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**Team Auriel**

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**Auriel App  
Vision  
Version 1.5**

Auriel Navigation System	Version: <1.5>
Vision Document	Date: 10/DEC/21

## Revision History

Date	Version	Description	Author
Dec. 1	1.0	Added introduction and positioning	Yinan Guo
Dec. 4	1.1	Added Stakeholders and Users information	Yinan Guo
Dec. 10	1.2	Added Product information	Yinan Guo & Pallavi
Dec. 10	1.3	Added Feature Attributes	Yinan Guo

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# Vision

## 1. Introduction

### 1.1 Purpose

The Vision document provides a high-level executive summary for a blind navigation system Auriel. For software development, for example, a Vision captures the essence of the envisioned solution in the form of high-level requirements and design constraints that provide stakeholders an overview of the system to be developed from a behavioral requirements perspective.

Therefore, a Vision document provides input to the project approval process and is closely related to the Business case. It communicates the project's fundamental "why and what" and is a gauge against which all future decisions should be validated.

### 1.2 Scope

This Vision document applies to the Auriel, a blind navigation application developed by Team Auriel that has four members-David, Pallavi, Akshaya, and Yinan. The system will include two interconnected parts, which will be run concurrently. These parts are Navigation and Voice Recognition. They will wait for commands from the user simultaneously and be triggered if the command taken concerns them. For non-blind people, a user interface will be provided, and all commands regarding these components will be obtained from this interface.

### 1.3 Definitions, Acronyms, and Abbreviations

System: the mobile application and all dependencies, including the APIs it uses, sensors, and devices it is connected to in a building or through the internet.

GUI: Graphical User Interfaces.

Android: Open-source mobile operating system developed by Google

IOS: A mobile operating system developed by Apple

POI: Point of Interest. In gis, a POI can be a house, a scenic spot, a post box, a bus stop, etc.

RSSI: Received Signal Strength Indication.

OS: Operating System

### 1.4 References

TBD

### 1.5 Overview

The first part is the introduction of the Vision document, which introduces the purpose of the Vision document and what the Vision document is. The second section tells the positioning of the Auriel application. Then the third section detailedly introduced the stakeholders and the users that Auriel will face. Product overview is the fourth section that will be talked about in the vision document. After that, the features of the product are presented as specific evidence. From the sixth to tenth section, we are concerned about the details of the product.

## 2. Positioning

### 2.1 Business Opportunity

With the popularity of mobile phones, the development of mobile Internet, and related navigation technologies, navigation through apps has dramatically facilitated our daily travel and has become an essential part of our daily travel. Due to congenital visual defects, blind people cannot perceive and find information about public facilities and apartments around them, let alone further plan the relevant routes. Even if you have been there before, traveling independently to reach appropriate locations is extremely difficult. In addition, the number of guide dogs for the blind is few, and it is difficult to train them to help ordinary people with vision defects. Some other special hardware devices also have the disadvantages of additional hardware purchase, poor effect, and inability to use existing map data to inform people of the surrounding facilities, businesses, and other information. This system will provide blind people an opportunity to travel in daily life through simple operation interface, voice broadcast, mobile APP, and

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other means combined with current information technology.

## 2.2 Problem Statement

The problem of	Walk condition within a building is complicated.
affects	Blind people.
the impact of which is	unable to perceive and find information about public facilities and apartments around them, let alone plan the relevant routes further.
A successful solution would be	blind people traveling daily through simple operation interface, voice broadcast, mobile APP, and other means combined with current information technology.

## 2.3 Product Position Statement

For	Blind people
Who	Feel the need for navigating and walking indoors without any human assistance.
The Auriel	is a software and hardware product.
That	Provide blind people the ability to travel in daily life through simple operation interface, voice broadcast, mobile APP and other means combined with current information technology, and it is cheap.
Unlike	Some special hardware devices have the disadvantages of additional hardware purchase, poor effect, and inability to use existing map data to inform people of the surrounding facilities, businesses, and other information.
Our product	Make full use of WIFI, Bluetooth, and other technical means to achieve accurate indoor positioning. By collecting three-dimensional data of the building and the location data of the relevant POI, the indoor map data is formed.

## 3. Stakeholder and User Descriptions

### 3.1 Market Demographics

Technological navigation systems are a significant cause for the miniaturization of electronics and the enhancement in processing power and sensing capabilities. According to the World Health Organization (WHO), about 285 million people are visually impaired, out of which 39 million people are blind. The WHO report says that this ratio of blind people will increase and double by 2020. Dhod et al. reported that about 7 million people are going blind each year, and this ratio is expected to double by 2030. It is a big underexplored market, and with our technological advantage, we can quickly seize a part of the market share.

