
UTD SE Senior Project

**NaviSense
Vision**

Version 1.1

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Revision History

Date	Version	Description	Author
02/04/24	1.0	Project I	Ubadah, Shay, Tabark, Omar
29/04/24	1.1	Project II	Ubadah, Shay, Tabark, Omar

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Vision

1. Introduction

This Vision document lays the groundwork for the development of the NaviSense app. It outlines the primary needs and features from the perspectives of stakeholders and target users, addressing the "why" behind the app's creation. It acts as a precursor to the use-case and supplementary specifications which will detail the execution of these needs.

1.1 Purpose

The purpose of this Vision document is to articulate the high-level objectives and functionalities of the NaviSense app. It will guide stakeholders through a shared understanding of the app's aspirations and serve as a benchmark for its development process.

1.2 Scope

This Vision document pertains to the NaviSense project, a smartphone app designed to aid blind individuals in indoor navigation. The scope includes the conceptualization and preliminary planning stages and serves as a point of reference for subsequent phases of the project.

1.3 Definitions, Acronyms, and Abbreviations

- Blind User: An individual who is visually impaired and will be the primary user of the app.
- NaviSense: The tentative name for the app, subject to change.
- Indoor Navigation: The process of orienting and guiding individuals through an indoor space.

1.4 References

Americans with Disabilities Act (ADA) Standards for Accessible Design

- U.S. Department of Justice
- 2010 Edition
- Available at [ADA.gov](https://www.ada.gov/)

ISO 9241-210: Ergonomics of human-system interaction - Part 210: Human-centered design for interactive systems

- International Organization for Standardization
- 2019 Revision
- Available for purchase at [ISO.org](https://www.iso.org/)

User Requirements and Feedback Report

- Internal Document #234
- Published: June 2023
- NaviSense Development Team
- Available internally at Company Document Repository

Mobile Application Development and Compliance Guidelines

- Report #789
- Tech Compliance Ltd.
- Published: March 2022
- Available at [TechComplianceResources.com](https://techcomplianceresources.com/)

1.5 Overview

Subsequent sections of this Vision document will elaborate on the stakeholder needs, detailed functional and non-functional requirements, anticipated challenges, and proposed solutions. The document is structured to facilitate easy navigation and clear understanding of the app's vision.

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2. Positioning

2.1 Business Opportunity

The NaviSense app addresses the critical need for visually impaired individuals to navigate indoor spaces safely and efficiently. By leveraging advanced smartphone technology, the project seeks to create a more inclusive environment and open up new opportunities for accessibility in public and private venues.

2.2 Problem Statement

The problem of	inadequate indoor navigation aids for the blind
affects	visually impaired students, employees, and visitors
the impact of which is	a lack of independence and increased risk in indoor navigation
a successful solution would be	an intuitive app that provides reliable guidance, enhances safety, and fosters autonomy.

2.3 Product Position Statement

For	blind or visually impaired individuals
Who	require assistance with indoor navigation
The (product name)	NaviSense is a smartphone application
That	offers voice-guided navigation and obstacle detection indoors
Unlike	traditional methods like canes or guide dogs alone
Our product	integrates with a smartphone's suite of sensors to provide a more comprehensive and empowering navigation tool

This statement underscores the NaviSense app's commitment to improving indoor mobility for the visually impaired, marking it as a pioneering solution in the market for assistive technologies.

3. Stakeholder and User Descriptions

To ensure that the NaviSense app effectively meets the nuanced needs of its stakeholders and users, a comprehensive identification and involvement strategy is integral to the Requirements Modeling process. This section profiles the diverse group involved in the project, focusing on their key concerns that the app proposes to address.

3.1 Market Demographics

The primary market for NaviSense includes visually impaired individuals in educational and professional settings. The market size is reflected by the millions worldwide who rely on assistive technologies for daily navigation. With the increasing focus on inclusivity, the demand for such products is growing. Our organization, known for innovative assistive tools, aims to enhance its reputation by providing cutting-edge solutions. NaviSense aligns with our goal of creating accessible environments for all.

