Vision Document

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Project: Theia – Indoor Navigation for the Blind

1. Introduction

1.1 Purpose

The purpose of this document is to describe the goals and vision for “Theia,” an indoor navigation app built for blind and visually impaired users. This app will support users in safely navigating college buildings by providing real-time voice instructions, obstacle detection, and emergency support. This document outlines the problem, solution, target users, key features, and success criteria of the project.

1.2 Intended Audience

- Professor Lawrence Chung
- Users, Accessibility services, their caretakers
- Our team

2. Background

2.1 Business Opportunity

Many blind or visually impaired individuals face difficulty when navigating complex indoor spaces such as universities. Traditional aids like canes and guide dogs can’t detect all hazards or provide room-level guidance. There is an opportunity to create a mobile solution that fills this gap by using built-in smartphone sensors and offering customizable, voice-guided help.

2.2 Problem Summary

The current state ("As-Is") is that blind users may miss turns, enter the wrong rooms, or fall without being able to notify help. Existing apps may not be optimized for indoor use or may rely on cameras, which raises privacy concerns. There is also no system that automatically alerts caregivers in case of emergency.

Theia solves this by offering private, real-time indoor navigation using voice feedback and non-camera-based sensors. It also detects emergencies and sends alerts.

2.3 Problem Statement:

The problem of	Safely navigating unfamiliar indoor environments without real-time guidance
affects	Blind and visually impaired individuals
The impact of which is	They are at risk of getting lost, entering the wrong room, or encountering obstacles without warning, and are unable to easily get help in emergencies.
A successful solution would	Provide real-time voice-guided directions, detect obstacles using sensors, and send emergency alerts if the user falls or is in danger.

3. Vision of the Solution

3.1 System Features

Theia will:

- Guide users with step-by-step audio directions
- Detect obstacles in real-time using LiDAR, gyroscope, and microphone
- Allow voice-based destination input and interaction
- Provide emergency alerts when a fall is detected
- Offer multi-language support
- Respect privacy by avoiding camera-based detection
- Include a hardcoded demo route for ECSS that will be showcased in the prototype

3.2 Benefits

- Safer indoor mobility for blind users
- Greater independence and confidence
- Less reliance on others for assistance
- Faster emergency responses
- Accessible app that runs on both Android and iOS

3.3 Product Position Statement:

For	Blind and visually impaired individuals
Who	Want to safely and independently navigate indoor environments such as college buildings
Theia	is a smartphone application
That	Offers step-by-step voice guidance, detects obstacles, and alerts emergency contacts in case of danger
Unlike	Traditional aids like canes or guide dogs that cannot detect specific hazards or guide users to exact destinations
Our product	Uses smartphone sensors (LiDAR, accelerometer, microphone) to provide private, reliable indoor navigation without relying on cameras

4. Stakeholders and Users

4.1 Stakeholders

- UTD and Professor – Project sponsors and reviewers
- Developers – Ajay Rao, Farrel Raja, Tonghong Sun
- End Users – Blind and visually impaired individuals
- Secondary Users – Family, friends, caretakers, accessibility support staff

4.2 User Characteristics

Primary users are blind or visually impaired and depend on voice input/output. They may be familiar with assistive tech but require minimal on-screen interaction. The app will provide voice commands, error recovery, and feedback support.

5. Product Overview

5.1 System Scope

Theia is a mobile app that offers safe, reliable navigation for indoor environments such as multi-floor academic buildings. It does not rely on GPS but uses internal sensors and building-specific logic.

5.2 Assumptions and Constraints

- Must work indoors without visual cues
- Must use non-camera sensors (LiDAR, mic, motion sensors)
- Navigation guidance must respond within 2 seconds
- App must run on both iOS and Android
- Must follow HIPAA and ADA privacy and accessibility standards
- Prototype must be demonstrable using Figma with preset route for ECSS

6. Prototype Plan

We will create a working prototype using Figma that includes:

- Login and registration screens
- Destination input and location selection
- Settings screen (language, emergency contacts, customization)
- Preset navigation route demo for ECSS
    - This will simulate directions like:
      "Walk forward 10 steps… Stop… Turn right… Room 2.205 is on your left."

This hardcoded route will allow us to demonstrate core functionality during our presentation.

7. Success Criteria

Theia will be considered successful if:

- The app correctly guides a user through a simulated indoor environment
- Users receive obstacle warnings in advance
- Emergency alerts are triggered after simulated falls
- Feedback from our updated questionnaire confirms user trust and usability
- The prototype is usable and clear during the presentation

8. Standards and Compliance

Theia will follow:

- HIPAA: All personal or location data will be protected through encryption
- ADA: Interface will be fully accessible for screen readers and voice commands
- IABNNS: Indoor assistive navigation standards for people with vision loss

9. Project Plan Overview

We will:

- Update all Phase 1 documents (Vision + WRS)
- Model system with RE-Tools (UML, PIG, SIG, IDEF0)
- Deliver Questionnaire II to validate new requirements
- Build and test a Figma-based prototype
- Finalize all deliverables and prepare a strong presentation