

Design of Elderly Smart Clothing Application Based on Wearable Device

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Abstract: China's increasingly severe population aging trend, the research and development of smart clothing for the elderly urgently needs to be reformed. Based on this, through research and technical data experiments, the overall analysis of the development of smart clothing and related content of the elderly, systematically combing and summarizing the relevant research results, starting from the use of wearable devices, summed up the smart clothing for the elderly In the different design of the function, and analyzing its development trend, the method of using the Raspberry Pi as the carrier of the wearable device to implement the corresponding functions is proposed.

1. Introduction

At present, China is already in the stage of population aging. The population of the elderly over 60 years old will be close to 500 million in 2050, accounting for about one-third of China's total population, accounting for about one-fourth of the world's elderly population [1]. Therefore, the elderly smart clothing can effectively improve the operability of the smart pension program through science and technology, thereby improving the level of aged care services nationwide [2]. In addition, the current smart clothing is mainly used in the sports and medical fields. The product development has not fully considered the needs of different consumer groups in other fields. Therefore, functional sensor devices are integrated with clothing to design consumer groups for different fields. The new wearable smart clothing is the development focus and new opportunity of the future garment industry [3]. In general, the design of smart clothing based on wearable devices will eventually form a high-efficiency, high-quality aged care service, which is of great significance to the economic development and harmony and stability of our society. It can not only provide new innovations for the development of enterprises. Points and breakthroughs can also create a comfortable environment for the wisdom of the elderly.

2. Wearable Technology Statuses

2.1. The concept of wearable technology

A wearable device refers to a device formed by intelligently designing and developing some wearing articles in people's daily life by applying wearable sensor technology. Common wearable device products mainly include wristbands, watches, glasses, gloves, footwear, smart clothing and other fields [4]. Smart-clothing is an important branch derived from the development of wearable devices. As one of the entry points for wearable devices, it has been paid attention to by many research institutions and companies around the world, and has begun to be laid out on the product side [5]. Smart wearable clothing can provide real-time information feedback and intelligent analysis based on changes in environmental conditions or other external factors through a series of feedback mechanisms. Collecting data through various types of sensors, transmitting data to servers and intelligently analyzing them through various information communication services is a core part of smart clothing.

2.2. Key technologies of wearable devices

Data communication methods between several commonly used wearable devices include Bluetooth, Wife, NFC, ZigBee, etc. According to different scenarios applied by wearable devices,

appropriate communication means can be selected [6].

According to the difference between the application scenario and the usage group, the wearable device uses several different types of sensors to implement the sensing function [7]. At the heart of the hardware part of the wearable device is a sensor that senses and detects some form of information and converts it into another form of information. There are many different types of sensors, and their operating principles are different. The information objects to be detected involve multiple parameters, which are classified according to its working principle, input information and application range.

The product form of the wearable device is mostly related to certain parts of the user. Because it needs to be worn for a long time, the product has higher requirements in terms of touch and comfort, needs to be ergonomically designed, and the softness needs to be more humanized, so the flexible component is an important part of the wearable device [8].

The operating system used in wearable devices is still in its infancy, and the most widely used wearable device operating systems on the market fall into the following categories: real-time operating systems, Samsung's Tizen operating system, Apple's iOS system, and Google's Android operations [9].

Finally, the key technologies involved in wearable devices can be divided into the following four parts, as shown in Figure 1.

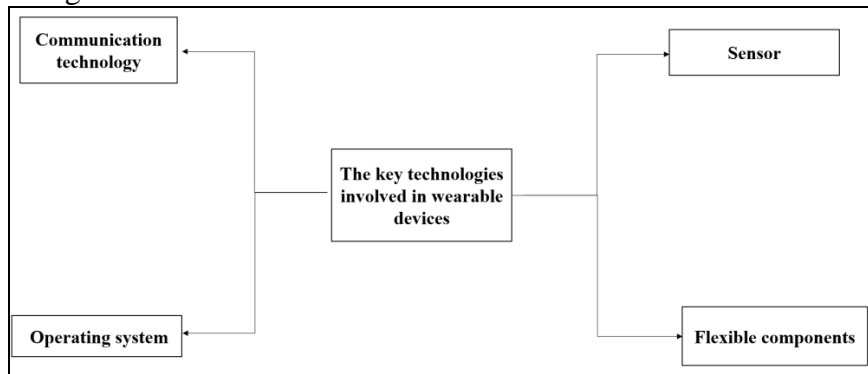


Fig.1. The key technologies involved in wearable devices

3. Elderly Smart Clothing Features

3.1. User analysis

Old-age smart clothing refers to clothing that integrates IT technology to prevent the adverse effects of various internal and external factors on the health of the elderly while ensuring comfortable dressing, and also has various intelligent functional services [10].

