

SE 4351: Requirements Engineering

WRS Evolution: NaviSense

Requirements Elicitation

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Revision History

Date	Version	Changes	Editor

Team Meetings Phase II

Meeting #	Date	Agenda	Participants	Key Takeaways
1	4/3	Project Description and Safety Requirements	Omar, Ubadah, Tabarak, and Shay	<ul style="list-style-type: none"> - reviewed the initial project description once more and identified areas where safety considerations are necessary - brainstormed potential risks and hazards that blind people may encounter when navigating indoors and discussed how the app can address these concerns - discussed the technical feasibility of the app and identified the sensors that could be utilized to enhance safe navigation through avoiding obstacles - identified the need for secure storage and transfer of any personal health information collected by the app - discussed potential encryption and authentication mechanisms to ensure compliance

				with HIPAA regulations
2	4/8	Process Specification and Issue Resolution	Omar, Ubadah, Tabarak, and Shay	<ul style="list-style-type: none"> - discussed the various modeling techniques that could be employed such as use case diagrams, activity diagrams, and state transition diagrams, to capture the behavior and functionality of the app - considered the potential use of rapid prototyping techniques to quickly iterate and refine the design based on user feedback - identified more areas of incompleteness, inconsistency, ambiguity, and redundancy - resolved these issues by considering different options, analyzing tradeoffs, and making decisions - addressed the ambiguity in the project description by conducting further research and gathering input from potential users

				<ul style="list-style-type: none"> - clarified the requirements related to the app's user interface, navigation features, and integration with existing smart home systems
3	4/14	Product Specification and Finalization	Omar, Ubadah, Tabarak, and Shay	<ul style="list-style-type: none"> - began to outline the specific features and functionalities that the app would provide - identified the user personas, scenarios, and use cases to capture the diverse needs and potential interactions of blind users with the app - discussed the accessibility requirements to ensure that the app is usable and navigable for individuals with visual impairments which involved considering options such as screen reader compatibility, voice command support, and high contrast interfaces - examined the security and privacy aspects of the app in more detail, refining the requirements related to data encryption, user

				<p>authentication, and secure communication protocols</p> <p>- finalized the product requirements models, including the use of formal modeling techniques such as UML diagrams to represent the app's architecture, behavior, and data flow</p>
4	4/19	Vision Document and Prototype Development	Omar, Ubadah, Tabarak, and Shay	<p>- discussed the development of the vision document for the smart home app</p> <p>- identified the key stakeholders and their respective needs and expectations</p> <p>- documented the high-level requirements, including functional and non-functional requirements, and defined the scope of the app</p> <p>- discussed the development of a running prototype based on the mockup prototype that was previously constructed</p> <p>- reviewed the feedback from user</p>

				<p>testing and identified areas for improvement</p> <p>- discussed the technical implementation details, such as the programming languages and frameworks to be used, and assigned tasks to team members to start building the prototype</p>
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Participant Signatures:

Omar Hussain

Ubadah Saleh

Tabarak Abaid

Shay Abaid

[1] Introduction

1.1.Purpose

The purpose of this is to outline the development of a smartphone app tailored specifically for blind individuals, aiming to address the considerable challenges they encounter while navigating indoor environments. By leveraging sensor data and audio cues, the app intends to provide real-time guidance and assistance, empowering users to move through indoor spaces confidently and securely. The primary objective is to create a user-friendly and intuitive solution that enhances independence and safety for

blind individuals, while also striving to seamlessly integrate with existing smart home technologies to augment the overall user experience.

1.2.Scope

The scope for the development of a smartphone app aimed at facilitating safe indoor navigation for blind individuals is to design, implement, and deploy a comprehensive digital solution that addresses the unique challenges faced by visually impaired users in navigating indoor environments. This involves conducting thorough research to understand user needs and preferences, designing an intuitive user interface with accessibility features, integrating sensor data and audio cues to provide real-time guidance and assistance, and ensuring seamless compatibility with existing smart home technologies. Additionally, the scope encompasses thorough testing, including usability testing with blind individuals, to refine the app and ensure optimal functionality, security, and privacy. Overall, the goal is to develop a user-friendly and inclusive solution that enhances the independence, confidence, and safety of blind individuals when navigating indoor spaces.

1.3.Objectives and Success Criteria

Objectives:

- Develop a smartphone app tailored for blind individuals to facilitate safe indoor navigation, addressing challenges such as obstacles, changing layouts, and lack of visual cues.
- Design an intuitive user interface with accessibility features to accommodate varying degrees of visual impairment and user preferences.
- Conduct thorough testing, including usability testing with blind individuals, to identify and address any usability issues, bugs, or shortcomings in the app.
- Ensure robust security measures are in place to protect user data, secure transactions, and safeguard against potential threats.

Success Criteria:

- Receive positive feedback from blind individuals regarding the effectiveness and intuitiveness of audio cues for navigation.
- Continuously update the app based on user feedback and technological advancements to enhance functionality and user experience over time.
- Receive no reported incidents of security breaches or data privacy concerns related to the app.

