Flutterform: A Choreography of Cells

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This project presents an innovative approach to sustainable and inclusive fashion, merging kirigami principles with cellular imagery drawn from biological research. The core design challenge was to create a no-sew, size-inclusive garment that minimizes textile waste while remaining visually and functionally dynamic. Inspired by Kirigami Bauble video (VectoriseArt, 2024). VectoriseArt's engineering-driven kirigami paperwork, the project investigates how laser-cut, repeated motifs can simultaneously serve structural, aesthetic, and sustainable purposes.

Developed through a STEAM-focused collaboration with the university's Chemistry department, the project draws inspiration from microscopic images of Axolotl cells. These cellular structures were tessellated and abstracted into motifs reminiscent of butterfly wings, symbolizing transformation and elegance. Using kirigami-inspired cutting on the motifs brings together a sense of scientific curiosity and creative flair, resulting in a design that feels both thoughtful and expressive.

Aesthetic Goals and Visual Impact

The design draws its visual impact from a light, airy feel and the way it moves with the body. Carefully placed cuts and folds create a fluttering motion that adds rhythm and shape, bringing the silhouette to life. The repeating patterns, inspired by Axolotl cells, give the fabric a delicate, lace-like look that carries a deeper scientific significance. 100% polyester taffeta was selected for its unique balance of crisp structure and fluid drape, allowing the motifs to maintain their shape while flowing with movement and breeze. The laser-cut motifs flutter softly as the wearer moves, creating both visual and auditory layers of expression.

Color plays a critical role in enhancing the design's dynamic qualities. The bright color of the lining peeking through the cut areas creates depth and visual texture in the overall presentation. The subtle reveals of color during movement mimic the iridescence of butterfly wings, reinforcing the theme of transformation.

Methods: Process, Technique, and Execution

The design process involved extensive experimentation with kirigami patterns and repeated motifs. Influenced by VectoriseArt's technique, the original pattern was tested by hand cutting and folding the paper to understand how it worked. The motifs were traced from the Axolotl cell and created flutter motif cut patterns. Through iterative prototyping, motifs were tested for design, shape, size, placement, and function. Laser cutting was used to execute precise, consistent cuts across the fabric, eliminating the need for traditional seams or stitching. 100% Polyester Taffeta was selected for its

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unique balance of stiffness and drape, which supports both structural cuts and soft movement.

As one of the goals is sustainability, this design focuses on zero waste or having as little waste as possible. The dress pattern is a one-piece, long, rectangular shape. The laser-cut motif patterns are repeated throughout the piece, with the shoulder part indicating the separation of front and back. In the shoulder areas, the motifs were rotated 90 degrees to prevent stretching and to have cut motifs lying smoothly. In the neck area, parts of the motifs are cut and manipulated by lacing them to create a neckline, which turned out to be both functional and aesthetically pleasing. The ability to cut anywhere on the motifs creates a customizable neckline shape and size to fit the wearer's head or to create different designs.

The repeated cuts of the flutter motifs allow the fabric to bend and flow in ways not typically achievable with static woven materials. The straight lines in between the flutter motifs allow easy folding (shown on the front chest). These folded lines not only create interesting textures but also allow the dress to be customizable in length. The folded elements can be created anywhere. The side seams are laced together without any sewing. The overall silhouette was kept simple but effective for anyone with chest and hip measurements less than 44 inches. The pattern can be revised to accommodate bigger or smaller sizes easily. With the ability to cut and fold the cut motifs, silhouette adjustments are also possible.

The lining piece was cut with the same motif along the side seams only. An oval-shaped hole was cut to create the neckline in the lining. The oval cut fabric piece was cut with the flutter motifs and later used to create the pendant (attached to the left chest). The pendant was created by lacing the strings of flutter motifs from the lining piece and scraps from the front and back scalloped hems. In the end, all trimmed and leftover cut pieces were used up, reinforcing the commitment to zero-waste design.

Cohesion of Concept and Execution

The final artifact demonstrates a strong cohesion between concept, material, and execution. The repeated motifs and laser-cut techniques visually and functionally reference kirigami's architectural elegance. Each element, from color selection to silhouette to size and length adaptability, serves the dual goals of beauty and function. The garment can accommodate different body types and sizes, and its no-sew construction and customizable length and neck shape make it an inclusive and transformative design. Details of the piece, from the fluttering ties to the subtle pop of color in the lining, reveal reinforce the central themes of sustainability, adaptability, and movement.

Design Contribution and Field Advancement

This work contributes new knowledge to fashion design by extending the use of kirigami from static engineering forms into adaptive textile applications. It demonstrates how cut motifs can replace traditional seam-based construction methods while also creating customizable forms. This project advances the concept of aesthetic

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functionality by enabling wearers to modify the neckline, length, and silhouette through motif manipulation, thereby fostering opportunities for individual expression and user engagement.

The integration of tessellated cell imagery into textile surface design illustrates how scientific visualizations can be recontextualized into wearable art with social and functional significance. This design opens future research opportunities in adaptive patterning, zero-waste systems, and STEAM collaborations in fashion education and practice.

References

VectoriseArt. (2024, September 15). *Kirigami Bauble* [Video]. Youtube. https://www.youtube.com/watch?v=nLRdwcm45PM

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