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Designing Compression Sportswear in Cad Systems

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Abstract: The article provides information about computer-aided design systems, their capabilities, design features of compression sportswear, anthropometric indicators of athletes, 3D design capabilities and assessment of clothing fit on a virtual mannequin. Also, this study explores the application of computer-aided design (CAD) systems in creating compression sportswear, emphasizing their role in automating design processes and enhancing garment precision. It examines key anthropometric considerations, the integration of 3D modeling, and virtual fit assessments on mannequins. The findings suggest that while CAD systems improve efficiency and accuracy, further refinement in virtual modeling capabilities is essential to optimize material properties and enhance consumer experience. The study highlights future directions for CAD development in textile engineering.

Keywords: automated design systems, compression sportswear, virtual mannequin, clothing fit, 3D design.

Introduction

Modern technical support for computer-aided clothing design systems makes it possible to automate almost all design stages. The choice of equipment and software depends on the goals, objectives and organization of production, the type of clothing and complexity of models, requirements for technological preparation of production design, and the qualifications of performers.

Computer-aided design systems in their full version allow you to automate the following processes: development of sketches of models; design and modeling; design patterns, obtaining derivative patterns; layout patterns; formation of technological sequence; development of a division of labor scheme; calculation of material consumption; cut planning; calculation of residual materials; preparation of a technical description of the model; drawing and cutting patterns; accounting raw materials (fabrics, fittings, cutting) and finished products; calculation of production costs and production planning.

CAD for clothing

Given the current direction of development of each CAD company, there are many opportunities for in-depth research in three areas, but this is more difficult. But this is undoubtedly the main direction of development of CAD for clothing. If this technology can really break through, it will bring a revolution to the garment industry and related fields. Modern computer-aided design systems can create both 2D and 3D patterns. In most cases, the work is done in 2D, since when designing clothes from a material in 2D, this is the most optimal way to obtain drawings of parts.

Modern CAD systems are developing a three-dimensional design that allows you to wear complex types of clothing in accordance with a virtual human physique. [1] With the development of three-dimensional computer technologies, sewing CAD has also begun to include 3D modules for various purposes. Most modern CAD systems offer virtual outfits according to the color scheme of the material used. Systems implementing three-dimensional dressing include "Investronica", "Gerber", "Assyst", "Julivi", "DressingSim", "I-Designer", "Lectra", "Symcad". Many modern CAD systems have many three-dimensional media mannequins that can not only be rotated around an axis, resized, but also moved on a virtual podium. This can be called due to the fact that today almost all leading companies in the field of software development for the fashion industry have identified equipping with a three-dimensional mannequin dressing module as one of their main priorities.

Imitation of clothing pressure in modern CAD systems

As already noted, the most important factor in the development of comfortable and functional clothing is [2]. Today, basic CAD (Gerber Technology, Lectra,) has modules for 3D virtual modeling and checks the fit of clothes in 3D models of virtual shapes [3]. For these purposes, the air spaces, the silhouette of the clothing and the distribution of stretch in the virtual clothing are analyzed together to avoid checking the material [4].

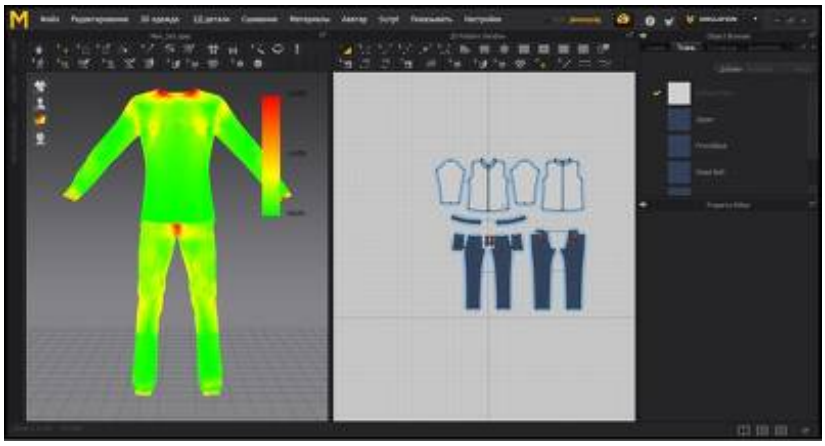

Figure 1. Pressure modeling in the Marvelous Designer program.

