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PROCESSING OF COTTON, TEXTILE AND LIGHT INDUSTRY

INFORMATION MODULES FOR AUTOMATION OF THE PROCESS OF FORMING THE STRUCTURE OF INDUSTRIAL COLLECTION OF WOMEN'S CLOTHING

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Abstract: The article discusses the issues of developing information and methodological support for the process of forming an assortment of an industrial collection of women's clothing, taking into account the characteristics of typical figures of various weight and height groups. It is possible to create preferred models and produce garments for figures of various weight and height groups that are not provided by the current range of women's clothing using a basic design developed for average weight and height. The process of transforming the graphic solution of clothing models is carried out by formalizing the search for compositional and constructive solutions, taking into account the accepted geometric shapes of standard figures. To form the structure of assortment collections, based on a study of a large number of analogue models and analogue designs of clothing models based on nominal and quantitative characteristics, a systematized database of geometric patterns of typical divisions and design parameters of the main parts of a woman's dress was formed.

Keywords: women's clothing, design and compositional solution, collection formation, product range, search for graphic schemes, typical figures.

The modern market provides consumers with a wide selection of sewing products. When choosing a product, the consumer is guided by the available size chart and the presented product range. At the same time, industrial design produces a product for average height and average fullness due to the labor-intensive process of developing patterns for all available standard figures in the presented standards. It is known that women of different weight and height groups have difficulty choosing fashionable clothes for themselves [1-3].

When creating promising clothing collections, the appearance of the model is determined relative to the conditionally ideal (fashionable) human figure, which is set by artists - fashion designers in sketches and advertising projects and is determined by the artistic directions of promising clothing collections. Conventionally, the ideal figure corresponding to modern standards, according to experts, is determined by the sizes 176-88-92 and 182-92-96 [4,5]. The parameters of the selected figures correspond to the dimensional characteristics of typical figures of the first

full group and tall. Consequently, the compositional and structural elements of fashionable clothing are determined by the proportions of a fashionable figure. The development of designs for fashion products for other standard figures of varying stature and stature (SFVSS) requires adjustment of the compositional and design solutions depending on the type and characteristics of the figure.

The widespread use of digital technologies in clothing production allows the production of customized products focused on the needs of the modern consumer [5-8]. In automated systems, chains of algorithms have been created, including the construction of figure outlines, technical sketches of the product combined with the figure outline, and the development of the product design with a clearly established relationship between their parameters. A method has been proposed for formalizing information on recognizing the design and compositional characteristics of a model, providing information interconnection at the stages of forming an artistic and technical sketch of a model [8], a method of morphological analysis for synthesizing models of women's dresses based on compositional and constructive solutions, focused on adjacent sizes, allowing to structure the process formation of an assortment of clothing [7]. At the same time, the issue of solving the problem of formalizing the process of forming an assortment collection of women's clothing, covering various height and weight groups based on a basic design developed for average weight and height, requires research.

