NaviSense Smartphone Application

Final Project Plan

Phase 2

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SE 4351.001

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Team Website: https://ubadahjs.github.io/requirementsCourse/

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1. Introduction

1.1 Project Background

This evolving project plan focuses on the development of NaviSense, a smartphone app specifically designed to assist blind individuals in navigating indoor environments. NaviSense aims to revolutionize indoor navigation for the visually impaired by leveraging cutting-edge technologies such as GPS, indoor positioning systems, and voice commands. Users can interact with NaviSense using voice commands, making it accessible and user-friendly. The app also delivers information about points of interest such as restrooms, exits, and elevators within indoor spaces. NaviSense has the ultimate goal of bringing enhanced independence for visually impaired individuals.

1.2 Project Scope

The scope of this project includes:
- Developing the NaviSense app with features tailored for indoor navigation for blind individuals
- Integrating GPS, indoor positioning systems, and voice commands to provide real-time audio instructions and obstacle identification
- Ensuring the app's compatibility with both iOS and Android platforms
- Adhering to accessibility standards to enhance user experience for visually impaired individuals

1.3 Project Objectives

The objectives for this phase are as follows:
- Develop a comprehensive understanding of the project requirements and constraints
- Define the functional and non-functional requirements for the NaviSense app
- Create a questionnaire to gather information from potential users
- Develop a WRS document
- Design a mockup prototype of the NaviSense app
- Identify and resolve any issues with the preliminary definition

1.4 Project Deliverables

Date	Deliverable	Team Leader	Description
2/19/24	Preliminary Project Plan	Omar Hussain	Outlined the name of our app, created team website, and noted the project description

3/25/24	Project Phase 1 Deliverables	Ubadah Saleh	A WRS document, evolving project plan, questionnaire, and presentation

2. Understanding the Project Description

2.1 Project Description

NaviSense is envisioned as a comprehensive indoor navigation solution for blind individuals. The app will provide audio instructions to guide users through various indoor environments, such as buildings, malls, and airports. NaviSense will utilize GPS and indoor positioning systems to determine the user's location and provide real-time audio instructions. The app will also include features to identify potential obstacles, such as stairs, walls, and doors, and provide warnings to users. NaviSense will have a user-friendly interface designed to cater to the needs of visually impaired individuals. The app will have customizable settings, such as the volume and pitch of audio instructions, to enhance the user experience. NaviSense will also include a feature to save frequently visited locations, enabling users to navigate to these locations easily. The NaviSense app will be developed with the aim of providing independent navigation support for visually impaired individuals, empowering them to navigate indoor spaces confidently. The app will be designed to comply with accessibility standards, ensuring that it is user-friendly for visually impaired individuals.

2.2 Stakeholder Analysis

The stakeholder analysis for the project involves identifying and understanding the key individuals and groups that have a vested interest in the app's development and implementation. This includes blind individuals who will use the app, user interface designers focused on creating an intuitive user experience, and accessibility experts ensuring compliance with standards. By comprehensively analyzing the needs, expectations, and challenges of each stakeholder group, we will ensure that NaviSense aligns with diverse user requirements and industry best practices.

2.3 Issues with preliminary definition and resolution

There are certain challenges that are present in the preliminary definition of the project requirements. These challenges include ambiguities in the specific user interface design requirements for visually impaired individuals as well as potential limitations in achieving seamless integration of GPS and indoor positioning systems for precise indoor navigation. However, through collaborative discussions and in-depth consultations, we will successfully resolve these issues. We believe that this resolution involves refining the user interface design

based on direct feedback from visually impaired individuals and conducting thorough assessments to address potential integration challenges.

2.4 Improved understanding

Following the resolution of the previously identified issues, we gained an improved understanding of the project description. The refined user interface design now incorporates direct insights from visually impaired individuals, ensuring a more intuitive and user-friendly experience. The technical assessments and subsequent solutions provide a clearer path for integrating GPS and indoor positioning systems, enhancing the app's accuracy in determining the user's location during indoor navigation. By addressing these issues, we now have a more refined and comprehensive understanding of the project description which will enable us to proceed with greater confidence and clarity in developing NaviSense.

3. Requirements Definition

3.1 Functional Requirements

As per our discussion, here are some of the following functional requirements that we have identified in addition to the ones already provided in the project instructions document:

- NaviSense should offer users both visual and audible input in real-time, contingent on their location.
- NaviSense will provide user-customizable feedback options based on ambient and user preferences.
- Voice commands will be supported by the system, enabling hands-free control and navigational modifications.
- Contextual location-based information, such as descriptions of nearby places and points of interest, will be provided via the app.
- An extensive mapping system, including indoor navigation for public buildings and transportation hubs, will be included into the app.
- In order to serve a multilingual user base and improve accessibility for non-English users, NaviSense will support multiple languages.

