Contents

Software Requirements Specification

1. Introduction

1.1 Purpose of Writing

The purpose of this Software Requirements Specification (SRS) document is to systematically describe the functional requirements and technical specifications of the "FZUGO" campus navigation WeChat Mini Program, ensuring clarity and feasibility in project development. By detailing the project's mission and background, the document clearly defines the goals of the "FZUGO" Mini Program, which is to assist students, faculty, staff, and visitors in effectively locating buildings and planning routes within the campus, thereby enhancing travel convenience on campus.

The primary users of this project include the faculty, staff, and students of Fuzhou University, as well as visitors to the campus. These users need to promptly find important locations and activity sites within the campus while also wishing to gain a better understanding of the campus's infrastructure.

Through the preparation of this document, we aim to provide clear direction and guidance for the development of the "FZUGO" Mini Program, ensuring that the software can fully meet the needs of its intended users.

1.2 Project Background

The name of this software project is the "FZUGO" Campus Navigation WeChat Mini Program. The project was proposed by Rongcheng Xie, a student from the Menus College of Fuzhou University, and it is being developed collaboratively by ten students from the FZUGO team at Fuzhou University. The primary objective is to enhance the efficiency of campus navigation and improve user experience. The main users include students, faculty, staff, and temporary visitors to Fuzhou University.

The "FZUGO" Campus Navigation Mini Program will also establish basic interconnections with other systems on campus. This includes integration with the university's academic management system to assist users in locating classrooms and other facilities; connectivity with the library management system to provide real-time location information and resource feedback; and collaboration with the university's announcement system to promptly convey information about events, road closures, and other relevant updates to users. These interconnections will enhance the practicality of "FZUGO," making it an indispensable navigation tool in campus life. Through these integrations and collaborations, "FZUGO" aims to not only improve user experience but also increase overall operational efficiency within the campus.

1.3 Definition

FZUGO: This is the name of the project, representing the WeChat Mini Program for the "Fuzhou University Campus Navigation System." The name combines "Fuzhou University" and "Go," symbolizing convenient campus travel and aiming to provide navigation and information services within the campus.

Original phrases for foreign acronyms:
GPS - Global Positioning System
API - Application Programming Interface
UI - User Interface
UX - User Experience
Wi-Fi - Wireless Fidelity
SD - Secure Digital
IoT - Internet of Things
AR - Augmented Reality
VR - Virtual Reality

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2. General Description

2.1 Goals

2.1.1 Development Intention

The development intention of the "FZUGO" campus navigation WeChat mini-program is to provide a convenient navigation tool for students, faculty, and visitors at Fuzhou University. This tool aims to help users efficiently locate various buildings and facilities on campus, addressing the navigation challenges posed by the complex layout. Additionally, it offers users a basic understanding of campus information. The software is designed to shorten the time users spend searching for their intended destinations and enhance mobility on campus, enabling newcomers and visitors to become familiar with the campus environment more quickly, thereby improving their overall campus experience.

2.1.2 Application Goals and Scope

The **primary objectives** of the application are as follows:

① **Enhance Navigation Efficiency**: Provide users with accurate real-time positioning and optimal route planning, enabling them to quickly locate classrooms, laboratories, dormitories, cafeterias, and other campus facilities.

② **Offline Functionality**: Ensure access to essential campus maps even in offline environments, allowing users to navigate smoothly under different conditions.

③ **Customization and Accessibility Services**: Support personalized UI settings and offer accessibility navigation options to provide a more user-friendly experience for all users.

④ **Infrastructure Information**: Include textual descriptions of academic buildings, office buildings, and laboratory buildings, along with floor plans showing room distributions to facilitate users in finding specific locations.

The **scope** of "FZUGO" encompasses the entire campus of Fuzhou University, covering all campus-related buildings, facilities, and roads within its service range. The software will integrate campus map information, user positioning technology, path planning algorithms, and more, to provide users with multiple optimal travel route options. It will also update campus dynamic information in real-time, such as road closures and building changes. This will assist students and faculty in better organizing their campus life while enhancing the convenience and safety of their travel.

In terms of background, the development of this software is an innovative project proposed by the management based on user feedback and actual needs. Its aim is to improve the campus navigation experience through information technology, specifically addressing the needs of freshmen and external visitors. Additionally, the project will fully utilize the existing technological infrastructure on campus, including the campus wireless network and computer resources, to ensure the efficient operation of the system.

