

Application of Interactive Devices in Apparel Design

Hongtingyu Li

Department of Textile & Fashion Design, Luxun Academy of Fine Arts, Shenyang 110004, China.

Abstract: Interactive smart clothing is an innovative product that blends technology and fashion, enabling clothing to interact and respond to people in real time by integrating various sensors, computing devices and communication technologies. It not only has a fashionable appearance, but also provides various functions and experiences to meet users' needs and enhance their quality of life.

Keywords: Smart Clothing; Interaction Design; Combination Mode

Introduction

With the rapid development of technology in the last two to three decades, some of the ideas from the classic science fiction movies of the 1980s and 1990s have been realized, especially in the area of interactive smart clothing. As the originator of time travel movies, "Back to the Future" released in 1985 represents the imagination of the people of the future technology, now has a history of 30 years, back to the future there are many interesting technology ideas have been realized, such as when the shoes under pressure will automatically tighten the shoelaces. The glowing costumes in "Tron" have been realized on Intel-designed clothing, with designers showing the wearer's emotions through changes in LED lights. This design concept is quickly becoming another new phenomenon in the fashion world.

1. Research background and status

1.1 Research background

Since the Stone Age, people have been using tools made of stone, copper and iron for production and living. The size of the tools, the length of their dimensions and the way they were used can be said to be the first forms of interaction. However, the core demand for tools at that time was for survival. After the industrial age, the industrial revolution brought new technologies that greatly enhanced social productivity, and in April 1913, Ford experimented with the first assembly line, after which standardized and homogenized products emerged to meet people's needs and provide more possibilities for people to choose. The use of products for use is no longer the only consideration for human beings to choose products, and there are gradually more criteria to measure whether the products are good or not. Since then, interaction design has entered the product development process as an independent process and role. The concept of interaction design was first introduced by Bill Mogridge at a design conference in 1984, and it was called "soft surface" because it reminded people of a very famous toy, which he later renamed as Interaction design.

With the development of the times and the progress of information technology, the boundaries between various industries are gradually fading. The apparel industry has also begun to gradually combine with technology and new techniques. With new technologies, designers' ideas have become more avant-garde and bold, and the language of clothing has become richer and richer. What kind of chemical reaction will occur when circuits, LEDs, light, and even temperature sensors are injected into clothing? Parisian fashion designer Clara Daguin brings it to life. When different colors of light are emitted in different ways, it can tell you what is technology, the future and art. For Clara Daguin, "light" is her source of inspiration.

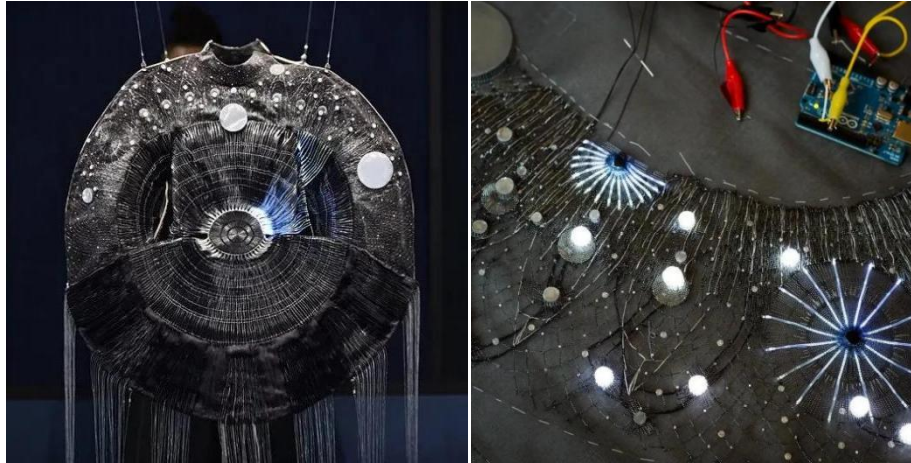


Fig.1.Experiments on the interaction between human body and clothing

1.2 Research Status

1.2.1 Smart clothing and apparel

Google is a search engine company who also takes care of cloud computing, driverlessness, etc. Due to its excellent technical conditions, in 2015 Google entered the field of smart clothing technology and started its initial development, after which they launched the Jacquard project in collaboration with Levis Strauss.

Google developed a set of ergonomically designed sensors for clothing, the system can improve athletes' sports performance, but also assess athletes' injuries, to facilitate athletes' training to protect their bodies. In 2017, Google and Levi's, one of the world's top three denim brands, launched a smart jacket, the Commuter Trucker Jacket. Smart Jacket unites clothing and technology more closely together. The jacket uses a special conductive thread used in the textile among the conductive thread woven into the fabric, rather than floating on the surface, carrying Google's Project Jacquard software, the jacket will achieve the function of a cell phone screen, you can answer or hang up the phone to switch songs, open voice services and other functions.

