SCOUT

Luke Becker

University of Cincinnati

Senior Capstone

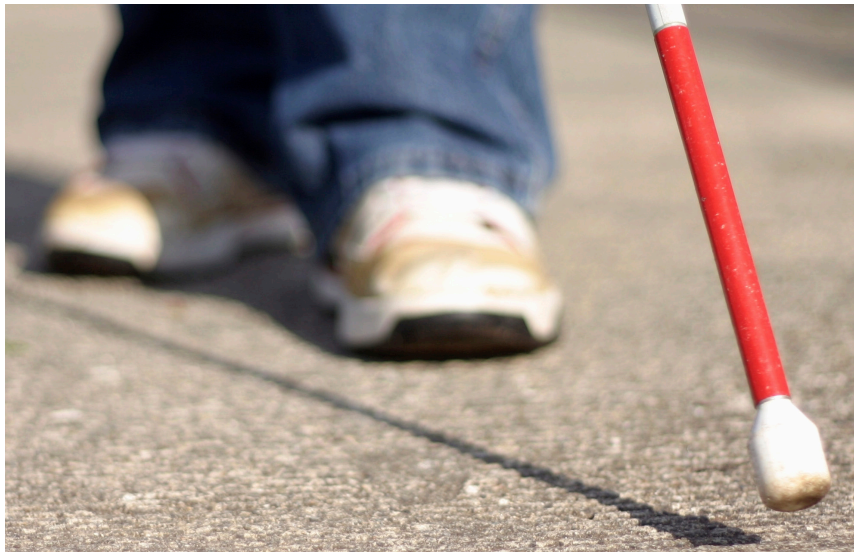
TABLE OF CONTENTS

INTRODUCTION

This capstone project brought something that I am passionate about and something I fear into the same arena. Through years of exercising and weightlifting, I have gained an appreciation for movement and bodies in motion. This was something I wanted to apply to a passion project.

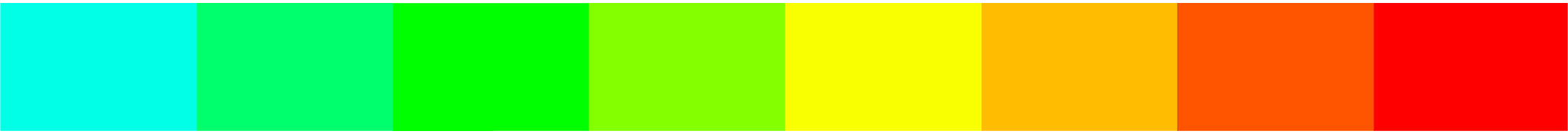
Blindness is a personal fear of mine and it was something I wanted to learn more about. From gaining more of an understanding of visual impairments, I grew to appreciate life from another perspective. These past few months were a humbling experience.

PROBLEM STATEMENT



People who become visually impaired tend to struggle to regain their confidence, particularly with their mobility. This lack of confidence leads to inactivity, which can increase the risk of numerous chronic illnesses.

UNDERSTANDING VISUAL IMPAIRMENTS



When understanding visual impairment, the first thing to know is that it is a spectrum. From someone who has to wear contacts, to someone who has complete vision loss, no visual impairment is alike. Vision loss can be congenital, or can be developed later in life. The cause of vision loss can range from an accident to macular degeneration, which is the most common. Regardless, when visual impairments are realized, there is typically a grieving process when someone begins to coup and move on with their life without vision.

INITIAL INVESTIGATION

My journey started in the summer of 2017 when I first reached out to the Cincinnati Association for the Blind and Visually Impaired. I got in contact with Chuck Gieger, a recruiter who gave me the essential materials in order to learn more about visual impairments. This included pamphlets, web resources, and other print materials to give me a foundation of knowledge to be able to further my research.

This initial networking led me to Brendan Devine, a mobility specialist who planned the 2017 Paralympic Day at LeBlond Community Center in Cincinnati. This was an introduction to understanding some of the ways people with visual impairments exercise. Some of the sports that were included at the event were goalball, wheelchair basketball, and kickball. This sports were participated by athletes with varying disabilities.

Participants playing goalball, a paralympic sport for athletes with visual impairments.

INITIAL RESEARCH FINDINGS

14 Million people in the United States have self-reported visual impairments.

24%

Of children and adolescents with visual impairments are classified as active.

50+

82% of the visually impaired are 50 years of age or older.

Exercise for aging adults is known to postive cognitive benefits.

PRE-CAPSTONE REFLECTIONS

How will I be able to share my thought process with someone who has vision loss?

Will I be able to make the product usable for both blind and low vision users?

Will the product give someone more confidence?

CAPSTONE SEMESTER

PHASE ONE: RESEARCH

RESEARCH PHASE: Interviews

Chuck Gieger - *Cincinnati Association for the Blind and Visually Impaired*

Brendan Devine - *Cincinnati Association for the Blind and Visually Impaired*

Dave Perry - *World Blind Union*

Mike Nooner - *Illinois Center for Rehabilitation*

RESEARCH PHASE: Interview Findings

When becoming visually impaired, regardless of age, it is all about regaining your confidence.

Educating and bringing awareness to both sighted and unsighted people is key.

People with visual impairments need friends, partners, and/or support system that gives them the push to be active.

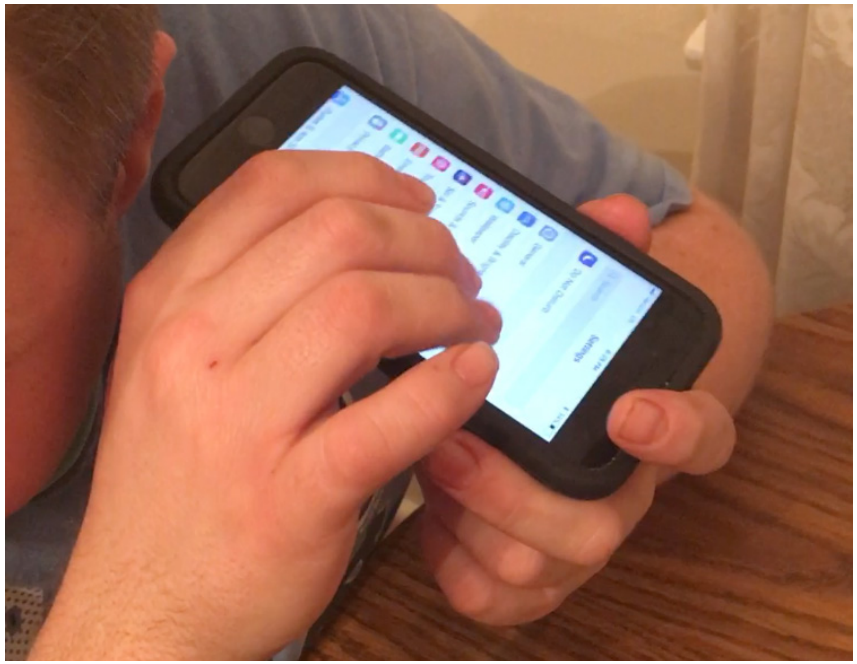
Smart phones are a critical part of everyday life.

