

Case ID:M19-170P
Published: 1/8/2020

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Origami-Inspired Foldable Quadrotor (FQR)

Background

In conventional quadrotors, motors and electronics are mounted on a rigid structure, which limits vehicle maneuverability. To address this challenge, several flexible multirotor designs have emerged. These include pulley-operated schemes for rotation of arms that enable in-flight morphing, and mechanisms for tilting motors to alter flight patterns. Even so, foldable quadrotor (FQR) technology is far from mature and can advance with new fabrication approaches.

Invention Description

Researchers at Arizona State University have developed an FQR that utilizes a multilayer manufacturing approach suitable for creating flexure-based hinges and revolute joints. Although origami-inspired, folding laminate structures have been demonstrated in applications such as millimeter-scale wing-flapping robots, these structures have not yet been explored for in-flight quadrotor morphing. The proposed FQR is made from laser-cut cardboard which significantly reduces cost and fabrication time. Tendon-actuated extension and retraction of the four arms is achieved with a centrally mounted motor. As a fully dynamic model with advanced control capabilities, the prototype outperforms conventional quadrotors in flight simulations through obstacles.

Origami-inspired FQR prototype.

Potential Applications

- Quadrotors and unmanned aerial vehicles (UAVs)

Benefits and Advantages

- Low-cost fabrication
- Enhanced maneuverability from in-flight morphing capabilities

Related Publication

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