Personalized Clothing Design Support System for Special Crowds Based on Artificial Intelligence Technology

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Abstract. In today’s society, people’s demand for personalized clothing is increasing, and they are increasingly pursuing traditional elements. Therefore, many fashion designers will incorporate folk elements into the traditional clothing design concepts to meet this demand. So a kind of computer technology Personalized auxiliary design software is produced. The function of this software is to use the MVC architecture to create system function modules, and then use the Kinect-based three-dimensional scanning system to model the human body, so as to clearly understand and obtain human body models with different characteristics. Take the folk art elements of opera as an example, integrate the opera elements into the costume design and save it in the database of the system. Under the action of the virtual algorithm, the personalized costume is matched with the human body model, which completes the costume design. Personalized design, and better design results can be obtained through this auxiliary design software.

Keywords: Personalization, Folk Art Elements, Auxiliary Design Software,Mvc Architecture, Kinect, Virtual Stitching Algorithm

1. Introduction
The continuous development of our country's clothing industry is due to the rapid development of social economy and the improvement of people's quality of life, but this has also intensified competition in the clothing market. Because traditional clothing can no longer satisfy the public's pursuit of individualization, the clothing industry must follow the trend of the times and gradually move closer to personalized clothing if it wants to continue to develop. Therefore, the clothing industry has begun to introduce traditional Chinese cultural elements, incorporate folk elements into clothing design, and continue to innovate to meet the psychological requirements of the masses. Nowadays, there are many examples of incorporating folk art into clothing, such as the paper-cutting folk art of northern Shaanxi, which can be made into lanterns and window grilles. The characteristics of paper-cutting are hollowing out, and the pattern is bright. The introduction of paper-cutting in the clothing design makes the clothing multi-element, laying the foundation for the clothing industry to shift from popularization to individualization. China’s paper-cutting culture has a long history. It is a Central Plains culture that comes from the folks. Adding it to the clothing design not only enhances the formal beauty of clothing, but also enriches the diversity of clothing, and at the same time...
demonstrates my country’s extensive and profound traditional culture. Traditional clothing design methods require a lot of manpower and cost, and are not suitable for personalized clothing design. Computer-aided design software provides more possibilities for clothing companies to innovate, and can reduce design costs [1]. In addition, it can satisfy Consumer demand for personalized clothing. What’s more, the auxiliary design software will also issue various fitting systems, through which consumers can know whether the clothes are suitable and see the overall dressing effect. Therefore, this article describes the design, structure, and application process of the software [2].

2. System requirement analysis
The survey shows that when consumers choose clothes, they first consider clothes design and experience, which is the so-called personalization. Therefore, when designing personalized clothing software, the most important thing is to increase the virtual fitting function. When consumers preview clothing online, they can try it on through this system. And they can experience the personality and advantages of the clothing more vividly, and see the overall effect of the clothing. If the consumer feels that the dressing effect is better, then they will join the shopping cart and buy. To complete this virtual fitting process, users have to upload their own photos to the system and the system will extract the user’s individual characteristics to facilitate subsequent fittings. After that, the user will try on the favorite clothes [3]. After the dressing effect, you can put it in the shopping cart if you are satisfied, and then buy it. If you are not satisfied, you can withdraw it.

3. System function module design
The system function modules of the auxiliary design software mainly include the human body model extraction module, virtual fitting module, shopping cart module, data management module, user information management and other modules. The functions of these modules are different. Mannequin extraction is to collect photos uploaded by users through Kinect, which lays the foundation for subsequent virtual fitting. There is a fixed human body model in the system. When users do not want to upload their own photos, they can browse the database in the system to find and select a human body model that is more consistent with their own body shape. The function of the system management module is to maintain the system and management authority. The virtual fitting module introduces different folk elements into clothing, allowing customers to try on and check the effect of the fitting, which is the key to the process of fitting. The shopping cart is a way for consumers to pay for purchases [4]. Data management is the management of user information and the management of three-dimensional models and clothing layouts, as shown in figure 1.

