

Research on Mobile Application Interface Design Strategy under the Background of Aging Society

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Abstract: With the acceleration of the global aging trend, the proportion of elderly people is increasing year by year, and their demand for mobile applications is also growing day by day. However, existing mobile application interface designs are often based on young user groups, ignoring the physiological, psychological, and behavioral characteristics of elderly users, resulting in many inconveniences for elderly users when using mobile applications. By analyzing the characteristics of an aging society and targeting the elderly user group, interface design elements are analyzed. Design strategies for simple and intuitive application interfaces, speech recognition technology application, and enhanced text recognition are proposed, and specific implementation methods are provided. The implementation of these strategies will help improve the user experience of elderly users and promote their integration into the digital society. To explore effective strategies for mobile application interface design in the context of an aging society, in order to improve the user experience of elderly users and promote their integration into the digital society.

Keywords: An aging Society, Mobile Applications, Interface Design

1. Introduction

With the advancement of technology and the popularity of smart phones, mobile applications have become an indispensable part of People's Daily life. However, in the context of an aging society, the use experience of the elderly user group is facing many challenges. Due to the decline in sensory functions such as vision and hearing, as well as the decrease in technology acceptance and operation speed, elderly users often feel confused and inconvenienced when using mobile apps. Therefore, the design of mobile application interface that meets the needs of elderly users has become an urgent problem to be solved.

2. Overview of Aging Society

An aging society refers to a country or region where the proportion of the elderly population (usually 60 years old and above or 65 years old and above) in the total population exceeds a certain value, resulting in significant changes in the social demographic structure. Internationally, it is generally believed that when the population of a country or region over the age of 60 accounts for 10% of the total population, or the population of older people over the age of 65 accounts for 7% of the total population, it marks that the country or region has entered the aging society^[1].

According to the statistics of the United Nations, the world's elderly population over the age of 60 will reach 1.083 billion in 2021, accounting for 13.70% of the global total population of 7.909 billion. By 2050 and 2100, this number is expected to reach 2.132 billion and 3.084 billion respectively, accounting for 21.96% and 29.80% of the total population by then.

At present, the global aging rate is accelerating. Since 2000, the global population over 60 years old exceeded 10%, marking the world's entry into the aging society, the aging process has been accelerating. The elderly population is growing faster in developing countries than in developed ones. The elderly population is growing at a particularly rapid rate in developing countries due to declining fertility rates and improved health care. In addition, the global aging society also presents the characteristics of regional imbalance. There are clear differences in the regional distribution of global ageing, with some Asian and European countries already entering deeply aged societies, while parts of

Africa and Latin America are relatively less aged. Japan, South Korea and other Asian countries have become the world's "oldest" countries. Japan, for example, has one of the oldest populations in the world, with nearly 30% of its population aged 65 and over. South Korea is expected to become the oldest country in the world by 2050, with the proportion of people aged 65 and over exceeding 40%. The global population aging trend is shown in Table 1.

Table 1: Trends of global population aging

Region \ Years	1950	1975	2000	2025
Africa	5.50	4.91	5.02	6.62
Latin AmericaNorth America	5.39 12.00	6.27 14.60	7.25 14.97	10.79 22.27
Europe	12.90	17.33	19.85	24.72
Oceania	11.29	11.13	19.85	24.72
South Asia	7.56	4.97	6.43	10.92
East Asia	7.53	8.23	11.45	19.59
China	7.63	7.96	10.71	19.31

3. Characteristics of the elderly user group

3.1 Physiological characteristics

As older users age, their physical and sensory functions go through a natural aging process, which largely affects their experience of interacting with digital devices. Specifically, sensory functions such as vision, hearing, and touch gradually decline in older users, and their ability to recognize interface elements also weaken.

(1) Visual analysis of the elderly

Vision in older age groups usually declines with age. It is mainly manifested in the following aspects: first, due to the aging of the elderly lens, their ability to perceive color is weakened; Second, the visual adjustment ability of the elderly group is decreased, and they can not quickly distinguish the sufficient contrast and detail of the object; Third, physical hyperopia and eye diseases, they may experience presbyopia, cataracts and other vision problems. These factors make it difficult for elderly people to recognize small, fuzzy interface elements. In the process of using mobile applications, most information sources need to be obtained through vision, which greatly affects the use experience of elderly users.

