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EVALUATION OF THE LEVEL OF HARMONISATION OF CLOTHES

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Abstract: The life cycle of fashion items are shortened and the items are being replaced within a very short period to fulfill consumers' needs. Consumer needs can be met by determining their functional, expressive, and aesthetic requirements. Aesthetic garment quality is one of the most important problems of the apparel design in Ukraine. This is complex problem because it is relaited to all stages of the design process. Aesthetic quality is usually achieved as a result of harmonization an outfit's colors, shapes, fabrics and proportions. Harmonize means to bring things into harmony, or to make things compatible. However, the ability to harmonize an outfit's features is depended from designer's personality. Some professionals have a natural eye for it, having a so-called "sense of style." This is not the same as "fashion sense" – knowing what is in vogue – but a feel for line and design. The lack of dress-sense could make the garment uncompetitive, though the garment's fitting is perfect. Thus all kinds of garments must have enough aethetic quality level. Besides that, fashion designer needs to have some numerical methods to evaluate the level of harmonization in order to reveal the weaknesses in the garment design. Method of complex assessment of aesthetic quality in clothes design is based on the calculation of the weighting factors of unit indexes of aesthetic quality. Compiled list of indexes which characterise aesthetic garment quality is represented in the table form. In order to obtain formal methods for the evaluation aesthetic quality and harmonization an outfit's features we calculated the weighting factors of the indexes of the harmonisation aethetic garment quality. Sequence of actions for the evaluation a level of harmonization is presented on example of women's outfits, particularly dresses.

***Keywords*:** Harmonization, aesthetic quality, index, aesthetic requirements

Introduction

The life cycle of fashion items are shortened and the items are being replaced within a very short period to fulfill consumers' needs. Consumer needs can be met by determining their functional, expressive, and aesthetic requirements. Aesthetic garment quality is one of the most important problems of the apparel design in Ukraine. This is complex problem because it is relaited to all stages of the design process. Aesthetic quality is usually achieved as a result of harmonization an outfit's colors, shapes, fabrics and proportions. Harmonize means to bring things into harmony, or to make things compatible. However, the ability to harmonize an outfit's features is depended from designer's personality. Some professionals have a natural eye for it, having a so-called "sense of style." This is not the same as "fashion sense" – knowing what is in vogue – but a feel for line and design. The lack of dress-sense could make the garment uncompetitive, though the garment's fitting is perfect. Thus all kinds of garments must have enough aethetic quality level. All kinds of garments must have enough aeshetic quality level.

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The problem of the quantitive evaluation of the beauty can be traced back to the works of Azgaldov, & Azgaldova (1971) where the formula of the calculation of the beauty level was described. Then works of Parmon (1985), Koblyakova (1988), and Nikolaeva (2011) can be considered as a base for the actual research of the aesthetic garment quality. Koblyakova described characteristics of the aesthetic garment quality, and Parmon proposed to use the etalon garment samples to evaluate these characteristics. Slavinska (2007) proposes to use a list of criterions for the evaluation the information arrays in apparel design process.

According to recommendations, which were described by Koblyakova (1988), Slavinskaya (2007), and Nikolaeva (2011) indexes list of the aesthetic garment quality was compiled by Kuleshova (2015).

Kuleshova, & Tumochko (2012) developed the method of improving artistic perfection of a dress. The method was based on the systematization of compositional elements for making a harmonious shape of the dress. This work was extended in Kuleshova, & Tumochko (2014), and the method of early diagnostic of the aesthetic garment quality was developed.

Methods

Analysis of harmony and compositional integrity of the system "person-clothes" was performed on the first stage of our work. It was conducted in order to determine characteristics of clothes harmony and as a result we could cluster them.
On the figure 1 we represent Ishikawa cause-and-effect diagram that shows potential factors causing an overall effect that means aesthetic garment quality.

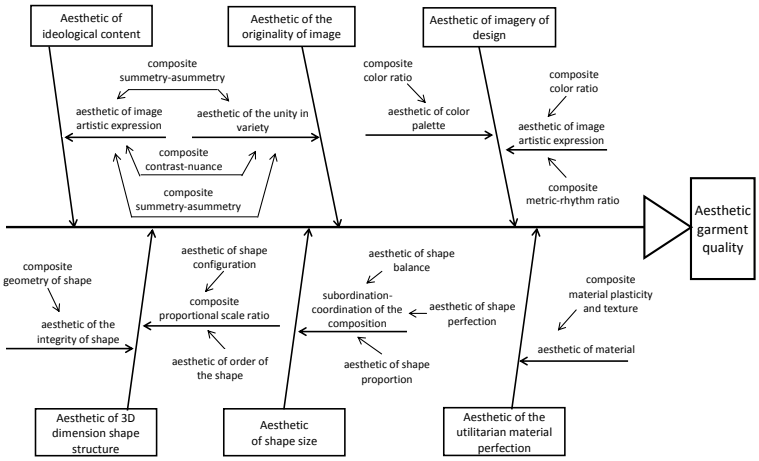

Figure 1. Cause and effect diagram in fishbone shape, that shows factors that affect the aesthetic garment quality

As we see aesthetic garment quality is a complex problem that include many different factors. Furthermore, in the case when we need to draft garment design for individual person we necessarily will have a deal with his or her appearance. Hence, one of the main directions in improving the aesthetic garment quality is development the method for design such clothes that can harmonize the consumer's appearance.

Then, in order to take into account a person's individualities we have to consider design of clothing as a system of three interconnected subsystems "figure", "design", and "material". These subsystems have a need of an evaluation the aesthetic quality of design solutions at each stage of design process. Hence, the cause-and-effect diagram that shows factors that affect the harmonization of clothes will be performed as it shown on the figure 2.

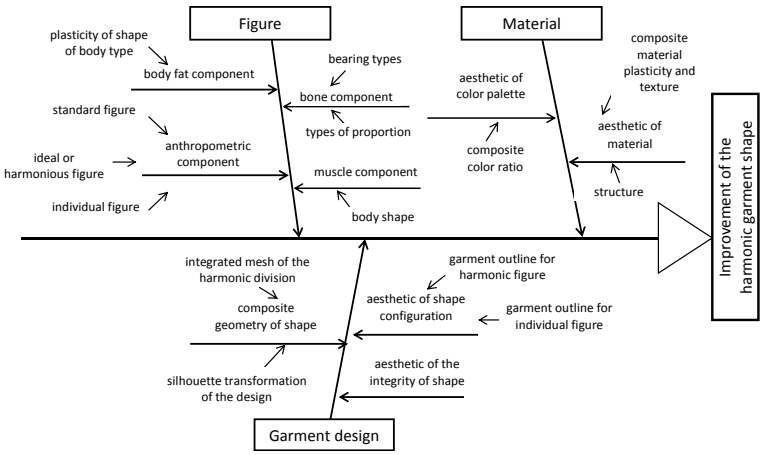

Figure 2. Cause and effect diagram that shows factors of the improvement of the harmonic garment shape

Koblyakova (1988) in her work described a method of evaluation the level of garment quality. Kuleshova (2015) used that method as a base for development a method for evaluation the level of clothes harmonization. Hence, we conclude that the method of evaluation the level of clothes harmonization provides for usage a list of the indexes that must have a certain value and relative weighting.

In order to determine the relative importance of each characteristic of clothes harmony a number of people have been asked to rank a list of the indexes of the clothes harmonization: from most important to least important. We conducted two independent surveys that reflect the opinion of two different expert groups. One of them includes consumers (30 respondents), and other one includes dress designers (13 respondents). Table 1 and 2 represent the lists of the indexes that were proposed for the group 1 (consumers) and group 2 (designers) respectively.

Table 1. The list of the indexes (Consumers survey)

Index	Factor
X_1	1. Proportion of the size and allocation of the parts of the garment
X_2	2. Concordance the colors to the fashion trends
X_3	3. Concordance garment size and human body size
X_4	4. Proportional allocation of the constructions lines
X_5	5. Ratio the garment size and consumer height
X_6	6. Concordance colors and usage circumstances
X_7	7. Concordance the size of the parts and size of the whole garment
X_8	8. Rhythm
X_9	9. Decor
X_{10}	10. Symmetry
X_{11}	11. Asymmetry
X_{12}	12. Concordance colors and appearance of the consumer

Table 2. The list of the indexes (Designers survey)

Index	Factor
X_1	1. Rhythm
X_2	2. Decor
X_3	3. Fitting of the garment
X_4	4. Scale
X_5	5. Color scheme of the garment style
X_6	6. Proportion

As a result of the survey we have got two histograms that are shown on the figure 3.

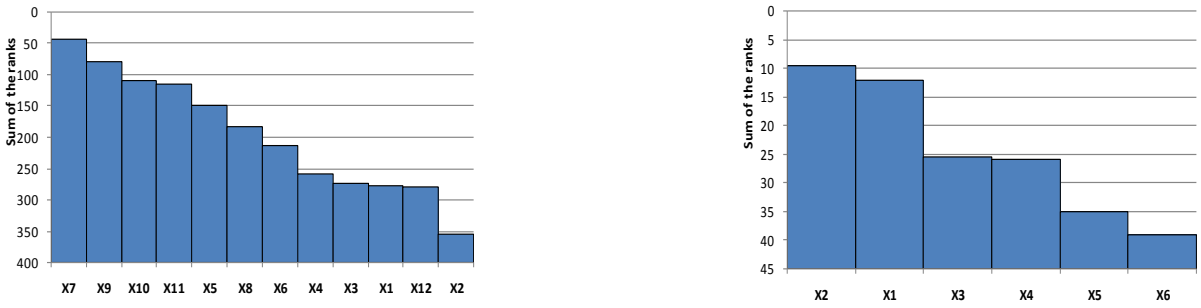

Figure 3. Ranking indexes in aesthetic garment quality

The values of *W* in table 3 indicate a degree of unanimity among the various respondents. As we see the degree is quite high, and that is why the results of the surveys can be used in further research.

Table 3. The assessing agreement among raters

Survey	Kendall's W	χ^2	χ^2 (the critical value)	Overall trend of agreement
1	0,79	260,91	19,68	+
2	0,84	24,50	11,07	+

We have computed weighting factors of the indexes in the tables 1 and 2. Thus, we have estimated values indicating the relative importance of each index in a group as compared to the other indexes in the group. Calculated weighting factors of the indexes are represented in the table 4.

Table 4. Weighting assignments for the indexes of the harmonisation aethetic garment quality

Group index	Subgroup index	Weight	Index	Index notation	Weight
Proportion	$K^{pr.}$	0.318	Ratio the garment size and consumer height	$K_1^{pr.}$	0.107
			Proportional allocation of the constructions lines	$K_2^{pr.}$	0.105
			Proportion of the size and allocation of the parts of the garment	$K_3^{pr.}$	0.106
Color scheme of the garment style	$K^{col.}$	0.315	Concordance the colors to the fashion trends	$K^{col.f.t.}$	0.110
			Harmony of the materials colors	$K^{col.har.}$	0.116
			Concordance colors and usage circumstances	$K^{col.us.}$	0.053
			Concordance colors and consumer's appearance	$K^{col.con.}$	0.036
Fitting of the garment	$K^{fit.}$	0.196	Fitting of the garment	$K^{fit.}$	0.196
Scale	$K^{sc.}$	0.171	Concordance garment size and human body size	$K_1^{sc.}$	0.112
			Concordance the size of the parts and size of the whole garment	$K_2^{sc.}$	0.059
Assigned weightings total:		1.000		Assigned Weightings Total:	1.000

The weight of indexes would be used for a calculation the level of clothes harmonisation.

The developed method of the evaluation the level of clothes harmonization must be performed according to the sequence of actions that is follow:

1. At first we need to perform a consumer's appearance identification.

2. We must choose a geometric silhouette of a garment from catalogs of fashionable geometric shapes of clothing silhouettes. Then we make a decision about a need to adapt the chosen shape of the garment. The shape could be altered if there are no much difference between individual figure and its harmonized prototype. Otherwise, it would be better to design the desired shape of the garment according to the consumer's appearance.

3. On the next stage we have to choose art and design parameters for the garment from a matrix that includes the preferred art and design parameters of a dress for fashionable figures. Then we make a decision about a need to adapt the chosen parameters the same way as previously we made the decision about the shape alteration.

4. Then we put a consumer's photo and a sketch of desired dress into a grid of harmonic segmentations. After that, the design parameters of the dress must be altered according to the grid limits.

5. An adequate choice of clothes color palette for the person's coloring is the next step of the method.

6. Finally we evaluate the indexes of clothes harmonisation as it is shown in the table 5. Hence, the method of the evaluation the level of clothes harmonization provides for a consistent use of the provided formulas.

Table 5. Sequence of the evaluation the level of clothes harmonisation

№	Index	Formula
1	Scale	$K^{sc.} = K_1^{sc.} G_1^{sc.} + K_2^{sc.} G_2^{sc.}$
2	Concordance garment size and human body size	$K_1^{sc} = S_{gar.} / S_{body}$
3	Concordance the size of the parts and size of the whole garment	$K_2^{sc} = S_{part.} / S_{gar.}$,
4	Proportion	$K^{pr.} = K_1^{pr.} G_1^{pr.} + K_2^{pr.} G_2^{pr.} + K_3^{pr.} G_3^{pr.}$
5	Ratio the garment size and consumer height	$K_1^{pr} = D_{gar.} / H$
6	Color scheme of the garment style	$K^{col.} = \mathrm{K}^{col.f.t.} G_1^{col.f.t.} + \mathrm{K}^{col.har.} G_2^{col.har.} + \mathrm{K}^{col.us.} G_3^{col.us.} + \mathrm{K}^{col.con.} G_4^{col.con.}$
7	The level of harmonisation of clothes	$K^H = \sum_{j=1}^{n} K^j G_j$

In the table 5:
S_{gar} – surface area of a garment, cm^2;
S_{body} – area of a projection of a human figure with clothes on it, cm^2;
S_{part} – total surface area of decorative parts of the garment cm^2;
D_{gar} – length of the garment, cm;
H – consumer's height, cm;
$K_2^{pr.}$ – proportional allocation of the constructions lines;
$K_3^{pr.}$ – proportion of the size and allocation of the garment parts;
$K^{col.f.t.}$ – concordance the colors to the fashion trends;
$K^{col.har.}$ – harmony of the materials colors;
$K^{col.us.}$ – concordance the colors and usage circumstances;
$K^{col.con.}$ – concordance of the colors and consumer's appearance;
K^j – value of harmony index j;
G_j – weighting factor of index j;
n – a number of the indexes.

Results and Findings

Consumer's Appearance Identification

Three photos of a consumer must be used as a base for the consumer's appearance identification: front, back, and side. Information about the consumer includes a dataset of the dimensional characteristic of the morphological features, a data about the figure shape, about specifics of the face and of the neck, and information about a person's color type.

The results of our work are advisable to consider with an example of the drafting a dress design for a particular consumer: a woman; she is 22; height – 170 cm; bust – 92 cm; hips – 100 cm; color type is mixed.

In order to perform the analysis of standard and real figures of the consumers we divide them into three groups: harmonious figures or ideal figures; harmonized figures that are not significantly different from the ideal, and require only the adaptation of the fashionable garments; inharmonious figures that require a special development of the clothes designs.

A harmony group of individual figure can be computed with method that was described in work of Medvedeva (2005). Besides that, the way of garment alteration can be determined by this method.

A standard figure (height – 170 cm; bust – 92 cm; hips – 100 cm) was tested by the method that described in work of Slavinska (2007), and a ratio of the body sizes of standard and harmonious figures was considered as a figure type "S-S-M" that means "Small – Small – Medium".

Geometric Silhouette and Design Parameters for the Garment

As a result of the individual consumer's appearance identification we propose the design alternatives of light women dresses that are presented in the table 6.

Table 6. The design alternatives of light women dress for the individual consumer

Style	Siluette	Geometric shape	The division surface	shoulder	neckline design	Decision on the bust line	on the waistline	hips	The color and texture of the material	Location structural and decorative elements	Length of garment
All	Semi-fitting		Vertical Diagonal Fantasy	not accented		accented	accented	not accented	Color palette of summer color type	At the top of the possible finding accented elements	Above the knee or maximum length

Harmonization of the Garment

The harmonization of the garment must be performed in accordance to the following order.
We put the consumer's photo and the sketch of the dress into the grid of harmonic segmentations as it shown on the figure 4.

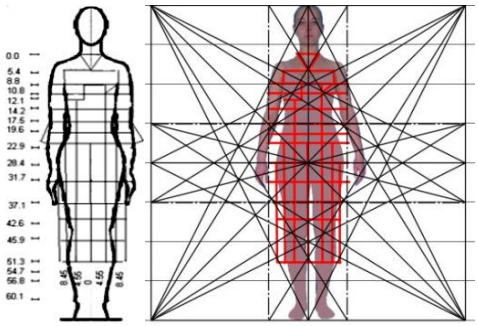

Figure 4. Preferred limits of the harmonic segmentations for the type of figures S-S-M

After that, the design parameters of the dress must be altered according to the grid limits.
Foremost it is necessary to begin with alteration of the garment length. Then the width parameters would be changed: the shoulders line as well as the hem line. These alterations are shown on the figure 5. We can also adjust the degree of fit at the waistline. Finally we have to change a form of the neckline, and the specifics of the decorative parts.

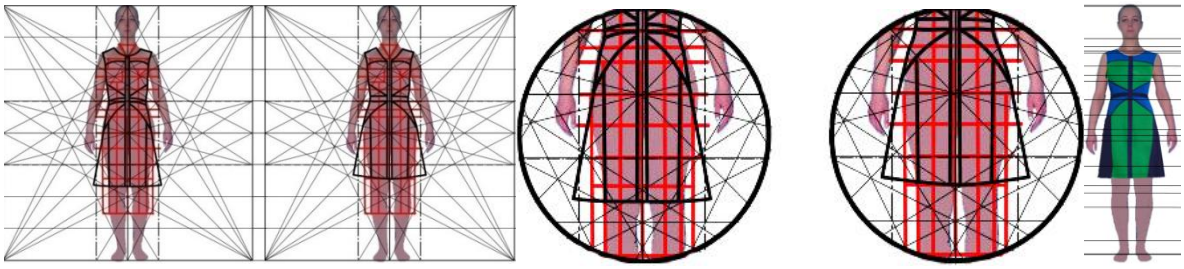

Figure 5. The example of the shape harmonization, the segments harmonization, and color selection for the particular consumer

On the figure 6 we can see the differences between the harmonized dress and the real fashionable dress that was shown in the fashion magazine.

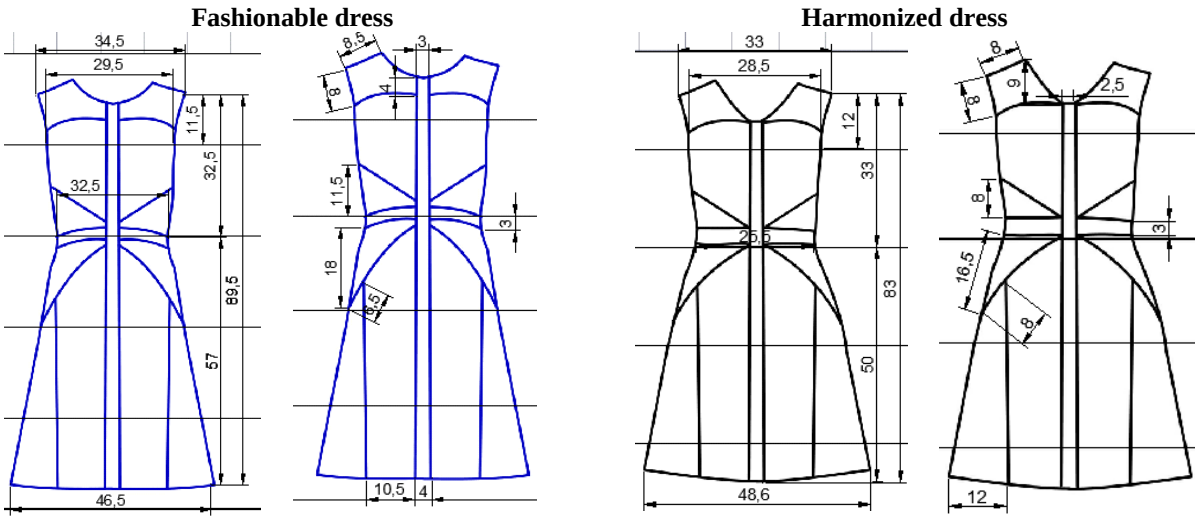

Figure 6. Real and harmonized parameters of composition segmentations of light women dress

The Selection of the Clothes Color Palette

According to the recommendations for colors of the consumers' types, which were described by Jackson (1987), Spillane & Sherlock (1995), Freer (2015), Henderson, & Henshaw (2006), Medvedeva (2005), and Zakharkevich, Kuleshova, & Shvets (2015), we compiled the lists of the recommended colors for the mixed consumer color type. The specifics of the color type are shown in the table 7, and in the table 8 there is the list of the recommended colors.

Table 7. Personal coloring for the consumer

Consumer type	Hair Color	Skin Color	Eye Color
Mixed (Summer – Spring)	Golden brown	Golden beige	Gray

Table 8. Recommended colors for mixed consumer type (monochrome harmony)

Consumer type	Color model	Fashionable colors				Recommended colors for the consumers' types, %		Recommended fashionable colors for the consumers' types, %			
		blue			green	green	blue	blue			green
Summer	C	C 36	C 77	C 100	C 48	35…84	30…100	36	80	100	48
	M	M 6	M 0	M 53	M 0	0…18	2…88	6	0	60	0
	Y	Y 9	Y 20	Y 3	Y 31	19…60	0…31	9	30	0	31
	K	K 0	K 0	K 12	K 0	0…3	0…17	0	0	45	0
Spring	C					27…86	31…84	36	77	85	48
	M					0…24	1…28	6	0	50	0
	Y					61…100	2…32	9	20	0	31
	K					0…12	0…2	0	0	0	0

According to the recommendations of Gill (2000), in the table 8 we used the CMYK color model:
C – Cyan, M – Magenta, Y – Yellow, K –Key.

Evaluation the level of clothes harmonization

On the final stage of the method we have to calculate the value of the indexes in the table 5. The calculations are shown in the table 9.

Table 9. Calculations for the evaluation the level of clothes harmonisation

№	Index	Calculation
1	Scale	$K^{sc.} = 0{,}59 \cdot 0{,}112 + 1 \cdot 0{,}059 = 0{,}125$
2	Concordance garment size and human body size	K_1^{sc} =2792,8/4743,9 = 0,59

3	Concordance the size of the parts and size of the whole garment	K_2^{sc} = 2792,8 / 2792,8=1
4	Proportion	$K^{pr.} = 0{,}49 \cdot 0{,}107 + 1 \cdot 0{,}105 + 1 \cdot 0{,}106 = 0{,}264$
5	Ratio the garment size and consumer height	$K_1^{pr.}$=83/169 = 0,49
6	Color scheme of the garment style	$K^{col.} = 1 \cdot 0{,}110 + 1 \cdot 0{,}116 + 1 \cdot 0{,}053 + 1 \cdot 0{,}036 = 0{,}315$
7	The level of the clothes harmonisation	$K^{H} = 0{,}125 + 0{,}264 + 0{,}196 + 0{,}315 = 0{,}9$

The dress does not need alterations anymore because the calculated level of the clothes harmonization is high enough.

Conclusion

The information we have obtained can be used as a basis for the formal methods for the evaluation the aesthetic garment quality.

Besides that the results could be provided for the development of an expert system that would be intended for make a decision about the needs for the adjustments of a garment's appearance.

Weighting factors that were obtained in the present work can be use for the evaluating of the harmonization level of any garment types.

Recommendations

Sequence of actions for the evaluation the level of clothes harmonization is presented on example of women's outfits, particularly dresses. As we see the evaluation might be performed few times because the first iteration is not always perfectly provides for the desired result.

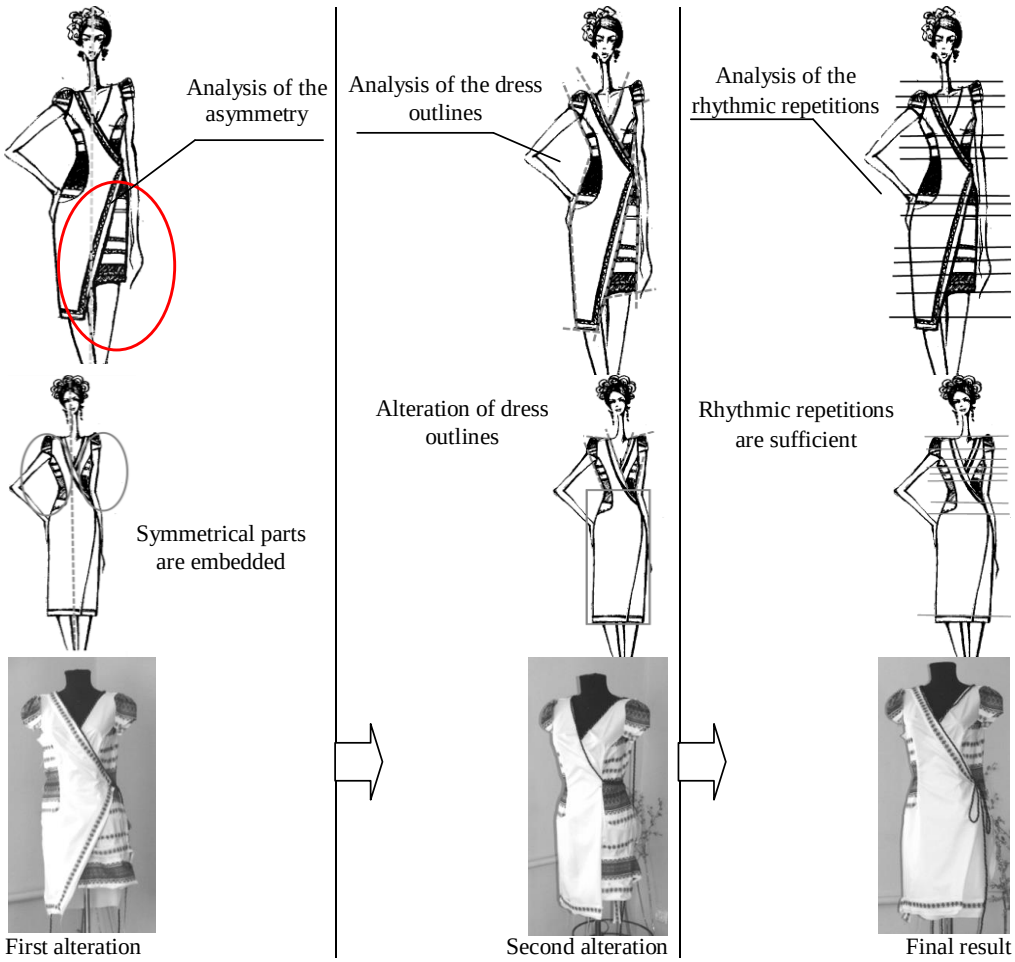

Figure 7. Harmonization of the collection of the dresses

The levels of the clothes harmonization K=0.6 (for the first alteration) and K=0.8 (for the second alteration) are not high enough. That is why the final appearance of the dress was changed. Its final level of the harmonization is sufficient (K=0.91).

Thus, the main purpose of our work is achieved as the recommendation for the evaluation of the level of clothes harmonization.

References

Azgaldov, G. G., & Azgaldova L. A. (1971). *Quantitative evaluation of quality. (Qualimetry). Bibliography*. Moscow, Standard.

Freer, A. (2015). *How to Get Dressed: A Costume Designer's Secrets for Making Your Clothes Look, Fit, and Feel Amazing*. New York, Ten Speed Press.

Gill, M. (2000). *Color Harmony: Jewels*. Rockport Publishers.

Henderson, V., & Henshaw, P. (2006). *Colour Me Beautiful: Colour me confident*. London, Hamlyn.

Jackson, C. (1987). *Color Me Beautiful*. New York, The Random House Publishing Group.

Koblyakova, E. B., & Ivleva, G. S. (1988). *Designing clothes with CAD elements: study guide* Moscow, Light Industry press.

Kuleshova, S. G. (2011). Development of the design principles of harmonious appearance of the consumer by visualization of the virtual system "human-clothing". *Interuniversity collection "Scientific notes", 34*, 148-153.

Kuleshova, S. G., & Slavinska, A. L. (2015). Method of complex assessment of aesthetic quality in clothes design. *Study of problems in modern science: new technologies in engineering, advanced management, efficiency of social institutions*. Monograph: ed. by Shalapko Y., Wyszkowska Z., Musial J., Paraska O. Bydgoszcz, Poland. 318-327.

Kuleshova, S. G., & Tumochko, K. R. (2012). Developing method of improving artistic perfection of costume, *Herald of Khmelnytskyi national university. Technical science, 6*, 100 – 105.

Kuleshova, S. G., & Tumochko, K. R. (2014). Development the method of early diagnosis of aesthetic garment quality, *Young scientists, 8*, 287 – 293.

Medvedeva, T. V. (2005). *Development the foundations of the quality formation in clothing design: Monography*. Moscow, GOUVPO "MGUC",

Nikolaeva, T. V. (2011). *Tectonic forming of suit: Textbook*. Kyiv. Aristei.

Parmon, F. M. (1985). *Costume composition: study guide*. Moscow, Light Industry press.

Slavinska, A. L. (2007). *Basis of a modular clothes design: Monography*. Khmelnitsky, Khmelnitsky national university,

Spillane, M. & Sherlock, Ch. (1995). *Color Me Beautiful's Looking Your Best: Color, Makeup and Style.* Lanham, Maryland, Madison Books.

Zakharkevich, O. V., Kuleshova, S. G., & Shvets, G. S. (2015). Determination of fabrics properties for reversible garments. *TEXTEH VII International Conference Proceedings*, Bucharest, Romania, *7*, 78-88.