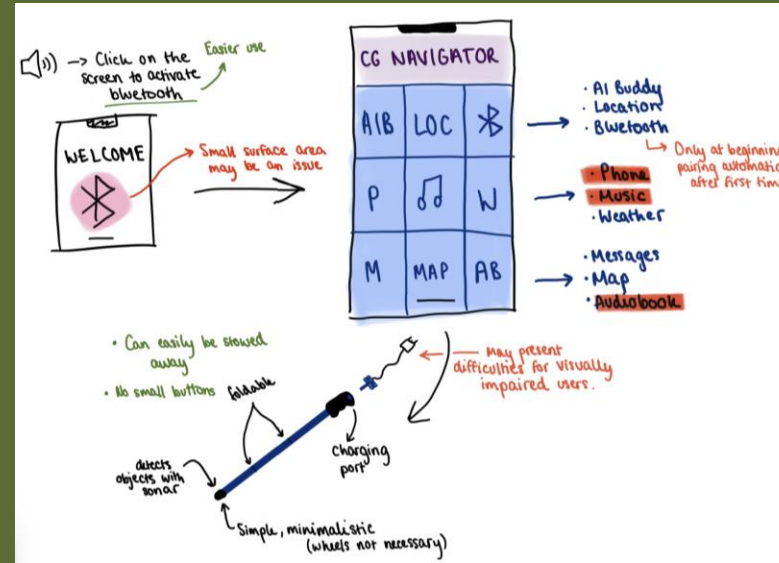
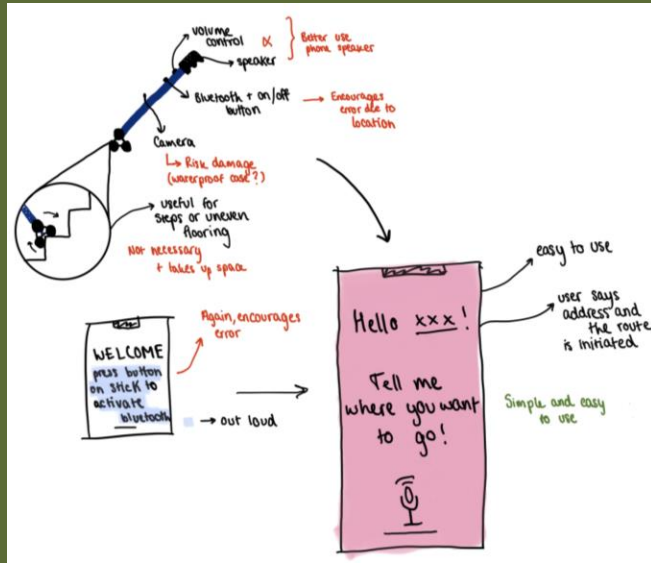
Some of the research statements that convinced me to definitely choose this as my final project are:

- 83% of information from the environment is obtained through the eyes.
- As of 2023 the WHO estimates at least 2.2 billion have a near or distance vision impairment, and in at least 1 billion of these vision impairment could have been prevented or is yet to be addressed.
- After multiple studies it has been proven that loneliness and blindness is strongly correlated even in people with low visual impairment.

## How my products works with these statements

Using echolocation to warn blind users of their surroundings through a hearing aid and connecting to google maps to help guide them through the streets, helping keep company and warnings about the weather forecasts and creating a community so people do not feel so alone.

# Iterative design



## NIELSEN'S 10 HEURISTICS:

### 1 - Visibility of system status

On the family and friends interface, you are here indicators show where you are and where your loved ones are, doesn't really apply to the VI (Visually Impaired) interface.

### 2 - Match between system and the real world

App will be programmed to be able to speak in Spanish, English, French, Arabic, Portuguese, Russian, Hindi, Chinese, Hindi, Bengali, Japanese, German, Italian, Turkish, Korean and Vietnamese to try and suit as many users as possible. Language will be kept basic and any directions or instructions will be given before starting the task.

### 3 - User control and freedom

Since the app will be voice controlled all the user has to do is tell the app to which page they want to go and the app will take them there.

### 4 - Consistency and standards

There is one home page and each function/subsection has their own interface and each interface is designed to be as simple as possible.

### 5 - Error prevention

To try and prevent errors the voice will also repeat the page/direction/command to the user to confirm the action.

### 6 - Recognition rather than recall

User will not have to recall anything, the app is equipped with some of the best AI so that even if they don't give the exact command, AI will suggest what they could be trying to say.

### 7 - Flexibility and efficiency of use

Users can set up certain keywords to create shortcuts such as 'Buddy take me home' for a quick way to initiate the route home.