1.4. Definitions, Acronyms, and Abbreviations

Definitions:

- **NaviSense:** Refers to the smartphone application designed specifically for blind individuals to facilitate safe navigation within indoor environments.
- **Sensor Data:** Information gathered from various sensors embedded in smartphones or connected devices, including GPS, Wi-Fi positioning, Bluetooth beacons, and inertial sensors, used to detect the user's surroundings and provide real-time guidance.
- **Audio Cues:** Sound-based signals generated by the app to provide navigation instructions, alerts, and feedback to users, aiding in orientation and obstacle avoidance.
- **Smart Home Technologies:** Refers to interconnected devices and systems within a home environment that can be controlled remotely or automated, including voice-controlled assistants, home automation systems, and Internet of Things (IoT) devices.
- **Accessibility Features:** Design elements and functionalities incorporated into the app to ensure usability for individuals with disabilities, such as screen readers, high-contrast interfaces, and alternative input methods.

Acronyms and Abbreviations:

- **IoT:** Internet of Things

1.5. Overview

Overview:

NaviSense is a cutting-edge smartphone application tailored to empower blind individuals with safe indoor navigation capabilities. Leveraging advanced sensor data and audio cues, NaviSense provides real-time guidance and assistance, enabling users to confidently maneuver through indoor spaces with ease and security. Designed with accessibility features at its core, NaviSense ensures inclusivity for individuals with disabilities, while seamless integration with smart home technologies enhances the overall user experience. Through rigorous usability testing and iterative improvements driven by user feedback, NaviSense is committed to delivering an intuitive and user-friendly solution that fosters independence and safety for blind individuals.

[2] Preliminary Definition

2.1. Preliminary Domain

PD_ID	Preliminary Domain Description
PD1	NaviSense is a smartphone app designed to assist blind individuals in navigating indoor spaces safely. Using sensor technology and audio cues, it offers real-time guidance through obstacles and changing layouts. With accessibility features and integration with smart home

	tech, NaviSense aims to enhance independence and confidence for users.

2.2.Preliminary Functional Requirements

P FR_ ID	Preliminary FR Description
PFR1	NaviSense shall offer real-time guidance, providing step-by-step instructions for navigating indoor environments effectively.
	NaviSense shall allow users to customize navigation preferences, including voice type, volume, and frequency of alerts, to suit individual needs.
	NaviSense shall offer support for multiple languages to accommodate users from diverse linguistic backgrounds.

2.3.Preliminary Non-Functional Requirements

PNFR_ ID	Preliminary NFR Description
PNFR1	NaviSense shall respect user privacy by implementing transparent data handling practices and allowing users to control their personal information.
	NaviSense Ensure compatibility with a wide range of smartphone devices and operating systems to maximize accessibility for users..
	NaviSense shall ensure compatibility with a wide range of smartphone devices and operating systems to maximize accessibility for users.

[3] Issues with the Preliminary Definition Given

3.1.Domain Issues

Domain Issue ID	Domain Issue Description
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DI1	PD_ID	NaviSense is a smartphone app designed to assist blind individuals in navigating indoor spaces safely. Using sensor technology and audio cues, it offers real-time guidance through obstacles and changing layouts. With accessibility features and integration with smart home tech, NaviSense aims to enhance independence and confidence for users.
	<ol style="list-style-type: none"> 1. Lack of Specificity: lacks specifics about NaviSense's features, functionality, and target users, making it hard to grasp its unique value. 2. Absence of Key Components: overlooks critical components like sensor tech, audio cues, accessibility features, and smart home integration, vital for understanding NaviSense's support for blind individuals. 	
	Option 1	Consider which categories of disability we can easily support with the minimum number of functional requirements and prioritize functional requirements to target those first.
	Option 2	Consider which categories of disability have the most sufferers and prioritize the requirements that target those first.
	Option 3	For each category of disability, research characteristics that define levels of minimal, moderate, and severe disability. Identify requirements that will aid each category and level, and determine if there are levels of disability that the team cannot realistically support.
	Choice	Option 3
	Rationale	Option three provides the most complete domain knowledge of the listed options. It also provides greater granularity when conducting traceability of requirements to problems within the domain.
Revised wording		4.1.3.1

3.2. Functional Requirements Issues

FR Issue ID	Description
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FRI1	PFR_ID	PFR1. Generating desired sentences and representing them pictorially as well as associating with a sound/voice.
	1. How to decide between picture and sound for that particular sentence?	
	Option 1	Use common sentences and associate them with sound (for the blind) or pictures (for the deaf).
	Option 2	Allow the user to select whether to associate words with pictures or with sounds at runtime.
	Option 3	Allow the user to configure the system to play sounds and/or associate pictures with sentences.
	Choice	Option 3
	Rationale	If the user wants to see the sentence in the form of a picture (or) in the form of sound he/she will have an option at run-time to choose from. This should be able to be adjusted in options as needed (if a user enters a noisy room, they may want to switch from sounds to pictures, for instance).
Satisfied by	FR1	

3.3. Non-Functional Requirements(NFR) Issues

NFR Issues ID	Description	
NFR11	PNFR_ID	PNFR1. The system shall be secure.
	What is the definition of security?	
	Option1	Confidentiality
	Option2	Integrity
	Option3	Authentication
	Choice	1

	Rationale	For the particular smartphone app. being considered, confidentiality seems the most relevant (in relation to HIPAA).
Satisfied by		