![Diagram](image)

**Figure 1.** Software system function design

4. Overall system architecture design
For the overall architecture of the software, the MVC architecture needs to be introduced, which is mainly composed of models, views, and controllers. The model is mainly responsible for data processing and is an important channel for accessing the database. The model is an independent
system that announces its own state changes at all times; the view depends on the model, and access to the view needs to be realized through the model. The view needs to be registered and registered on the model. The model can pay attention to and obtain the view information in time, and query the database. The received data is displayed; the core bridge of the MVC architecture is the controller. Its workflow is to let the view and the model interact, and send the user's needs on the view to the model, and the model will also be fed back to the view. The controller plays a control role, controls the running process of the entire program, and is the event processing center. The role of MVC in personalized clothing software is to separate the business logic layer, data layer and presentation layer to complete the independent development of modules [5].

5. Kinect-based three-dimensional human body modeling
The three-dimensional human body scanning system includes a three-dimensional acquisition system, a hardware system and a point cloud data calibration system. The specific operation of this system is through three-dimensional human body scanning, the system obtains human body information, and after the information is collected, the human body data is obtained before processing the image. As shown in Figure 2 [6].

![Figure 2. Three-dimensional human body scan](attachment:image)

6. Clothing modeling
6.1. Clothing design
The most important thing in clothing modeling is to introduce folk elements. The designer introduced opera elements and paper-cut elements of northern Shanxi into the clothing design to highlight the folk elements and personalized design, breaking the traditional popular design format. When designing clothing, we should consider many aspects. The clothing is divided into multiple layers, and the calculated height value is used as the parameter point as the interface diagram of the clothing. The single-layer design of clothing needs to insert different clothing points. A specific algorithm is used to fit the pattern on the clothing to complete the multi-layered graphic. In order to enrich the clothing model, enrich the clothing model database, and improve the innovation of clothing software, in addition to introducing paper-cut elements and opera elements. It also introduces traditional architecture, cloth art, ethnic minority special patterns, shadow puppets and other folk art elements. As shown in Figure 5 [7].
The introduction of traditional folk art elements into clothing is an innovative design. Incorporating them into clothing not only greatly enhances the personalization of clothing, but also allows consumers to experience the charm of incorporating folk elements into clothing and improve the public’s appeal. The aesthetic ability also shows the exquisiteness of our traditional culture [8].

6.2. Virtual stitching algorithm design

Everyone has a different body shape. In order to let users know whether the clothes are suitable and get a better virtual fitting effect, the body shape and the clothes must be matched, that is, the size and shape of the clothes must change with the change of the human body model. Therefore, a virtual stitching algorithm design should be used, where virtual stitching is the key to checking whether the clothes are suitable. When the fusion distance value is less than the set value of the two points, the stitching points of different clothes are close to each other under the action of the stitching force, and the clothes are merged according to the geometric vertices, and the particles corresponding to the geometric vertices are merged. As shown in Figure 5 [9].

![Figure 5. Schematic diagram of sewing clothes](image)

Among them, fsew is suture force, which is the size of the vector formed by the suture points to determine the direction of the suture force. The calculation formula is:
Among them, \( f_{s ew} \) is composed of a function of \( \varepsilon X_{ab} \), shock stability factor \( \Delta A_a \) and air resistance-\( \tau V_a \), \( \delta \)——distance threshold, \( \varepsilon, c, \tau \)——constant, \( \Delta A_a \)——corrected value of acceleration. \( X_{ab} = X_b - X_a \), and \( X_b \) and \( X_a \) represent the centroid coordinates of \( P_b \) and \( P_a \) in Figure 6.

7. Test results
Practice is the only criterion for testing truth. To know whether the above software design is reasonable and whether the test is feasible, we selected a girl with a height of 158 for testing, and the test proved that the software is feasible [10].

![Figure 6. Test results](image)

8. Conclusion
Design a personalized clothing design system from the perspective of hardware and software, and make clothing design more convenient through MVC architecture and Kinect. Incorporating folk elements into clothing design can speed up the transition process of the clothing industry to individualization. The system combines personalized clothing elements with virtual fittings, allowing consumers to experience the effects of fittings in real life, thereby enhancing the service capabilities of businesses. Because personalized clothing design software is hindered in technology and knowledge to a certain extent, there are still many defects in software design. It is necessary to invest energy and talents in software design, and continue to develop and improve the software system.

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