Blind Vision

Final Phase 2

Vision Document

Team 6

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Team Website: *https://github.com/ishre27/Blind-Vision-.git*

Submitted To:
SE 4351: Requirements Engineering
Professor: Lawrence Chung
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Revision History

Date	Version	Changes	Editor
May 1st, 2024	1.0	Start of the Vision Document	Team 6

1. Introduction

1.1 Purpose

This document's goal is to produce a clear, complete, unambiguous, non-contradictory description of what the software requires when it is in the hands of blind people. The document will give details about the issues of the domain, functional requirements, and non-functional requirements as well as many different options to choose from for the solution.

The audience for this document would include the instructor who assigned the project and the TA who will grade the project.

1.2 Scope

The Blind Vision application is focused on enabling blind and visually impaired users to navigate indoors with ease. It utilizes modern smartphone technology to provide real-time guidance, obstacle avoidance, and emergency assistance. The application is compatible with both iOS and Android operating systems, making it accessible to a wide range of users.

1.3 Objectives and Success Criteria

1.3.1 Primary Objectives:

1. To provide accurate and reliable indoor navigation for blind and visually impaired users.
2. To ensure user safety by detecting and alerting users of obstacles and potential hazards.
3. To offer emergency assistance features, such as fall detection and emergency contact notification.

1.3.2 Success Criteria

4. User satisfaction with the accuracy and reliability of navigation.
5. Positive feedback on the ease of use and accessibility of the application.
6. Reduction in navigation-related accidents and incidents among users.

1.4 Definitions, Acronyms, Abbreviations

- Blind Vision: The name of the application being developed.
- GPS: Global Positioning System.
- LIDAR: Light Detection and Ranging.
- NFR: Non-Functional Requirement.
- FR: Functional Requirement.

- UTD: University of Texas Dallas

1.5 References

1. Requirement Engineering –Advanced Requirement Engineering. CS/SE 6361, Section 001, Fall 2010. http://www.utdallas.edu/~chung/RE/syllabus.htm

2. Software Engineering (Update) 8th Edition – Ian Sommerville

1.6 Project Overview

This project's goal is to develop an app that allows blind students or a blind visitor to go from one location to another safely either in the same or different building. The app will focus on the user's safety as it is important to detect obstacles and avoid any collision. It will also need to be able to cover a wide range of various places, for example, cafeteria, lounge room, offices, labs, etc. Lastly the app must be able to approximate the time to reach the destination using the Dijkstra algorithm.

Phase one is the preliminary project plan (which is what we are currently working on as of speaking). Our focal point for Phase two would be focusing on the WRS-document, creating Questionnaire and a PPT for the presentation, and how we can take the Project Plan to the next step.

2. Positioning

2.1 Business Opportunity

An app that allows blind students or a blind visitor to go from one location to another either in the same or different building. The app will focus on the user's safety as it is important to detect obstacles and avoid any collision. It will also need to be able to cover a wide range of various places, for example, cafeteria, lounge room, offices, labs, etc. Lastly the app must be able to approximate the time to reach the destination using the Dijkstra algorithm.

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2.2 Problem Statement

The problem of	Inadequate and unsafe indoor navigation capabilities for blind and visually impaired individuals.
Affects	Blind and visually impaired individuals who require assistance navigating indoor environments such as university buildings, particularly at the University of Texas Dallas (UTD).
Impacts of which is	This lack of effective and safe indoor navigation options can lead to increased risk of accidents, decreased independence, and reduced overall quality of life for visually impaired individuals. It also contributes to the challenges in accessing educational facilities and services, affecting their academic career and campus experiences.
A successful solution would be	An application that utilizes modern smartphone technologies, such as LIDAR, GPS, and other sensors, to provide accurate, reliable, and easy to use indoor navigation tool. The solution should detect obstacles, offer real-time guidance, and integrate with emergency services and assistance features. This would enhance the safety, independence, and the well-being of visually impaired users by making indoor environments more accessible and safer. Additionally, user satisfaction should be high, reflected in positive feedback about the application's ease of use and functionality, with a noticeable reduction in navigation-related incidents.

