

CptS 484: Software Requirements

WRS Evolution

Requirements Elicitation

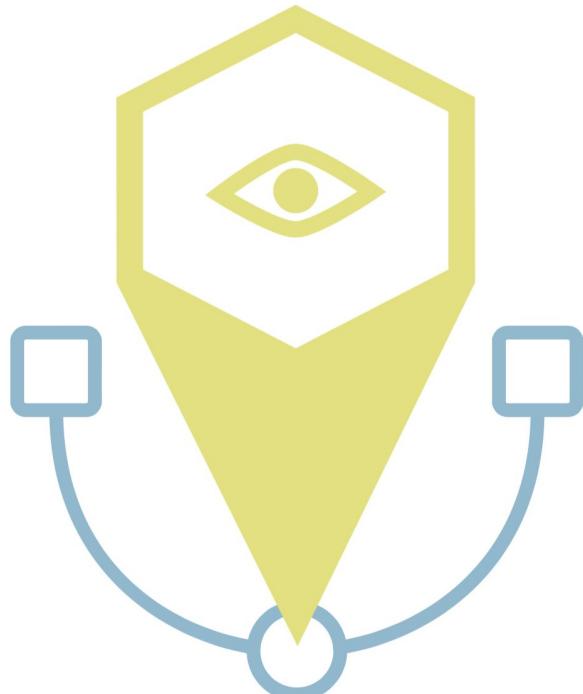
Team Moderamen

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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

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[1] Introduction

1.1. Purpose

Navigating the world as a blind or visually impaired individual is no easy feat. So much so, that many of these individuals choose to stay close to home, feeling as though the "world is not made for them"[4]. Without proper assistance, the visually impaired risk exposing themselves to a variety of threatening 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 encounter while navigating the world through our user-friendly mobile application.

1.2. Scope

The scope of our project can be defined by the following milestones...

- Develop or use an indoor navigation API that will be the backbone of our navigation system.
- Create a GUI that is easily usable by any caretaker or individual trying to assist a blind or visually impaired person using our application.
- 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 that...

- Maintains a budget of \$0, so that we do not need to pay for any tools or equipment we use.
- Follows the timeline outlined by the project specification document hosted on Blackboard.
- Passes all usability test 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 commands through an audio input device rather than by using the mouse or keyboard, 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.

Camera Module

A camera module is just a more technical way of saying the camera on the back of your mobile device.

Blueprint

In architecture and building engineering, a blueprint or floor plan is a drawing to scale, showing a view from above, of the relationships between rooms, spaces, traffic patterns, and other physical features at one level of a structure.

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 by providing blind and visually impaired individuals 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, etc.. We hope to provide a solution to all these problems with our app, Moderamen. It 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 provides collision detection through the phone's camera module. 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 along with a camera to help navigate those areas and unmapped areas.

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 communicate the things it views within its camera.
VR1	Be able to offer a visual interface for setup for caretakers/passerby.
VR2	Able to detect objects with its camera.
TR1	Work Offline.
TR2	Allow connection with 3rd party translation software.
TR3	Allow Blueprints to be added to map database.

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 blueprints 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 blueprints 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.
	Choice	Option 2
	Rationale	We cannot guarantee the quality of the blueprints provided by non-stakeholders in option 1, having the actual landowner puts responsibility on them to generate a high quality blueprints as they are a stakeholder.
Satisfied by	TNR1	

FR Issue ID	Description	
FRI3	PFR_ID	VR2. Able to detect objects with the camera.

	What is defined as an object? How will the camera recognize objects?	
	Option 1	Objects are defined as anything that is not part of a recognized hallway minus people.
	Option 2	Objects are defined as anything in the hallway that is not registered in the map minus people.
	Choice	Option 1+Option 2
	Rationale	The application is designed to be used within the buildings that have blueprints uploaded and ones that don't so the application should take advantage when a blueprint is provided but should not be tied to it. If people were recognized as objects then application could take too long to voice them all out.
Satisfied by	AR5 + TR3	

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	Complete timed market research and add additional languages as necessary with additional app updates.
	Choice	1

	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.
Satisfied by	TR2	

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.
	Choice	1 + 3
	Rationale	Having a more robust algorithm to track 'risk' and 'variability' of a path is necessary to keep the user safe - however, when unavoidable the user should be notified of the possible risk.
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 Microsoft Sam and allow to select other Microsoft voices.
	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	All Options
	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. All the options above will help achieve a voice that is more understood.
Satisfied by	AR1-AR5	

[4] WRS

4.1. W

4.1.1. Problem

Problem ID	Problem Description	Corresponding Goals
P1	People with impaired 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
P4	Users of our application speak different languages.	G3
P5	Unforeseen changes to building layout may occur.	G4, G5
P6	Others might need to assist our visually impaired 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
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4.1.2. Goals

Goal ID	Goal Description	Backward Traceability	Forward Traceability
G1	Our application allows users with impaired sight to navigate through supported indoor areas.	P1	ID1, FO1, FO2, SH3
G2	Our application should not be hindered in its functionality by internet connection.	P2	NFO1,FO4
G3	Our application should provide functionality regardless of their language.	P4	FO3
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 blueprint. (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 impaired users navigate our app without voice commands.	P6	SH2
G7	Our app should be able to process new building blueprints 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 navigate indoor in unsupported buildings through phone camera detection.
ID3	Users with impaired vision will experience easier navigation through buildings.
ID4	Caretakers will be able to more easily assist their visually impaired 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	<p>People who own building will need to provide a blueprint of their buildings to enable our application to assist visually impaired users to navigate their buildings.</p> <p>If they do not our application will still be able to assist visually impaired users navigate through camera detections.</p>	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	P6	G6

		issues or just to increase speed of navigation.		
SH3	Visually Impaired	Those who are visually impaired 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 blueprint that navigate indoor areas, and notify user when the application does not have a valid blueprint or changes to old blueprint.	P1,P3	G1
FO3	The application should connect with 3rd party translation software.	P4	G3
FO4	Application notifies users when its offline.	P2	G2
FO5	Application can be used without voice commands. (i.e. has a UI).	P6	G6
FO6	The application can use the camera module to detect unforeseen obstacles not included in blueprint.	P3,P5	G4,G5

FO7	Application should maintain navigation instructions even if network connectivity is lost.	P2	G2
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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
NFO2	The application can assess risk or danger of a certain room, hallway, building that it has not previously mapped.	P5	G4, G5
NFO3	Application increases efficiency of navigation for our visually impaired 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 amount of blueprints 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
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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 Blueprints to be added and verified before being uploaded into the Database
Satisfies Functional Requirement Issue	FRI2
Satisfies Objectives	FO2, NFO6
Satisfied by prototype feature	Map/Map Database

FR ID	Description
FR3	The Application's camera will detect things not on the hallway's Blueprint, or everything minus people if no Blueprint is provided.
Satisfies Functional Requirement Issue	FRI3
Satisfies Objectives	FO6,NFO3
Satisfied by prototype feature	Camera

FR ID	Description
FR4	The Application will have full functionality offline, being online only updates Blueprint database and voices any changes to current Blueprints
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

