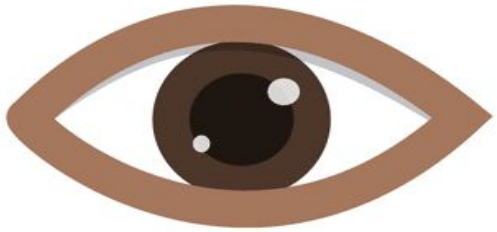


Blind Vision

Team: 6

Aditya Sajeev

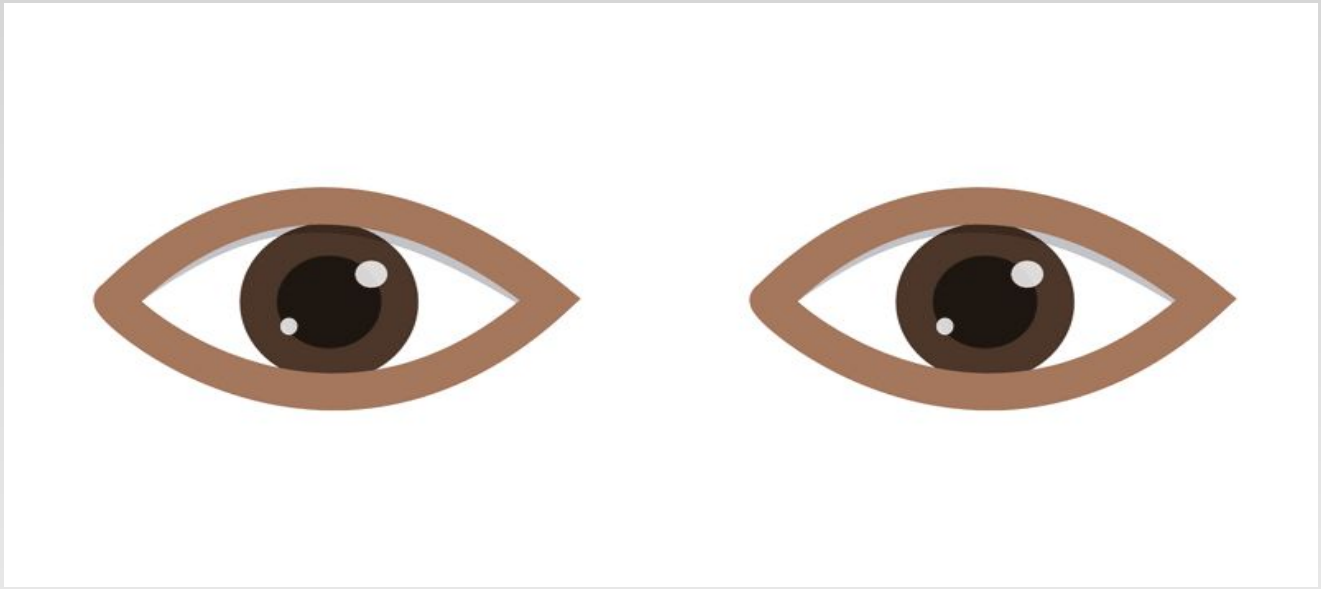
Celio F. Kelly

Ismael Retana

Joshua Brown

Rishi Meka

Tommy Wright



Project Phase 2
System Requirements Specification
Professor/Instructor: Dr. Lawrence Chung
Teaching Assistant: Vlad Birsan

Summary

- AS-IS and TO-BE
- Requirement Engineering Process
- Preliminary Definition Issues
- Prototype/Prototype Mockup
- UML Diagram
- PIG Diagram
- SIG Diagram
- IDEF0 Diagram
- Why you should choose use?
- Questionnaire

AS-IS (Problem)

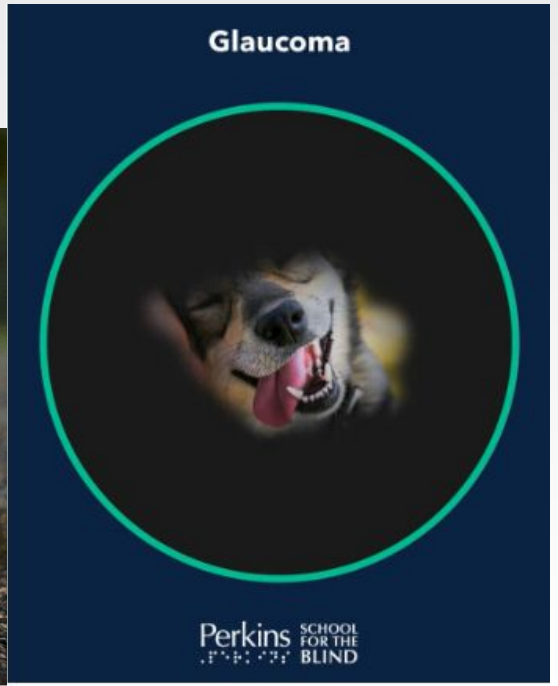
- Partial, Complete, Congenital, Legal, and Nutritional are some of the example that a person might have vision lost.
- Blind people currently don’t have a way to navigate safely at UTD (ex. not able to avoiding obstacle and not able to read sign of the room)
- People with vision disability will have a difficult time contacting emergency services (ex. UTD and UTD Police).

TO-BE (Solutions)

- Help blind people to travel safely indoor at UTD from one destination to another while avoiding obstacle.
- For it to work we would need an assistant AI that will do the work for us.
- Providing assistant services for emergency

AS-IS Scenario 1

- Timmy has glaucoma, a type of blindness where it limit of what Timmy can see around the surrounding area.
- Timmy is at UTD and his next class is in ECSW 1.365. While he's walking there, Timmy bumps into multiple wall, glass door, wet sign, and chairs.
- Timmy become very sad and frustrated.

