

Abstract

Origami-Inspired Smart Building Skin †

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Abstract: We propose the design of an environment-responsive, deployable origami-inspired structure to be used as a smart building skin. The folding structure is composed by rigid panels connected to each other through hinge-like connectors. The overall degree of openness of the whole structure is adjusted in response to variations of environmental parameters like lighting and temperature, recorded by a network of embedded sensors. The geometry and kinematics of the origami are selected so as the deployment of each module can be induced at some key points that only slide along a linear axis; in this way, electric motors with a positional control logic can prove efficient. By properly tuning the properties of each panel mounted on the frames, the proposed solution can be adopted as a shading or light refraction system, thus improving the comfort of the building interiors. Through digital prototyping and small-scale models, the effectiveness of the proposed solution is assessed. Some site-specific applications are finally discussed from the self-sensing, self-actuation and self-powering viewpoints.

Keywords: adaptive systems; deployable structures; modular origami structures; self sensing and actuation



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