2.1.3 User scenario

① **Characteristics of End Users:**

The software is designed to be simple and convenient to operate, requiring no advanced educational background. Generally, users only need to be familiar with smartphone operations and have some experience using WeChat Mini Programs to effectively utilize the software.

② **Operators and Maintenance Personnel:**

The primary users will be students and staff from Fuzhou University, who should possess strong skills in computer programming, database management, network security, and system maintenance. They must be capable of effectively addressing technical issues, troubleshooting faults, and regularly updating system data.

③ **Expected Frequency of Use:**

(1) Daily Use: Students and staff may require the navigation function during class transitions, activities, and meal times, with an anticipated daily usage frequency of over 5,000 times.

(2) Special Events: During large campus events (such as orientation, open days, lectures, etc.), the usage frequency among visitors will significantly increase, with short-term usage potentially exceeding 10,000 times per day.

(3) Peak Periods: During major examination seasons and the start of new semesters, the demand from freshmen and their parents will intensify, likely maintaining daily navigation requests in the tens of thousands.

2.1.4 Product Prospects

① **Assumptions:**

(1) Stable User Demand: It is assumed that there will be no significant changes in user demands throughout the development process, and the design and functional requirements will effectively meet the basic needs of the target users.

(2) Technical Feasibility: It is assumed that the technologies employed (such as GPS positioning, Wi-Fi-based positioning, and map data processing) are feasible and can achieve the expected functionalities within the campus environment.

(3) Data Availability: It is assumed that the university can provide accurate campus map data and information on various buildings to facilitate precise display of various positioning and navigation functions in the software.

(4) User Base: It is assumed that all anticipated users (students, staff, and visitors) are capable of using smartphones and are familiar with the basic operations of WeChat Mini Programs.

(5) Team Skills: It is assumed that the project development team possesses the necessary skills and experience in software development, user interface design, and database management.

② **Constraints:**

(1) Budget Limitations: The development budget for the project must remain within the range approved by the university's IT department, as insufficient funds will limit the expansion of software functionalities and subsequent maintenance support.

(2) Development Timeline: The software development cycle must be controlled within one academic semester (approximately 2-3 months) to ensure completion before the start of the next semester.

(3) Technical Platform Limitations: Since the target users will be using WeChat Mini Programs, the development team must adhere to the technical specifications and limitations of the WeChat development platform to ensure software compatibility and stability.

(4) Data Privacy and Security: When handling user data and location information, it is imperative to comply with relevant privacy protection policies and legal regulations to ensure the security and privacy of user data.

(5) System Compatibility: The software must be compatible with most mainstream smartphone operating systems (such as iOS and Android) and support various phone models to enhance user coverage.

(6) Future Maintenance and Support: Project development must consider future maintenance and support, ensuring timely responses to user feedback and issue resolution after the software is launched.

3. Specific Requirements

3.1 Class Diagram

3.2 Properties

3.2.1 Functional Specifications

① IPO Table

No.	Input	Processing	Output
1	User Location (GPS, Wi-Fi Signal)	Obtain the user's current location through positioning technologies (e.g., GPS, Wi-Fi, Bluetooth)	The user's current real-time location
2	Destination (e.g., classroom, cafeteria)	Calculate the best route from the user's current location to the destination	Optimal walking (or biking) route and estimated arrival time
3	User Query (e.g., “Library”)	Search the campus map database for the location information of the queried place	Location of the library and navigation guidance
4	User Feedback (e.g., errors or suggestions)	Collect user feedback and classify it for processing	Confirmation that feedback has been collected and a response to the user (e.g., acknowledgment message)
5	Campus Dynamic Information (e.g., events, closures)	Retrieve real-time information from the school's announcement system	Latest campus updates and notifications
6	Selected User Activities	Retrieve information related to activities from the database and arrange competitions	Detailed information about the activities and relevant navigation
7	User Login Information	Verify the user's login credentials	Login success/failure message and user personal information
8	Device Information	Identify the user's device and operating system to optimize program compatibility	Usage recommendations tailored for the device
9	Building Information	Retrieve textual information and floor plans from the database	Usage recommendations tailored for the device

② Supported Terminal Count and Concurrent User Operations:

(1) Supported Terminal Count: The software will support mainstream smartphone operating systems, including iOS and Android. Theoretically, it can support hundreds of thousands of user terminals; however, for practical use, it is recommended to limit the number of simultaneous online users on the server to ensure smooth operation.

