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Generative Garment Design for Circularity

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Advanced computational tools and new technologies employed in the fashion industry promote the continuation of linear business models and marketing. For example: Artificial intelligence (AI) and machine learning (ML) strategies (such as generative adversarial networks (GAN)) are used for predicting consumer behaviour and fit; gamification through virtual reality (VR) and augmented reality (AR) are utilized for extracting data, altering consumer behaviour and hyper-personalized marketing. There is great potential for the fashion industry to leverage these tools and focus their capabilities on enabling circular collaborative customization business models in the design and production phases.

The fashion industry has yet to pivot to a model which produces meaningful climate impact. Circular fashion design has been supported with limited industry educational content and plans for recyclability, garment collection, and resale following mass production standards. Radical change to the industry, fashion business models, design and production is necessary to improve fashion's footprint.

This paper investigates such tools and their potential to support the inclusion of circularity analytics to inform the garment design and production. These tools are envisioned in a generative garment design process to produce fashion silhouettes which are based on circular principles from the initial design stages. The development of the generative garment design process for circular fashion aims to understand the aesthetics of extreme design constraints for meaningful climate impact. The proposed design workflow builds upon the circular collaborative customization strategy, utilizing advanced garment tools such as body scans for customization, generative garment design, and circularity analytics in order to determine the possibilities of customizable silhouettes.

Generative design workflows are currently used in several related industries such as in engineering for optimization and simulation, industrial and product design, and with limited success in architectural applications. In this paper generative garment design and circular performance garment objectives and constraints are defined, utilized, and evaluated. The iterative process of generative design allows for the consideration of circularity at the same time acknowledging both the aesthetic costs in relation to circular costs. The circular silhouette allows the implementation of global data to confirm design aspects on the body to create one unifying garment reaching across cultural needs to aid in achieving planetary climate needs.