3.2 Nonfunctional Requirements

As per our discussion, here are some of the following nonfunctional requirements that we have identified in addition to the ones already provided in the project instructions document:

- To safeguard user privacy, NaviSense will provide data encryption and user anonymity.
- NaviSense will guarantee peak performance and dependability, providing prompt replies and less downtime.
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- By guaranteeing user-friendly navigation, quick load times, and seamless interaction across the app, NaviSense will provide an outstanding user experience, accommodating users with varying levels of technical proficiency.
- To protect user privacy, NaviSense will offer data encryption and user anonymity.
- In order to guarantee that the app is fully useable by people with a wide range of disabilities, NaviSense will uphold the highest standards of accessibility and inclusivity.

4. User-Centric Approach

4.1 Questionnaire Development

The questionnaire development process for the NaviSense project involves creating a comprehensive set of questions aimed at gathering valuable insights from potential users. The questionnaire will focus on eliciting information regarding the preferences, challenges, and expectations of visually impaired individuals related to indoor navigation. Key areas of inquiry will include user preferences for audio instruction delivery, obstacles commonly encountered during indoor navigation, desired features for enhancing the user experience, and feedback on existing indoor navigation solutions. By designing a well-structured questionnaire, we aim to collect data that will ensure that the app meets the specific needs of its target users.

4.2 User Feedback Analysis

Upon receiving responses from the questionnaire, we will conduct a thorough analysis of the user feedback to extract valuable insights and trends. The analysis process will involve identifying recurring themes, key preferences, and areas for improvement highlighted by visually impaired individuals. By synthesizing and interpreting the feedback data, we will gain a deeper understanding of user expectations and pain points related to indoor navigation. This analysis will serve as a foundation for refining the requirements of NaviSense, prioritizing feature development, and enhancing the overall user experience of the app. Also, this will update the evolution of NaviSense, guiding its enhancements and ensuring a more user-centric indoor navigation experience.

4.3 Integration with Voice Assistants and Smart Home Devices

A crucial aspect to consider for the NaviSense app is the integration with voice assistants and smart home devices. By integrating with voice assistants, such as Amazon Alexa or Google Assistant, NaviSense can provide users with a hands-free navigation experience that allows them to interact with the app using voice commands. Users can access the app's functionality without the need to physically interact with their device, which can be particularly beneficial for individuals with visual impairments. Furthermore, integrating NaviSense with smart home devices, such as smart speakers can provide users with an enhanced navigation experience that incorporates real-time visual and audio cues. Smart home devices can display maps or directions on a screen or provide audio guidance through connected speakers. This integration can create a more immersive and intuitive navigation experience that caters to the specific needs and preferences of visually impaired individuals. Overall, the integration with voice assistants and smart home devices for NaviSense ensures that the app is designed to provide an intuitive navigation experience that meets the needs of visually impaired individuals.

5. Inclusive Design

5.1 WRS Document Content

The WRS document for this project will encompass a detailed outline of the functional and non-functional requirements, stakeholder types, issues with the preliminary definition, mockup prototype, user manual, and traceability. The WRS document will serve as a comprehensive guide for us, providing a structured overview of the project objectives, key features, technical specifications, and user interface design requirements. By encapsulating all essential project information in a single document, the WRS will ensure alignment for our project, facilitate effective communication, and serve as a reference point for decision-making throughout the development process of our app.

5.2 Mockup Prototype Details

The mockup prototype of the NaviSense app will offer stakeholders a visual representation of the app's interface design, navigation features, and user interactions. The prototype will be created using wireframing tools to showcase the layout, functionality, and flow of the app in a simplified and interactive format. Key elements of the mockup prototype will include the main screen layout with navigation options, settings for audio instructions customization, obstacle detection alerts, and the feature to save and recall frequently visited locations. By visually presenting the app's design and features early in the development process, the mockup prototype will enable stakeholders to provide feedback, validate design decisions, and ensure that NaviSense aligns with user expectations and project requirements.

5.3 Accessibility Compliance

In the development of the NaviSense app, ensuring accessibility compliance is a critical consideration that goes beyond functionality. Accessibility compliance encompasses designing the app in a way that makes it usable for individuals with diverse abilities and disabilities, including those with visual impairments. By adhering to established guidelines and standards such as the Web Content Accessibility Guidelines (WCAG), NaviSense can enhance its usability and ensure inclusivity for all users. One key aspect of accessibility compliance is providing compatibility with screen readers, assistive technologies that convert on-screen text into spoken words or braille output for users with visual impairments. By optimizing NaviSense to work seamlessly with screen readers, visually impaired individuals can effectively navigate the app and access crucial information about their surroundings. Moreover, incorporating features like high contrast interfaces and customizable font sizes can further improve the user experience for individuals with visual impairments. By prioritizing accessibility compliance in the design and development of NaviSense, the app not only becomes more user-friendly for individuals with disabilities but also aligns with ethical considerations and legal requirements.