### 8 - Aesthetic and minimalist design

Design is simple, no unnecessary links or icons.

### 9 - Help users recognize, diagnose and recover from errors

If users commit an error, the app will explain why they can't do that action or will tell them if something is missing to complete that action.

### 10 - Help and documentation

The app should be simple enough for a visually impaired person to set everything up on their own, but should they have any issues there is also documentation that comes with the cane that explains everything in detail and provides an emergency/help email and phone number

# Application prototype

Welcome page for first...

## WELCOME

Blind User



Guest User

Guest user is for friends, family, caretakers... to communicate with their loved ones through text, getting notified in case of emergency, also being able to locate them. If the user chooses this option text-to-speech would be disabled.

connect app to stick



Guest user

### Friends and Family

Phone number:

07962 399662

Name (Messages will be announced with this name):

Jane Doe

Notifications:

This means you will be notified when your friend/family leaves/enters home. Message notifications and emergency situations.

☐ off

Continue

In the proposal for my innovative accessibility app, I would include a free screen reader that significantly improves the user experience for visually impaired individuals making the text-entry touchscreen optional.

The app allows users to connect their smart canes seamlessly via Bluetooth by telling the user to tap the top of the cane once charged and a simple 'touch anywhere on the screen'. Due to the diverse needs of our users, the app incorporates subtle colors for those with partial visual impairment. To sustain the app's operations with no charge, we propose integrating non-intrusive ads.

Blind user homepage

## Hello, Jane!



MESSAGES

AI Buddy

Find my cane

Weather

Family and friends hom...

CG Navigation



MESSAGES

DONATE NOW

THIS IS AN AD FOR MEN.

CG Navigator thanks you for helping

We also aim to include a donation option, allowing users to contribute voluntarily to either the app's development or support blind people charity associations. The chat section plays a crucial role, fostering a sense of community through multiple group chats, promoting social interaction and addressing feelings of loneliness from visually impaired/blind individuals.

On the right is an image of what would happen once the blind users click on to activate the bluetooth, emitting at the same time a beeping sound that increases in frequency when closer to the stick, and says how far away and in which direction to move.

Cane stick finder

3 m

# Application

## AI buddy

Buddy

Ask a question...

This app, mainly for blind users introduces various subsections to enhance their daily lives. The first subsection, only included on the blind users interface, features an artificial intelligence 'buddy' which is connected to the mobiles camera. This intelligent companion employs image recognition technology to identify products, read labels, and even discern prices while navigating the aisles of a supermarket. What we're most excited about is its integration of a cutting-edge emotion recognition system, enabling it to understand the user's feelings allowing it to have a tailored conversation according to the user's needs. The second subsection offers a comprehensive weather app designed to provide an hour by hour forecast, ensuring users are prepared for changing weather conditions while also suggesting suitable outfits based on the forecast. These subsections exemplify the app's commitment to inclusivity and personalized user experiences.

**Image: (bottom right corner)** iPhone location app  
**Source:** iPhone weather app screenshot

# Prototype

## weather



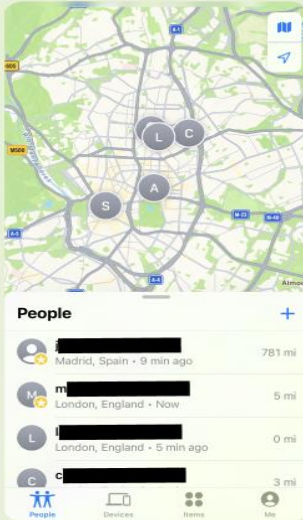
**Image:** Weather forecast prediction  
**Source:** iPhone weather app screenshot

This app also has two additional subsections to enable seamless communication and safety for users of all abilities. The first interface offers a chat portal designed for both disabled and non-disabled users. For those with visual impairments, messages are read aloud into their earpieces, but first they will be notified of the message, giving the opportunity for them to listen instantly or later on. Moreover, the system includes a safety feature that calls certain contacts established by the user in case of emergency. Guest users can enjoy the chat portal without the text-to-speech feature, ensuring broad usability. The second subsection introduces a location tracker, providing a valuable tool for both disabled and non-disabled users. Loved ones can easily track the location of their visually impaired family members and disabled users can receive via audio the whereabouts, know if they are on the move and mode of transport. Importantly, our app respects privacy by allowing users to toggle this feature on and off at their discretion, ensuring a balance between connectivity and personal space for all users. These features exemplify the app's commitment to inclusivity, safety, and functionality for disabled users.

