Synthesis Flow

Kristen D. Morris, Colorado State University, USA
Jean Parsons, University of Missouri, USA

Keywords: Laser cutting, digital printing, design process

Concept and context: *Synthesis Flow* began as a prototype experiment to blend digitally printed textile designs with laser cutting. The primary goal of this design was to use laser cutting as an integral aspect of how the garment shape was developed. In this work, the laser cutting was the beginning point for the garment shape development. Scholars have experimented with laser cutting for both aesthetic and functional purposes. Laser cutting can be used to create precisely accurate details and is used by designers to create new patterns in fabrics (Baker, 2016), create surface embellishments, or to add visual interest (Hwang & Zhang, 2015). The authors have also experimented with using laser cutting to enhance the function of garments in other works by creating vents to improve breathability (Morris, 2016) or openings in the fabric for better mobility (Morris & Parsons, 2018).

To the best of our knowledge, no scholars have tried to combine laser cutting with digital printing in this method where the laser cutting and digital printing are synthesized in one work to create a new design approach. This exploration in synthesizing digital textile printing and laser cutting resulted in a distinctive art-wear garment.

Process, techniques, and execution: Laser cutting was used as a technique to make strategic cuts in the cloth to create unique shapes and forms and become incorporated into the design as the square cloth was shaped to fit the body. To begin the process, the first author developed vector artwork using Adobe Illustrator to laser cut experimental shapes, such as scallops and curved lines, in a muslin square (Figure 1). Through a series of laser cutting and draping experiments, the authors determined how the cut lines and curves could enhance the addition of pleats and folds, extend the garment, and control shape. In the initial vector artwork, there were many more cuts. During the laser cutting and draping iterations, we taped up cuts that were too large or unnecessary and added cuts to open up spaces for armholes, necklines, and other tucks. After four iterations in muslin, the designers prepared the final cut files and digitally printed fabrics.

The authors intentionally did not create cutouts with the laser cutter, which is a common approach to laser cutting (Baker, 2016). Instead, the authors cut slits in the fabric to achieve the 3D design goals and retain the structural integrity of the fabric. The scalloped shapes were added both to outer edges as well as to an internal section that allows the large square to open up on drop over the head. The cuts made it easier to fold and manipulate the fabric. The textile design was developed to retain a large and uninterrupted surface on which to create the digital art composition. The photographic imagery used is of water flowingunder the ice during a spring thaw, combined with photographs of rust. The images are both linear and fluid, including areas of softly defined curves. The artwork was printed on dye-ready silk crepe on a Mutoh digital textile printer that has been optimized to print silk fabrics. Laser cutting synthetic textiles melts the cutting edges, resulting in clean, perfectly finished and sealed edges (Baker, 2016). Since the art was printed on 100% silk, we needed to devise a method to finish the cut edges by fusing the silk crepe to a silk dupioni with a layer of Pellon Fusible web. When cut with the laser cutter, the fusible web adhesive transfers onto the silk, sealing the cut edge and preventing it from fraying. The combination of the silk

crepe, fusible web, and silk dupioni has a stiffer drape. We utilized this stiffer drape to support the pleats and cuts.

Aesthetic properties, visual impact, and cohesion: *Synthesis Flow* has a distinct visual impact resulting from the combination of digital printing and laser cutting. The design aesthetic of this work is intended to create an experimental art-wear garment with unique, organic shapes that draw attention to the wearer's face. The laser cutouts are organic shapes that reflect the lines in the digital textile print. These cut shapes inspired possible directions for the garment silhouette and with the fabric fusing process, resulted in a textile with a stiff body that could support the lifts and tucks made possible with the laser cutting.

Design contribution and innovation: The synthesis of digital textile printing and laser cutting used in this garment is an experimental design method that can be built upon by others. Through the synthesis of these two technologies, it is possible to develop artistic expressions that may not be possible through other methods. When using laser cutting and fusible web that finishes the edges during the cutting process, designers can devise unique shapes without having to worry about limitations regarding finishing raw edges. This synthesized design process has many possibilities to push the capabilities of laser cutting and digital textile printing and develop design innovations that are not possible by using one technology alone.

Date completed: June 15, 2017
Materials: Silk crepe, silk dupioni, Pellon fusible web
Measurements: Female mannequin size medium (chest: 34", waist: 27"; hip 37")

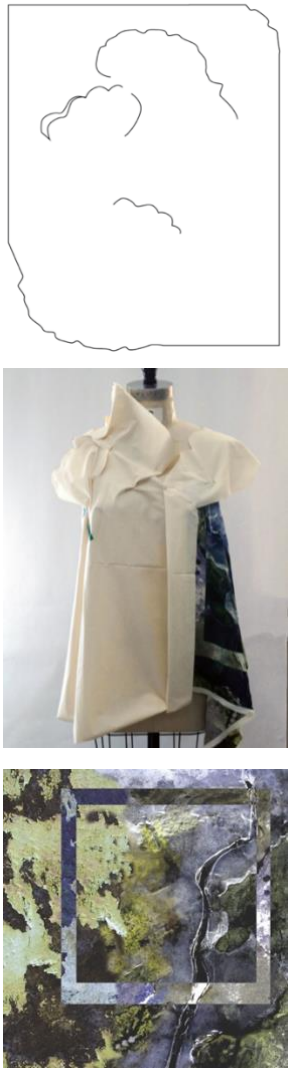

Figure 1. Top: Vector artwork for laser cutting. Middle: An iteration of a draped muslin with tape (left side) to close up excessively large cuts that were resolved in the final laser cut. Bottom: Digital print composition.

References

Baker, L. B. (2016). *Laser Cutting for Fashion and Textiles.* London, United Kingdom: Lawrence King Publishing.

Hwang, C., & Zhang, L. (2015). Carving a rose window. International Textile and Apparel Association (ITAA) Annual Conference Proceedings.

Cho, S. (2017). Depth of color. International Textile and Apparel Association (ITAA) Annual Conference Proceedings.

Morris, K. D., & Parsons, J. (2018). Afterglow: An Equitable Approach to Design. International Textile and Apparel Association (ITAA) Annual Conference Proceedings.

Morris, K. D. (2016). Thermic: A Research-driven Base Layer Developed for Runners. International Textile and Apparel Association (ITAA) Annual Conference Proceedings.