WRS Evolution

CptS 484: Software Requirements

Requirements Elicitation

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Revision History

Date	Version	Changes	Editor
10/14/2023	0.1	Initial Draft	Samuel, Julie, Ahmed, Caden, Brenden
10/15/2023	0.11	Formatting Fixes	Samuel
12/5/2023	0.12	Initial Phase 2 changes	Samuel, Julie, Ahmed, Caden, Brenden
12/8/2023	0.12	Added some KAOS models	Samuel, Ahmed

[1]   Introduction

1.1. Purpose

The objective of this project is to develop an application capable of providing a safe navigation solution for the vision impaired. The application should improve upon traditional navigation tools such as canes, taking into consideration obstacle detection, collision avoidance, timeliness, and familiarity.

1.2. Scope

The scope of the application should be limited to only addressing the provided requirements. The application will function for indoor navigation, consisting of multi floored buildings and elements such as elevators, stairs, and bathrooms.

The application's features will be built to accommodate the primary user, the blind and vision impaired, as well as a secondary caretaker user.

The core functionalities of the application are determined to be the following:

- Accepting a destination location from the user.
- Calculation of routes from the user's location to the destination.
- Giving audible instructions to the user on where and how to move.
- Obstacle detection.
- Placing emergency calls or messages.

1.3. Objectives and Success Criteria

The project objectives and success criteria are that the software must:

1. Help the user safely navigate indoors.
2. Lead the user through the fastest route.
3. Lead the user through the route that the user would feel the most comfortable with.
4. Usable for blind and vision impaired.
5. Be customizable by any user.
6. Extensible to accommodate variations.

1.4. Definitions, Acronyms, and Abbreviations

Term	Definition
PD	Preliminary Domain
FR	Functional Requirement
NFR	Non-Functional Requirement
DI	Domain Issues

1.5. Overview

Section 2 will describe the preliminary domain, functional, and non-functional requirements gathered from the initial project description. In section 3, issues determined from the preliminary definitions are laid out. The issues cover the domain, functional, and non-functional requirements, options, choice, and rationales.

Section 4 covers the topic of W and RS. The section for W describes the problems, goals, and relations between the two. Each goal has backwards traceability and forward traceability noted. Further on, an improvement on the preliminary domain, functional, and non-functional requirements are made and connected to relevant problems and goals. The RS section lists the functional, non-functional requirements and specifications. Satisfied functional requirement issues and objectives are also included.

[2]   Preliminary Definition

2.1. Preliminary Domain

PD_ID	Preliminary Domain Description
PD1	Indoor locations, which can consist of multiple floors, each of which possibly hosts multiple rooms, bathrooms, elevators, etc.
PD2	A blind or vision impaired person who needs to navigate indoors.
PD3	A caretaker who sets the application configuration and comes to aid the primary user in case of emergencies.

2.2.Preliminary Functional Requirements

P FR_ ID	Preliminary FR Description
PFR1	Accepting from the user the destination location.
PFR2	Suggest or confirm a possible destination location based on the user's routine.
PFR3	Calculation of routes to a destination, informing the user of the route options, and accepting user's preference.
PFR4	Telling the user directions for walking, stopping, or turning.
PFR5	Obstacle detection and telling the user how to avoid the obstacle.
PFR6	Placing emergency calls and messages after detecting a fall or losing the current location.
PFR7	Figuring out the user's next action and suggesting or accepting the user's choice.

2.3.Preliminary Non-Functional Requirements

PNFR_ ID	Preliminary NFR Description
PNFR1	Help the user safely navigate indoors.
PNFR2	Lead the user through the fastest route.
PNFR3	Lead the user through the route that the user would feel most comfortable with.
PNFR4	Usable for blind people.
PNFR5	System shall be ubiquitous.
PNFR6	System shall be customizable to every user.
PNFR7	System shall be easily extensible to accommodate the following typical variations: variations in interface, language, definitive needs of the user, new features, new sensors and hardware, etc.

[3]   Issues with the Preliminary Definition Given

3.1.Domain Issues

Domain Issue ID	Domain Issue Description	
DI1	PD_1	Indoor locations, which can consist of multiple floors, each of which possibly hosts multiple rooms, bathrooms, elevators, etc.
	1. Ambiguous or incomplete definition. Only some elements of 'indoor locations' are defined.	
	Option 1	Provide a proper definition for indoor locations that should be handled by the application.
	Option 2	Assume the application must be able to handle all locations, including indoors, outdoors, and other unique instances.
	Choice	Option 1
	Rationale	Developing the application to work in all locations will result in tremendous scope creep. Refining the definition for workable locations will require less work.
Revised wording		
DI2	PD_2	A blind or vision impaired person who needs to navigate indoors.
	2. Ambiguous. Does the user only have to be blind or vision impaired, or can they have other disabilities?	
	Option 1	Assume blind or vision impaired users have no other disabilities.
	Option 2	Accommodate navigation of blind as well as other disabilities.
	Choice	Option 1
	Rationale	Developing the application to accommodate additional disabilities will result in an ever-increasing scope creep.

Revised wording		
DI3	PD_3	A caretaker who sets the application configuration and comes to aid the primary user in case of emergencies.
	3. What if no caretaker user available?	
	Option 1	Assume application can only be configurable with the aid of a non-vision impaired.
	Option 2	Allow configuration of application for vision impaired users.
	Choice	Option 1
	Rationale	Adding the ability for a vision impaired user to configure the application would also result in scope creep.
Revised wording		

3.2. Functional Requirements Issues

FR Issue ID	Description	
FRI1	PFR1	Accepting from the user the destination location.
	1. How should the application receive this input?	
	Option 1	Keyboard text input.
	Option 2	User voice input.
	Choice	Option 2
	Rationale	Since the primary user is blind or vision impaired, accepting the location via user voice input is the most accessible option.
Satisfied by	FR1	

FR Issue ID	Description	
FRI2	PFR2	Suggest or confirm a possible destination location based on the user's routine.
	The problem is determining if the user is in hurry or have time to select route	
	Option 1	Always recommend best route to user
	Option 2	Allow user to disable recommendation in settings
	Choice	Option 2
	Rationale	If the user does not want a recommendation from the app, then they can disable the option, otherwise the app will recommend the fastest safest route to the user.
Satisfied by	FR2	

FR Issue ID	Description	
FRI3	PFR3	Calculation of routes to a destination, informing the user of the route options, and accepting user's preference.
	How to list options to user via voice command and accept correct user input	

	Option 1	Preface each voice command with enumerated wording as in "Route 1, route 2...route n"
	Option 2	Just list each route depending on user naming
	Choice	Option 1
	Rationale	This will allow the user to select a preferred route and allow the system to double check user input. By having a universal system for route names. It will make communication much more consistent between all users of the application.
Satisfied by	FR3	

FR Issue ID	Description	
FRI4	PFR4	Telling the user directions for walking, stopping, or turning.
	How to time direction initiation. how to avoid miscommunication between user and app	
	Option 1	Create a secondary system that notifies user of wrong turns
	Option 2	Extensive communication system that counts for each step from the user with a secondary system in case for wrong turn
	Choice	Option 2
	Rationale	The system needs to be extremely rigorous in communicating with the user to allow user to get a feel for how the app communicates. In addition, allow for fallback system in case a user turns too soon or skips a turn or a stare.
Satisfied by	FR4	

FR Issue ID	Description	
FRI5	PFR5	Obstacle detection and telling the user how to avoid obstacles.