2.3 Product Position Statement

For	The blind or visually impaired
Who	Need to navigate through UTD while avoiding obstacles
The HELP system	Is a software solution
That	Employs advanced technologies like LIDAR and smartphone sensors to enable real-time navigation assistance, obstacle avoidance, and emergency support within indoor environments.
Unlike	Traditional navigation aids such as canes or guide dogs, which may not always provide sufficient information about dynamic indoor obstacles, or require constant human assistance,
Our product	Employs a blend of audible alerts, haptic feedback, and user-friendly interfaces to empower users to navigate independently and safely at UTD without the constant need for personal assistance.

3. Key Stakeholder and User Description

3.1 Market Demographics

The target market segment includes all the visually impaired people who find it difficult to overcome their physical barriers caused by not being to navigate safely through the UTD building, the estimated market size of this Blind Vision system is huge, since it needs AI (artificial intelligence), assets, and the cooperation with UTD and the UTD police to make it all work together. It can range between hundreds to thousands of dollars.

When it comes to marketing, we do not have to worry about it. If the app works perfectly the story will spread across the states, even other countries.

3.2 Stakeholder Summary

Name	Interests	Influence	Interaction
Primary Users	High interest in a reliable and effective indoor navigation solution.	Direct feedback from usage will significantly influence iterations and improvements of the application.	Primary users of the application, their experiences and needs drive the core functionality and usability enhancements.
UTD Emergency and Police Services	High interest in enhancing safety features within the campus for all students, particularly in emergency response capabilities.	High influence on the development of emergency features within the app.	Uses the app's data and functionality to improve response times and effectiveness in emergencies involving visually impaired individuals.
Software Development team	High interest in successfully developing and deploying a functional product.	High influence over the design, development, and iteration of the application.	Engages in all phases of the project from conception through to deployment and post-launch support.

Sponsor - Dr. Chung	High interest in successfully developing and deploying a functional product.	Moderate influence over the design, development, and iteration of the application.	Engages at the end of all phases of the project from conception through to deployment.

3.3 User Summary

Name	Description	Responsibility
Primary User	This group consists of individuals with varying degrees of vision impairment who need help navigating indoor environments. Their needs vary based on the severity of vision impairment and familiarity with the environment.	Utilize the application to navigate indoors safely, provide feedback on usability and functionality, and report any issues or difficulties encountered during use.
UTD - Accessibility Office	This group consists of individuals at the University Accessibility office. They are the first line of contact when individuals with disabilities need any assistance.	Assist in the initial setup and configuration of the application for users, offer technical support and troubleshooting and conduct regular assessments to ensure the application meets accessibility standards.
UTD - Emergency and Police Services	Emergency personnel such as campus police or medical staff who might interact with the application during emergencies involving blind or visually impaired users.	Use the application's features to locate and assist users in distress quickly, provide feedback on the application’s effectiveness in emergency situations, and participate in regular training on how to best utilize the application for emergency responses.