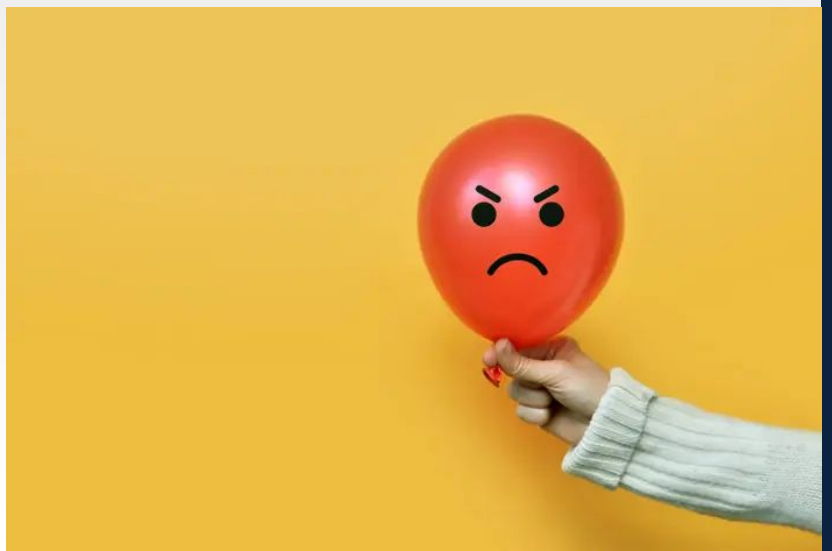


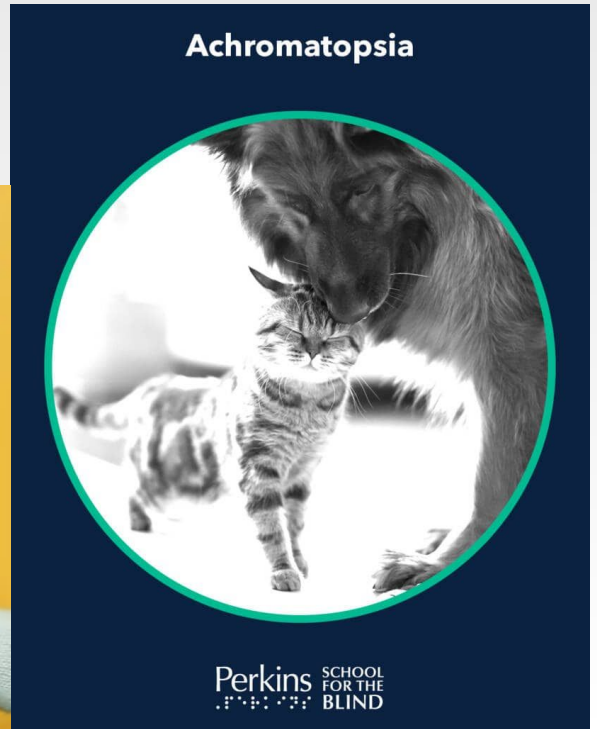
TO-BE Scenario 1

- To solve the problem, our application will escort Timmy from one destination to another while safely avoiding obstacles that are in his way.
- That way Timmy can stay focus on getting his Software Engineering degree and be happy once again.

AS-IS Scenario 2

- Tammy, a visitor at UTD, she has Achromatopsia. A blindness where she can not see colors only black and white.
- Tammy was looking for ECSW 1.365, but she can not find it due to the overpowering of the contrast on her eyes.
- Tammy become sad and angry.