RESEARCH PHASE: Interview Analysis

From the beginning, I had the concept of exercise for people with visual impairments set in my head. However, I was uncertain how exactly most people typically exercised. During the interview phase, I spoke with people to get a better understanding.

Based off of the interviews, I was told that the most common form of exercise for people with visual impairments is typically **walking**. From here, the next step was to take a closer look at what were common struggles and obstacles to overcome when going for a walk.

RESEARCH PHASE: How It's Done Today



Walkthrough of using a smart phone

In order to get a better understanding as to how someone with visual impairments gets around, I went out for a walk with Dave Perry to understand how he utilizes his smart phone and his cane.

This was when he showed me how he used Google Maps to help direct him while using his walking cane. He utilized his mobility training to help him cross the street.

Using navigation apps to get around

RESEARCH PHASE: Walking Concerns

There are concerns about safety (street crossings, construction areas, strangers, etc.)

You want to walk with confidence.

Awareness of addresses is very important.

Being about to count street blocks is useful.

CAPSTONE SEMESTER

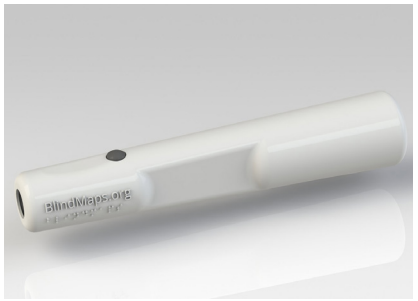
PHASE TWO: CONCEPTUALIZATION

CONCEPTUALIZATION: Design Goals

Design to ***motivate*** and ***promote*** people with visual impairments to be active.

Design to assist ***mobility***.

CONCEPTUALIZATION: Benchmarking

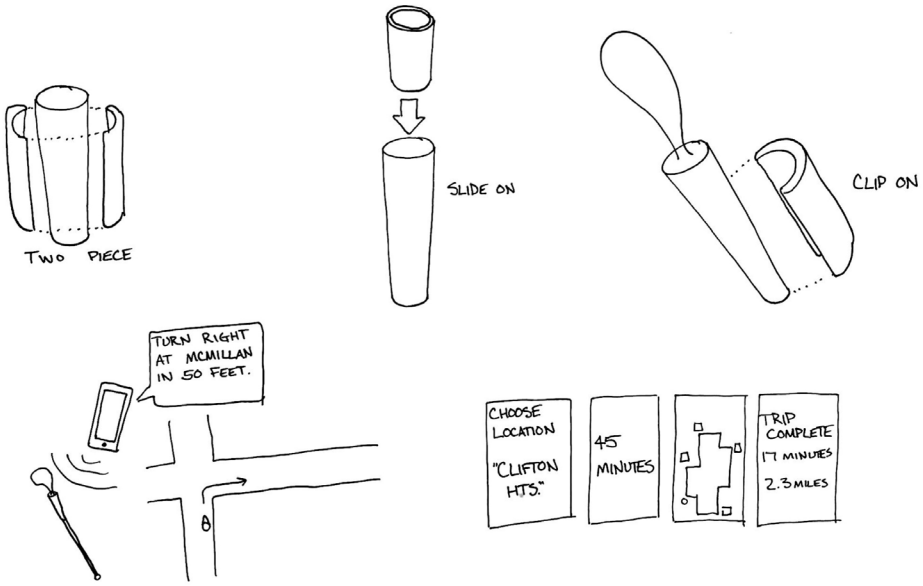


BlindSquare | *BlindMaps* | *Smart Canes*

	BlindSquare	BlindMaps	Smart Canes
Navigation Features	✓	✓	✗
Safety Features	✗	✗	✓
Hands Free	✗	✓	✓

The current market for products that assist people with visual impairments that assists them with mobility is fairly limited. Many of these items are inaccessible due to high prices.

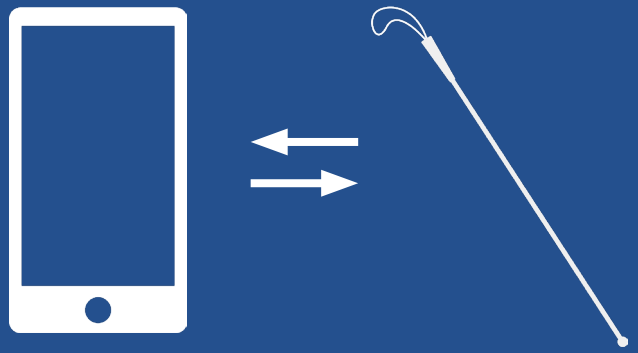
CONCEPTUALIZATION: Ideation

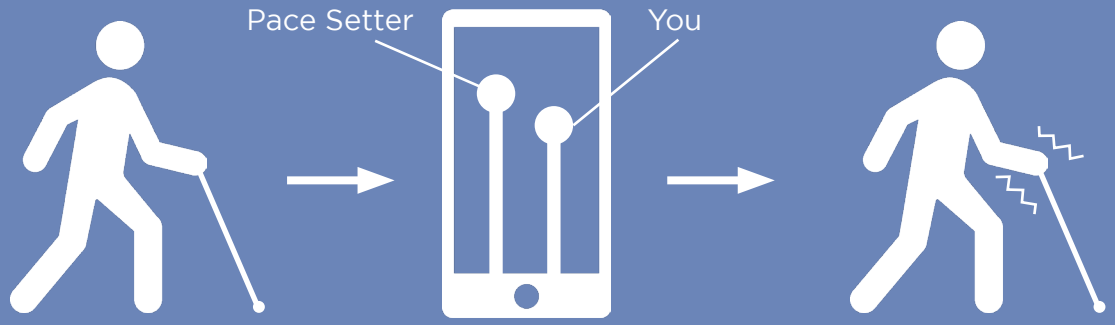


The concept would have to center around a common item that a person with visual impairments would have. A white walking cane is a fundamental extension to a person. Implementing Scout to a can could be a catalyst to change.