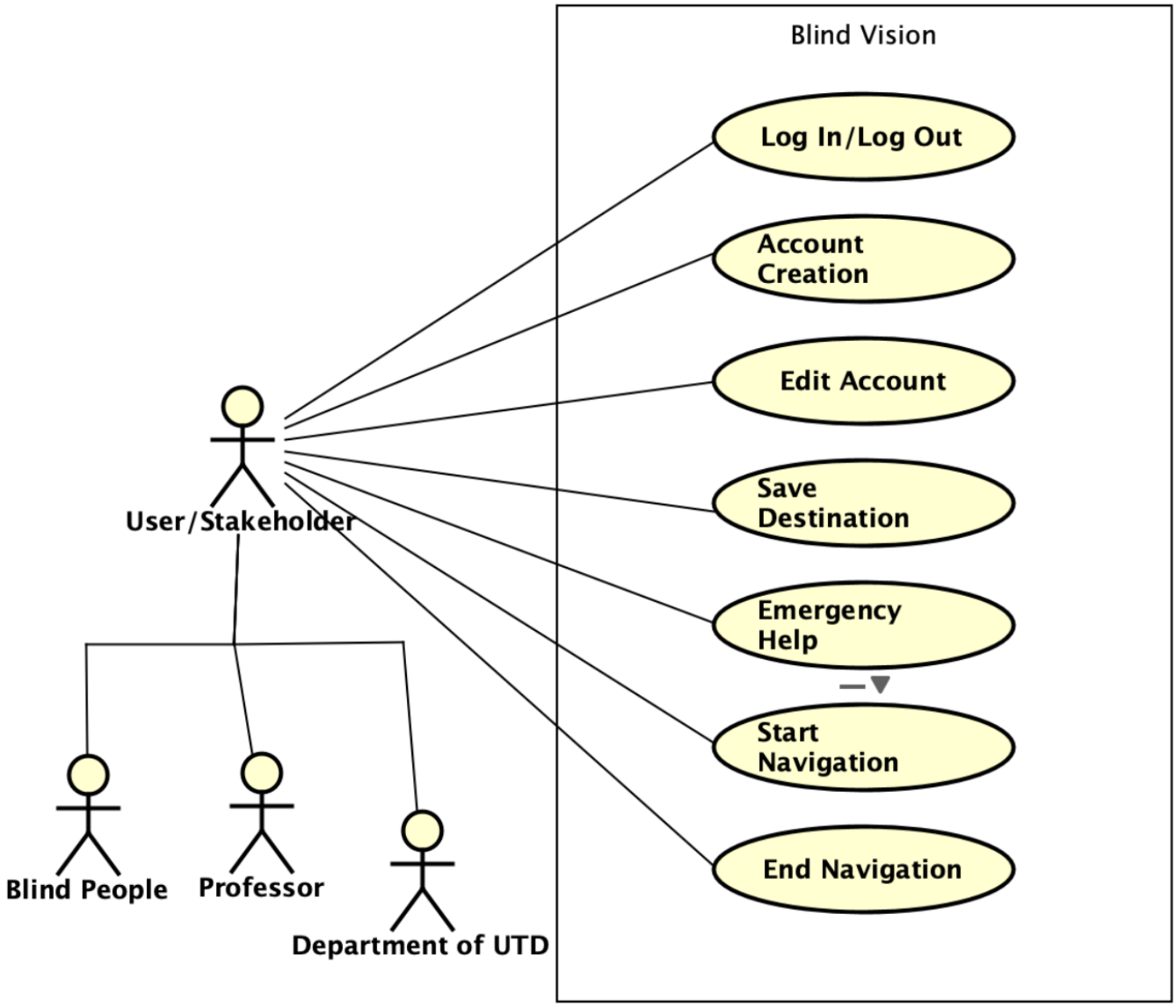
User’s Emergency Contacts	Relatives/caregivers of blind or visually impaired users who may use the application to assist in navigation or emergency situations.	Support the primary users in setting up and learning to use the application, monitor the application's emergency features for alerts, and provide feedback from a caregiver’s perspective to enhance application safety and usability.

Software Development team	The software developers, engineers, and IT staff are responsible for developing, updating, and maintaining the "Blind Vision" application (Team 6).	Design, develop, and deploy the application according to user requirements and feedback, ensure the application's continuous improvement through updates and fixes, and monitor system performance and user satisfaction to guide future enhancements.

