Rigid Origami to Fold a Flat Paper into a Patterned Cylinder

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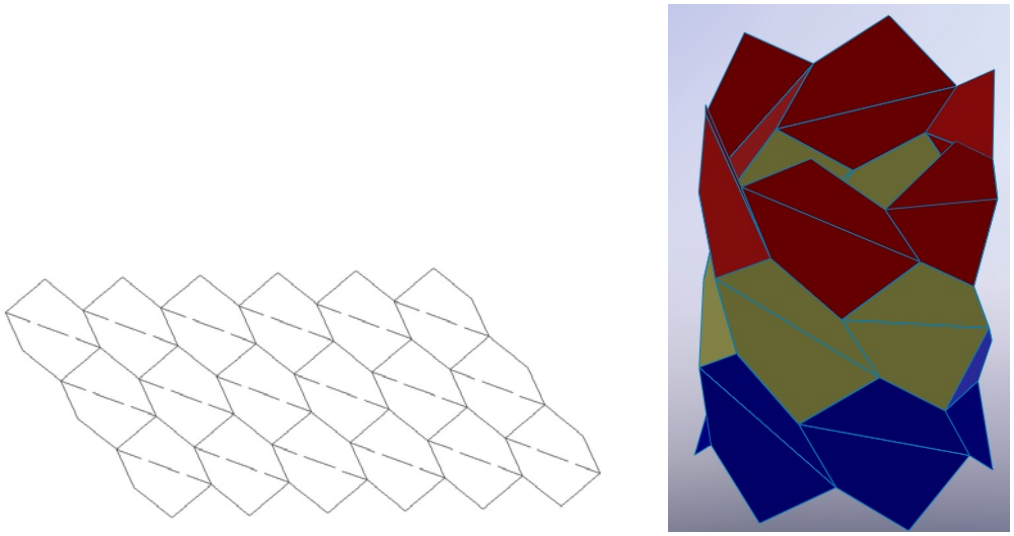
Abstract:

In this work, several patterns have been designed to fold flat papers into closed patterned cylinders following the condition of rigid origami.

The existing folding patterns of cylinder are either non-rigid origami or with multi-degree of freedom. And the formed cylinders can be folded further in axial and longitude directions. The proposed patterns are to fold the flat papers into patterned cylinders which cannot change the shape after sealing the edges to get stable structures.

In order to keep the rigidity of origami pattern, all the vertices are with only four folds in valley or hill. The geometric condition of the folding angle and length has been derived. In fact, the four folds at each vertex form a spherical 4*R* linkage with single degree of freedom. As a result, the origami patters are the assemblies of a number of same or different spherical 4*R* linkages, which are arranged in such a way that the whole assemblies have only one degree of freedom. Therefore, the folding process can be demonstrated by the kinematics motion of the linkage and linkage assemblies.

There are totally four patterns are presented in this paper. One example of the folding pattern and patterned cylinder is shown in Figure 1.



(a) (b)

Figure 1 Design A. (a) rigid origami pattern; (b) the resultant patterned cylinder.

Submission categories: Design

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Audio/Visual requirements*: projector