CONCEPTUALIZATION: Initial Walking Companion

Phone syncs up with cane



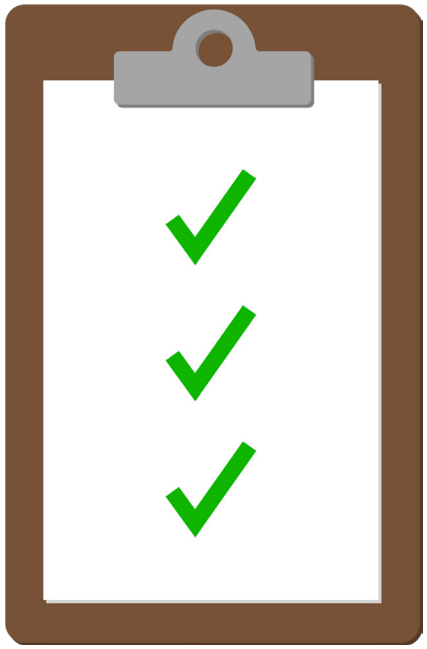


When falling behind the pace, a vibration will be felt, prompting the user to speed up to complete the task.

This can be a device that connects everyday items such as a smartphone and walking cane. It can give someone that “push” that is needed even when a physical companion is unavailable.

Users can select if they desire to be in the “company” of a supporter or a competitor. This collaboration can make even the most basic of task such as picking something up from the grocery store, and turning it into a training session.

CONCEPTUALIZATION: Need for Feedback

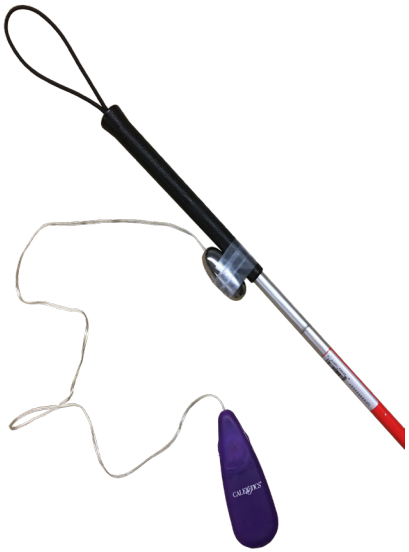


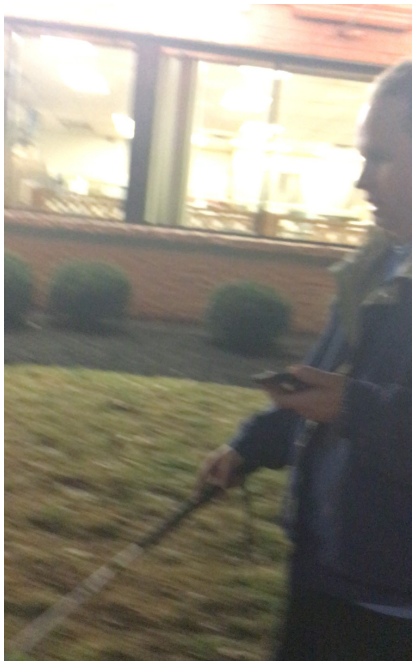
From here, I would need to go out and test the concept with users. To do that, I would first need to figure out how the concept would be presented, and ***how*** I would gauge feedback. I also would need to make sure that I would get feedback from enough people to further validate my concept.

CAPSTONE SEMESTER

PHASE THREE: VALIDATION

VALIDATION: Initial Testing





After coming up with the initial concept, I first tested out the idea of haptic feedback. I wanted to see what a user's initial reaction to it would be. Would it encourage them to pick up their pace?

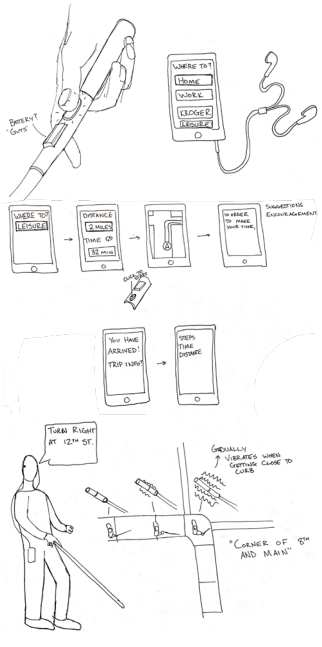
I rigged up a hand held massager to a walking cane to test it out. When walking out in the street with Dave, I turned the knob to apply more and less of a vibration. We used a similar route as when we did when we went for our initial walk.

VALIDATION: Initial Feedback

The original idea of using haptic feedback to make the user speed up was shot down immediately. This was due to issues with safety. I was told there could be issues around construction sites and intersections. If you're walking ***too*** confidently, then there could be careless mistakes along the way.

However, what was mentioned is that the haptic feedback gave him more of a sense of caution. When the vibration came on, his reaction was to initially slow down, as if there was a curb or walkway coming. This was it clear that haptic feedback could be utilized, but as more of a safety feature.

VALIDATION: Refined Concept Testing



Notes from the validation.

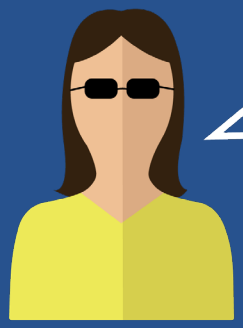
I further validated the concept after a goal ball practice where I walked the participants through the process of getting from point A to point B. I used my notes to be able to give them clear detail.

I also had the participants hold a walking cane with a mocked up device onto the handle that was 3D printed. This would give them the idea as to how small it would be and also where they would be interacting with it.

VALIDATION: Feedback

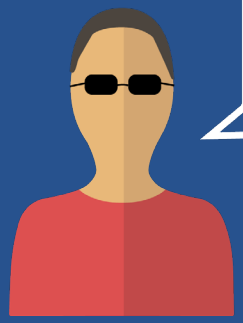
"Safety is a critical part of the project. All elements should be considered throughout."

Richard



"Can this also be beneficial to people with low vision?."

Mariah



"I'm curious what the marketing strategy for this would be."

Mike

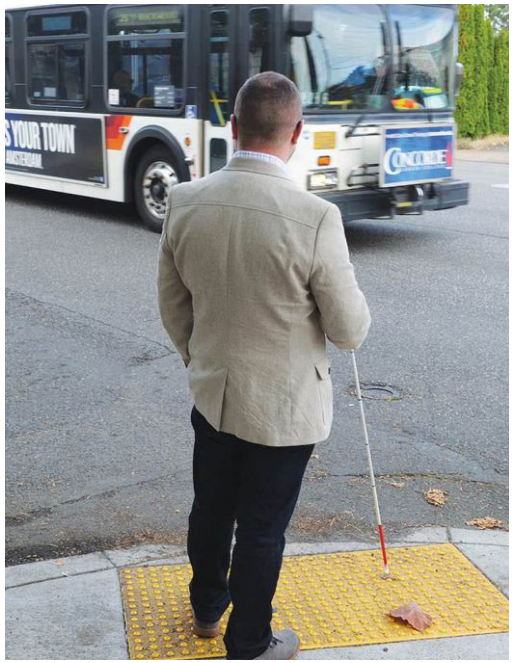
"Identification for the device would be nice in order to not get mixed up with others."

