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## Present Situation and Future Development Trend of Smart Clothing

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### ABSTRACT

With the rapid development of science and technology, our daily clothes are changing quietly. Wearable smart clothing has gradually the leading role in the clothing market. This article first explains the concept of wearable intelligent clothing in china, and then I analyze the various types of wearable smart clothing that is currently facing problems, and summarized about the key points and future directions of wearable intelligent clothing design. From the beginning of 2013, smart watches, bracelets, glasses have entered the public vision, become a "trendsetter who sought the object", this year the industry was identified as "the first year of wearable equipment". In simple terms, a wearable device is a portable device that can be worn directly on the body, or integrated into the user's clothing or accessories. However, with the development of wireless sensor technology, kinds of wearable smart clothing gradually appeared in people's life, the smart clothing is made up of small chip, electronic components, power equipment, embedded into clothing, can achieve a specific function, in order to facilitate people's life.

**Keywords:** Clothing, Wearable electronic devices, Wearable smart clothing.

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### 1. Basic concepts of smart clothing

As an emerging interdisciplinary field, wearable technology mainly explores and creates scientific and technological equipment that can be worn directly or integrated into the user's clothing or accessories. Clothing, as one of the essential equipment for everyday life, integrates wearable technology into clothing and forms clothing with a dual function of perception and feedback called intelligent clothing (Jun et al., 2015, Xiaojun et al., 2006), which not only can perceive the external environment or internal situation changes, but also through the feedback mechanism, in real time to respond to this change.

Smart clothing mainly clothing through the following two kinds of way: one is the smart clothing design requires the use of smart clothing materials, such as shape memory materials, phase change materials, off-color material etc. The other is the sensor technology, microelectronics technology and

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information technology into people's daily wear clothing, such as the application of flexible sensors, low-power chip technology, low-power wireless communication technology and power supply, medical detection, tracking the user's vital signs (heart rate and other vital signs), or fitness guide (such as detection heat consumption, pressure level).

## **2. Present situation of smart clothes**

Smart clothing combines the latest technology with the traditional textile industry. It is the latest technological achievement in the fields of integrated materials, electronics, machinery, automation, computers, information and communications, etc. Under the interpenetration of multi discipline technology, the connotation extends continuously, the technology develops rapidly, and the industry continues to upgrade, which makes the whole textile and garment industry change from labor intensive to technology intensive.

European countries have paid much attention to the development of smart clothes in the past twenty years, It is not yet well integrated into the garment with sensors, electronic devices, power supplies, and wires, As a result, the comfort of smart clothing needs to be improved for long-term health monitoring. High stability and high precision flexible sensor technology, ultra-low power consumption technology and new garment processing technology is the basis for the development of intelligent clothing, These technologies are still in the early stage of industrialization, so it will take some time to integrate these technologies to achieve intelligent clothing with high accuracy, high stability measurement, high comfort and long endurance.

In recent years, China has made some progress in the field of intelligent clothing, and related advanced technology has the potential to enter the industrial application and spread promotion, However, for a long time, the problem of intelligent clothing is the lack of low battery capacity, high energy consumption of electronic equipment and flexible sensors (especially the development of high-precision and high-capacity batteries, flexible sensors). Therefore, in recent years, low power consumption electronic devices, flexible batteries and high-capacity batteries have developed rapidly. Flexible sensors have made intelligent clothing hit a bottleneck. So the research of flexible sensor materials has become the focus of target research. Therefore, flexible sensor materials become the hotspot in the study of the target.

## **3. Design emphases and future trends of smart clothes**

Smart clothing design is different from ordinary clothing design, in addition to consider the aesthetic performance, but also need to consider the wearability, availability, reliability, durability and other factors. The focus of intelligent clothing design mainly summarized the following aspects.

### **3.1 People oriented democratic design**

In the process of transforming from the seller's market to the buyer's market, In order to satisfy the objective function, the clothing should organically combine each essential factor, but also must satisfy person's subjective function, including psychology, physiological demand and so on. The acceptance of new technology stems from the user's social, values, gender, educational experience, and so on, all of which will have an impact. As the material carrier of wearable devices, smart clothing is designed to gratify a wide variety of needs. Therefore, it is necessary to pay attention to solve the problem about the acceptance of intelligent equipment technology and parameters by evaluating user perceptions and emotions.

### **3.2 Accord with ergonomic wearability**

The use of smart clothing purpose and requirements are different, with a variety of forms, but its basic conditions are the human body. There are four factors as the core elements, including the form of the human body, movement, physical, psychological, so when we design smart clothing, you need to consider the ergonomic requirements, so that the body can wear to maintain the most natural action.

Smart clothing needs to open up the application of the occasion, with the functionality at the same time, the overall costume design should meet the basic comfort. Foreign researchers indicates that the design of smart clothing is especially concerned with comfort properties, including thermal-wet

comfort of clothing, sensor and human skin contact with the feeling of comfort and taking safety and so on. For example, with flexible sensor technology, sensors and clothing materials are integrated into one of the basic fabric of smart clothing, which can sensitively detect various physiological and environmental parameters variety.

### 3.3 A medical device that improves human functioning

The emergence of intelligent clothing also plays a significant role in improving function of the human body. A Japanese technology company developed a set of exoskeleton, with the aid of the hydraulic pump unit, the user provides additional force when lifting the heavy object, mainly used to help disabled, lose self-care ability of the elderly, or require long-term people engaged in manual labor, so that it can produce significant improvements. While providing better health services for people, it can relieve the pressure of medical and pension institutions, and have good social benefits.

### 3.4 Convenient operation

The usability of smart clothing means that the products provided to the end-users must be easy to operate and value in use. Especially for the elderly and chronic patients, It's simple and convenient to use.

### 3.5 Providing software and services

Under the influence of Internet and industry 4.0, the development of smart clothing is based on software system and Internet platform, and combines with Internet of things, big data and cloud computing to realize intelligence. Or it combine with mobile computing, applications, and social media to implement customization, for instance, if you send your patient to a smartphone and a computer via a LAN, According to the situation Doctors will determine whether emergency treatment is necessary.

## 4. Conclusion

Intelligent clothing is not only one of implementation strategy in China's 2025, but also one of the ways to upgrade the garment industry. Therefore, the era of rapid development of intelligent clothing in the future. Smart clothes as one of the forms of wearable devices, the focus is on "wear", the current smart clothing in various forms, but the general problem exists in the low wear. Therefore, how to improve the intelligent clothing is both wearable and beautiful, Therefore, how to improve the intelligent clothing is both wearable and aesthetics, All-round broaden the application of intelligent clothing, It will be an important part of intelligent clothing design, and will be the development direction of intelligent clothing in the future.

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