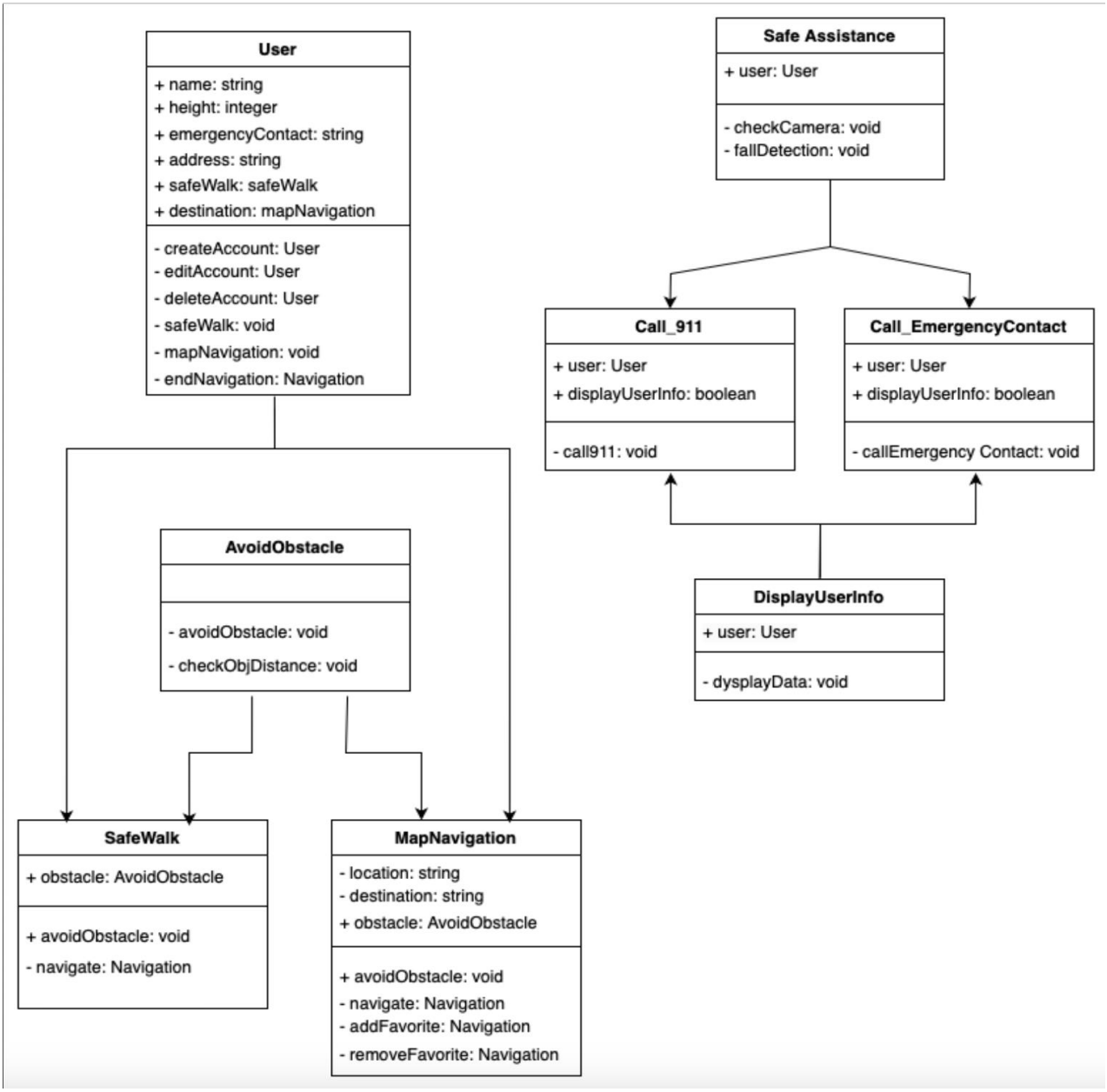
3.4 User Environment

A blind user utilizes a specialized app on their mobile device, designed to enhance accessibility. The app includes text-to-speech and speech-to-text features for easy communication and an image-to-speech converter that describes visual content audibly. It also offers practical tools like object recognition for navigating physical spaces, a medicine reminder for health management, and emergency services for quick access to help. Additionally, the app's sound amplifier assists in clearer hearing. This comprehensive suite of features supports the user in leading a more independent and informed life.

