

Research on urban intelligent fashion advertising service model based on wearable devices

Zhen Chen^{1,2}, Zhi Tang³, Shunqi Mei^{1,2*}

(1 School of Mechanical Engineering and Automation, Wuhan Textile University, Wuhan 430073 China;

2 Hubei Digital Textile Equipment Key Laboratory, Wuhan 430073 China;

3 School of Fashion, Wuhan Textile University, Wuhan 430073 China;

*Corresponding author's email: meishunqi@vip.sina.com)

Abstract: We are developing a novel wearable devices called the urban intelligent fashion advertising. Such system is mobile information devices capable of supporting remote communication and intelligent interaction between terminals. In this paper, we explore the possible functions of such a wearable devices and will present the service-based architecture combing the hardware and the software. This architecture involves two major parts. The first part is hardware design, which includes microcontroller, display part, communication module, and positioning system module. The second part is software design, which is a real-time interactive system that includes signal reception, position detection, and user workload assessment. Then, we use the interactive concept and interactive technology to construct the urban fashion advertising service model, and elaborate on its business model. Finally, we present sustainability development recommendations for the proposed service model.

Key words: urban intelligent fashion advertising service; sustainable development; wearable devices; interactive concept and interactive technology

1 Introduction

With the rapid development of microelectronics, computer technology and modern wireless communication technology, wearable devices have many new features, such as stronger computing power, larger storage space, higher data transmission^[1-2]. On the other hand, the types of sensors integrated in wearable devices are increasingly diversified, including gyroscopes, accelerometers, microphones, digital compasses and cameras. Based on these wearable sensors, a large number of perceptual applications are in the ascendant, which greatly facilitates people's daily life. Regular life also has a profound impact on people's living habits^[3].

Currently, the flexibility of wearable hardware devices and the integration of wearable devices and clothing have become one of the hot areas of science and technology companies and academic research in the 21st century. Human motion tracking based on wearable inertial sensors has the advantages of convenient wearing, unrestricted motion space and low cost. It has found wide applications in medical treatment, sports, human-machine interaction, virtual reality and other fields^[4]. To realize initial design and experimental verification of wearable flexible electronics, Zhang et al proposes an electronic rapid preparation method based on "cutting and pasting"^[5]. In view of the current practical application of wearable technology, the safety of monitoring, the comfort of clothing and the safety of data. The status of the application and development of health monitoring equipment were summarized^[6]. According to the current research status of wearable devices in the field of textiles and apparels, Sun et al introduce the development history of wearable devices^[7].

In this intelligent era, wearable technology can be said to lead the clothing market into a new direction of development. With the improvement of modern people's personalized needs and quality of life, wearable devices will continue to develop in materials, practical value, data extraction and protection in the future.

Based on urban advertising, this paper studies wearable devices and technologies in the field of advertising, focusing on highlighting the personalized needs of different users for wearable devices, so as to realize. Now it has higher application value and commercial value, so that more users can benefit. A novel wearable devices called the urban intelligent fashion advertising (UIFA) is mobile information devices capable of supporting remote communication and intelligent interaction between terminals. In this paper, we explore the possible functions of such a wearable devices and will present the service-based architecture combing the hardware and the software. This architecture involves two major parts. The first part is hardware design, which includes microcontroller, display part, communication module, and positioning system module. The second part is software design, which is a real-time interactive system that includes signal reception, position detection, and user workload assessment. Then, we use the interactive concept and interactive technology^[8] to construct the urban fashion advertising service model, and elaborate on its business model. Finally, we present sustainability development recommendations for the proposed service model.

The rest of the paper is organized as follows. In Section II, we will discuss the interactions of the UIFA. In Section III, the design of a prototype of the wearable device of UIFA will be presented. The detailed design of the service-based network architecture of the UIFA will be introduced in Section III, including hardware design and software design. We use the interactive concept and interactive technology to construct the urban fashion advertising service model in Section IV. We present sustainability development recommendations for the proposed model in Section V. Section VI contains the conclusion.