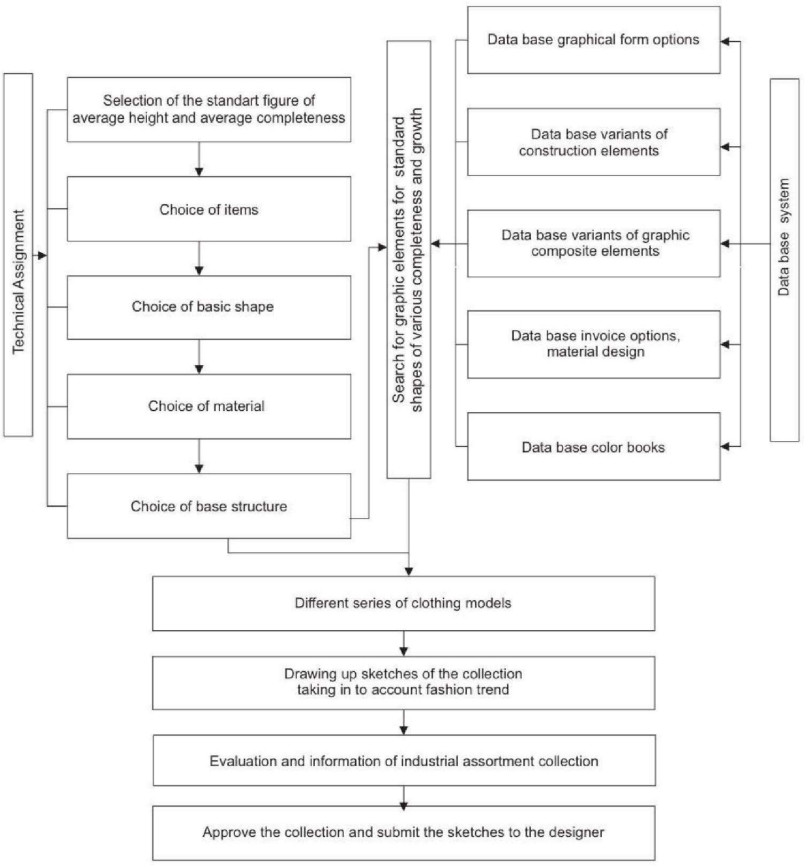

Figure 1. Block diagram of the organization of information modules of the database of the process of forming the structure of assortment collections

The purpose of the work is to develop a structure of information and methodological support for formalizing the process of automated formation of an assortment of women's clothing, taking into account the characteristics of typical figures of various weight and height groups at the initial stages of design. The object chosen is the process of forming an assortment collection of women's dresses for consumers in the mass market segment. Obtaining harmonious models of women's dresses using mixed fiber materials requires determining methods for obtaining the desired shapes and methods of processing products.

Expanding the possibilities of creating harmonious models at the stage of the creative process for SFVSS through the development of a computer-aided design system involves the creation of information modules for converting geometric solutions of the proposed fashionable clothing model based on the selected silhouette shape of the basic design. A block diagram of the organizational structure of the database for the process of forming assortment collections, taking into account the features of SFVSS, is shown in Figure 1.

The algorithm for forming the structure of assortment collections, which involves transforming the graphic solution of a clothing sample taking into account the peculiarities of SFVSS, includes modules of sketching processes with the possibility of using expert recommendations, intelligent decision support, and artificial intelligence technologies [9,10]. An intelligent module in computer-aided design is based on a technique for coordinating the artistic design of a product with the parameters of the SFVSS. The solution to this problem is based on the development of methods that make it possible to “recognize” graphical solutions of models for SFVSS. The implementation of recognition methods is carried out by expert knowledge that establishes visual and graphic analogies of figurative content and graphic display of a clothing model. When forming the structure of assortment collections, allowing to take into account various weight and height groups, it is necessary to take into account two components: specifying a clothing model for a fashionable figure and specifying an outline of typical figures. The initial information for graphic displays of clothing models is the contour of the figure, which provides illustrativeness, graphic displays and dimensional characteristics of SFVSS, which provide the information aspect of specifying a clothing model [11].

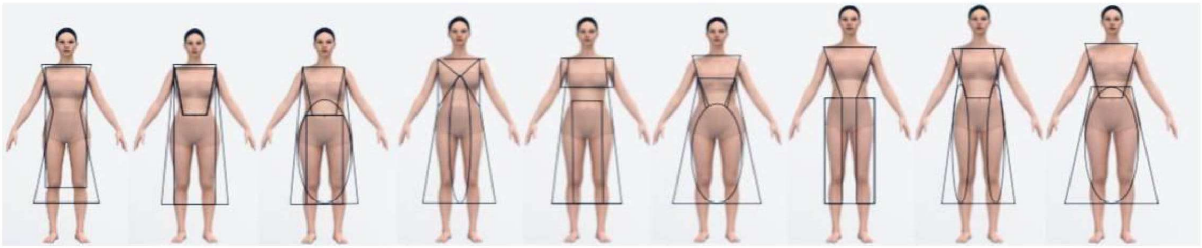

Figure 2. Development of geometric shapes of the product for the SFVSS figure

There are known methods for developing harmonious forms of models for standard and individual figures, in which a stylized sketch is adapted for a human figure by correcting the vertical and horizontal parameters of the sketch using a proportioning grid based on an A-rhombus [12], based on the calculation of the slimness coefficient of an individual figure, defined as the ratio of the transverse