Amy

"It can have educational value too."

Brendan

VALIDATION: Analysis



General reception was ***positive***.

The importance of remembering your ***street corners*** was reaffirmed.

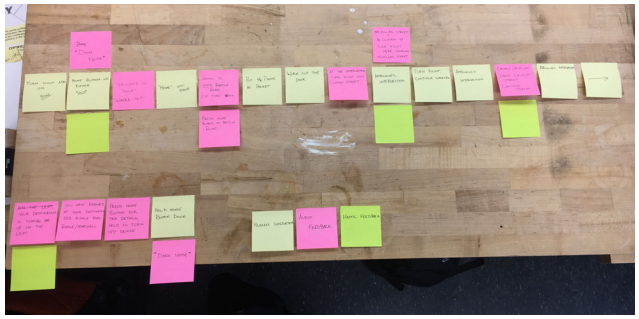
Identification could be critical, especially in cases where multiple people with visual impairments are together.

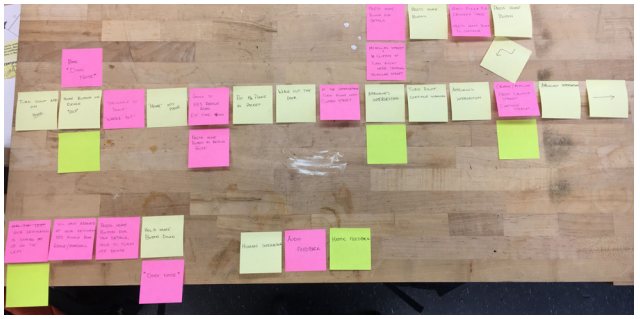
CAPSTONE SEMESTER

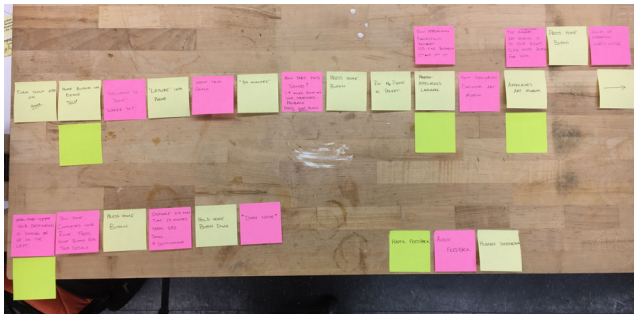
PHASE FOUR: FINAL CONCEPT

FINAL CONCEPT: Walkthrough Scenarios

The initial walkthroughs of the device were done by using Post-it notes. A key aspect of Scout's design is that the user does not need to use their phone while out. These walkthrough exercises were used to make sure that could be done smoothly by only using one interaction on the device.







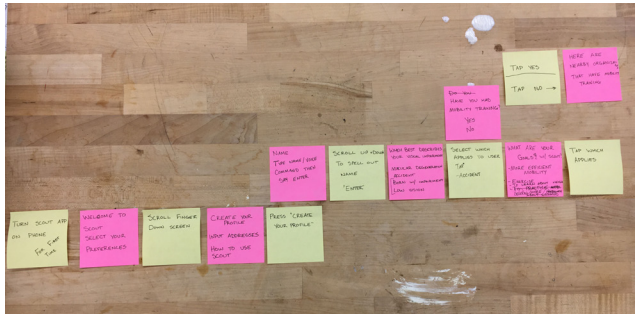
Human Interaction

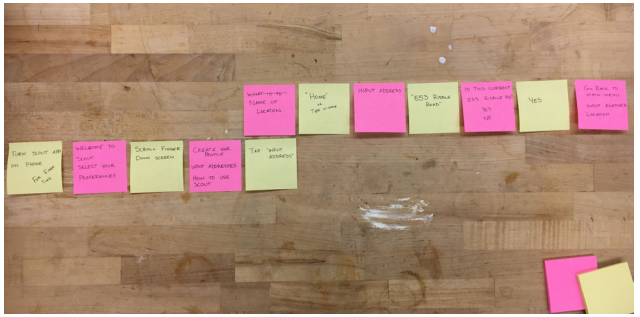
Audible Feedback

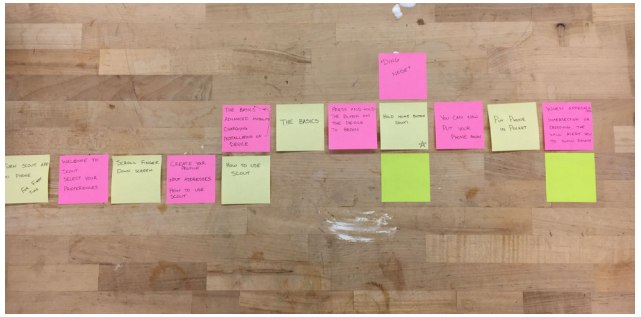
Haptic Feedback

FINAL CONCEPT: Setup Scenarios

Some other features were initially tested such as creating your profile, inputting addresses, and initial instructions as to how to use Scout. Most of this would be done via the user's smart phone.





