Enhancing Mobility: An Innovative Indoor Navigation Solution for the Visually Impaired

Team 3

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Indoor navigation is crucial for enhancing the **mobility** of visually impaired individuals. This presentation explores an innovative solution designed to improve their **independence** and **safety** within indoor environments. We will discuss the technology, benefits, and real-world applications of this system.

Understanding the Challenges (As-Is)

Visually impaired individuals face significant **challenges** in navigating indoor spaces, such as **obstacles**, lack of **landmarks**, and **inconsistent layouts**. These barriers can lead to feelings of **disorientation** and **dependence** on others, highlighting the need for effective navigation solutions.

Innovative Technology Overview (To-Be)

Our proposed solution utilizes camera and LiDAR fusion to track objects and estimate distances. These tools work together to provide real-time **guidance**, ensuring users can navigate their environment **safely** and confidently, enhancing their overall **experience**.

Stakeholders

Of
- Investors
- Iphone App Store

By
- Development Team
- Architect Team
- Requirements Team
- Deployment Team

For
- Visually Impaired
- Healthcare Providers
- Caregivers
- Family Members of Visually Impaired

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These relate to the needs and constraints of the specific domain (navigation for blind people) and the app's functional requirements:

- **Accessibility Needs**: Voice commands, screen reader compatibility (VoiceOver, TalkBack), haptic feedback.
- **Obstacle Detection**: Real-time lidar and sensor data to detect obstacles.
- **Indoor Navigation**: Bluetooth beacons or Wi-Fi for indoor environments.
- **User Safety Features**: SOS functionality, emergency alerts.
- **Landmark Recognition**: Descriptions of surroundings like buildings, street names.
- **Crowdsourced Data**: User-submitted updates on navigation issues, obstacles, or hazards.

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These are the detailed technical features that connect both domain properties (user needs) and the computer/programming aspects (technical implementation):

- **Accurate GPS and Lidar Data Integration**: To detect obstacles and provide precise location-based directions.
- **Customizable Navigation Preferences**: Allowing users to adjust settings (voice feedback, route type) that tie user needs with the programming logic.
- **Voice-Based Navigation Interface**: A system where the app offers navigation instructions through a voice interface, using TTS and NLP.
- **Real-Time Obstacle Detection**: Integration of sensors with the app to detect obstacles, using both domain-specific requirements (obstacle avoidance) and programming (lidar, camera data processing).
- **Offline Navigation**: Preloaded maps and routes that work without an active internet connection, addressing user requirements while utilizing local storage and data management on the phone.
- **Crowdsourced Updates**: Systems to allow users to report hazards in real-time, which both the app infrastructure (servers, databases) and domain requirements (need for up-to-date environmental information) depend on.

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These relate to the technological tools, platforms, and programming needed to build the app:

- **Programming Languages**: Swift (for iOS), Kotlin (for Android).
- **APIs**: GPS services (Google Maps, Apple Maps), Text-to-Speech (TTS) API, screen reader API.
- **Sensors**: Lidar sensor usage for obstacle detection, GPS integration.
- **Database Systems**: Cloud-based storage for user data, route history, and crowdsourced information.
- **Machine Learning Models**: Image recognition (for landmarks and objects), NLP for voice commands.
- **Bluetooth/Wi-Fi Tech**: For indoor navigation through proximity sensors.

