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THE ESTABLISHMENT OF THE BASIC ELEMENTS OF MODELING AND DIGITALIZATION IN THE DESIGN OF PARTS OF AN OBJECT

Abstract. The regularity defining the organization of the General composition creating integral perception is established. Due to this, the efficiency and integrity of the composition is achieved, which contributes to the establishment of a relationship between the shape of the product, the compositional expression of the figure and the overall design. Based on the unification model of the elements of the ornaments, the options of forming non-standard ornamental compositions from the standard patterns, the considered methods and performance techniques, types of finishes and guidelines for placement of designs. We have also developed an algorithm of modern methods of designing clothes based on the traditional Kazakh costume. this is based on the analysis of the formation of the traditional Kazakh costume, structural analysis of the most characteristic costumes-images and the structure of the general code. The basic elements of their modeling and digitization in the design of object parts are considered.

Key words: composition, object, national, ornament, technique, design, Kazakh, clothing.

World practice requires specialists with a narrow specialization and knowledge of the technology for manufacturing light industry products, including products made on the basis of a traditional national costume [1], but also able to use the knowledge gained in the field of digitalization.

Time proves that national clothing was created by wise and practical creators. A feature of Kazakh national clothing is that the processes of their design and manufacture must be carried out with the mandatory observance of the requirements, canons and traditions of the Kazakh people [2]. Scientific developments in this direction are practically absent. Some information on the types of Kazakh national clothing is contained in some scientific papers. But they lack any information on the methods of designing and manufacturing national clothes.

Therefore, we identified the types of clothing of Kazakhs of the XYIII- beginning of the XX centuries, analyzed the use of Kazakh national traditions in modern clothing, developed a method for forming a rational structure of the assortment of Kazakh clothing taking into account national traditions.

On the basis of a specially developed structure of a unified system analysis of national clothes, developed by Dr. Parmon, and the result of a retrospective analysis revealed the most characteristic Kazakh national costumes-images and the structure of the common code of Kazakh national clothes [3].

Since the form of national clothes is being improved with each subsequent step, there is a need to study the connection of national clothes with modern ones.

The methodology of designing modern clothes based on the traditional Kazakh costume leads to the development of graphic design of ornaments of Kazakh national clothes.

The decor of Kazakh national clothing is a rich heritage in the field of ornamental art. Separate motifs of the ornament, elements of Kazakh national clothing, rooted in ancient times, are now indispensable sources for the design of modern clothing. A retrospective analysis of the artistic and graphic features of the ornament contributes to the preservation of the traditions of the Kazakh ornament, the design on their

basis of new compositions for modern clothes with the mandatory preservation of national traditions. This will enrich and reveal the artistic qualities of modern clothing.

The results of the analysis of Kazakh national ornamentation show that the real idea of the world is generalized and stylized in the form of ornaments. The design of Kazakh national ornaments consists of geometrically regular standard elements. This contributes to the use of modern computer technology, dictated by the onset of a new stage in the improvement of modern clothing design.

The development of a computer graphic sketch of Kazakh ornaments is carried out using the Corel Draw X6 vector graphics package. In this way, there are great opportunities for creating an ornament by filling the background and contour with various colors, as well as moving from one shade to a completely different one in a given direction.

Based on a number of completed works, we proposed the creation of non-standard ornaments from standard ones to create completely new artistic and constructive solutions to models of modern clothes based on traditional Kazakh costume, inherent in the era of the 21st century.

Thus, the proposed technique contributes to the identification of groups of ornaments of plant, zoomorphic, cosmogonic, geometric origin used in the design of modern clothing based on traditional Kazakh costume; the creation of a variety of non-standard ornaments from existing standard (primary sources), leading to the expansion of the product range.

It has been established that, with the development of the market, the demand for ornamented products increases, since decor contributes to the expansion of the possibilities of artistic solutions to clothing and the diversity of its assortment.

The results obtained are recommended to be used in the development of artistic and constructive solutions of modern clothing based on the traditional Kazakh costume. Variants of shaping non-standard ornamental compositions from standard ornaments have been developed.