(2) Hearing analysis of the elderly

Studies have shown that since the age of 40, people's hearing in the high-frequency region began to show signs of decline; After the age of 50, this hearing impairment is no longer limited to the high frequency area, but gradually spread to the middle and low frequency area, at this time people begin to feel the so-called "back of hearing". For younger groups, their hearing frequency is usually in the broad range of 20 Hz to 20,000 Hz. However, due to the long-term wear and tear of hearing in adults' daily lives, they will gradually lose their auditory perception of high frequency sounds as the years pass, especially after reaching old age^[2].

The cochlea is a vital part of the auditory system, responsible for converting sound waves into neural signals for the brain to recognize and understand. However, as the years pass, the hair cells (especially the outer hair cells) and supporting cells within the cochlea may gradually wear out or degrade. These cells play a key role in the capture and transmission of sound, and if damaged, sound cannot be properly converted into nerve signals, which affects the sensitivity of hearing. Aging can also lead to slower auditory nerve transmission and a decline in the brain's ability to process sound information. Taken together, these changes make the elderly's perception of sound become blurred, dull, and even have hearing loss. This makes them likely to need a louder voice to hear audible messages such as prompts and voice commands.

(3) Tactile analysis of the elderly

Touch is the sensation produced by the skin touch receptors after contact with mechanical stimuli. The surface of the skin is scattered with contacts of varying size and irregular distribution, usually the

most in the finger abdomen, followed by the head, and the back and lower legs. Tactile bodies deep in the skin, in which sensitive nerve cells send tiny electrical signals when they feel pressure from touch. These electrical signals travel along nerve fibers to the brain, allowing the brain to sense touch and distinguish its extent and location^[3].

In old age, the skin, as the main sensor of touch, will gradually become loose, dry, and may even appear age spots and wrinkles. These skin changes not only affect the appearance, but more importantly, they reduce the sensitivity and reaction speed of the skin. As a result, older people using touch-screen devices may no longer be as acutely aware of finger swipes and taps on the screen as they were when they were younger. In addition, as we age, the conduction speed of the nervous system also slows down, which further affects the transmission and processing of touch. When an older person touches an object, nerve endings transmit tactile information to the brain more slowly, causing the brain to process the tactile information for longer. This delay can make it confusing or uncomfortable for older adults to use touch-screen devices because they cannot immediately perceive finger movements and feedback from the screen.

(4) Memory and thinking decline

As people age, their reaction times may slow down, showing that they do not respond to problems or tasks as quickly as before. At the same time, the mind of the elderly may become dull and poor, lacking in creativity and flexibility. They may not be able to quickly understand and process new information or situations. Some older people may also have a logic disorder, which manifests as an inability to articulate their ideas or understand the perspectives of others. This is because the number of neurons and synapses in the brain gradually decreases as we age, which can lead to slower information transmission and processing, which can affect memory and thinking skills^[4]. In addition, chemicals in the brain, such as neurotransmitters and peptides, also change with age, and these changes may also have an impact on memory and thinking.

3.2 Psychological characteristics

From the perspective of the psychology of the elderly, due to the growth of age, the elderly may have a negative attitude towards life, such as loneliness, inferiority and loss, due to the decline of physical function, social role change and other reasons^[5], which may affect their willingness and enthusiasm to use mobile applications.

(1) Loneliness

With the change of the social role of the elderly, they may face an empty life and the death of their partner after retirement, and then become empty nesters. They may feel that their emotional needs are not being met, and they may feel lonely, empty, and helpless.

(2) Feelings of inferiority

With age, the physiological function of the elderly gradually declines, which may lead to decreased mobility, weakened learning ability, and even the idea that they have no survival value, thus triggering feelings of inferiority.

