Light-Driven Dandelion-Inspired Polymer-Assembly Glides in the Air

Jianfeng Yang*[1] and Hao Zeng[1]

[1]Tampere University – Finland

Abstract

The ceaseless progressions in smart materials and photomechanical actuators have unfolded novel avenues for small-scale, soft robotics amenable to remote manipulation. However, despite the achievement of conventional modes such as walking, leaping, and aquatic locomotion, the realm of aerial flight encompassing dispersal, gliding, or even hovering remains uncharted territory for soft robots. The obstacles to achieving high-performance actuators, lightweight frameworks, and effective photomechanical modulation of aerodynamics are immense. To tackle these quandaries, this research proposes a soft material structure, inspired by dandelion seed, that can disperse under the gentle wind. Particle Image Velocimetry (PIV) measurement uncovered the presence of a separated vortex ring pattern above the structure, inducing a negative pressure that aids in its suspension within the air. The artificial seed is endowed with a light-responsive liquid crystalline elastomer, thereby facilitating reversible opening and closing of the structure upon illumination. The study shows the optically guided wind-assisted ascension and descent behaviors through meticulous adjustment of terminal velocity and drag coefficient. The revelations brought forth by these findings offer innovative avenues for the advancement of wirelessly controlled, miniature devices capable of aerial locomotion.

*Speaker