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Computer Technology in Fashion Design and Product Development

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Abstract

The computer technologies have a crucial role not only in the processes of textile and fashion design and the related competitive business, but also in fashion design education. In the following text we briefly discuss several key steps during the fashion design. For each step discussed, the indispensable usage of various systems and methods is pointed out.

1. Introduction

Over the decades, computers and fashion have developed gradually, changed with time, taste and trend. The role of innovative computer technologies in the processes of textile and fashion design is one of the indispensable factors in successful and competitive business of textile and clothing manufacturers. The dynamics of changes in fashion trends and an increasing interest in the clothing market that will reflect a person's fashion identity creates a need for designers to express their creative potential in accordance with customer needs. The application of CAD systems and software packages intended for textile and fashion design with the three-dimensional visualization of a model significantly accelerates the development of new fashion collections, whereby the realistic presentation of a designer's idea is achieved. The analysis of design fit for the selected body type is thus made possible. Also anthropometrical measurements as basis for clothing construction became more precise, faster and efficient with use of modern 3D body scanning technology, encouraging individual approach in designing and creating unique garments or small made-to-measure collections.

2. Role of ICT in fashion design education

Although, most designers and fashion design colleges initially use traditional design methods, including hand drawing and manual flat pattern construction, cutting-edge education focuses on computer-aided methods of design. Computer-aided design (CAD) is the use of computer technology for the process of design and design-documentation. CAD may be used to design curves and figures in two-dimensional (2D) space; or curves, surfaces, and solids as three-dimensional (3D) objects. CAD allows designers to view designs of clothing on virtual models in different sizes and with application of various colors and textures, thus saving time by requiring fewer adjustments of prototypes and samples later. It is also possible to design textile products for other fields, like automotive and furniture industry, Fig. 1. Introducing this technological aspect can help students to understand designing process a lot better and to release their creativity to the maximum [1].

3. 3D Body Scanning

The application of the 3D body scanner has an increasing implementation in the field of body measurement for garment construction [2]. Beside the linear body measurements that are most commonly used data in the clothing industry, 3D scanning is used to obtain data on body shape, anthropometric relationships of individual body parts, deviations from the normal proportions and body posture characteristics [3,4]. In this manner, all relevant data necessary for Computer-aided design and modification of garment patterns according to the individual body anthropometric characteristics are determined. International standard ISO 20 685 has been developed to ensure the comparability of body measurements defined by ISO 7250 (Basic Human Body Measurements for Technological Design) and ISO 8559 (Garment Construction and Anthropometric Surveys-Body Dimensions) obtained using various 3D body scanners.

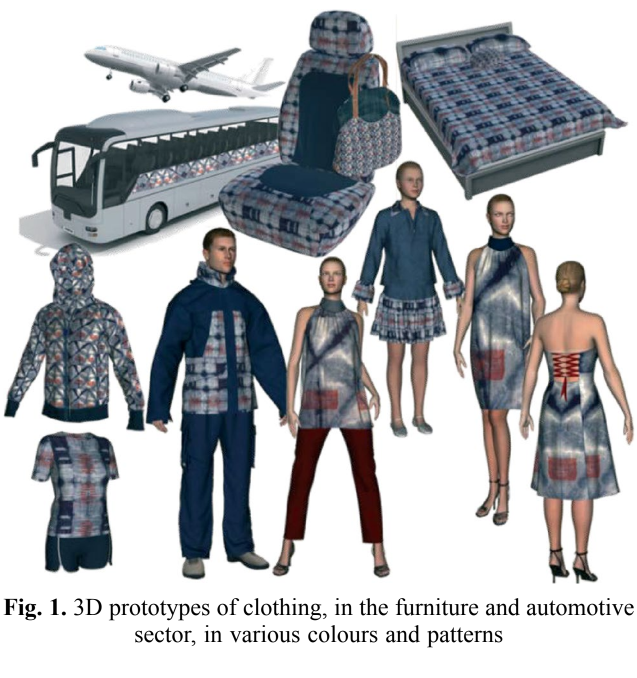

Fig. 1. 3D prototypes of clothing, in the furniture and automotive sector, in various colours and patterns