4.2.2. Non-Functional Requirements

NFR ID	Nonfunctional Requirement 1	
NFR1	The system can assess risk using it's camera in unmapped rooms.	
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	Camera
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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 Microsoft 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
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Nonfunctional Requirement 4		
NFR ID		
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	

Nonfunctional Requirement 5		
NFR ID		
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
FS2	The application can connect with Third Party Translation software to help with non-english speakers
Satisfies Functional Requirement	FR1
Satisfies Objectives	FO3
Satisfied by prototype feature	Settings,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 Blueprints 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 Blueprints, or if Blueprint is not found
Satisfies Functional Requirement	FR2
Satisfies Objectives	FO2
Satisfied by prototype feature	Voice/Database

Functional Specification ID	Functional Requirement

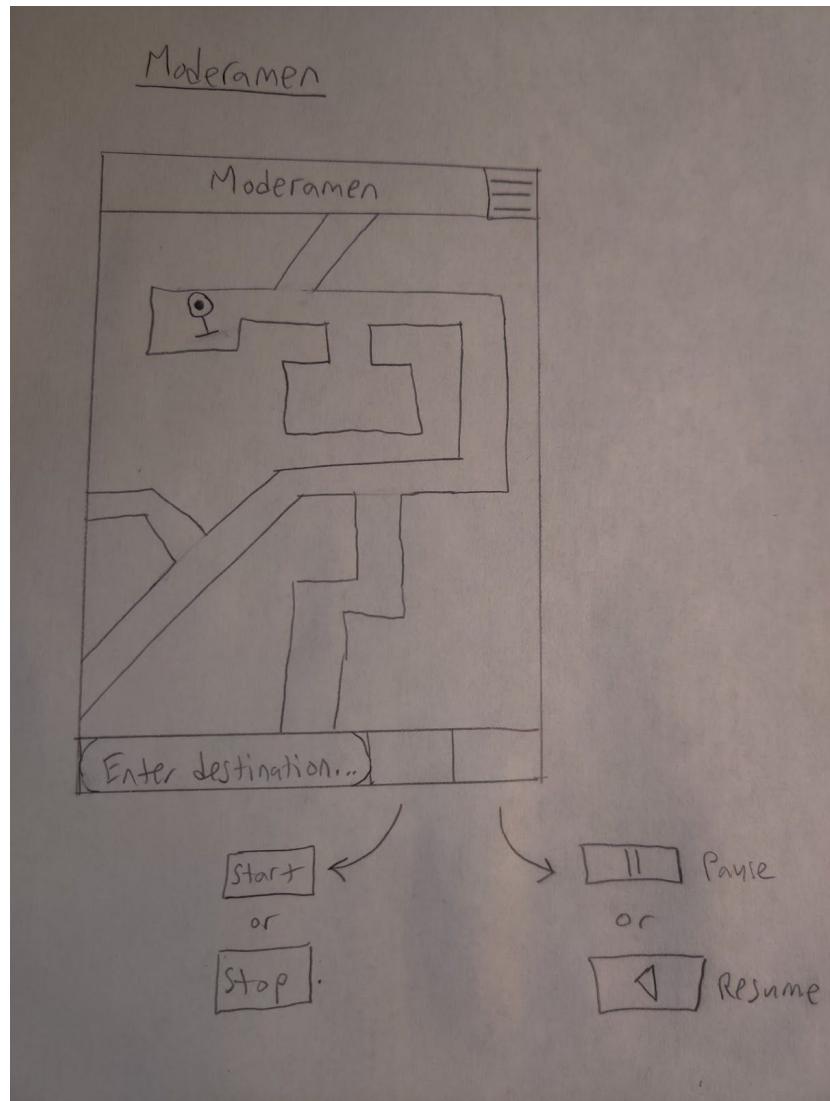
FS6	When the Camera is held to the hallway, it will let the user know of any objects in the hallway and voice them
Satisfies Functional Requirement	FR3
Satisfies Objectives	FO6
Satisfied by prototype feature	Voice/Camera

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

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 the application voice when it leaves the Application screen
Satisfies Functional Requirement	FR5
Satisfies Objectives	FO5
Satisfied by prototype feature	Voice

[5] Preliminary Prototype



[6] 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] 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)

$$72 \text{ FPs} * 0.8 \text{ Factor} = 58$$

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.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Specialized data communications are required.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are distributed processing functions.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Performance is critical.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
The system runs in an existing, heavily utilized operational environment.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The system requires on-line data entry.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The on-line data entry requires transactions over multiple screens/operations.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ILFs are updated on-line.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
The inputs, outputs, files or inquiries are complex.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The internal processing is complex.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The code is designed to be reusable.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conversions /installation are included in the design.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The system is designed for multiple installations in different organizations.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The system is designed to facilitate change and ease of use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

[8] PowerPoint Presentation

See [Appendix A](#)

[9] User Manual

See [Appendix B](#)

[10] Preliminary Plan

See [Appendix C](#)

[11] Meeting Notes

See [Appendix D](#)

[12] References

- [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/>.

Appendix A

See Next Page Powerpoint Presentation...

Cpts 484: Phase I Presentation

Moderamen

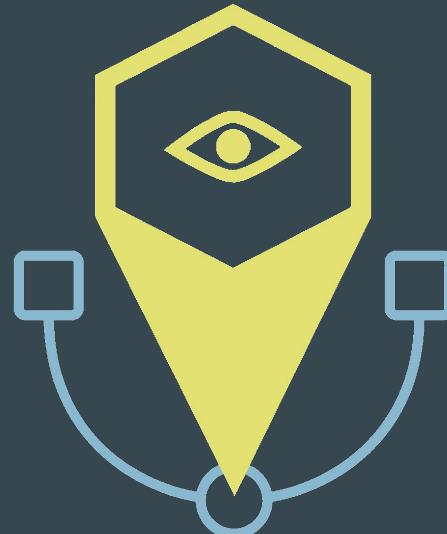
Austin Marino

...

Cole Bennett

Freya Varez

Sean Cornia



As-Is Scenario One

Situation: Stevie needs to navigate to his next class. He roughly remembers the way but isn't sure. He thinks he needs to walk a few steps straight and then turn left once he reaches the corner (end of the hallway).

Decision: After walking a few steps forward, down the hallway, he thinks he has reached the corner but can't quite tell for sure.

Result: He proceeds to turn left, believing he is at the corner, but unfortunately turns out to be wrong; and hit the wall headfirst. He now is more confused than before and is in pain.

To-Be Scenario One

Situation: Stevie needs to navigate to his next class. He roughly remembers the way but isn't sure. He thinks he needs to walk a few steps straight and then turn left once he reaches the corner (end of the hallway).

Decision: He decides to pull out his phone and use the Moderamen app. He interacts with Moderamen's VUI and provides his desired destination and waits for the route to load.

Result: The Moderamen app calculates the route from Stevie's current location to his next class. The app then provides vocal directions such as "walk straight ten steps, then turn left".

