CptS 484: Software Requirements

WRS Evolution

Requirements Elicitation

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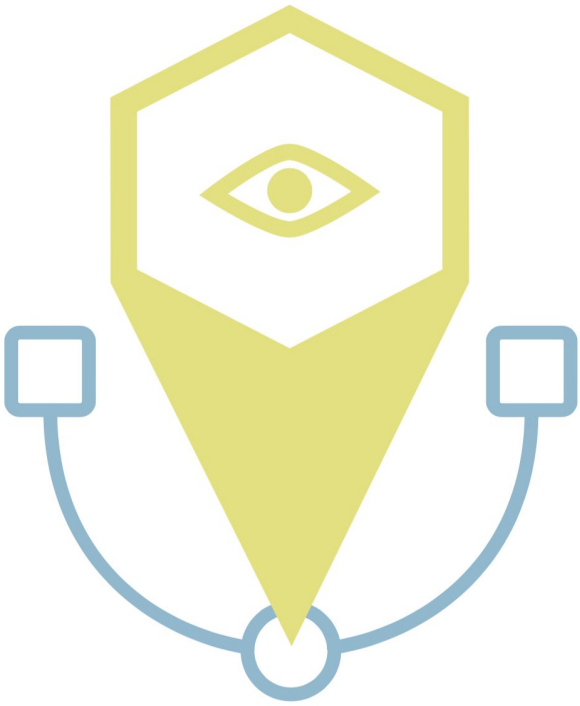

Revision History

Date	Version	Changes	Editor
09/18/19	1.0	Phase I Rough Draft	Moderamen Team
10/13/19	1.1	Phase I Final Submission	Moderamen Team
12/8/19	2.0	Phase II Final Submission	Moderamen Team

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[1] Introduction

1.1. Purpose

Navigating the world as a blind or visually impaired individual poses many problems that visually abled individuals do not experience. These problems are so prevalent that many of these visually impaired people choose to stay close to home, feeling as though the "world is not made for them"[4]. Without proper assistance, the visually impaired community struggle to ensure their safety and even risk endangering themselves when traveling through a variety of unique terrains. Some of these risks include unforeseen obstacles on the ground, doorways opening and closing, and even getting lost while trying to navigate a building. The Moderamen team wants to reduce the problems that the visually impaired community encounter while navigating the world through our user-friendly mobile application. We hope that through the use of our, alongside other effective measures, users can feel safer and more confident as they navigate through unfamiliar buildings.

1.2. Scope

Our project's scope can be broken down into the following milestones...

- Develop or use an indoor navigation API that will be the backbone of how our system gets users from point A to B.
- Create a carefully crafted GUI that is usable for any visually impaired or visually abled user. We hope to achieve this feat by...
    - meticulously designing the placement of buttons and other elements.
    - providing accessibility information about our app's user interface elements.
- Provide an VUI for a blind or visually impaired user to easily interact with our application through vocal commands and responses.

1.3. Objectives and Success Criteria

The overall objectives and success criteria for the Moderamen team would be to create a mobile application which...

- Maintains a budget of zero dollars, so that we do not need to pay for any tools or equipment we use.
- Follows the agreed-upon timeline broken down in our project specification document.
- Passes all usability tests performed, indicating that our application meets user requirements.

1.4. Definitions, Acronyms, and Abbreviations

Voice Command

Voice commands allow the user to control an application by speaking directly to their mobile devices rather than being forced to use our app's GUI; thus, giving the user hands-free control of the application.

Moderamen

Management or Direction.

Mobile App (Application)

A mobile application, most commonly referred to as an app, is a type of application software designed to run on a mobile device, such as a smartphone or tablet computer.

API (Application Programming Interface)

A set of subroutine definitions, and tools for building software.

GUI (Graphical User Interface)

A form of user interface that allows users to interact with electronic devices through graphical icons and visual indicators such as secondary notation, instead of text-based user interfaces, typed command labels or text navigation.

VUI (Voice User Interface)

Makes human interaction with computers possible through a voice/speech platform in order to initiate an automated service or process.

OS (Operating System)

An operating system is system software that manages computer hardware, software resources, and provides common services for computer programs.

API (Application Programming Interface)

A set of subroutine definitions, and tools for building software.

1.5. Overview

Our goal at Moderamen is to reduce that manifested fear of exploring new terrains for blind and visually impaired individuals by providing them with a platform that will increase the efficiency and safety of their navigation indoors. We understand that navigating indoors provides many safety concerns with obstacles such as doorways, tables, stairs, and many more; and, we hope to provide a solution to all these problems with our app, Moderamen. Our app provides both visual and vocal directions for anyone who requires assistance while navigating indoors. It will not only provide clear and precise navigation instructions but also warns users of documented obstacles that other users have logged. We hope that anyone who uses our app feels less anxiety when it comes to navigating the world and makes it to all their destinations unharmed and unphased.

