Daring to Sprint: 3D Printing Textiles

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Since the 3D printing (3DP) technology took off in the textile and apparel industry worldwide in the recent years, an increasing number of designers, researcher, and innovators have been exploring new ways to print wearable material and exploring new material potentials. The conventional approach in applying 3DP in digitally fabricating products is staying within the limit of the existing material capabilities and 3DP processes to make rigid objects, such as a mug or even jewelry. Previously, many 3D modeling experts from non-apparel field have replied on computational computer-aided design (CAD) techniques in creating articulating objects for wearable product. The fashion technology company, Continuum, created the first 3D printed biniki using a unique set of moveable circular units (N12, n.d.). The 3D CAD process such as this is an unique example of computational design. Furthermore, technology innovator, Nervous System (Kinematics dress, 2014), developed a virtual designing interface and to allow hinge-join based unique to multiply and create a full garment. The outcome was 3D printed in one print job with the help of an unique simulation tool in 3D modeling program. However, articulating 3D printed structures, or “textile”, have been achieved through only expensive 3DP technology, such as the Selective Laser Sintering (SLS) process. Recently, fashion designer Danit Peleg has explored printing 3D printed textile using the common Fused Deposition Modeling (FDM) techonology, a much cheaper process (2014). She was able to versatile and fine textured material for the entire fashion outfits using the polylactic acid (PLA) filament on FDM desktop printers. However, current research is limited in experimenting with 3DP material in this direction. Gap still exist in exploring alternative FDM filament.

This design research aims to explore alternative 3DP material for wearable product. The goal is to experiment with specially FDM nylon filament and various 3D modeling approaches. This research design adopts the research through design methodology and applies reflexive journal for documentation. Samples were evaluated based on flexibility for body contour, resilience, and durability. The final chosen 3D printed textile sample was integrated in a knit based garment.

Daring to Sprint is inspired by fierce spirit in the athletes and activewear. The ensemble consists of two parts using both compression knit and 3D printed nylon textile. The bodice portion is symmetrically designed in a sports bra style with center back hook and eye closure. The 3D printed textiles, 3 pieces on each side, are integrated as insets in the bra front and serves to provide both functional and aesthetic values. Similarly, the 3D printed textile is also applied in the bra back. The bottom portion of the ensemble is created as a compression pants. The symmetrical design incorporated both knit and 3D printed insets in the front and back to draw focal point Overall, the ensemble is futuristic and bold, reflecting the innovation in the material advancement and innovation. The diagonal lines and movement communicated suggest an energized feeling. The textile design is digital printed using photographic engineered print techniques. The 3D printed textiles were printed in semi-translucent color and later dip dyed (Rit) in gray and pink to achieve an ombre affect for design cohesion.

The 3D printed textile applied is 3D modeled in Rhinoceros (Rhino) using think filaments. In order to achieve the highest level of stretch and flexibility, it is created in a bias fabric structure, as used in traditional woven material. The specialty nylon material is printed using FDM printer in a layer and layer format using a base platform. The maximum printing dimension is limited to desktop versions. The engineered print on the compression knit is created through manipulating multiple photographs in color balance and light contrast using Adobe Photoshop. Traditional draping and flat patternmaking techniques were applied in the garment prototype and construction process.

The findings in this research suggest the great potential in treating 3D printed textile material the similar to traditional fabric in using common sewing techniques in garment construction. Also, learning curve exists in understanding the way the 3DP nylon textile behave in the sewing process. It however does serve as garment supporting device when stress areas and compression functions are needed. At the same time it also provides unique resilient property when contour is needed on the human body. For future, more material evaluation must be explored in both physical testing and 3D CAD modeling approaches.

Reference

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