As-Is Scenario Two

Situation: Jane has a doctor's appointment at the County Hospital. She is in the correct building and has been there numerous times; so, she feels comfortable navigating the building. However, she can tell that the building is bustling today, from the noise around her, and feels less comfortable navigating as she usually would.

Decision: Jane decides that she will be fine and will be more cautious than usual as she proceeds to the room where her appointment is.

Result: While walking through the hallways, a little boy, chasing his sister, bumps into Jane, knocking her onto her butt. She is now disoriented and has a bruised tailbone.

To-Be Scenario Two

Situation: Jane has a doctor's appointment at the County Hospital. She is in the correct building and has been there numerous times; so, she feels comfortable navigating the building. However, she can tell that the building is bustling today, from the noise around her, and feels less comfortable navigating as she usually would.

Decision: Jane decides to pull out her phone and use the Moderamen app. Once loaded, she places the phone against her chest; so that, the camera module is facing the area in front of her.

Result: The Moderamen app uses her phone's camera to detect obstacles around her and informs her when she is nearing a possible threat.

As-Is Scenario Three

Situation: John's retirement community is going on a field trip to the local mall. He wants to visit the food court but doesn't know how to get there, and neither does his caretaker.

Decision: The caretaker decides to try and use the mall's signs to navigate John to the food court.

Result: Unfortunately, the caretaker takes John on a longer route than needed, by accident. By the time they get to the food court, John is out of breath and needs to sit down to catch his breath and lower his heart rate before he can ordering/eat any food.

To-Be Scenario Three

Situation: John's retirement community is going on a field trip to the local mall. He wants to visit the food court but doesn't know how to get there, and neither does his caretaker.

Decision: John remembers his son installed Moderamen on his phone and ask his caretaker to use the app.

Result: The caretaker takes John's phone and opens the Moderamen app. Once loaded, the caretaker inputs the food court as the desired destination using the App's GUI. The app then displays and voices out the directions, so both John and the caretaker know how to proceed. John and the caretaker arrive at the food court in little time and grab a bite to eat.

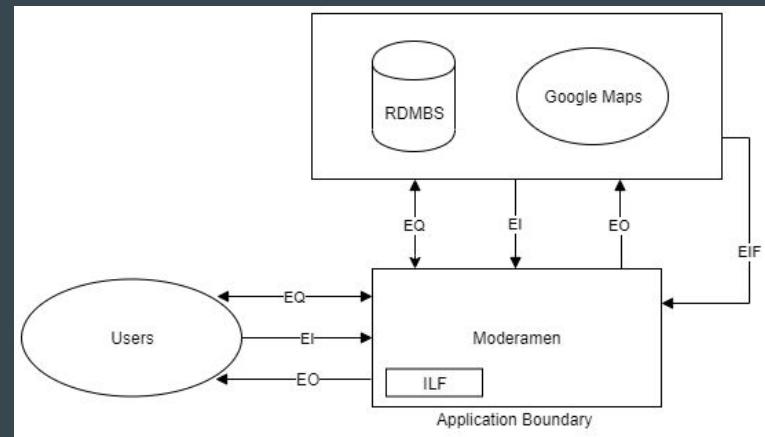
Function Points & Creep Rate

Phase I Final Submission Development Function Point Count (DFP1): 58

Creep Rate (estimated rate we can handle):

$$(((DFP2 - DFP1) / DFP1) * 100) / 3 \text{ months} = ((100 - 58) / 58) * 100 = \mathbf{24.1\% \text{ per month}}$$

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



Tools (Part 1) - *How Moderamen compares to alternatives*

	Cane	Guide Dog	Moderamen	Cane + Moderamen	Cane + Guide Dog	Guide Dog + Moderamen	Cane + Guide Dog + Moderamen
See	No	Yes	Yes	Yes	Yes	Yes	Yes
Feel	Yes	Yes	No	Yes	Yes	Yes	Yes
Hear	No	Yes	Yes	Yes	Yes	Yes	Yes
Talk	No	Yes (Bark)	Yes	Yes	Yes	Yes	Yes
Think	No	Yes	Yes	Yes	Yes	Yes	Yes
Smell	No	Yes	No	No	Yes	Yes	Yes

Tools (Part 2) - *How Moderamen compares to alternatives*

	Cane	Guide Dog	Moderamen
Ease of Usability	High	Low	Very High
Cost	Low	Very High	Low
Reliability	High	Medium	Medium
Functionality	Low	Very High	High

Conclusion - *Why Moderamen is the best solution in the market*

By functionality:

Cane < Moderamen < [Cane + Moderamen] < Guide Dog < [Cane + Guide Dog] <
[Moderamen + Guide Dog] < [Moderamen + Guide dog + Cane]

By functionality alone - guide dogs are the most useful to clients. However, taking into consideration the high cost of \$40,598 for a trained guide dog [1], Moderamen would have a much larger client attainability with similar functionality.

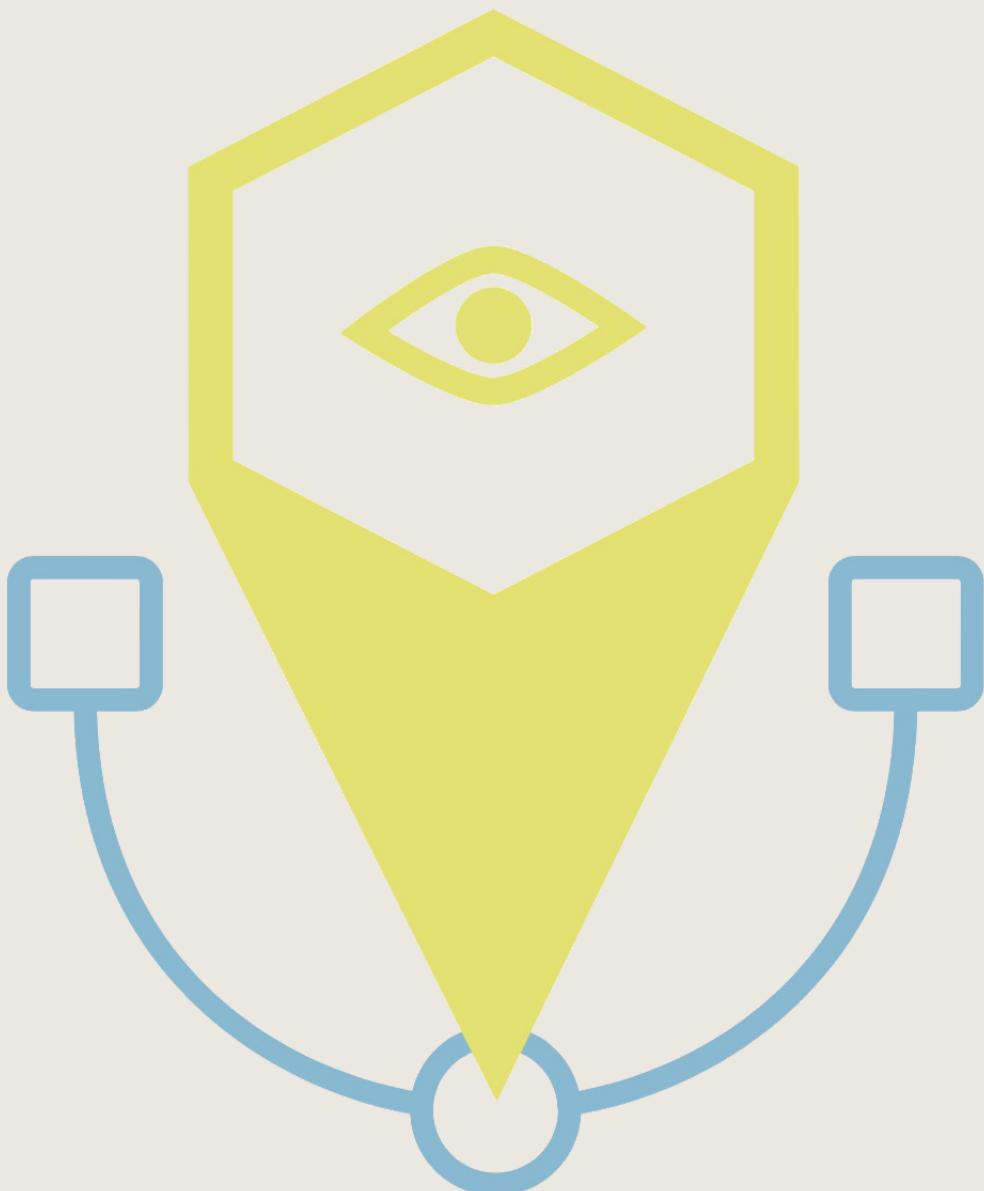
[1] https://www.cdc.gov/visionhealth/pdf/dog_guides.pdf