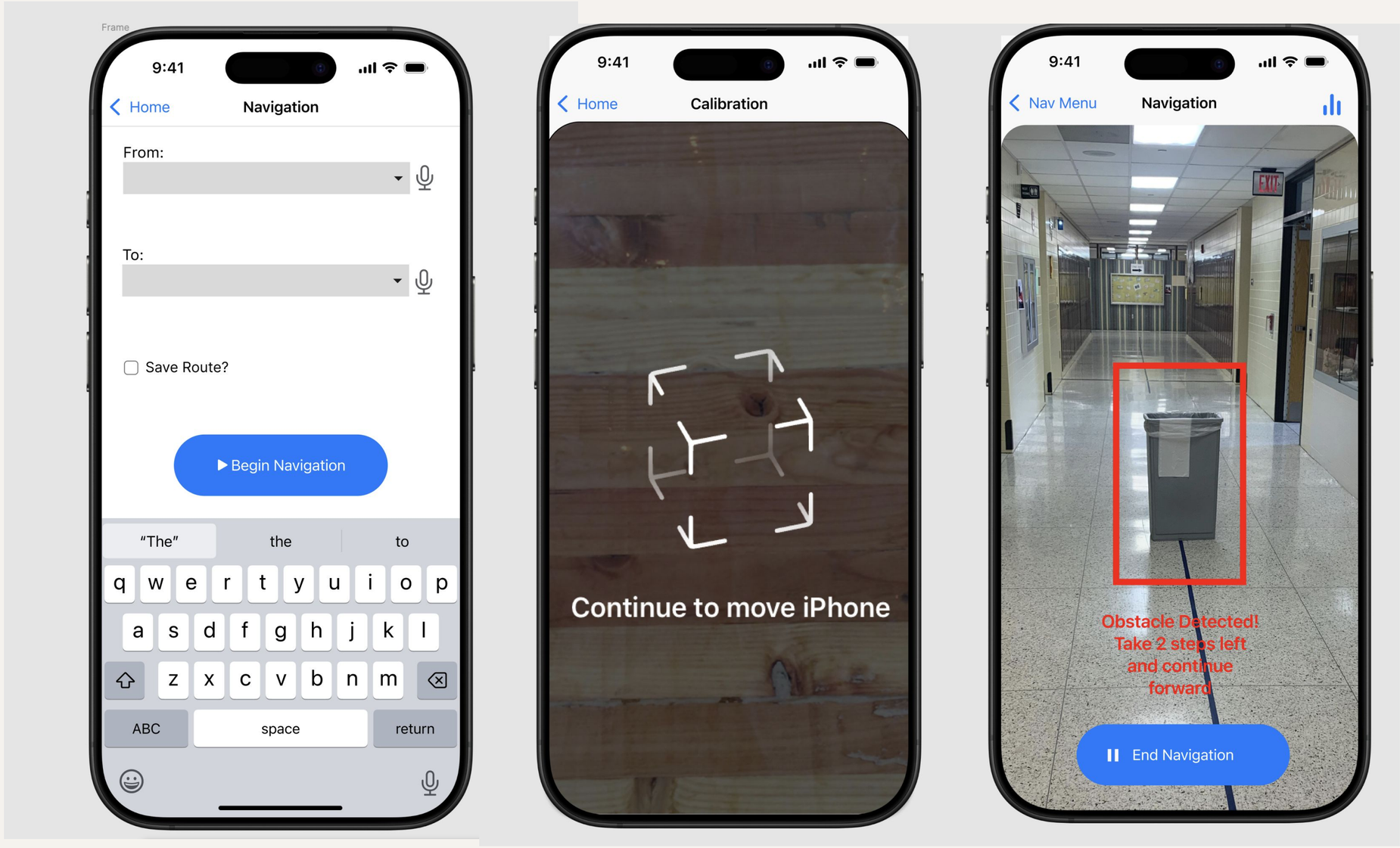
User-Centric Design Approach

The design of our navigation solution is centered on the **user experience**. We conducted extensive **user research** to understand their needs and preferences, ensuring that the interface is **intuitive**, accessible, and tailored for **ease of use** for visually impaired individuals.

Real-World Applications

This innovative indoor navigation solution has potential applications in various settings, including **malls**, **airports**, and **hospitals**. By implementing this technology, we can significantly improve the **independence** and **quality of life** for visually impaired individuals in these environments.

Mockups


Frame
9:41
Home
Navigation
From:
To:
Save Route?
▶ Begin Navigation
"The"
the
to
q w e r t y u i o p
a s d f g h j k l
z x c v b n m
ABC
space
return
9:41
Home
Calibration
Continue to move iPhone
9:41
Nav Menu
Navigation
EXIT
Obstacle Detected!
Take 2 steps left
and continue
forward
End Navigation

On Requirements Creep

Our team shall handle up to **10%** change in requirements per month. We have a well-defined scope, but understand that software should adapt to the needs of its users.

We will work with stakeholders to find out what needs to be added or changed.