2 Interactions of UIFA

We design a wearable devices system of UIFA, which can support interaction between different terminals (Fig.1). Assume that UIFA_1 and its owner User_1 are situated in environment 1, and UIFA_2 and its owner User_2 are situated in environment 2. This simple scenario may give rise to different types of possible interactions. First of all, the UIFA can interact with its owner through its intelligent interface. The

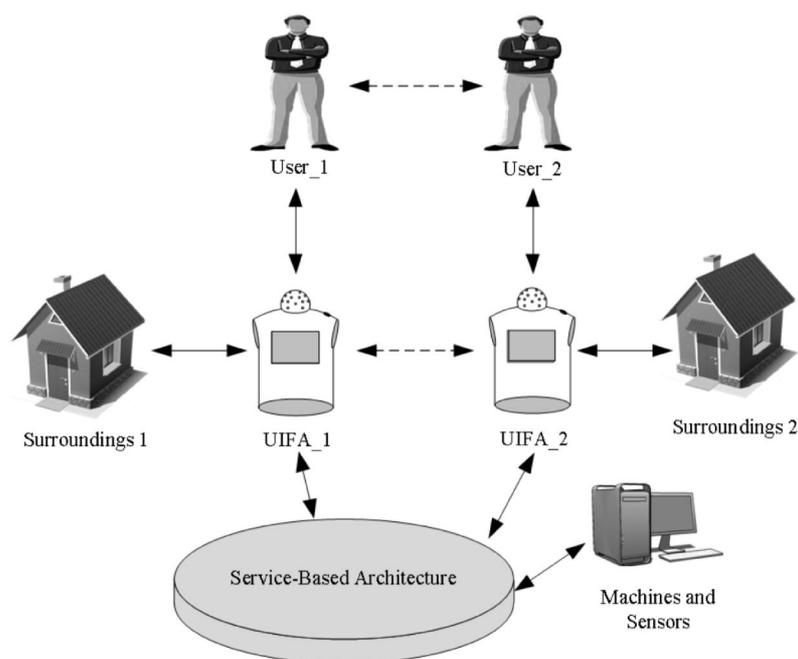


Fig.1 Types of interactions supported by the system

UIFA can be equipped with different sensors to detect its owners intentions. The UIFA can also express its operational state and feedback using its actuators. The interaction between the human and the environment can be observed and analyzed by the UIFA using various sensors.

In addition, the communication between different UIFAs allows them to exchange information and interact with each other. The human users can keep communication each other to keep UIFAs' actions unified. This process may proceed after the direct negotiation between the users or upon the satisfaction of certain agreed conditions. Moreover, under mutually accepted terms, a user may explore the environment where another remote robot is situated. Finally, robots can be used to control other networked machines or be used to reveal the state of those machines.

Apart from the capability of supporting the interaction between robots, humans, and networked machines, contextual information processing is also a key technology incorporated into our distributed service architecture. By making the applications context-aware, we can increase the amount of situational information made available to robots. Recent development in the area of context-awareness computing, which can help us to identify important types of context information. Such development may include (1) system environment, such as network capability, connectivity, and cost of computation; (2) user environment, such as location, identity of nearby people, and social situation; (3) physical environment, such as lighting, temperature, and noise level.

3 UIFA design

We have developed a wearable device of UIFA prototype by integrating various microcontroller, display part, communication module, and positioning system module (Fig.2). The wearable device is characterized by properties desirable for mobile devices, such as, small in size, light in weight, and flexible in functionality.

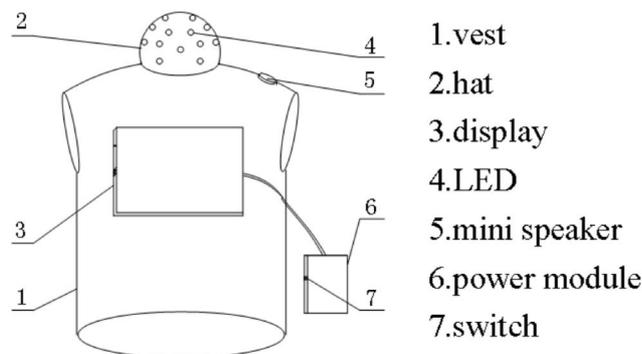


Fig.2 The model of UIFA

The hardware of UIFA is consists of ARM9 core control panel, display screen, mini voice box, GPS positioning, GPRS, power module, PC. The ARM9 hardware circuits plays a central role in the whole circuit. The PC sent the signal to the intelligent GPRS through the wireless network, then GPRS module sent the signal to the core Dashboard by wireless network. Then the core Dashboard control the screen to display the advertisement. At the same time, the core Dashboard control the mini voice box to work. When the user starts to work, start the GPS positioning system and transmit it's data to the core Dashboard. At last, after the controller processing. The data via GPRS transmit back to the PC.

The software of UIFA is divided into two parts: PC, the ARM9 core Dashboard. The ARM9 core

Dashboard obtained the GPS positioning of latitude and longitude by GPRS and then transmitted the acquired information to the PC's LabVIEW program through the network communication. And the LabVIEW program did the data comparison and made a determination. After that, the correct information is updated to the user workload database in real-time and the LabVIEW program sent the data through the network to user workload assessment system. According to the information from the user workload assessment system, the user can obtain the corresponding reward.