NFR Issues ID	Description	
NFR12	PNFR_ID	PNFR1. The system shall be usable.
	What mechanism does the system support for Confidentiality?	
	Option1	Password
	Option2	Access Card
	Option3	Retinal Scan
	Choice	1 + 2
	Rationale	Easy to implement and cheap, and yet provides a satisfactory level of assurance.
Satisfied by		

[4] WRS

4.1.W

4.1.1. Problem

Problem ID	Problem Description	Corresponding Goals
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P1	Inability to navigate public areas because of a visual impairment	G1
P2	Limited alternatives for the visually handicapped in current navigation tools.	G5
P3	Heavy reliance on auditory cues, which can be crippling in noisy environments	G2
P4	A more user-friendly and adaptable user interface is required to accommodate different levels of visual impairment.	G3, G4

4.1.2. Goals

Goal ID	Goal Description	Backward Traceability	Forward Traceability
G1	To improve visually impaired people's capacity for autonomous public space navigation	P1	FO1
G2	To create an adaptive navigation tool that reduces the need for audio signals in challenging situations.	P3	
G3	To design a user experience that is clear and simple for novice users to understand	P4	
G4	To include interface options that can be customized to accommodate different levels of visual impairment	P4	

G5	To incorporate accessibility elements that the current navigation tools do not have	P2	
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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	NaviSense will include capabilities that make it easier for visually impaired people to travel to specific areas.

4.1.3.2. Stakeholders

- Users with visual impairments
- Marketing Managers
- Family members
- Experts in accessibility/disability
- Blindness Research Centers
- App Devs

4.1.3.3. Improved Functional Objectives

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

Improved FR Objective ID	Objective Description	Alleviates Problems	Achieves Goals
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IFRO1	NaviSense will offer a user-friendly navigation system that provides direction via both visual and audible cues.	P1, P3	G1, G2, G3, G4
IFRO2	An extensive, current mapping system will be included into NaviSense for both indoor and outdoor navigation.	P2	G5
IFRO3	The application will make use of sensors or interface with other gadgets to deliver obstacle notifications in real time.	P1, P3	G1, G2

4.1.3.4. Improved Non-Functional Objectives

Improved NFR Objective ID	Objective Description	Alleviates Problem	Achieves Goal
INFRO1	NaviSense will guarantee the security and privacy of user data.	P1	G2
INFRO2	The application must function well in a range of networks and environmental circumstances.	P3,P4	G2,G3,G4

4.2. RS

4.2.1. Functional Requirements

FR ID	Description
FR1	NaviSense shall offer real-time visual and audible inputs based on the user's location.

Satisfies Functional Requirement Issue	FRI1
Satisfies Objectives	FO1, FO2, FO3
Satisfied by prototype feature	Yes

FR ID	Description
FR2	NaviSense shall provide customizable feedback options tailored to ambient conditions and user preferences.
Satisfies Functional Requirement Issue	FRI2
Satisfies Objectives	FO1, FO2, FO3, FO4
Satisfied by prototype feature	Yes

FR ID	Description
FR3	The system shall support voice commands, enabling hands-free control and navigation adjustments.
Satisfies Functional Requirement Issue	FRI3
Satisfies Objectives	G2,G3
Satisfied by prototype feature	Yes

FR ID	Description
FR4	The app shall provide contextual location-based information, including descriptions of nearby places and points of interest.
Satisfies Functional Requirement Issue	FRI5
Satisfies Objectives	IFRO4

Satisfied by prototype feature	Yes
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FR ID	Description
FR5	NaviSense shall include an extensive mapping system, incorporating indoor navigation for public buildings and transportation hubs.
Satisfies Functional Requirement Issue	FRI5
Satisfies Objectives	IFRO2
Satisfied by prototype feature	Yes

FR ID	Description
FR6	NaviSense shall support multiple languages to serve a multilingual user base and improve accessibility.
Satisfies Functional Requirement Issue	FRI6
Satisfies Objectives	G1,G5
Satisfied by prototype feature	Yes

4.2.2. Non-Functional Requirements

NFR ID	Nonfunctional Requirement 1	
NFR1	NaviSense should ensure data encryption and user anonymity to safeguard user privacy.	
Operationalized Functional Requirements	OFR1	The system shall provide login function with password .
	OFR2	Support the privacy of users when processing and storing data.

Satisfies Nonfunctional Requirement Issue	NFRI1
Satisfies Non-functional Objective	NFO2
Constrains	FO1, FO2, FO3, FO4
Satisfied by prototype feature	Yes

NFR ID	Nonfunctional Requirement 1	
NFR2	NaviSense shall guarantee peak performance and reliability, ensuring prompt responses and minimal downtime.	
Operationalized Functional Requirements	OFR1	Respond to input from the user in two seconds.
	OFR2	Achieve high uptime
Satisfies Nonfunctional Requirement Issue	NFRI2	
Satisfies Non-functional Objective	NFO1	
Constrains	FO1, FO3, FO5	
Satisfied by prototype feature	Yes	

NFR ID	Nonfunctional Requirement 1	
NFR3	NaviSense should deliver an outstanding user experience by ensuring user-friendly navigation, quick load times, and seamless interaction, accommodating varying levels of technical proficiency.	
Operationalized Functional Requirements	OFR1	The system architecture shall support updates.
	OFR2	The app's ability to accommodate growing numbers of users will be tested.

