Frontier of Artificial Network

Department of Data Science
香港城市大學
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Constructing High-performance Robotic Insects With Origami Transmission Mechanism

Invited Speaker

Yide Liu

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Date: July 18, 2025 (Friday)

Time: 11:00 am-12:00 am (Hong Kong Time)

Zoom Meeting: 954 9414 1471

Biography

Yide Liu is a postdoctoral researcher with the Department of Mechanical Engineering at Tsinghua University. He received a B.Eng. degree in Mechatronics from Harbin Institute of Technology in 2018 and a Ph.D. degree in Mechanics from Zhejiang University in 2023. His research interests include robotic insects, micro-manipulators, multi-robot systems, and central pattern generators. He has published in Nature Communications, Science Advances, T-RO, RA-L, and IROS. He was nominated as RSS Pioneers (Robotics: Science and Systems) in 2023 for his research in robotic insects and assembly robotic systems.

Abstract

Designing robotic insects with high mobility is becoming an essential challenge in the field of robotics research. Among the methods for fabricating the transmission mechanisms of robotic insects, the Smart Composite Microstructure method (SCM) is garnering increasing attention. This method can construct compact and functional miniature origami mechanisms through planarized fabrication and folding assembly processes. We have identified two limitations in the SCM process: the connectivity in design and the singularity in pop-up assembly. We also demonstrated solutions for these limitations using screw algebra and Grassmann-Cayley algebra, respectively. By overcoming these limitations, we can significantly enhance the performance of the origami transmission mechanisms. We further proposed a series of untethered prototypes, named S2worm and S2worm-G. The S2worm-G weighs 4.71 grams, scales 4.0 cm, achieves a top speed of 75.0 cm/s, and a relative speed of 18.8 body lengths per second. The experimental results proved that the S2worm-G robot is one of the best robotic insects for its size, mass, and mobility.