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3.2 Stakeholder Summary

Name	Description	Responsibilities
Accessibility Experts	Specialists in assistive technology	Ensure the app meets diverse accessibility needs
Project Sponsors	Funders and promoters	Approve funding, monitor progress
Development Team	Engineers, designers, and developers	Build and maintain the app, ensure quality
Legal Advisors	Regulatory compliance professionals	Advise on legal and privacy concerns

3.3 User Summary

Name	Description	Responsibilities	Stakeholder
Blind Users	Primary users of the app	Provide feedback, use the app for navigation	Accessibility Department
Caretakers	Family members or guardians	Configure app settings, assist in navigation	User Advocacy Groups

3.4 User Environment

The NaviSense app will be utilized in a variety of indoor environments, from single users in a home setting to multiple users in institutional settings like universities or corporate offices. The task cycle varies based on the user's familiarity with the environment, with the aim to reduce it over time with the app's assistance. Unique constraints such as varying indoor conditions are considered. The app will be developed for iOS and Android to cover a wide range of smart devices and will integrate with existing accessibility features on these platforms.

3.5 Stakeholder Profiles

3.5.1 Kerry Tate

Representative	Kerry Tate, Director of Accessibility Services at UTD
Description	The department responsible for ensuring accessibility standards are met across the organization.
Type	Expert; familiar with technical and legal aspects of accessibility.
Responsibilities	Oversee the app's compliance with accessibility regulations, provide expertise on user needs.
Success Criteria	A system that meets or exceeds accessibility standards and receives positive feedback from users.
Involvement	Regularly reviews requirements and tests app iterations.
Deliverables	Project I, Project II, Presentation I, Presentation II

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Comments / Issues	Need to balance user needs with technical feasibility.
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3.6 Key Stakeholder or User Needs

Need	Priority	Concerns	Current Solution	Proposed Solutions
Reliable indoor paths	High	Safety, Privacy	Canes, Guide Dogs	Real Time Navigation
Obstacle detection	Medium	Safety, Speed	Human assistance	Sensor based alerts

3.7 Alternatives and Competition

3.7.1 Traditional Tools (e.g., Canes)

3.7.1.1 Strengths: Known, simple, no tech requirements.

3.7.1.2 Weaknesses: Limited in function, does not provide dynamic guidance.

3.7.2 Competitor Apps

3.7.2.1 Strengths: Existing market solutions, user familiarity.

3.7.2.2 Weaknesses: May not fully address indoor navigation, may lack specific features for the blind users' needs.

4. Product Overview

4.1 Product Perspective

NaviSense is envisioned as a self-contained, standalone product designed specifically for indoor navigation by the visually impaired. While independent, it will interact with smartphone operating systems and other assistive technologies to enhance its functionality. A block diagram to illustrate these interactions may be included in detailed technical documentation.

4.2 Summary of Capabilities

Table 4-1 NaviSense App

Customer Benefit	Supporting Features
Empowers visually impaired users with independent indoor navigation.	Voice-guided directions, obstacle alerts, and location confirmation.
Enhances user safety and comfort.	Emergency contact features and customizable user preferences.
Supports caretakers and facility administrators.	Remote configuration and monitoring capabilities.

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4.3 Assumptions and Dependencies

It is assumed that users will have access to smartphones with standard sensors and internet connectivity. The app's effectiveness is dependent on the accuracy of indoor mapping data and the integration capabilities of third-party APIs. Changes in technology accessibility may necessitate revisions to this document.

4.4 Cost and Pricing

Development: Includes salaries for developers, designers, and testers, as well as software tools.

Maintenance: Regular updates and customer support.

Marketing: Promotion and distribution costs.

Pricing Model:

- Free Version: Basic features with optional ads.
- Premium Version: Full features at \$9.99 per month or \$99 annually.
- Institutional Licensing: Special rates for organizations.

4.5 Licensing and Installation

The app will require a user-friendly licensing and installation process, compatible with both iOS and Android platforms. Any licensing agreements, including network licensing, and installation requirements such as accessibility configurations will be developed to ensure a smooth setup experience for users.