	The issue is real time detection. Will the app be able to process objects and notify user in time before an accident occurs
	Option 1 | Use darknet technology for fastest real time image processing while in motion
	Option 2 | Build a solution from scratch
	Choice | Option 1
	Rationale | Using pretested open-source solutions is more practical and safer for. Taking on such an extensive task will over extent the scope and teams' ability to accomplish task
Satisfied by	FR5

FR Issue ID	**Description**
	PFR6 | Placing emergency calls and messages after detecting a fall or losing the current location.
	In case of fall or phone drop how to act accordingly and in timely manner to minimize injuries
FRI6	**Option 1** | Always assume the worst-case scenario. In case of fall detection immediately dial 911
	Option 2 | In case of fall detection, voice command ask user if they're ok. If there is no reply within 5 seconds dial 911. If user is ok and they dropped their phone,e guide the user to the phone by voice and volume.
	Choice | Option 2
	Rationale | Option 2 does not hinder the user safety and unnecessary 911 calls.
Satisfied by	FR6

FR Issue ID	**Description**
	PFR7 | Figuring out the user's next action and suggesting or accepting the user's choice.
FRI7	Recommending the most common action by users post navigation
	Option 1 | Ask the user if they have arrived to destination safely and if they are ready for their next navigation.

	Option 2	Automatically end trip once arrived at destination
	Choice	Option 1
	Rationale	Allow user input regarding destination and option to reach a different location
Satisfied by	FR7	

3.3.Non-Functional Requirements(NFR) Issues

NFR Issues ID	Description	
NFRI1	PNFR1	Help the user safely navigate indoors.
	What defines safe navigation?	
	Option1	Navigation with no obstacles or obstructions.
	Option2	Navigation with no obstacles or obstructions that can directly harm the user
	Option3	Navigation that avoids any potential obstructions.
	Choice	1
	Rationale	Being able to detect the type of intent of an obstacle would be unfeasible by the application, therefore navigation that avoids any obstacles would be considered safe.
Satisfied by		

NFR Issues ID	Description	
NFRI2	PNFR2	Lead the user through the fastest route.
	What is considered the fastest route?	
	Option1	Shortest length from current location to destination out of all calculated routes.

	Option2	Shortest length from current location to destination out of all possible routes calculated or not.
	Choice	1
	Rationale	The application cannot determine the shortest path from routes not calculated or routes it is not aware of. Limited the fastest route to the shortest path from known routes is most realistic.
Satisfied by		
NFR Issues ID	**Description**	
NFRI3	PNFR3	Lead the user through the route that the user would feel most comfortable with.
	How will the app know which route the user is comfortable with?	
	Option1	Provide the user with an option of routes. Chosen route is considered comfortable.
	Option2	Assume which route is comfortable by utilizing user configurations, past routes, or more data.
	Choice	1
	Rationale	Providing the user with the route options requires the least work while being more accurate to what is considered comfortable by the user.
Satisfied by		
NFR Issues ID	**Description**	
NFRI4	PNFR4	Usable for blind people.
	To what extent is considered usable?	
	Option1	All features of the app should be usable by a blind user.

	Option2	Features intended to be used by a blind user.
	Choice	2
	Rationale	Considering a secondary user for the application is a caretaker, features developed for that user may not be useable by a blind user. Only features intended to be used by a blind user should be useable.
Satisfied by		
NFR Issues ID	**Description**	
NFRI5	PNFR5	System shall be ubiquitous
	To what extent is considered ubiquitous?	
	Option1	The app will be aware of the visual surroundings at all times during navigation.
	Option2	The app will be aware of visual surroundings at all times.
	Option3	The app will be aware of visual and audio at all times during navigation.
	Choice	1
	Rationale	Considering the user is intended to be blind, the app should mainly be accounting for this and should be aware of visuals. Additionally, the app only needs this awareness during navigation when obstacle detection is important.
Satisfied by		
NFR Issues ID	**Description**	
NFRI6	PNFR6	System shall be customizable to every user.
	Which features should customizable or not.	
	Option1	Only user preferences such as volume, audio type, location, information, etc.

	Option2	User preferences and feature settings such as obstacle detection.
	Option3	The app will be aware of visual and audio at all times during navigation.
	Choice	1
	Rationale	For safety purposes, only preferences not tied to integral features of the app should be customizable by every user. Allowing a blind user to change settings related to route or obstacle detection could result in danger and should only be changed by developers or other expert users.
Satisfied by		

NFR Issues ID	Description	
NFRI7	PNFR7	System shall be easily extensible to accommodate the following typical variations: variations in interface, language, definitive needs of the user, new features, new sensors and hardware, etc.
	How exposed should this extensibility be?	
	Option1	Only developers may add these variations to the app.
	Option2	Any user may add these variations to the app.
	Choice	1
	Rationale	Since extensibility comes from the design and architecture of the app, developers should be the ones primarily adding these variations. Allowing any user to do so would result in scope creep for creating a user-friendly way.
Satisfied by		

[4] WRS

4.1.W

4.1.1. Problem

Problem ID	Problem Description	Corresponding Goals
P1	How to help blind people navigate indoors?	G1
P2	How to recognize a user's indoor location?	G2
P3	How to recognize the floor the user is on?	G2
P4	How to handle locations with semi outdoor connections?	G2
p5	Should we initialize communication with the application to expect the worst case scenario?	G3
P6	How to handle loss of internet connection?	G4
P7	How to communicate with a blind and deaf user?	G3
P8	How to receive information from a blind user?	G3
P9	How to allow the user to configure accessibility settings?	G5
P10	Calculation of route to destination?	G6
P11	How to inform the user of the route to their destination?	G3
P12	What is the best route possible?	G7
P13	What is the safest route possible?	G7

| P14	Communicating with the user via sound and vibration while in route?	G8
P15	What will the app do in case of phone drop?	G9
P16	What will the app do if the battery is low?	G10
P17	How to contact an emergency?	G11
P18	Is real-time object recognition the only option for navigation?	G12
P19	Can a blind user customize the app?	G13
P20	Can a caretaker customize the app?	G14