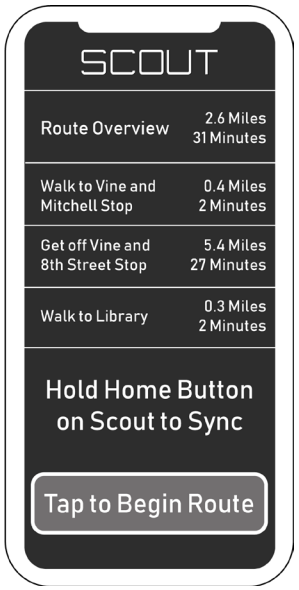


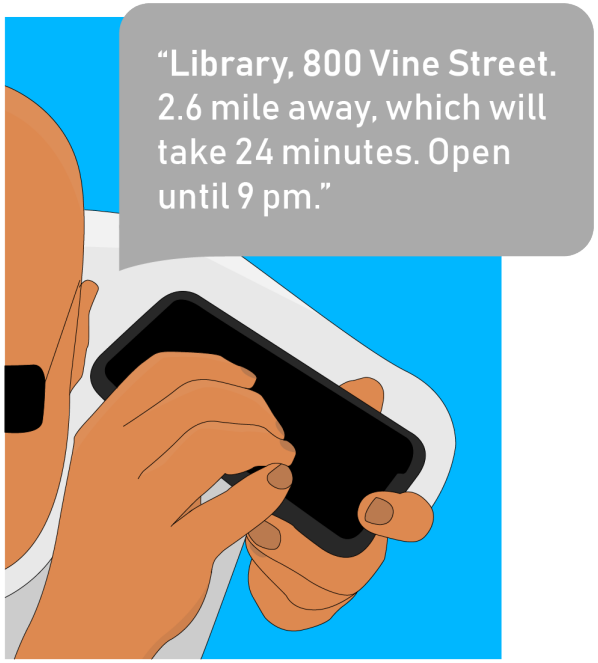
Human Interaction

Audible Feedback

Haptic Feedback

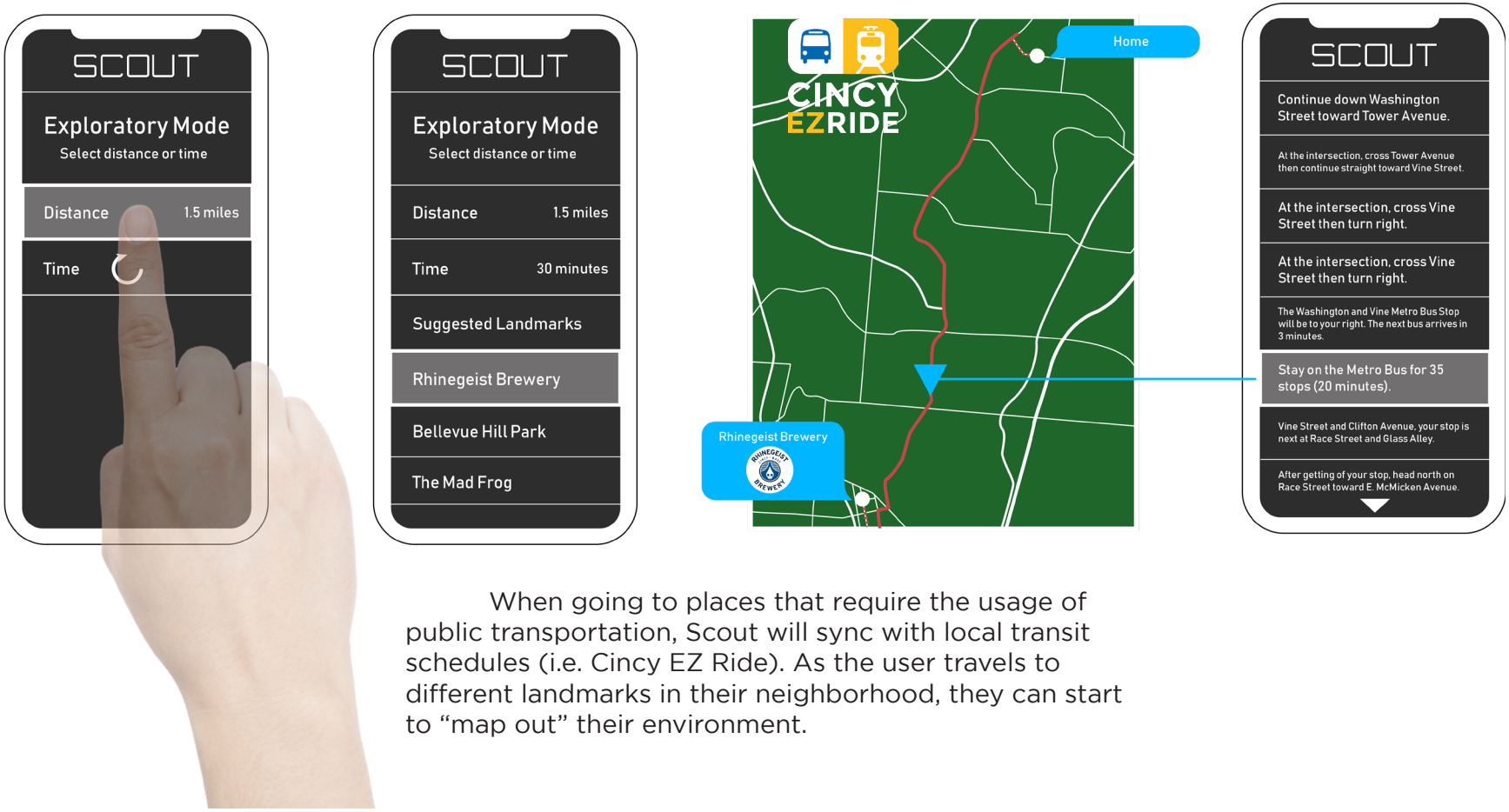
FINAL CONCEPT: The App





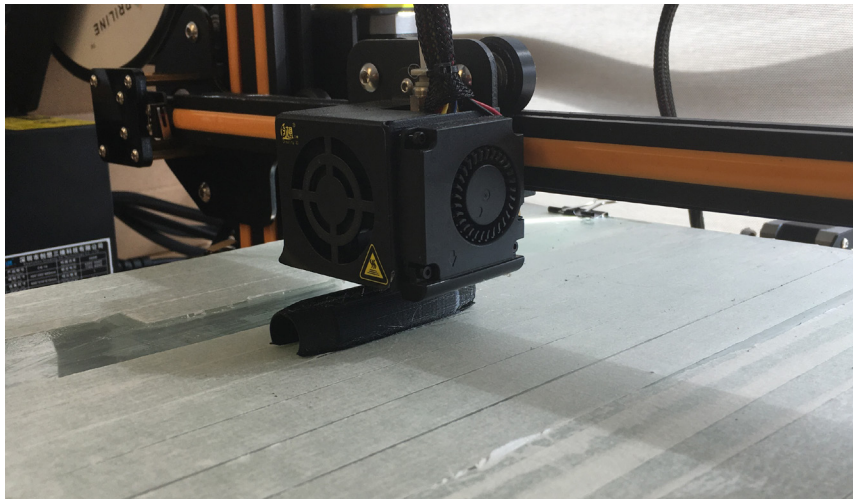
When the user becomes accustomed to using Scout, they can start to discover new places and neighborhoods based off of selected proximity and travel time.