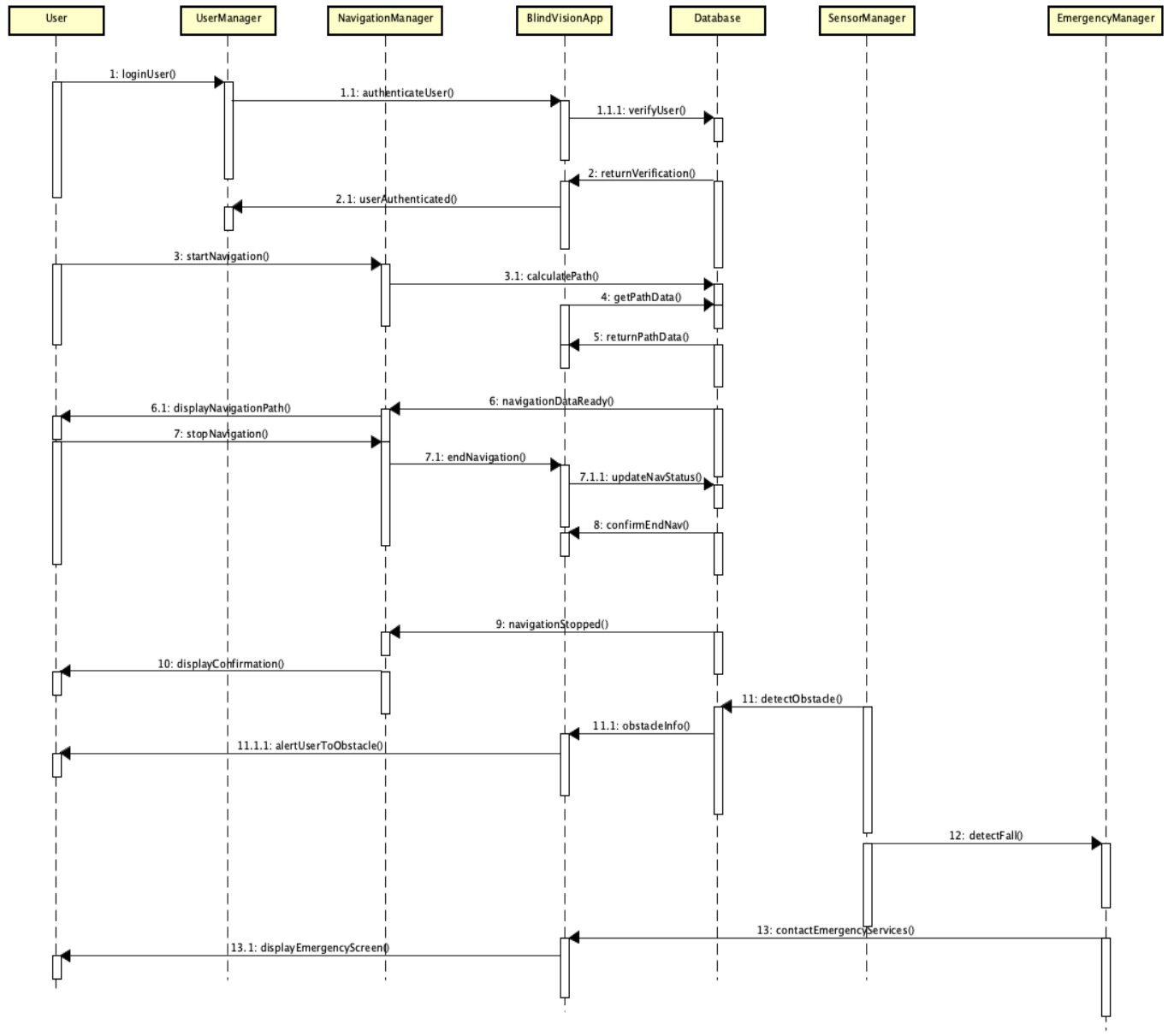
3.5 SYSTEM USE CASE



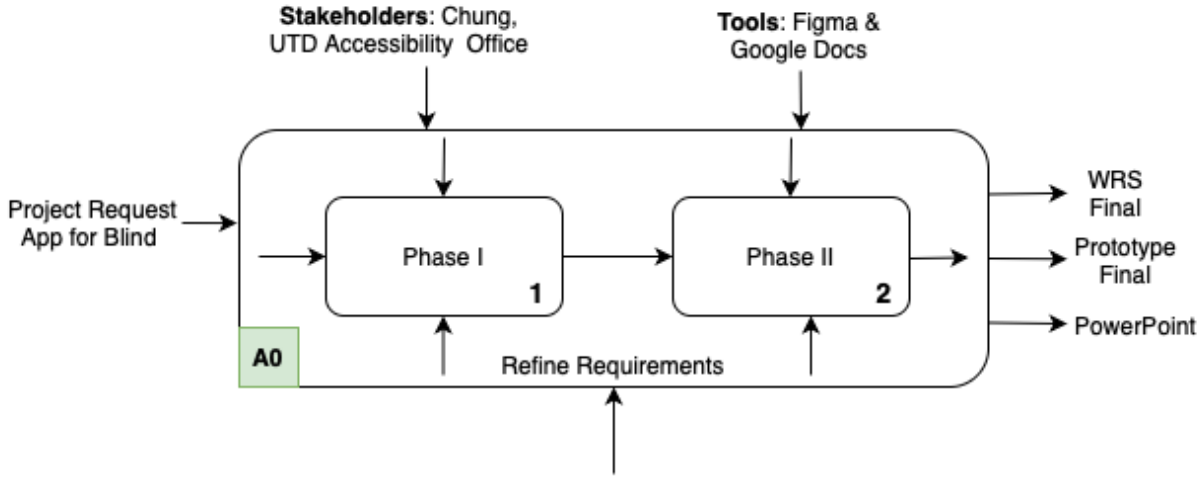
3.6 System Class Diagram

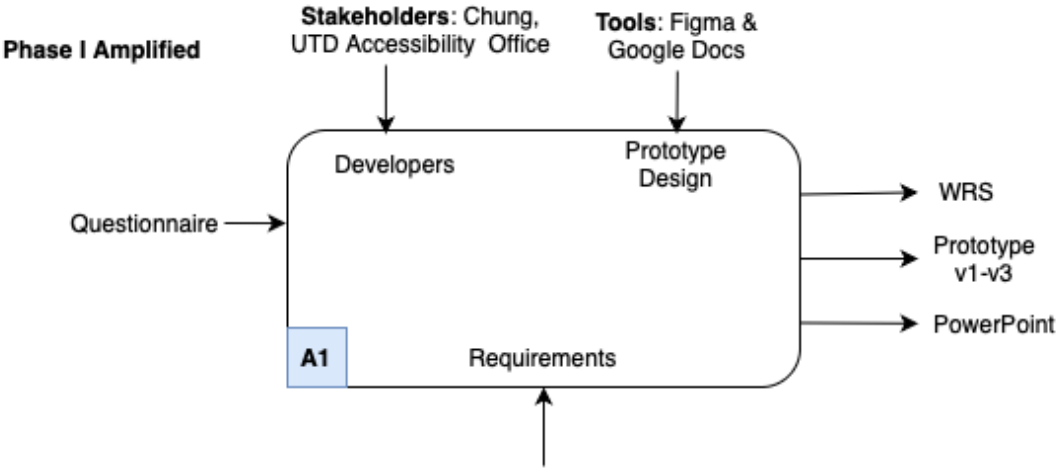


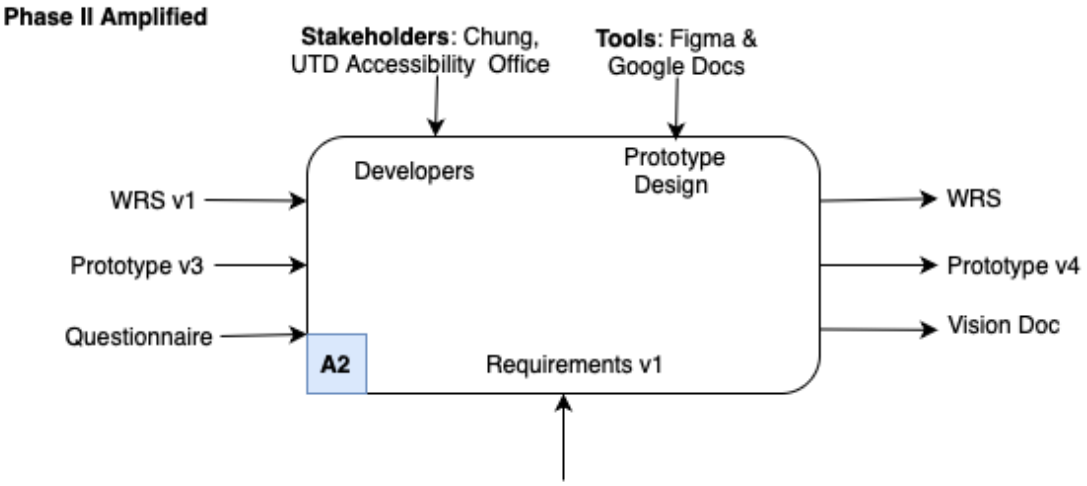
3.7 System Sequence Diagram



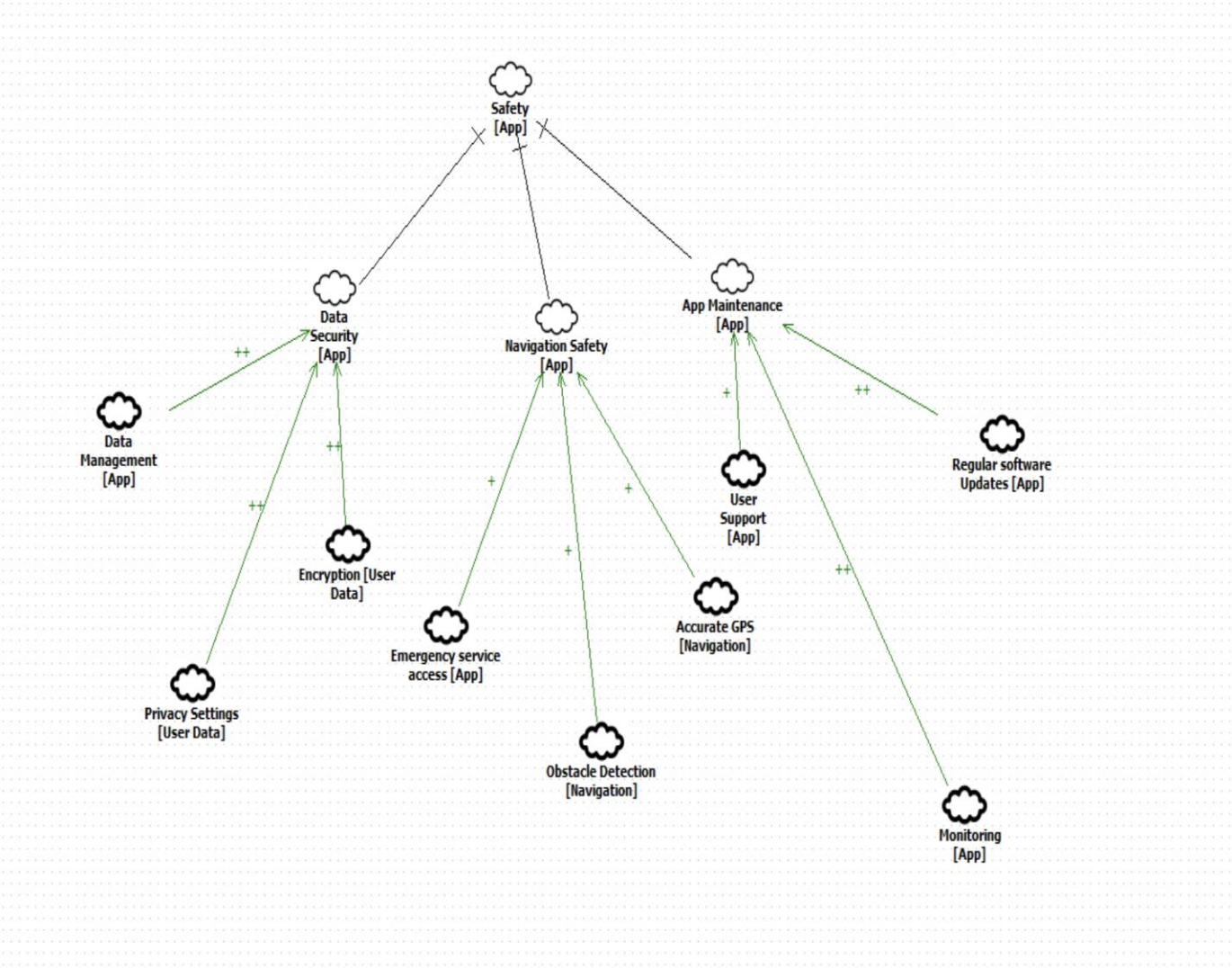
3.8 IDEF0 Diagram







3.9 SIG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Accurate GPS [Navigation]
User Support [App]
Regular software Updates [App]
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3.10 PIG


System Compatibility
Indoor Navigation System
Obstacle Detection
Safety Measures
User Feedback System
Accessibility Features
Emergency Assitance
User Interface Adaptations
External API
Device Hardware Capabaliites
Requirements - Regulatory Compliance

3.11 Creeping Rate

As we expected in our phase one, we saw about a 17 - 20% creeping rate. This increase was due to requirement changes or additions based on the user feedback on our initial mockups.

