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High frequency underwater actuation in liquid crystal elastomer film

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Abstract:

Self-sustained artificially engineered soft matter systems capable of achieving continuous motions under consistent stimulus facilitate the exploration of biomimetic, autonomous soft robotics. Soft liquid crystalline elastomer (LCE) has been observed to be a versatile material system exhibiting multi-stimuli responsiveness and remarkably large reversible shape morphing [1,2]. Concurrently, utilizing optical fields to induce shape morphing in LCEs can provide precise spatial control and remote control. Optically programmable LCEs can adapt to complex environments and execute various tasks such as locomotion and object translocation. Here, we demonstrate an underwater actuation using single layer of photo driven LCE. The variation in frequency of input optical field can be used to tune the actuation as well as speed of LCE film. The remote actuation control in wireless, small-scale robotics highlights the novel capabilities of photo driven actuator that can be manipulated in untethered, isothermal, and wet environmental conditions, thus suggesting various potential applications, including underwater soft robotics.

References

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