4.1.2. Goals
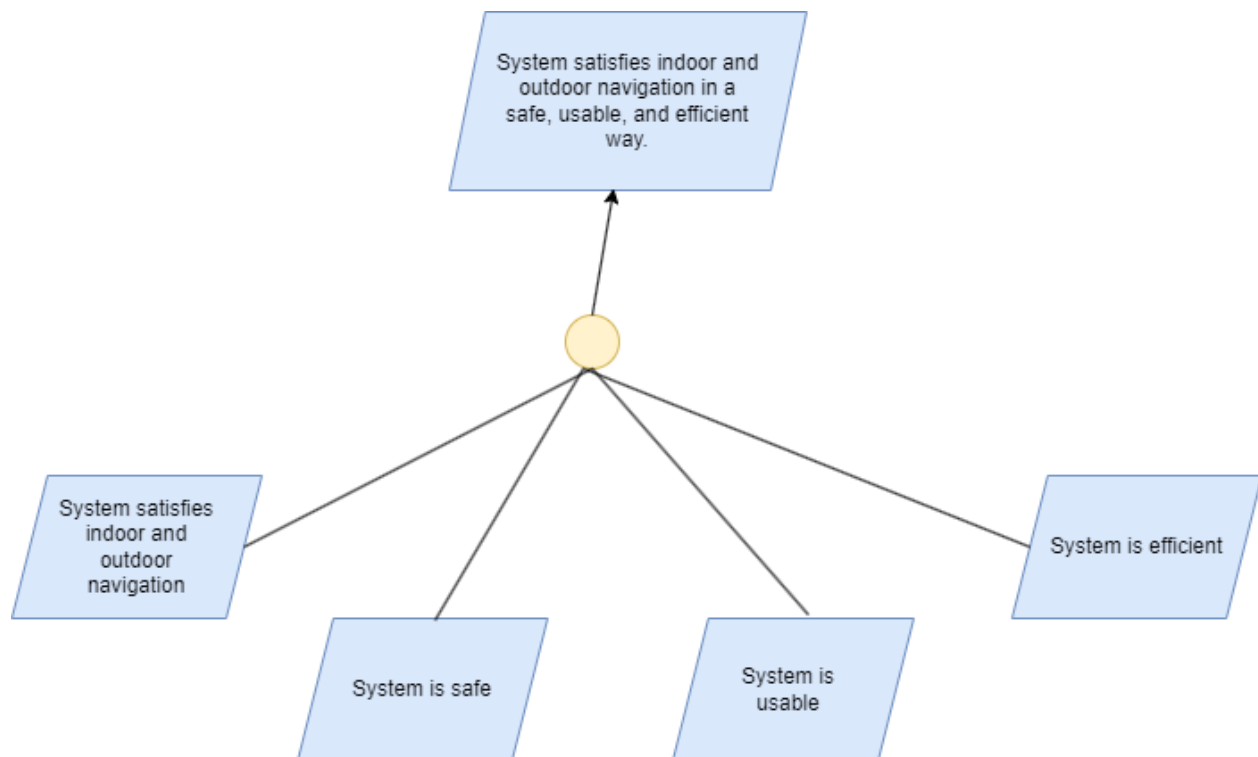
Figure1: Goal: "System satisfies indoor and outdoor navigation in a safe, usable and efficient way"
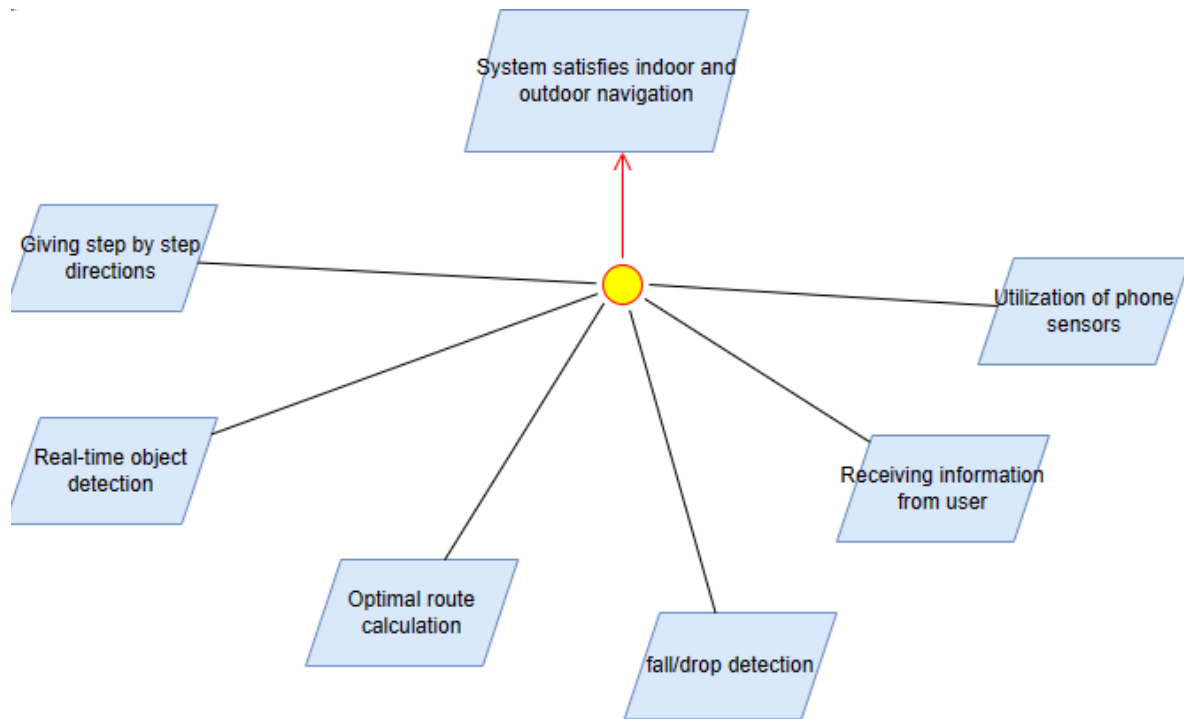

Figure2: Goal: "System satisfies indoor and outdoor navigation"

Goal ID	Goal Description	Backward Traceability	Forward Traceability
G1	Decompose Indoor navigation into smaller subsystems	P1	IFRO1
G2	Use indoor location recognition API	P2 P3 P4	IFRO1
G3	Implement indoor level recognition	P5 P7 P8 P11	IFRO1
G4	Enable smooth transition between outdoor to indoor navigation with no interruption	P6	IFRO1, IFRO3

G5	Implement multiple fallback systems for emergency	P9	IFRO5, INFRO5
G6	Implement local data base	P10	IFRO2, IFRO6
G7	Develop multi modal communication system through visual and verbal communication	P12 P13	INFRO3, INFRO4, INFRO7
G8	Implement optimal route APIs	P14	INFRO2
G9	Implement drop and fall functionality	P15	IFRO5, INFRO5
G10	Develop conservation of battery mode system	P16	IFRO5
G11	Enable easy emergency contact	P17	IFRO5, INFRO5
G12	Explore real time object detection via camera systems	P 18	IFRO4, INFRO1, INFRO5
G13	Enable customization of app preferences for both blind and caretaker users	P19 P20	INFRO6, INFRO7

4.1.3. Improved Understanding of Domain, Stakeholders, Functional, and Non-Functional Objectives

4.1.3.1. Improved Domain

Improved Domain ID	Improved Domain Description
ID1	Indoor locations may consist of multiple floors, multiple rooms, bathrooms, elevators, stairs, etc. Indoor locations include buildings or structures containing an entrance, walls, and roof.
ID2	Users who are blind or vision impaired and have no other disabilities.

ID3	A required caretaker user who sets up the application configuration and comes to aid of primary user in case of an emergency.