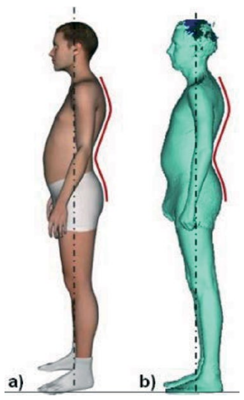

Fig. 2. Body posture adjustment: a) avatar, b) scanned body model

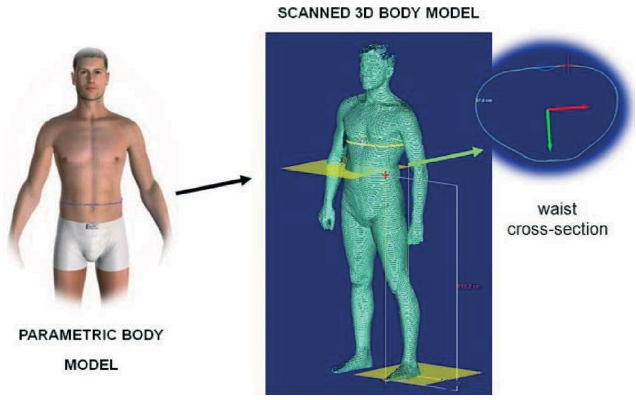

Fig. 3. Harmonization the waist girth and determination of the cross-section at the given position

However, for performing 3D garment simulations it is also necessary to ensure harmonization between the anthropometric measurements determined by 3D body scanner and the corresponding measures of an avatar in the CAD system, Fig. 2. and Fig. 3. Most existing computer programs for 3D virtual garment use parametric human models or avatars, with different number of body measurements that can be interactively customized [5].

The Vitus Smart 3D body scanner installed at University of Zagreb Faculty of Textile Technology allows users to scan an object in the area of 1,200 x 800 mm and 2100 mm in height. Scanning is performed by the system of 8 cameras and lasts 10 seconds, whereby 500,000 to 600,000 spatial coordinates of the scanned body are extracted. Data processing takes about 40 seconds [6]. Softwares ScanWorx or Anthroscan are used for human body measurements, necessary for the implementation in the computer program for the garment pattern alteration according to the individual characteristics. The use of a 3D scanners and accompanying computer program also enables precise 3D body model measurements in dynamic postures, Fig. 4., where the dimensions of the surface parts and segments volumes can be determined in order to achieve high garment fit and to ensure the comfort in dynamic conditions of use.

4. 3D flattening method for designing tight fit clothing

Tight-fit clothing items represent a specific group of products intended for wearing close to the body. When using 3D flattening method for 3D construction of tight-fit clothing it is necessary to take in consideration physical and mechanical properties of the material from which the clothing will be made. It requires comprehensive knowledge of fabric behaviour, tensile and shear properties, its behaviour on the body as well

