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Design Trend of Voice Interaction Technology Applied in China's Elderly Home Care

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Abstract

With the development of artificial intelligence, smart elderly home care has become one of the important development directions. The mode of human-computer interaction has changed from interface interaction to non-interface interaction, while the emergent studies related to machine philosophy promotes the development of artificial intelligence to the direction of artificial philosophy and logic. Voice interaction is closer to the natural interaction mode between people, in which information transmission is fast and convenient. Besides, it can contain emotional expressiveness and voice input with more humanistic meaning, thus reducing the cost of human-computer learning. It may be likely to provide a natural interaction adapted to the body and mind of the elderly, facilitate the use of products in their lifestyle, and thus become an important means in the design of smart home products. This article will address the interaction design trends between Chinese elderly smart home care and natural speech in relevant scenes from the perspective of speech interaction.

Keyword

Elderly care, voice interaction, smart home care, design trend

1. Aging and Internet life in China

In 2017, the number of Chinese people aged 65 and above reached 158.31 million, accounting for 11.4 percent of the total population. However, the birth rate is declining in China. It signifies considerable increase of dependency ratio, namely ratio of the non-labor population in the future. As the

traditional way of elderly home care is gradually transforming to smart way, the smart home design and the smart community construction for the elderly will become the development orientation of the smart home care in China. The basic cultivation of the Internet behavior habits of the elderly also provides scientific and technological life experience for the smart elderly care, and provides a user base for the establishment of the smart home care system. Statistics reveal that in 2019, the elderly aged over 50 have become the largest incremental group in China, accounting for 30% of all Internet users. The Internet behaviors of the elderly are characterized by gradual increase of use time, frequent use of mobile devices, and social interaction supplemented by multiple purposes. Nowadays, more than a third of the elderly spend 3 hours or more in using the Internet. They are highly active and influential in the social media, and even lead a trend of "silver hair". In terms of the devices with access to the Internet, the mobile phone has become the most commonly used tool. The elderly people use the mobile Internet mainly for socializing, coupled with information such as health care, catering and tourism. The mobile network increases their happiness and relieves their loneliness in life. The formation of Internet habits of the elderly in China has not only reduced the cognitive difficulty for the elderly in using smart home care devices, but also increased the intensity of the elderly's demand for smart home care.

2. Advantages of Voice Interaction applied in smart elderly life

Recent years have witnessed the rapid development of technologies related to voice interaction, the

recognition rate of which has exceeded 97%. The application of voice interaction in household products has been gradually expanded to the mass market. This kind of interaction actually reflects the evolution of human-computer interaction in the past decades, returning from machine-oriented to human-oriented natural interaction. Voice interaction can adapt to the behavioral characteristics of the elderly due to its advantages of natural interaction. It has the following advantages in the development of smart products and services:

2.1 Physiological Need of Voice Interaction

First of all, the intuitiveness of voice interaction meets the physiological needs of the elderly. Physiologically, the sensibility of the elderly decreases with age, including visual perception, visual reaction speed and color recognition, so do the hearing ability, tactile sensitivity and positioning ability. In this case, it will be inevitably troublesome to use the interface and tactile interaction. Compared with interface interaction and tactile interaction, voice interaction is more intuitive and convenient, and closer to life experience with respect to interaction logic, rendering it intuitive and easy to wake up smart devices and delegate tasks. With spatial flexibility, the voice interaction solves the limitation of using space to a certain extent.

2.2 Voice Interaction with User Interaction and Emotional Communication

Secondly, the presentation of voice interaction is more anthropomorphic. A virtual character should be created for voice interaction. The virtual character determines the voice gender, timbre attribute, and certain personality metaphor. It is an embodiment of emotional design.

The anthropomorphic voice eliminates the difficulty of usage, and arouses the curiosity of elderly users to try the voice interaction products. On the other hand, the anthropomorphic voice creates scenes and atmosphere close to real-person communication, providing more opportunities for elderly users to use language. It is convenient for elderly users to express ideas and emotions,

establish man - machine trust and develop the habit of using the device, infiltrating smart devices into the elderly life. The humanized natural communication mode provides two dialogue scenes : Task-based dialogue design and chat-based dialogue design. Task-based dialogue involves the main content of the current voice interaction. The user gives the instruction, and then the machine recognizes and completes the task. Chat-based dialogue mainly involves search services. In the future, chat-based dialogue will be an important direction for the development of voice interaction. The in-depth and intelligent chatting mode will be closer to the interpersonal communication scene, thus improving the naturalness of user interaction and the intensity of emotional communication.

