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An approach to design solutions for garments using a CAD system

Abstract

The making of patterns is the beginning of the cycle of designing garments. Pattern making is an accomplished technique requiring technical ability, flexibility for interpretation of design, and a realistic understanding of the construction of garments. It is a feature of bridge function between design and development. This is an effective and conservative approach that can be manipulated by a technique known as flat pattern designing to construct the pattern for various types. The most frequent issues of pattern making are following only Dart Manipulation or Added fullness or Contouring method rather than all at a time. If this practice of all methods can compare with the CAD system the output would be more accurate to resolve the issues of miss fit, imbalance, and so on. Another result of the research shows that the designs are substantially constructed without understanding that the design is based on certain concepts and structures. The principles of pattern making consist of three most prominent methods namely Dart Manipulation, Added fullness, and Contouring. This is essential to know for making flat patterns and alterations according to individual designs. When we perceive the basic principles of pattern making and modification we produce any kind of design without affecting the original pattern size and shape thus we can meet the desired fit and balance. This study will demonstrate a way of applying three pattern-making methods to garments manually as well as CAD. These patterns can be manipulated and changed into shapes through the slash-spread technique. The slash-spread technique is easy to understand as it clearly illustrates the changes taking place. The outcome of this study will impact the new upcoming fashion industry and also the garment industry.

Keywords: CLO 3D, virtual, working pattern, dart manipulation, added fullness, contouring, design analysis

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Introduction

Pattern creation is a skilled practice that calls for technical proficiency, flexibility in design interpretation, and a realistic understanding of how clothes are made.[1] It is also known as a feature of bridge function between design and development. A fundamental or establishment design can be made by any of the two strategies, to be specific, by drafting or by hanging fabric on a dress form.[2] Pattern drafting is characterized as a procedure or strategy of drawing patterns on brown paper with perfection and clarity, based on the body estimations or standard measurement chart.[3] This is an effective and conservative approach that can be manipulated by a technique known as flat pattern designing to construct the pattern for various types.

Now a day's automation has been a key factor in success in modern garment manufacturing industries as well the application of computers and automated systems is widely practiced for design solutions.[4] However, the majority of current works on computerized pattern drafting have concentrated on the development of a simple pattern modification method allowing pattern professionals to express their talent more quickly, rather than the development of pattern drafting principles.[5] As technology is evolving design solutions should be practiced in CAD systems also besides the manual method to meet quick throughput time in terms of solution. Understanding the procedures and guidelines is important before pattern drafting processes as this is mandatory to achieve an accurate and precise pattern.

Pattern terminology used to interpret the design solution

Category	Issue	Technical ability	Ref.
Construction	Basic pattern set	A five-piece pattern set, consisting of front and back bodice and skirt and a long sleeve, illustrating the proportions of a particular shape or figure. Basic patterns are always traced for creating flat patterns of different types, and then further modifications are made by slash and spread techniques.	6–8
	Flat Pattern	The flat-pattern approach is where the whole pattern is drafted from measurements on a flat surface, using rulers, curves and straight edges	7
	Working Pattern	Working pattern is construct conforming to the specific dimension of particular style without allowance. Working pattern pieces are cut and marked for the common name of the pieces and the size of the garment to which they belong	9,10
Style line creation	Pattern manipulation	The act of slashing and spreading, or pivoting a pattern to modify its original form. A well-fitting basic block is used when applying either of these techniques. The new form of the pattern represents design features of the garment.	11,12
	Pattern plot	The act of placing lines on a traced copy of the working pattern relating directly to the design features. The lines are used as guidelines for pattern manipulation.	13,8

Category	Issue	Technical ability	Ref.
Fit & Balance	Pivotal point	A fixed point on pattern, frequently the point of the bust, from which the pattern is pivoted. This makes change of shape to the pattern piece, but does not change the fit	13,8
	Ease	The additional value that we add or subtract from the actual body measurements in order to meet desirable comfort, flexibility and easy movement is called ease	14,15
	Stress	Stress refers how much pressure generated to the body by garments and vice versa when a garments adorn to a body	16
	Strain	Strain refers to how much the garment is stretched when being worn to the body	16