Experimental examples from the Morphing Matter Lab at Carnegie Mellon University, USA. Carnegie Mellon University has one of the world's top computer science programmes and an excellent level of interaction design, and its research into interactive smart clothing is at a world-leading level. Today wearable devices have become a promising platform for interaction. This unlocks a very wide range of applications, including information access, sports, medical and fashion. Yet its comfort and fit has long been a problem for designers.

The Morphing Matter Lab has created a completely untethered wearable electronics in its 2018-2019 experiments, simplifying the components with great comfort and flexibility. The designers, whose initial goal was to better adapt to the dynamic nature of the human body and have better durability and reusability, came up with the concept of unfolding tattoos instead of external and implantable ones. They layered the entire system material, joining the individual components together using stretchable wires and assembling them on a spandex textile that could be stretched for up to 60% deformation.

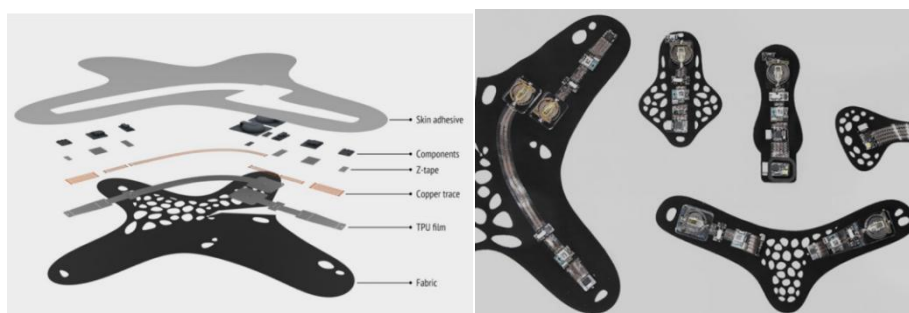


Fig.2.Completely unfettered, scalable, highly customizable electronics

In 2016 Chinese traditional clothing brand Dye launched two smart jackets at the conference, breaking through the concept of traditional jackets with up to 17 fitted invisible storage pockets, the latest development of blackout eye mask and homeopathic inflatable pillow. And can be detached from the mobile to control music, remote control to take pictures and record steps. If the phone leaves the user more than five meters, it will trigger the loss reminder function. Dye realized that due to the popularity of domestic smart phones brought about by too many low-headed people, and at the same time the phone contains photos of important documents and other important information once lost, may not be protected. Therefore, we design this kind of intelligent clothing. At the same time, the dye sign also integrates a collection of a variety of functions of the smart bracelet, record life trajectory, music control information reminders, monitoring sleep, etc.. Let people's life more intelligent and convenient, at present the dye brand intelligent clothing has been officially listed in Tmall, it can be said that the market prospects are very promising.

1.2.2 Virtual apparel technology

Virtual clothing is a concept based on virtual reality (VR) or augmented reality (AR) technology that allows users to experience and display virtual clothing in a digital environment. The main purpose of virtual clothing is to allow users to preview, customise and purchase clothing through virtual projections or digital simulations without actually wearing the physical clothing.

Climate change, extreme weather events, the social environment, the arrival of the post-epidemic era and many other factors have brought about some changes in human life. These changes have also had a subtle impact on the fashion industry. Returning to nature, cultural belonging, national style and trend, cross-border cooperation, female power and diversified aesthetics have all become design concepts expressed by designers in this period. Virtual fashion was a big hit, with futuristic metal virtual models and virtual scenes, creating a virtual show full of visual enjoyment for several brands.

With the addition of virtual technology, the virtual fashion and models created by the digital clothing engine offer unlimited possibilities for the development of fashion. The application and continuous improvement of virtual technology has brought light to the traditional fashion industry, and virtual fashion is not only a self-revolution of the fashion industry, but also solves the technical problems of the industry at certain levels.

2. Self-practice

2.1 Design theme

2.1.1 Design theme: Invisible Access

Invisible access is a metaphor for the fact that everyone can be an informant behind the scenes of the Internet, expanding the sources of Internet information to an infinite extent, while the real faces of these people are hidden beyond the screen, disappearing.

2.2 Material selection and color matching of fabric and auxiliary materials

First of all, the first feeling to highlight the effect of the light band. The whole dress is made of a layer of jacquard fabric, and the texture of the fabric material is hidden under the reflection of the light. Colour matching chose black and lake blue as the main colour, the overall interpretation of a sense of mystery.

2.3 Light strips, controllers and programming

2.3.1 The principle of the light strip and controller

The strip uses a 300-lamp WS2812 illumination strip, whose light source is SMD 5050 LED an IC control of an LED composition, a set of controllers through the control of microelectronic devices to control the circuit inside the printed circuit board, so that the LED strip changes into a variety of different effects. The use of low voltage DC 5v power supply safety and reliability is high.