(2) Concurrent User Operations: The system should support at least 15,000 users online simultaneously to ensure that user experience is not affected during peak times (such as class hours or event times). The server must have sufficient load capacity to handle high concurrent access scenarios.

3.2.2 Performance Requirements

Section	Performance Requirement	Details	Design/Explanation
3.2.2.1 Accuracy			
Input Data Accuracy Requirements **①User Location Data**	GPS Accuracy ⩽ 5 meters	The GPS accuracy must be within 5 meters in open areas to ensure accurate location retrieval.	Applicable for outdoor navigation, ensuring high accuracy of GPS data for precise user location tracking.
	Wi-Fi Accuracy 3-10 meters	Wi-Fi accuracy is required to be between 3-10 meters indoors, especially in densely built areas such as campuses.	Wi-Fi positioning plays a crucial role in indoor navigation, ensuring better location accuracy in dense building areas.
	Bluetooth Accuracy 1-3 meters (if applicable)	Bluetooth accuracy between 1-3 meters is needed for specific areas (e.g., libraries or event venues) to achieve precise indoor navigation.	Bluetooth provides fine-grained indoor positioning, especially in specific areas like libraries or event venues.
②Query Data	Campus buildings and facilities location accuracy ⩽1 meter	The location information of campus buildings and facilities should have an error margin within 1 m.	Ensures users can find accurate locations of building entrances and facilities when searching.
	Campus dynamic information updated daily	Campus announcements and dynamic information must be updated daily to ensure users receive the latest information.	Ensures timely updates of campus activities and other information to improve information accuracy and timeliness.
Output Data Accuracy **①Route Planning**	Route Planning Accuracy ⩽ 5 meters	The route planning accuracy should focus on actual traversable paths, with an error margin of ⩽ 5 meters.	Ensures users can smoothly follow the planned route, avoiding navigational errors.
	Estimated Arrival Time Accuracy ± 2 minutes	The estimated arrival time calculation must consider the user’s mode of travel (walking, biking, etc.) with an accuracy of ±2 minutes.	Enhances user trust in time management by providing reliable time estimates based on their mode of travel.

②User Feedback Processing Accuracy	User feedback data must be effectively validated	The system must validate user inputs to ensure accuracy, avoiding issues caused by input errors.	Provides clear interface prompts during the feedback process to ensure accurate input and prevent user errors.
Data Transmission Accuracy	Data transmission delay ⩽ 200 ms	Data transmission delays must be controlled within 200 ms to ensure smooth user experience.	Ensures smooth user-system interaction, preventing user experience degradation due to delays.
	Data integrity	Data packets should be validated during transmission to ensure accuracy and prevent data loss, duplication, or errors.	Ensures security and integrity of data, preventing tampering during transmission.
3.2.2.2 Temporal Characteristics Requirements			
Response Time ⩽ 200 ms	Response Time for complex requests ⩽ 500 milliseconds	For complex requests (e.g., querying multiple routes), response time can be extended but should not exceed 500 ms.	Ensures fast response times to improve user experience while allowing for more processing time on complex queries.
Update Processing Time ⩽ 5 minutes	Campus map and user feedback data processing time ⩽ 5 minutes	The dynamic information for campus activities and feedback must be updated in real-time to ensure accuracy.	Ensures campus dynamic information is processed within 5 minutes so users always have access to the latest data.
Data Conversion and Transmission Time	Data transmission ⩽ 100 ms, conversion ⩽ 50 ms	Data transmission should be within 100 ms, and data conversion (e.g., converting GPS signals to location coordinates) should be ⩽ 50 ms.	Ensures quick data processing, reducing the impact of long data transmission and conversion, especially during peak usage periods.
Solution Time	Route planning solution time ⩽ 300 ms (complex routes ⩽ 500 ms)	The solution time for calculating navigation routes and optimal paths must be ⩽ 300 ms, with up to 500 ms for complex routes.	Ensures efficient route planning, even for complex routes that take into account traffic conditions and user preferences.
3.2.2.3 Flexibility			
Changes in Operating Methods	Supports multiple input methods	The software must support various interaction methods, including touch, voice commands, gesture operations, etc.	Modular design enables easy integration and upgrade of different input methods, allowing users to customize the interface based on their preferences.