Appendix B

See Next Page for User Manual...

Moderamen App

User Manual



Sean C. | Freya V. | Austin M. | Cole B.

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What is the Moderamen App?

Navigating the world as a blind or visually impaired individual is no easy feat. So much so, that many of these individuals choose to stay close to home, feeling as though the "world is not made for them"[1]. Without proper assistance, the visually impaired risk exposing themselves to a variety of threatening 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 encounter while navigating the world through our user-friendly mobile application. Our app, Moderamen, 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 provides collision detection through the phone's camera module. 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.

Terminology

Voice Command

Voice commands allow the user to control an application by speaking commands through an audio input device rather than by using the mouse or keyboard, 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.

Android

Android is a mobile operating system based on a modified version of the Linux kernel and other open source software, designed primarily for touchscreen mobile devices such as smartphones and tablets.

iOS

iOS is a mobile operating system created and developed by Apple exclusively for its hardware; including the iPhone.

Camera Module

A camera module is just a more technical way of saying the camera on the back of your mobile device.

Blueprint

In architecture and building engineering, a blueprint or floor plan is a drawing to scale, showing a view from above, of the relationships between rooms, spaces, traffic patterns, and other physical features at one level of a structure.

Equipment and Requirements

Mobile Operating System

Whatever device you decide to use must run on either Android or IOS. This is because our application is only available to download through the Google Play Store and the App Store.

Mobile Device

To use our application, you need to have access to some form of a mobile device such as a phone or tablet. We recommend that you use a smaller device such as a phone; since our application is most useful when held in front of your body to enable obstacle detection.

Camera Module (*optional*)

Our application uses your device's camera module, if allowed and possible, to detect obstacles not included in the building's layout design. Possible obstacles consist of wet floor signs, people, and open doorways. Our app will still provide directions without this added safety feature but will not be as useful as it could be. Thus, while not required,

our application is most useful if the device you choose to navigate with has a working camera module.

Extra Assistance (*optional*)

While our application is designed to be used without assistance, we always recommend never to navigate alone. Getting assistance from those who are capable of using our GUI is always recommended. We especially urge new users to seek help from friends, family, or caretakers when using the app until you feel genuinely comfortable using it alone.

Voice Commands

Utilizing voice commands is the primary way you can interact with Moderamen. If you ever plan on using our application without assistance from someone who is not visually impaired, you need to understand how to interact with our VUI. Here is a list of supported voice commands and features.

Set Destination

Where {destination} is the desired location you would like to navigate to, or as a caretaker, send your dependent to. If the destination is valid and supported, then Moderamen will automatically start navigation.

VUI	Options
User Command	“Go to {destination}” “Navigate to {destination}” “Directions to {destination}”
App Response	“Did you want to begin navigation to {destination}?”

Verify Navigation

If you ever want to verify that you are navigating to the correct place or you forget where you were navigating to, simply ask one of the following questions.

VUI	Options
User Command	“Where am I going?” “What is my current route?”
App Response	“You are currently navigating to {destination}?”

Navigation Status

If you ever want to better understand where you are in your current route, simply ask one of the following questions.

VUI	Options
User Command	“Where am I?” “How far away am I?” “How much longer?”
App Response	“You are currently {distance} feet from your {destination}?”

Start Navigation

Once you have asked to begin navigation to a specific destination, the app will respond with a question to ensure you are ready to begin the route. You must now respond with the commands below so that the app understands if it should begin navigation.

VUI	Positive Options	Negative Options
User Command	“Start”, “Yes”, “Go”, “Okay”, “Begin”	“No”, “Stop”, “End”
App Response	“Starting navigation to {destination}?”	“Navigation Stopped”

Pause Navigation

You can pause your navigation directions at any time. Simply state one of the commands below to inform the app that you would like to pause the navigation for the time being.

VUI	Options
User Command	“Pause Navigation”, “Pause Directions”, “Pause Route”
App Response	“Pausing navigation to {destination}?”

Resume Navigation

If you have paused your route to a specific destination, you can resume it anytime before it has expired (30 minutes after pausing). Simply state one of the commands below to inform the app that you would like to resume a previously paused navigation.

VUI	Options
User Command	“Resume Navigation”, “Resume Directions”, “Resume Route”
App Response	“Resuming navigation to {destination}?”

End Navigation

If you would like to end navigation at any time, simply state one of the commands below to inform the app that you would end navigation to the specified destination.

VUI	Options
User Command	“{key-word} Navigation”, “{key-word} Directions”, “{key-word} Route” {key-word}: “Stop”, “End”
App Response	“Stopping navigation to {destination}?”

Cautions & Warnings

Pay Attention to Surroundings

Although our app tries its best to provide accurate and safe navigation, errors can still occur. Therefore, it is essential to be aware of your surroundings at all times. Never completely obstruct your ability to hear while using the app. What we mean by this is to never wear headphones/earphones in both of your ears at anytime while using our app. Even though this might provide you with clearer audio, it also restricts your ability to understand your surroundings. We recommend wearing one head/earphone, while using our app, to provide an excellent VUI experience and also provide the ability to detect your surroundings through audio cues.