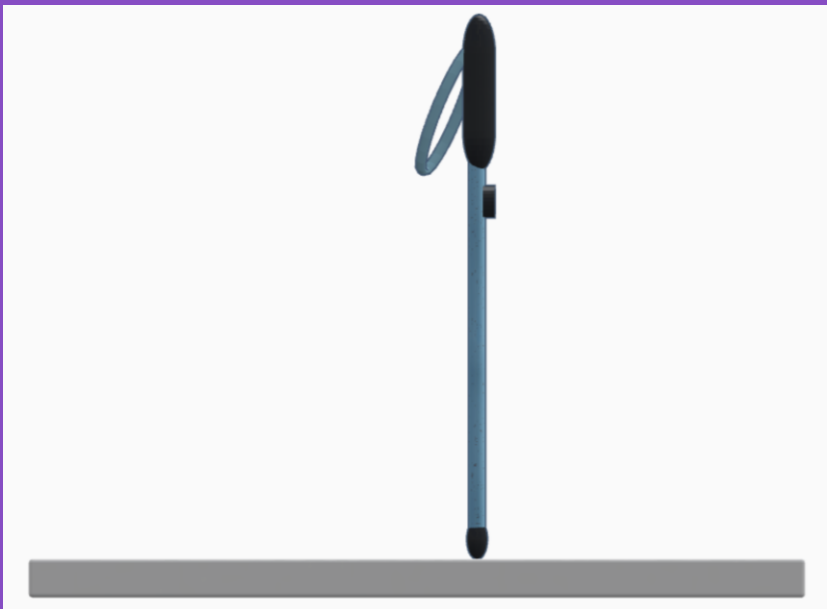
## messages

- AA MUM
- AA DAD
- CHARLIE

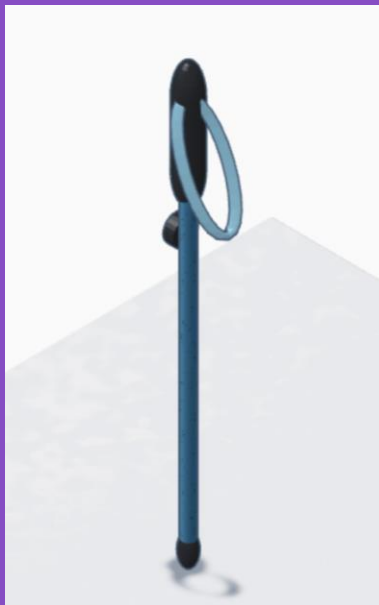
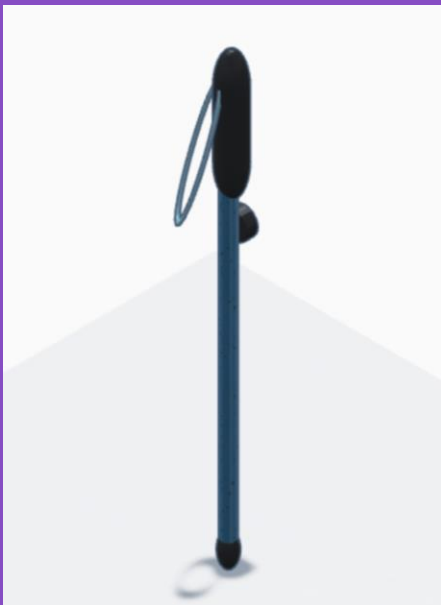
## location







CANE NS 3165



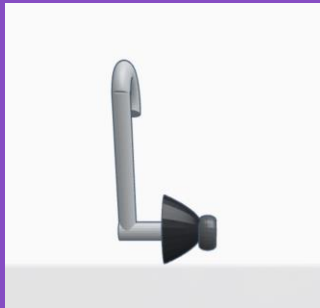
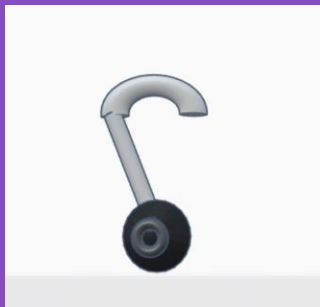
# Walking stick + Earpiece