diameter of the hips to the height and selection of the appropriate basic geometric silhouette shape of the model, as well as the proportioning of the shapes of clothing models into typical and individual female figures based on the Fibonacci number series [13], a method of geometric harmonization of the shape of a suit based on the additive Fibonacci and Luc series [14], as well as a complex proportioning system based on the A-rhombus and the Hambridge rectangle [15]. In this work, using the above methods of creating harmonious clothing models for various types of figures, a database of basic preferred geometric shapes of products was generated (Fig. 2).

To create harmonious models for various SFVSS based on the proposed fashionable shape, at the stage of the creative process, it is necessary to solve the problem of optimizing the design solutions of the model depending on the parameters of the basic design of the selected silhouette shape. To identify typical basic designs and design solutions for models, based on a study of a large number of analogue models and analogue designs based on nominal and quantitative characteristics, a database of geometric patterns of typical divisions and design parameters of the main parts of a woman's dress has been generated. At the same time, minimum boundaries for the width of basic structures are established at the horizontal level of the hip line for a large full group.

The main initial information for the formation of the design process for an assortment of women's clothing is the determination of the basic shape of the product and the basic design corresponding to it. The formation of a sketch based on a given artistic representation of a clothing model based on the selected basic design is determined by the connection between the graphic elements of compositional and design solutions and the outline of the figure for average height and average fullness. The formation of assortment collections of products, taking into account the characteristics of SFVSS, changes the constructive and decorative solution of the model in terms of the size of the outline of the figure and the parameters of geometric shapes, while maintaining the ideological concept of the collection. The basic shape of the model is adapted for SFVSS by adjusting the vertical and horizontal parameters of the model sketch. The preferred position of the projected levels of the bottom line of products, sleeve divisions, yokes, undercuts, decorative details, etc. is determined.

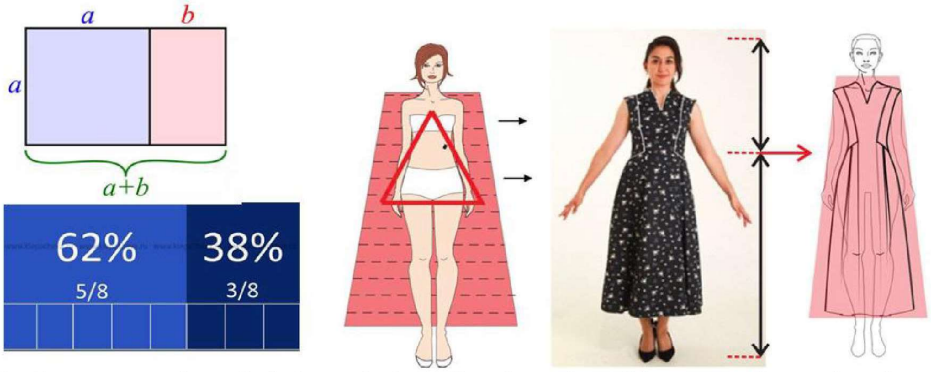

Figure 3. An example of determining the levels of harmonious horizontals based on the Fibonacci number series

The levels of harmonious horizontal lines for various height groups and the value of increases along the hip line are determined in accordance with the fullness group. Using the rules for searching for the necessary graphic solutions at addresses that will have the best combination in the designed model, a graphic structure of the proportional model range of the collection is obtained. Based on an assessment of the resulting graphic structures of the products, the designer develops the collection taking into account fashion trends. In accordance with the proposed approach to forming a collection assortment based on a basic model, taking into account the features of SFVSS, a base of elements that make up the graphic solution of a women's dress has been formed. Based on the Fibonacci number series (Fig. 3), relative to the length of the base model product, the levels of harmonious horizontal lines for various height groups were determined. The graphic design of the artistic design of women's dress models for SFVSS is presented in Figure 4.

