

Analysis on the Design and Application of Bisection Illusion in the Shaping of Specific Shape

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Abstract: Bisection illusion is a combination of aesthetics and psychology. This concept is embodied in different degrees in modern clothing, but there is no specific and detailed collation and induction in some of the existing literature. It is also scarce to conduct researches that adopt this concept to a certain style of clothing. This paper deduces a bisection illusions theory that is applicable to all types from the concept of narrow segmentation, summarizes from the internal structure of modern clothing to external decoration, and sorts out a variety of latest forms of bisection illusion on clothing, which is a useful practice. It can be concluded that bisection illusion is a creative design technique that maximizes the power of formal beauty and reshaping. This technique came into being in clothing. It has a relative guiding effect on shaping a specific shape.

Keywords: Bisection illusion, Modern clothing, Design techniques, Body shaping

1. Introduction

Visual perception is an important way for human beings to receive external information but is disturbed by external factors such as light, shape, and color. Coupled with their own physiological and psychological factors, people tend to judge the form of things based on subjective perception experience, and optical illusion is produced in this case [1].

Due to the continuous improvement of people's requirements for clothing, the advanced expressions of some forms of segmentation and deconstruction in clothing are favored by consumers. The bisection illusion based on the visual illusion theory is also closely related to fashion styling and clothing consumption psychology. However, there is no very academic definition of the concept of bisection illusion, and most of them are discussions on regular bisection illusions.

Therefore, the broadly bisection illusion theory provides a broader imagination space for this paper. This paper has a detailed understanding and derivation of the parallax design through the division lines, fabric patchwork and 3D cuts included in the internal structure, and the printing and craftsmanship, etc. covered in the external decoration, and explores the impact and latest trend of the application of the bisection illusion in different design forms on garments in recent years, providing multiple development possibilities for design transformation and innovation.

2. Overview of Bisection Illusion

2.1. Narrow Bisection Illusion

In a narrow sense, bisection illusion is the distorted perception produced by objects composed of dividing lines [2]. In the relationship between dividing line and optical illusion, it is roughly divided into two types: long-short stitching and dynamic visual illusion. For example, in the experiment of the famous Müller-Lyer optical illusion (Fig. 1), if the two ends of a line segment of the same length are marked with inward and outward arrows, the length of the line will be wrongly predicted. In Wundt's visual illusion experiment (Fig. 2), the parallel line segments are disturbed by external radial lines to produce a feeling of depression, while the parallel lines in Herring's optical illusion (Fig. 3) appear opposite in a beam of two-way rays.

These psychological visual experiments provide valid theoretical support for defining bisection illusions, while the division of lines is only part of what constitutes segmentation and is not sufficient to encompass all types of bisection illusions when applied to basic judgments.

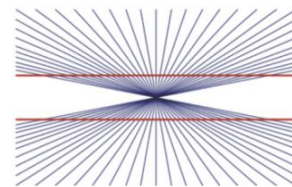
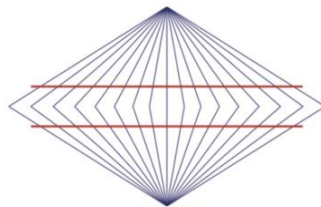


Figure 1: Müller-Lyer's optical error

Figure 2: Wundt's optical error

Figure 3: Herring's optical error

2.2. Broadly Bisection Illusion

The western aesthetician Clive Bell believes that aesthetic effects arise from the combination of lines, colors and reflect in a particular way into a particular form or the relationship under the action of the form [3]. In the " Café wall illusion " (Fig. 4), first proposed by Professor Richard Gregory, the stitching of black and white blocks in multiple sets of equidistant parallel lines creates a contrasting change from wide to narrow or from narrow to wide between adjacent parallel lines - the optical illusion of a split surface.

The plotted planar visual illusion is the initial practice based on the theory and is also a derivation of the existing bisection illusion. Similarly, Zellner (Fig. 5) uses the interference of fine lines in different orientations to show the tendency of horizontal deflection [4]. If the divided quadrilateral and the internally connected short lines are regarded as a whole, it is actually a patterned bisection illusion. Therefore, in a broad sense, the generalized bisection illusion should be the visual illusion effects produced by the interaction of color, geometry, distance, and angle under the premise of containing line structure.

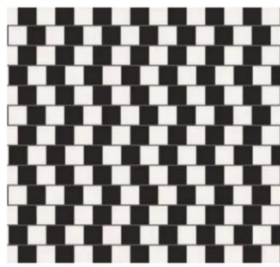


Figure 4: Café wall illusion

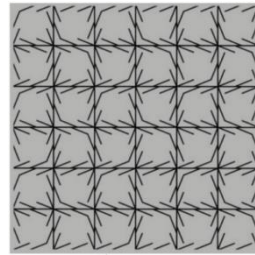


Figure 5: Cerner's optical illusion

3. Visual Splitting Effect in Clothing

3.1. Application of Structure

3.1.1. Structural Line

Lines are composed of innumerable moving points. The things composed of surfaces and bodies shall have a linear structure. Therefore, the geometric structure also reflects the divergent thinking of line split and surface split. In recent years, the development of this type has become more and more personalized, giving clothing unique 3D and dynamic features [5].

A dividing line is a common form of visual segmentation. For example, in the 1870s, the famous British designer Charles Voss first proposed the princess line split, the impact of which is similar to the principle of the corset. When the lines are distributed in different places in the figure, they also have different shaping textures:

Nensi Dojaka has won high praise in the industry for her divided silhouettes between underwear and ready-to-wear, which is not limited to the arcs that raise the bottom of the bust or the silhouette that connects the bust to the perimeter of the bust to show the proportions and shape of the bust. Instead, she adopts straight lines of varying widths, irregular circles, and scalloped arcs of different curvatures to create an unconventional visual structure of the bust, making the silhouette of the bust it has a surreal and experimental nature.

The distribution of the dividing line on the waist can be divided into transverse and longitudinal. In order to achieve a state close to the ideal preset, the horizontal part of the waistline is mainly adjusted by raising the position of the waistline, elliptically stretching the arc of the waistline upward, and dividing the arcs of multiple arcs in descending order. Vertically, the shapes enclosed by the dividing lines have become diversified, with curved division, vertical division, inverted triangular division, and inverted trapezoidal division, etc.

The morphological changes of the limbs are affected by the sleeve shapes and the trousers shapes: some exaggerated sleeve shapes such as puff sleeves, lamb's leg sleeves and gourd sleeves, their own curvatures can be merged and connected with the curvature of the dividing structural lines, forming a specific visual direction; Pants such as flared trousers are characterized with retro and slender proportions. If supplemented by appropriate dividing lines, they will realize the characteristics of enhancing the silhouette advantage.

There are also design points for the shoulders and hips between the limbs, chest and waist. In the case of the shoulders, the use of split lines to change the relative visual position of the shoulder line and the chest line has the effect of suggesting a weakening of the original shoulder shape and coordinating the support role of the garment and the body [6]. Hence, the local division is also linked to the overall relationship, more strongly oriented to the vision when different local division lines act on the same type of visual illusion at the same time in the design.

3.1.2. Structural Plane

Modern clothing is good at thinking about the relationship between fabric and design from different angles: black is used to interpret the visual pantomime so as to enliven the rest of the color components; The color contrast is used to the extreme in the clothing shooting or concept elaboration is also reflected. Meanwhile, the fabric can play its color properties in the segmentation as a result of both the color and the unique texture and nature, so-called in the formation of the division need to always consider the softness of the fabric, the degree of the stiff profile, whether combined with the elasticity of the fabric can amplify the visual effect of the division. Fabrics can also seek some special substances, such as silicone, sequins, plaster, fish skin, etc., after many transformations, and splicing, which is conducive to conveying the creativity of clothing and expressing the spirit and attitude from clothing.

3D modeling is a method to spy on the initialization of clothing and restore the actual clothing to unrestrained changes depending on high-tech operations, such as 3D printing and laser cutting, which have a magical effect on the 3D segmentation of garments. Iris Van Herpen specializes in using 3D printing technology to divide the garment into a large number of independent parts to build the silhouette. In the 2019 haute couture collection (Fig. 6), the garment is cut by laser technology into reflective silk textured liquid lines, which hot bonded pressed connect each of the cut micro-coating pieces. Each undulating curve forms a segmented shape in a distinct space as if it is flowing round and round; the flat and narrow split surface of different parts runs through the whole garment, bringing a sense of slenderness, which is a new technology to study the Parallax segmentation.

In the advanced vertical tailoring, the silhouette also has a splitting effect, which is manifested in the contradictory aesthetics of planar vision and 3D shapes [7]. The visual splitting of the 3D shapes does not mean that all the garment pieces are adjacent to each other in a three-dimensional way, but must be accompanied by a structure that forms a 3D surface. In the design of the 3D surfaces, the property of the fabric, the rationality of structural connection and the proportion of division should be measured; For soft fabrics, multi-layer stacking and pleating can be taken to three-dimensionality. The pieces of insert pleat and godet easily show a contrast of division by using rigid fabric. In general, the fabric for suits will use viscose lining to maintain the contour of a ready-made garment, whereas comparatively softer fabrics are suitable for adding additional fishbone, transparent copper wire to support the edges, or taking soft materials such as yarn, cotton or sponge to fill in the volume. The formation of a split surface can also be represented in some novel drapings, such as the work of St. Martin's student (Fig. 7), which combines the shaded side of vertical cutting shapes and two sides of different space to represent the split surface's sense of volume on the broad-shouldered garments.



Figure 6: 3D printing



Figure 7: 3D modeling

3.2. Application of Color

Aristotle once said, "Color can be seen only by the presence of light, and light travels like waves." From this perspective, color is transparent to a certain extent. When light is thrown into the retina for imaging, color information and emotions become tangible. Colour contrast is based on the system of hue, brightness, and purity, with different qualities of different colors, and pretty much the same color family in different variables.

Canadian designer Paolina Russo embodies the use of colorful divisions in her sports collection in collaboration with Adidas. In a set of tights, she used a variety of fabrics in specific color divisions to visualize the body shape, exuding a futuristic sporty style. The spiral chest segmentation is detailed within the bumpy knit texture, a green region on the convex side and a black region on the concave side, which is a sporadic gradation from the pure black segmentation at the waist, presenting a dynamic trend of colored blocks. Despite the seemingly identical color of the upper and lower parts of the skirt's central cutout, there are in fact subtle differences, with the upper part being bluish and the lower part purple, a delicate correlation between the split color zones and the surroundings.

The nature of hue in the choice of color is also about how to create the optical illusion wanted to express. Warm colors have the swell look, colds have a feeling of shrinkage, and high saturation colors in cool tones will instead present an expansion effect. For example, highly saturated blue reflects the outward sense of power, while the black on the outer edge can subtly control the expansion of the shape visually and keep the posture within the envisaged range, at which point the tension between colors constitutes the energy factor of the clothing surface.

3.3. Application of Pattern

Color is conveyed by pattern, and the parallax in the pattern has the effect of camouflage, concealment, and modification, and molding shape is the focus of writing this paper[8]. The most classic should be geometric patterns, and the parallax design of segmentation type is composed of their size and shape changes, strong and weak changes of brightness and purity and the scheduling of combination angles. In some trendy brands, splitted printing will also be produced on the fabric in different printing and dyeing methods, including gluing, heat transfer, digital direct spray, foil, 3M reflection, etc., which makes the native fabrics have certain quality color differences and contrasts. As such, the parallax segmentation formed by printing is uncontrollable, and the combination of different degrees will transform the illusion of different colors.

Many emerging designers have established their individual styles with prints. Such as creating complex printed fabrics for asymmetrical segmentation to make them geometric in nature, and the density and depth of stamped color factor highlight the presentation of bisection illusion; in the superposition of pure color and printed fabrics with brightness, the color blocking segmentation is applied according to the contrast of different hues, thus producing unusual effects. The stitching of different prints is used in Marine Serre's 2020 collection to produce a certain visual change in the shape. A variety of fabrics are used in the dress (Fig. 8) for segmentation. The upper body print is the most representative moon-shaped logo of the brand, while the black and yellow pattern is faintly visible on the waist and extends to the ankle, showing a tall body proportion. The black curved surface of the skirt guides the shape of the skirt from the high neckline to the ends of the hemline, showing a kind of radian that tends to be S-shaped and conveys the elegance of a woman's body shape in this way. As far as the printed interiors are concerned, the design can also rely on the division of color blocks and the change of patterns to produce visual changes in the shape (Fig. 9). Through the scaling of the circular pattern, it seems that the dresser is just like a full, thin waist image.

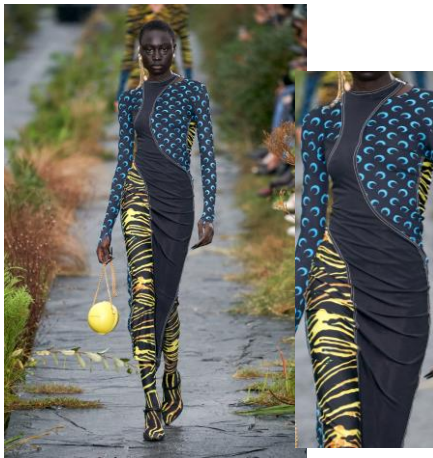


Figure 8: External Divisions

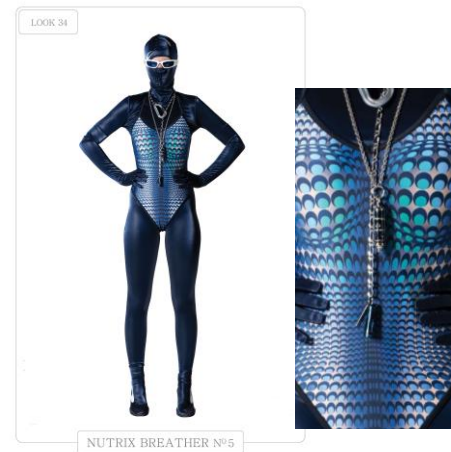


Figure 9: Internal Divisions

3.4. Application of Technology

The expressiveness of the overall color directly affects the presentation form of the modeling structural lines [9]. Fabrics with weak expressiveness usually have hidden structural lines. The craftsmanship of sewing a little modification can not only break the conventional division of clothing but also enhance its original value. This Paper mainly focuses on the following three processes:

3.4.1. Hollowing

Hollowing is the engraving of a pattern that penetrates the surface of an object. There are various forms of hollowing, such as knitted openwork, cutting hollowing, lace weave cut-out, laser cutting, embroidered openwork, etc. In Dion Lee's ready-to-wear show in the fall of 2018 (Fig. 10), the new fabric was hollowed out to show the elastic sense of retraction.

3.4.2. Special Stitching

Special fancy sewing refers to unconventional stitching to decorate the appearance of the garment pieces and sometimes has the reinforcing performance of the dividing lines. Currently, special stitching has developed hundreds of sewing patterns, such as fishbone, sonic shape, crescent-shaped, etc., which break through the traditional process and optimize the design pattern.

3.4.3. Rolled Edges

In the 1930s, it was popular to use "fine thread roll" to decorate the traditional cheongsam, and the decorative effect of the rolled edges was gradually discovered and innovated. For instance, in addition to the conventional single rolled edges, the form of the multiple rolled edges can also be used, while contrasting colors, similar colors and other fabrics are chosen to strengthen the details and segmentation levels of clothing[10]. The denim jacket in Y/Project (Fig. 11) 2020 has a rolled edge on the shoulders and front to outline the round body form in the same fabric.



Figure 10: Hollowing Splitting



Figure 11: Rolled Edge Splitting

4. Conclusion

Through data collation, this paper has a clear discussion on the split design and optical illusion and has a gradual induction and research on the effect of bisection illusion in the discussion of the laws and nature of both. This paper summarizes various applications and manifestations of the theory of bisection illusion in clothing.

Through the research, this paper finds that the method of the bisection illusion meets the original intention of the clothing design from different aspects of function and decoration, and also contains the designer's own emotions and ingenuity. However, there is a lack of quantitative investigation and analysis on the transformation from visualization to data, which needs to be improved and developed in future research. In the era of booming creativity, the application of parallax segmentation will become more and more extensive, and the combination of cross-apparel field and fashion design will coin more possibilities and research directions for parallax segmentation design.

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