Satisfies Nonfunctional Requirement Issue	NFRI3
Satisfies Non-functional Objective	NFO3
Constrains	FO1, FO2, FO3, FO4
Satisfied by prototype feature	Yes

NFR ID	Nonfunctional Requirement 1	
NFR4	NaviSense shall uphold the highest standards of accessibility and inclusivity, making the app fully usable by people with a wide range of disabilities.	
Operationalized Functional Requirements	OFR1	Use UI design principles to make sure the app's functions are easily accessible and the navigation is user-friendly.
	OFR2	For a flawless user experience, optimize the app's speed to guarantee fast load times and fluid interaction.
Satisfies Nonfunctional Requirement Issue	NFRI4	
Satisfies Non-functional Objective	NFO4	
Constrains	FO1, FO2, FO3, FO4	
Satisfied by prototype feature	Yes	

NFR ID	Nonfunctional Requirement 1	
NFR5	NaviSense shall offer data encryption and user anonymity to protect user privacy.	
Operationalized Functional Requirements	OFR1	Encrypt all user data before it is sent or kept within the NaviSense ecosystem.
	OFR2	Provide user anonymity tools to make sure that when using the app or analyzing data, personal identifiers are kept private.

Satisfies Nonfunctional Requirement Issue	NFR13
Satisfies Non-functional Objective	NFO1
Constrains	FO1, FO2, FO3
Satisfied by prototype feature	Yes

NFR ID	Nonfunctional Requirement 1	
NFR6	In order to guarantee that the app is fully useable by people with a wide range of disabilities, NaviSense shall uphold the highest standards of accessibility and inclusivity.	
Operationalized Functional Requirements	<div>OFR1</div> <div>OFR2</div>	<p>Incorporate accessibility features, including as voice commands, haptic feedback, and screen reader compatibility</p> <p>To find and fix any accessibility issues with the software, test its usability with people who have a range of disabilities.</p>
Satisfies Nonfunctional Requirement Issue	NFR6	
Satisfies Non-functional Objective	NFO2	
Constrains	FO1, FO2	
Satisfied by prototype feature	Yes	

4.2.3. Specifications

Functional Specification ID	Functional Requirement
FS1	For navigational assistance, the device will translate GPS data into audible and sensory feedback.
Satisfies Functional Requirement	FR1
Satisfies Objectives	FO1, FO2, FO3
Satisfied by prototype feature	Yes

Functional Specification ID	Functional Requirement
FS2	Voice-controlled operation will be made accessible by NaviSense, enabling users to provide commands, request directions, or specify locations with voice commands.
Satisfies Functional Requirement	FR2
Satisfies Objectives	G2
Satisfied by prototype feature	Yes

Functional Specification ID	Functional Requirement
FS3	The user can activate NaviSense's emergency assistance feature, which will notify established contacts or services of the user's location.
Satisfies Functional Requirement	
Satisfies Objectives	G1, G3
Satisfied by prototype feature	Yes

Functional Specification ID	Functional Requirement
FS4	Advanced auditory guiding systems will be implemented by NaviSense, which will use 3D spatial audio cues to assist users in understanding and navigating their surroundings. Directions, distances, and environmental descriptions will all be sent using this method.
Satisfies Functional Requirement	
Satisfies Objectives	G1
Satisfied by prototype feature	Yes



USER MANUAL

What is NaviSense?

NaviSense offers voice-activated, intuitive guidance through spatial audio cues and real-time feedback, revolutionizing navigation for the blind and visually impaired. Experience newfound independence and confidence as you explore the world around you with ease.



Getting Started

1. **Download:** NaviSense may be downloaded and installed by searching for it in the app store on your smartphone. The iOS and Android operating systems support the application.
2. **Create an Account:** To create a new account, launch the app and follow to the instructions. You'll have to set up a password along with providing an email address. You will be guided through each step by voice prompts.
3. **Set up Profile:** Using voice commands or the accessible touch interface, change the navigation settings and emergency contact details on your profile.

NaviSense's Features

- With its voice-activated, spatial audio cues and real-time feedback, NaviSense transforms navigation for the blind and visually impaired.
- **Voice-Controlled Navigation:** Just say "destination" to begin your journey. NaviSense will use 3D spatial audio to deliver audible guidance in real-time.
- **Dynamic Route Adjustment:** The software updates your route to take into account user input and real-time obstacle detection to make sure you're traveling the safest possible route.
- With the use of an advanced emergency feature, users may instantly notify certain contacts or emergency services of their location, guaranteeing that help is always available.

How to Navigate?

1. **Instructions for Navigation:** First, speak your destination into the app to activate it. Along with directions on how to continue, you'll hear an audio confirmation.
2. **Keeping Up the Route:** Get 3D spatial audio cues by using headphones. You'll receive alerts from the app about turns, obstructions, and elevation changes.
3. **Making Preference Adjustments:** At any point, you can use voice commands to reach the settings menu and change where you are headed to.

FAQs

Q1: Is internet access required for using NaviSense?

A1: In order to use real-time capabilities like obstacle detection and public transportation updates, NaviSense needs an internet connection. However, GPS access alone is sufficient for basic navigation to operate.

Q2: Does NaviSense come in languages other than English?

