3D Body Scanning to Transform Sleeve Patternmaking in the Fashion Industry

Sumayah WAZIR *, Simeon GILL, Kristina BRUBACHER
The University of Manchester, Manchester, UK

https://doi.org/10.15221/24.07

Keywords: Pattern construction, Sleeve pattern, 3D body scanning, Parametric patterns, Technology, Garment fit, Customization, Fashion innovation.

Abstract

In apparel design, sleeve patternmaking plays a pivotal role in determining both the comfort and aesthetic of a garment, especially for set-in sleeves. These sleeves not only contribute to the overall fit but also influence the wearer's range of motion and ease of movement. However, the process of creating a well-fitted sleeve pattern is complex, as it requires an in-depth understanding of the relationship between body measurements and pattern design. This understanding can be significantly enhanced by using 3D body scanning technology and parametric software, which offer precise and accurate measurements that reflect the wearer's unique shape.

This research focuses on enhancing the design of women's set-in sleeve patterns by incorporating 3D body scanning technology into the drafting process. By using advanced parametric tools, such as Seamly 2D Parametric software, this study assesses how precise, real-time body data can revolutionize the accuracy of sleeve patterns. The focus of the study is on size 12 Alvanon UK women's forms, which serve as a standardized model for evaluating eight established sleeve drafting methods. These methods, while unique in their approaches, share a common goal: to create a sleeve that fits well and meets the design's aesthetic requirements. Each method is sequential and detail-oriented, involving direct measurements (from the body or bodice pattern), proportional calculations, and fixed integers to define the shape and size of the sleeve.

At the core of the research lies a comprehensive comparative analysis**.** This study meticulously evaluates each method's calculation of critical dimensions such as sleeve crown height, bicep width, and armhole circumference. The visual comparisons produced by Seamly 2D highlight distinct variations in sleeve shape, reflecting differences in ease, styling, and how each method approaches fit. Despite all methods being applied to the same size 12 Alvanon body form, each yields a uniquely shaped sleeve. The analysis vividly highlights these differences, pointing out the primary factors of variation across the methods, such as ease and crown height.

The study also involved evaluating sleeve pattern drafting methods through virtual fit analysis in CLO 3D, employing a standard UK size 12 Alvanon avatar without modifications to the original drafts. This comparison aimed to understand each method's strengths and limitations, offering a foundation for proposing new engineered sleeve pattern construction approaches. By analysing the theoretical underpinnings and practical outcomes of these sleeve-drafting methods, as well as conducting virtual assessments, the research identified several shortcomings in traditional techniques, such as their lack of adaptability to diverse body shapes. These deficiencies underscored the need for an innovative approach that integrates modern technology to refine the process. By leveraging tools like 3D body scanning and virtual fitting, the research seeks to develop innovative solutions for diagnosing and addressing sleeve fitting issues, contributing to the advancement of sleeve design techniques and promoting a synthesis of traditional drafting methods with modern digital tools to enhance garment fit and aesthetics.

The integration of 3D body scanning technology signals a key advancement in custom-fit apparel, offering accurate body measurements and precise contours that help produce sleeves with enhanced fit and comfort. Aligning 3D scans with sleeve patterns enables designers to visually assess and make real-time adjustments to the fit, permitting nuanced modifications potentially overlooked in traditional methods. This precise data ensures sleeves that not only conform to the wearer’s shape but also complement the body’s natural movements, achieving harmony between aesthetics and functionality.

* sumayah.wazirali@postgrad.manchester

As part of this research, a new method was developed that not only incorporates the strengths of traditional drafting techniques but also enhances them by integrating detailed, accurate data from 3D body scans. This method accounts for the wearer's bones, joints, and muscles, creating sleeves that allow for natural movement and enhanced comfort. The 3D scans provide precise measurements that capture the true contours of the arm, ensuring a custom fit not only to the size but to the wearer's unique body shape. Furthermore, an analysis of armhole sizes and the correlation between shoulder height and underarm height was conducted to understand the variation in armhole depth across a diverse population of females. Using Python for statistical analysis, this correlation analysis revealed the relationship between shoulder and underarm height, providing insights into different body shapes and informing the pattern-making process. The analysis indicated potential variability in armhole depth, which was incorporated into the new method to create patterns that adapt to various body shapes. This data-driven approach improves the functionality and aesthetics of garments, allowing for better-fitting, more comfortable sleeve patterns that meet the needs of a wider population.

Conclusion

This research marks a significant advancement in sleeve patternmaking by integrating modern technology, specifically 3D body scanning, with traditional drafting techniques. The personalized and accurate approach to sleeve construction, particularly for women's set-in sleeves, is supported by detailed comparative analysis and expert feedback, which provide insights into optimizing sleeve fit and movement. As the fashion industry evolves, these findings pave the way for more advanced, body-responsive patternmaking methods suitable for both bespoke and ready-to-wear markets. The future of sleeve design lies in the combination of technology and craftsmanship, enabling more precise garment construction that offers better-fitting, more comfortable clothing tailored to individual body shapes.