2.3 Relationship between Independent Elderly life and Voice Interaction

Furthermore, voice interaction increases the independence of the elderly in using the product. The technological home care aims to alleviate the burden of providing for the aged, provide new elderly life and improve medical efficiency, while establishing a smart home care community. Voice interaction makes it easier for the smart home care devices to wake up the user, easier and human to interact, and more efficient to use. In institutional and home care scenarios, voice interaction technology coupled with wearable products improves the efficiency of various service modes and significantly reduces the cost of care. The smart voice system and the Internet of Things technology even enable the elderly to use smart devices to monitor various physical indicators or participate in consumption and social activities on the Internet.

3. Opportunities for the development of voice interaction technology in China's elderly care

The rapid development of computer and network resulted in the emergence of information technology philosophies such as logic machine philosophy of A.W, Burks and artificial life

philosophy, and promoted the in-depth research on evolutionary logic. The smart voice interaction system essentially symbolizes a technical regression. The natural voice interaction focuses on the principle of human logic. It is expected to establish a more natural and optimized human-computer interaction process in the future.

Mostly based on the smart space, the voice interaction products for the elderly are optimized and specialized according to the physiological and psychological characteristics of the elderly. The natural voice interaction system for the elderly is based on artificial intelligence, the Internet of Things, and 5G technologies, and is committed to the development of intelligent agents, providing products for elderly partners, nursing robots, and smart speakers.



Figure 1 Elderly companion robot of ELLI-Q(Left)
RUDY elderly companion robot by INF Robotics(right)

Based on artificial intelligence, Internet of things, 5G and other technologies, the natural voice interaction system for the elderly is dedicated to the development of intelligent agents, providing elderly care companion products, nursing robots, smart speakers, etc. (see figure 1). Elderly users tend to be segmented in China. The elderly of different regions, ages and education levels have different living needs, which means that more attention should be paid to user needs and experience differentiation in terms of functional design for voice interaction products. The large number of product segments also poses greater challenges to the design. The good news is that the population base of elderly people is large in China. There are about 400 million people aged over 50, with an increase of 15 million people aged over 60 every year. In addition, due to the popularity of Internet usage and online

consumer behavior, elderly people are getting more familiar with the use of the Internet and developing online consumption habits, which is conducive to the development of voice interaction products. Currently, the smart home care products are primarily applied in China's first-tier and second-tier cities. The energetic elderly aged between 50 and 64 are highly acceptable to products and services. The energetic elderly are characterized by stronger adaptability, and better learning ability and financial strength, the preference for competitive consumption and new types of services, and the willingness to spend more time on health and sports. Therefore, the energetic elderly population will become the initial service target of voice interaction products, and voice interaction technology will become an important application technology to improve the life quality and create a high-tech lifestyle for the elderly. Compared with other types of voice products, the voice interaction products for the elderly feature simpler operation, more natural interaction and more care. Smart voice interaction products, on the one hand, provide more convenience and enhance the comfort of home care for the elderly, on the other hand, create more communication and companion scenes for elderly, providing more spiritual and life care. The article will discuss the design trends from the perspective of voice interaction applied to the elderly care scenes, specifically, home care assistance for the elderly, companionship and communication, early dementia treatment, and medical tracking and care.

3.1 Home care assistance services in cities

In terms of life information services, smart voice interaction products can provide weather, news, song broadcasting and other services. Elderly users can easily and intuitively obtain information such as news, weather, travel and traffic through voice interaction. Music is also one of the important contents. The product contains a music library for the aged, which plays music or opera through voice interaction, such as the songs of Deng Lijun and Cai Qin, or Peking Opera and Yue Opera.

In terms of entertainment and fitness services, voice interaction products can provide entertainment

programs and information favored by the elderly. For example, the smart speaker an example. In addition to playing music, it also allows users to order accompaniment besides playing music, thus creating a family KTV environment. In addition, as energetic seniors in cities love outdoor activities and exercise to find a sense of collective belonging, the voice interaction products provide fitness training contents for the elderly, such as shadowboxing classes, boxing music, and aerobics for the elderly.

In terms of home security protection and reminders, common voice interactions can effectively realize the switching functions of household appliances, such as switching on and off lights and air conditioners. The elderly in China have a strong awareness of turning off the lights. In order to confirm whether the lights are turned off, they often go back and forth multiple times, which cause inconvenience for them, especially those who have difficulty in walking. Such repetitive behavior of confirmation can be eliminated through voice interaction, which makes life more convenient and comfortable. Besides, voice interaction can be used to remind and manage home security for the elderly, such as door lock security, water leaks, and gas leaks; the security system connects with switches of cameras and monitoring devices to monitor home security in real time and proactively give voice reminders about door lock status when the user enters and exits the door; with regular monitoring of water and gas mains, the voice interaction can give remote warning of potential threats via mobile phone, etc.

3.2 Daily companionship and communication for the empty-nest elderly

The total number of the empty-nest elderly is increasing year by year in China, and is expected to reach about 118 million by 2020. Daily communication becomes a big problem for the elderly. The smart companion robot can provide voice chat services for elderly users, creating scenarios for elderly users to speak through voice interaction, and take care of the elderly's diet, including medication reminders, dietary suggestions, playing local news, uploading health information

before the user goes to bed, etc. Smart companion robot can become "friend" of the elderly, creating more emotional communication for them, thus increasing their frequency of receiving external information, and effectively alleviating the loneliness and depression caused by lack of communication. In addition, the smart speaker that includes video system, electronic photo album, and third-party voice-driven APP is also a home appliance with companion function. The video system allows elderly users to quickly call video services with voice, and communicate remotely with family and friends at any time, simplifying the complexity caused by dialing; the electronic album can quickly establish the cloud album function that allows sharing with friends and family through voice, enabling multiple users to upload and share photos.; the third-party smart speaker APP can start the voice memoir service, allowing the elderly to record memoirs and snap life photos. The above-mentioned services provided by the smart speaker can effectively help the elderly build a life memory bank to summarize and store daily information. It not only enriches the elderly life, but also relieves their loneliness when they are alone.

3.3 Initial treatment for elders with disabilities and dementia

In 2015, China's population aged 60 and over reached 221 million, of which nearly 40 million were disabled and semi-disabled, accounting for 18% of the total elderly population. Voice interaction products such as smart speaker can provide nostalgic treatment for patients with early dementia. The elderly people with early dementia suffer the loss and dissipation of short-term memory, while the long-term memory is unaffected. Treatments for early dementia include emotion therapy, music therapy, and nostalgia therapy. In terms of therapeutic principle, smart speaker alleviates the symptom of dementia of elderly patients by combining nostalgia and music. By means of recollecting the music and voice stories that have been heard in the past, patients can achieve emotional relief and improve their happiness, thus improving their mental state.

Intelligent and digital technology can enrich nostalgic content, attracting the attention of patients with dementia effectively through nostalgic photo albums, nostalgic music, remote video guidance, etc., thereby achieving better interactive effect. For example, smart speaker enables the patient to continuously review the life experiences and historical knowledge by playing personalized nostalgic music, playing life information frequently, and reminding festivals and explaining historical events, so as to maintain the activity of the elderly brain and effectively improve the cognitive ability of the patient with dementia, help exercise memory and communication skills, and strengthen social skills (see Figure 2). During the nostalgia and music therapy through smart speaker, demented elderly people can have more opportunities for communication, further get more social attention to reduce the loneliness, and obtain positive emotions to effectively improve the dementia state.

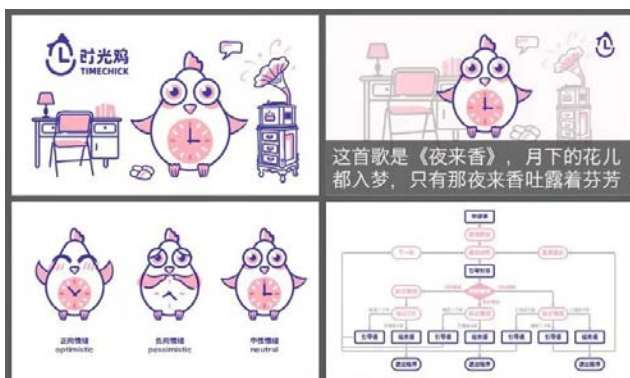


Figure 2 Scenario for the elderly to use smart speaker

3.4 Medical follow-up and care for patients with chronic diseases

The demand for medical care for the elderly is expected to peak by 2038 in China. The smart voice elderly care products are also applied to medical assistance, such as smart mattress, fall detector, smart toilet seat and physical sign monitoring pad. There medical assistance is commonly divided into remote monitoring and long-term care assistant. Remote monitoring, such as smart home system, mainly provides detection modules for physiological and environmental information. These modules can collect various physiological data of the elderly at any time, and

act as medical test personnel to stay by the side of the elderly 24 hours a day. For long-term care assistant, voice interaction mainly provides social, medical monitoring, reminder and other services through wearable devices. By means of voice interaction, the product reminds the elderly users of their current physical conditions and measures to be taken, such as providing medication reminders, routine monitoring, and long-term monitoring of physiological indicators (blood pressure, heart rate, etc.), reminds patients of the time for medical examinations, and arranges hospital appointment, inquires doctor information, and records medication and physical condition and other related care services.

4. Conclusion

China will gradually build a complete and comprehensive smart technology community in the near future. The community comprising families is built based on cutting-edge interactive technologies, mobile network technologies, big data and cloud services. It will provide customized medical services for elderly home companionship, body monitoring, medical data acquisition and medical solutions, and enrich the elderly's activities, thus meeting their entertainment and social needs. This development can not only prevent and alleviate the occurrence of elderly diseases, but also help the government reduce the financial burden on elderly care and medical care, and better improve medical efficiency and give full play to the advantages of technology in smart home care.

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