A2: To accommodate people globally, NaviSense does support multiple languages. During setup or at any time, you can adjust the language to your preference from the options.

Q3: How do I use NaviSense?

A3: Launch NaviSense from the app store, select your preferred navigation settings, then establish an account by following the voice-guided setup instructions.

Q4: What should I do if I discover a navigational or mapping error?

A4: The app's feedback feature allows you to easily report any errors. Based on customer feedback, we update and enhance NaviSense frequently.

Q5: What should I do if NaviSense stops giving me audio feedback?

A5: Initially, make sure that the volume on your smartphone is turned up and that your earbuds or headphones are firmly attached. Restart the program and make sure you have a reliable internet connection if the problem continues. Please email support@navisense.com or use the app to reach out to our support staff for additional help.

Any questions?

We are available to assist you with any general inquiries or troubleshooting issues. Do not hesitate to contact our customer service center by phone or via email at support@navisense.com. Our committed staff is on hand to offer you the assistance you need to guarantee an effortless and enjoyable NaviSense experience.

www.navisense.com



support@navisense.com



214-000-0000



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TX 12345



[6] Traceability

Item Type	Item ID	Description	Traces To	Satisfied By Prototype Feature
Improved Functional Objectives (IFRO)	IFRO1	NaviSense will offer a user-friendly navigation system providing direction via both visual and audible cues.	P1, P3	Yes
	IFRO2	An extensive, current mapping system will be included for both indoor and outdoor navigation.	P2	Yes
	IFRO3	The application will use sensors or interface with gadgets for real-time obstacle notifications.	P1, P3	Yes
Improved Non-Functional Objectives (INFRO)	INFRO1	NaviSense will guarantee the security and privacy of user data.	P1	Yes
	INFRO2	The application must function well in various networks and environments.	P3, P4	Yes
Functional Requirements (FR)	FR1	NaviSense offers visual and audible input in real-time, based on user location.	FRI1	Yes
	FR2	NaviSense provides user-customizable feedback options.	FRI2	Yes
	FR3	System supports voice commands for hands-free control and navigation adjustments.	FRI3	Yes
	FR4	Contextual location-based information will be provided.	FRI5	IFRO4, Yes
	FR5	An extensive mapping system, including indoor navigation, will be integrated.	FRI5	Yes
	FR6	Support for multiple languages to serve a multilingual user base.	FRI6	Yes

Item Type	Item ID	Description	Traces To	Satisfied By Prototype Feature
Non-Functional Requirements (NFR)	NFR1	Data encryption and user anonymity to safeguard privacy.	NFR11	Yes
	NFR2	Guarantee peak performance and reliability.	NFR12	Yes
	NFR3	Designed for easy scalability and future feature support.	NFR13	Yes
Functional Specifications (FS)	FS1	Device translates GPS data into audible and sensory feedback for navigation.	FR1	Yes
	FS2	Voice-controlled operation enabling command and direction requests via voice.	FR3	Yes
	FS3	Emergency assistance feature to notify contacts or services of user's location.		Yes
	FS4	Advanced auditory guiding systems using 3D spatial audio cues for navigation.		Yes

[7] Further issues with requirements

7.1 Further Issues with NFRs

- **Performance:**
 - Issue: Lack of specific performance targets (e.g., maximum acceptable latency).
- **Accessibility:**
 - Issue: The requirement mentions compliance with accessibility standards but does not specify which standards or guidelines will be followed.
- **Reliability:**

