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Research on the Design Scheme of "Boundless Vision" Social App for Visually Impaired People

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Abstract: The "Boundless Vision" project focuses on creating novel user interfaces to improve the experience of visually impaired individuals when using smart devices. By incorporating features such as high-contrast color schemes, enlarged text, and voice control, an intuitive and accessible interface is developed. Moreover, the project leverages online volunteer services to offer telephone and video guidance, aiding visually impaired users in navigating urban environments and accessing information. Through a comprehensive process involving needs assessment, UI design, system development, and service evaluation, the project aims to boost the independence of visually impaired individuals and foster greater societal awareness of visual impairment challenges. Ultimately, the project will deliver a suite of user interface designs that can serve as a model for advancing inclusive technology across society.

Keywords: Visually impaired people; UI design; User interface; Navigation service; Volunteer platform

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1. Introduction

With the rapid development of technology, smart devices have gradually become indispensable in modern life. However, traditional interfaces often fail to meet the needs of visually impaired people. Many assistive tools on the market are still complex and lack clear feedback, causing difficulties for visually impaired users. This limits their social participation and autonomy. Therefore, developing suitable interfaces is crucial for improving their quality of life.

The project aims to provide convenient and efficient smart device experiences for visually impaired individuals through innovative UI design and an online volunteer service platform [1]. It focuses on understanding their needs, optimizing interface design with multi-sensory feedback, and offering navigation services to enhance independence and self-confidence. The platform also utilizes social resources to ensure high-quality volunteer services, promoting inclusiveness and fairness in the digital age.

2. Requirement analysis and user research

2.1. Investigation on the needs of visually impaired individuals

Visually impaired people face many challenges when using smart devices. A demand survey found that their main needs are simplifying operations, enhancing interface readability, and adding voice interaction [1]. Existing interfaces are often too complex, with small fonts and insufficient contrast, making them hard to use and read. Traditional touchscreen operations lack tactile feedback, making it difficult to locate and operate interface elements accurately [1]. They rely more on voice recognition, but existing systems often have low recognition rates and slow responses.

2.2. Major challenges faced by visually impaired individuals when using smart devices

2.2.1. Issues concerning interface design

When visually impaired people use smart devices, interface design issues are particularly prominent. Traditional interfaces often have small fonts and low contrast, making it hard for users to distinguish content [2]. Button and icon designs lack operability optimization, with insufficient voice prompts or tactile feedback, leading to confusion. Existing UI designs do not fully consider the cognitive characteristics and habits of visually impaired users, resulting in complex menus and cumbersome operations. To solve these problems, designers need to use high-contrast colors, large fonts, voice control, and simple layouts.

2.2.2. Challenges of navigation services

For visually impaired individuals, navigation services are crucial for enhancing independence and security [2]. Existing services face challenges in real-time accuracy and detailed guidance. Voice navigation often fails to update promptly or provide sufficient road information in complex urban environments. Navigation is usually limited to single feedback modes, which may not meet diverse needs in different settings [2]. For example, video navigation can be more effective indoors by providing spatial details. Current systems lack features like dynamic obstacle alerts and facility guidance. Diversified navigation services need optimization based on user habits and feedback to improve safety and convenience.

2.2.3. The core issues reflected by users' feedback

Based on feedback from visually impaired users, core issues lie in device operability, service real-time nature, and personalized user experience. Many users report that existing devices lack simplicity, with complex interfaces and inaccurate voice recognition leading to frequent misoperations. Voice navigation provides some assistance but often lacks timely feedback, especially in noisy environments where voice commands are hard to recognize. Personalized settings are insufficient, as different users have varying needs such as adjusting voice speed, volume, font size, or contrast. Collecting this feedback provides valuable references for future design improvements.

3. Analysis of characteristics and demands of visually impaired individuals

3.1. Physiological characteristics

The physiological characteristics of visually impaired individuals are mainly reflected in the absence or limitation of visual perception, which leads to the inability to obtain visual information normally. The degree of visual impairment varies, ranging from complete blindness, low vision or visual field loss. Completely blind individuals cannot perceive light or images, while those with low vision can only partially perceive light but cannot clearly

identify objects. Individuals with visual field loss can only see a local area. Visually impaired individuals rely on hearing, touch, and smell to make up for the deficiency in vision and are particularly sensitive to sounds and identify object features through touch. When designing interfaces for visually impaired users, services that are in line with their perception methods, such as large fonts, high-contrast color schemes, and voice prompts, should be provided.

3.2. Psychological Characteristics

The psychological characteristics of visually impaired individuals are closely related to their life experiences and environmental adaptability. They have strong auditory, tactile, and spatial perception abilities, allowing unique environmental perception. They exhibit high independence and self-management awareness, forming suitable life patterns and coping strategies. They often have strong resilience but may also experience depression or anxiety. Technological products should consider their emotional needs, providing functions that enhance self-confidence and reduce anxiety.

3.3. Behavioral Characteristics

The behavioral characteristics of visually impaired individuals reflect their adaptive habits. They rely on other senses for strong environmental perception and spatial orientation, using hearing to judge object positions. When using devices, they prefer voice input and auditory feedback over visual displays. In daily activities, they adopt a cautious gait and rely heavily on tactile perception for object information. Designing intelligent products should focus on optimizing tactile feedback and simplifying operations to reduce errors.