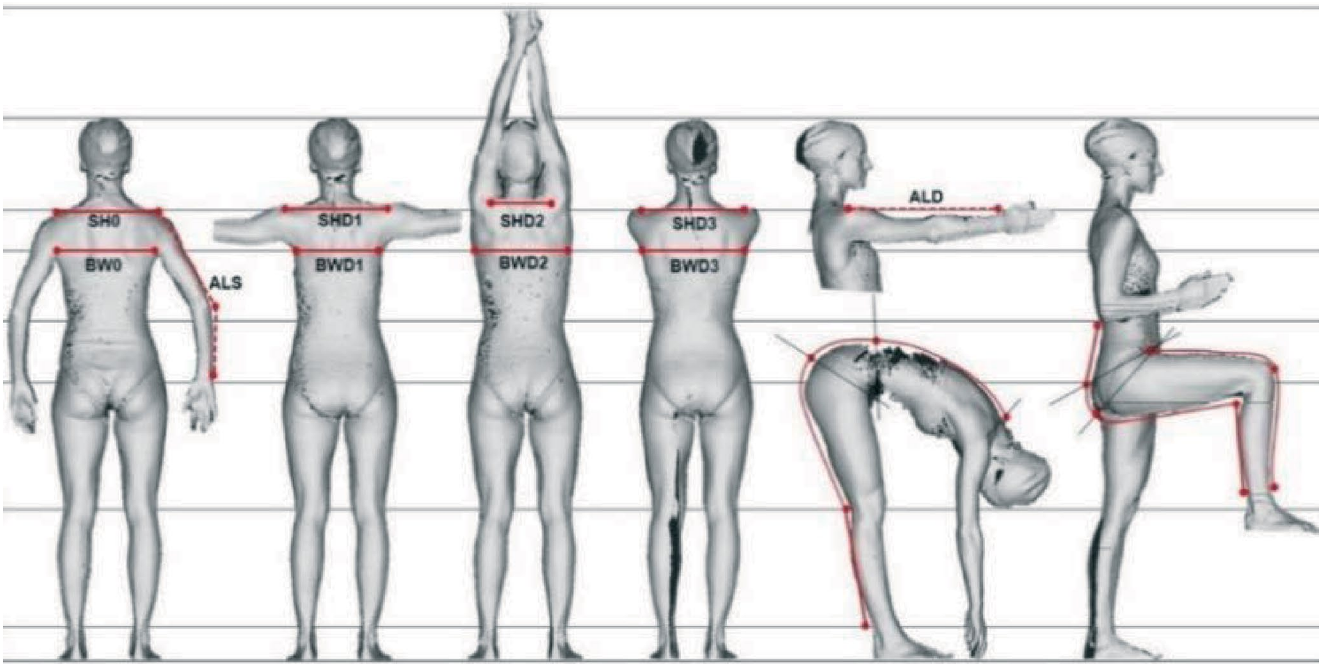

Fig. 4. Position of taken measurements in static and dynamic position

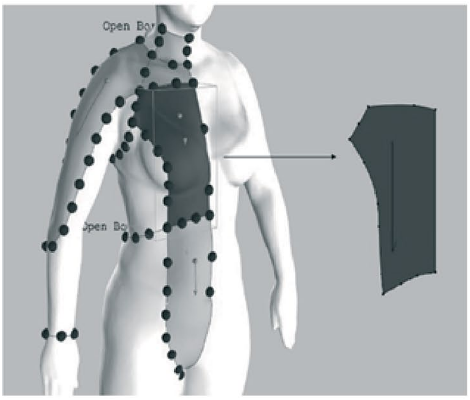

Fig. 5. Computer-based 3D clothing construction

Fig. 6. 3D simulation process

Fig. 7. Computer prototype

as constructional and functional requirements imposed on the clothing. Application of 3D flattening method for the construction of a female diving suit [7], involves drawing and creating pattern lines directly on the surface of a computer body model, separation of discrete 3D surfaces and transformation into 2D cutting parts, Fig. 5.

5. 3D simulation of model prototypes

Virtual garment simulation is the result of a large combination of techniques that have dramatically evolved during the last two decades [8]. Besides the mechanical models used within existing mechanical engineering for simulating deformable structures, many new challenges arise from versatile nature of textile fabrics. Therefore, garment simulation is based on the development of the efficient mechanical simulation models, which support the reproduction of the specific non-linear mechanical properties of textile materials. In addition, the garments interact strongly with the body, as well as with other garments layers. This requires the development of the advanced methods efficiently detecting the geometrical contacts constraining the behaviour of the fabric and integrated them into the mechanical model [9,10]. In order to verify the patterns developed by flattening method, 3D simulations of diving suit models have been performed with physical and mechanical properties of neoprene material applied to the patterns, Fig. 6 and 7.

Analysis of computer prototype showed positive assessment of 3D flattening method application for obtaining precise garment pattern suitable for production of a real prototype [11]. Material stretch analysis on computer prototype and verification of real garment prototype by professional female diver in conditions of use, confirmed that method enables development of functional tight-fit clothing.

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