[2] Preliminary Definition

2.1. Preliminary Domain

PD_ID	Preliminary Domain Description
PD1	People suffering from blindness and rely on other senses to navigate.
PD2	Caretakers setting up the application for their patient, and passerby who wish to help.
PD3	To be used in pre mapped indoor areas with an ability to map out buildings that aren't already.

2.2. Preliminary Functional Requirements

P FR_ ID	Preliminary FR Description
AR1	Generating desired sentences and representing them with text as well as associating with a sound/voice.
AR2	Recognizing vocal commands from the user and communicating the software's trouble of understanding if it cannot understand the commands.
AR3	Listing the options out for audio commands.
AR4	Having the software voice the current status of the indoor area (from a technical perspective like not supported or from physical perspective like construction today).
AR5	Be able to warn users of obstacles.
VR1	Be able to offer a visual interface for setup for caretakers/passerby.
VR2	Be able to log obstacles.
TR1	Work Offline.
TR2	Allow connection with 3rd party translation software.
TR3	Allow Routes to be added to map database.
TR4	Allow the ability to search routes.
TR5	Allow the ability to request routes.

2.3. Preliminary Non-Functional Requirements

PNFR_ ID	Preliminary NFR Description
PNR1	Generating desired sentences and translating them to interpretable commands, supporting variations of commands.
PNR2	People suffering from blindness and rely on other senses to navigate.
ANR1	To support additional languages that can be added.
ANR2	The app's voice should be clear and give easily understood commands/directions.
VNR1	The app's visual interface should be clear to users who have never seen the app before.
TNR1	Scalability so that more maps and more locations can be added/verified as time goes on.
TNR2	If routes are changed or added we should notify the users of such changes.
TNR3	The app's performance should be consistent.
TNR4	The app should always be available and maintained without shutting service down.
SNR1	The app will take the best measures possible to prevent leading users to possible harm.
SNR2	The app will not share personal identifying information. Any information shared is clearly communicated to the user.

[3] Issues with Preliminary Definition Given

3.1. Domain Issues

Domain Issue ID	Domain Issue Description	
DI1	PD_ID	PD1. People suffering from blindness and rely on other senses to navigate.
	1. Ambiguous or incomplete. What other senses are being used to help navigate	
	Option 1	Consider only using sound
	Option 2	Make the app usable by caretakers and volunteers able to assist.
	Choice	Option 1 + 2
	Rationale	Makes the scope of the project far more realized and something that can be accomplished.

Domain Issue ID	Domain Issue Description	
DI2	PD_ID	PD3. Caretakers setting up the application for their patient, and passerby who wish to help.
	2. Ambiguous: What is the background of the volunteer. Should they have access to the direct users information? Do they know how to use the app?	
	Option 1	Only allow specialized caretakers to access the app through a login
	Option 2	Make the app available to all users. Design the app for universal usability (even to those whom have never used the app before). Keep any volatile or identifying information secure and off the screen

	Option 3	Make the app usable only to the direct user through a secure login and locked/secured against all other users. Design the app to be only directly usable by those whom are visually impaired.
	Choice	Option 2
	Rationale	Provides a set user-group and determines design principles. Ex :What security should be put in place for the app, what information should be available through the app, how should usability be designed.

3.2. Functional Requirements Issues

FR Issue ID	Description	
FRI1	PFR_ID	PFR1. Generating desired sentences and representing through text as well as associating with a sound/voice.
	1. How to decide between text and sound for that particular sentence?	
	Option 1	Have all visual screen components associated with a respective text to voice capability
	Option 2	Allow the user to select text and/or visual based UI/VI at runtime.
	Option 3	Have the application play only sounds and vocal text - knowing that both visually impaired/capable can understand and navigate the application.
	Choice	Option 1
	Rationale	The application is primarily targeted towards the visually impaired and as such should be designed for their benefit. Similarly the application should be able to be easily navigated by a visually capable.