Phase 1				Phase 2			
Functional Req.		Non-Functional Req.		Functional Req.		Non-Functional Req.	
Total	Coverage %	Total	Coverage %	Total	Coverage %	Total	Coverage %
6	100%	4	100%	7	86%	5	80%

*% show how much of the defined FR & NFR the team will be able to delivery

4. Product Overview

4.1 Summary of Capabilities

Customer Benefit: Seamless and accessible UTD indoor navigation experience for blind and visually impaired users.

Supporting Features:

Ease of System Access: User-friendly GUI designed specifically for ease of use by visually impaired users, leveraging audio feedback.

Efficient Navigation: Real-time guidance and obstacle avoidance to reduce the time taken to navigate indoors significantly.

4.2 Assumptions and Dependencies

The user is assumed to have basic knowledge of using a smartphone.

The system's functionality is designed assuming the user interacts in languages supported by the system.

4.3 Cost and Pricing

The pricing model and cost structure are to be determined (TBD).

4.4 Licensing and Installation

Blind Vision is marketed on a licensing basis, particularly aimed at enhancing accessibility for visually impaired users. Users can install the application with minimal support required, promoting independence and ease of setup.

5. Product Features

Text to Speech: Converts text into spoken audio, facilitating ease of use.

Object Recognition: Identifies and describes objects within the user's environment.

Emergency Services: Quick access features to contact emergency services if necessary.

Navigation Assistance: Provides guided navigation using audio cues to avoid obstacles.

User Interface Customization: Designed to be simple with large buttons and minimalistic menus for ease of use.

Reliability: Operates effectively across various devices and conditions, ensuring consistent assistance.

6. Constraints

6.1 Security

Data Encryption: Sensitive data is encrypted to protect user privacy.

Authentication: Requires user authentication to access sensitive features like emergency contacts.

6.2 Usability

Interface Simplicity: The GUI is designed with no more than six buttons on any screen to ensure visibility and accessibility.

Ease of Navigation: The app avoids deep menu hierarchies to ease use and memory load for the user.

6.3 Responsiveness

System Response: The app is optimized for quick responsiveness to user inputs and commands to ensure a smooth user experience.

6.4 Miscellaneous

Flexibility: The system is built with scalability in mind, allowing for updates and integration with other technologies as they develop.

7. Qualities Range

Availability: The app must be able to run 24/7.

Visual Clarity: The background display must be customizable and clear enough to be usable under various lighting conditions and for users with mild to moderate vision impairments.

Icon Visibility: All icons must be distinguishable, adequately sized, and designed to accommodate users with partial sight.

8. Precedence and Priority

Launch Date: The Blind Vision system is scheduled to be fully operational by December 2024.

9. Other Product Requirements

9.1 Application Requirements

Phone Hardware Compatibility: The application requires smartphones that have Lidar capabilities for obstacle detection systems.

Battery Efficiency: When active, the application should not reduce the battery life by more than 20% compared to when the application is not running.

Visibility in Daylight: The application's display must remain clearly visible under direct sunlight.

9.2 System Requirements

Camera Integration: Essential for object recognition and navigation assistance.

Display Requirements: Smartphones must have a large, high-resolution screen to accommodate large icons and text for easy interaction.

9.3 Performance Requirements

Speed of Conversion: Text-to-speech and image-related transformations must be completed within 2 seconds.

Object Detection: Capable of identifying objects within 20 meters with at least 99% accuracy.

Audio Clarity: System-generated audio feedback must be clear, free of noise interference, and provided within 1 second of a user command.

10. Documentation Requirements

10.1 User Manual

Main Menu Instructions:

Vision problems: Access features through the "Vision" icon.

Hearing issues: Use the "Hearing" icon for audio assistance features.

Speech challenges: "Speech" icon for communication tools.

Memory assistance: "Memory" icon to access cognitive support features.

Everyday living: "Everyday Living" icon for daily assistance like health issue communication and emergency services.

10.2 Installation Guides and Configuration

Detailed installation and configuration guides will be provided to facilitate user setup and adjustments.

APPENDIX-A

Features Implemented and Features to Be Implemented

Features implemented so far:

Text to Speech Converter: Converts written text into audible speech, assisting users in understanding textual information through audio.

Emergency Services: Provides quick access to emergency contacts and services, essential for immediate assistance in urgent situations.

Obstacle Detection: Senses obstacles in user’s path and notifies the user using audio or vibration

Features to be implemented: