Theia

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Team

- Team Member
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- Team URL
  - https://github.com/RealSao/CS-SE-6361.001

AS-IS: User will be endangered by various hazards

- “I need to walk straight ahead”
- (Unaware of the water in front)
- “Ahhh I slipped”

AS-IS: Can Not Notify Caretakers if Emergency

- *"I need to keep moving forward."*
- (Steps onto the wet surface, loses balance, and falls to the ground.)
- *Ahh! I slipped! That really hurt..."*
- (Lies on the floor, disoriented and in pain.)
- *"I need help... but I don't have a way to notify anyone."*
- (Time passes, but no one arrives because there was no emergency alert.)
- *"If only someone knew I was in trouble..."*

AS-IS: Missing the Correct Room

- *"I need to find Room 205. I think I should be close by."*
- (Reaches out to the first door and opens it.)
- *"Excuse me, I think you have the wrong room."*
- *"Oh! Sorry about that. I'll try the next one."*
- (Moves to the next door, unsure if it's correct.)
- "*I really wish I had a way to confirm the room number before entering..."*

Right Room

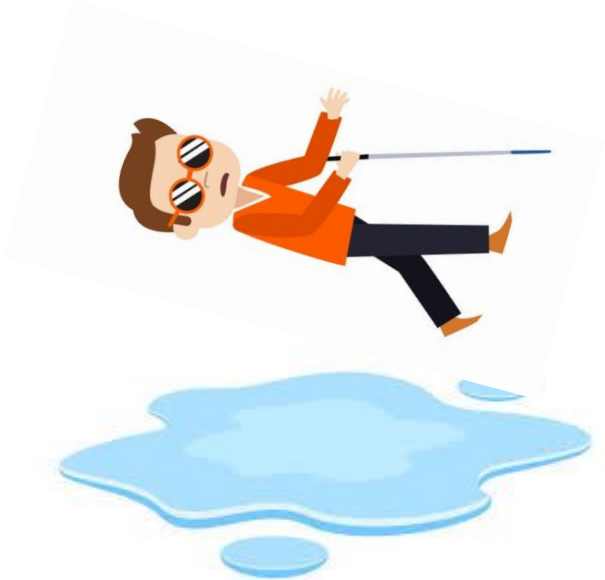
Wrong Room

Wrong Room

TO-BE: App Notifies User of Hazards

- *“Caution! Wet floor detected ahead. Adjust your path slightly to the right to avoid slipping."*
- *"Thanks, Theia! Adjusting my direction now."*
- (The user safely walks around the hazard and continues forward.)
- *"That was easy! No falls, no worries."*

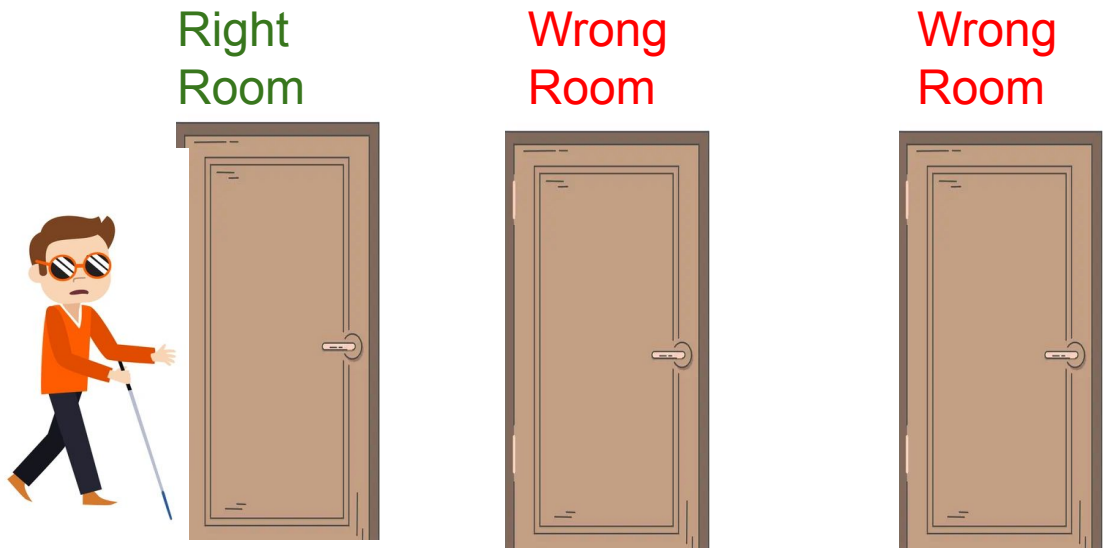
TO-BE: App Notifies Emergency Services and Caretakers if Needed



- *"Ahh! I fell! I need help..."*
- *Fall detected! Checking for movement..."*
- (A few seconds pass.)
- *"No movement detected. Alerting your emergency contacts and nearby assistance."*
- (A caretaker or emergency responder receives the alert and arrives shortly.)
- *"We got the alert! Are you okay?"*
- *"Thank you! I couldn't call for help myself, but Theia took care of it."*

TO-BE: App Gives User Directions to Correct Room

- *"I need to find Room 205. Theia, can you help me?"*
- *"Yes! Walk forward 10 steps, then stop."*
- (The user follows the instructions and stops in front of a door.)
- *"You are now in front of Room 205. Reach out to your left to find the door handle."*
- *"Got it. Thanks, Theia!"*
- (The user enters the correct room confidently.)



Process

Stakeholders:

- Of: UTD
- By: Tonghong, Ajay, Farrel
- For: Blind People, Friends, Family, Caretakers, Accessibility Services, Emergency Services

Tools

- Figma
- Google Docs
- Google Slides
- ChatGPT
- Android Studio

Standards

- HIPAA - Compliance for medical data privacy
- IABNNS - Standard for indoor navigation for people with blindness or low vision
- ADA Standards

Questions

- How do you currently navigate indoor spaces? (e.g., cane, guide dog, assistance from others, smartphone apps)
- Would you prefer step-by-step voice guidance or a general route overview?
- How comfortable are you with using voice commands to interact with the app on a scale of 1 to 5 where 5 means most comfortable?
- Do you often follow the same routes daily, or do your destinations change frequently?

Issues with the Definition

- Lack of Clear Emergency Escalation Path
  - The document mentions emergency assistance, but fails to specify the priority levels for the types of emergency
- Route Selection for Blind Users
  - It states that the app the will offer the user a route they feel most comfortable with, yet fails to specify how they would evaluate and choose a preferred route
- Differentiating Falls from Other Movements
  - It doesn’t specify how the app should differentiate between fall and other sudden movements
- Data Privacy and HIPAA compliance
  - The document doesn’t specify how the user’s data will be protected
- Voice Recognition Capabilities
  - Document mentions voice recognition, but doesn’t go in depth in its range of capabilites

Issues with Functional Requirements

- Navigation in bathroom
  - Problem: use of camera may raise privacy issue
  - Option:
    - Use LiDAR or ultrasonic sensors.
    - Disable navigation in bathrooms.
    - Allow users to manually input layouts.
  - Choice:
    - Option 1
    - The use of sensors will still provide functionality with privacy ensured

Issues with Non-Functional Requirements

- Data Privacy and HIPAA Compliance
  - Problem: Protection of user data not specified
  - Options:
    - End-to-end encryption and access controls.
    - Store data locally, avoid cloud storage.
    - Use anonymization and explicit user consent.
  - Choice:
    - Option 1 with option 3
    - It ensures that sensitive navigation data remains secure while providing necessary transparency.

WRS

- W:
  - **Problem**: Helping Blind people navigate indoors safely
  - **Solution**: Create an App that will give them step by step instructions to help them navigate to their desired location, and notify them of any potential hazards
  - **Improved Understanding:**
    - **Domain:** Indoors
    - **Stakeholders:** Blind people, family, friends, caretakers, accessibility services, emergency assistance, and other people
    - Functional Objectives: indoor navigation, alternate route suggestions, emergency assistance, collision detection
    - Non-Functional Objectives: Safe, fast, accurate and user-friendly navigation, customizable features

Functional Requirements

1. System shall allow the user to navigate indoors at UTD.
2. System shall allow for user to input destination.
3. System shall detect obstacles and potential collisions and warns the user.
4. System shall have a way of detecting if the user falls.
5. System shall have a of allowing the user to contact caretaker if they’re lost.
6. System shall call emergency services or contact caretaker if needed.
7. System shall provide hazard alerts.
8. System shall allow the user to navigate bathrooms without the use of phone cameras.
9. System shall give the user directions to direct them to their desired location.
10. System shall give the user multiple routes.
11. System shall tell the user to walk the correct distance.
12. System shall tell the user to turn at the right place.
13. System shall figure out the user’s schedule or habit to make route suggestions.
14. System shall accept voice commands for searching destinations and interacting with the system.
15. System shall provide the user with audio instructions regarding directions and collision detection.
16. System shall be able to detect the user’s current position.
17. System shall be customizable for user.
18. System shall be available for both IOS, and Android
19. System shall have battery optimization
20. System shall have login and password capability

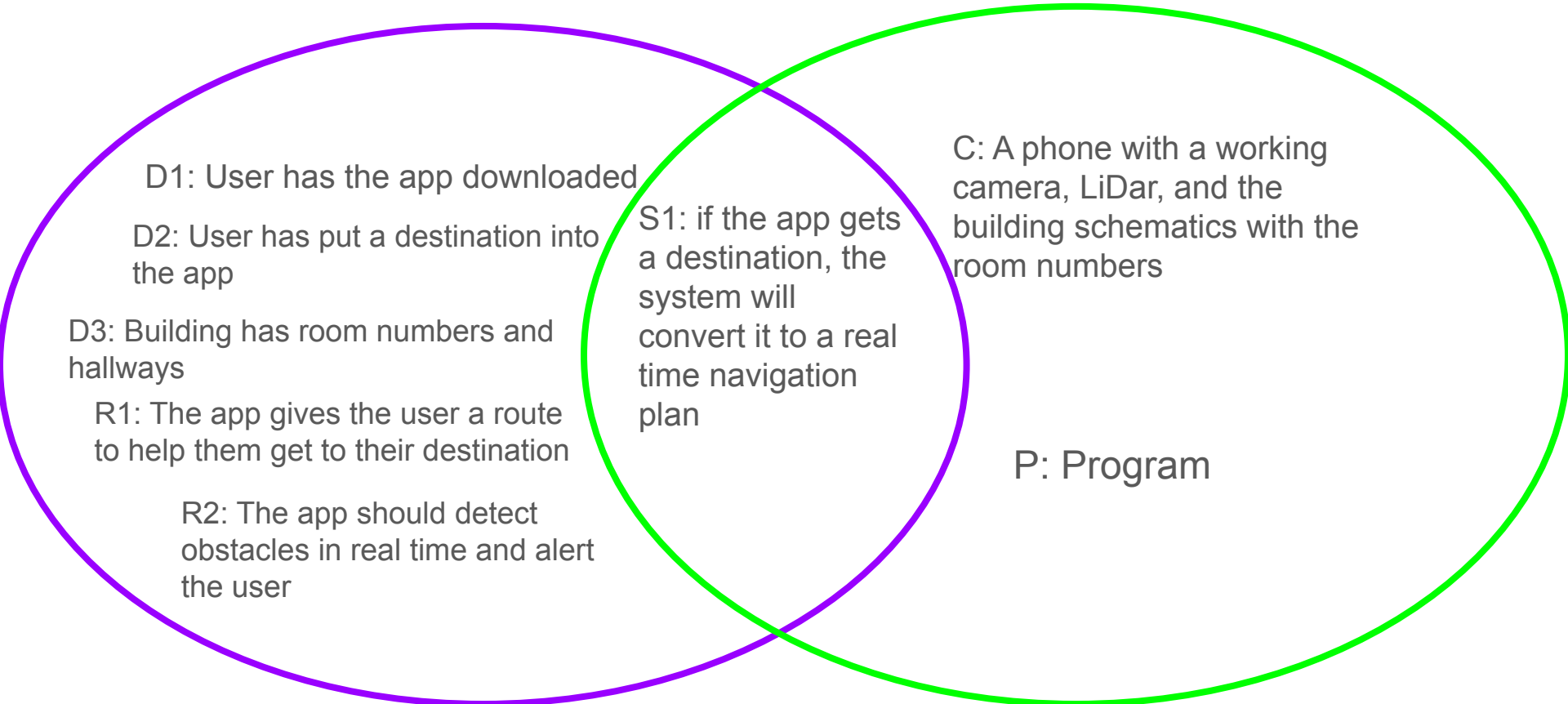
Non-Functional Requirements

1. System shall ensure that the navigation is safe, accurate and fast.
2. System shall provide a user friendly interface.
3. System shall keep the user safe.
4. System shall be customizable .
5. System shall be easily modifiable for future changes.
6. System shall respond to route changes quickly.
7. System shall be responsive with minimal latency.
8. System shall keep the User’s data secure.
9. System shall minimize battery consumption.
10. System shall provide multiple language options.
11. System shall be compatible with IOS and Android.

Traceability between NFR and FR

NFR	FR
1.	1, 3, 4, 7, 10, 15, 16
2	2, 9, 14
3	4, 5, 6, 8
4	17
5	13
6	9, 10, 11, 12
7	3, 11, 12, 15
8	5, 6, 20
9	16, 19
10	8
11	18

Reference Model



Prototype

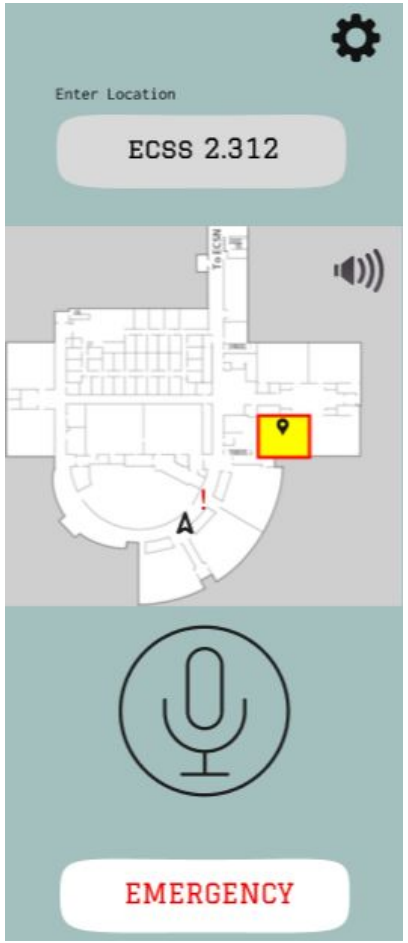

Theia
Username:
jsmith100
Password:
****
Login
Create Account

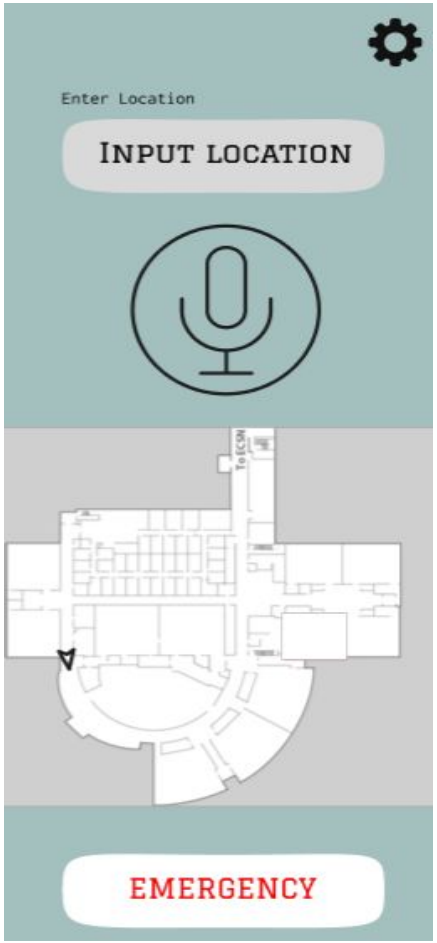

Theia
Account Registration
Username:
jsmith100
Password:
password
Full Name:
John Smith
Emergency Contact Number:
348-469-0123
Your Phone Number:
348-469-0111
Email Address:
jsmith100@gmail.com
Create Account

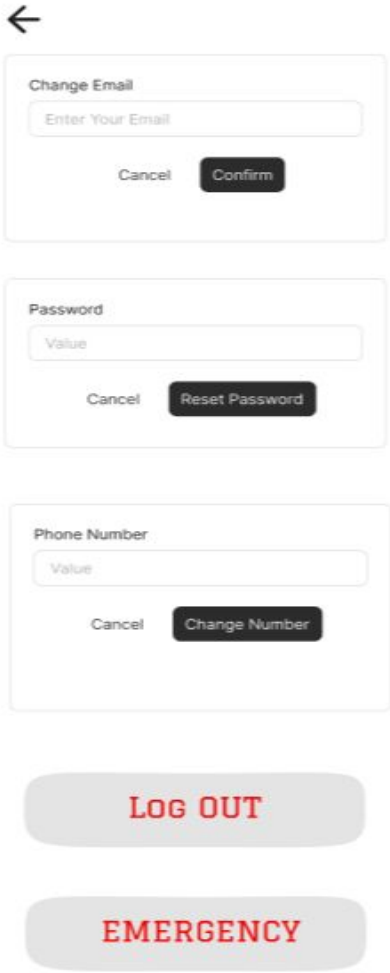

Enter Location
ECSS 2.312
EMERGENCY


Volume
Route Selection
Fastest
Language
English
Battery Saving Mode
Enable
Text Size and Contrast
Default
User Profile
EMERGENCY

Prototype


Enter Location
ECSS 2.312
EMERGENCY


Enter Location
INPUT LOCATION
EMERGENCY


Change Email
Enter Your Email
Cancel
Confirm
Password
Value
Cancel
Reset Password
Phone Number
Value
Cancel
Change Number
LOG OUT
EMERGENCY

Why us?

- Safe navigation
  - Uses real-time voice guidance and obstacle detection.
- User friendly
  - Customizable route preferences based on user habits.
  - Supports multiple languages and speech patterns.
- Fast Response
  - Priority-based emergency response ensures safety.
- Care about Privacy
  - Privacy-focused (LiDAR/sensors instead of cameras).

Thank you