



Original Contribution

OPTIMUM USE OF DRAWING TOOLS IN CAD SYSTEMS IN AUTOMATED APPAREL DESIGN

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ABSTRACT

CAD systems help in design, constructing and modelling of garments with rapidity and extra accuracy. The apparel design is very specific with its various drawing tools and tools for modification in CAD systems. The maximal aid is possible only after the optimum use of tools. This paper presents a classification of drawing tools and tools for modification in connection with 2D apparel design, construction and modelling.

Key words: CAD, apparel design constructing, apparel design modelling

PROBLEM STATEMENT

CAD/CAM systems made their debut in the garment industry in the 1960s, but design constructing and modelling are last automated stages. Apparel constructing and modelling are bi-dimensional (2D) and three-dimensional (3D). The present paper views the 2D apparel design. Bi-dimensional constructing and modelling are based on traditional hand design of garments. The traditional hand methodologies are transformed for automated design in conformity with the drawing tools and tools for modification. A study of systems and publication about 2D apparel design show different using of tools for drawing and modification. There is no concrete information about use of a fixed tool and why it is chosen. One and the same construction is drawn in CAD using of very different tools.

The paper presents a classification of drawing tools and tools for modification in connection with 2D apparel design constructing and modelling. The purpose of this classification is optimum using of tools for design of garment.

RESEARCH COURSE

The design constructing and modelling of garment is very specific and its results are

directly connected with the human body. Therefore it exacts different use of drawing tools and tools for modification in CAD systems. The classification for optimal use in apparel design of drawing tools and tools for modification in CAD system is made by following criteria:

- Geometrical characteristic of drawing tools;
- The way of its induction in CAD system;
- Geometrical congruence between design and constructional elements and drawing tool;
- Connections between design and constructional elements;
- Rapidity of drawing;
- Extra accuracy of constructing;
- Practical try.

CLASSIFICATION

The following drawing tools and tools for modifications in CAD systems are used in automated design constructing of garment:

- **Basic lines:** constructional elements – vertical and horizontal straight lines, vertical and horizontal segments; measuring of distances – vertical and horizontal segments, circles;
- **Neckline:** constructional elements – B-splines (in particular NURBS); subsidiary elements – horizontal and vertical segments, bisectors, tangents; measuring of distances – vertical and horizontal segments, circles;
- **Shoulders:** constructing elements – segments, parallel segments; subsidiary

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- elements – segments; measuring of distances – segments, circles;
- **Bust dart (in lady's garment):** constructional elements – segments; subsidiary elements and modifications – circles, arcs, rotation; measuring of distances – circles;
- **Armhole:** constructional elements – B-splines; subsidiary elements – horizontal and vertical segments, tangents; measuring of distances – vertical and horizontal segments, circles;
- **Side seam and waist darts:** constructional elements – segments; B-splines, segments; subsidiary elements and modifications – mirror; measuring of distances – circles;
- **Sleeve (basic lines and seams):** constructional elements – segments; subsidiary elements and modifications – perpendicular lines, segments, mirror; measuring of distances – vertical and horizontal segments, circles;
- **Sleeve Cap:** constructional elements – B-splines, segment; subsidiary elements – horizontal and vertical segments, segments, tangents; measuring of distances – vertical and horizontal segments, circles.

Practically every drawing tools and tools for modification in CAD systems are used for automated apparel design modelling.

The classification is presented on **Figure 1**.

The classification, presented on figure 1 shows that only ellipse, cubic spline and Bezier are the drawing tools, which does not allow optimum use in design constructing and modelling of garment. They can be used rarely in design modelling.

APPLICATION

Two illustrations about optimal use of drawing tools and tools for modification in CAD systems in design constructing and modelling of garment are presented on **Figures 2 and 3**.

Figure 2 presents design constructing and modelling of shawl collar for lady's garment in great dimensions, bigger than the width of the shoulders with curvilinear neck opening line (1). The neck opening line on the front 3÷4 is drawn with NURBS and lines 3÷5 and 3÷6 are made after rotation of curve 3÷4. The rotation guarantees identity of curvilinear lines 3÷4, 3÷5 and 3÷6. It is attainable with difficulty in traditional hand design modelling.

