

Abstract Submitted
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Quantification of a Helical Origami Fold¹ ERIC DAI, Washington University in St. Louis, XIAOMIN HAN, ZI CHEN, Dartmouth College — Origami, the Japanese art of paper folding, is traditionally viewed as an amusing pastime and medium of artistic expression. However, in recent years, origami has served as a source of inspiration for innovations in science and engineering. Here, we present the geometric and mechanical properties of a twisting origami fold. The origami structure created by the fold exhibits several interesting properties, including rigid foldability, local bistability and finely tunable helical coiling, with control over pitch, radius and handedness of the helix. In addition, the pattern generated by the fold closely mimics the twist buckling patterns shown by thin materials, for example, a mobius strip. We use six parameters of the twisting origami pattern to generate a fully tunable graphical model of the fold. Finally, we present a mathematical model of the local bistability of the twisting origami fold. Our study elucidates the mechanisms behind the helical coiling and local bistability of the twisting origami fold, with potential applications in robotics and deployable structures.

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