According to data released by official institutions in China, at present, the number of elderly people over the age of 60 in China is close to 250 million. It is the only country in the world with an elderly population exceeding 100 million. In 2050, the number of elderly people in China will account for the total population of the country. 1/3. The increasing number of elderly people has made the physical and mental health problems of the elderly gradually become a social problem in China [8]. According to statistics, by 2020, China's elderly consumer market will be 300 million to 400 million yuan, and clothing is an important part of the elderly consumer sector, integrating apparel fabrics, design, production, IT technology applications and other aspects. It is especially important to design and develop smart clothing for the elderly that meets the needs of the elderly and has potential for market development and development [6].

From the perspective of physical function, with the increase of age, the physiological functions of the elderly gradually decline, the physical indicators of the elderly will change at any time, the traditional physical detection products are no longer suitable for the daily use of the elderly, and wearable devices the characteristics are more in line with the needs of the elderly. Through the wearable device to detect and monitor the physical function index data of the elderly, the specific physical condition of the elderly can be obtained accurately and in real time, and then the targeted

care and treatment of the elderly can be performed according to the data index. The elderly user group has become an important social group. It is an inevitable requirement for the elderly to design a smart clothing that can monitor the physical health of the elderly and meet the physiological and psychological needs of the elderly users.

3.2. User characteristics analysis

Old-age smart clothing combines various types of biosensors, microprocessors, flexible displays, etc. with older clothing, and monitors the physical data of the elderly in real time through sensors such as blood pressure, heart rate, and electrocardiogram, and converts them through a microprocessor. The communication protocol is transmitted to the storage unit and the display unit for data storage and visualization.

In terms of usage characteristics, it is mainly considered from the following aspects:

First, the function: to provide real-time, accurate body detection data. Second, the appearance: the elderly is conservative in style and color. Third, location: Considering the use of the elderly, the placement of wearable devices should be considered in terms of privacy and convenience, and close to the usage habits of the elderly. Fourth, applicability: The size of the wearable device is generally small, and the display terminal should consider the font size and voice output. Fifth, the operation: the operation should be simple and easy to understand, and the one-stop operation is more in line with the usage characteristics of the elderly user group.

4. Elderly Smart Clothing Application Design

4.1. Product-Positioning

At present, the functional aspects of the elderly smart clothing need to be considered: whether the data is comprehensive, whether the data is accurate, whether the collected data is sent in a timely manner, whether the acquired physical data can be scientifically analyzed and summarized. --To achieve the above aspects, we can maximize the advantages of smart clothing for the elderly.

In the implementation of specific functions, it mainly includes the following functions:

First, the old man falls alarm and real-time positioning function. Second, physical health data such as body temperature and heart rate are detected in real time. Third, the reminder function: remind the elderly to regularly drink water and take medicine. Fourth, the amount of exercise recorded.

4.2. Product features

In terms of specific functions, the smart clothing for the elderly is mainly realized through three refinements of software, hardware and clothing fabrics.

The hardware part of the old smart clothing will use different biosensors according to different body parts that the user needs to detect. The hardware components such as heart rate sensor, temperature sensor and acceleration sensor are responsible for detecting the physiological indicators of the human body. This design uses Raspberry Pi 3 as the sensor carrier in the wearable device, combined with the functional sensors needed for the design of the elderly smart clothing, so as to finally realize the application design of the smart clothing for the elderly. Usually the sensor in the smart clothing has small size and work.