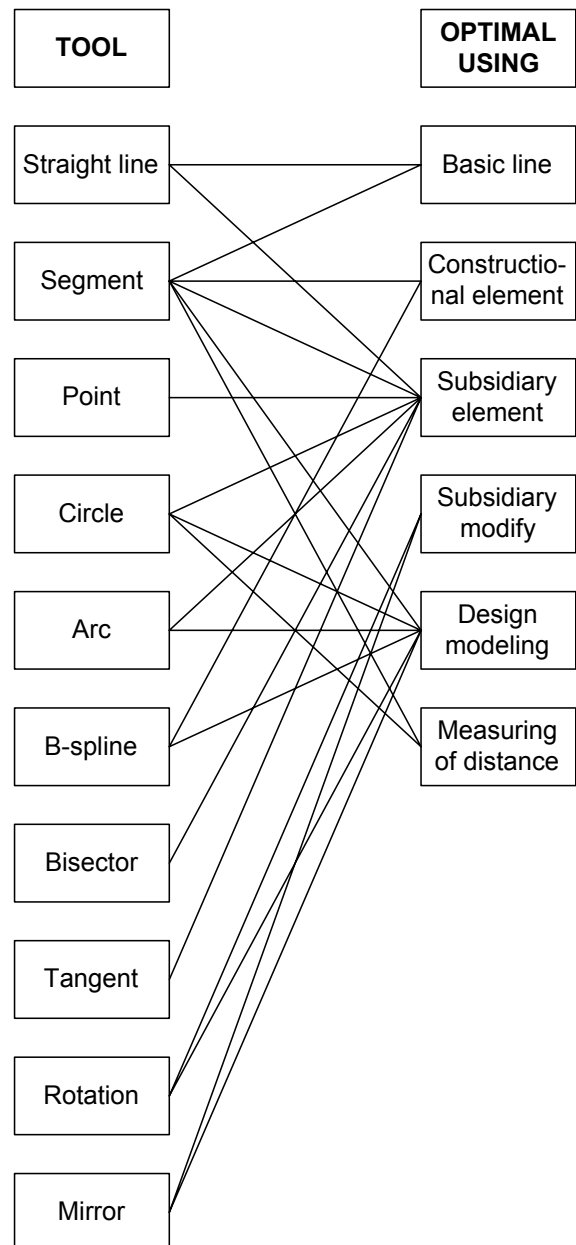


Figure 1. Classification of drawing tools and tools for modification

The back neckline is drawn with NURBS with the help of tangent d. The use of d as tangent guarantees supply neckline in the middle of the back. The collar edge is drawn with NURBS and arc with the help of tangent f. The using of NURBS allows design modelling of collar edges with infinite variety of forms. This is impossible in hand apparel design. The tangent f guarantees supply line of collar edge in the middle of the back. This is impossible with drawing of curvilinear contour with cubic spline or Bezier, because they aren't drawn with use of tangents. **Figure 3** presents a constructional base of kimono, raglan, gusset and sloped down armhole sleeves of the front for lady's garment (2). The construction is drawn with using of many circles as subsidiary elements and for measuring of distances.