4.1.3.2. Stakeholders

- Sponsors: Washington state University
- Faculty: Bolong Zeng
- Potential users: Development team, Visually Impaired People, Caretaker, Accessibility faculty members in workplaces, Police and security members and family members of blind persons.

4.1.3.3. Improved Functional Objectives

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

Improved FR Objective ID	Objective Description	Alleviates Problems	Achieves Goals
IFRO1	Will acquire user location via current location APIs. Will figure out correct level of user.	P1 P2 P3 P4 P6	G1 G2 G3 G4
IFRO2	The destination tab will keep a cache of frequent used destination to suggest possible destination	P10	G6
IFRO3	Route API will calculate best routes and inform user of options available	P6	G4
IFRO4	Provide real-time obstacle detection mechanism and notify users via voice, vibration and UI of expected and unexpected obstacles.	P18	G12
IFRO5	Emergency system to place emergency calls in case of fall or malfunction.	P9 P15 P16 P 17	G5 G11 G10 G9
IFRO6	Anticipating user action post successful trip	P10	G6

4.1.3.4. Improved Non-Functional Objectives

| Improved NFR Objective ID	Objective Description	Alleviates Problem	Achieves Goal
INFRO1	Navigation should be concluded without any injuries to the desired destination	P18	G12
INFRO2	Show user variety of options regarding routes	P14	G8
INFRO3	Allow user to select desired route	P12, P13	G7
INFRO4	Text to voice and voice commands	P12, P13	G7
INFRO5	App is able to process surrounding environment in real time. Detect falls or abnormality. Response to user input under any circumstances.	P9, P15, P17, P18	G5, G9, G11, G12
INFRO6	Allow user to customize volume, favorite routes, font size, vibration and pre/post trip recommendation	P19, P20	G13
INFRO7	Include settings for caretaker and users that are not familiar with application	P12, P13, P19, P20	G7, G13

4.2.RS
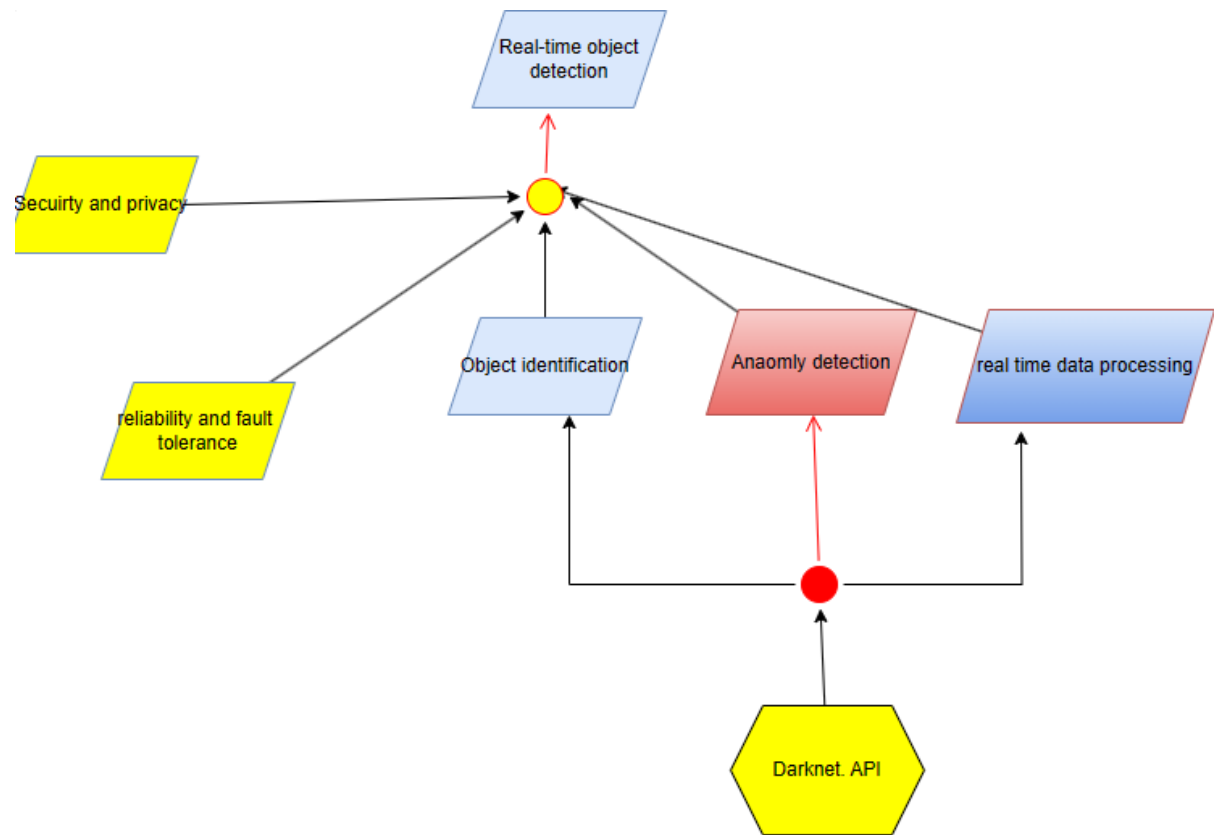
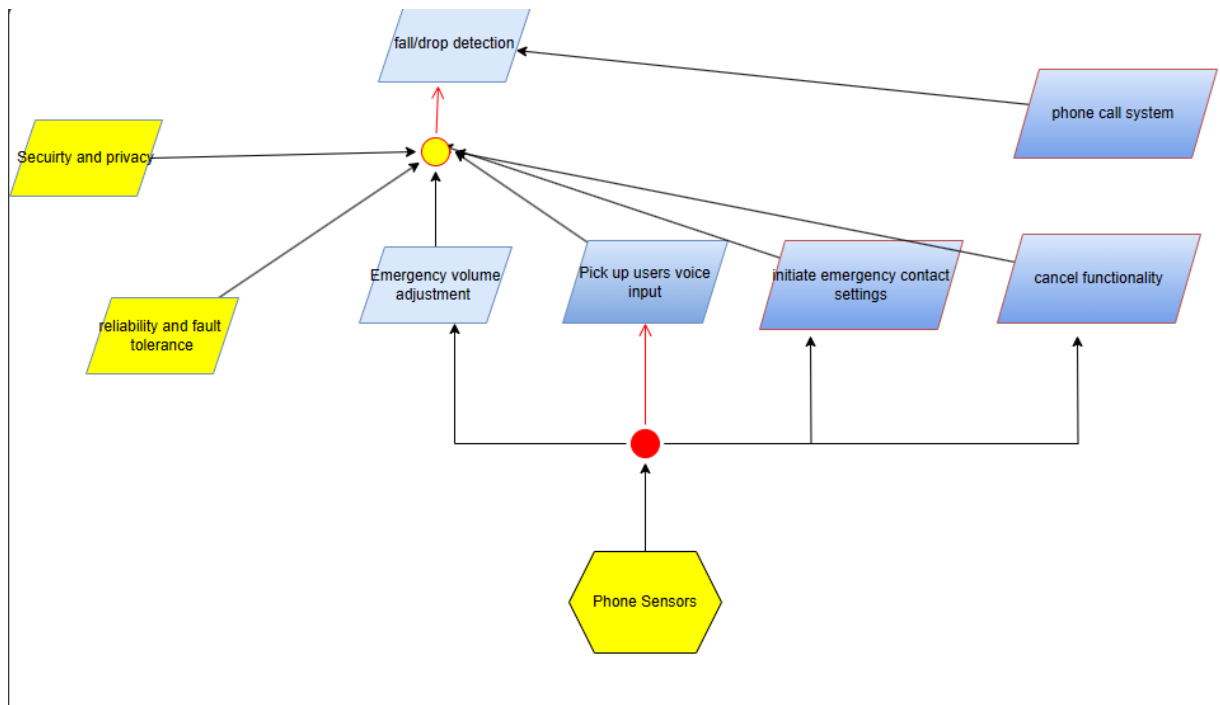Figure3: Responsibility: "Real-time object detection"