In the preparation of engineer-teachers in the study of Kazakh national clothing, it is necessary to give training, including courses in engineering and computer graphics. Students in this case will receive the necessary information in the field of using modern information technologies, get acquainted with the capabilities of graphic packages.

The skills gained in the study of computer graphics contribute to their use in independent work. High quality of sketches and short terms of their creation confirm the prospects of this direction.

The development of a computer graphic sketch of models of modern clothing based on a traditional Kazakh costume consists of the following steps.

Stage 1 - creating a graphic base of a human figure.

This is the first and crucial stage on which the appearance and perception of the model ultimately depend. Using the simplest elements (rectangles, polygons, ellipses), a color palette for lines and contours, build a frame of the figure.

2-stage creation of graphic databases of product parts.

The second stage involves the development of sketches of details of modern clothes based on the traditional Kazakh costume for this figure. Modern graphic editors provide a powerful tool for this (from the editor of nodes and contours to intersections and associations of graphic images), which allows you to quickly create large collections of parts, decorative stitches and perforations that give the product a certain aesthetic appearance that matches the fashion direction.

Stage 3 - filling with texture and giving volume to models of modern clothes based on traditional Kazakh costume.

The next step in the outline design of clothing models is to fill in the details with a specific color or texture.

Graphic editors provide ample opportunities for decorating objects, including the ability to fill objects and its outline with the same or different colors, the transition of one color (shade) to another in a given direction. Many of the editors allow you to include in your library of textures your textures of materials entered from a scanner or camcorder. Of special interest are special tools for creating highlights, shadows, transparency. Having neither experience nor knowledge about the center of perspective (entry point) or light source, it is possible to turn a two-dimensional object into a three-dimensional using a computer. The specialist's task is to use all of the above effectors, to transfer the characteristic features of the model's shape, using the traditions and canons of the Kazakh costume.

Stage 4 - creating catalogs of models of modern clothes based on the traditional Kazakh costume.

This is the final stage and, as the bases replenish the human figure and details, it becomes the main one when developing new models. The process of preliminary design at this stage boils down to combining the elements of the parts bases on the selected human figure. Using the capabilities of creating multi-layer drawings and setting various sequences of parts in the model, it is possible to create and design several guide collections in a short time.

Designing new models of modern clothes based on the traditional Kazakh costume is a comprehensive solution to the artistic, technical, technological, economic and other problems in the process of developing sketches, layouts, drawings, manufacturing techniques and product samples.

We found that the appearance and location of the ornament have a great influence on the artistic and decorative design of clothing details. Based on this, a group of ornaments was developed depending on the location along the edge and corner elements of clothing.

Based on the use of typical elements of ornaments, options for shaping non-standard ornamental compositions from typical ornaments, the methods and techniques for performing the types of decoration and principles for placing ornaments, the types of ornament that are most significant for designing clothes are established.

We have identified options for different locations of ornaments on the shelf, as well as options for the location of various ornaments. In order to select the types of ornament in the details of the designed clothing, a questionnaire was conducted among specialists, using the example of a female camisole. To determine the most significant type of ornament when designing clothes, factors are established that affect the artistic and decorative design: types and location of the ornament. At the same time, the types of ornament (zoomorphic, floral, geometrical, cosmogonic, and derivative) are taken for variables — and the location and location of the ornament (edge of the neck, neck, bottom, side cut, armhole) for a constant.

Based on this, a fragment of the drawing is proposed in the questionnaire, where, with the same location of the ornament, different types of crucible, zoomorphic, geometric, cosmogonic and platoon (plant and zoomorphic) ornaments are recommended. The influence of each factor is estimated by the value of the rank - the place that is assigned to the specialist in ranking all the factors. In the objective processing of personal data obtained as a result of the survey, the method of a priori ranking of factors is used.

The sum of the ranks by the factors is

$$\sum_i^m a_{ij}$$

The difference between the sum of each factor and the average sum of ranks

$$\Delta_i = \sum_i^m a_{ij} - \frac{\sum_1^k \sum_1^m a_{ij}}{k} = \sum_i^m a_{ij} - T. \quad (1)$$

Sum of squared deviations

$$s = \sum (\Delta_i) = 19\,374, \quad (2)$$

where a_{ij} – rank of each i -th factor in the j -th specialist; m – number of specialists (100); k – the number of factors (5); T – average amount of ranks.

The concordance coefficient shows the degree of coordination of the opinions of all specialists.

$$\omega = \frac{12 \cdot s}{m^2(k^2 - k) - m \sum_1^m T_i} = 0,699, \quad (3)$$

where $T_j = \sum (t_j^3 - t) = 342$, where t_j – number of identical ranks in the j th ranking.

Since the value of the concordance coefficient differs significantly from zero, there is a significant relationship between the opinions of specialists. The value of ω differs markedly from unity, therefore, experts unequally rank factors. Using special tables, the significance of the concordance coefficient is evaluated. The value of χ^2 – the criterion is determined by the following formula

$$\chi^2 = 217$$

$$x^2 = \frac{12 \cdot s}{mk(k+1) - \frac{1}{k-1} \sum_1^m T_j^2} = 79,7. \quad (4)$$

We have given a ranking matrix based on the data of interviewed specialists. From the known static distributions we find that for a 5% significance level, with the number of degrees of freedom $f = 5 - 1 = 4$, $x^2 = 9.5$.

Since this value is less than the calculated one, it can be argued with 95% confidence that the opinion of experts regarding the degree of influence of factors is consistent with the coefficient of concordance. Based on a priori ranking, an average ranking diagram is constructed for the factors considered in accordance with figure 2.

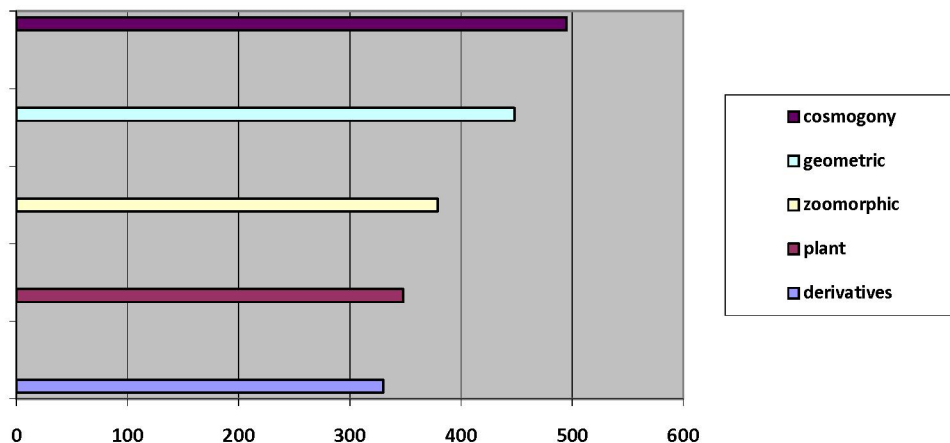


Figure 1 – Average prior ranking chart

The diagram shows that according to the results of a survey of specialists, the types of derivative, floral, zoomorphic and geometric ornaments have the greatest influence on the artistic and decorative design of a female camisole. Since the cosmogonic form of the ornament scored the highest amount of points, which makes it possible to exclude the use of this type in the artistic and decorative design of the camisole. Studies of the artistic techniques of clothing based on typical ornaments and their derivatives, used in combination with its various types, have made it possible to preserve the stylistic link between the existing ornament and the newly created one.

Thus, we have identified a relationship that allows you to establish a pattern that determines the organization of the overall composition of clothes, creating a holistic perception, due to which the design and integrity of the compositional solution are implemented, which helps to establish the relationship of the form of clothing, compositional expressiveness of the ornament, and the whole design.

On the basis of the developed methodology, variants of artistic and decorative design of the main and structurally decorative parts for the developed model designs of national costumes are offered.

The effectiveness of design procedures, assessed by the timing and quality of the development of the project, increases when specialists use modern methods for creating clothes of various shapes, silhouettes and cuts. Improvement of clothing design methods is currently aimed at digitalization.

Kazakh national pockets on the upper female products (camisole, beshmet) have a curly neckline in the form of a parabola, therefore they have their own characteristics [3].

The line of entry into the pocket was determined in the old-fashioned way: the contour of the pocket was drawn at the ends of the five fingers (fingers should be placed freely, without tension). The ends of the pocket were determined by the little finger and thumb. The middle finger showed the place of the greatest bend of the line.

To automate the process of transforming various lines of clothing designs using the example of a pocket entry line (figure 2), we have developed a method for using information technologies. We suggest expressing the line of entry into the pocket as a function (figure 3). The initial function was the entry line into the pocket for size 46, length 20.6 cm. The length of the pocket was measured by a parabola.

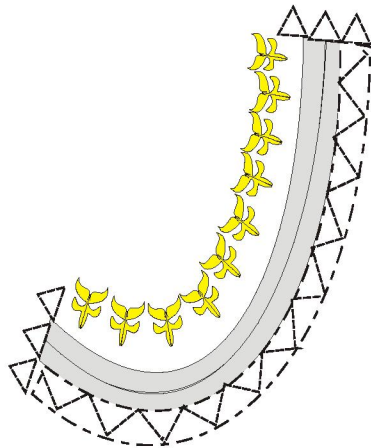


Figure 2 –
The appearance of the pocket

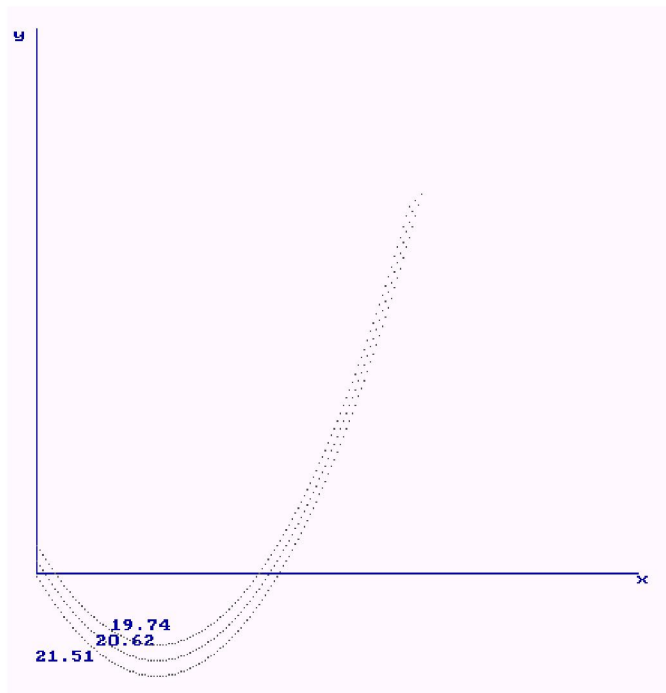


Figure 3 –
Entrance lines
to the camisole pocket
for three sizes

To build the line of entry into the pocket (figure 4), we used a program in the Turbo Pascal language:

```

program pocket (input, output);
uses Crt, Graph;
var Gd, Gm: Integer;
    l,l1:real;
function St(I: real): String;
var
    S: string[6];
begin
    Str(I:0:2, S);
    st := S;
end;
procedure rr(a1:real;y,x:integer);
var k,a:real;
begin
    K:=1;

```

```

a:=0;
while (a<=a1+0.1) do
begin
l:=(1/4)*(a-2)*(a-2)-1;
l1:=(a-2)/2*sqrt(1+(a-2)*(a-2)/4)+ln((a-2)/2+sqrt(1+(a-2)*(a-2)/4))-sqrt(2)-ln(-1+sqrt(2));
putpixel(90+round(10*(a+a*SIN(pi/2))),450-y-round(8*(1-l*COS(5*pi))),15);
a:=a+0.1;
K:=K+0.05;
end;
outtextxy(50+x,450-y,st(l1));
end;
begin
Gd := Detect;
InitGraph(Gd, Gm, "");
if GraphResult <> grOk then
Halt(1);
setcolor(2);
line(50,50,50,400);
line(50,400,450,400);
outtextxy(35,50,'y');
outtextxy(450,400,'x');
rr(10.8,0,0);
rr(10.6,10,40);
rr(10.4,20,50);
readln;
CloseGraph;
end.

```

Since such a pocket on the upper female products has a curved neckline in the form of a semicircle, they also have their own characteristics in processing. Before processing the pockets, it is necessary to embroider, which is usually located above the top line of the slot of the pocket in the form of a semicircle.

Based on a retrospective analysis, it was found that the following factors play a big role in choosing the location of an ornament: the purpose of the clothes; artistic expressiveness of the model; material used; variety of clothing item.

It has been established that the forms of ornamental techniques have a huge impact on the aesthetic properties of modern clothing based on the traditional Kazakh costume: appearance, technique, location of the ornament, as well as a combination of materials with various physical and mechanical properties. Therefore, depending on the form of ornamental reception, ornaments were divided into the following categories:

1. Edge - along the edge of the side, bottom of the sleeves, bottom of the product, collars and other edges of clothing.
2. Ornaments are circular in shape - in the center of large and small planes, backs, sleeves, upper part of the skullcap and other details allowing to determine the compositional center.
3. Ornaments to fill certain parts of the plane - the corners of the parts - the bottom corner of the shelf, the design of the side cuts.

This arrangement of ornaments allows you to express very simple details of the clothes of the national costume, transforming it, and emphasizing its ethnic differentiation.

Based on the developed unification of typical elements of ornaments, options for shaping non-standard ornamental compositions from standard ornaments, the methods and techniques for performing decoration types and principles for placing ornaments, as well as an analysis of the formation of a traditional Kazakh costume, a structural analysis of the most characteristic costumes-images and the structure of a common code, we developed an algorithm for designing modern clothes based on a traditional Kazakh costume.

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НЫСАН БӨЛШЕКТЕРІН ЖОБАЛАУ КЕЗІНДЕ МОДЕЛЬДЕУ МЕН ЦИФРАНДЫРУДЫҢ НЕГІЗГІ ЭЛЕМЕНТТЕРІН АНЫҚТАУ

Аннотация. Объектінің жалпы композициясын ұйымдастыруды анықтайтын заңдылықтарды анықтауға мүмкіндік беретін тәуелділік анықталды. Осының есебінен композициялық шешімді безендіру және оның бүтіндігі жүзеге асырылады, бұл бұйымның пішінінің, ою-өрнектің композициялық мәнерлілігінің және жалпы конструкцияның өзара байланысын орнатуға ықпал етеді. Ою-өрнектің типтік элементтерін, стандартты ою-өрнектің стандартты емес композицияларын қалыптау нұсқаларын әзірленген біріздендіру негізінде ою-өрнектің өңдеу түрлері мен орналасу принциптерін орындау тәсілдері мен техникасы қарастырылған. Сондай-ақ, біз дәстүрлі қазақ костюмінің қалыптасуын талдауға, неғұрлым тән костюм-бейнелердің құрылымдық талдауына және жалпы кодтық құрылымға негізделе отырып, дәстүрлі қазақ костюмінің негізінде заманауи киімді жобалау әдістемесінің алгоритмін әзірледі.

Түйін сөздер: композиция, объект, ұлттық, ою-өрнек, әдістеме, жобалау, қазақ, киім.

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УСТАНОВЛЕНИЕ ОСНОВНЫХ ЭЛЕМЕНТОВ МОДЕЛИРОВАНИЯ И ЦИФРОВИЗАЦИИ ПРИ ПРОЕКТИРОВАНИИ ДЕТАЛЕЙ ОБЪЕКТА

Аннотация. Определена зависимость, которая позволяет установить закономерность, определяющую организацию общей композиции объекта, создающая целостное восприятие. За счёт этого осуществляется оформление и целостность композиционного решения, что способствует установлению взаимосвязи формы изделия, композиционной выразительности орнамента, и в целом конструкции. На основе разработанной унификации типовых элементов орнаментов, вариантов формообразования нестандартных орнаментальных композиций из стандартных орнаментов, рассмотренных способов и техники исполнения видов отделки и принципов размещения орнаментов. А также нами разработан алгоритм методики проектирования современной одежды на основе традиционного казахского костюма на основе анализа формирования традиционного казахского костюма, структурного анализа наиболее характерных костюмов-образов и структуры общего кода.

Ключевые слова: композиция, объект, национальная, орнамент, методика, проектирование, казахская, одежда.

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