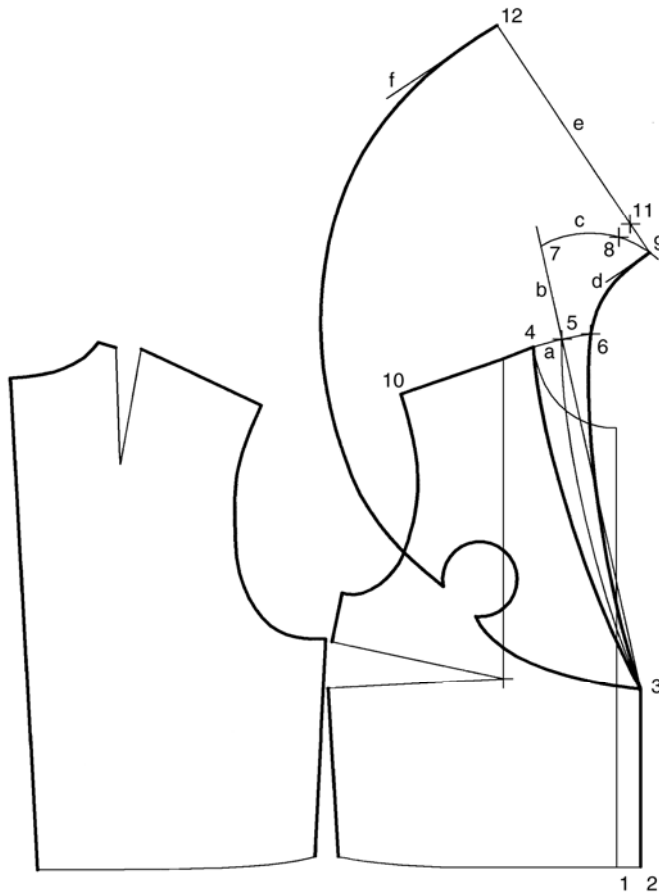


Figure 2. Design of shawl collar (1)

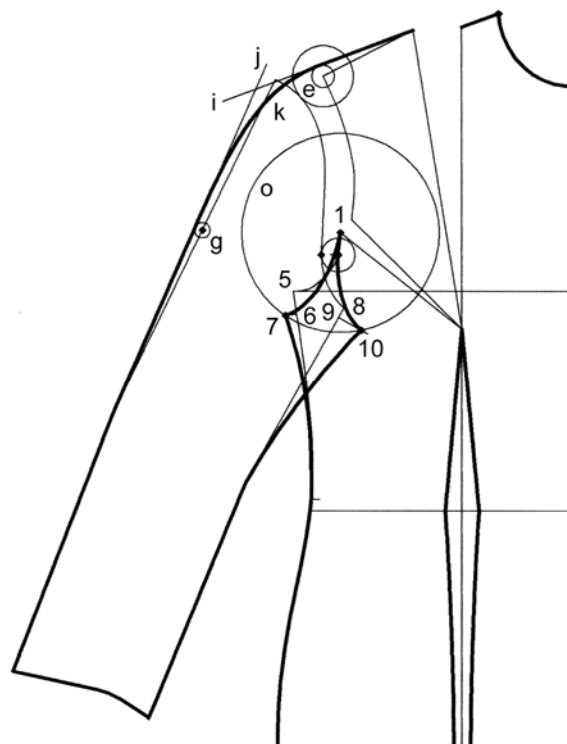


Figure 3. Constructional base of kimono, raglan, gusset and sloped down armhole sleeves (2)

The circles are drawn quickly only by centre and radius. When they are used for measuring, radius is equal to required dimension. This construction is described with sections, which are located to other sections on the fixed

distance. The sleeve parts are contacted to the front and the back in this way. The location is made easier with the help of circles, not only for measuring of distances, but as contact lines. The curvilinear contour k of the outside

seam is important for the form of the sleeve. The curve k is drawn with NURBS with the help of the tangents i and j. The tangent i and j guarantee supply stage between curve k and straight line, formed by sleeve seam and shoulder. The lines i and j are drawn as tangents to circles e and g. The extra armhole depth – the contours 1÷7 and 1÷10 are drawn with NURBS with the help of distances 5÷6, 8÷9, perpendicular segment 6÷7, circle o, and perpendicular segment 9÷10.

CONCLUSION

The main priority of automated constructing and modelling over hand apparel design – rapidity, extra accuracy and easy design of new models on the base on extant one, are possible only by optimal use of drawing tools and tools for modification in CAD systems.

The geometrical specificity and connection between the design and the constructional elements are important for the

choice of tools.

The B-splines (in particular NURBS) are preferred to cubic splines and Bezier curves for drawing of curvilinear contour because they are fixed by points and tangents. In this way they come up to the requirements for interaction between the design and the constructional elements.

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