4. UI design and function development

4.1. Principles and concepts of UI design

For UI design targeting visually impaired individuals, the first principle is simplicity and intuitiveness [3]. The interface should avoid complex elements and information overload, allowing quick understanding and operation. High contrast and large fonts are essential to ensure clear perception of content. Accessibility and operability must be considered, ensuring smooth interaction through voice recognition or touchscreen operations. Voice and tactile feedback enhance user-friendliness, helping users confirm operations or obtain information. Design should be optimized based on user feedback to better meet actual needs.

4.2. Design process

The design process is crucial for effective UI design [4]. It starts with analyzing requirements to understand the needs and habits of visually impaired users through surveys and interviews. Based on this analysis, designers establish UI principles like simplicity, color contrast, font size, and voice interaction. Next, they create prototypes and collect user feedback for adjustments. Finally, designers work with developers to implement and refine the design based on feedback, ensuring the final product meets user needs. The process emphasizes user participation and multiple iterations to maximize user experience.

4.3. Interface design and user experience

In the interface design of this project, we focused on ensuring accurate and timely information transmission for visually impaired users. We adopted a high-contrast color scheme and large fonts to enhance visibility.

Buttons and function items have voice description functions, providing clear feedback after the user clicks. Tactile feedback, such as vibration prompts, helps confirm operation completion. The design emphasizes user-centeredness, simplicity, and efficiency, ensuring a pleasant and smooth user experience through repeated testing and optimization.

4.4. Design and development of navigation system

In this project, the navigation system aims to provide precise and real-time route guidance for visually impaired individuals [4]. It integrates telephone and video navigation: telephone navigation uses voice commands for clear location and path guidance, while video navigation combines real-time images and environment recognition for intuitive guidance in complex environments [5]. The system employs AI for accurate path planning and dynamic route adjustments. It supports personalized settings like voice speed, volume, and language type [6]. Enhanced voice recognition ensures timely and clear feedback, improving travel convenience and independence for visually impaired users.

4.5. Design case presentation

As shown in **Figure 1**, this design interface adopts a style that is highly concise and has a high contrast ratio. The high-contrast approach enables visually impaired people to perceive color differences more easily and perform simple operations.

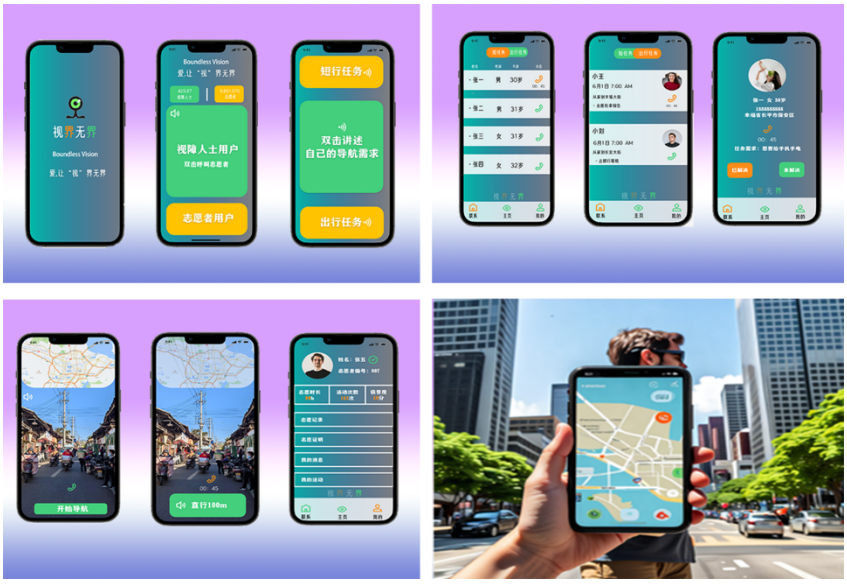

Figure 1. The “Boundless Vision” Social App UI Design

5. Service testing and optimization

5.1. User testing and feedback collection

During the project development process, user testing is crucial to ensure service feasibility and determine optimization directions. Visually impaired individuals conducted functional tests, providing feedback on UI interface and navigation system accuracy and usability [6]. Users encountered issues with voice recognition accuracy, navigation clarity, and interface layout [7]. Feedback was collected through interviews, phone follow-

ups, and online surveys. Regular user discussions and experience activities provide valuable data for design adjustments.

5.2. Service optimization and adjustment

Based on user feedback, we have made multiple optimizations to the service. We optimized the voice input module and adopted advanced voice recognition technology to improve accuracy and efficiency. We added real-time location updates and optimized voice navigation to ensure smoother guidance in complex environments. Interface design was simplified, improving button layout, font size, and contrast for better readability and convenience. A regular update and maintenance mechanism was added to continuously optimize the system.

6. Summary

Through user testing and feedback, we have successfully created a UI design and navigation system for visually impaired people. Continuous feedback collection and real-time optimization ensure the design's rationality and convenience. We will maintain user interaction and continuously improve the product. This project enhances autonomous mobility for the visually impaired and provides new solutions for visual impairment assistance. We expect this service to be promoted to more cities, promoting accessible environment construction and inclusive social development.

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