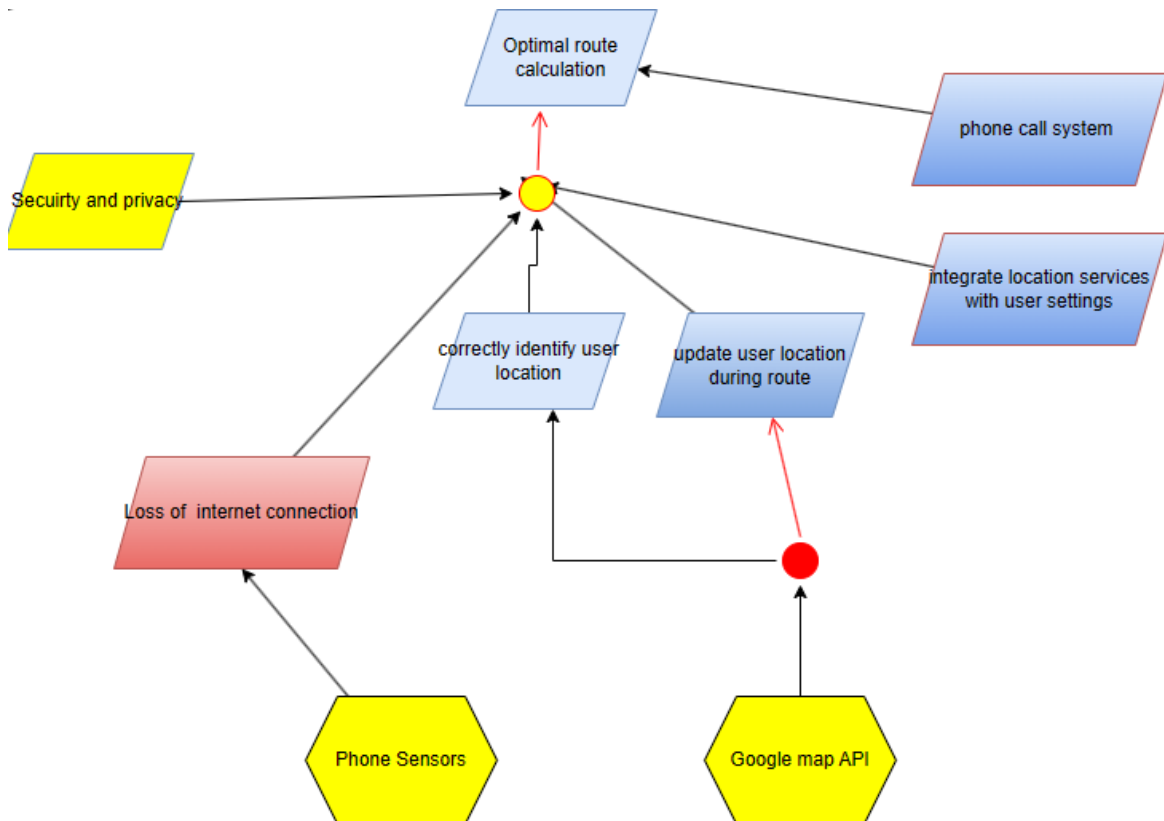figure 4: responsibility: "fail/drop detection"
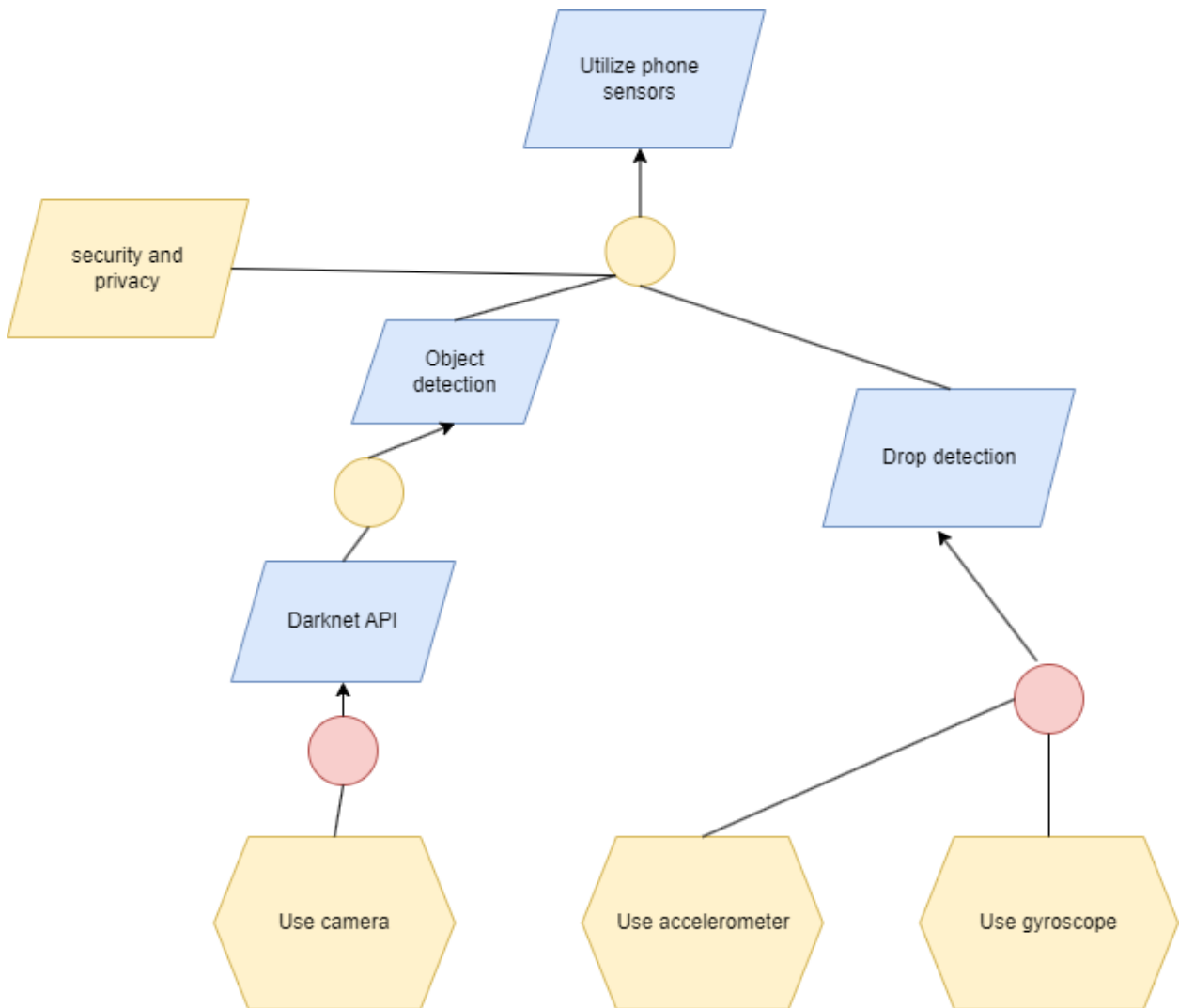
figure 5: responsibility: "optimal route calculation"