5. Product Features

5.1 Voice-Guided Navigation

Description: Enables users to receive audio instructions for indoor navigation, guiding them through various indoor environments with clear, step-by-step directions.

Functionality: Integrates with the smartphone's GPS and sensor array to provide real-time navigation cues.

Usability: Focus on clarity of voice instructions and ease of understanding to accommodate users with varying levels of hearing ability.

5.2 Obstacle Detection and Alerts

Description: Alerts users to potential obstacles in their path using audio signals, enhancing safety during navigation.

Functionality: Utilizes the smartphone's camera and other sensors to detect obstacles and warns the user accordingly.

Usability: Alerts must be timely and discernible, with options to adjust alert types and volumes based on user preferences.

5.3 Customizable User Settings

Description: Allows users to customize various aspects of the app, such as voice speed, volume, and route preferences, to suit their individual needs.

Functionality: Users can modify settings via a simple, accessible interface.

Usability: Interface design must be intuitive, with high contrast and large buttons for ease of use.

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5.4 Emergency Assistance

Description: Provides the ability to quickly contact emergency services or predefined contacts if the user feels unsafe or requires immediate assistance.

Functionality: Integration with the phone's native emergency calling features, activated by voice or a simple gesture.

Usability: Must be easily activated in stressful situations, with fail-safes to prevent accidental triggers.

5.5 Indoor Positioning System Integration

Description: Enhances accuracy of indoor navigation through integration with building-specific indoor positioning systems.

Functionality: Works with existing IPS technology within buildings to provide precise location data.

Usability: Seamless operation in the background, providing enhanced navigation without user intervention.

6. Constraints

Design Constraints:

- Accessibility Compliance: Must meet international web accessibility standards.
- Interface Simplicity: Design must be simple and intuitive to accommodate users with varying levels of tech-savviness.

External Constraints:

- Device Compatibility: App should function across a broad range of smartphones and operating systems.
- Data Privacy Regulations: Must comply with data protection laws, including GDPR and CCPA.

Dependencies:

- GPS Accuracy: Dependent on the smartphone's GPS capabilities.
- Indoor Mapping Data: Requires up-to-date and detailed indoor maps from third-party providers.

7. Quality Ranges

- Performance: The app should load and respond quickly, with navigation updates in real-time.
- Robustness: Must be capable of running continuously without crashing, especially in background mode.
- Fault Tolerance: Should handle errors gracefully, providing users with clear information on what went wrong and how to proceed.
- Usability: Designed for ease of use, even under stress, with audio feedback that is clear and easy to understand.
- Adaptability: Able to adjust to varying indoor environments and user preferences without degradation in performance.

8. Precedence and Priority

- Voice-Guided Navigation: High priority; essential for the core functionality of the app.
- Obstacle Detection and Alerts: High priority; crucial for user safety.
- Emergency Assistance: Medium priority; important for user security but secondary to navigation.
- Customizable User Settings: Medium priority; enhances user experience and personalization.
- Indoor Positioning System Integration: Low priority initially; can be enhanced in later phases as technology becomes more widespread.

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9. Other Product Requirements

9.1 Applicable Standards

- Legal and Regulatory: Complies with the Americans with Disabilities Act (ADA), ensuring the app is accessible.
- Communications Standards: Adheres to Internet standards such as TCP/IP for data transmission.
- Platform Compliance Standards: Compatible with both iOS and Android standards to ensure broad accessibility.
- Quality and Safety Standards: Meets ISO 9241 standards for ergonomics of human-system interaction to ensure usability.

9.2 System Requirements

- Operating Systems Supported: iOS 12 and above, Android 8.0 Oreo and above.
- Network: Requires stable internet connection for real-time data processing and updates.
- Memory: Minimum of 1GB RAM recommended for optimal performance.
- Companion Software: Should be compatible with screen reading software and other assistive technologies already in use.