FINAL CONCEPT: Exploratory Mode



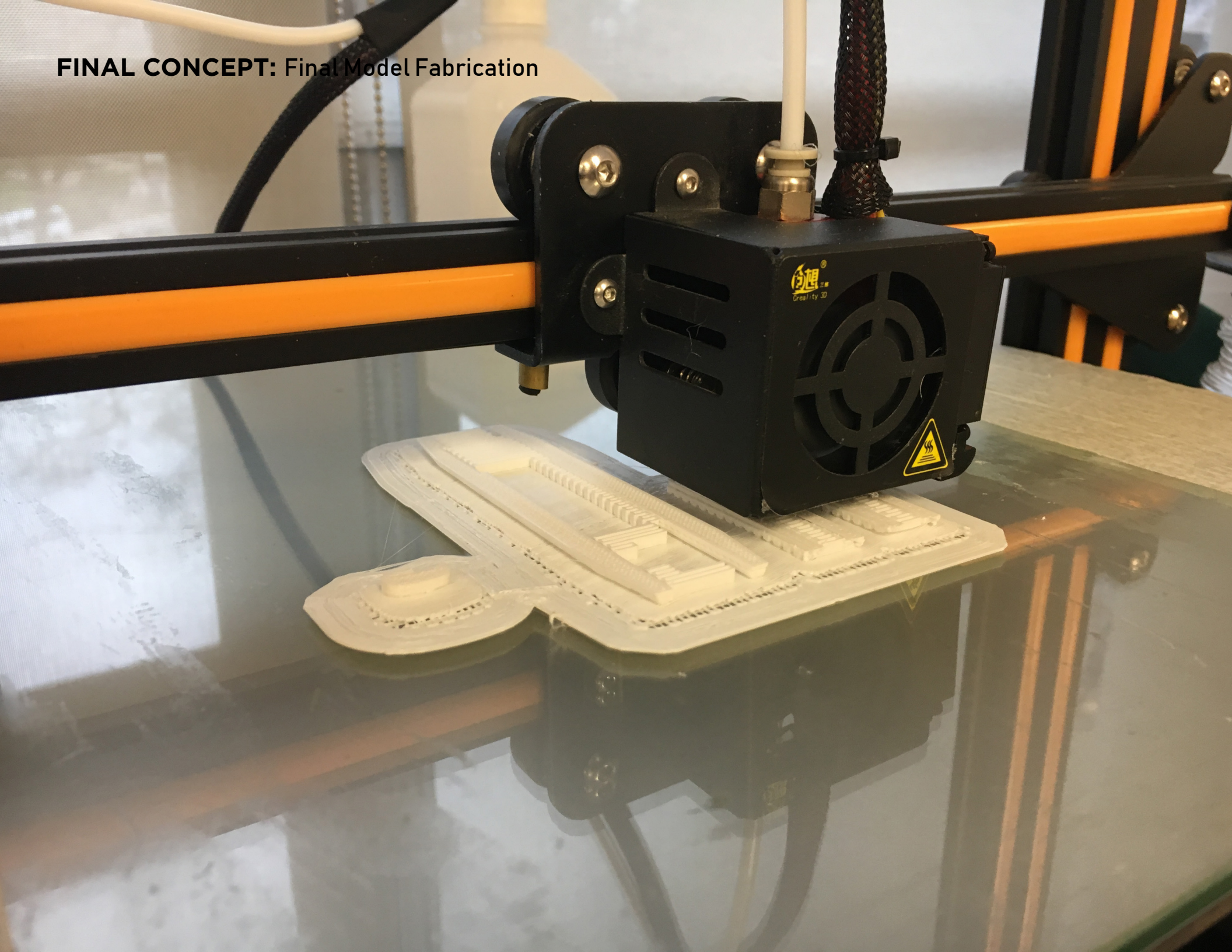
When going to places that require the usage of public transportation, Scout will sync with local transit schedules (i.e. Cincy EZ Ride). As the user travels to different landmarks in their neighborhood, they can start to “map out” their environment.

FINAL CONCEPT: Model Material Testing

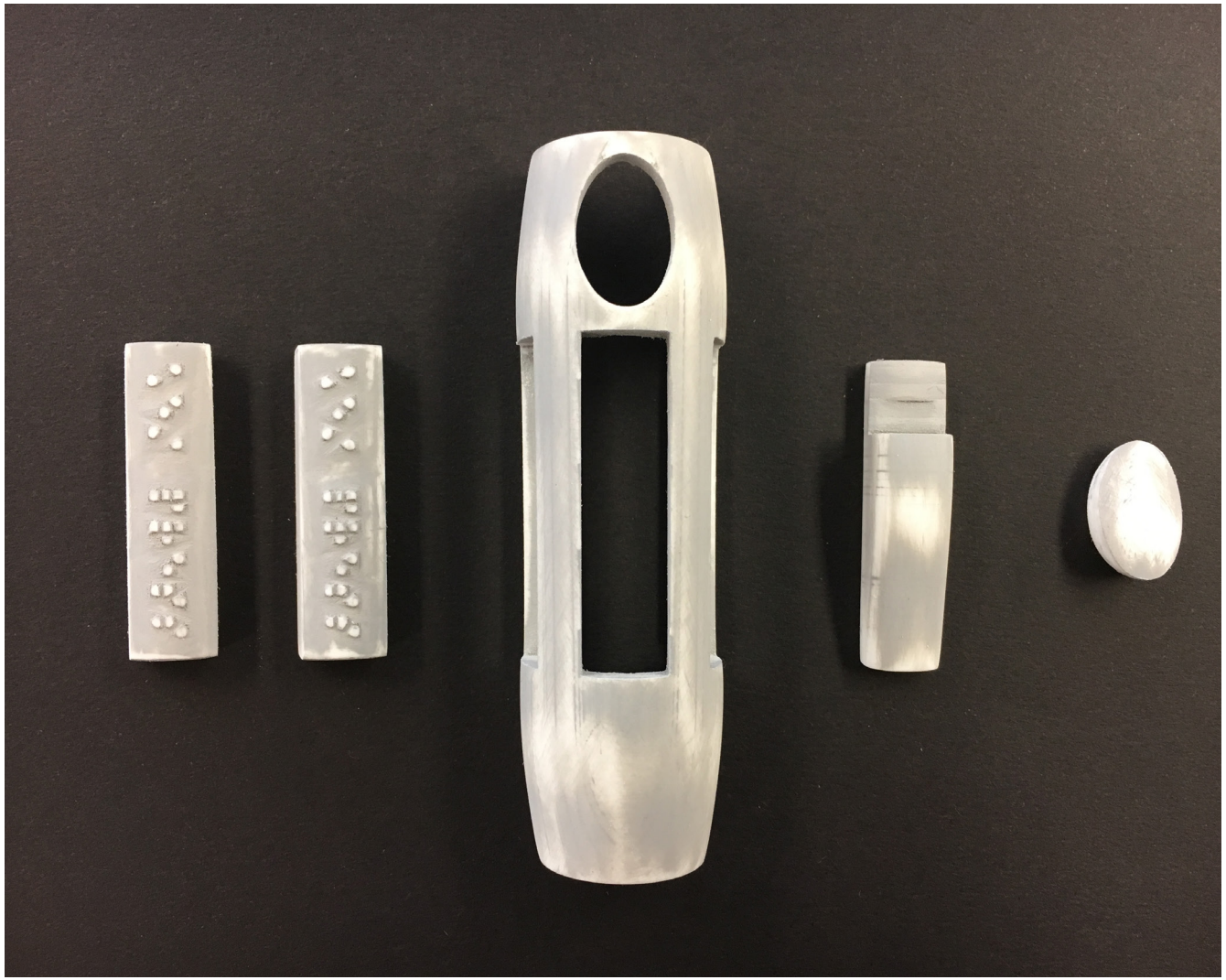


Initial material testings with PTEG, a flexible plastic were unsuccessful due to to brittleness. This led to landing on using PLA for the final material. The final would be split into six pieces: the main body, two side panels, the charging port, and the button.