6. App Development

6.1 Sensor Utilization and Integration

Our team will focus on implementing the identified sensors to enhance safe navigation through obstacle avoidance. The utilization and integration of sensors such as proximity sensors and environmental sensors will be explored to detect obstacles and provide real-time feedback to the user. We will work on integrating the sensor data with the app's navigation system to ensure accurate and reliable obstacle detection. Additionally, we will conduct extensive testing to validate the effectiveness and reliability of the sensor-based obstacle avoidance features.

6.2 Prototype Refinement and Testing

Building upon the feedback from user testing, we will refine the running prototype of the NaviSense app to address identified areas for improvement. This refinement process will involve enhancing the user interface design based on direct insights from visually impaired individuals, optimizing the audio instruction delivery system, and improving the accuracy of obstacle detection alerts. Furthermore, rigorous testing procedures will be implemented to ensure the app's functionality and performance. This testing phase will encompass usability testing with visually impaired individuals, compatibility testing with various screen readers and assistive technologies, as well as performance testing to validate peak performance and dependability.

7. Product Specification

7.1 User Interface Design Refinement

The user interface design will undergo further refinement based on direct feedback from visually impaired individuals, ensuring that the app provides an intuitive and user-friendly experience. This refinement process will focus on optimizing the layout, contrast, and navigation elements to enhance usability for individuals with visual impairments. Additionally, customizable settings for font sizes, color contrast, and audio feedback preferences will be integrated to cater to diverse user needs.

7.2 Security and Privacy Enhancements

To further strengthen the security and privacy aspects of the app, additional measures will be implemented to ensure data encryption, user authentication, and secure communication protocols. We need to ensure that the privacy and confidentiality of user data is protected. To achieve this, we will prioritize the use of industry-standard encryption algorithms and authentication mechanisms which can safeguard user data and maintain compliance with privacy regulations. Moreover, continuous security assessments and vulnerability testing will be conducted to identify and mitigate potential security risks.

7.3 Performance Optimization

The NaviSense app will undergo performance optimization to ensure quick load times, seamless interaction, and prompt responses. The development team will focus on minimizing app downtime, optimizing resource utilization, and enhancing the overall responsiveness of the app. This optimization process will involve profiling the app's performance, identifying bottlenecks, and implementing efficient solutions to deliver a smooth and reliable user experience.

7.4 Development of Vision Document

The team will develop a comprehensive vision document that outlines the overarching goals, technical specifications, and user experience objectives for the NaviSense app. This document will provide a clear roadmap for the final implementation and serve as a reference for stakeholders and team members involved in the project. The vision document outlines goals such as enhanced safety, independence, and efficient navigation. The document also includes objectives such as seamless interaction, clear instructions, and error handling. This will serve as a compass, guiding our team toward creating an inclusive, efficient, and reliable indoor navigation solution for blind users. Stakeholders can refer to this document throughout the project lifecycle to ensure alignment with the original vision and goals.

8. Process Specification

8.1 Agile Development Methodology

The development phase will be executed using an agile methodology, allowing for iterative and adaptive development practices. The team will follow a sprint-based approach, with regular feedback cycles and incremental feature development. This methodology will enable the team to respond to changing requirements, incorporate user feedback effectively, and maintain a high level of flexibility throughout the development process.

8.2 Usability Testing and Validation

Usability testing and validation will be a critical aspect of the development process for the NaviSense app. We will engage visually impaired individuals in usability testing sessions to ensure that the app meets the highest standards of accessibility and inclusivity. Additionally, compliance with established accessibility guidelines such as WCAG will be regularly assessed to guarantee a user-centric design approach. The usability testing and validation process will involve collecting feedback from visually impaired individuals on various aspects of the app, including the user interface design, audio instruction delivery, obstacle detection alerts, and voice command support. The feedback will be analyzed to identify areas for improvement and to refine the app's features and functionality. We plan to conduct multiple rounds of usability testing to ensure that the app is fully optimized for use by visually impaired individuals.
Moreover, the validation process will involve assessing the app's compliance with industry standards, best practices, and regulations. We will conduct comprehensive testing procedures to ensure that the app meets the functional and non-functional requirements outlined in the project plan. This validation process will involve performance testing, security testing, compatibility testing, and accessibility compliance testing. The findings from these tests will be analyzed to refine the app's features and ensure that it meets the highest standards of quality and reliability.

8.3 Continuous Integration and Deployment

Continuous integration and deployment practices will be implemented to streamline the development workflow and ensure the timely delivery of updates and enhancements. Automated testing suites and deployment pipelines will be utilized to validate new features, maintain code quality, and facilitate seamless updates for the app. This approach will enable us to maintain a high level of development efficiency and responsiveness to user needs.