		Having both capabilities with an emphasis on vocal components provides more universal usability
Satisfied by	VNR1 and ANR2	

FR Issue ID	Description	
FRI2	PFR_ID	TR3. Allow Routes to be added to the map database.
	How will people add the maps? How will we verify the information?	
	Option 1	Allow people to add the maps through a OpenStreetMaps/Wikipedia style of verification.
	Option 2	Check that the person who submits a map to us through email is the registered landowner or a proven representative.
	Option 3	Maps will be added as the individual walks along their respective route, no login necessary
	Choice	Option 3
	Rationale	We cannot guarantee the quality of the Routes provided by non-stakeholders in option 1, however within the initial release we will not be able to add a secure login, or user-tied routes.
Satisfied by	TNR1	

FR Issue ID	Description	
FRI5	PFR_ID	TR5. Allow the ability to request routes.
	What does requesting mean in this context?	
	Option 1	A request is a route that the user has personally request.
	Option 2	Allow the user after searching the ability to request the same route if it wasn't in the database.
	Choice	Option 2
	Rationale	This allows the users to be easily able to request something important like a route without having nested functions.
Satisfied by	TR4	

FR Issue ID	Description

FRI3	PFR_ID	VR2. Ability to warn users of obstacles that could impede the users pathway or lead to harm.
	What is defined as an obstacles? How will the app know there are obstacles?	
	Option 1	Objects are defined as anything that is not part of a recognized hallway minus people. Objects are inputted by the users or landowners.

	Option 2	Objects are defined as anything in the hallway that is not registered in the map minus people. App will use a camera held by the user to detect objects.
	Choice	Option 1
	Rationale	The application is designed to be used within the buildings that have mapped out Routes saved. When a user recognizes that there is an unlogged obstacle then they can add it to the buildings Routes to warn other users.
Satisfied by	AR5 + TR3 + VR2	

FR Issue ID	**Description**	
FRI4	PFR_ID	TR4. Allow the ability to search routes.
	How can we search something as vague as a route?	
	Option 1	Create a fixed form to be made.
	Option 2	Allow abstract definitions
	Choice	Option 1
	Rationale	By having a definition of a route be fixed, like start, end we can create a fixed way of making sure that each route has a clear defined way.
Satisfied by	AR5 + TR3 + VR2	

3.3. Non-Functional Requirements (NFR) Issues

NFR Issues ID	Description	
NFI1	PNFR_ID	ANR1. To support additional languages that can be added.
	Domain too large: What languages should be supported?	
	Option1	Allow connection with a 3rd party translation app for a larger variety of languages
	Option2	Translate only popular languages
	Option3	Add only english in initial deployment
	Choice	3 (with possibility of 1 in later updates)
	Rationale	Offloading translation capabilities to a 3rd party software saves time and money for the project and allows more varied usability for the user-base. Additionally costs are kept low as any language updates are done on the end of the 3rd party software. However, this will not be possible in the initial release - the initial prototype will have english only.
Satisfied by	ANR1	

NFR Issues ID	Description	
NFI2	PNFR_ID	SNR2. The app will take the best measures possible to prevent leading users to possible harm.
	Vague: What harm is meant? How does the application keep users from harm? How 'able' must the application be to avoid harm to the users.	

	Option1	Prevent harm to the users by recognizing paths with high variability and/or calculated risk and warning the user.
	Option2	Only guiding the user through paths that are well-understood or tested by the software.
	Option3	Provide more robust algorithms that are able to more readily guide users through high-risk paths.
	Option 4	Require the user to agree to terms of service that warn the user of the app limitations.
	Option 5	Add a feature for users to log route dangers and obstacles.
	Choice	4 + 5
	Rationale	We cannot implement the necessary functionality to allow for automatic obstacle detection, however we can implement a volunteer obstacle logging system. Because the application is lacking is said functionality, we will notify the users upon downloading of the dangers.
Satisfied by	VR2	

NFR Issues ID	**Description**	
NFI3	PNFR_ID	VNR1: The app's visual interface should be clear to users who have never seen the app before.
	Vague: What is defined as clear? How will it be judged as clear?	
	Option1	Clear will be defined by user experience testing.
	Option2	Clearness will be defined as having all the functionality of the application visible and not hidden/nested

	Option3	It will be clear by relying on similar UIs of popular applications.
	Choice	Option 1 and Option 2
	Rationale	Since the person who uses the application will not be able to communicate what visuals of the application looked like, the application should not have nested functionality or rely on popular UIs so that the caretaker could understand eventually just by reading the application.
Satisfied by	VR1	

NFR Issues ID	Description	
NFI4	PNFR_ID	ANR2: The app's voice should be clear and give easily understood commands/directions.
	Vague: What is defined as clear? How will it be easily understood?	
	Option1	Use the voice of a commonly trusted voice tool. Developers define the voice as easily understandable.
	Option2	Test by using User Experience testing to see what is defined as clearer.
	Option3	Let the User access the help/audio command menu at any time.
	Choice	Option 1
	Rationale	Sound is going to be the most important part of the application, if the sound can not be understood by the user than the application will lose its main purpose. That being said, voice tools currently on the market are highly reliable and should perform pur requirements. Developers can test and choose the best voice tool.

Satisfied by	AR1-AR5

[4] WRS

4.1. W

4.1.1. Problem

Problem ID	Problem Description	Corresponding Goals
P1	People with imparied sight have trouble navigating through indoor areas.	G1, G5
P2	Areas can fluctuate between good or bad internet connection.	G2
P3	Some areas may not be mapped out, including rooms, hallways or entire buildings.	G1, G55
P5	Unforeseen changes to building layout may occur.	G4, G5
P6	Others might need to assist our visually impared user.	G6
P7	Building owners will want to register their buildings in our application.	G7
P8	People may not want their travel information shared	G8

4.1.2. Goals

Goal ID	Goal Description	Backward Traceability	Forward Traceability
G1	Our application allows users with imparied sight to navigate through supported indoor areas.	P1	ID1, FO1, FO2, SH3

G2	Our application should not be hindered in it's functionality by internet connection.	P2	NFO1,FO4
G4	The application should help users even with unsupported areas.	P5, P3	FO2,FO6
G5	Our application should detect obstacles not listed in a buildings routes. (i.e. boxes on the floor or wet floor warnings)	P1, P3	NFO2
G6	Our app should also provide a nice UI for those who want to help our visually impared users navigate our app without voice commands.	P6	SH2
G7	Our app should be able to process new building routes when a building owner wants to include their building within our database.	P7	SH1
G8	Our application will not threaten the privacy of its users.	P8	NF07

4.1.3. Understanding of Objectives, Domain & Stakeholders

Improved Understanding of Domain, Stakeholders, Functional & Non-Functional Objectives

4.1.3.1. Improved Domain

Improved Domain ID	Improved Domain Description
ID1	Allow users to navigate indoor in supported buildings through navigation API.
ID2	Allow users to add new buildings to our database by creating routes for them.
ID3	Users with impared vision will experience easier navigation through buildings.

ID4	Caretakers will be able to more easily assist their visually impared dependents.
ID5	Building owners can acquire more visitors through improved accessibility.

4.1.3.2. Stakeholders

Stakeholder ID	Stakeholder	Description	Related problems	Related Goals
SH1	Building Owners	People who own building will need to provide a routes of their buildings to enable our application to assist visually impared users to navigate their buildings. If they do not provide our application with routes, then users will still be able to register a building routes themselves through our app.	P1, P3, P5, P7	G7, G5
SH2	Caretakers	Caretakers will need to be able to use our app in cases where the voice commands are having issues or just to increase speed of navigation.	P6	G6
SH3	Visually Impared	Those who are visually impared will be our main users and will use our application to navigate a building with more ease.	P1	G1
SH4	Developers	Developers who are involved in the design, implementation, maintenance, and deployment of the application.	P1-P7	G1-G7

4.1.3.3. Improved Functional Objectives

Based on the above information and our goals, the functional objectives of Moderamen are:

Improved FR Objective ID	Objective Description	Alleviates Problems	Achieves Goals
FO1	The application's features should be fully accessible without sight. (i.e. Voice Commands)	P1,P3,P5	G1
FO2	The application should have building routes that navigate indoor areas, and notify user when the application does not have a valid routes or changes to old routes.	P1,P3	G1
FO3	Application can be used without voice commands. (i.e. has a UI).	P6	G6
FO4	The application will enable users to log potential obstacles, not included in routes, so that other users can be aware of potential hazards in their pathway.	P3, P5	G4, G5
FO5	Application should maintain navigation instructions even if network connectivity is lost.	P2	G2
F06	Allow the user to request and search maps in the database	P3	G4

4.1.3.4. Improved Non-Functional Objectives

Improved NFR Objective ID	Objective Description	Alleviates Problem	Achieves Goal
NFO1	Application's performance works regardless of internet.	P2	G2

NFO3	Application increases efficiency of navigation for our visually impared users.	P1	G1, G5
NFO4	Application properly interacts with users through voice commands	P1	G1
NFO5	Application provides easy to use visual interface.	P6	G6
NFO6	Application is scalable to changes in the amount of routes stored.	P7	G7
NFO7	Users identify and other personal information will not be shared without notice to user beforehand.	P8	G8

4.2. RS

4.2.1. Functional Requirements

FR ID	Description
FR1	If a user makes a sound to the system, the system shall make a sentence from the detected sound. Along with voicing any changes to the application.
Satisfies Functional Requirement Issue	FRI1
Satisfies Objectives	FO1, FO3, FO4, NFO4, NFO3
Satisfied by prototype feature	Voice

FR ID	Description
FR2	The Application will support Routes to be added to a database
Satisfies Functional Requirement Issue	FRI2

Satisfies Objectives	FO2, NFO6
Satisfied by prototype feature	Map/Map Database

FR ID	Description
FR3	The Application will provide users the ability to add unlisted obstacles to the building's routes so that other users traveling that same way can be warned of potential hazardous obstacles in their pathway.
Satisfies Functional Requirement Issue	FRI3
Satisfies Objectives	FO6,NFO3
Satisfied by prototype feature	Obstacle Logging

FR ID	Description
FR4	The Application will have full functionality offline, being online only updates routes database and voices any changes to current routes.
Satisfies Objectives	FO2,FO7
Satisfied by prototype feature	Online Functionality

FR ID	Description
FR5	The Application will provide a UI for its caretakers/passerbys.
Satisfies Objectives	FO5

Satisfied by prototype feature	UI

FR ID	Description
FR6	The Application will allow the ability to search and request a route.
Satisfies Functional Requirement Issues	FRI4,FRI5
Satisfies Objectives	FO6
Satisfied by prototype feature	UI

4.2.2. Non-Functional Requirements

NFR ID	Nonfunctional Requirement 1	
NFR1	The system can assess risk using logged obstacles not already included in the routes.	
Operationalized Functional Requirements	OFR1	Assessing risk algorithm.
	OFR2	Voicing the results of the risk algorithm.
Satisfies Nonfunctional Requirement Issue	NFI2	
Satisfies Non-functional Objective	NFO2,NFO3	
Constrains	FO2, FO6	
Satisfied by prototype feature	Obstacle Logging by Users	

NFR ID	Nonfunctional Requirement 2

NFR2	The application's functionality will all be visible from the screen shown to a caretaker/passersby.	
Operationalized Functional Requirements	OFR3	One Screen UI
Satisfies Nonfunctional Requirement Issue	NFI3	
Satisfies Non-functional Objective	NFO5	
Constrains	FO2, FO5	
Satisfied by prototype feature	Main View	

NFR ID	**Nonfunctional Requirement 3**	
NFR3	The application will use a voice software that gives instructions that are tested to be clear.	
Operationalized Functional Requirements	OFR4 OFR5	Connected to Speech API Have the voice voice the response.
Satisfies Nonfunctional Requirement Issue	NFI4	
Satisfies Non-functional Objective	NFO4	
Constrains	FO1, FO2, FO3, FO4	
Satisfied by prototype feature	Voice	

NFR ID	**Nonfunctional Requirement 4**

NFR4	The application's functionality is not limited by internet.	
Operationalized Functional Requirements	OFR6	None
Satisfies Non-functional Objective	NFO1	
Constrains	F07	
Satisfied by prototype feature	N/A	

NFR ID	**Nonfunctional Requirement 5**	
NFR5	The application will not share info and protect the info of its users.	
Operationalized Functional Requirements	OFR7	All information will be temporary/not stored.
Satisfies Non-functional Objective	NFO7	
Constrains	N/A	
Satisfied by prototype feature	N/A	

4.2.3. Specifications

Functional Specification ID	**Functional Requirement**
FS1	If a textual sentence is entered to the system, the system shall make a sound corresponding to the input sentence.

Satisfies Functional Requirement	FR1
Satisfies Objectives	FO1
Satisfied by prototype feature	Voice

Functional Specification ID	**Functional Requirement**
FS3	Whenever the Application goes offline, let the user know.
Satisfies Functional Requirement	FR1
Satisfies Objectives	FO4
Satisfied by prototype feature	Voice, Internet connectivity.

Functional Specification ID	**Functional Requirement**
FS4	Support routes being added along with verification.
Satisfies Functional Requirement	FR2
Satisfies Objectives	FO2
Satisfied by prototype feature	Database

Functional Specification ID	**Functional Requirement**

FS5	Voice any changes to old routes, or if routes is not found
Satisfies Functional Requirement	FR2
Satisfies Objectives	FO2
Satisfied by prototype feature	Voice/Database

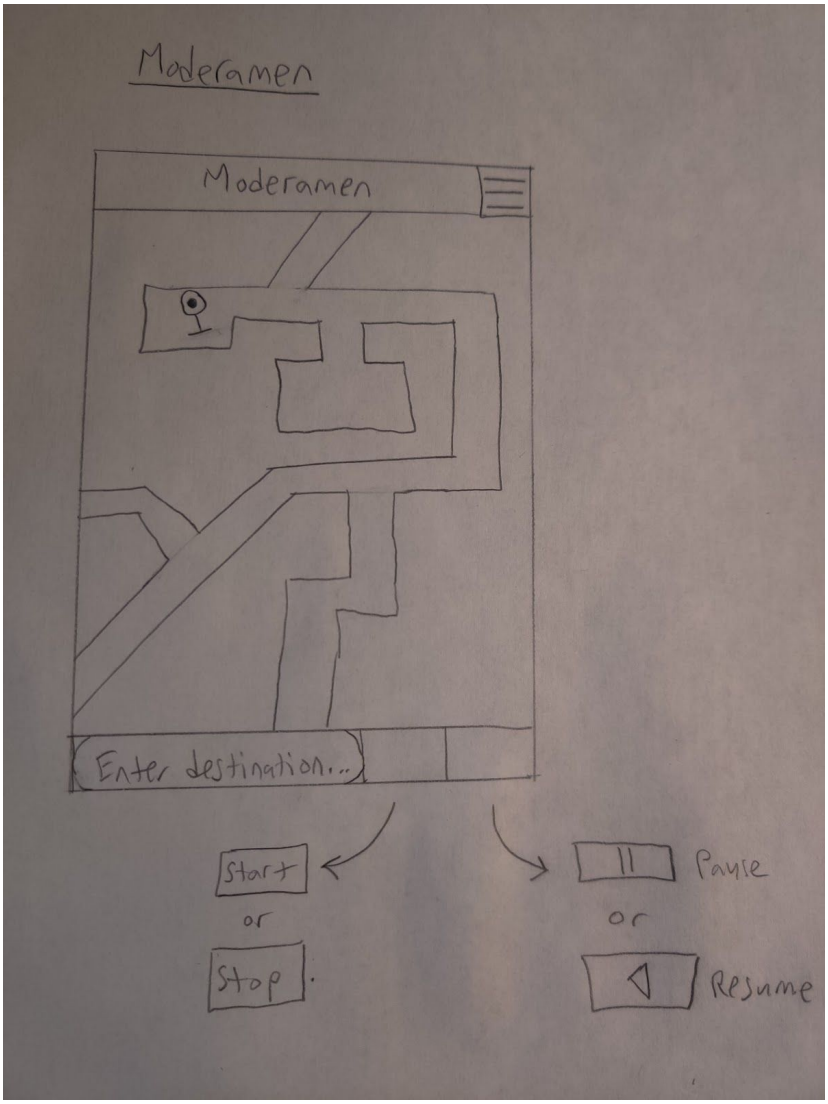
Functional Specification ID	**Functional Requirement**
FS6	When the logged obstacles are forthcoming, it will let the user know of any objects in the hallway and voice them.
Satisfies Functional Requirement	FR3
Satisfies Objectives	FO6
Satisfied by prototype feature	Voice/Obstacle Logging

Functional Specification ID	**Functional Requirement**
FS7	When the application goes online, update the Route database
Satisfies Functional Requirement	FR4
Satisfies Objectives	FO2, FO7
Satisfied by prototype feature	Voice/Obstacle Logging

Functional Specification ID	Functional Requirement
FS8	Display a UI on the main screen.
Satisfies Functional Requirement	FR5
Satisfies Objectives	FO5
Satisfied by prototype feature	Screen

Functional Specification ID	Functional Requirement
FS9	Have a search bar to search database and a request database
Satisfies Functional Requirement	FR6
Satisfies Objectives	FO6
Satisfied by prototype feature	Screen

[5] Phase I Preliminary Prototype



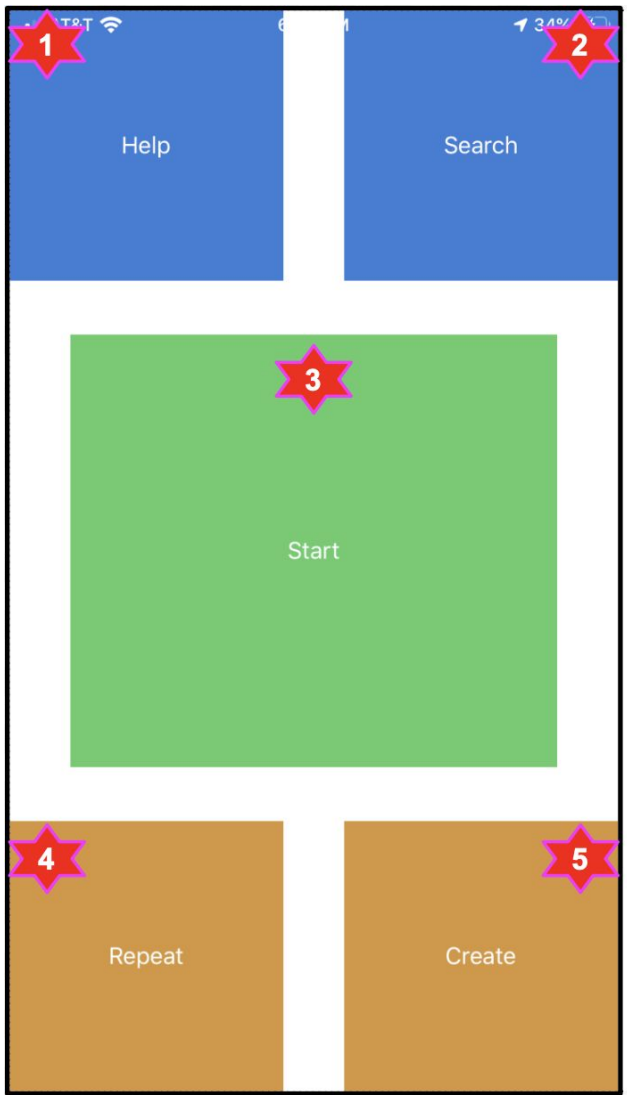
[6] Phase I Prototype Interface Mock-ups