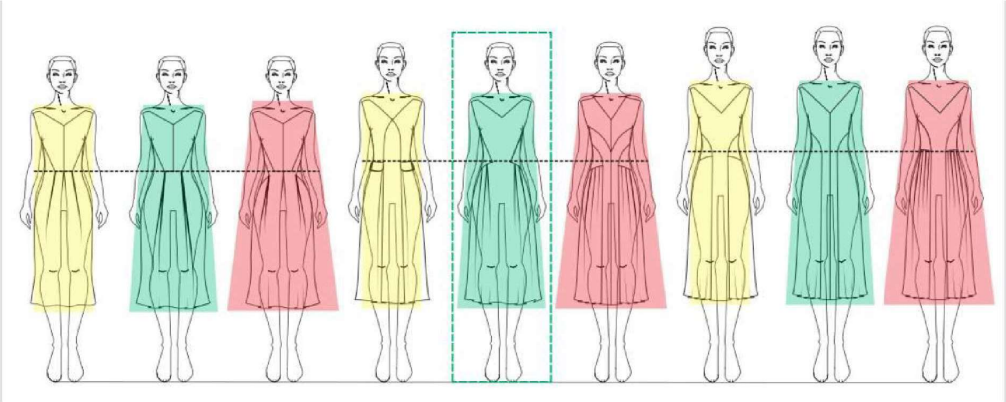

Figure 4. Formation of graphic structures of a woman's dress based on the basic dress model, taking into account the features of SFVSS

When developing sketches of women's dresses, a database of graphic analogies was used. Based on the proposed shape of the semi-adjacent silhouette of the dress and the basic design selected for its implementation from the graphic database, options for constructive solutions for the form elements corresponding to the SFVSS were determined. In general, for three height and three weight groups, to create a harmonious model, a structural and compositional solution is determined by changing the horizontal and vertical divisions of the model without changing the parameters of the width of the base structure according to the chest circumference. In Figure 4, the fourth complete groups of figures are highlighted in red, in which it is necessary to expand the parameters of the basic design along the hip line by designing folds and gathers, while it is required that the solution found should visually narrow the figure along the hips. For low height groups, the solution found should also visually lengthen the figure. The development of mathematical support for the process of geometric transformation of a clothing model will allow the transformation of the graphic display of the product in an automated mode. The use of a graphical display database in the automated design of clothing collections can significantly reduce the time for design development and reduce the number of errors caused by the human factor. To determine estimates of the compositional solution of clothing models, optimization of

varying compositional and design parameters is required. Currently, work is underway to determine the optimality criterion characterizing quality; determining a variety of variable technical parameters; determining the limits of their variation.

The components of the information modules of the system for converting graphic solutions of a clothing model are implemented in the form of test examples and an operating software and methodological complex 3D CLO. Figure 5 shows the results of research on creating models of women's dresses for the mass market segment using various mixed fabrics. The designer can change the color or structure of the fabric of individual clothing items, combine various materials in a collection, obtaining combined colors in accordance with fashion trends.

Figure 5. Graphic solution of women's dress models, taking into account the features of SFVSS

Thus, based on a study of methods for displaying a graphic solution of a clothing sample for the development of an industrial collection of women's clothing, satisfying the needs of typical figures of various weight and height groups, a database system of functional modules of design automation systems has been formed. A database of graphic elements of the shape of a woman's dress has been formed and the process of converting graphic information at the creative stages of designing new clothing models has been formalized. The formation of an assortment collection of women's clothing based on the proposed automation approach, which provides an information and retrieval process for graphic solutions of models at the initial stages of design for various typical figures, makes it possible to create original solutions for clothing models, expand the range of products, and also meet the requirements of women of different stature and height groups. The use of a graphical base for displaying a collection in computer-aided design significantly reduces the time for developing the design of women's clothing and reduces the number of errors caused by the human factor.

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