Never Solely Rely on the Moderamen App

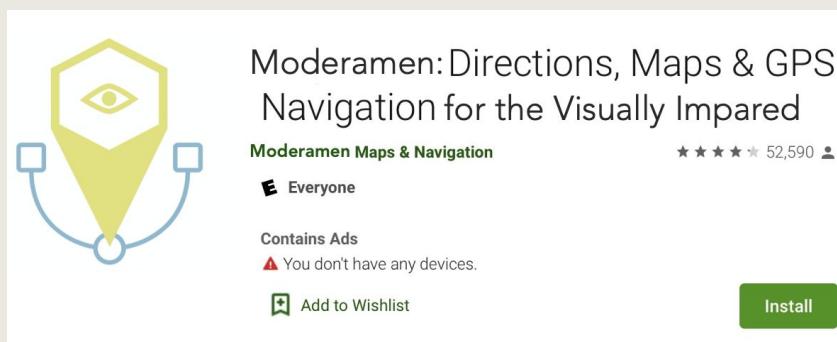
While we desire to have every building correctly mapped out and the ability to detect all obstacles through your phone's camera, that is, unfortunately, not the reality. Our app is not to be used as your sole means of navigation and should instead be used in combination with existing tools, infrastructure, and other systems to provide the safest and most efficient means of navigation. We suggest that you also seek assistance from a cane, guide dog, braille, or even a caretaker while also using our app.

Using the Moderamen App

I. Downloading the App

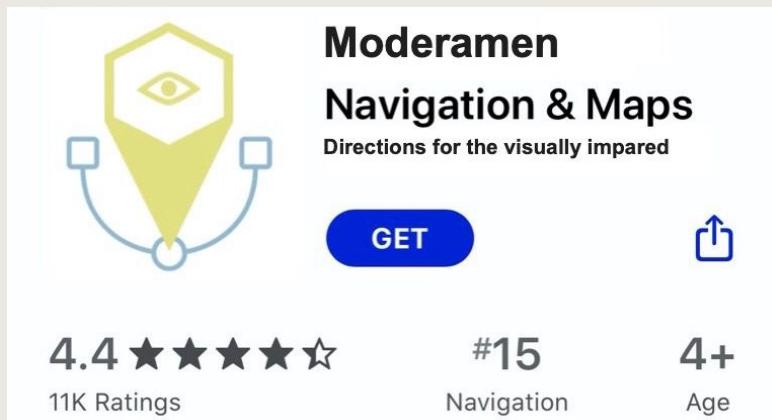
Android Mobile Device

If you have an android phone, simply launch the Google Play Store application and search “Moderamen” in the search bar. Once all the options have loaded, scroll down until you see our logo and then select the “Install” button.



IOS Mobile Device

If you have an IOS phone, simply launch the App Store application and search “Moderamen” in the search bar. Once all the options have loaded, scroll down until you see our logo and then select the “get” button.



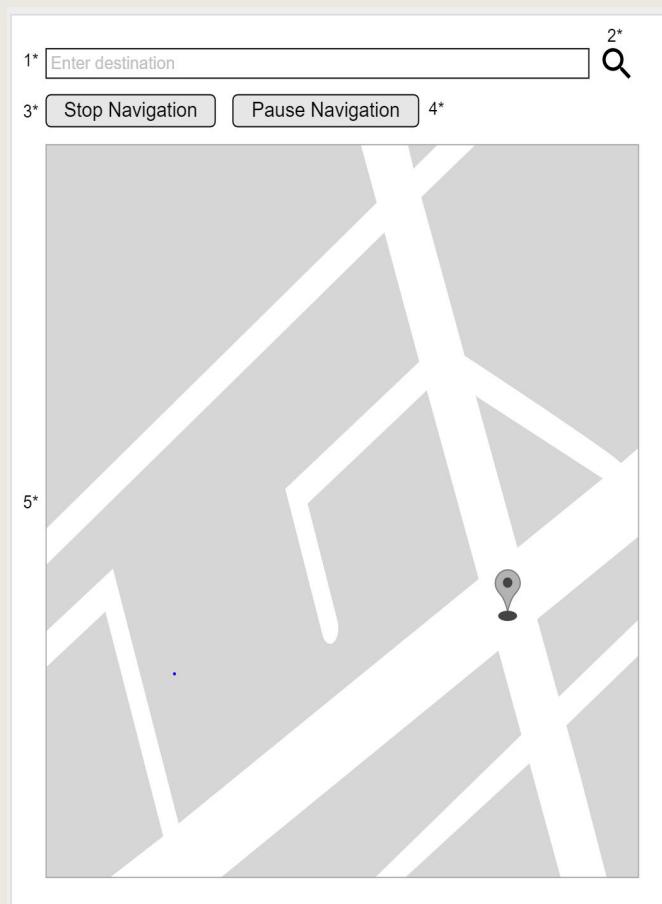
II. Opening/Starting the App

Using your mobile devices built-in accessibility features or through the assistance of a caretaker, navigate to the Moderamen application and launch it. Once the app has been opened, you should experience the same GUI and VUI across all devices, no matter your mobile device's OS.

III. Using the App

With Assistance

application, then they can mostly rely on our GUI. Here, a non-visually impaired user can navigate our interface as they usually would on nearly any other navigation application. The image and descriptions below provides a clear break down on all the parts of our GUI with a nice description.



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.

******. Toggle Screen Visibility by double tapping anywhere on the screen with two fingers.

Without Assistance

If you plan on using our application without assistance, then you first need to become comfortable with the commands used to interact successfully with our VUI. We believe we have made the commands quite intuitive, so it hopefully won't be much of a struggle to remember and speak the correct commands when needed.

Using Obstacle Detection Feature

If you would like to use the obstacle detection feature in the Moderamen application, hold the phone against your chest. Hold it such that the back of your phone is facing away from your body, meaning the screen is facing you. When the app detects that is held correctly, it automatically will start collision detection and alert you if you are nearing an obstacle.

Conclusion

Our goal at Moderamen is to reduce the anxiety that comes about when a visually impaired individual navigates a new or changing terrain. We hope that our app successfully fulfills this goal and increases the efficiency and safety of navigation indoors for the visually impaired.

Troubleshooting

Navigation Unavailable

Unfortunately, we only provide navigation assistance in select buildings as of now. This is because, in order to ensure that all our users receive the best directions possible, we need to ensure all the buildings we provide services to are correctly mapped out. Thus,

if you would like a particular building added to our applications navigation database, please contact the building owners/management and ask them to send their buildings blueprints to us ASAP. Until then, you can always use your device's camera module to detect obstacles around you as you navigate indoors.

Incorrect Navigation

If you are ever routed incorrectly, this could be due to building owners changing the layout of their building without telling us, or we have a bug. Either way, we want to fix it ASAP. Thus, if we provide navigation assistance in a particular building, but you routed incorrectly, please let us know immediately. We take this issue seriously here at Moderamen as we want to reduce the risk of navigating indoors, not add to it.

Obstacle Detection Issues

One of our favorite features of our app is the ability for obstacle detection using your devices camera module. However, this is an imperfect system that will continue to advance with each app update. While we desire to catch all possible threats around you, we, unfortunately, are not quite there yet and recommend not solely to rely on it during navigation. If you have any recommendations on how to better our detection capabilities, please feel free to contact us and let us know.

App not Working Correctly

We strive to create the best user experience possible, but we can't promise always to be perfect. Thus, if you experience any issues while using our app, we recommend you fully close the app and restart it. If the issue still exists after doing so, please reach out to us and let us know so we can try and fix it ASAP.