Changes in Operating Environment	Stable operation across different hardware and OS environments	The software should run stably on different versions of iOS and Android operating systems.	Uses cross-platform development frameworks to ensure compatibility and extendability across different systems.
Changes in Interfaces with Other Software	Flexible adaptation to changes in external system interfaces	The system must adapt to interface changes with other systems, such as school announcements, online courses, and library management systems.	API-driven design ensures seamless data exchange and future interface updates/extensions.
Changes in Accuracy and Timeliness	Automatically adjusts based on changing accuracy and timeliness requirements	The system should optimize algorithms during peak times or based on user needs to improve response speed and accuracy.	Implements the Strategy Pattern to dynamically select algorithms for varying accuracy and timeliness requirements without modifying core system logic.
Changes or Improvements in Planning	Supports rapid iteration and updates to adapt to policy and user feedback	The software must support quick iteration and modification of functions to adapt to changes in school policies, user feedback, and technological advancements.	Uses agile development processes and CI/CD for rapid feature development, testing, and deployment, ensuring flexibility in responding to changing requirements.

3.3 Input and Output Requirements

Input Data Types	**User Location Data**	**Media:** GPS, Wi-Fi signals, Bluetooth, etc.
		Format: Typically in latitude and longitude format
		Value Range: Latitude range is -90 to 90, Longitude range is -180 to 180.
		Accuracy: GPS accuracy should be within 5 meters, and Wi-Fi location accuracy should be between 3 to 10 meters.
	Query Data	**Media:** User input via text, either through a keyboard or voice input.
		Format: String format (e.g., "Library," "Lecture Hall").
		Value Range: Not applicable.
		Accuracy: User input text should be validated and corrected, supporting fuzzy search (e.g., entering "cafeteria" should bring up relevant facilities).
	User Feedback Data	**Media:** Text input or selection options.
		Format: String (e.g., "Error Feedback"), or enumerated types (e.g., "Suggestion," "Complaint").
		Value Range: Not applicable.
		Accuracy: Text input should undergo basic validation for authenticity and accuracy.
		Media: Text and screen display.

Output Data Types	**User Location Data**	**Format:** String format
		Value Range: Not applicable.
		Accuracy: The accuracy of the location feedback should match the input location data processing accuracy.
	Route Planning	**Media:** Displayed maps and route animations.
		Format: JSON/Geolocation format, including path nodes, distance, etc.
		Value Range: Distance is typically expressed in meters.
		Accuracy: Route planning accuracy should be within 5 meters.
Control Outputs and Report Types	**Hard Copy Reports**	**Normal Output:** Print user route planning, current location, etc. **Example:** A simple text report including the user's current location, destination, and estimated time of arrival.
		Status Output: Include system status and user location, providing real-time feedback. **Example:** A status report may include "System is operating normally, current user is near the 'Library'," and can be formatted as a table.
		Error Output: Any error that occurs during the process should clearly indicate the cause of the error and may suggest a solution. **Example:** A report might state "Location retrieval failed," and suggest the user try resetting their location.
	Graphical or Display Reports	**Type:** Route planning presented as a map view, showing the starting point, destination, and path, along with real-time position markers.
		Description: Users can see a dynamic map on the screen, with markers indicating the starting point, waypoints, and destination, with animated routes displaying the recommended walking path.
		Information Display: Interactive graphical interface including markers for unselected buildings and points of interest. **Example:** Map pins that users can click to view detailed guidance information, along with the ability for users to adjust the map view.

3.4 Data Management Capability Requirements

Number of Files and Records to be Managed	**User Information Table**	**Number of records:** An estimated 10,000 user records (considering the number of students and staff on campus, along with future user growth).
		Number of fields: Approximately 10 fields, including User ID, Name, Gender, Student ID, Contact Information, etc.
	Location Data Table	**Number of records:** An estimated 5,000 location records (including buildings, points of interest, facilities, etc.).
		Number of fields: Approximately 6 fields, including Location ID, Name, Coordinates (Latitude and Longitude), Type (e.g., Lecture Hall, Cafeteria), etc.
	Route Planning Records Table	**Number of records:** An estimated 10,000 route planning records.
		Number of fields: Approximately 8 fields, including Record ID, User ID, Start Point, End Point, Path, Distance, Estimated Time,