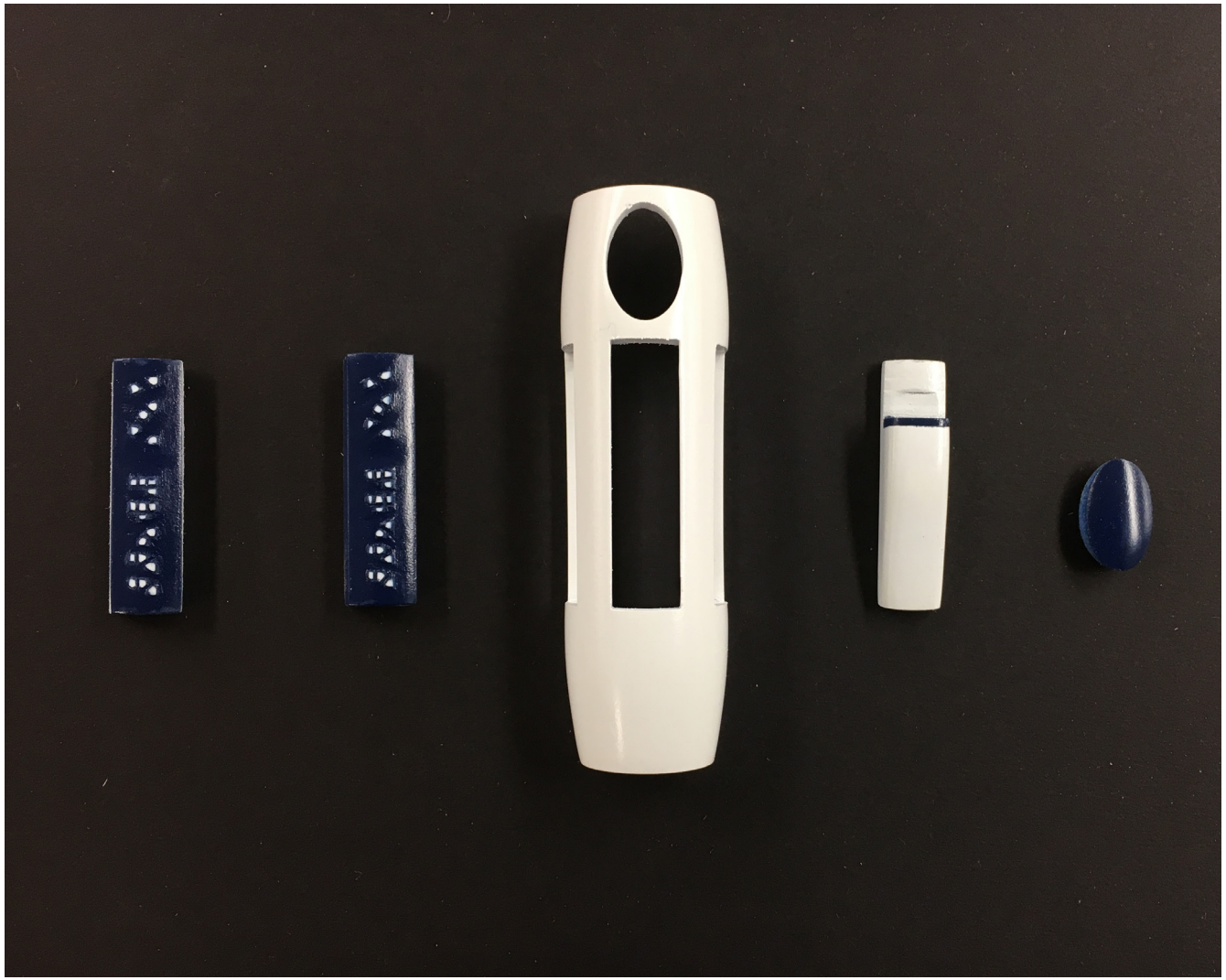
FINAL CONCEPT: Final Model Fabrication



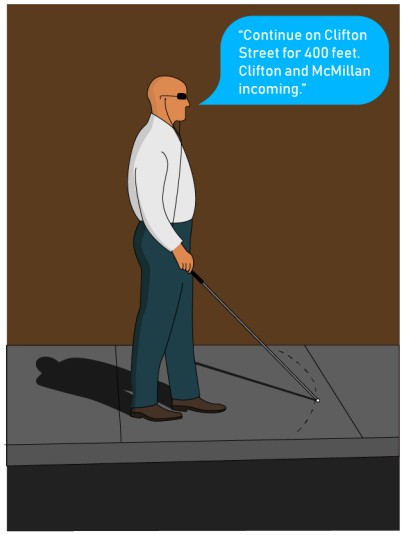
FINAL CONCEPT: Final Model Fabrication



FINAL CONCEPT: Final Model Fabrication

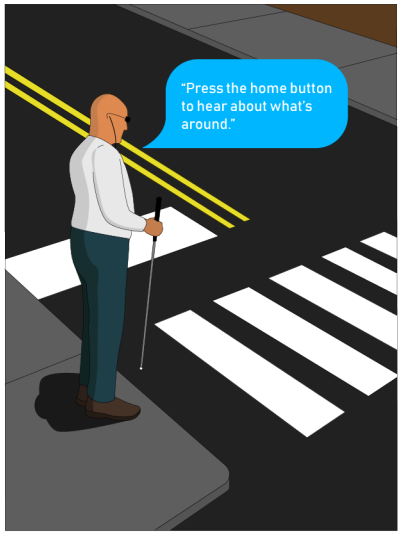


FINAL CONCEPT: Walkthrough

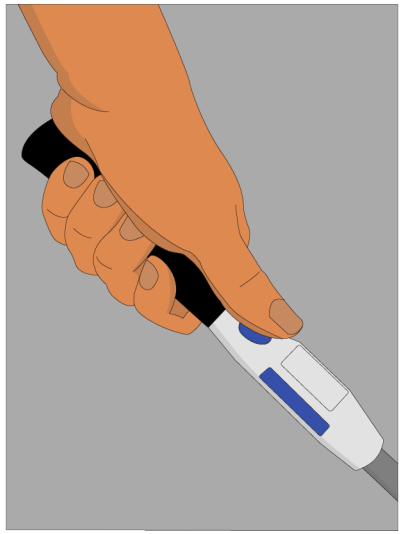


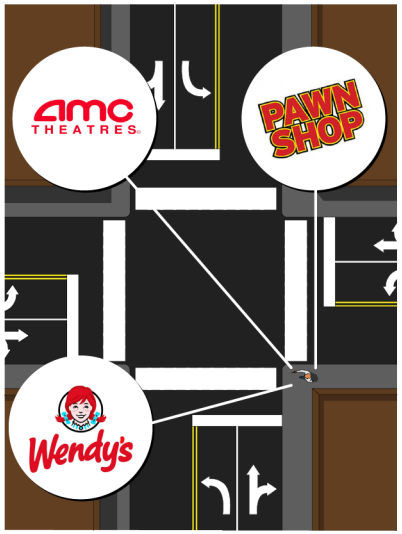
Audible directions guide the user.