The method of direct determination of compression pressure is certainly preferable, but its implementation in existing systems is not supported by a reliable database and therefore can be considered approximate under these conditions.

In most cases, in virtual 3D scanning, the pressure is determined by the second method: the distribution of stresses in the material caused by the difference between the dimensional characteristics of the Avatar and the length of the corresponding parts of the clothing.

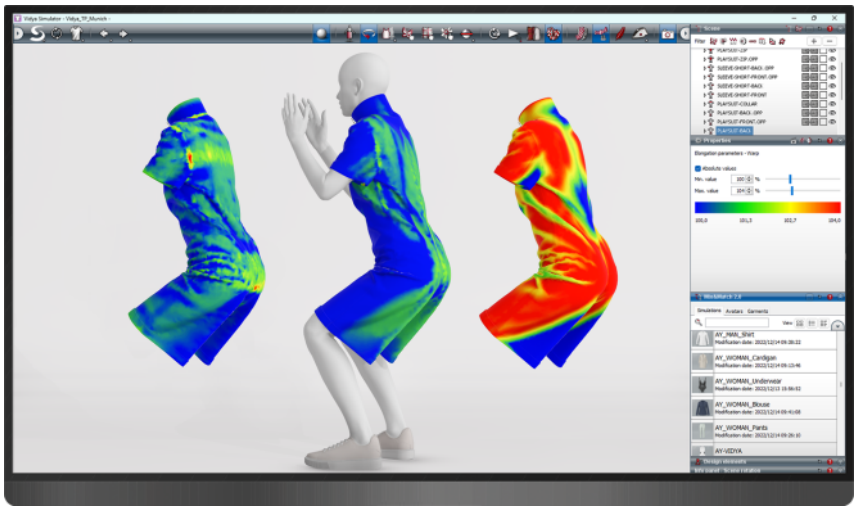

Figure 2. Pressure modeling in the 3D Vidya program, Assyst.

Of course, this approach is performed conditionally, since under stretchable materials, for example, fabric and knitwear, the resulting compression pressure will be different not only because of differences in properties, but also because of the different morphology of the layers and the sensitivity of their sections. The use of this method is possible only if the databases are pre-structured, including reliable relationships between the stretching of the material and the pressure exerted on various parts of the formation.

The compression pressure under clothing is closely related to the volume of air space in the figure-clothing system and its change during movement [5]. Thus, the fit of clothing and comfort under pressure play an important role in shaping the comfort and functionality of clothing, especially in the case of tight-fitting clothing. Despite the obvious prospects of 3D systems for virtual inspection and analysis of compression pressure, there are even more serious problems that need to be solved before they can be fully used.

Projection spaces and their distribution in the figure-clothing system are the main obstacle to pressure forecasting, and in the processes of virtual 3D scanning it is necessary to take into account three types of such spaces: constructive addition (from 2D drawings); dynamic increase (for freedom of movement) and increase depending on the properties of textile materials. However, these three aspects have not yet been developed in modern modeling models.

The two existing methods for determining pressure are not yet based on clearly accepted objective indices; they are for the most part intuitive and have no practical significance for consumers or designers in terms of predicting consumer feelings.

Conclusion

In conclusion, it can be said that the use of CAD in the design of complex types of clothing and clothing for professional athletes gives a good effect. In this case, the manufacturer's time is saved, and the accuracy of the construction of the designed product is high. The possibilities for the user will expand.

However, when designing compression clothing, the characteristics of the physical and mechanical properties of materials remain the weakest point for reproducing the actual behavior of materials on the figure due to the influence of size, shape and variety of clothing. One of the main problems is the insufficient accuracy of the results of virtual 3D simulation. 3D modeling systems must not only accurately predict the shape and location of clothing in a virtual form, but also accurately reproduce all the properties of textile materials. Most CAD systems have modules for selecting indicators of material properties necessary for correcting drawings, but the methods of testing samples of materials and the conditions of their manifestation in clothing can vary significantly.

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