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Tunable Helical Origami ZI CHEN, ERIC DAI, Washington University, HUANG ZHENG, Fujian Radio and Television University — 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 begun to inspire innovations in science and engineering. For example, K. Miura led the study of a paper folding pattern in regards to deployment of solar panels to outer space, resulting in more efficient packing and unpacking of the solar panels into tightly constrained spaces. In this work, we study the geometric and mechanical properties of a twisting origami pattern. The pattern created by the fold exhibits several interesting properties, including rigid foldibility, and finely tunable helical coiling, with control over pitch, radius, and handedness of the helix. In addition, the pattern closely mimics the twist buckling patterns shown by thin materials, for example, a mobius strip. In our work, we relate the six parameters of the twisting origami pattern to generate a fully tunable graphical model of the fold. In addition, we demonstrate that the morphogenesis of such folding pattern can be modeled through finite element analysis. We hope our research into the diagonal fold brings insight into the potential scientific and engineering applications of origami and spark further research into how the traditional paper art can be applied as a simple, inexpensive model for complex problems.

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