Any Other Issues

If you experience any other issues not covered above, please reach out to us and let us know as we want to deliver the best user experience possible.

FAQ

- **Does Moderamen cost money?**

➤ We can proudly say that our Moderamen application is 100% free and will never contain any hidden fees.

- **How do I get a particular building added to your app?**

➤ Our hope is to one day have nearly every building mapped out in our application. However, this is a long and tedious process, and with your help, we can make this dream a reality quicker. If you know of a building you would like added to our application, please reach out to us and let us know. Also, if you can ask the building owners/management to submit their building's blueprints to us, that would be incredibly helpful as well.

- **Can I still use your app if I'm not visually impaired?**

➤ Of course! While the focus of our app is to assist those with vision impairments, we welcome all and any users.

References

- [1] 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/>.

Appendix C

See Next Page for Preliminary Plan...

CptS 484 - Moderamen

Software Project Management Plan

Austin Marino, Cole Bennett, Freya Varez, Sean Cornia

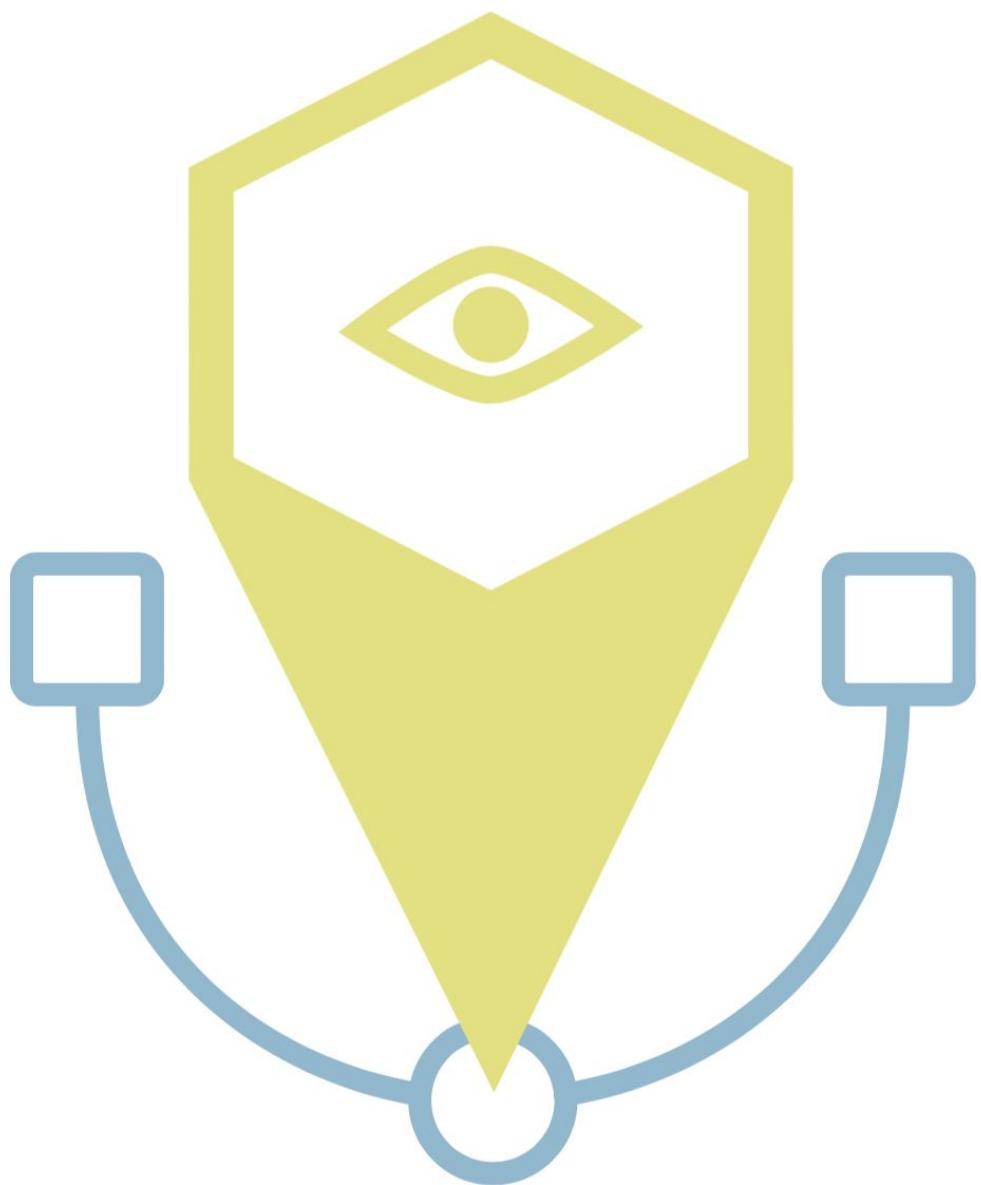


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Cole Bennett - Developer	4
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Sean Cornia - Developer	5
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Introduction

Project Overview

Our project is to develop a mobile application currently titled Moderamen that will help visually impaired people with navigating interiors of buildings. This document, Software Project Management Plan (SPMP), that breaks down the people behind this application, their roles and their plan to fulfill the project. The document also defines in written the deliverables along with schedule that we wish to deliver them and work on the project.

Project Deliverables

The project has various deliverables separated by a phase I and phase II. Currently, only the project phase I deliverables are listed and phase II deliverables will be listed when they are defined.

Project Phase I Deliverables Listed in Order of Submission Date

- Software Project Management Plan
- World Requirement Specification
- Software Requirements Specification - written descriptions of resolving issues within functional and nonfunctional requirements
- Prototype
- User Manual
- Meeting Records
- Prestation for phase I deliverable

Evolution of Document

The plan is currently used for the development of phase I of Moderamen. For the development of phase I the plan currently holds within its scope a general description of Moderamen, scheduling along with deliverables, a clear outline of the organization of our team, and our current evaluated risks. Throughout the project of SPMP will evolve so that it remains an information source that translates our technical progress into a readable format, which in turn will cause different versions to be mindful of. Risk Management, Monitoring and Controlling Mechanisms, and Technical Progress are the expected ones to receive dramatic evolutions throughout the SPMP's lifespan within phase I.

As a reminder the current version is 0.1.0. When the description of phase II has been provided, the SPMP will have its most radical change with major additions to our deliverables along with our scheduling.

