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Technology Transfer Office

Design and Kinematic Optimization of a Waterproof Shape Shifting Surface

Researchers at the University of South Florida have improved on an existing design for a shape-shifting surface by making it an effective barrier to fluid flow (waterproof) and have reduced internal stresses experienced during device operation.

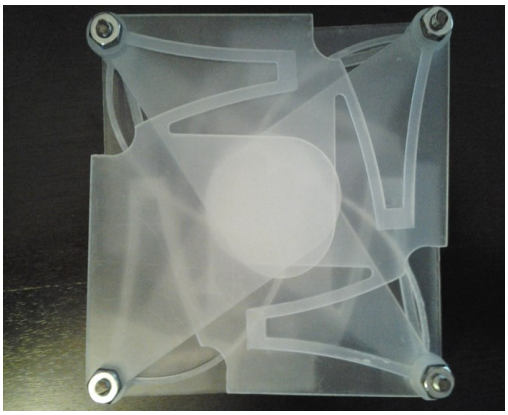
The complaint links are the individual pieces which makeup a shape-shifting device in order to coordinate system orientation. The unit cell consists of multiple compliant links oriented at ninety degrees from one another and bound at the nodes. When the parts are fused, compression and tension in the flexure occurs if the path of the node is not a straight line in the X-direction. As a result, the kinematics of the moving node are a significant determiner of the maximum stresses seen as the flexure deflects.

USF inventors have combined the structural integrity of a Shape Shifting Surface (SSS) with the water-tight seal of a flexible plastic sheet to create a surface which would be strong, flexible, and waterproof. Solid mechanisms theory was used to analyze the behavior of the part using the virtual work method. Together, these theories formed the basis of the optimization component of the invention which aimed to reduce stress in the flexure by improving its kinematics (i.e. making its motion more nearly straight-line in X-direction). This method also incorporates the origami membrane that makes it waterproof. This has applications in the maritime and medical industries.

ADVANTAGES:

- **Water-tight**
- **Flexible and strong plastic sheet to create structural integrity in Shape Shifting Surfaces**

Optimized and Water-Tight Shape-Shifting Surface



Example of unit cell: Equilibrium position

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