Principle of the work

Pattern-making principles are essential to know for making flat patterns and alterations according to individual design. It is the responsibility of the patternmaker to analyze designs and determine which principles to apply to the pattern in development to ensure that the exact pattern replica emerges from the finished pattern shapes. When we perceive the basic principles of pattern making and modification we produce any kind of design without affecting the original pattern size and shape. By knowing the three basic principles, any pattern can be generated and changed (Figure 1).

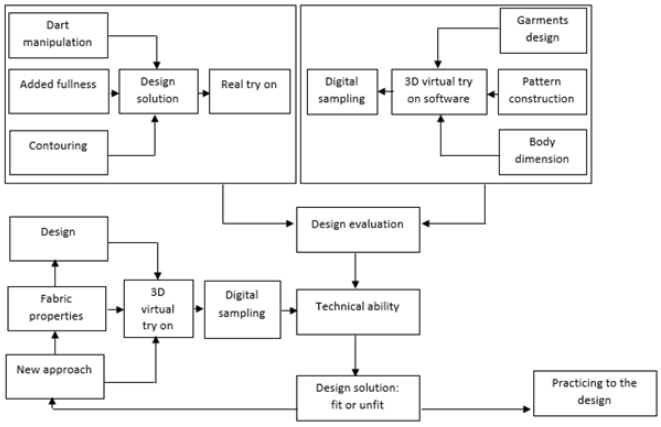

Figure 1 Working flow chart.

The above chart depicts the way of applying three pattern principles to a design solution. The task was initiated from the application of principles manually based on design analysis. In experiment 2 virtual technique was queue applied to understand the pattern accuracy. After analyzing experiments we can evaluate the design solution based on pattern accuracy or technical ability. If the pattern construction fits with the design configuration we can suggest the technique for further practice, if a negative further new technique is applied to the desired solution manually and virtually.

Experimental work-02: Design solution front part

Step 1

At the first front, the pattern needs to be traced on the fold with a pushpin and transfer Guideline 6. Their side seam and shoulder guides should be included. Cut pattern from paper and it should remain unfolded. Connect guidelines, marking guideline 6 on the shoulder left side of the pattern only. Then Mark A 3 inches from the shoulder tip and down 1/4inch. Mark B and C 1 inch below armholes on side seam guidelines. Draw a curve line from A to B. where after Blend armhole to point C. Draw slash lines from bust points to shoulder tip. Finally cut the pattern from paper.

Step 2

In this stage at first Cut slash lines to, not through, the bust points. Then place the pattern on the paper. Close A guideline 6 (broken line) and B waist dart; open new shoulder dart. Draw slash lines from bust points to side seam C to D. Lastly trace the pattern and Draw grainlines.

Step 3

Here in this point slash lines needs to be cut to, not through, the bust points. Then place on paper. After that close A guideline 6 (broken line) and B, C waist dart. Open new shoulder dart D and side dart E. Finally trace the pattern and Draw grainlines.

Step 4

At this stage, slash lines need to cut, not through, the bust points. Then Place on paper. Here we need to ensure new shoulder dart should be minimized and the side dart as well. After that slash lines should be opened and add measurements for gather (added fullness). Finally, trace the pattern (Figure 2).

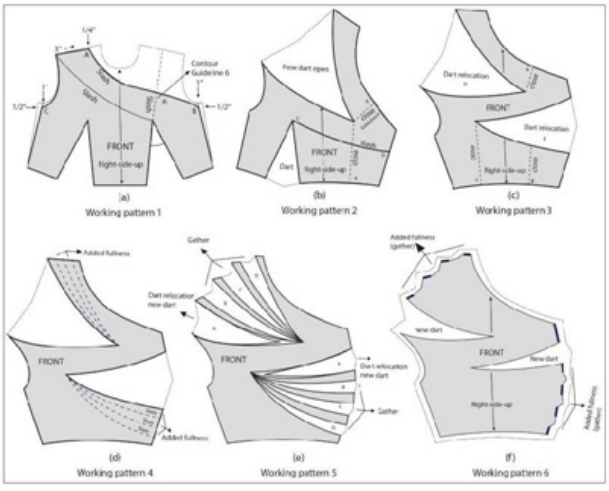

Figure 2 Design solution (manual) front part.

Step 5

At this stage, the dart should be relocated at point A, on both sides Shoulder, and side seam. Then redraw the pattern. After this open slash lines and add measurements A, B, and C for gathering (added fullness). Finally, trace the pattern.

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Step 6

New dart relocation in shoulder and side seam (one side). Then mark the gathering area. Afterward, Trace the pattern and draw grainlines. Lastly, add seam allowance.

Experimental work-02: Design solution back part

Step 1

Here back pattern needs to be traced. Then convert mid-Neck Dart B from mid-shoulder A dart. Lastly, draw dart legs to the center point of the cross mark.

Step 2

Here at first style line should be repeated and armhole shape instruction should be given for the front pattern (Figure 3). Then Label the pattern right-side-up. After that pattern should be cut from the shaded area. Finally, Complete patterns for a test fit.

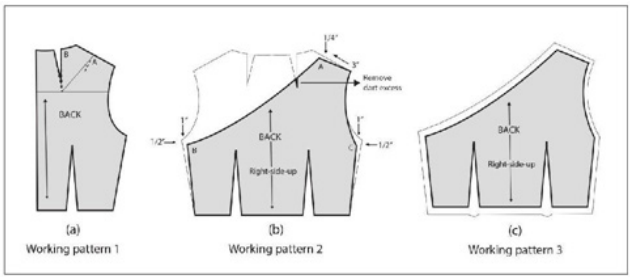

Figure 3 Design solution (manual) back part.

Step 3

Here at first shaded area should be cut from the pattern and add seam allowances. Finally, complete patterns for a test fit.

Experimental work-02: Design solution 3D CLO software

The traditional pattern-making process is very time consuming and requires professional fashion design knowledge. To develop a form-fitting garment to meet customers' individual needs, pattern makers must rely on a "trial and error" procedure until the customer is satisfied. But in Three Dimensional designs, 3D pattern design lessens the steps necessary in the product development phase. All prototyping is done accurately with less chance of human error. In this paper, the authors did Three Dimensional design analysis of three major Pattern making principles in CLO3D software. Then transferred only one design into paper through printing which was the combination design of the three major patternmaking principles (Figure 4).

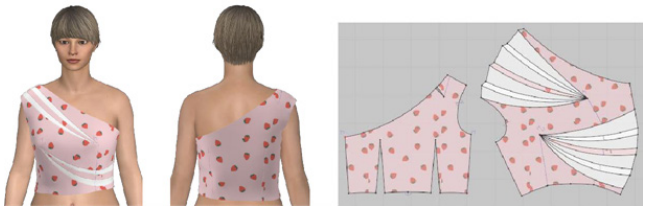

Figure 4 Design solution 3D CLO software.

Discussion

The way of pattern-making processes is closely related to fit as well as production.[17] As technology is evolving 2D patterns and 3D patterns are both important for design solutions. Design solutions are always a major concern to the designers, technicians, pattern makers or experts to get desired output. In light of the above observation, this paper develops a methodology of reactive 2D/3D procedure to support the garment design modification.[18] Firstly, the designer initiates the design solution by applying the slash and spread method to the targeted area to create a style line maintaining the grain line direction. We can apply to contour and add fullness chronologically to get the desired solution. 3D CLO software works simultaneously to solve the design which is a more effective and efficient methodology of design solution compared to the traditional and modern technology as the 3D software pattern solution will give us stress and strain mapping also besides the fittings. Styling features are always key to finding the design solution, but the proper method & media application play a vital role to come up with good results.[19] As a result, 3D practicing besides manual practicing is important as CAD systems for garment design lead to highly accurate cloth shape results for virtual prototyping and quality evaluation tasks.[20] The results of the experiment carried out with the design practitioner are encouraging and prove the validity of our approach and evaluation.

The modern clothing industry is increasingly choosing to use computer-aided design (CAD) techniques for both fashion design and pattern creation as it provides more effective and time-saving solutions to many challenging tasks and makes it easier for designers, manufacturers, and retailers to communicate online.[21] There are currently commercially accessible packages of three-dimensional (3D) CAD software for creating virtual prototypes of apparel. A review of published literature has identified two distinct approaches to clothing design taken into consideration while developing 3D CAD systems.[22] Today's garment-making technology has expanded a lot. It has become easier to learn and quickly adjust completely to the specific necessities of apparel designing. Computer technology has become a non-segregated aspect of our work lives. In the garment industry, patterns are mainly used because of cutting the fabric pieces to make the garment. Through these patterns, garment manufacturing can be easily done. In the current scenario, pattern-making in the industry is done digitally. Because manually pattern making for bulk production is near impossible and very time-consuming as well. That is the reason various AutoCAD software for pattern makings are getting dominating the RMG field. Through this software, it is easy to increase the accuracy and efficiency of the cutting room and create accurate samples in time to help reduce costs. AutoCAD software's useful for making repetitive patterns. Overall CAD saves time during the design process and helps to create new design ideas. It also shows every design component, develops a prototype, and helps to amend the new design before production. There are various CAD software systems available in the garment industry. But the best ones are known for Lectra Systems, Gerber Technologies, Tukatech, and Optitex.[23] But still, with this software, there are some limitations available. One of them is making production samples. In the traditional garment development process, according to buyers' requirements, at least four to five physical samples need to be created before the brands confirm their desired product. That eventually takes lots of time not only because of the sample product but also for taking confirmation from the buyer. Which is considered a backlog in our industry. Garment enthusiasts are constantly trying to increase efficiency, and accuracy and reduce time and cost in terms of production. In recent times many new technologies are getting introduced in this garment industry such as 3D technologies.CLO3D is one of them. While other software only shows 2D designs and patterns but CLO3D also shows 3D modeling as well. It helps to replace physical samples with 3D virtual models to reduce cost and make design decisions faster. CLO3D makes it easier for designers to create 3D versions of samples. With the use of 3D technology, pollution created at the initial garment development stage

can be dramatically reduced as well which will give a boost to the lead time of the production. 3D clothing prototyping system eliminates sample wastes in the pre-manufacturing phase. The 3D technologies not only offer fashion brands a realistic way towards sustainability by reducing material wastes and minimizing returns but also solve the lead time problem, cost, and as well as sampling issues in the RMG industry.

Conclusion

Flat pattern making is the quickest and most effective process designed to create patterns of design that monitor the size consistency and fit of mass-produced garments. Flat pattern making is unusual among other methods in relying on copies of patterns (working patterns) previously produced for manipulation using slash, or pivotal methods. Flat patternmaking is based on three major patternmaking principles and techniques: *dart manipulation* (relocating darts), *added fullness* (adding more fabric in the design), and *contouring* (fitting to the hollows of a model's figure).[24] Designs are usually created without understanding that certain principles are the basis for the creation. Design analysis will play a vital role in ensuring the project begins and remains on track. This can often help to estimate the performance of a product before it even exists as an integral part of design activities. Analyze the designs and determine which principles to apply to the developing pattern to ensure that the replica of the design will emerge from the finished pattern shapes.

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Conflicts of interest

No potential conflict of interest was reported by the authors.

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