Twisted Plane

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After the middle of the 19th century, great progress was made when Johann Joseph Oppel defined geometrical-optical illusions based on relatively small visual space distortions (Wade, 1982). The term *geometric-optical illusions* was translated from the German *geometrisch-optische Täuschungen* and became the most famous and thoroughly studied of all illusions (Fermüller & Malm, 2004). Artists applied the study of illusion to the exploration of art, which gave rise to the art of illusion, also known as Optical (Op) Art. Agac and Sakarya (2015) proposed that Geometric-Optical Art also be called Perspective (Angle) Optical Art, and it soon became the most influential art of all types of Op Art. Geometric-Op Art yields an awareness of a mismatch of geometrical properties between an item in object space and its associated perception (Westheimer, 2008). Inspired by Geometric-Op Art and the concept of perception, the goals of creating this design research were to a) utilize fabric color and textures to express the visual effect of optical illusions, and b) determine the feasibility of creating Op Art motifs with textiles and garment patterns for making creative silhouettes.

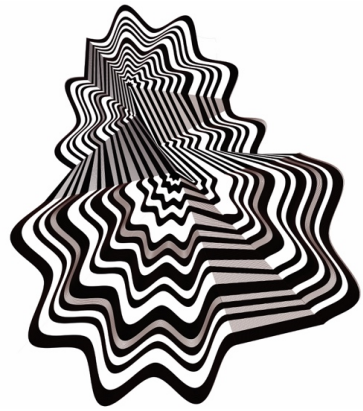

Figure 1. The created motif pattern for digital textile printing and laser cutting

The first step was creating motif patterns for laser cutting and digital textile print. First, the full circular lines were gradually filled from the center to the outline within perfect circles. The circular shape was then divided into several parts randomly. According to the aesthetic segmentation of the circle, segmented circular sections were adjusted in different directions through different sizes, scales, and angles. After adjustment, the lines of each part were connected. Then the shadows were added on different cut planes to make the three-dimensional effect of the pattern stronger. The designer created a graphic pattern consisting of a certain width of lines between some of the circles. The dark gray lines were arranged inside the black lines of the motif (see Figure 1).

The second step of the design process was textile manipulation, which mainly combined inspirational images and the created motif in the first step with the researched fabric modification methods to transform two-dimensional planar patterns into three-dimensional stereoscopic texture effects. According to the comparison of a series of fabric manipulation samples made by the designer, the designer chose to top-stitch the sequins of the same color as the prints on the surface of the fabric. When the creation of the Op Art motif pattern was completed, in order to test the effect of the motif pattern combined with specific fabric texture, the digital printed swatches of 5.07 oz cotton satin, cotton drill, and 5.9 oz cotton twill were digitally printed. A half-size scale dress form was used for draping, so the half-size digital printed motifs was sufficient for testing the

visual effect of the final garment. Through comparing all fabric swatches, the most suitable fabrics, Duchess Satin 4.1 oz, was selected as the final choice, due to its strong durability, medium stiffness, and ability to easily attach sequins. In order to emphasize the effects of the printed lines and enrich the texture details of the garment, the plain black sequins were sewn into the black print area in the form of lines that were parallel to the edges of the black print.

The third step was implementation. The silhouette was tested by using both draping and flat pattern making techniques from two dimensions to three dimensions and back to two dimensions (2D-3D-2D). The method of 2D-3D-2D was based on flat pattern making as the starting point, under the condition of measuring the body size of the model. The flat pattern was created on a half-size mannequin. A circle was drawn to cover a half-size mannequin from the neck to the knee on flat pattern paper, and then cut on calico according to the paper circle for draping on the half-size mannequin. Then, the circular calico was cut along with the cutting lines as the turning lines and a triangular or quadrilateral calico was inserted to make a three-dimensional turning effect. As a result, the actual stereoscopic effect of the experiment was both unique and interesting. Therefore, the designer decided to use the draping method of inserting irregular shapes of fabric into the main body of a circular shape to create a three-dimensional turning effect and combined the structured garment with digital printed fabric. Figure 2 shows the calico with a modified shape during draping. An unfinished hem line was modified by two-dimensional pattern making. The digital printed duchess satin was laser cut along the edge line of all pattern pieces as the edge line of the entire skirt was entirely curved with a large curvature. By laser cutting the pattern pieces, the edge lines were kept as raw edges; laser cutting made it possible to seal the edges of the fabric that contained non-natural ingredients, making it an integral step in the finishing of this dress. The setting of cutting on the laser cutting machine was fixed at 100% power, 50% speed, and 1,000 PPI. The initial dress shape was not fitted to the body shape, because the pattern came from a circular motif. Therefore, four pieces of two-layers of mesh were used as shoulder pieces to secure the positions of front and back pieces of fabric on the shoulder. Also, to keep the edge lines clean, hooks and eyes were used in the side seam. The sequins on the skirt were top stitched with the sequin trimming along the black motifs on the skirt to create a three-dimensional texture on two-dimensional Op prints.

Figure 2. Draping calico on a half-size mannequin

The design demonstrated a successful design process, showing a transformation from motif creation to textile digital printing inspired by Op Art, as well as fabric manipulation and silhouette creative experiments. The design achieved the purpose of expressing the beauty of the art through the creative process and the final garment.

References

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Image A-. Front view

Image B- Back view

Image C- Side view

Image D- Detail view