Audible and haptic feedback alert the user of incoming crosswalks and street crossings.

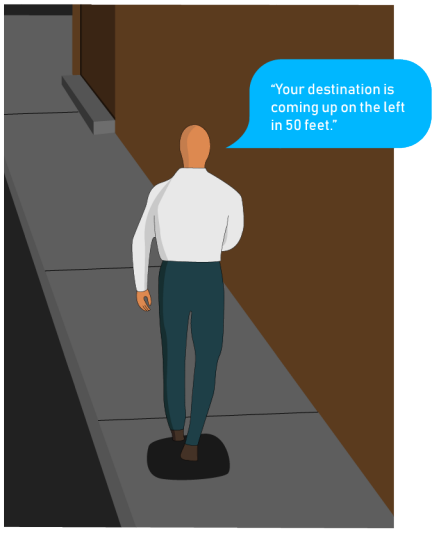


When at an intersection, the user can be notified what is in the nearby area.

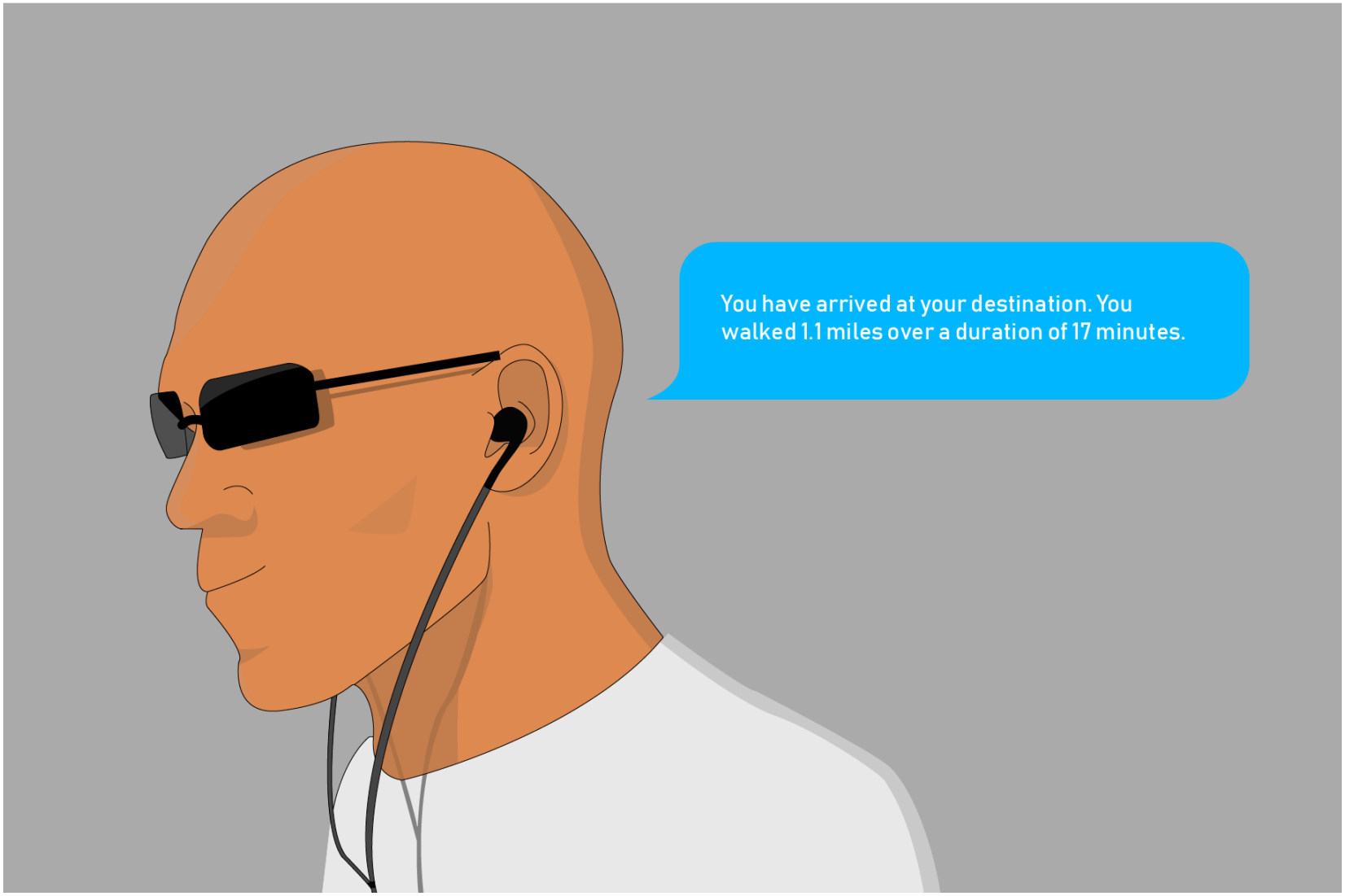




Scout will read out nearby points of interest.



FINAL CONCEPT: Walkthrough



When completing a route, the user gets an overview of the trip.

WORKS CITED

Capella-McDonnall, Michelle. “The Need for Health Promotion for Adults Who Are Visually Impaired.” *Journal of Visual Impairment and Blindness* 101.3 (2007): 135. Web. 25 July 2017.

Cincinnati Association for the Blind & Visually Impaired. Web. 25 July 2017.

“National Data.” *Centers for Disease Control and Prevention*. Centers for Disease Control and Prevention, 30 Sept. 2015. Web. 25 July 2017.

Taylor, Denise. “Physical activity is medicine for older adults.” *Postgraduate Medical Jounal* 90.1059 (2013): 29. Web. 25 July 2017.

Thomas, Empish J. “Have a Visual Impairment? Think Exercising Is Out of the Question? Learn How I Created My Workout Game Plan.” Web log post. *VisionAware*. American Foundation for the Blind, 22 Jan. 2014. Web. 25 July 2017.

United States Association of Blind Athletes. Web. 25 July 2017.

“Visual impairment and blindness.” *World Health Organization*. World Health Organization, Aug. 2014. Web. 25 July 2017.

Thank you to everyone who made this project possible.