

Abstract Submitted
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Origami Metamaterial based on Pattern Rigidity¹ YAN CHEN,
Tianjin University, ZHONG YOU, University of Oxford — Origami inspired mechanical metamaterials are made from a tessellation of origami units. Their mechanical behaviour is closely related to the behaviour of the origami units used. In this article, we focus on a family of metamaterials that are created by the tessellation of the square twist origami units. Generally a square twist origami unit can have four distinct hill-valley crease arrangements, two of which are rigidly foldable whereas the others are not. The rigidly foldable unit has, in general, lower stiffness than that of the non-rigidly foldable one if the facets can easily rotate about the creases. We shall show that it is possible to put rigidly foldable and non-rigidly foldable units together to form a geometrically compatible tessellation, and the stiffness of the overall structure based on such a tessellation is primarily decided by the number of non-rigid units. By astutely placing such units in a tessellation, we are able to create a metamaterial with a tunable stiffness.

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