The controller uses a programmable MIMI full-color controller, the maximum number of IC support for 1024, the whole 75 mm, 18 mm wide, the use of TF card, lightweight, powerful, easy to install in clothes.

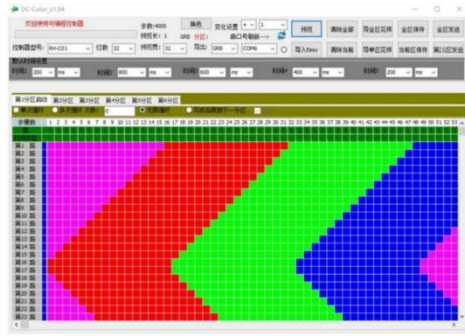


Fig3.DC-COLOR

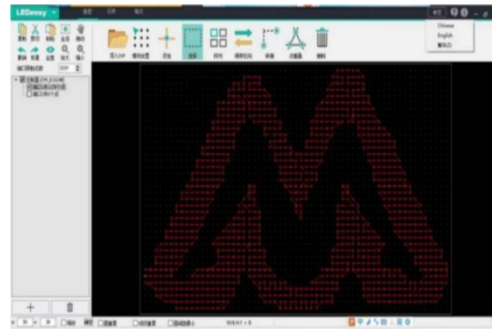


Fig4.LEDeasy

2.4 Programming method

Use LEDeasy and DC-COLOR software. LEDeasy is an easy-to-use LED software, in three steps to complete the production effect, the first step to import a good point DXF file or manual wiring to create the shape, the second step to import video files or built-in patterns to create dynamic effects, the third step to preview the demo effect, export the effect file. DC-COLOR is a full-color controller software, after selecting the controller model, according to the needs of setting a single cycle or infinite cycle, you can also set multiple cycles. Also you can browse to the final effect of the light strip. Import the pattern file of the exported program, and then do the subsequent editing in the full color controller software. Then use USB-X-C and send the pattern effect.

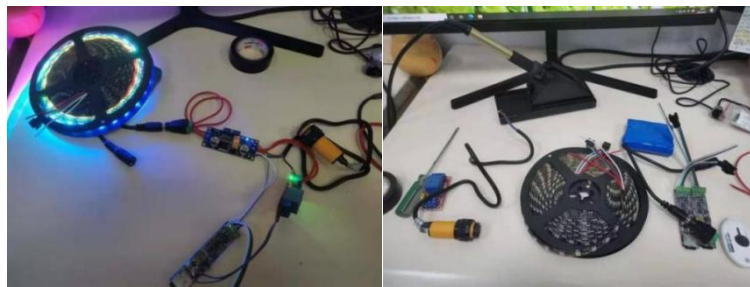


Fig.5.Production process

2.5 Preliminary experiments

The previous experiment tried to join the interactive device, by adding a diffuse photoelectric switch (infrared sensor), so that the light strip effect can switch the light effect according to the interactive behavior, between 10 cm and 100 cm, by hand shaking to switch the light color and frequency. Due to the relatively large number of light strips and supporting components, the overall weight of the garment exceeded the comfort standard, so the device was removed in the product iteration and the light strips were boldly used in a streamlined manner throughout the garment, providing a luminous effect while reducing some weight.

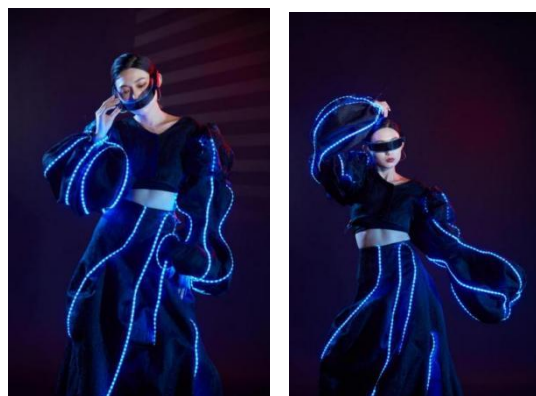


Fig.6.Finished garments show picture

2.6 Reflections on product iteration

The overall weight of the garment is large, limited by the brightness of the light belt, due to its requirements of the voltage is large at the same time in order to maintain the normal operation of the light belt to ensure the stability of the current, the power supply is required to have a large capacity. After testing, large-capacity rechargeable batteries can meet these conditions, but the weight of a rechargeable battery in the 500 grams to 800 grams or so, a set of clothes need at least three rechargeable batteries, so the overall weight is larger, the impact on the comfort is also relatively large. Therefore, in the subsequent design and improvement, to find a better and more lightweight power supply, or in the outer layer of clothing to add exoskeleton structure to support the weight of the rechargeable battery.

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