

Distortion

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The examination and theoretical investigations of visual illusions have lasted for several centuries and continue into the present day. After the mid-19th century, bold stripes were incorporated into geometrical-optical illusions when Johann Joseph Oppel defined geometrical-optical illusions as a subset of spatial illusions (Wade, Todorović, Phillips, & Lingelbach, 2017). The term “geometrical-optical illusions” (translated from the German *geometrisch-optische Täuschungen*) eventually became the best known, most studied of all illusions (Fermüller & Malm, 2004). The initial goal of the current wearable art design, *Distort*, was to explore more possibilities in designing motifs of geometrical-optical illusions on 2-D textiles and 3-D garment utilizing, digital embroidery, and laser cut technologies assisted by a handcraft technique. The purposes of this design research were to: (a) create geometrical-optical illusion motifs using textiles based on the artists’ works and to manipulate the motifs with laser cutting technology, and (b) experiment with methods of engineering the complexity motifs of digital embroidery and laser cutting on the digital garment patterns.

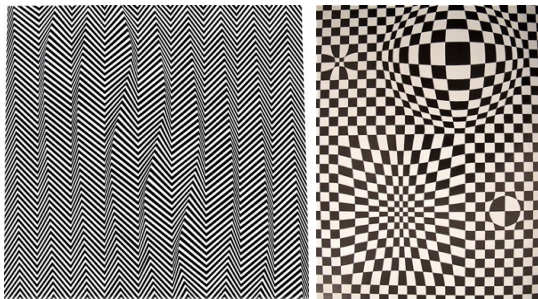


Figure 1. *Descending* by Bridget Riley
Figure 2. *Color Motion 4-64* by Edna Andrade

Two artists’ works were selected as resources for this project. *Descending* (see Figure 1) was created by acrylic emulsion on board in 1968 by British artist Bridget Riley, one of the foremost proponents of Optical Art (Art, 2016). The oil painting work *Color Motion 4-64* was created by American artist Edna Andrade in 1917 (see Figure 2). Both works present how to distort lines and shapes to create geometrical-optical illusions, but in unique, transforming ways. The reason for selecting these two pieces was to create patterns with stereoscopic vision through lines and quadrangles.

The first step of the design process involved creating motif patterns for laser cutting and testing fabric swatches with a variety of fabric combinations. Due to the limitation of the size of the original drawing on the canvas, the designer redrew the *Color Motion* for an expanding the caving effect to fit on the larger size garment patterns. To expand the perspective effect of the original works, the designer cropped the cave view section from Figure 2 and followed the radiating directions to continue drawing the cave view quadrangle (see Figure 3). Three different motif patterns were created and separately located in “front left,” “front right,” and “back” body

patterns. For the patterns on the skirt, the designer stretched the original digital work of Figure 1 on the horizontal direction and rotated it 90 degrees to keep lines radiating in a vertical direction. The image was scaled up to fit into the skirt patterns. All digital motifs were completed with Adobe Illustrator, so they could be sent to the laser cutter to perform the task. In addition, several groups of fabrics were tested collectively to determine which could be woven together. The combination of double-side wool and velvet was determined the best option for creating a large-scale silhouette coat, accompanying leather and tulle as the elements for constructing the lightweight and transparent skirt.

The second step included creating a silhouette through flat pattern making and prototype making. The prototypes were made to examine the pattern shapes and fitting on a size 8 mannequin. Once the prototypes were finalized, all patterns were digitized into the Lectra Modaris Classic 2D V8R2. The patterns were modified and amended by adding $\frac{1}{2}$ inch seam allowances and then converted into DXF files to be opened in Adobe Illustrator (for merging with the motif pattern from the previous step). All laser cutting motifs for the coat had to be separately drawn in two layers through lines (see Figure 3). The short lines were cut on the upper layer of double-faced wool to allow the rectangle shape on the bottom layer of velvet to insert. Due to the high accuracy of laser cutting technology, the top and bottom layers of fabrics could be matched perfectly. The black leather was laser cut into wavy stripes inspired by the artwork of *Descending*. The skirt was constructed using white tulle and attached with the laser cut wavy stripes using double-sided fabric bond paper.

This design project exhibits an innovative method for exploring the application of Optical Art concepts into textile design using laser cutting technology, previously rarely achieved with traditional hand cutting methods. It also demonstrates a successful combination of using a variety of computer-aided design software programs in creating a piece of apparel design such as digital pattern making, laser cutting, and digital embroidery.

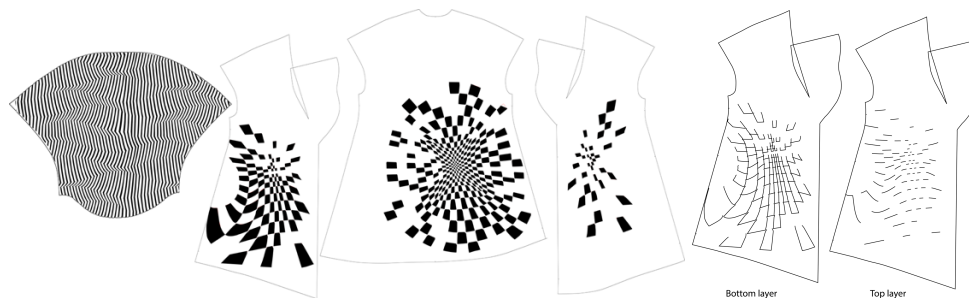


Figure 3. Motif patterns engineered on flat patterns and laser cutting lines

Reference

- Arts. (2016, October 20). Bridget Riley at the Scottish Gallery of Modern Art. *The Saint*. Retrieved from <http://www.thesaint-online.com/2016/10/bridget-riley-at-the-scottish-gallery-of-modern-art/>
- Fermüller, C., & Malm, H. (2004). Uncertainty in visual processes predicts geometrical optical illusions. *Vision Research*, *44*(7), 727-749.
- Wade, N. J., Todorović, D., Phillips, D., & Lingelbach, B. (2017). Johann Joseph Oppel (1855) on Geometrical–Optical Illusions: A Translation and Commentary. *I-Perception*, *8* (3). <https://doi.org/10.1177/2041669517712724>.



Image A- Front



Image B- Back



Image C- Side view



Image D- Detail