Transforming 2D Materials into 3D Objects: Flexing and Stretching the Rules

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Weaving is an orderly entanglement; it has long been a way to deal with complexity and unorganized components and aims to introduce geometric characteristics and physical properties such as structural efficiency and elegance into a fabric of entwined strands. Weaving embeds a fundamental construction principle of transformational properties through which a 2D woven mesh can become a 3D network. The traditional basket-making strategy provides a clear set of rules for achieving a broad range of complex doubly curved morphologies (including free-form and high genus topology) while only using straight edge strips of material in fabrication.

The versatility of weaving patterns and form-related components relating to three-dimensional geometry of shape and complex surfaces means that these techniques can be pushed beyond conventional craft-based limits towards novel applications across disciplines [1][2].

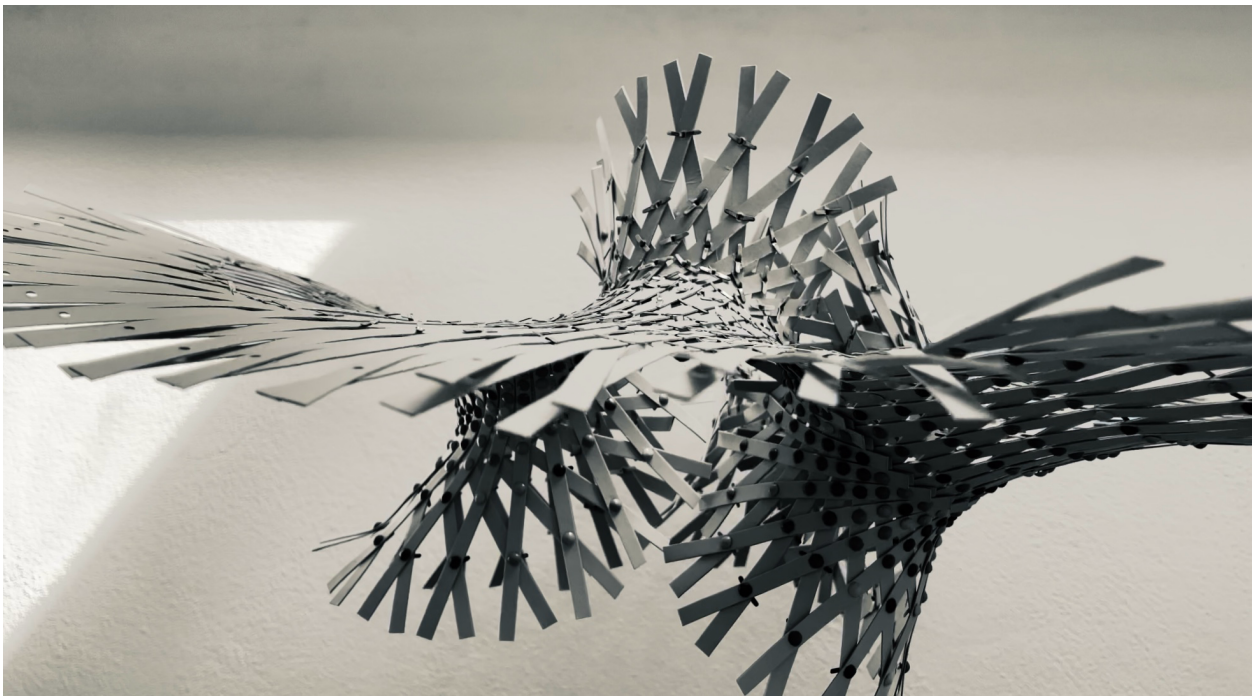

Figure 1: *Minimal surface, woven version. Planar Enneper's. Woven paper, 2025.*

References

[1] Alsion Martin. "Smooth Triaxial Weaving with Naturally Curved Ribbons." *Physics Review Letters*, vol. 127, no. 10, 2021. https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.127.104301

[2] Alison Martin. "3D Weaving with Curved Ribbons." *ACM Transactions on Graphics*, vol. 40, no. 4, pp. 1–15. https://dl.acm.org/doi/10.1145/3450626.3459788