4 Urban fashion advertising service model

4.1 The relationship between interactive design and UIFA

Overlooking today's social trends, the integration of science and art is a major trend. The whole society has stepped into the information age, and the digital orientation permeates all aspects of social life. Based on the concept and technology of interactive design, the traditional advertising methods are studied. With the support of clothing, this paper aims to design a kind of interactive intelligent advertising clothing which is beneficial to ordinary propagandists and meets the interests of advertisers. Through the concept of interactive design and interactive induction technology, the intelligent interactive design of advertising clothing is carried out. In this way, we can improve the salary of ordinary propaganda personnel and bring rich economic benefits to advertisers.

The combination of interactive design and intelligent clothing is the necessity of their development. The development of interactive design is bound to be more and more closely related to people's life, and the intelligence of clothing is also one of the direction of clothing development and evolution. The intelligence of advertising clothing cannot be without the support of interactive technology and the integration of interactive design thinking. Therefore, interactive design and advertising intelligent clothing are mutually promoting relationship, the combination of the two is the inevitable development of information society.

4.2 The UIFA service model(Fig.3)

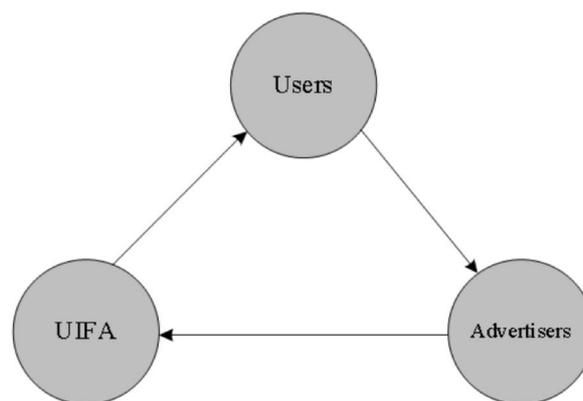


Fig.3 The relationship of the UIFA service model

(1)Target users. The target users can be the existing traditional flyers in the market, the staff in the crowded commercial area, or even anyone who has free time to move freely in the crowded area. In this way, the target users can move in the crowd, transmit the advertising information to the audience around them, and have a great ability of information coverage.

(2)Work base station. The function of the work base station is mainly composed of three parts: one is to store, distribute and recycle the smart advertising clothing; the other is to handle the work card free of

charge and register the user information and work information; the third is to check the completeness of the smart advertising clothing for the convenience of the user; the fourth is to replace the battery of the smart advertising clothing for the convenience of the user's continuous use; the fifth is to transfer the sorted user work data back to work Backstage.

(3)Work background. Enable the advertising push system to push the established advertising content to the intelligent advertising clothing worn by the target user group, so that it can normally transmit the advertising information According to the user work data transmitted back from the work base station, the user work evaluation system determines the workload from three dimensions: effective time t , effective activity radius d and effective activity density m , and transmits the determined level data to the user salary settlement system, which is convenient for the user to settle the salary.

(4)Settlement center. The settlement center can be set up in cooperation with large supermarkets and banks, or the settlement center of intelligent advertising clothing operators can be set up in convenient traffic areas. According to the data provided by the work background, pay the corresponding salary to the user. The center can be equipped with corresponding query service computers to facilitate users to query working data by themselves.

(5)Advertisers. The advertiser pays the corresponding advertising fee to the intelligent advertising clothing operator according to their own needs, and the operator will launch the corresponding number of intelligent advertising clothing according to the specific requirements of the customer for regular and fixed-point publicity At the same time, the publicity effect will be fed back to customers.

5 Sustainability development recommendations

5.1 Precise positioning and pushing content

In the design, we should not only ensure the precise positioning of users of UIFA, but also ensure that the signals that can be pushed cannot be lost. In terms of accuracy, the premise to improve the accuracy of the device is to improve the algorithm of receiving and optimizing the software of the built-in receiver for the advertising content; secondly, improve the compatibility between the devices in the perception layer, unify the data format of the perception information, and ensure the accuracy in the process of data transmission; finally, make full use of the technical advantages of self optimization of big data, constantly update the database, and communicate with. Through close real-time monitoring and real-time data analysis, the deviation caused by non professional quantity can be eliminated, and the real restoration of users' working conditions and advertising content can be realized. Under the premise of ensuring the accuracy, we should pay more attention to the actual working environment of users and realize the perfect combination of human body and equipment.

