An investigation of design of twist knot drape clothes

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Abstract. A study about pattern making of twist knot drape shows that in the constructional systems there isn’t any mathematically founded dependence between the diameter of the knot and the widths of the draped pieces in the place of twist. The paper presents an investigation of connection between the knot diameter and the widths of the draped pieces in the place of twist in design of patterns with twist knot draperies. The investigation has been made only for woven fabrics. The obtained dependence between the knot diameter and the widths of the draped pieces in the place of twist has made the design of patterns with twist knot draperies fully systematized. The systematization gives possibility for easy and correct pattern making of twist knot drape clothes with various sizes of diameter of knot and drapery parts width. The system facilitates the process of fashion design and pattern making and gives possibility of variety of new designs twist knot drape clothes. It is very useful for ready-to-wear industry.

1. Introduction

The twist knot drape is one of types of drapery in ladies’ clothing and as the name of this drapery indicates it is designed in result of a twist of two pieces into a knot. A study about pattern making of this type of drapery shows that in the constructional systems [1, 2, 3, 4, 5] there isn’t any mathematically founded dependence between the diameter of the knot and the widths of the draped pieces in the place of twist. It is logical that the bigger width of draped parts leads to the bigger diameter of the knot.

The paper presents an investigation of connection between the knot diameter and the widths of the draped pieces in the place of twist in design of patterns with twist knot draperies, id est searching for a mathematical dependence between them. The investigation has been made only for woven fabrics.

2. Pattern Making

Figure 1 presents a design and pattern making of a twist knot lady’s dress. The pattern making is inspired by the geometrical system of Tomiko Nakamichi [1]. The main difference of the pattern making, shown in Figure 1, and the construction, presented in [1], is the number of divisions about drapery folds of the pieces. A previous investigation [6] shows that the two parts of the draped piece can be divided only ones. The bigger number of folds is a result of the twisting in the knot. In Figure 1 W is the diameter of the knot and W is the width of the draped pieces in the place of twist.
Figure 1. Pattern making of twist knot drape.
3. Methodology
The dependence between the knot diameter and the widths of the draped twisted pieces is searched because it will make the design of patterns with twist knot draperies fully systematized and will lead to design of twist knot drape clothes with various sizes of diameters of knot and drapery parts widths.

For this aim a linear regression is used [7, 8]. The same statistical method leads to easy sizing, which is very important for pattern making, and was successfully used in a previous investigation about pattern making of twisted draperies, presented in [8].

4. Experimental
The fully systemized pattern design has to be suitable for different woven fabrics with good drapability. By this reason four fabrics with good drapability but in different structures are chosen. From the four fabrics double rectangles in skew direction are cut with widths: 32.5 cm (the investigation shows the width bigger than 32.5 cm lead to unnecessary volume), 30, 25, 20 and 16.5 cm (the investigation has shown that for this type of draperies the minimal width has to be 16.5 cm). The double cut pieces are twisted in knots and the diameters of the knot are measured. The twisting and measuring of the knot are presented in Figures 2 and 3. For every combination of material and width five twists in knot and measurements are made.

![Figure 2. Twisting of the pieces in knot.](image1)

![Figure 3. Measurement of twist knot.](image2)

After the measurements the dependence between the knot diameter and the widths of the draped pieces in the place of twist has been obtained on the base of a linear regression [7, 8] – formula (1):

\[
Y = a + b \cdot X, \quad (1)
\]

where \( Y \) is the dependent variable; \( X \) – independent variable; \( a \) – constant; \( b \) – coefficient of regressions.

In the presented investigation formula (1) acquires mode (2):

\[
W = a + b \cdot D, \quad (2)
\]

where \( W \) is the widths of the draped pieces in the place of twist; \( D \) - the diameter of the knot; \( a \) – constant; \( b \) – coefficient of regression.

The regression analysis is made with STATISTICA 7.0 [7, 8].
5. Results
The results of regression analysis are: \( a = -4.4 \) and \( b = 5.15 \), and formula (2) is transformed in dependence (3):

\[
W = 5.15 \cdot D - 4.4.
\] (3)

The accuracy of the regression model is proved by the values of \( p < 0.0000 \), \( R\)-square = 0.9126, and Std. Error of estimate = 1.4429.

Therefore the dependence (3) successfully can be used for determination of the width of the draped pieces in the place of twist – \( W \) on the base of the diameter of the knot of twist – \( D \). According to the design idea the turned variant of dependence (3) can be used or determination of the diameter of the knot – \( D \) on the base of the draped pieces width – \( W \), formula (4):

\[
D = 0.2 \cdot W + 0.85.
\] (4)

6. Fashion design application
According to fashion design the twist knot drapery is suitable for casual and formal ladies’ clothing in various types of styles [1, 2, 3, 4, 5, 6, 9].

Figure 4 presents a design and pattern making of a lady’s dress with a twist knot in the waist area. In fashion design the center of the waist is maybe the most popular place of the knot. For that dress the diameter of the knot \( D = 7.0 \) cm is chosen according to the main design idea for rich volume folds of drapery. The width of the draped pieces in the place of twist \( W = 31.65 \) cm is determined by dependency (3).

Figure 4. Design and pattern making of a lady’s dress with a rich volume twist knot drapery in the center of the front waist area.
Figure 4 center shows the pattern making on the front constructional base. The center of the circle of the knot with diameter \( D = 7.0 \) cm is located on the front middle line between the waist and the bust dart apex. The seam of connection of both twisted pieces is under the knot circle by the middle line. The neck opening is formed over the circle of the knot. The seam of drapery fixing is situated between the center of the knot circle and the point of intersection of the waist line and the side seam. The second circle is drawn with the same center of the knot circle, but with diameter which is half of the diameter of the knot. The lines, which determine the places of additional volume for drapery, are tangents to the smaller circle. They start from the arm hole and bust dart for the top part of the draped piece, and the point of interaction of hip and side seam for the down part of the draped piece.

Figure 4 right present the pattern of the draped piece after additional opening for drapery volume, which sizes the width of the draped pieces in the place of twist \( W = 31.65 \) cm. After the additional opening the upper and lower parts of the draped piece are connected each other on a line in diagonal direction (skew direction of the fabric), which determines the place of twisting.

![Figure 4](image.png)

Figure 5. Design and pattern making of a lady’s dress with asymmetrically situated in the neckline twist knot.
Figure 5 presents a design and pattern making of a lady’s dress with a twist knot, situated asymmetrically at the neckline. The knot divides the neckline in the Golden proportion \[10\]. For that dress the width of the draped pieces in the place of twist \( W = 16.5 \) cm (the smaller size in presented investigation). The diameter of the knot \( D = 4.15 \) cm is cm determined by dependency (4). The pattern making of draped pieces is made similarly to the pattern design of the lady’s dress, shown in Figure 4.

In Figures 4 and 5 fashion designs are shown by the experienced models, prepared using presented patterns. According to the materials, lengths, accessories the presented designs can be adapted for casual or formal ladies’ dresses in various styles.

7. **Conclusion**

The obtained dependence between the knot diameter and the widths of the draped pieces in the place of twist has made the design of patterns with twist knot draperies fully systematized. The systematization gives possibility for easy and correct pattern making of twist knot drape clothes with various sizes of diameter of knot and drapery parts width. The system facilitates the process of fashion design and pattern making and gives possibility of variety of new designs twist knot drape clothes. It is very useful for ready-to-wear industry.

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