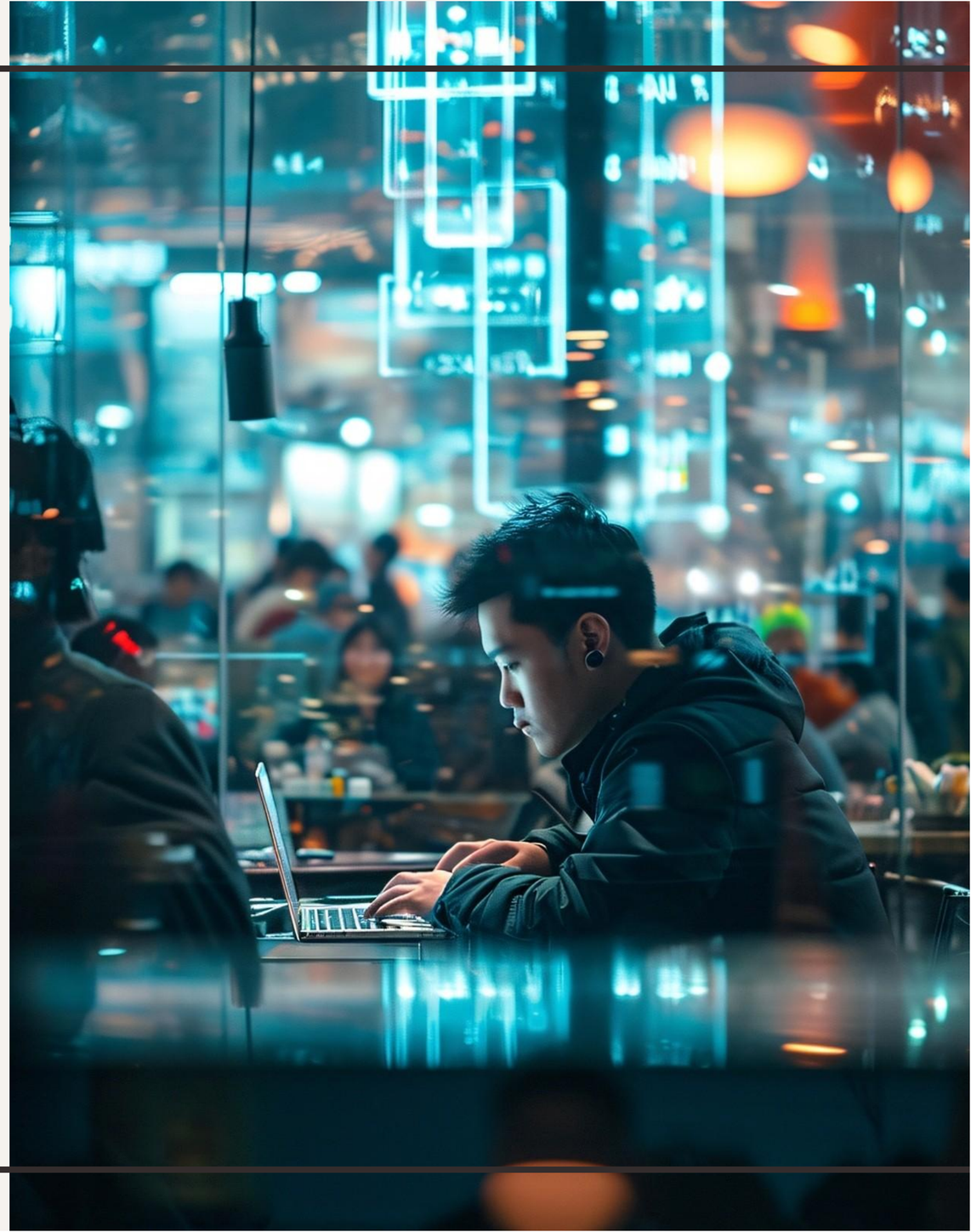
Why Choose Our Solution?

- Highly Accessible and User-Centric Design
- Intuitive and easy-to-use UI
- Cutting Edge LiDAR Technology
- Real time, Reliable Guidance
- Committed to improving Quality of Life

Conclusion and Future Directions

We are committed to enhancing mobility through an innovative indoor navigation app.

Future developments will focus on **expanding functionalities**, integrating with smart city initiatives (**IOT**), and fostering **collaborations** to ensure widespread adoption and impact.



Thanks!

Do you have any questions?

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