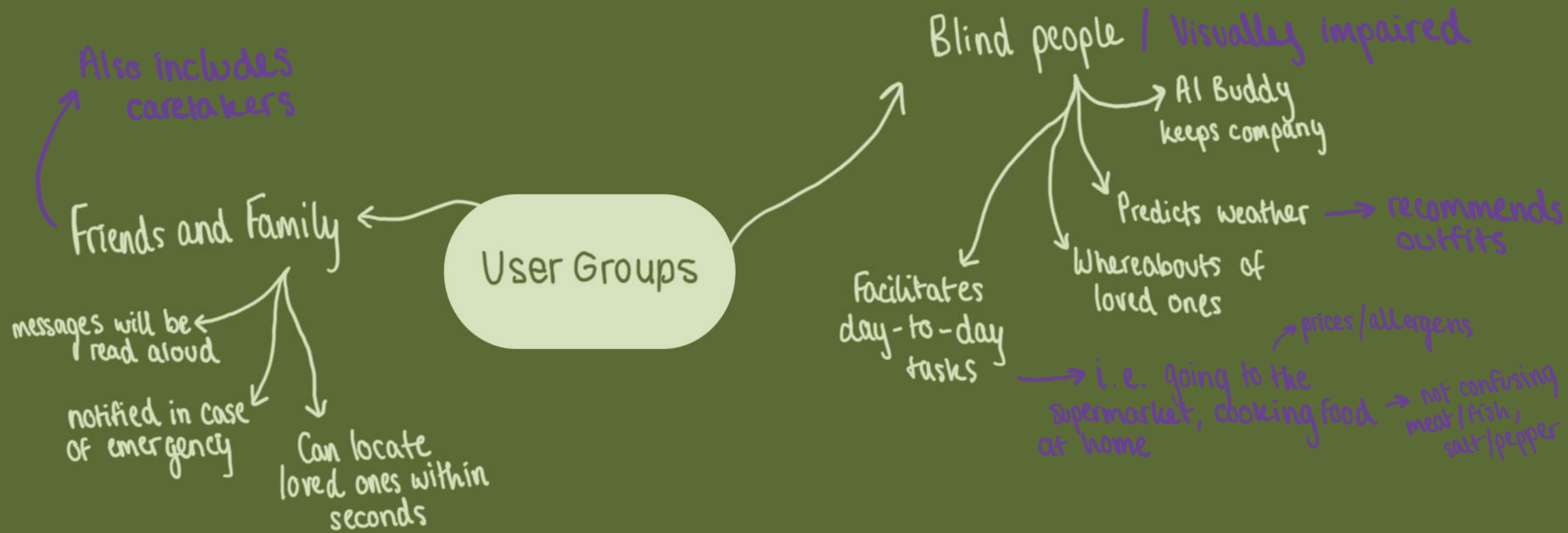
## THE CANE -

The cane accompanying this comprehensive accessibility app integrates technology to enhance the mobility and safety of visually impaired users. At the cane's tip, a strategically placed button with a large surface area, facilitates connection to the app. Once set up, this button becomes the initiation button for routes, users will say the location they wish to go to out loud, the ear-piece repeats the location and asks for confirmation and then the user can initiate the route anytime they want by pressing the button. The stick's tip is equipped with sonar technology, providing help by warning users of steps ahead or obstacles in their path. To improve navigation with minimum effort, the stick vibrates at every change of direction, providing haptic feedback for a more intuitive walking experience. In the event the user cannot find the cane, an in-built alarm can be activated, aiding users in locating their walking stick. Additionally, the cane's foldable design ensures convenience, allowing users to easily stow it away when not in use or in situations where mobility aids may not be required. This multifunctional walking stick exemplifies a thoughtful fusion of technology and practical design, addressing the diverse needs of individuals with visual impairments.

## THE EARPICE -

The accompanying earpiece serves as a critical component in the user's interaction with the app, providing discreet and personalized assistance. When inserted into the user's ear, the earpiece detects its location, automatically turns on, and pairs seamlessly with the app. This optional addition minimizes disturbance to others and ensures the user can navigate crowded and loud spaces with optimal hearing. The earpiece complements the cane's directional cues by verbally articulating direction changes when the cane vibrates, improving the user's spatial awareness. Messages received through the application are managed taking into account the user's preferences. The earpiece notifies the user of incoming messages, it proceeds to offer the option to read them aloud immediately or at a more convenient time. Recognizing the common challenge of forgetting messages, especially without visual reminders, the headset periodically reminds the user of unread messages, offering a practical solution to improve communication and information retention for the visually impaired.





## User groups

The app quite clearly caters to blind or visually impaired individuals, which according to a report from the WHO as of October 2017 there is an estimated 36 million (blind) and 217 million (visually impaired) individuals and as of 2023 the global number for both combined sums up to a 2.2 billion total, with at least 1 billion cases that could have been prevented or are yet to be assessed. The other possible group of users for this app are the friends, family and caretakers of the disabled users. Hoping to help calm the loved ones by keeping track of their location and facilitating communication while also facilitating and encouraging users to support non-profit organizations and this app.



# Improvements

# Discarded ideas

# Final prototype

This app, although being a breakthrough in technology it is catered to a niche group as although it affects billions of people, it is still only a 3.44% of our population as of 2018. Despite this app being able to improve billions of peoples lives, it doesn't take into account other disabilities, as people who are for example - visually impaired and deaf people would not be able to use this app. Furthermore, the setting up is designed to be as simple and easy as possible but still may require some external help, such as plugging in the charger or getting used to the stick and opening it/closing it. The biggest issue about this product would be the fact that even though the app may be free the walking stick isn't and would probably be costly due to the cutting-edge technology implemented, although there is a fund set up for people to donate, either to our company or an NGO, our company would use that money to maintain the app and give as many discounts possible or maybe even give some out for free to people more in need.

## 1 - HCI systems for blind users

- CG Nav, the final option I decided on.

## 2 - Natural gesture or speech HCI

- A home device that uses natural gestures and speech to control various home appliances.

## 3 - Interactive exhibitions in museums

- An exhibition that uses AR to superimpose digital content on top of physical objects, for example showing a 3D model of a dinosaur when a fossil is scanned by the camera.

## 4 - Storytelling using XR technologies

- Gives a visual of stories setting while incorporating elements/obstacles in the room as fictional obstacles e.g. if a story is set in the forest and there is a chair in the way it may be portrayed as a tree stump. Some stories are already set-up but you can also personalise.

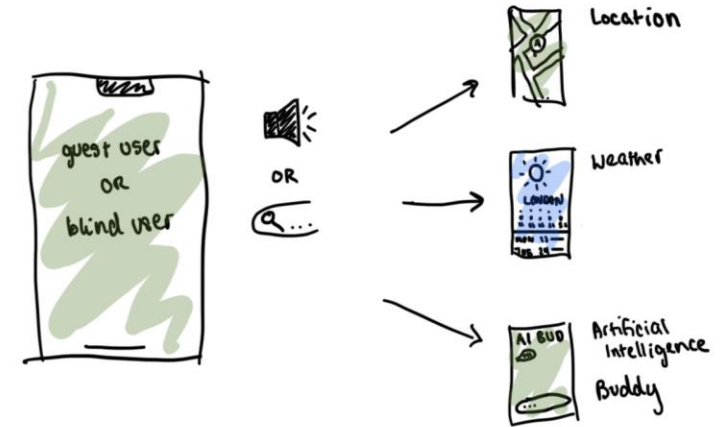
## 5 - Designing Assistive HCI for older adults

- An app that provides help to older adults (could also possibly be useful to other user groups) to manage their medication.

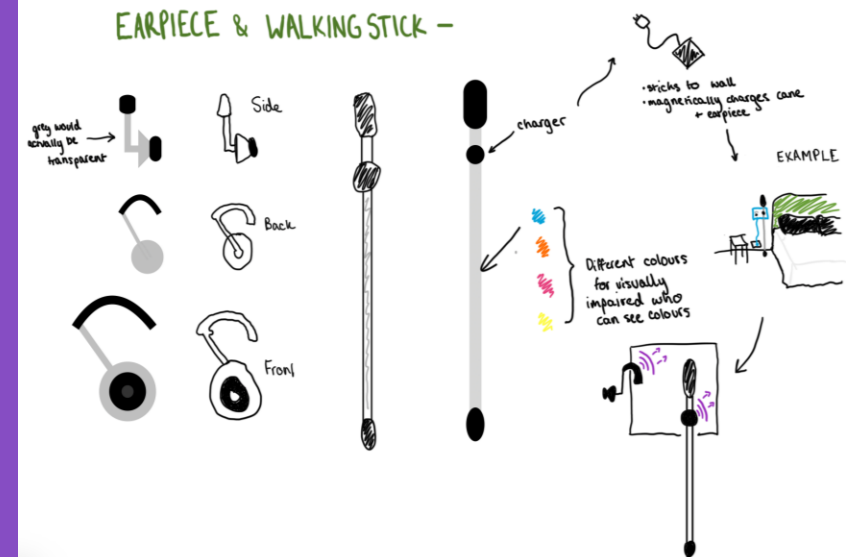
## 6 - Art and HCI

- A digital art installation that uses HCI (Sensors, gaze-based interaction...) to create art based on the users movements and maybe also include haptic feedback.

## APP DEVELOPMENT -



## EARPIECE & WALKING STICK -



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