Figure 6: responsibility: "utilize phone sensors"

4.2.1. Functional Requirements

FR ID	Description
FR1	Accepting a voice input of destination location from the user.
Satisfies Functional Requirement Issue	FRI1
Satisfies Objectives	IFRO1
Satisfied by prototype feature	Yes

FR ID	Description
FR2	Suggest or confirm a possible destination location based on the user's routine.
Satisfies Functional Requirement Issue	FRI2
Satisfies Objectives	IFRO2
Satisfied by prototype feature	YES

FR ID	Description
FR3	Calculation of routes to a destination, informing the user of the route options, and accepting user's preference.
Satisfies Functional Requirement Issue	FRI3
Satisfies Objectives	IFRO3
Satisfied by prototype feature	YES

FR ID	Description
FR4	Perform real-time collision detection using the phone's camera to warn the user of objects in front of them.
Satisfies Functional Requirement Issue	FRI4
Satisfies Objectives	IFRO4
Satisfied by prototype feature	YES

FR ID	Description
FR5	Calls emergency services upon user request.

Satisfies Functional Requirement Issue	FRI5
Satisfies Objectives	IFRO5
Satisfied by prototype feature	YES

FR ID	Description
FR6	Collect user route data to more accurately determine future route suggestions.
Satisfies Functional Requirement Issue	FRI6
Satisfies Objectives	IFRO6
Satisfied by prototype feature	YES

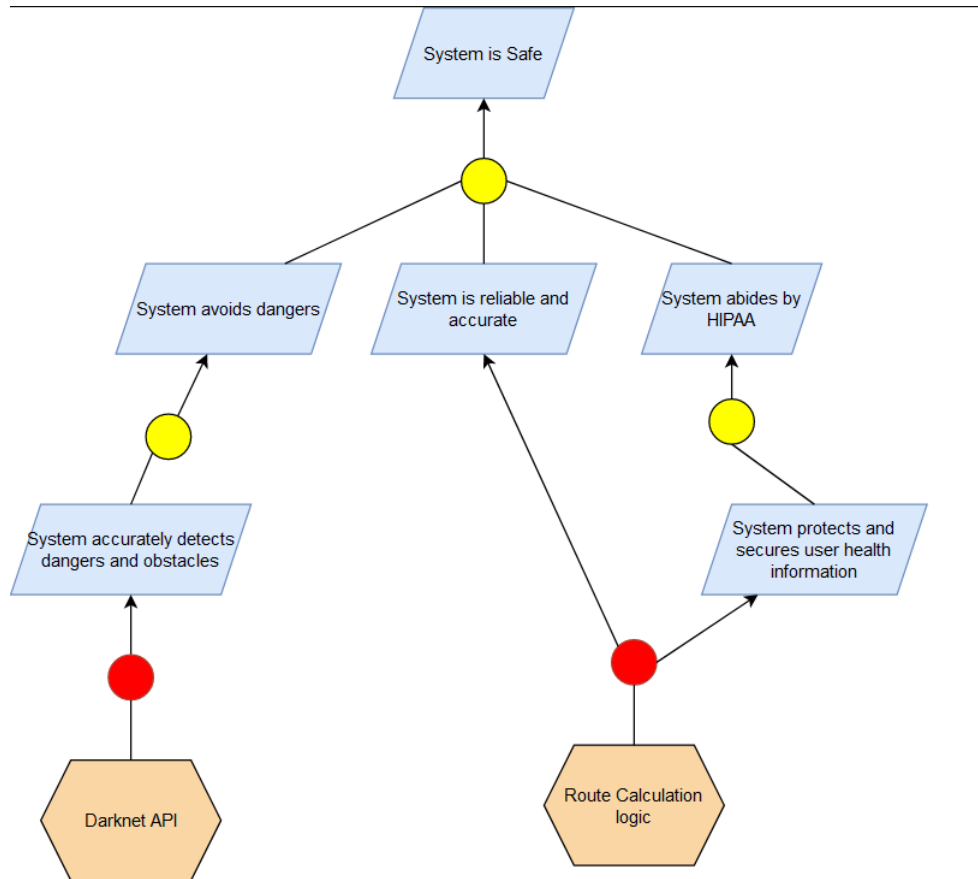| FR ID	Description
FR7	Collect user route data to more accurately determine future route suggestions.
Satisfies Functional Requirement Issue	FRI7
Satisfies Objectives	IFRO7
Satisfied by prototype feature	YES

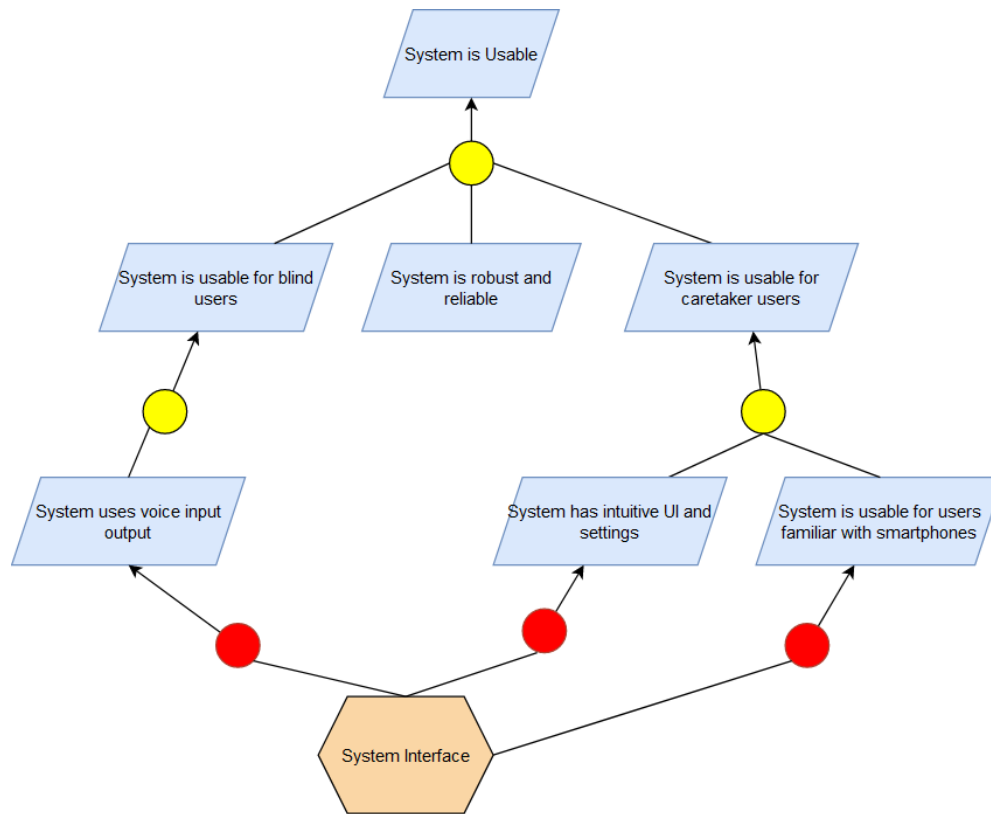## 4.2.2. Non-Functional Requirements

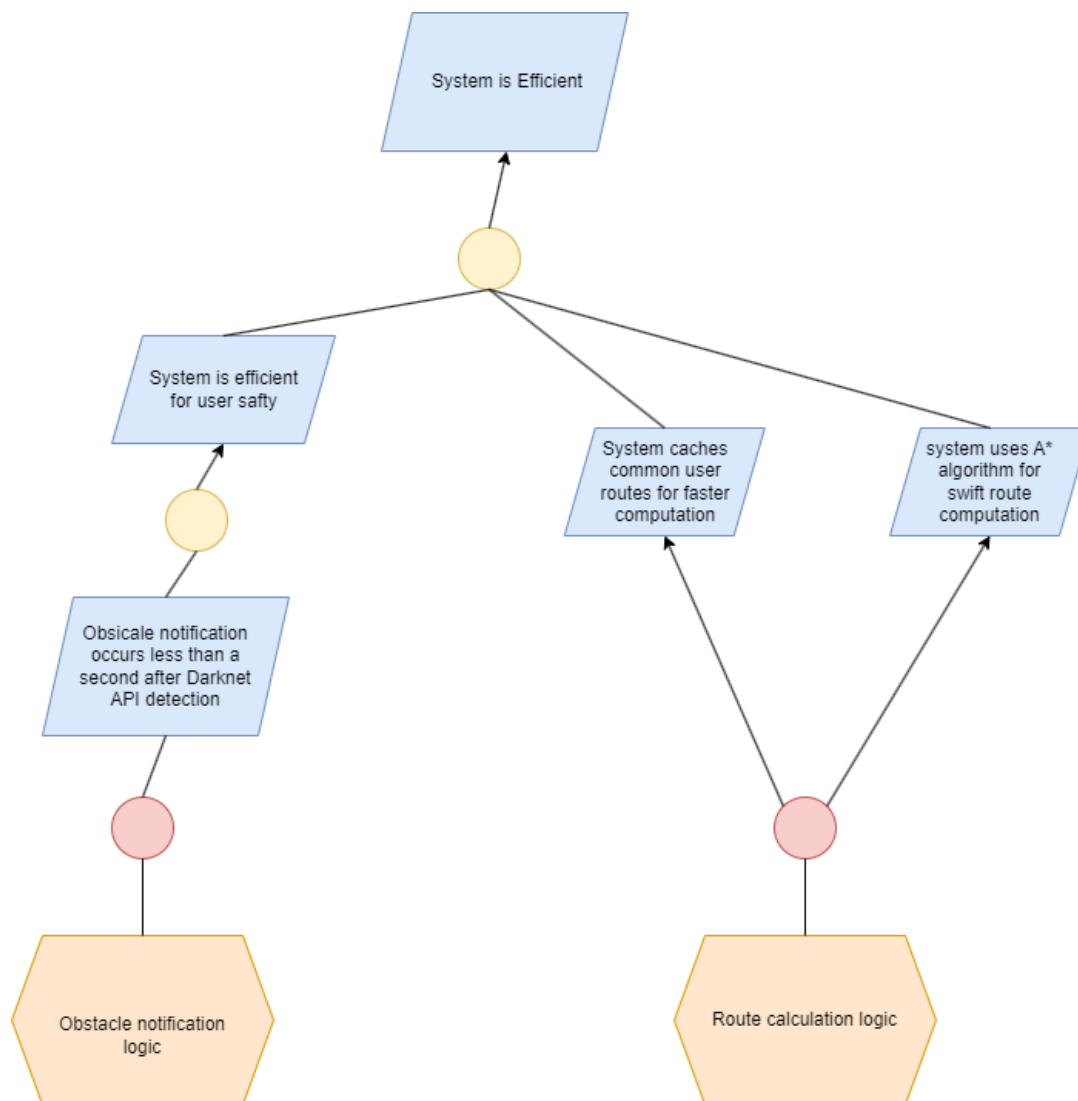Figure 7: Goal: "System is safe"

Figure 8: Goal: "System is usable"

Figure 9: Goal: "System is efficient"

NFR ID	Nonfunctional Requirement 1
NFR1	Help the user safely navigate indoors.
Operationalized Functional Requirements	FR4
Satisfies Nonfunctional Requirement Issue	PNFR1
Satisfies Non-functional Objective	INFRO1
Constrains	Budget constraints may limit certain navigation features

Satisfied by prototype feature	YES

NFR ID	Nonfunctional Requirement
NFR2	Lead the user through the fastest route.
Operationalized Functional Requirements	FR2, FR3, FR6
Satisfies Nonfunctional Requirement Issue	PNFR2
Satisfies Non-functional Objective	INFRO2
Constrains	Budget constraints may limit certain navigation features or certain phones not compatible with haptic feedback
Satisfied by prototype feature	YES

NFR ID	Nonfunctional Requirement
NFR3	Lead the user through the route that the user would feel most comfortable with.
Operationalized Functional Requirements	FR2, FR3, FR6
Satisfies Nonfunctional Requirement Issue	PNFR3
Satisfies Non-functional Objective	INFRO3
Constrains	Budget constraints may limit certain navigation features or certain phones not compatible with haptic feedback
Satisfied by prototype feature	YES

NFR ID	Nonfunctional Requirement
NFR4	Usable for blind people
Operationalized Functional Requirements	FR1, FR4, FR5

Satisfies Nonfunctional Requirement Issue	PNFR4
Satisfies Non-functional Objective	INFRO4
Constrains	Budget constraints may limit certain navigation features or certain phones not compatible with haptic feedback
Satisfied by prototype feature	YES

NFR ID	Nonfunctional Requirement
NFR5	System shall be ubiquitous
Operationalized Functional Requirements	FR4
Satisfies Nonfunctional Requirement Issue	PNFR5
Satisfies Non-functional Objective	INFRO5
Constrains	Budget constraints may limit certain navigation features or certain phones not compatible with haptic feedback
Satisfied by prototype feature	YES

NFR ID	Nonfunctional Requirement
NFR6	System shall be customizable to every user.
Operationalized Functional Requirements	FR2, FR3, FR6
Satisfies Nonfunctional Requirement Issue	PNFR6
Satisfies Non-functional Objective	INFRO6
Constrains	Budget constraints may limit certain navigation features or certain phones not compatible with haptic feedback
Satisfied by prototype feature	YES

NFR ID	Nonfunctional Requirement
NFR7	systems shall be easily extensible to accommodate typical variations: variations in interface, language, definitive needs of the user, new features, new sensors, and hardware, etc.
Operationalized Functional Requirements	FR3
Satisfies Nonfunctional Requirement Issue	PNFR7
Satisfies Non-functional Objective	INFRO7
Constrains	Budget constraints may limit certain navigation features or certain phones not compatible with haptic feedback
Satisfied by prototype feature	YES

4.2.3. Specifications

Functional Specification ID	Functional Requirement
FS1	Accepting a voice input of destination location from the user.
Satisfies Functional Requirement	FRI1
Satisfies Objectives	IFRO1
Satisfied by prototype feature	Yes

Functional Specification ID	Functional Requirement
FS2	Suggest or confirm a possible destination location based on the user's routine.
Satisfies Functional Requirement	FRI2
Satisfies Objectives	IFRO2
Satisfied by prototype feature	Yes

Functional Specification ID	Functional Requirement
FS3	Calculation of routes to a destination, informing the user of the route options, and accepting user's preference.
Satisfies Functional Requirement	FRI3
Satisfies Objectives	IFRO3
Satisfied by prototype feature	Yes

Functional Specification ID	Functional Requirement
FS4	Perform real-time collision detection using the phone's camera to warn the user of objects in front of them.
Satisfies Functional Requirement	FRI4
Satisfies Objectives	IFRO4
Satisfied by prototype feature	Yes

Functional Specification ID	Functional Requirement
FS5	Calls emergency services upon user request.
Satisfies Functional Requirement	FRI5
Satisfies Objectives	IFRO5
Satisfied by prototype feature	Yes

Functional Specification ID	Functional Requirement
FS6	Collect user route data to more accurately determine future route suggestions.

Satisfies Functional Requirement	FRI6
Satisfies Objectives	IFRO6
Satisfied by prototype feature	Yes

| Functional Specification ID	Functional Requirement
FS7	Collect user route data to more accurately determine future route suggestions.
Satisfies Functional Requirement	FRI7
Satisfies Objectives	IFRO7
Satisfied by prototype feature	Yes

[5]   Preliminary Prototype

The preliminary prototype of the THEIA is located on the project's GitLab repository. It also includes related documents and resources.

Link to the repo: https://gitlab.eecs.wsu.edu/cpts484-fall23/icebucket

[6]   Prototype Interface Mock-ups
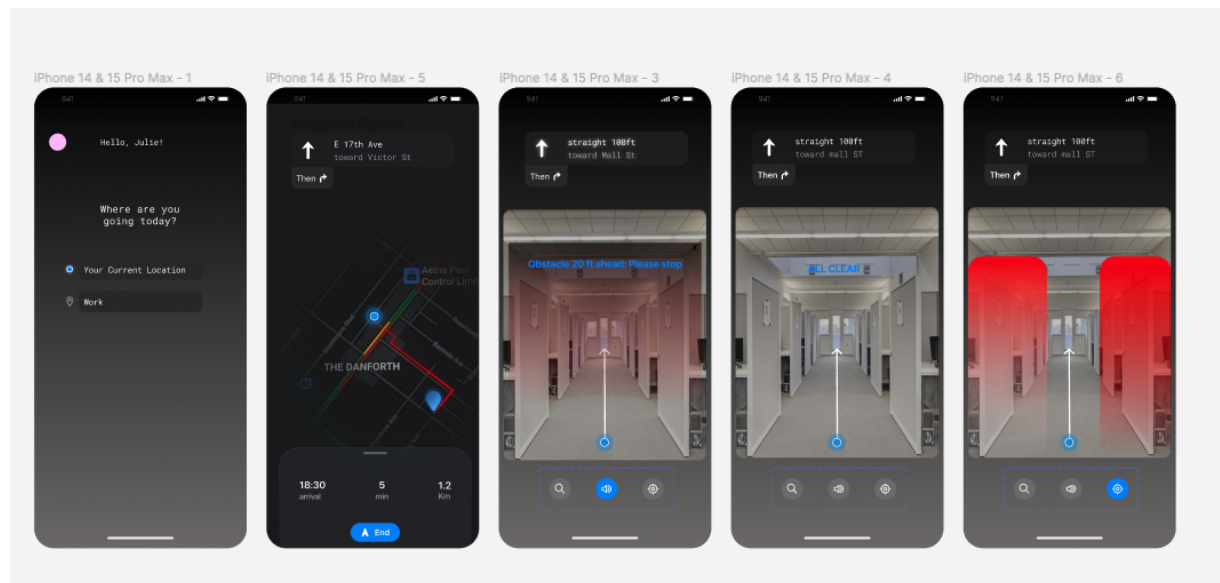
Frame Breakdown

Frame 1 - Destination Input:
- Description: The user activates the navigation feature. Two input methods are available: voice command and text input. The interface displays a microphone icon for voice command and a keyboard icon for text input, indicating the user's options to enter their destination.

Frame 2 - Route Confirmation:
- Description: Upon destination entry, the app confirms the location and begins route guidance. The screen shows a highlighted path on a map, indicating the route from the user's current location to the selected destination. A message 'Route Set - Proceed' appears at the top of the screen.

Frame 3 - Obstacle Detection with Haptic Feedback:
- Description: As the user follows the indoor route, the app detects a distant obstacle. The screen zooms in on the obstacle's location, marking it with a red exclamation icon. Simultaneously, the user receives a gentle haptic feedback as a warning, and a message appears: 'Obstacle Ahead - Proceed with Caution.'

Frame 4 - Clear Path Notification:
- Description: In this frame, the route is clear of obstacles. The screen displays the indoor route with a 'green check' icon, and a message at the bottom reads 'All Clear - No Obstacles Detected.' There is no haptic feedback, indicating a safe path ahead.

Frame 5 - Immediate Obstacle Warning:
- Description: The app detects an obstacle in close proximity. The screen focuses on the nearby obstacle, highlighted with a flashing red icon. A strong haptic feedback is triggered, accompanied by an urgent warning sound. A message 'Immediate Obstacle Detected - Stop or Reroute' is displayed, alerting the user to take immediate action.

[7]   User Manual

- Installation

1- Launch app store

2- Search for Theia

3- Click on install

- Initial customization

1-input emergency contact

2- Grant access to camera, microphone, location

3- Test microphone and voice commands

4- Set preferences

- Using Theia

1- Use voice command to set a destination or use keypad to enter destination

2- Choose Favorite route

- Navigation:

1- App will guide you through the route by voice commands.

2- Notification if there is an obstacle in the way

- Emergency

1- In case of fall, app will dial 911 automatically

2- User can use voice command to activate emergency contact or dial 911

    3- User can change volume using voice command

- Customization menu

    1- User can set favorite route using voice commands or UI in customization menu

    2- User can adjust default volume levels

    3- User can add emergency contacts