(3) Feelings of loss

After retirement, older people may feel less connected to society and less of a sense of belonging to society. This change can make them feel abandoned, left out, and even feel useless and worthless, which can lead to a sense of loss.

3.3 Behavior characteristics

As they get older, their physical functions may gradually deteriorate, which directly affects their speed when using touch screen devices. Older users tend to have slower hand flexibility and reflexes than younger users, making them more cautious and slow when swiping a screen, clicking a button or typing text. In terms of technology acceptance, elderly users may have a certain resistance to new mobile applications due to a lack of understanding of new technologies, or long-standing inherent usage habits. They may be more inclined to use their own familiar and accustomed way to complete the task, for the new interface design and functional layout, it takes more time and patience to get familiar with and master.

4. Mobile application interface design principles for elderly groups

4.1 Usability principle

The usability principle plays a crucial role in the design of mobile APP interface for the elderly. It emphasizes that the design of interface functions should ensure that the elderly can successfully and efficiently complete various operational tasks and achieve their operational goals. This principle not only helps the elderly to solve problems in daily life, but also satisfies their psychological needs in the process of use, such as a sense of self-realization and a sense of accomplishment^[6].

The usability principle is the basis of mobile application interface design for the elderly. It ensures that the basic functions, layout and visual elements of the interface are designed around the normal operational goals of the elderly, thus ensuring that they can feel comfortable and confident when using the APP. Through a well-designed interface, the elderly can find the required functions more easily, reducing the confusion and frustration of operation.

4.2 Fault tolerance principle

The elderly often do not know enough about the rapid development of technology, coupled with the decline of their own physical functions, they often have a sense of fear of unknown things, afraid that they will make mistakes. Therefore, in the principle of fault tolerance, we design the functions and logical architecture of the APP interface more from the emotional perspective of the elderly. This is because the "black box effect" of the information terminal often makes the elderly hold a strange and fearful mentality of information products, but also full of curiosity and enthusiasm^[7]. In order to reduce the psychological pressure of the elderly, reasonable fault-tolerant design of mobile application interface becomes particularly important.

Based on the principle of fault tolerance, error space can be reserved in the design, even if the elderly user makes a mistake, it can easily return to the origin or undo the operation. This can reduce their frustration and increase their confidence in using the app. Provide confirmation steps for actions that may affect important data. This prevents older users from losing or changing their data due to misoperation.

4.3 Principle of ease of use

The elderly are very poor in the operation and use of smart phones. Coupled with the restriction of continuous physical degradation, ordinary smart phones on the market are difficult for the elderly to operate. Therefore, the mobile application interface design for the elderly should adhere to the principle of usability. Usability is based on usability, and the core goal of this principle is to simplify the operation process, optimize the user experience, and ensure that the elderly can complete various operational tasks more easily and conveniently, so as to fully enjoy the convenience and fun brought by technology^[8]. The interface design should be adapted to the likely hand condition of the elderly user, ensuring that the buttons and interactive elements are sufficiently large and properly spaced for easy clicking^[9]. This helps reduce the frustration caused by operational errors. Minimize steps and avoid complicated submenus and Settings. Through the intuitive operation process, elderly users can find the features they want faster and improve the efficiency of use. Design an easy-to-access help system with clear operational feedback. This can help older users better understand how the app operates and get timely help when needed.

5. Mobile application interface design strategy for elderly groups

5.1 The application interface is simple and intuitive

For the elderly with visual degradation and cognitive decline, the physiological and psychological characteristics should be combined. In the design of application interface, the complex design should be abandoned and the visual effect should be simple and intuitive. Between pages, the consistency of elements should be maintained to avoid too many elements disrupting the thinking of the elderly group. In the design and application of colors, the use of colors should be minimized, especially in the same interface, the use of colors should not exceed three, and the color should not be too bright. For a larger proportion of the area, try to use a single color of white or black, but for important information or key

buttons should try to use a highly recognizable color (Figure 1).

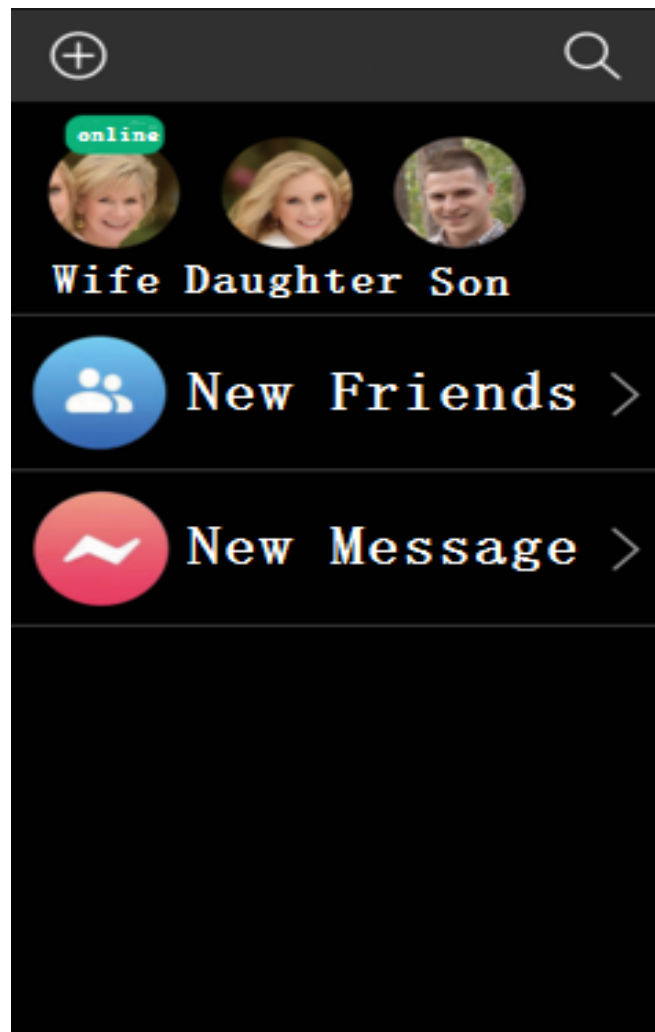


Figure 1: Simple and intuitive application interface

5.2 Application of speech recognition technology

Voice is a convenient and fast way of information transmission and communication. Using voice recognition technology, elderly users can perform complex operations, such as "open photo album" and "play music", through simple voice commands, without complicated clicking and sliding operations. At the same time, voice prompts and feedback are provided during application use to help elderly users better understand the application status and operation results. For example, when the app receives a voice command, it can voice reply "Album is open" or "Music is playing." This can simplify the procedures for the elderly to operate mobile phones, reduce the occurrence of operational errors, and reduce the difficulty of elderly users to use mobile phones, especially for elderly users with mobility difficulties, but also provide them with great convenience^[10].

5.3 Enhance text recognition

The visual ability of the elderly is reduced, and it is difficult to distinguish and recognize the small ICONS and fonts in the application interface. Therefore, in the design of the application interface, the recognition of the text should be enhanced, and the size of the text and icon should be increased appropriately. In general, in the interface design of smartphones for the elderly, fonts larger than 24px are more appropriate. In the choice of font size, it should be kept uniform, in addition to raising the font size to make it look larger^[11]. As shown in Figure 2, both sets of fonts are typeface typeface with the same size, but the font on the right is pulled higher in height, which visually produces a larger font on the right.

High font High font

Figure 2: Font size comparison

6. Conclusion

With the deepening of the aging society, as well as the development of technology and the Internet era, more and more elderly groups have begun to use smart phones. However, the elderly group is different from the young group in all aspects, and the current mobile application interface design is generally not friendly to the elderly group. Based on the analysis of the characteristics of the elderly user group, this paper puts forward the design strategy of simple and intuitive application interface, the application of speech recognition technology and the enhancement of text recognition, and gives the concrete implementation method. The implementation of these strategies will help improve the experience of older users and facilitate their integration into the digital society. In the future, with the continuous progress of technology and the changing needs of elderly users, mobile application interface design strategies also need to be constantly innovative and improved.

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