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# Inverse Design of Conformal Kirigami Structures

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## Abstract

Shape-morphing structures can transform from one state to another, making them highly valuable in engineering applications. In our study, we are interested to design kirigami structures that can morph into prescribed configurations. During the first phase of this study, we propose a two-stage shape-morphing framework, inspired by 2D kirigami, to design structures that can deploy from a compacted configuration to a prescribed state, under certain mechanical stimuli. The proposed framework establishes a connection between some known aspects of the geometry and previously missing elements in the mechanics of kirigami structures. This approach combines finite element analysis, genetic algorithm, and an analytical energy-based model to obtain kirigami designs with robustness and computational efficiency. In the second phase of our study, we leverage our framework to 3D scenarios. By combining conformal mapping and optimised bistable kirigami units, we can design a cut pattern that can morph from 2D kirigami sheets into 3D configurations that can be stable without external constraints

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