References

Definitions, Acronyms, & Abbreviations

SPMP Software Management Plan

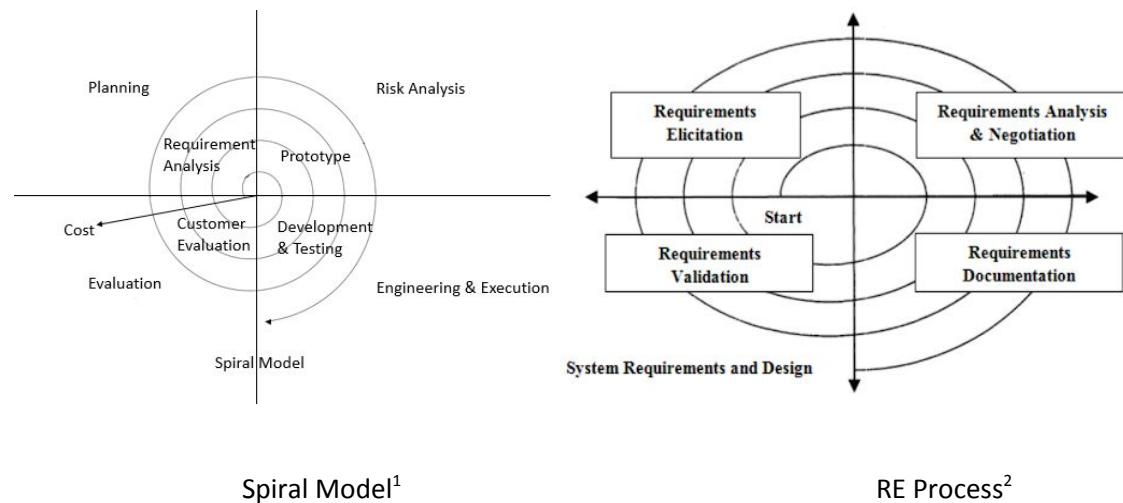
WRS World Requirement Specification

RE Requirements Engineering

Project Organization

Process Model

The Moderamen team uses the Spiral software development method because it's iterative by nature like the requirements engineering process. This fundamental structural similarity between the two processes allows them to work well in unison during the development of software. Our team follows the RE (featured on the right) process during the "Planning: Requirements Analysis" section of the Spiral method (featured on the left). Additionally, the Spiral method places an emphasis on risk analysis in order to reduce any unwanted or unforeseen negative outcomes from arising. There is also a review period at the end of each iteration to reevaluate what new features or updates should be proposed for the next iteration, RE; which avoids, wasted resources and money.



Spiral Model¹

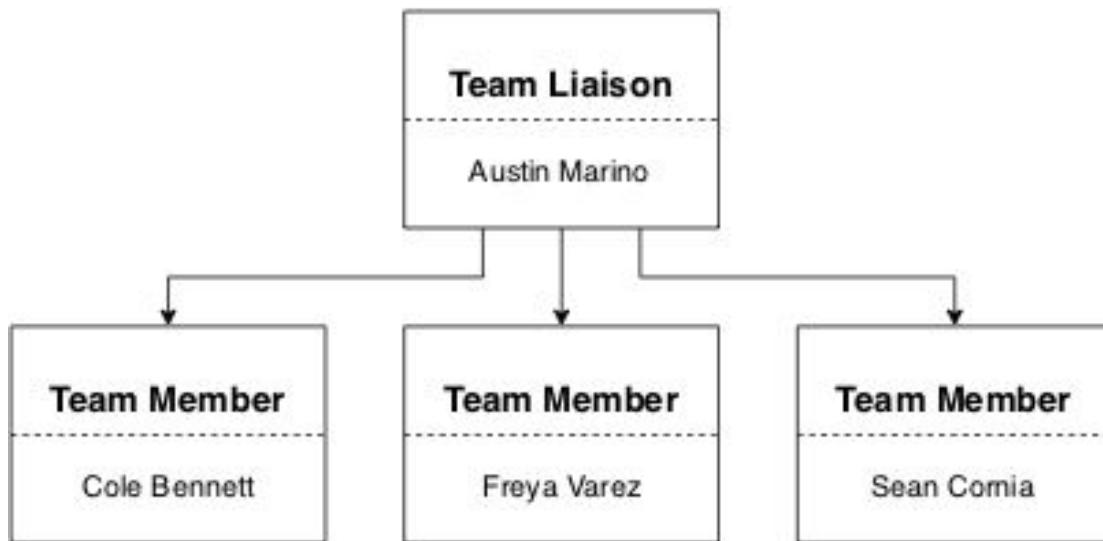
RE Process²

¹ Naveen. "What Is Spiral Model in Software Testing and What Are Advantages and Disadvantages of Spiral Model." Testing Freak, January 30, 2015. <http://testingfreak.com/spiral-model-software-testing-advantages-disadvantages-spiral-model/>.

² "Requirements Engineering Processes, Tools/Technologies & Methodologies." Google Sites. Accessed August 5, 2019. <https://sites.google.com/site/richchihleese/home/se-research/requirements-engineering-processes-tools-technologies-methodologies?tmpl=/system/app/templates/print&showPrintDialog=1>.

Organizational Structure

The Moderamen team is composed of four individuals and thus does not need a complex hierarchy. We rely on all four individuals working in tandem with one another to ensure we produce the highest quality of work possible. The central oversight comes from the team liaison, Austin, who ensures that the whole team is staying on the outlined schedule the team unilaterally agreed on. Each major milestones workload is equality partitioned amongst the group. During our weekly meetings we conduct code/work reviews to ensure that each member of the team met their goals. The image below shows the minimalist structure the group is broken up into.



Organizational Boundaries & Interfaces

Austin Marino - Team Liaison / Developer

Austin's role is as the team liaison and software developer. He communicates with all stakeholders, such as Bolong Zeng, and parlays project information back and forth between his team and outside clients. When Austin is not communicating with clients he is assisting his team in the development of their project's documents and codebase.

Cole Bennett - Developer

Cole's role is as a software developer. He spends most of his time working alongside his other teammates developing software and creating and revising the documents that guide their development process.

Freya Varez - Developer

Freya's role is as a software developer. She spends most of his time working alongside her other teammates developing software and creating and revising the documents that guide their development process.

Sean Cornia - Developer

Seans role is as a software developer. He spends most of his time working alongside his other teammates developing software and creating and revising the documents that guide their development process.

Project Responsibilities

Project Phase	Deliverable	Component Breakdown	
		Component	Assignee
Project Phase I	Preliminary Plan	Introduction	Sean Cornia
		Project Organization	Austin Marino
		Managerial Process	Freya Varez
		Technical Process	Cole Bennett
		Work Elements, Schedule & Budget	Austin Marino
Project Phase I	Final Submission	Component	Assignee
		WRS Introduction	Austin Marino
		WRS Preliminary Definition	Sean Cornia Freya Varez
		WRS Issues with Preliminary Definition Given	Sean Cornia Freya Varez
		W and RS	Austin Marino Cole Bennett Sean Cornia Freya Varez

Preliminary Plan Revisions	Austin Marino
User Manual	Austin Marino Cole Bennett
PowerPoint Presentation	Freya Varez Cole Bennett Austin Marino
Hand Drawn Prototype	Cole Bennett
Digital Mockups	Cole Bennett

Managerial Process

Management Objectives & Priorities

Moderamen is, first and foremost, a medical device - classified under FDA guidelines of a *Mobile Medical Application*.³ As the software must follow various regulations before deployment as well as requirements set forth by stakeholders. A liaison will remain as a contact with all parties to assure new information and guidelines are communicated with the development team.

The development team must design and implement a user-friendly, extensible application; thus this team will be less focused on agility - and more on testing and redesign. A team lead will assist in assuring all guidelines set forth by stakeholders are met.

