

USE OF 3D GARMENT CONSTRUCTION AT TECHNOLOGY LESSONS ENGLISH

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Abstract

3D-systems, or systems of «spatial» construction, enable to describe models with spatial coordinates X, Y, Z, and are based on the use of engineering methods of second class construction. These systems are aimed at solving design problems of creating spatial geometric images of products, as they allow three-dimensional viewing of the product.

The basic data for CAD clothing are anthropometric data about the surface of the torso figures in the form of digital models, which, in turn, represent a topographic network of multiple points of intersection of two sections. As synthesis of the individual figure of the consumer is problematic due to small oscillatory movements of the body, the authors proposed a new version of the software and hardware complex that helps to obtain flat instantaneous images of complex spatial objects using photogrammetry methods and mirrors, a software package for the synthesis of digital models for flat images and a set of computer equipment.

Currently, experts of many scientific organizations are conducting research into the development of computer-based three-dimensional systems (MSUDT, SPSUTD, IvSPU). There are three main types of model parameterizing in three-dimensional systems:

- wire or wire-frame models;
- surface models when a surface is represented by a set of points that make up a solid shell;
- solid-body models of a three-dimensional object image.

In the garment industry, the first two types of three-dimensional models are mainly used, since on the display screen it is possible to obtain an image of the dummy frame, or products with an image of the main design lines. In progressive systems of this type attempts have been made to use three-dimensional visualization to reproduce the original vision of clothes. The design process in the 3D database system in this case includes the following design stages:

- first step – marking points that determine the boundary of the surface of the spatial shape of clothing;
- second step – defining the edges on the curves that determine the surface boundary;
- third step – select the sections that define the boundaries of the parts.

The boundaries of the part are defined as cubic curves in the transformed space, where the first two coordinates are the parameters of the surface of the human body, and the third coordinate is the degree of joining at the marked points.

The development of CAD clothes on the basis of three-dimensional anthropometric database is focused on the implementation of design work without the manufacture of intermediate layouts and product samples by obtaining accurate designs of clothing parts that ensure anthropometric compliance with any figures.

This made it necessary to develop adapted patterns of clothing models, taking into account information about the external image of the individual consumer by using computer-aided design. For this purpose, appropriate databases of groups of visually similar figures have been created, in which the external image of the consumer consists of the main dimensions of the figure, features of the physique, anthropological parameters of the head, hair color, eyes, complexion, psychophysiological and social features of a particular person.

At the same time, the elimination of the limitations of the 2D method has made it competitive with the 3D method, as it employs engineering design methods and develops new technologies for the design and manufacture of clothing without pre-fitting method through creating precise models of the surface of the torso of the customer, based on the integration of the two production methods

(industrial methods of making garments tailored to the individual characteristics of a particular user) using the latest advances in computing technology.

Three-dimensional design systems are distinguished by the type of surface model of the projected object.

There are roughly three types of models: solid, polygon, and NURBS surface model.

Specialized 3D-CAD systems are divided into the so-called «Deployers» and «Dressers».

In «Deploy» CAD 3D-technologies are applied before the stage of two-dimensional modeling. CAD of this class enables you to design the shape of the product in three-dimensional space, and then get the sweep of the product on a plane a flat pattern for further transformation.

In «Dress» CAD 3D-technologies are used after the stage of two-dimensional modeling. They are meant to design flat patterns of the product by traditional methods, then to «assemble» them and to «dress» a virtual dummy in order to check the cut and the fit of the garment and to make changes to the patterns.

CAD classification by the degree of parameterization determines the ability of a system to describe and store the design process in the form of a set of parameters in order to reproduce it automatically at new parameter values.

Parametric CAD systems enable you to develop algorithms for construction and conversion of structural drawings omitting the traditional process of graduation.

In non-parametric CAD design objects are described with the help of digitizers using computer graphics methods, which copy the actions of the designer during manual design. Pattern development and editing are carried out so that information is presented in the form that is natural for the designer. Archive databases of design objects (sets of patterns) are stored as coordinates of reference points, and each part is stored separately, which, of course, takes a large amount of memory resources of the computer. Among the non-parametric systems they include «STAPRI» and others.

Combined CAD systems are a combination of parametric and non-parametric systems. By the degree of user access to design parameters all combined CAD systems are classified into 3 types:

- with limited access;
- with full access at individual stages of design;
- with full access at all stages of design.

Combined systems of the first type with limited user access to design parameters are based on a nonparametric approach and offer the user ready-made design algorithms with the possibility to change parameters («EleandrCAD», Russia; «Lectra», France).

Combined CAD of the second type with full access at separate design stages have a clear division into subsystems depending on the design stage, in this case some subsystems have full or partial parametrization («Comtense», Russia; «Gerber», USA; «Investronica», Spain; «Optitex», Israel; «PADsystem», Canada; "Реликт", Russia).

Combined systems of the third type with full access to design parameters allow the user to enable the recording mode of the algorithm and to determine its parameters at any stage of product design. Such systems include CAD «Ассоль» (Russia) and «Грация» (Ukraine).

Today, ITC tools are used while teaching general education subjects at almost all schools. Using the technology of 3D garment construction in class not only enlivens the learning process, but also develops students' professional competence, helps to organize pair work and group work effectively, to carry out project activities with gifted students, to help them create their own collections. 3D design lessons have practical results; they are interesting to the modern generation. The first experiments of the introduction of this technology into the learning process have yielded positive results.

On March 27, 2017, four model technology lessons for seventh-grade students were held in workshops and classrooms of Moscow College of Automation and Information Technologies № 20. In the information class, students mastered the computer program «Compass-3D», creating real-world details. Technology teachers, foremen and teachers of the College met with specialists of the

educational complex «Southwest». The foreman of vocational training demonstrated to the model lesson participants the possibility of studying sewing in the workshop of the College. Students and teachers were given a task to design a pocket for an office dress, and it was necessary to understand exactly where to place this pocket, that requires design thinking.

On September 27, 2017 the practice-oriented seminar «3D modeling Possibilities in development of pupils' technical creativity» was held at MAEI «Specialized Secondary school №27» in Stary Oskol. The participants shared their experience of teaching children 3D modelling. After the discussion, the participants attended an extra lesson on 3D design, where they got acquainted with students' achievements in modeling.

On December, 13 2017 the II city meeting of the methodology association of teachers in clothes modelling and design was held in Khabarovsk Municipal Autonomous Institution of Preschool Education «Otrada». The theme of the meeting was «Innovative approach to teaching children tailoring»

We have developed a program for students «3D modeling clothes» (36 classroom hours).

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