### 3.2 Stakeholder Summary

Name	Description	Responsibilities
Customers	A customer is an individual or business that purchases another company's goods or	- Customers determine the main requirements and project scope and sign contracts with the leading project

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	services.	performers. They constantly interact with the team, approve or supplement the plan with new implementation points.
Project manager	A project manager is a professional in the field of project management.	- Project Managers control the entire project creation process, considering the interests and needs of all stakeholders. Their primary interest is creating a solid product on time and within budget, satisfying customers. They lead a development team and supervise the project implementation processes, making necessary adjustments.
Business Analysts	A business analyst (BA) is a person who analyzes and documents the market environment, processes, or systems of businesses.	- A BA team analyzes the customer's ideas, communicates with the development team, and determines project scope and requirements. They make predictions to understand the project budget and time and create project decomposition.
Development Team	A development team is a group of people that work together to create software.	- Developers as stakeholders are responsible for timely software delivery and estimation. Based on their experience and innovation trends, the developers can advise on business idea implementation and quality estimation to understand the scope of work and resources required.  This group includes QA engineers who define bugs to meet specified requirements and prevent failed user scenarios.
Designers	A designer is a person who plans the form or structure of something before it is made by preparing drawings or plans.	- UI&UX designers make the product interface user-friendly and understandable. They understand that a user comes to the site or works with the application to solve a specific problem. Therefore, designers make customers get what they want quickly and easily.
Government	A government is the system or group of people governing an organized community, generally a state.	- The state, represented by the regulatory authorities, can also be a stakeholder. Regulators adopt international standards that influence the development of a software product and impose fines for non-compliance with the rules.

### 3.3 User Summary

Name	Description	Responsibilities	Stakeholder
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People with a vision disorder	A person with blindness has complete or nearly complete vision loss.	<ul style="list-style-type: none"> <li>- Follow the voice prompt and walk carefully</li> <li>- Choose the destination and mode</li> <li>- Answer the phone when 911 or assistant calls</li> </ul>	self
Assistant	An assistant is a person who contributes to the fulfillment of a need or furtherance of an effort or purpose.	<ul style="list-style-type: none"> <li>- Help blind people to set up the maps</li> <li>- Help blind people to set up POI</li> <li>- Set up voice recognition function for blind people</li> <li>- Store their contact information and set up as the emergency contact</li> <li>- Help blind people to set up accounts and password</li> </ul>	Blind people

### 3.4 User Environment

Operating system: Android 7.0+, IOS 9.0+

Network conditions: WIFI and mobile network communication is good

Hardware configuration: Android: 4G RAM, IOS: 2G RAM

### 3.5 Stakeholder Profiles

#### 3.5.1 Blind person

<b>Representative</b>	
<b>Description</b>	The one with complete or nearly complete vision loss.
<b>Type</b>	This is a casual user, possibly with previous use of blind navigation systems
<b>Responsibilities</b>	Follow the voice prompt and walk carefully. Choose the destination and mode. Answer the phone when 911 or an assistant calls.
<b>Success Criteria</b>	Success is defined by the customer that can perfectly realize indoor travel.
<b>Involvement</b>	We will have sample customers to help evaluate our design, and market research results will also guide our vision.
<b>Deliverables</b>	
<b>Comments / Issues</b>	

#### 3.5.2 Assistant for blinds

<b>Representative</b>	
<b>Description</b>	An assistant for blinds is a person who contributes to the fulfillment of helping blind people in their daily life.
<b>Type</b>	This is an advanced user with experience in supporting similar blind navigation



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	systems.
<b>Responsibilities</b>	Help blind people to set up the maps. Help blind people to set up POI. Set up a voice recognition function for blind people. Store their contact information and set them up as emergency contact. Help blind people to set up accounts and passwords.
<b>Success Criteria</b>	The success is completely defined by the ability of the assistant to manage the standard demands while using our system and process emergencies.
<b>Involvement</b>	We will have sample customers to help evaluate our design, and market research results will also guide our vision.
<b>Deliverables</b>	
<b>Comments / Issues</b>	

### 3.6 User Profiles

See previous section.

### 3.7 Key Stakeholder or User Needs

Need	Priority	Concerns	Current Solution	Proposed Solutions
Broadcast messages	High	The sound will be disturbed.	None	Provides speed and tone Settings for the user
Secured access	High	Management of private user information	None	Manage user access with PINs and encryption
Safely navigation	High	There are always some obstacles on the route.	The application will use the obstacle alert system (OAS) via the proximity sensor to detect obstacles.	The application will use the obstacle alert system (OAS) via the proximity sensor to detect obstacles.
Fast navigation	Moderate	It is hard for blinds to decide which route is fastest.	The system will calculate the length and estimated time of the route.	The system will calculate the length and estimated time of the route.
Comfort navigation	Moderate to high	Blinds may feel uncomfortable when traveling with an unfamiliar route.	Users can store locations and routes according to actual needs.	Users can store locations and routes according to actual needs.

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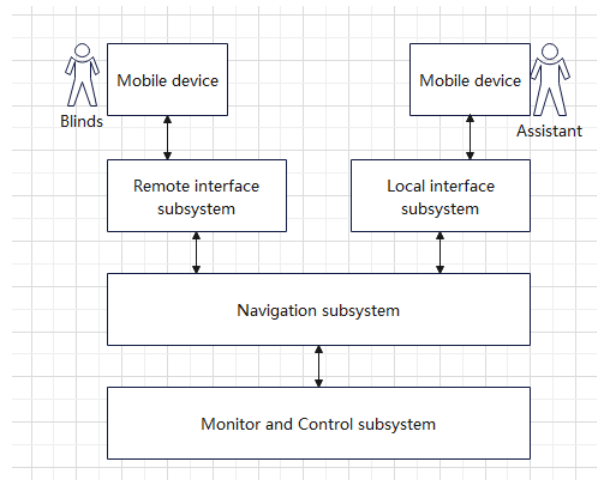
### 3.8 Alternatives and Competition

3.8.1 Be my Eyes

3.8.2 NavCog

## 4. Product Overview

### 4.1 Product Perspective



### 4.2 Summary of Capabilities

**Table 4-1 Customer Support System**

Customer Benefit	Supporting Features
Convenient, flexible access to the system	Auriel supports entire voice operations.
Secured access to the system.	authentication, access control to the system
System responds quickly	
People with blindness can move around indoors freely.	<p>The Angle between the user's current orientation and the floor direction is analyzed in real-time by collecting data from the magnetic field sensor of the mobile phone. If the Angle between the user's orientation and the floor is greater than the specified threshold, an audio broadcast immediately alerts the user of the Angle between the current orientation and the floor.</p> <p>The navigation system offers a proposal if the user chooses a route with fewer people and more elevators. If the user needs to use the stairs and elevator or access the stairs and the elevator, the voice should remind the user to pay attention to safety.</p> <p>Indoor precise positioning is the basis of indoor navigation. Because the satellite</p>

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	signal is interfered with by the building, there is a significant error in using the satellite positioning system for positioning, so the traditional outdoor positioning method is not applicable here. Can make full use of WIFI, Bluetooth, and other technical means to achieve accurate indoor positioning.
When an emergency happens, blind people can contact the assistant or 911 immediately.	The application allows users to contact an assistive person in an emergency quickly. Support users to set emergency contacts. Emergency contacts should support multiple area codes. The default area code is related to the phone system setting region. There is a one-click button to call emergency contacts on the home page

#### 4.3 Assumptions and Dependencies

The HACs is developed using a component-based software engineering approach.

#### 4.4 Cost and Pricing

This product has no cost associated with the development process. All dependencies used were free based on a developing account license. Advertising partnerships may be pursued to generate revenue if the app proves successful.

#### 4.5 Licensing and Installation

This product requires installation through a mobile OS application storefront. The end user's caretaker can do the installation and initial setup. All parties must agree to the terms and agreement provided by the app.

### 5. Product Features

- 5.1 Application Setup Process
- 5.2 Select a destination
- 5.3 Make an emergency gesture
- 5.4 Using voice, tell the next direction to take in the current route
- 5.5 Cancel current route
- 5.6 The following features pertain to functionalities that depend on system sensor values.
- 5.7 Detect current obstacles in the user's path
- 5.8 Make an emergency call if the system detects a fall
- 5.9 Set emergency contact information

### 6. Constraints

Security:

Users should register and log into the system using their mobile phone numbers. In the case of device migration, you

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can use the login account to recover the data. At the same time, it can back up user Settings and save data to the cloud.

A user can register and log in using a mobile phone number plus a verification code. On the APP end, the user only needs to enter the mobile phone number, request the verification code, input the correct verification, and click the login button to complete the login operation. If the background does not have information about the user, the background automatically creates a user.

After a user logs in to the APP and performs related Settings, the Settings are automatically backed up to the back-end service. After the next login, users can restore the previous Settings to the APP.

After the user logs in at the APP end, the storage location and line information will be restored to the local storage system after the next login. At locally-collected locations, line information can be synchronized to back-end services.

Capacity:

Users can adjust the relevant settings on the application to meet the user's needs.

Speech speed setting: provide users with 10-speed setting options from 0 to 9

Volume setting: provide users with ten-volume setting options ranging from 0 to 9

Broadcast distance setting: set the broadcast distance of POI points such as classrooms, offices, bathrooms, lounges, elevators, etc.

Different values are set in the alarm threshold "Settings": 30, 45, 90, 135, and 150. The broadcast type of the Angle is left \ right + Angle.

Usability:

Easy to use (especially safety-related features).

Request for an ambulance, police, or assistant needs to be at the push of a button or voice-activated.

## 7. Quality Ranges

Auriel takes full advantage of technologies such as WIFI and Bluetooth for precise indoor positioning. Requirements are as follows:

- 1) Indoor positioning error should be within 0.5m
- 2) Users can complete positioning by mobile phone without special hardware support.
- 3) Fast positioning within 0.1s.
- 4) Can accurately judge the floor of the user.
- 5) Recognize the obstacles over 5m.

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## 8. Precedence and Priority

Select a destination

Using voice, tell the next direction to take in the current route

Detect current obstacles in the user's path

Make an emergency call if the system detects a fall

Set emergency contact information

Make an emergency gesture

Application Setup Process

Cancel current route

## 9. Other Product Requirements

The application needs to be configured in mobile phone, which contains several essential types of equipment:

Magnetic field sensor

Bluetooth or wifi positioning function

Proximity sensor

Accelerometer

Motion sensor

### 9.1 Applicable Standards

UCC; TCP/IP; Windows; Android; IOS; UI; UL; ISO; CMM; NDS; ECDIS; IEEE 802.11; L2CAP; RFCOMM; SDP; VPS; MQTT-SN; NMEA; DNS; HTTP;

### 9.2 System Requirements

Operating system: Android 7.0+, IOS 9.0+

Network conditions: WIFI and mobile network communication is good

Hardware configuration: Android: 4G RAM, IOS: 2G RAM

### 9.3 Performance Requirements

Indoor positioning error should be within 2m. Users can complete positioning by mobile phone without special hardware support. Fast positioning within 0.1s. Can accurately judge the floor of the user. Can form an accurate three-dimensional model of the building. Have the following POI names, location details: stairs, elevators, toilets, doors, blind lanes, business windows, platforms, boarding gates, airport/waiting room, and shops. When the orientation changes by more than 45 degrees, the voice announces the current user's orientation. The specific broadcast types are as follows: east, southeast, south, southwest, west, northwest, north, the northeast. In the process of the user to the destination, after the appropriate distance, real-time broadcast informs the user of the current distance to the destination.

### 9.4 Environmental Requirements

Temperature: -20°C-60°C

Air Humidity: 0-100%RH

Sound: 50Hz-20KHz

## 10. Documentation Requirements

### 10.1 User Manual

The user manual gives an overview of using the application both for the visually impaired and the assistants. Please read it carefully before using the app for navigation.

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## 10.2 Installation Guides, Configuration, and Read Me File

Installation guides, configuration files, and README files are all present in the Gitlab repository.

## 10.3 Labeling and Packaging

Mockups of the app are present in the WRS document.

## A Feature Attributes

### A.1 Status

Proposed	Make an emergency gesture
Approved	Application Setup Process
Incorporated	Select a destination Using voice, tell the next direction to take in the current route Detect current obstacles in the user's path Make an emergency call if the system detects a fall Set emergency contact information Cancel current route

### A.2 Benefit

Critical	Select a destination Using voice, tell the next direction to take in the current route Detect current obstacles in the user's path Make an emergency call if the system detects a fall Set emergency contact information
Important	Make an emergency gesture
Useful	Cancel current route Application Setup Process

### A.3 Effort

Through the product evaluation and complexity analysis, the team decides to pay more attention and effort on the critical and important functions like voice recognition and broadcast, positioning and obstacle detection.

### A.4 Risk Exceptional

High risk: The project could not be completed on schedule due to time constraints. Lacking test time for the system. The quality does not meet the requirements of users.

Medium risk: Lack of in-depth grasp of software development will lead to poor product performance and quality. In the process of software project development and implementation, the necessary management tools, development tools, testing tools are not in place in time.

Low risk: There are problems in the development of software structure systems, which make the completed software products fail to achieve the predetermined goals of the project. Team members were unable to participate in the

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design due to accidents.

#### **A.5 Target Release**

Version 1.0: voice recognition, voice broadcast and positioning

Version 1.1: navigation system

Version 1.2: route choose function, route collect function

Version 1.3: road deviation warning and path planning

Version 1.4: emergency contact function

Version 1.5: setting function

#### **A.6 Assigned To**

Akshaya: Using voice, tell the next direction to take in the current route

David: Detect current obstacles in the user's path

Pallavi: Make an emergency call if the system detects a fall. Set emergency contact information

Yinan: Select a destination. Cancel current route.

#### **A.7 Reason**

Select a destination: Team project specification line 10.

Using voice, tell the next direction to take in the current route: Team project specification line 11.

Detect current obstacles in the user's path: Team project specification line 16.

Make an emergency call if the system detects a fall: Team project specification line 17.

Set emergency contact information: Team project specification line 19.

Make an emergency gesture: Team project specification line 22.

Application Setup Process: Team project specification line 13.

Cancel current route: Team project specification line 13.