Main View (For Caretakers)

- 1*: The caretaker enters the full address of where they would like to navigate their dependent too.
- 2*: The caretaker selects the search icon to initiate a navigation session to the address entered in the text box. A voice message will be played indicating that navigation has started.
- 3*: The caretaker selects “Stop Navigation” to end the current navigation session if one is active. The address text box and map components are both reset. A voice message will be played indicating that navigation has ended.
- 4*: The caretaker selects “Pause Navigation” to pause the current navigation session if one is active. A voice message will be played indicating that navigation has been paused.
- 5*: The major component of the user interface is a dynamic and interactive map, which will display the current area and the destination location to the caretaker.
- **: The user can toggle the visibility of the application’s UI.
    - If the screen is visible and the user double taps anywhere on the screen that is not a text box or button, then the screen will turn to black.

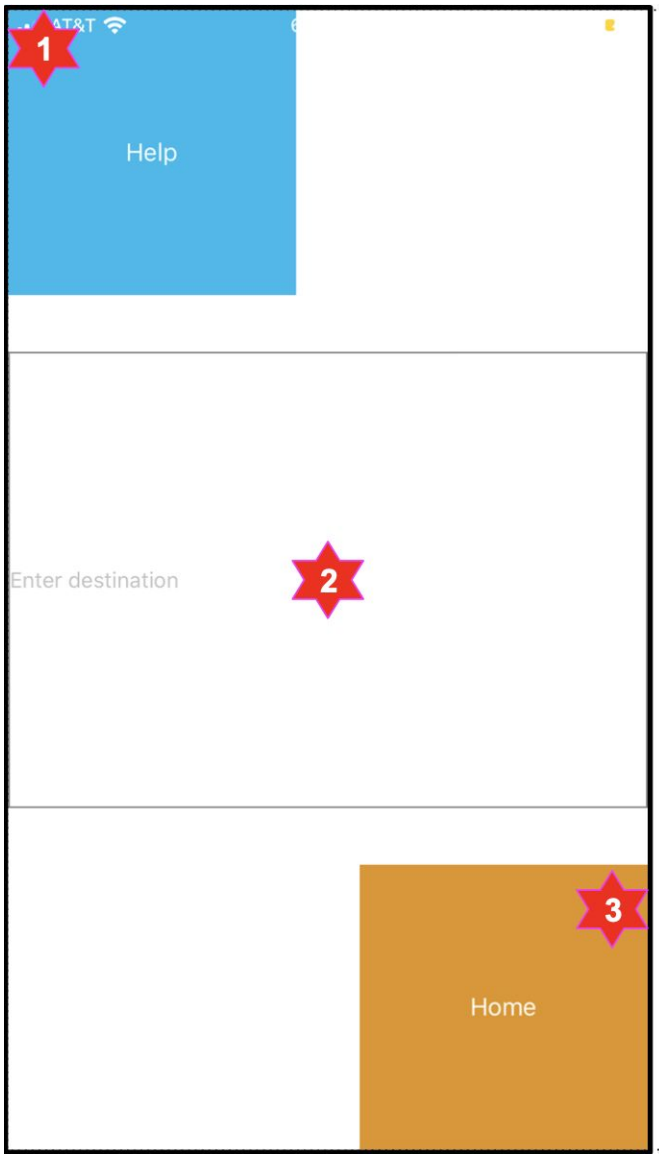
- If the screen is not visible, then the user can single tap anywhere on the screen to make the application visible once again.

[7] Phase II Prototype Interface Mock-ups



1. This button will provide a breakdown of all the UI elements the user can interact with and what they will do.
2. This will bring up a screen that allows the user to enter the destination they would like to navigate to.
3. If a route has been selected by the user then this button will begin providing the route necessary to guide the user to their destination.
4. This will repeat the last direction provided to the user.
5. This will direct the user to a new screen to be able to create a new route so that other users can use it.

1. This button will provide a breakdown of all the UI elements the user can interact with and will also inform the user what is currently requested.
2. This button will log that the route being created contains a doorway in the next step.
3. This input field allows the user to input further details about the most recent step in the route.
4. This button will log a new step in the route.
5. This input field allows the user to provide a name for the new route.
6. This button will log that the route being created contains a stairway in the next step.
7. Takes the user back to home screen and saves the new route.



