Alternative Pattern-making 3D Design Software

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Introduction: The purpose of this project was to explore alternative design software that allow 3D designs to easily convert into 2D patterns for apparel production. The 3D design software programs explored for this project include CAD software Rhinoceros (Rhino) and 3D Studio Max (3DsMax). In comparison to software such as Optitex, Modaris 3D Lectra, and other pattern-making software, these alternatives may be more accessible to design students, present a user-friendly interface, allow a more abstract approach in design creativity, and provide the interdisciplinary value beneficial for projects that may evolve into 3D printing. Although learning the professional pattern-making software is essential for apparel design students entering the apparel industry, these software programs however, are not accessible to many students outside of their institution or working context. Learning alternative design software assists students to not being detached from the technology while being outside of the didactic or industry circumstances.

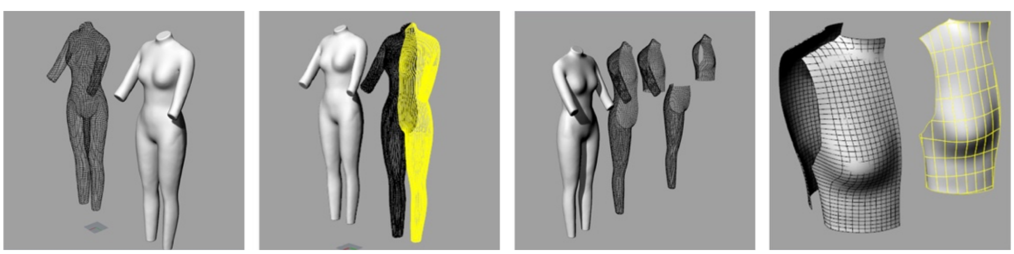
Literature and Background Research: There are multiple ways to approach 3D design with CAD software programs. An approach suited for apparel design involves cutting planes to build semantic feature classifications on the vertices, edges and faces of the body scan mesh such as the neck, shoulder, chest, bust, waist, hips, etc., as necessary to accommodate the garment design (Liu *et al.*, 2010, 577). This precise base model approach then allows for apparel design modeling to be guided by two design zones, design for fit, or design for fashion (Kim & Park, 2007). Fit zone modelling proceeds by digitizing the body scan data to create optimum fit as well as the ideal shape of the garment. Fashion zone modelling uses parameters that determine the aesthetic appearance of the garment that users can design garments with various silhouette intuitively (Kim & Park, 2007, 8). These models then transform into the next step, which is producing patterns for garment construction.

Pattern making methods by computer, studied by Yunchu and Weiyuan (2007) identify two types which are geometrical flattening and physical flattening. Geometrical flattening techniques do not consider the physical properties of materials and require complex spatial rotations and translations to transform 2D segments from individual planes of projection into a chain-linking plane (x, z) of segments into the contours of individual 2D cutting patterns. Physical flattening represents cloth models as triangular or rectangular grids with points of finite mass at the intersections (336). Distortions in the 2D pattern flattened from 3D apparel model do occur, and require examination before utilizing (Yunchu & Weiyuan, 2007). It can be difficult to construct the real garment model in these systems but with experience and software knowledge precision can be obtained.

Concept: Access to design software such as Optitex and 3D Modaris Lectra may present challenges to design students, whether that includes financial, technological, or design process challenges. Introducing 3D CAD design software to design students enables the ability to explore a new thought process when approaching design. This exploration may involve body to garment relationship design, or abstract design utilizing 3D objects that can then be modeled around and transformed while varying the body shape and size through the addition of geometric shapes that may then present new creative design thinking.

Process: The common thread amongst these 3D design software programs begin with the use of a 3D body scan saved as a stereolithography file (.stl). The body scan creates the base avatar, or dress form that could then be used to model 3D apparel designs. These designs could map the body for a fitted look in case of using stretchable fabrics such as bodysuits, or away from the body to create a more abstract, sculptural look by applying a reasonable amount of ease. The design process involves thinking of how to obtain the end design through the use of geometric shapes and modifications. The user interface provides examples and instruction of each step that needs to be taken to achieve the end goal. Multiple design attributes are available through descriptive icons, or easily typed commands that populate immediate word lists to choose the desired action. For example, steps to follow this process in Rhinoceros involve capturing the 3D object, alignment of the object with the horizontal and vertical axis, providing cross sectional segments and dividing the body into critical sections (such as arms, upper body, and lower body), connecting sections, applying ease, separating the front and back pieces, and finally obtaining the 2D image of each piece in PDF (Figure 1). Patterns are then created from these 2D images and allow us to construct the garment for the final stage to verify the sewn garment represents the same characteristics of the digital 3D model.

Figure 1.



Conclusion: According to this empirical research, this design process relies on the users' selection for each modification, making an individual apparel piece, or a full ensemble a quick transition into patterns, sections, or exploded diagrams. These tools allow for pattern pieces to then be printed and used for garment assembly, as well as provide design communication for technical specification packages, presentations, and professional student portfolio projects. The conversion from 3D to 2D designs in Rhino and 3DsMax differ in process, but both present user-friendly interfaces, and multiple viewports for accuracy and precision in design.

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