Assumptions, Dependencies, & Constraints

Assumptions:

1. Moderamen must be usable visually impaired users (primary stakeholders) as well as non-visually impaired users (caretakers, staff and emergency response).
2. Moderamen is primarily used indoors or between buildings.
3. Funding is approved.
4. Necessary equipment and software is available.
5. A team of 5 is available for development and communication.

Dependencies:

1. Moderamen must be available to a wide variety of users on different operating systems. Moderamen must also continue to work with updates to underlying systems.
2. API endpoints are available to gather necessary information such as routes, language translations etc.

³ "Mobile Medical Applications" (United States Food & Drug Administration, September 4, 2018), <https://www.fda.gov/medical-devices/digital-health/mobile-medical-applications>.

Constraints:

1. Moderamen must be available across language barriers and as ubiquitous as possible for users.
2. Moderamen must follow FDA guidelines.

Risk Management

	Risk	Likelihood	Description
Market Risks	Market saturation	Medium	One or more applications are available that compete with ours causing financial non-viability.
Financial Risks	Over-budget	Low	Insufficient planning or changes in requirements cause the project to run over-budget.
Technology Risks	Data corruption or loss	Low	Important software or data loss due to system corruption or improper version control.
	Insufficient hardware or OS	Low	Final app is unsupported on customers phones.
People Risks	FDA disapproval	Low	Application does not follow FDA regulations and guidelines - is not approved for deployment.
	Software leads to injury	Low	Software is unable to correctly identify obstacles causing tripping or injury.

Monitoring & Controlling Mechanisms

Risk	Monitoring and controlling mechanisms.
Market saturation	Significant preemptive research will be done before development is progressed to assure that this product has a financially viable customer base.
Over-budget	Planning will be done before development is progressed to determine the products requirements and budget.
Data corruption or	GIT version control will save all necessary data to the cloud as well as local repositories and/or servers.

loss	
Insufficient hardware or OS	Multiple versions of the app will be created and tailored to popular operating systems.
FDA disapproval	Research will be done during planning to determine the apps feasibility with respect to FDA restrictions. The team liaison will be in contact with FDA officials to ensure these regulations are met.
Software leads to injury	Significant (re-)testing will be done to assure the application has a low failure rate.

Technical Process

Methods, Tools, & Techniques

The project will be implemented using the Spiral software process model. Following the methodologies of Spiral, we will perform a review process at the end of each phase. Git (specifically GitLab) will be utilized as primary tool for enforcing this review process through branching. Semantic Versioning 2.0.0 will be utilized as the versioning scheme for the project, which entails that we conform to the `MAJOR.MINOR.PATCH` format.⁴ Each phase, feature, and bugfix will hold their own branch:

- Each phase, indicating a major version increase, will have its own branch. All features (minor version increase) and bug fixes (patch version increase) associated with a phase will be merged into this branch.
- A formal review process will be performed for each feature and bugfix: A pull request to merge (or rebase) a feature/bugfix into a phase branch must be opened. All team members must review and approve the request for it to be accepted.
- At the end of each phase, an additional pull request must be opened to merge the phase branch into master.

Software Documentation

Documentation of the project will be present in the following ways:

1. All functions, classes, and variables of importance will be associated with concise and descriptive comments, formatted according to the industry standard conventions of the programming language(s) chosen for the project.
2. Markdown and PDF files will be utilized as the formats for documentation files in the project repository. The following documents will be included:
 - a. A readme document containing general information and installation/build steps.

⁴ Preston-Werner, Tom. "Semantic Versioning 2.0.0." Semantic Versioning. <https://semver.org> (accessed September 6, 2019).

- b. A user manual document describing how to use the application from an incoming user's perspective.
- c. Software Requirements Specification defining functional and non-functional requirements, and also use cases of the application.

Project Support Functions

Technical support of the project will include testing, configuration control, and quality assurance:

1. Testing of the application will be derived from the project's requirements specifications.
2. Software configuration control will be facilitated by Git for program, requirement, design, and version release changes.
3. Quality assurance measures will be taken to validate that our application is adhering to the requirement specifications.

Work Elements, Schedule & Budget

Schedule

Team Meetings

We have meetings from 5:00pm to 6:00pm every wednesday; however, we continuously communicate using Slack.

Project Phase I

Preliminary Project Plan	September 8th, 2019
Checkup Meeting	September 18th, 2019
Final Submission	October 13th, 2019

Project Phase II

Checkup Meeting	October 30th, 2019
Final Submission	December 15th, 2019

Budget

Currently not available.

Appendix D

See Next Page for Meeting Notes...

Cpts 484
Team Meeting Notes

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September 4th, 2019

Current Discussions

- Discussed how to proceed with Phase 1 preliminary plan (Due September 8th)
 - **Introduction:** Sean
 - **Introduction (Definitions, Acronyms, & Abbreviations):** Everyone fills out as they write in their assigned sections
 - **Project Organization:** Austin
 - **Technical Process:** Cole
 - **Managerial Process:** Freya
 - **Work Elements, Schedule & Budget:** Everyone

Future Discussions

- Begin process of understanding and reading over WRS document
 - Assign tasks for everyone to complete in WRS document, Mockups, User Manual
 - Discuss how to finalize the Phase 1 preliminary plan
 - Keep powerpoint and collection meeting notes (this document) in mind
 - Phase 1 preliminary plan:
<https://docs.google.com/document/d/1GI2ep99U9wsSYLu1ldTdRJdZuQW51xxHUWqpds6TETU/edit>
-

September 11th, 2019

Current Discussions

- WRS Doc:
 - Introduction - Austin
 - Preliminary definition - Sean & Freya
 - Issues with preliminary definition - Sean & Freya
 - WRS
 - W - Austin & Cole
 - RS - Cole

- Preliminary prototype
 - Prototype interface mock-ups - Freya
 - User Manual - Freya
- Traceability - All
- References - All

Future Discussions

- Continue working on WRS:
<https://docs.google.com/document/d/1jalmSSgrTi29ubiELoSUT-VjM6FzuihcQ-UgkIIRKvM/edit>
 - Discuss requirements
 - Go over possible mock-ups and what the app will be like
 - Keep power point in mind
 - Revise preliminary SPMP
-

September 18th, 2019

Current Discussions

- Examples of Mockups?
- Go over WRS to ensure everyone is on track and

Future Discussions

-
-

October 2nd, 2019

Current Discussions

- Looked over WRS doc and ensured we are all on track
- Made changes where needed to WRS doc
- Assigned new task for future changes for deliverable 1
 - User Manual - Cole and Austin
 - Updated to WRS - Sean and Freya
 - Updated Preliminary Plan - Austin
 - Update schedule and budget section
 - Presentation - Still to be assigned
 - Prototype (hand drawn) - Cole

- Prototype (Computer) - Cole & Sean
 - Create preliminary decision tree of voice command interactions - Sean
-

October 13nd, 2019

Current Discussions

- Added function point calculations
- Finalized our WRS document
- Created our presentation
- Updated our preliminary plan document