Accessing Axis

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In recent few years, the application of 3D printing technology has expanded beyond the traditional industrial design and reached to biomedical, culinary, and even the fashion industry. This additive manufacturing is a rapid prototyping process that turns digitally developed 3D models into physical objects using additive or building material in production (Barnett, 2013). Experts also foresee the advancement in such technology may lead to the next industrial revolution (Barnett, 2013). Today, the fashion industry has begun to apply 3D printing in developing jewelry, accessories, shoes, and limited garment designs. Designers such as Francis Bitonti and Michael Schmidt collaborated to customized the worlds first fully articulated 3D printed gown for model Dita Von Teese (Mau, 2013). However, such application in fashion industry is currently limited not only by printing material and machinery but also the knowledge in the 3D modeling and printing process. Many designers often rely on collaboration with professional 3D printing companies in the process of 3D modeling and design production, and much of the key knowledge is yet to be shared.

Moreover, 3D printed apparel and accessory designs often are fully produced using 3D printing material and do not include machine-sewn textile parts. The overall goal of this design was to explore the application of 3D printing technology using Selective Laser Sintering System (SLS®) in developing a 3D printed accessory, a waist cage, to be worn with a garment designed with an engineered digital textile print.

The inspirational imagery used in this garment referenced the dramatic geometric details of a gothic cathedral ceiling, which was reflected in both the textile print and the waist cage. The pre-selected imagery was manipulated in Adobe Photoshop through applying color saturation and contrast. The image was also repeated and manipulated in scale to allow appropriate visual proportion to the waist cage design. The final image was engineered into the skirt patterns for digital printing using silk charmeuse. Gradient was also added to create an ombré from lower skirt to waist in order to accentuate the complex visual design of the waist cage.

In the 3D modeling process, the asymmetrical waist cage was virtually developed in 3ds Max® using an avatar converted from 3D body scan, which simulated the function of a dress form in conventional draping method. The waist cage was developed from a tubular shape that later was modified to fit the body and hollow out various geometrical shapes to reflect the textile print. The waist cage was also sliced into four parts to accommodate the printing space in the SLS printer.

The Selective Laser Sintering System (SLS®) used for the 3D printing or rapid prototyping process allows recyclable nylon powder melts and compresses nylon powder into layers to build the model. SLS also allows nylon powder to serve as both building and supporting material. Unlike other 3D printers, it enables printing of free flowing objects as well as flexibility and durability in the material that the waist cage requires. The preparation process involved creating the proper layout to fit the individual waist cage 3D slices into the defined printing space using Netfabb® as well as SLS® computer programs. Finishing process for SLS® printed object included powder brushing and blowing to ensure clean and smooth surface. Before assembling, the waist cage pieces were dipped in Rit® dye at the top and bottom edges to create ombré effect and reflect the textile colors. Surface accent included gold paint and metal, which also aided the adhesion of the two pieces for front and back at center. Metal screw fasteners were used on either side of the cage for closure.

Overall, the geometrical shapes from the textile print and waist cage echo each other and allow cohesion in the ensemble. The outcome suggests that the two materials and techniques helped to create an elegant silhouette that is both ornate and futuristic, presenting juxtaposition between softness and rigidness. Further, this design research allowed the designer the insights of 3D printing process for apparel product and ways traditional design thinking must be improvised for new technology. By allowing integration of two different approaches, the research provided an alternative method to incorporate digital textile design with accessory design. Knowledge is also gained in the area of dyeing SLS printed nylon with synthetic dyestuff. Future research may examine the effective use of 3D body scan in the 3D modeling process to ensure the accurate measurement of final 3D printed apparel product.

Reference

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