Older smart clothing is often used in conjunction with smart devices, and APP applications on smart devices can be functionally customized to meet different body part detection applications for different user groups. All kinds of sensors built on the clothing will transmit the collected elderly user's vital signs data to the cloud platform and the local database through wireless transmission protocol, and then clean and analyze the data through big data and artificial intelligence technology, and move the final analysis result through the mobile The APP is pushed to the guardian, or the information is displayed through other visualization platforms, thereby breaking through the space limitation and real-time understanding of the physical condition of the elderly, so that the guardian can take timely monitoring measures. The workflow of the old smart clothing system is shown in

Figure 2.

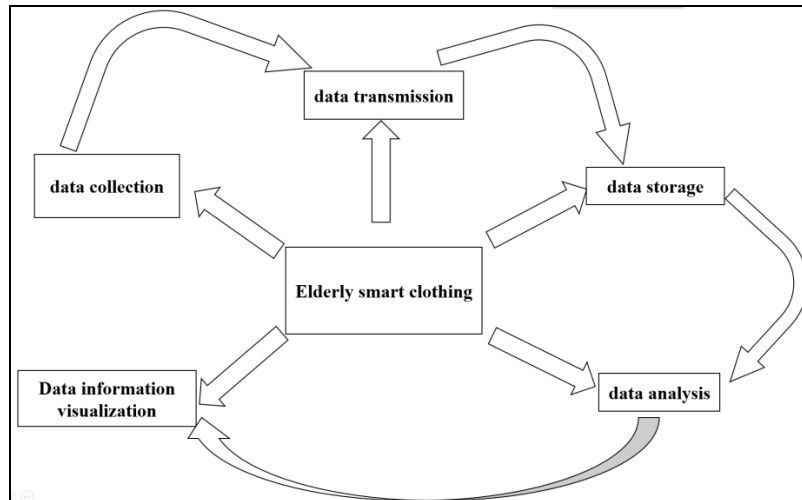


Fig.2. Elderly smart clothing system

There are two types of commonly used fabrics for smart clothing for the elderly, namely functional fabrics and special fabrics. The functional fabric itself does not have the characteristics of intelligence, and the functional fabric has the characteristics of antibacterial, breathable, perspiration, anti-mite, etc., often combined with various electronic hardware devices to realize the intelligentization of the garment; the special fabric refers to the adoption The smart fabric made by the new material production industry has special functions such as judging, intelligent temperature regulation, sensing and early warning.

Special fabrics made from graphene materials have been used in tempered jackets, ski wear, underwear and other clothing. Digital fiber integrated into microelectronic components can collect body characteristic signals through its own or built-in sensors, and further form a closed-loop network by transmitting data to realize the functional application of smart clothing for the elderly.

4.3. Product design

In terms of structural style, the smart clothing of the elderly not only has to show its sense of science and technology, but also reflects the beauty of the body. The overall structural design of smart clothing for the elderly is designed from both artistic and engineering aspects. The details also need to consider the difference between different gender styles and color combinations and the matching of different seasons. A large proportion of the elderly consumer groups expect that smart clothing can be worn regardless of the occasion in daily life, and a small number of users need smart clothing to appear in the form of underwear. Therefore, in the design phase, we should focus on the intelligent application of these two types of clothing. In the design stage, the smart clothing for the elderly should be dominated by H, A, and O profiles, avoiding too long a short contour, and at the same time having a high wearing comfort. The elderly has the characteristics of less activity and less activity. Therefore, in the stage of fashion design, a certain degree of looseness needs to be considered. The loose design of the cuffs and chest circumference can meet the needs of the elderly consumer groups for comfort. Considering the rationality of the function and the economics of the process, the industrialized mass production of the mass is achieved.

5. Conclusion

By analyzing the technological development of wearable devices of different gender styles, the Raspberry Pi is used as a device carrier for various sensors, which perfectly solves the problem of performance optimization and device heat dissipation, and also has good data transmission characteristics. The experimental results show that the use of Raspberry Pi as a carrier of wearable devices for the design of smart clothing for the elderly is an innovative idea under the current technical conditions, and also provides a certain degree of innovation and design for the intelligent

clothing of the elderly. The follow-up will continue to further research and application integration in the various functional aspects of the elderly smart clothing, and finally form a set of intelligent clothing application design modules for the elderly, and try to apply it to product marketing and related projects.

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