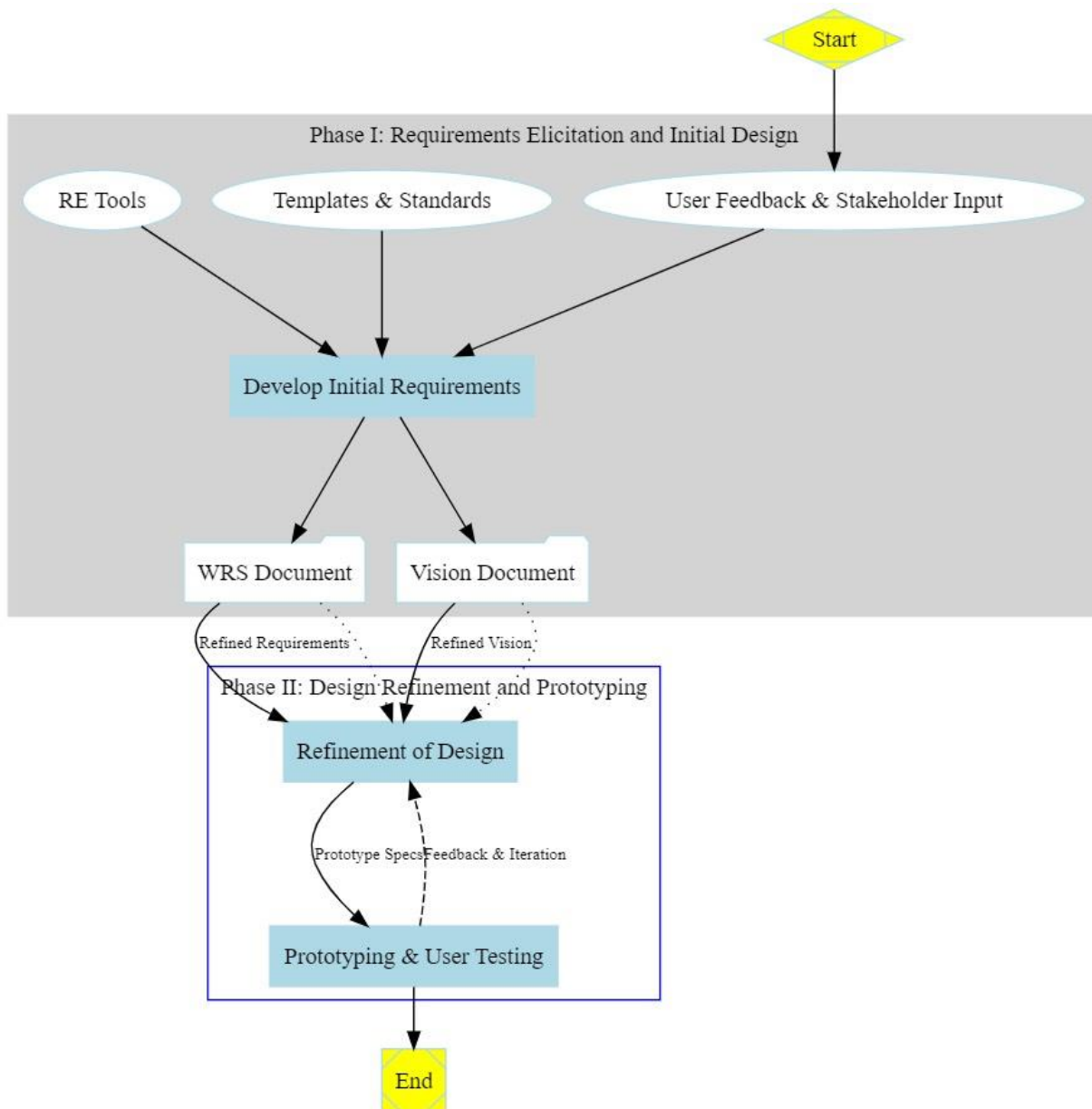
- Issue: The requirement lacks clarity on how reliability will be measured or ensured.
- **Security:**
 - Issue: The requirement mentions encryption and secure storage but does not specify the encryption algorithms or security protocols that will be used.

7.2 Further Issues with FRs

- **Navigation:**
 - Issue: The requirement lacks specificity on the types of indoor navigation instructions provided (e.g., turn-by-turn directions, landmark descriptions).
- **User Feedback:**
 - Issue: The requirement mentions user feedback but does not specify how it will be collected or utilized.
- **Emergency Assistance:**
 - Issue: Emergency assistance features are mentioned but not specified in terms of how users can request assistance or what actions the app will take in emergencies.

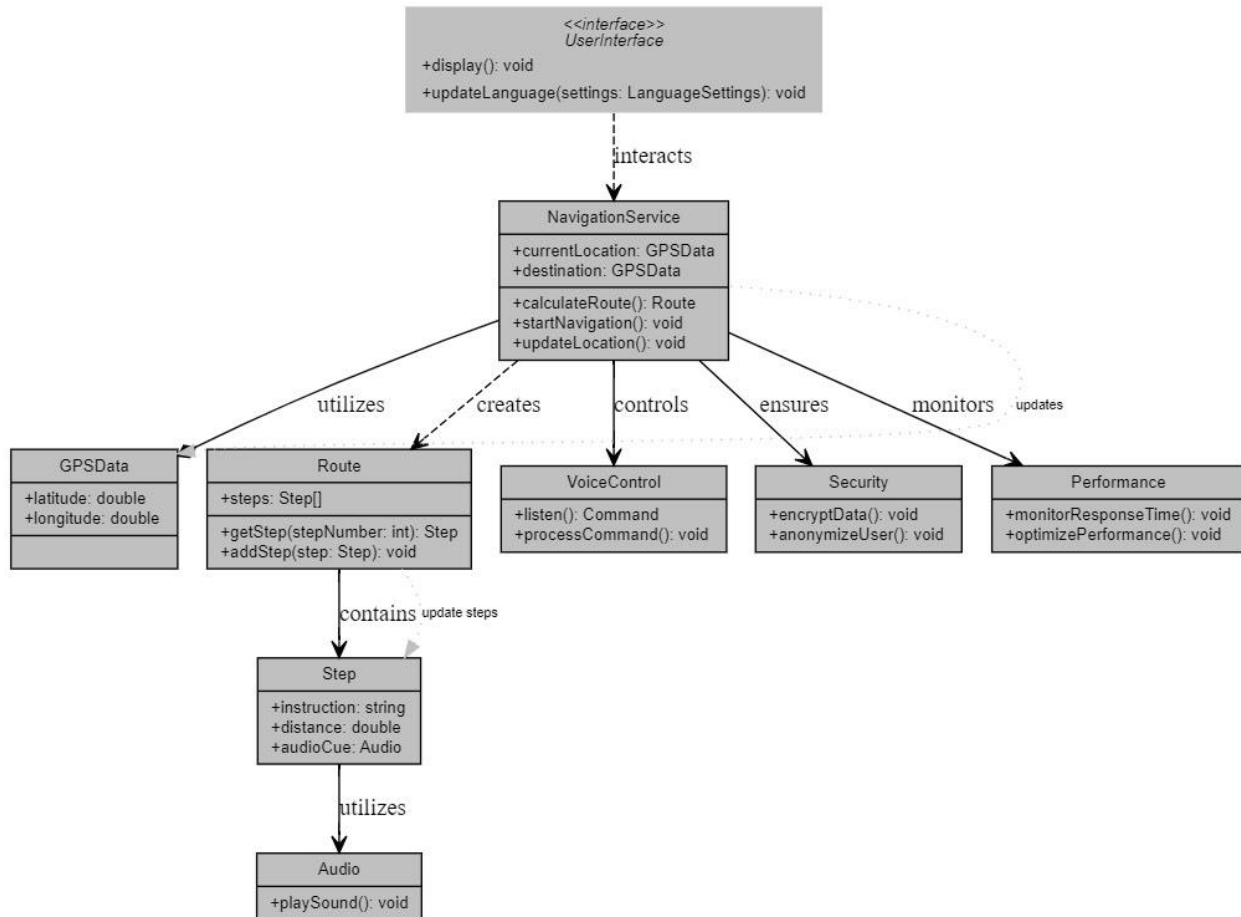
[8] Process Specification:

8.1 IDEF0 Diagram

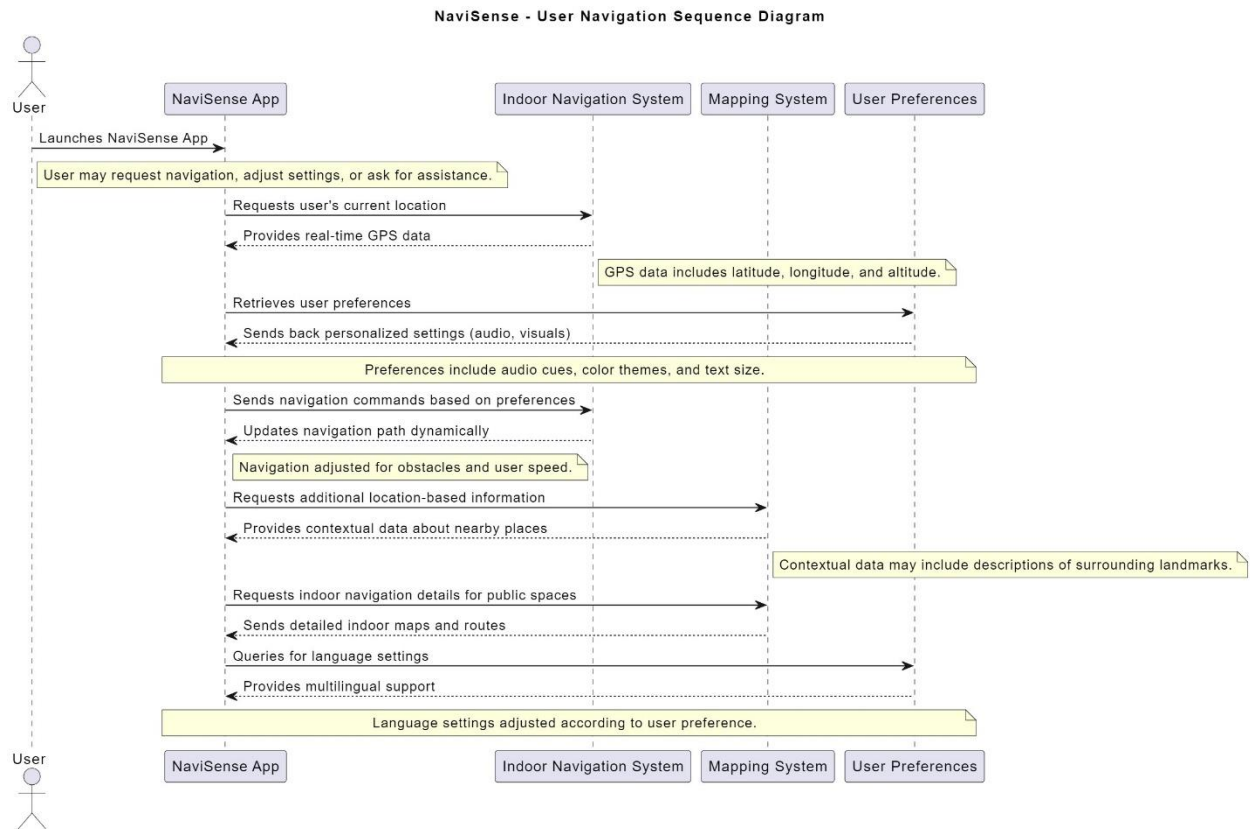


[9] Product Specification:

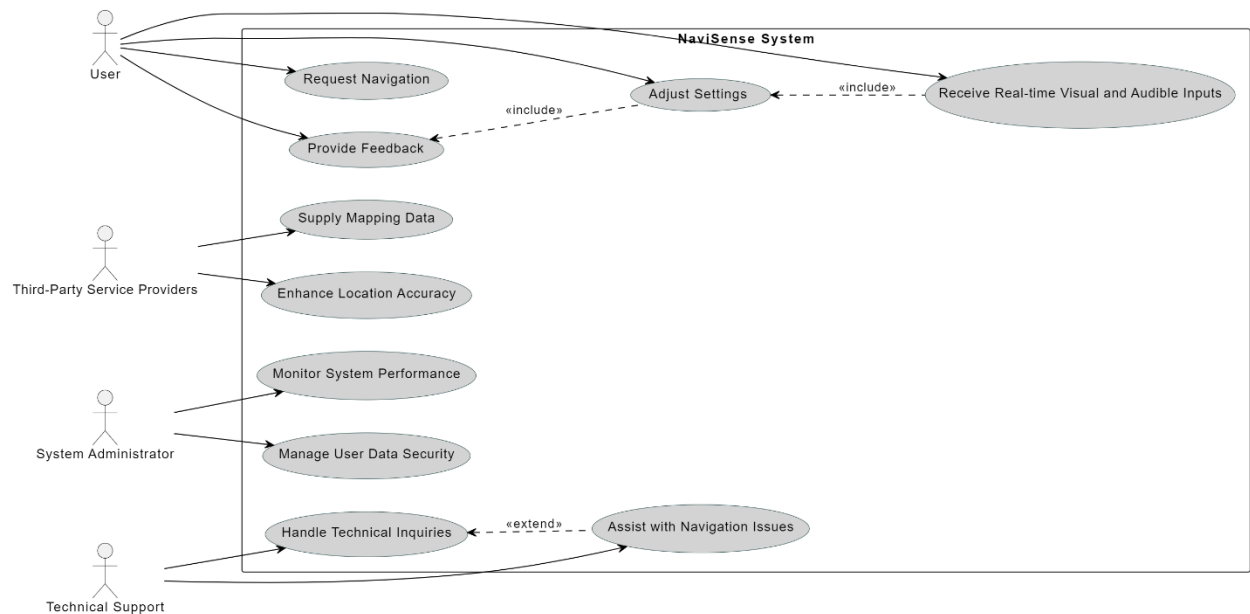
9.1 Class Diagram



9.2 Sequence Diagram



9.3 Use Case Diagram



[10] Running Prototype

The development of the NaviSense app, designed to facilitate safe indoor navigation for blind individuals, has progressed through its initial phase. Phase 1 focused on the creation of a user manual, which served as the preliminary prototype. This manual was instrumental in outlining how the app works, including the integration of sensor data and audio cues, and the interface's accessibility features. It also detailed the app's compatibility with smart home technologies. Feedback from this phase, particularly from usability testing conducted with blind individuals, is currently being used to refine the app's design and functionality. The insights gained are directly influencing the enhancement of user interface elements and the optimization of real-time navigation aids to ensure they meet the specific needs and preferences of visually impaired users. This iterative process is crucial for ensuring that the app not only provides practical navigation solutions but also upholds the highest standards of security and privacy.

[11] References

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[12] Requirements Creeping Rate Reasonability

At a 25% creeping rate, our progress aligns with the expanded scope of our project. It's reasonable in a way where it now includes compatibility with wearable devices, integration with external services, and advanced AI-driven obstacle detection. These enhancements, while increasing our workload, significantly improve the app's functionality and appeal, justifying our current and overall pace.

[13] Smartphone App Persuasion

Our smartphone app for blind navigation is not just good, but exceptional, and we firmly believe that it surpasses any other team's app in the market. After carefully observing and analyzing other teams'; presentations, we have identified several key reasons why our app should be the

preferred choice for blind individuals.

Firstly, our app boasts an innovative and highly accurate indoor positioning system. Unlike other apps that rely solely on GPS or Wi-Fi signals, we have integrated cutting-edge technology that utilizes Bluetooth beacons strategically placed throughout indoor environments. This allows our app to provide precise and reliable navigation instructions, ensuring that blind users can confidently navigate unfamiliar indoor spaces without any detours or confusion.

Secondly, our app offers a comprehensive set of features specifically tailored to address the unique challenges faced by blind individuals. We have developed an intuitive and user-friendly interface that combines auditory and haptic feedback, allowing users to receive real-time information about their surroundings through a combination of sound and vibrations. This multi-sensory approach significantly enhances the user experience and provides a higher level of spatial awareness compared to other apps on the market.

Additionally, our app goes beyond basic navigation by incorporating advanced obstacle detection capabilities. By leveraging the power of artificial intelligence and computer vision, our app can identify and alert users of potential obstacles in their path, such as furniture, doors, or even people. This proactive approach to obstacle detection sets our app apart from others, ensuring a safer and more efficient navigation experience.

Furthermore, we have placed great emphasis on customization and personalization. Our app allows users to tailor the interface and settings to their individual preferences and needs.

Whether it's adjusting the volume and pitch of auditory cues or fine-tuning the intensity of haptic feedback, our app ensures that blind individuals have full control over their navigation experience, making it truly personalized and empowering.

Lastly, our app has undergone rigorous user testing and iterative design processes, incorporating valuable feedback from blind individuals and accessibility experts. We have taken the time to understand the unique needs and challenges faced by blind users and have implemented these insights to create an app that truly addresses their requirements and enhances their independence.

In conclusion, our app stands out from the competition due to its innovative indoor positioning

system, multi-sensory interface, advanced obstacle detection, customization options, and user-centric design. We firmly believe that these key features make our app the top choice for blind individuals seeking a reliable, comprehensive, and empowering indoor navigation solution.