1. This button will provide a breakdown of all the UI elements the user can interact with and what they will do.
2. This input field allows users to input their desired destination.
    - They can input a destination through speech or by using the keyboard.
3. This will take the user back to the home page to begin the navigation to their desired destination if it existed in our system.

[8] Phase I Function Point Calculations

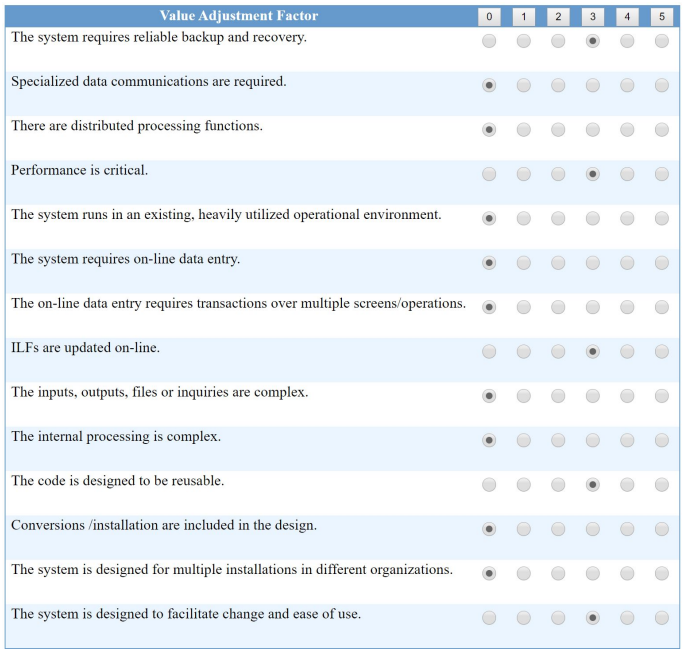
Function Points

- External Inputs (EIs)
    - User interaction with the mobile application's user interface (low)
    - User interacts with the mobile application through voice commands (high)
    - Mobile application interacting with the backend API server (avg)
- External Outputs (EOs)
    - Backend API server interacting with the remote relation database (avg)
- External Inquiries (EQs)

    - Backend API server interacting with Google Maps (avg)
    - Backend API server interacting with the remote relation database (avg)
- Internal Logical Files (ILFs)
    - Mobile application local map storage (avg)
    - Backend API server cache (high)
- External Interface Files (EIFs)
    - Remove relational database (avg)
    - Remote map file storage (avg)
    - Google maps public data (API access) (avg)

72 FPs * 0.8 Factor = **58**

Direct Measure	Count			Weighted Measure
	Simple	Average	Complex	
External Inputs (EIs)	1	1	1	13
External Outputs (EOs)	0	1	0	5
External Inquiries (EQs)	0	2	0	8
Internal Logical Files (ILFs)	0	1	1	25
External Interface Files (EIFs)	0	3	0	21



Value Adjustment Factor	0	1	2	3	4	5
The system requires reliable backup and recovery.	○	○	○	●	○	○
Specialized data communications are required.	●	○	○	○	○	○
There are distributed processing functions.	●	○	○	○	○	○
Performance is critical.	○	○	○	●	○	○
The system runs in an existing, heavily utilized operational environment.	●	○	○	○	○	○
The system requires on-line data entry.	●	○	○	○	○	○
The on-line data entry requires transactions over multiple screens/operations.	●	○	○	○	○	○
ILFs are updated on-line.	○	○	○	●	○	○
The inputs, outputs, files or inquiries are complex.	●	○	○	○	○	○
The internal processing is complex.	●	○	○	○	○	○
The code is designed to be reusable.	○	○	○	●	○	○
Conversions /installation are included in the design.	●	○	○	○	○	○
The system is designed for multiple installations in different organizations.	●	○	○	○	○	○
The system is designed to facilitate change and ease of use.	○	○	○	●	○	○

[9] Reference

[1] Erickson, W., Lee, C., & von Schrader, S. (2012). 2010 Disability Status Report: United States. Ithaca, NY: Cornell University Employment and Disability Institute(EDI).
[2] Erickson, W., Lee, C., & von Schrader, S. (2012). 2011 Disability Status Report: United States. Ithaca, NY: Cornell University Employment and Disability Institute(EDI).
[3] L. Chung (2014). *CS/SE 6361 Advanced Requirement Engineering, Spring 2014, Project Phase 1: Requirements Elicitation: Initial Understanding*. [Online]. Available: [material url]
[4] Crawford, Susan. “The Challenge of Helping Blind People Navigate Indoors.” Wired, June 25, 2019. https://www.wired.com/story/challenge-helping-blind-people-navigate-indoors/.