9.3 Performance Requirements

- User Load Factors: Capable of supporting thousands of concurrent users without degradation of performance.
- Bandwidth: Minimal bandwidth consumption to ensure functionality across all network conditions.
- Throughput: Efficient data processing to deliver real-time navigation and obstacle alerts.
- Accuracy: High accuracy in voice-guided navigation and obstacle detection.
- Reliability and Response Times: App must perform reliably with quick response times, particularly in emergency situations.

9.4 Environmental Requirements

- Usage Conditions: Must be functional in a variety of indoor environments, from quiet offices to noisy public spaces.
- User Environment: Designed to be used across a range of light conditions and noise levels.
- Resource Availability: Optimized for low resource consumption to preserve device battery life.
- Maintenance and Updates: Regular updates to improve functionality and adapt to new mobile OS versions.
- Error Handling and Recovery: Robust error handling to ensure the app continues to function in case of minor failures, with clear recovery options available to the user.

10. Documentation Requirements

10.1 User Manual

Purpose: The user manual will provide end-users with comprehensive guidance on how to use the NaviSense app effectively.

Contents:

- Overview of the app's features and interface.
- Step-by-step tutorials for setting up and using the app.
- Troubleshooting section for common issues.
- Safety information related to indoor navigation.
- Contact information for support.

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Details:

- Length and Detail: Concise yet detailed enough to serve as both a reference and a learning tool.
- Index and Glossary: Includes a thorough index and a glossary of terms to aid navigation and understanding.
- Format: Accessible digital format (PDF), printable upon request.
- Accessibility: Adheres to accessibility standards to ensure usability by visually impaired users.

10.2 Online Help

The online help system will be integrated within the app, offering context sensitive help and FAQs.

10.3 Installation Guides, Configuration, and Read Me File

Installation Guide:

- Detailed steps to install and configure the app on various devices.
- Screenshots and diagrams to guide the user through the installation process.

Read Me File:

- Updates and New Features: Description of new features and enhancements.
- Compatibility and Known Issues: Information on compatibility with different devices and known bugs with potential workarounds.

10.4 Labeling and Packaging

- Consistent use of the app's branding across all digital assets.
- Copyright and Patent Notices: Clearly displayed on app startup and about page.
- Corporate Logos and Icons: Standardized icons and graphics used throughout the app.

A Feature Attributes

A.1 Status

Proposed	Features like advanced obstacle detection using AI are under discussion but have not been reviewed by the steering committee.
Approved	Basic voice-guided navigation has been reviewed and approved for immediate implementation.
Incorporated	Emergency assistance features have been incorporated into the current product baseline and are being developed.

A.2 Benefit

Critical	Voice-guided navigation is essential for the system's operation, crucial for enabling blind users to navigate indoors independently.
Important	Obstacle detection alerts enhance user safety and are significant for user satisfaction but are secondary to navigation.
Useful	Integration with third-party apps like Google Maps for outdoor-to-indoor navigation transition is useful but not essential.

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A.3 Effort

Estimations are provided by the development team based on the complexity of the feature, which may be quantified in person-weeks, lines of code, or function points. Voice-guided navigation requires approximately 50 person-weeks to develop, reflecting its complexity and integration with existing systems.

A.4 Risk

High: Integration with third-party indoor mapping services poses a high risk due to potential changes in external APIs.

Medium: The implementation of obstacle detection using the camera involves medium risk related to hardware compatibility.

Low: Enhancements to the user interface for settings adjustments carry low risk.

A.5 Stability

Assesses the likelihood of changes to the feature's definition or understanding. High stability indicates little expected change, while low stability suggests that further analysis and requirements elicitation might be needed.

- The emergency assistance feature is highly stable with well-defined requirements and little expected change.
- The AI-based obstacle detection feature is less stable, with potential changes as new technologies and algorithms evolve.

A.6 Target Release

1.0 - Voice-guided navigation is targeted for this release.

1.2 - Advanced AI-based features are slated for this release, allowing more time for development and testing.

A.7 Assigned To

- The voice navigation feature is assigned to the Core Features Team.
- The emergency assistance feature is overseen by the Safety Features Team.

A.8 Reason

Voice-guided navigation was identified as a critical feature based on user interviews and feedback from the initial focus groups/