Abstract Submitted
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Prediction of the force required to unwrap a thin-film origami structure[1] LEE WILSON, SERGIO PELLEGRINO, Caltech — We consider thin film membranes wrapped around a polygonal hub according to the origami crease pattern developed by Guest and Pellegrino [1]. The problem of unwrapping such membranes is important for applications such as space solar sails. Their deployment can be controlled by displacing four edge points radially outwards. During deployment the film buckles multiple times, creating a complex deployment force profile. We have used finite element simulations to investigate how different models of the creases affect the predicted force profile and we have compared the results of our simulations with experimental results for Kapton thin film thicknesses of 50um, 25um, 12.5um and 7.5um. The deployment force profile is also highly dependent on the initial packaged configuration of the film, which in our model is obtained by simulating the folding process from a flat state.
[1] S.D Guest and S. Pellegrino, Proc. First Int. Seminar on Struct. Morphology, R. Motro and T. Wester, eds. (1992) pp 203-215

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