Digital Fashion: An Integrated Approach to Additive Manufacturing in Wearable Fashion

Authors : Lingju Wu, Hao Hua

Abstract : This paper presents a digital fashion production methodology and workflow based on fused deposition modeling additive manufacturing technology, as demonstrated through a 3D printed fashion show held at Southeast University in Nanjing, China. Unlike traditional fashion, 3D printed fashion allows for the creation of complex geometric shapes and unique structural designs, facilitating diverse reconfiguration and sustainable production of textile fabrics. The proposed methodology includes two components: morphogenesis and the 3D printing process. The morphogenesis part comprises digital design methods such as mesh deformation, structural reorganization, particle flow stretching, sheet partitioning, and spreading methods. The 3D printing process section includes three types of methods: sculptural objects, multi-material composite fabric, and self-forming composite fabrics. This paper focuses on multi-material composite fabrics and self-forming composite fabrics, both of which involve weaving fabrics with 3D-printed material sandwiches. Multi-material composite fabrics create specially tailored fabric from the original properties of the printing path and multiple materials, while self-forming fabrics apply pre-stress to the flat fabric and then print the sandwich, allowing the fabric's own elasticity to interact with the printed components and shape into a 3D state. The digital design method and workflow enable the integration of abstract sensual aesthetics and rational thinking, showcasing a digital aesthetic that challenges conventional handicraft workshops. Overall, this paper provides a comprehensive framework for the production of 3D-printed fashion, from concept to final product.