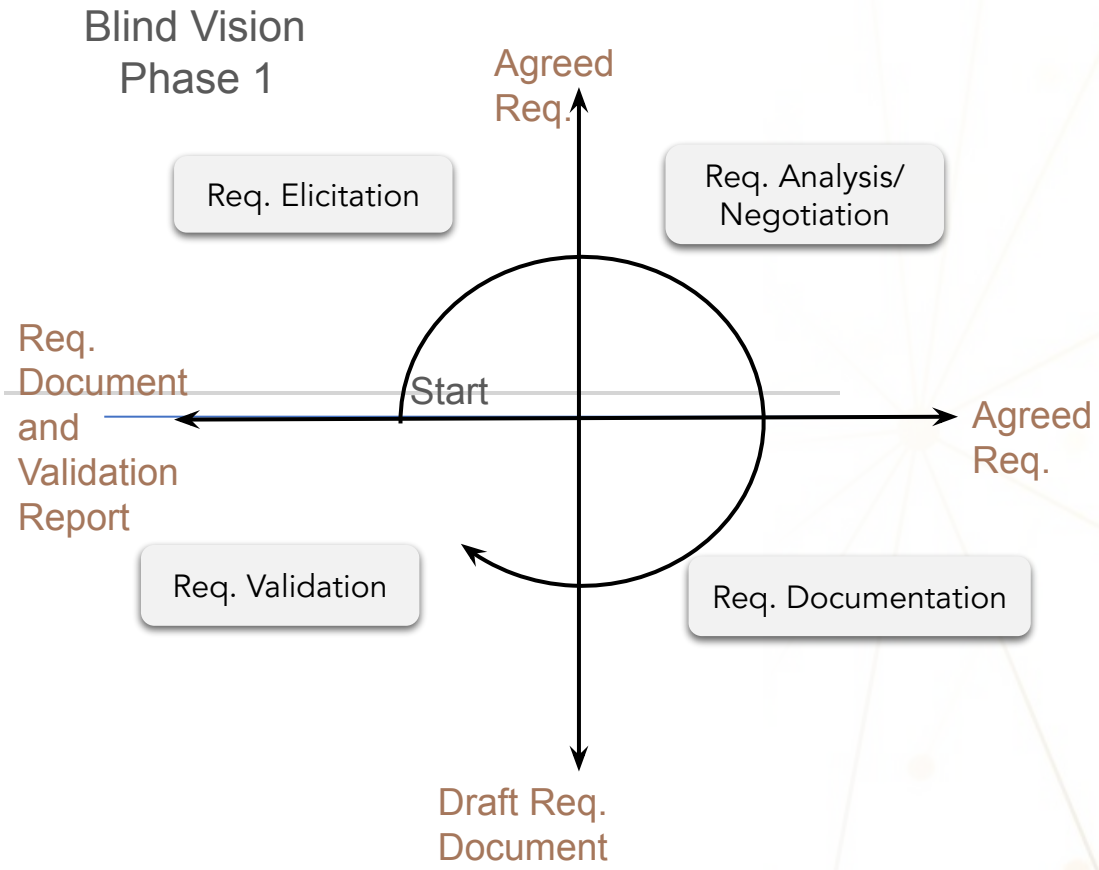
TO-BE Scenario 2

- Our application will guide Tammy safely from her current location to the room that she was looking for, while avoiding obstacles.
- That way Tammy would likely to choose UTD for her school

Requirement Engineering Process

Process-Model

The spiral process was chosen since the project is small and only will go over two phases.



Stakeholders

Of: Lawrence Chung, Accessibility Office, and UTD Police.

By: Team 6 (Helldiver)

For: Blind people, Accessibility Office, UTD Police, and user that assist blind.

Preliminary Definition Issue

WRSPM Model

Environment

D1:The accelerometer can detect if the user falls.

D2: Blind users can use the app to navigate inside UTD buildings.

D3: The camera, LiDAR, and GPS work to scan the area for obstacles.

R1: User should be able to create an account and enter data.

R2: User should be able to clearly hear the sounds made by the app.

System

S1: GPS identifies the user's location.

S2: System uses the camera to identify text on signs and doors, then reads it.

S3: System can ask if the user needs assistance.

S4: System can warn the user if camera or sensors are blocked.

C1: Accelerometer detects the rapid changes in the user's position.

C2: The exact location can be sent to emergency contact.

C3: Can make a call by voice command in an emergency situation.

C4: Read and vocalize the screen content to the user.

C5: Mic can detect the user's voice for entering inputs and commands.

Domain	Domain Issue
• D 1: The accelerometer can detect if the user falls.	• DI 1: Accurate indoor navigation is challenging without the aid of GPS signals.
• D 2: Blind users can use the app to navigate inside UTD buildings.	• DI 2: It must address the complexity of obstacles within the building.
• D 3: The camera, LiDAR, and GPS work to scan the area for obstacles.	• DI 3: User privacy and data security are paramount, given the application's access to sensitive information.

Functional Requirements

- FR 1: The app shall allow users to enter data to create an account.
- FR 2: The app shall access and use microphone, camera, lidar, accelerometer, and GPS.
- FR 3: The app shall guide users to navigate indoors at UTD buildings safely.
- FR 4: The app shall detect if the user falls and needs assistance and send a message and location to his/her emergency contact.
- FR 5: The app shall detect if the smartphone camera and other sensors are covered and ask the user to stop.
- FR 6: The app shall be able to read signs “text” to the user.

Non-Functional Requirements

- NFR 1: The app shall be available and running 24/7.
- NFR 2: The app shall be feasible to maintain.
- NFR 3: The app shall navigate the users safely indoors.
- NFR 4: The app shall be scalable to be implemented in other OS or new features.

Functional Requirements Issue	Non-Functional Requirements Issue
• FRI 1: Determined how the user can input values to create account.	• NFRI 1: Using iPhone hardware and UTD map API bring the cost down significantly.
• FRI 2: Ensure that the app can access the hardware and sensors.	• NFRI 2: To guarantee indoors navigation the app is dependable of UTD map API.
• FRI 3: Use UTD map API to guarantee the user can navigate independently of internet connection.	• NFRI 3: Design the app for future scalability.

Requirement Specification

Obstacle Avoidance

- The app shall use the device's camera to detect obstacles in the user's path and provide audio or haptic feedback to guide the user around them.
- The app shall have a real-time navigation mode that continuously monitors the environment for obstacles and updates the user's route accordingly.

Obstacle Identification:

- The app shall use image recognition technology to identify objects within the camera's field of view.
- The app shall provide audio descriptions of identified objects to the user, including their type, distance, and relative position.

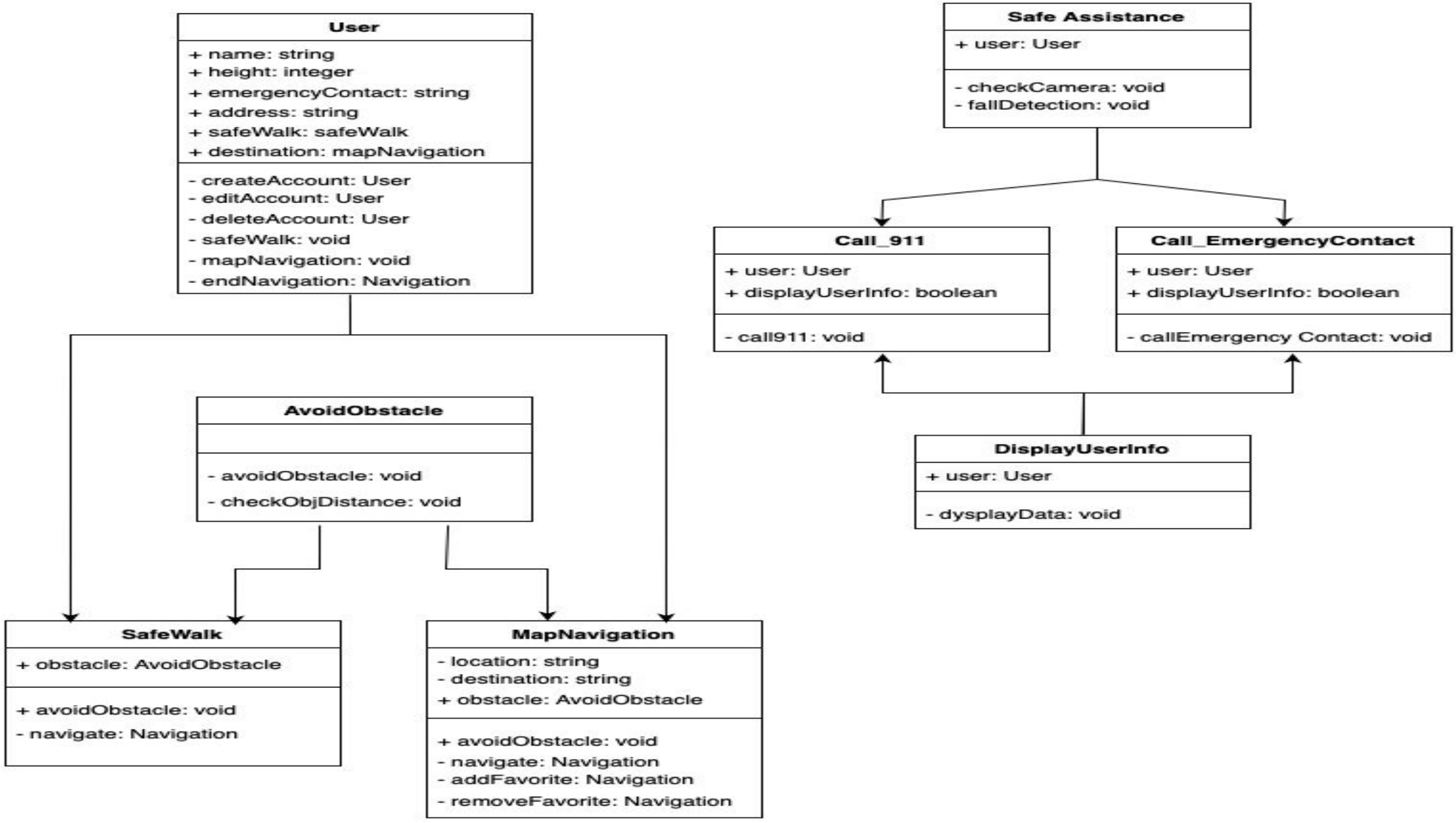
Emergency Safety:

- The app shall include an emergency mode that can be activated by the user with a simple gesture or voice command.
- In emergency mode, the app shall automatically send the user's location to predefined emergency contacts or local emergency services.
- The app shall provide audible instructions to the user on how to stay safe in various emergency situations (e.g., fire, earthquake, lost in an unfamiliar area).

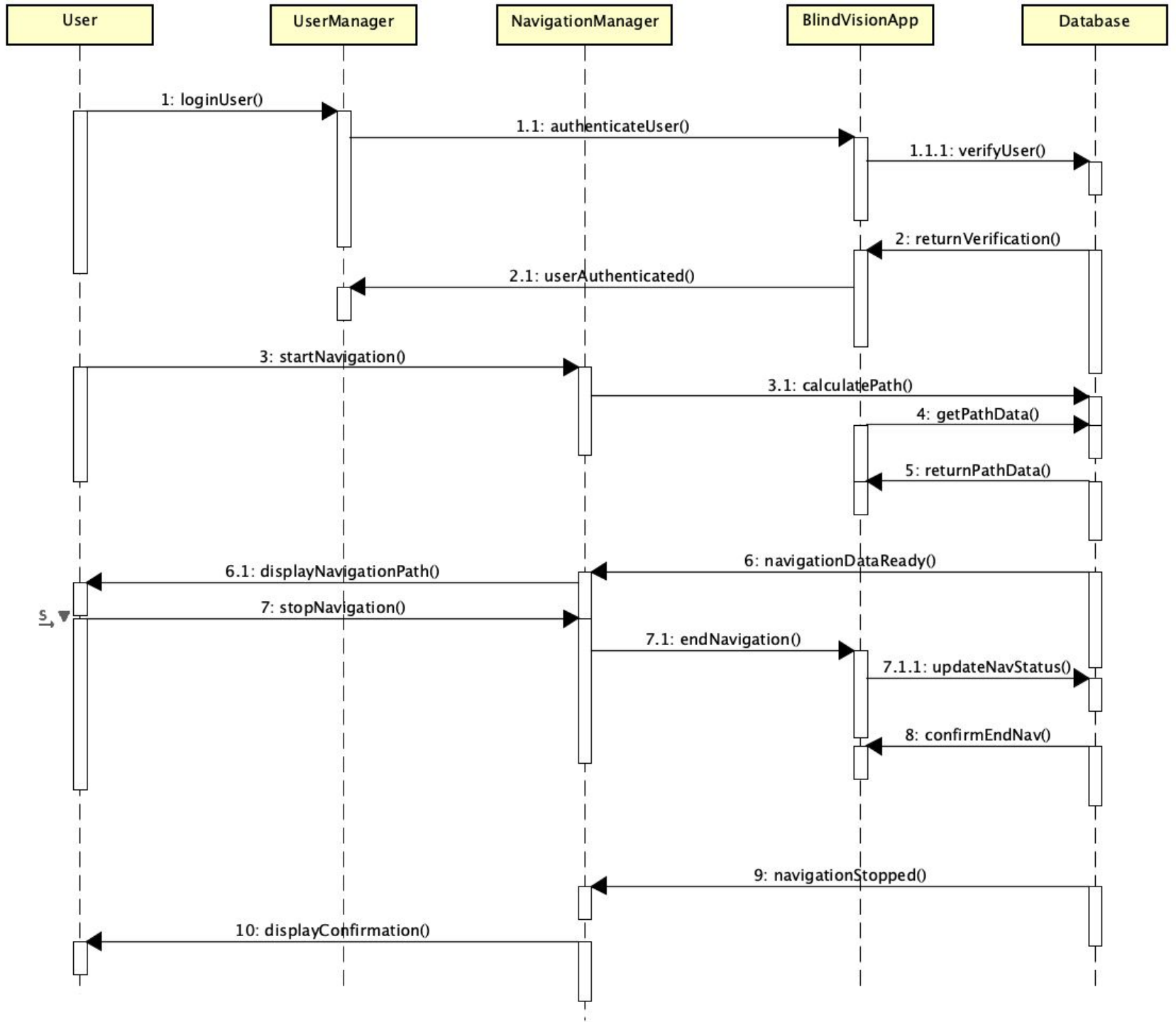
Prototype

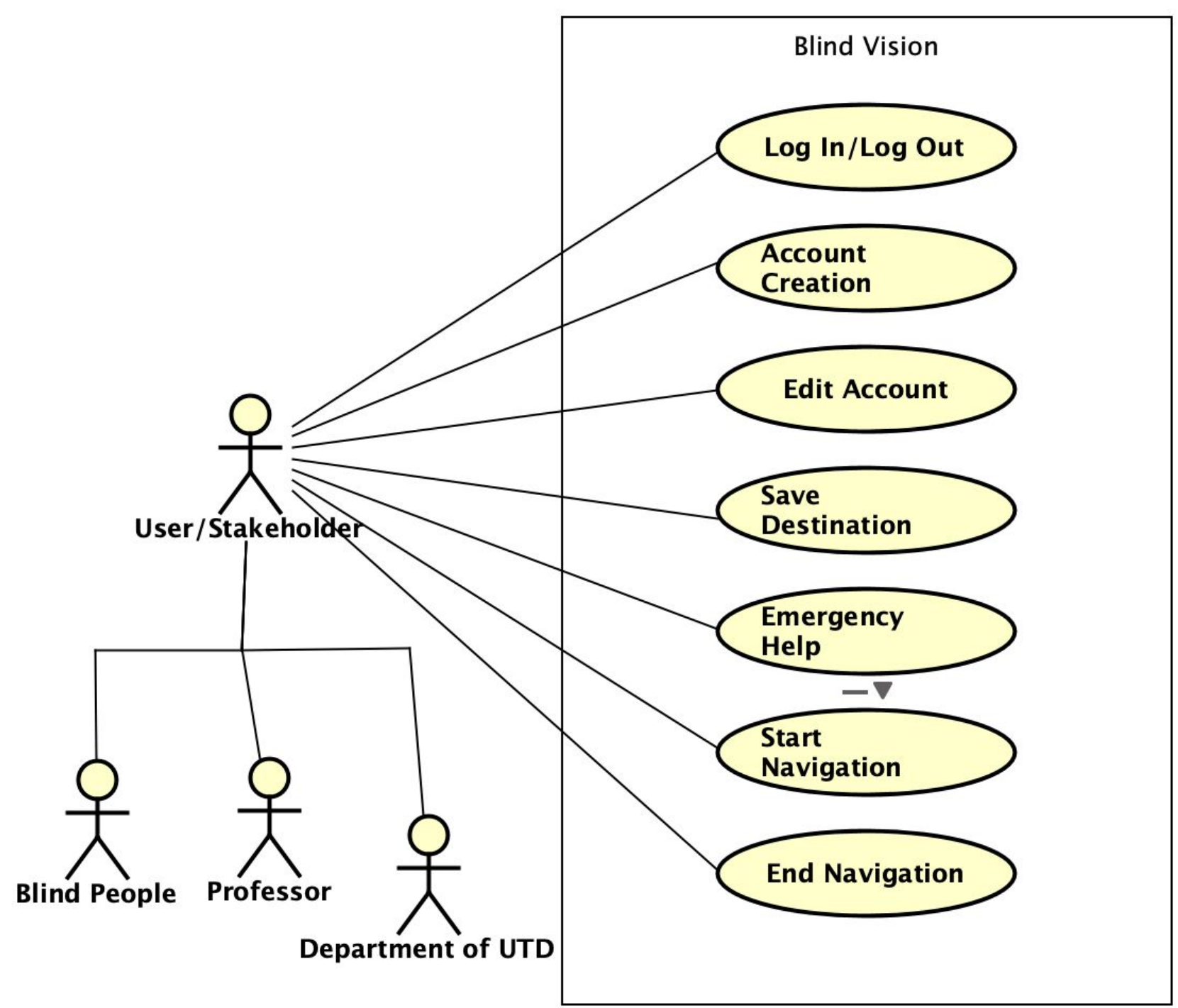
Blind Vision app demonstration: You can check it out on GitHub
https://github.com/ishre27/Blind-Vinsion-

UML Diagrams


User
+ name: string
+ height: integer
+ emergencyContact: string
+ address: string
+ safeWalk: safeWalk
+ destination: mapNavigation
- createAccount: User
- editAccount: User
- deleteAccount: User
- safeWalk: void
- mapNavigation: void
- endNavigation: Navigation
Safe Assistance
+ user: User
- checkCamera: void
- fallDetection: void
Call_911
+ user: User
+ displayUserInfo: boolean
- call911: void
Call_EmergencyContact
+ user: User
+ displayUserInfo: boolean
- callEmergency Contact: void
AvoidObstacle
- avoidObstacle: void
- checkObjDistance: void
DisplayUserInfo
+ user: User
- dysplayData: void
SafeWalk
+ obstacle: AvoidObstacle
+ avoidObstacle: void
- navigate: Navigation
MapNavigation
- location: string
- destination: string
+ obstacle: AvoidObstacle
+ avoidObstacle: void
- navigate: Navigation
- addFavorite: Navigation
- removeFavorite: Navigation

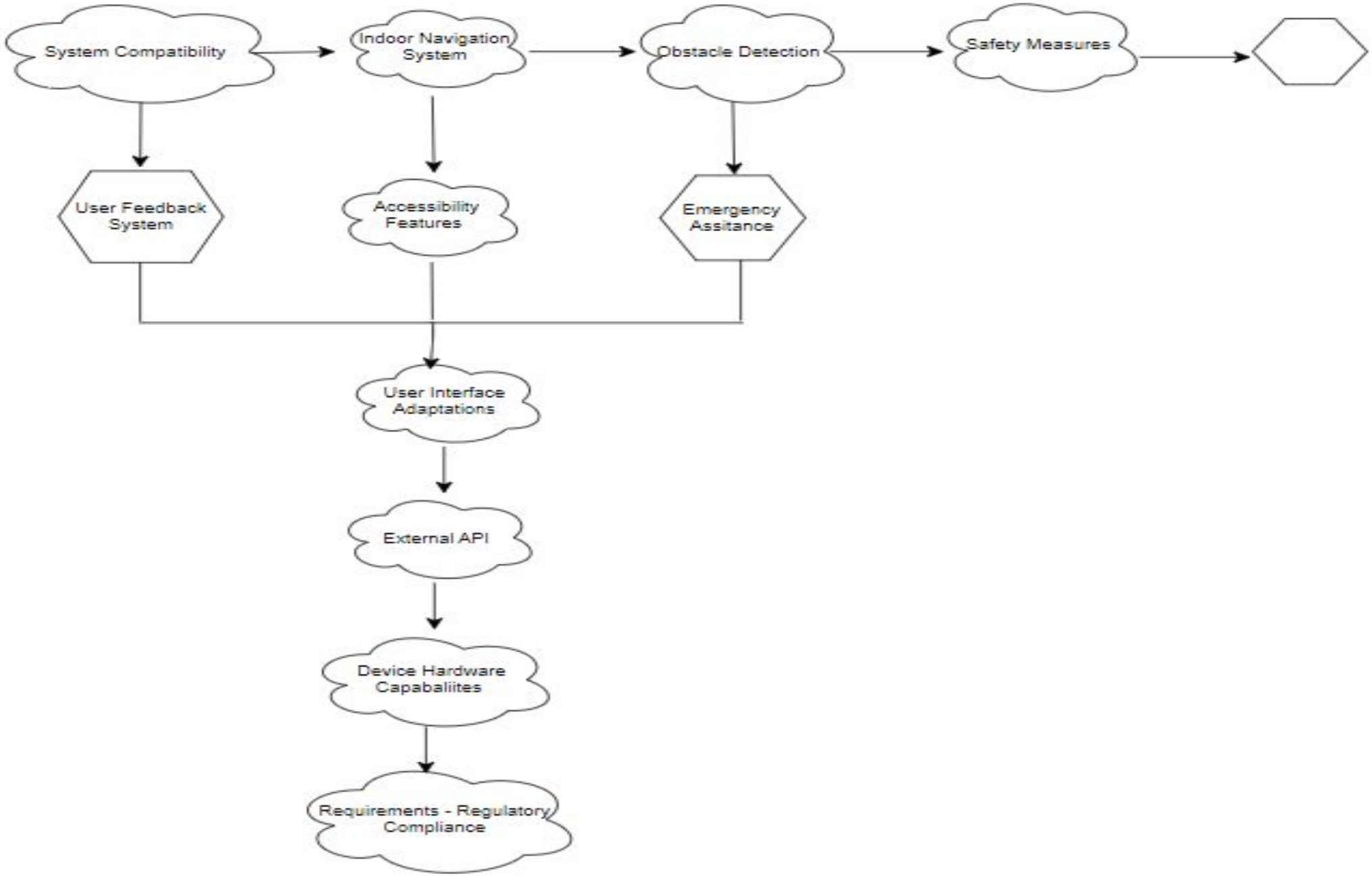
Sequence


User
UserManager
NavigationManager
BlindVisionApp
Database
1: loginUser()
1.1: authenticateUser()
1.1.1: verifyUser()
2: returnVerification()
2.1: userAuthenticated()
3: startNavigation()
3.1: calculatePath()
4: getPathData()
5: returnPathData()
6.1: displayNavigationPath()
6: navigationDataReady()
7: stopNavigation()
7.1: endNavigation()
7.1.1: updateNavStatus()
8: confirmEndNav()
9: navigationStopped()
10: displayConfirmation()

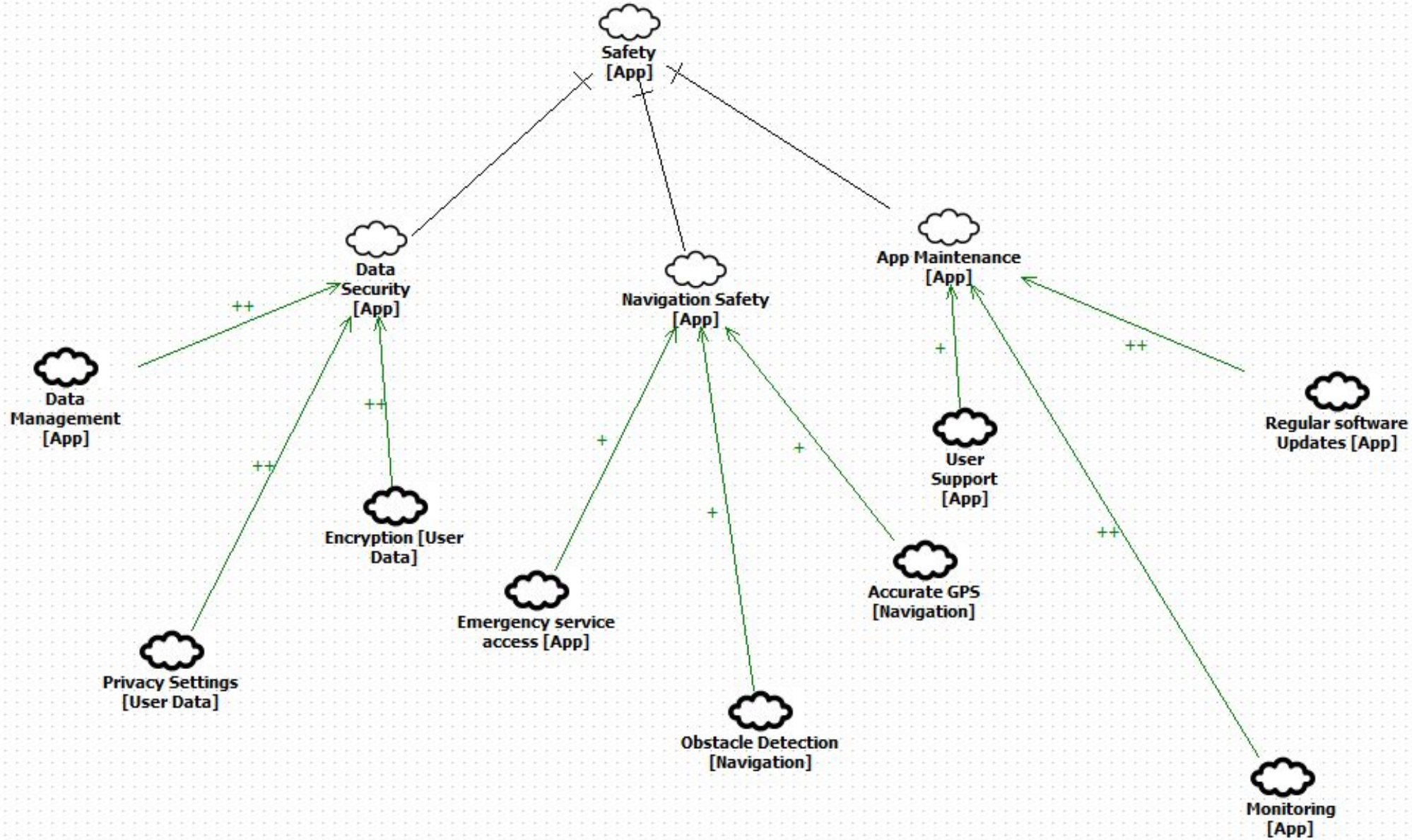

Blind Vision
Log In/Log Out
Account Creation
Edit Account
Save Destination
Emergency Help
Start Navigation
End Navigation
User/Stakeholder
Blind People
Professor
Department of UTD

Use Case

PIG Diagram


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

SIG Diagram


Safety [App]
Data Security [App]
Navigation Safety [App]
App Maintenance [App]
Data Management [App]
Encryption [User Data]
Privacy Settings [User Data]
Emergency service access [App]
Obstacle Detection [Navigation]
Accurate GPS [Navigation]
User Support [App]
Regular software Updates [App]
Monitoring [App]
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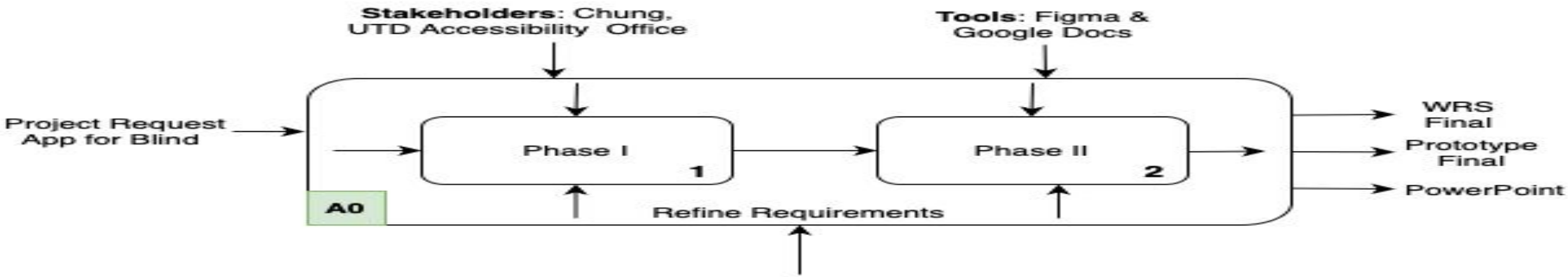
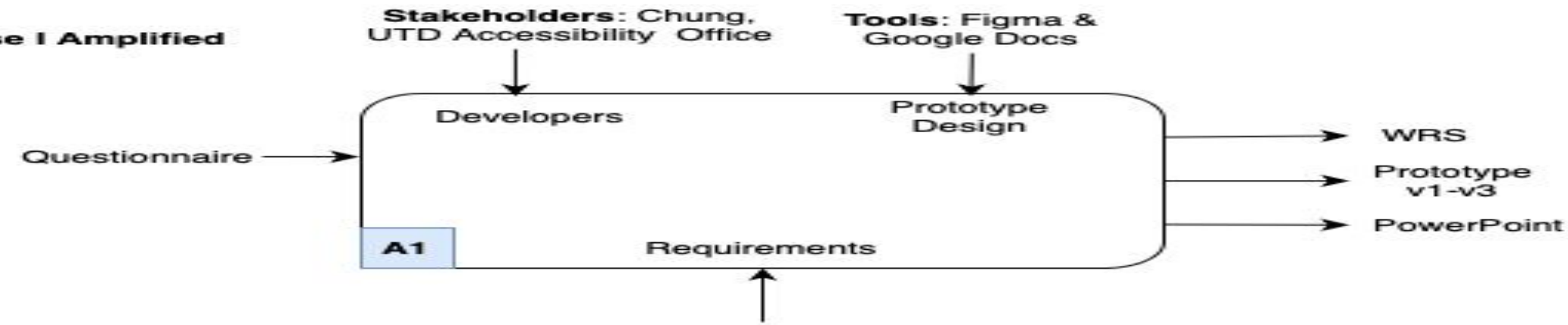
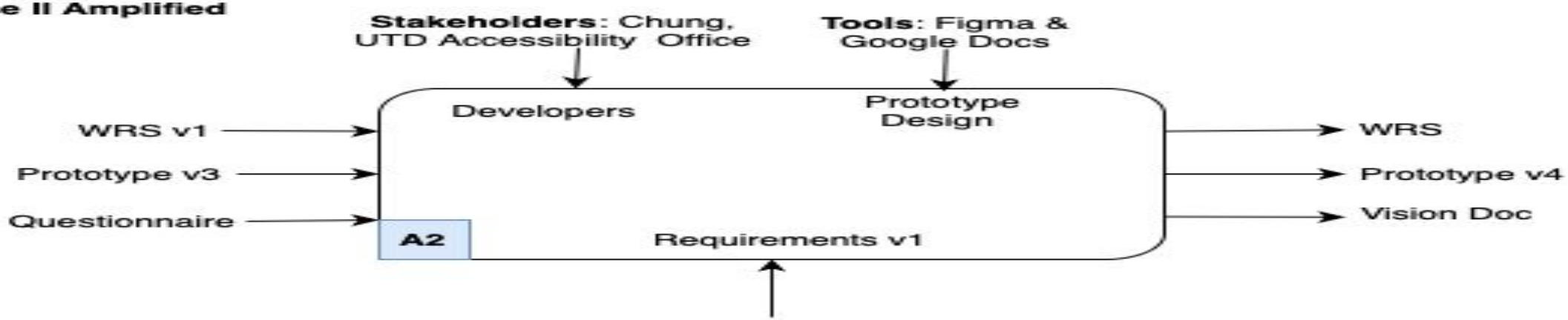
IDEF0 Diagram



Phase I Amplified



Phase II Amplified



Why should you choose us?

Our Blind Vision app stands out due to its use of advanced LIDAR technology for precise navigation and obstacle detection, compatibility with both iOS and Android, and critical safety features like fall detection and emergency contact notifications. These elements ensure it is reliable, accessible, and focused on user safety, setting it apart in the market for assistive technologies.

Why should you choose us? Summary

…solves the problem.

…made very cost effective.

…the system is scalable.

…app is simple and intuitive.

Creeping Rate

We expect to see about 15-30% of requirements change through the course of the project as we get more customer feedback, but we hope to limit the increase in scope. This is due to an increase in scope resulting in less streamlined efficiency and focus.

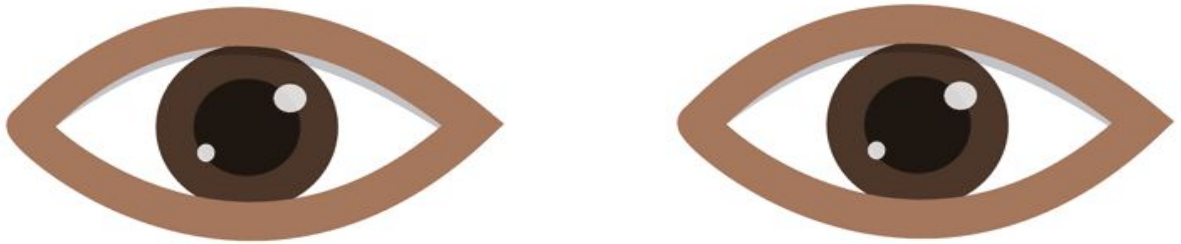
Phase 1				Phase 2			
Functional Req.		Non-Functional Req.		Functional Req.		Non-Functional Req.	
Total	Coverage %	Total	Coverage %	Total	Coverage %	Total	Coverage %
6	50%	4	50%	7	86%	5	80%

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

Questionnaire Targets

- User Satisfaction Insight
- Areas for Improvement
- Feature Validation
- Product Development Roadmap
- Competitive Analysis

Questions?



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