		etc.
	Dynamic Information Table	**Number of records:** An estimated 2,000 dynamic information records (such as announcements, event information, etc.).
		Number of fields: Approximately 5 fields, including Information ID, Title, Content, Release Time, Expiration Time, etc.
	User Feedback Table	**Number of records:** An estimated 5,000 feedback records.
		Number of fields: Approximately 6 fields, including Feedback ID, User ID, Feedback Type, Content, Status, etc.
Table and File Size Estimation	**User Information Table**	**Each record size:** Approximately 200 bytes (including string lengths and field overhead).
		Total size: 10,000 records × 200 bytes = 2,000,000 bytes (approximately 2 MB).
	Location Data Table	**Each record size:** Approximately 100 bytes.
		Total size: 5,000 records × 100 bytes = 500,000 bytes (approximately 500 KB).
	Route Planning Records Table	**Each record size:** Approximately 250 bytes.
		Total size: 10,000 records × 250 bytes = 2,500,000 bytes (approximately 2.5 MB).
	Dynamic Information Table	**Each record size:** Approximately 150 bytes.
		Total size: 2,000 records × 150 bytes = 300,000 bytes (approximately 300 KB).
	User Feedback Table	**Each record size:** Approximately 150 bytes.
		Total size: 5,000 records × 150 bytes = 750,000 bytes (approximately 750 KB).

Projected Growth and Storage Requirement Projected Growth Calculations (over a 3-year period)	**User Information Table:** Expected growth of 20% per year.	**In 3 years:** 10,000 × (1.2^3) ≈ 17,280 records.
		Estimated size: Approximately 3.5 MB.
	Location Data Table: Expected to remain stable.	**In 3 years:** 5,000 records, approximately 500 KB.
	Route Planning Records Table: Expected growth of 50% per year (due to user activity).	**In 3 years:** 10,000 × (1.5^3) ≈ 33,750 records.
		Estimated size: Approximately 8.5 MB.
	Dynamic Information Table: Expected growth of 25% per year (due to increased campus activities).	**In 3 years:** 2,000 × (1.25^3) ≈ 2,440 records.
		Estimated size: Approximately 400 KB.
	User Feedback Table: Expected growth of 30% per year (due to increased feedback).	**In 3 years:** 5,000 × (1.3^3) ≈ 7,315 records.
		Estimated size: Approximately 1.1 MB.

3.5 Fault handling requirements

3.5.1 Software Failures

Software Failures	**Program Crash**	Consequences	Users are unable to use the program properly, resulting in a decline in user experience. If data is not saved, it may lead to the loss of user information.
		Failure Handling Requirements	Implement exception handling mechanisms and log crash events.
			Provide user-friendly error messages and guide users to restart the program.
			Optimize the code to prevent potential crashes.
	Data Corruption	Consequences	Important data (such as user feedback, location data, etc.) may be lost or become unusable, affecting system availability.
		Failure Handling Requirements	Regularly perform data backups to ensure data integrity and security.
			Introduce data validation mechanisms to automatically detect and repair corrupted data.
			Establish a detailed error handling and recovery plan to address data corruption scenarios.
	Database Connection Failure	Consequences	Unable to access or retrieve important information such as user data or route planning, causing key application functionalities to fail.
		Failure Handling Requirements	Implement retry mechanisms and connection pooling to automatically restore the connection.
			Provide clear error messages informing users that certain functions are temporarily unavailable.
			Monitor the database connection status and issue timely alerts for resolution.
	API Interface Failure	Consequences	Data exchange with third-party systems (such as map services or user feedback systems) is affected, resulting in functional failures.
		Failure Handling Requirements	Monitor API availability with automated testing and health checks.
			Provide fallback solutions or use cached data to reduce reliance on the API.
			Maintain robust error handling mechanisms and provide feedback to users.

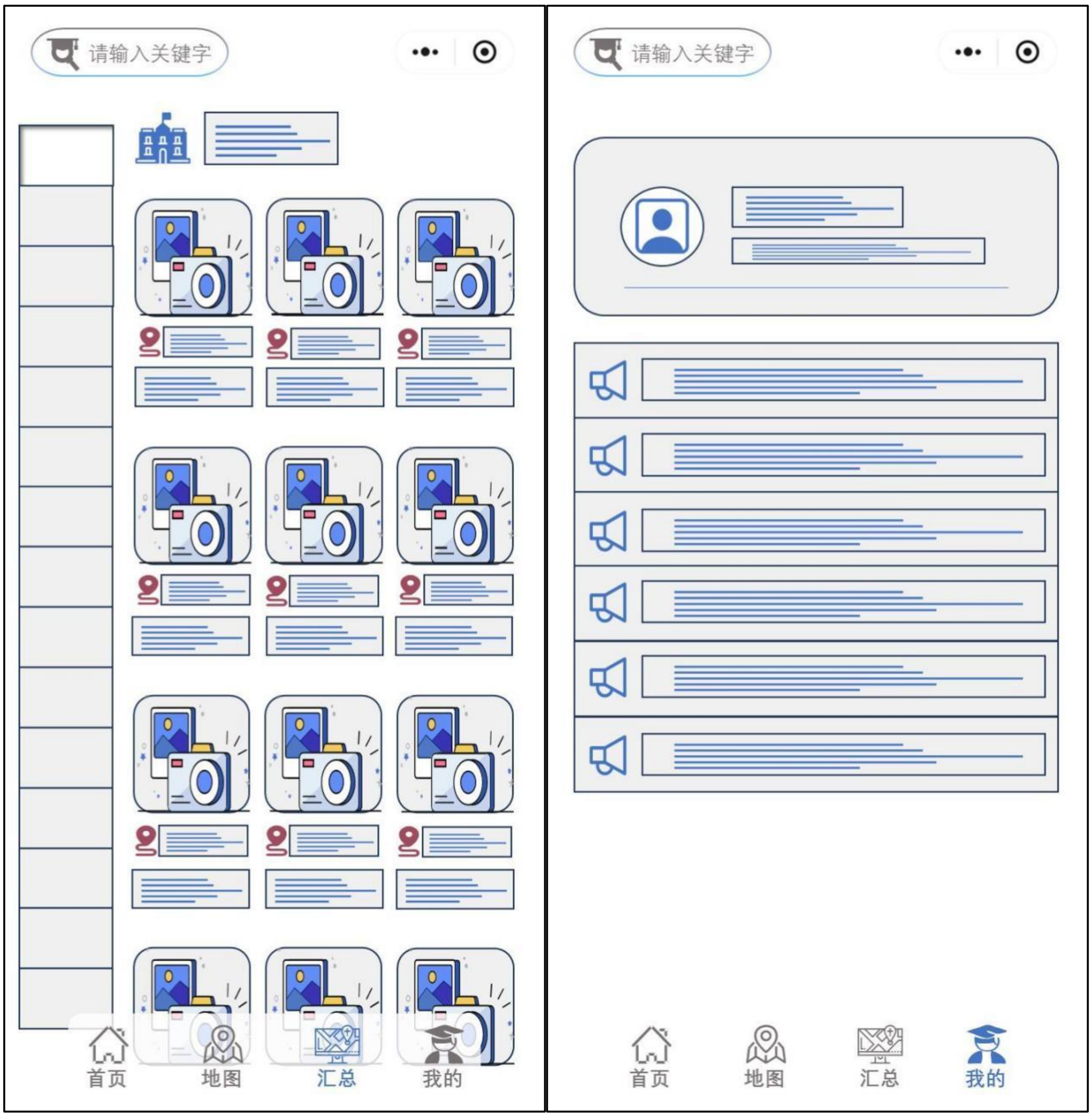
3.5.2 Hardware Failures

Hardware Failures	**Server Downtime**	Consequences	The application becomes unavailable, preventing users from accessing the system and causing a widespread impact.
		Failure Handling Requirements	Implement redundancy solutions (such as regular backups and load balancers) to quickly switch to backup servers.
			Configure monitoring systems to detect server status and send alerts promptly.
			Develop a server recovery plan to ensure swift and effective restoration of services.
	Network Failure	Consequences	Affects data transmission speed and user experience, potentially causing delays or unresponsiveness in the application.
		Failure Handling Requirements	Monitor the network connection status and promptly issue alerts for repair.
			Implement data packet retry and persistence strategies to reduce the risk of data loss caused by network issues.
			Provide user-friendly notifications to inform users of network problems and their potential impact.
	User Device Failure	Consequences	Users may be unable to use the application properly (e.g., due to phone malfunctions or insufficient memory), leading to incomplete data saving or crashes.
		Failure Handling Requirements	Provide clear device requirements and compatibility guidelines to help users maintain their devices.
			Display user-friendly prompts when issues arise, advising users to restart their device or clear memory.
			Implement memory management and resource optimization within the application to reduce hardware dependency.
	Sensor Failure	Consequences	A sensor malfunction (such as a GPS module failure) may affect location accuracy, directly impacting the effectiveness of navigation services.
			Offer alternative location methods (such as Wi-Fi or

		Failure Handling Requirements	Bluetooth positioning) for fault tolerance.
			Monitor sensor status and provide timely feedback on related failures.
			Provide user guidance to help them manually locate positions in case of location service failures.

4. Interface Prototype

For the user prototype, we have currently designed the initial version and will continuously improve it in the progress of subsequent projects.



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5. Function description and acceptance verification standards

5.1 Detailed function description

User Positioning	**Real-time Positioning:** Users can view their real-time location on the campus map. The system provides accurate positioning using various technologies such as GPS, Wi-Fi, and Bluetooth.
	Floor Recognition: The system can automatically detect the user's current floor and switch to the corresponding map, helping users find specific locations.
	Offline Mode: Users can use the cached map data for navigation when there is no internet connection, ensuring usability in areas with poor signal.
Route Planning	**Optimal Route Navigation:** The system calculates multiple optimal walking routes (e.g., fastest, shortest) based on the user's start and end points.
	Destination Search: Users can enter building names or keywords in the search bar, and the system will provide navigation routes to the related buildings.
	Navigation Prompts: Voice and text prompts guide users to their destination, including directions, distance, and information about surrounding landmarks.
	Accessible Routes: Special accessible routes (including elevators, ramps, etc.) are provided for users with mobility difficulties.
Map Management	**Multifunctional Map Display:** The map shows building names, surrounding environment, roads, and landmarks. Users can freely zoom in and out.
	Indoor Navigation: Indoor navigation is provided within complex buildings (e.g., lecture halls, laboratories) to help users quickly find specific rooms.
	Real-time Updates: The system regularly updates the campus map to ensure accuracy and reflect changes in buildings and facilities.
User Interface	**Clear and Simple Interface:** The design is intuitive, allowing quick usage and reducing the learning curve for users.
	Customizable Themes: Users can choose different themes and modes (e.g., day and night) to enhance their personalized experience.
	Bookmark Function: Users can add bookmarks for frequently visited locations, making it easier to navigate there next time.
Data Security and Privacy	**User Data Protection:** The system strictly follows privacy policies, encrypting user location data to prevent leakage.
	Location Sharing: Users can choose whether to share their real-time location with specific friends or teams.

5.2 Input and output format

Input Formats	Users input the start and end points (with the option to select the current location) for navigation requests.
	Keyword searches for specific buildings or facilities (e.g., “Library,” “Cafeteria”).
	Users configure personalized settings (e.g., interface themes, adding bookmarks).
Output Formats	**Map Interface:** Displays the user’s current location and destination, with routes highlighted in different colors.
	Route Information: Text and voice-based navigation instructions, including directions, distance, and estimated arrival time.
	Search Results: A list of matched buildings and facilities, with clickable options to display the navigation route.

5.3 Interface Acceptance Criteria

① **User-friendliness:** The user interface should be intuitive and easy to use, with no more than three steps to access any function, allowing users to quickly find the desired feature.
② **Response Time:** Interface operation response time should not exceed 2 seconds, ensuring a smooth experience.
③ **Visual Clarity:** All text must be highly readable, icon designs should align with common usage habits, and the display should be consistent across different devices.

5.4 Functional Acceptance Criteria

① **Positioning Accuracy:** GPS accuracy should be within 5 meters in different environments, and Wi-Fi or Bluetooth-assisted positioning should have an accuracy within 3 meters.
② **Route Planning Accuracy:** The planned routes should be tested, and 95% of users should be able to reach their destination within the specified time.
③ **Accessible Routes:** All accessible routes must be physically tested to ensure they are suitable for users with mobility challenges.
④ **Offline Functionality:** In areas with no network access, users should still be able to smoothly use cached maps, covering over 95% of the campus area.
⑤ **User Feedback:** Through user experience testing, over 90% of users should report satisfaction or high satisfaction, indicating a smooth interface and functional experience.