5.2 Big data and cloud storage technology

Each intelligent advertising clothing is a unique IP address, can become an Internet portal. When users wear smart advertising clothing in the crowd, these internet portals are everywhere. In this way, big data is obviously the core element of its operation.

To build an integrated advertising management service system with intelligent wearable devices as the core of advertising content active promotion needs the support of big data and cloud storage technology at the network level. Without the high-speed ubiquitous information network advertising management service system, there will be no source. First of all, we should make full use of the algorithm recognition of big data and the data mining and analysis system based on cloud computing to process the data transmitted from

intelligent wearable devices to the cloud in real time, transform the data into visual information, and provide the basis for the analysis of the work background. Secondly, the high-speed transmission of data, image and video needs a high-speed, low delay, large capacity network environment and communication environment.

5.3 Perfect integrated service

Data collection is only the first step. Professional data analysis and integrated services are the real part of creating value for customers. Therefore, the value of products should be embedded in the demand ecosystem of consumers to achieve customized services. In the future, intelligent wearable devices should not only ensure smooth device experience, but also realize complete supporting services, so that they can be transformed from indispensable products into essential daily necessities.

After advertisers find problems in advertising methods through intelligent advertising clothing feedback, they need follow-up integrated services. This requires intelligent advertising clothing and advertisers to find their own position in the vertical segmentation field and form characteristic services. The professional integrated service embedded in the consumer demand ecosystem can form stronger customer stickiness. Therefore, intelligent advertising clothing and advertisers form a joint force, integrate the advertising value chain, cooperate with users, and achieve integrated services.

5.4 Localized business model

For advertising intelligent wearable devices, it is not enough to only sell devices. More importantly, it is necessary to explore new business models through big data of various industries, which involves the selection of development models by intelligent advertising clothing manufacturers and advertisers, and is also the biggest problem for intelligent wearable enterprises. Therefore, in the process of continuously subdividing the local market, it is the driving force for the development of smart advertising clothing to gradually explore a win-win business model of users, smart advertising clothing operators and advertisers.

6 Conclusion

In this paper, we explore the possible functions of such a wearable devices and will present the service-based architecture combing the hardware and the software. This architecture involves two major parts. The first part is hardware design, which includes microcontroller, display part, communication module, and positioning system module. The second part is software design, which is a real-time interactive system that includes signal reception, position detection, and user workload assessment. Then, we use the interactive concept and interactive technology to construct the urban fashion advertising service model, and elaborate on its business model. Finally, we present sustainability development recommendations for the proposed service model.

In a word, using the thought of internet service to serve users is the future development thought of intelligent wearable devices and the direction of every manufacturer's efforts. Although the popularity of intelligent wearable devices will take a long time, with the performance advantages of intelligent wearable devices such as portability and cloud interconnection becoming more and more obvious, the diversified advertising information and the accuracy of transmission have an increasing demand for people, and the perfect combination of the two will undoubtedly become the driving force for the explosive growth of intelligent wearable device market.

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References:

- [1]Kim J., Campbell A. S., et al, Wearable biosensors for healthcare monitoring, *Nature Biotechnology*, 2019, 37, 389–406.
- [2]Begley M. R., Gianola D. S., Ray T. R., Bridging functional nanocomposites to robust macroscale devices. *Science*, 2019, 364 (6447), eaav4299.
- [3]Liu Q., Li J.S., Yu Y., Cai Z.P., Zhou T.Q., Data security and privacy preserving techniques for wearable devices:a Survey. *Journal of Computer Research Development*, 2018, 55(1), 14–29.
- [4]Zhang J. H., He B. Y., Yang X. S., Zhang W. A., A Review on Wearable Inertial Sensor Based Human Motion Tracking. *Acta Automatica Sinica*, 2019, 45(8), 1439–1454.
- [5]Yao X., Yu Q. B., Han Z. R., Xie H. Q., Duan W. J., Qin Q., Kinetic and experimental characterizations of biomass pyrolysis in granulated blast furnace slag, *International Journal of Hydrogen Energy*, 2018, 43(19), 9246–9253.
- [6]Sun Y., Fan J., Wang L., Liu Y., Research progress of wearable technology in textiles and apparels. *Journal of Textile Research*, 2018, 39 (12), 131–138.
- [7]Liu, Y. N., Cong, S., Research progress of wearable technology in human health monitoring, *Journal of Textile Research*, 2018, 39(10), 175–179.
- [8]Wang W., Nagi Y., Fang Y., Maekawa M., Interactive technology embedded in fashion emotional design: Case study on interactive clothing for couples. *International Journal of Clothing Science and Technology*, 2018, 30(3), 302–319.

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