SEMINAR SERIES

北京大学工学院 先进制造与机器人系

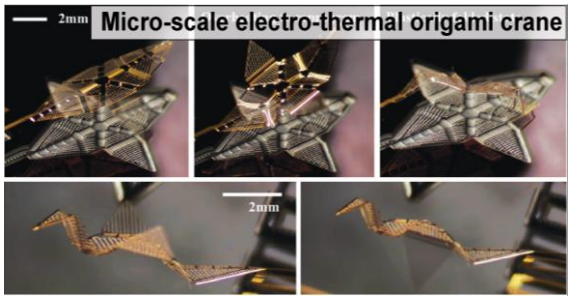
Mechanics and Design for Origami at Multiple Scales

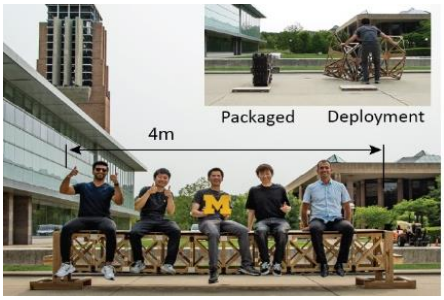
Evgueni T. Filipov

Associate Professor
Department of Civil and Environmental Engineering
Department of Mechanical Engineering
University of Michigan

Abstract:

Folding of thin sheets based on the principles of origami can create a rich variety of deployable, reconfigurable, and mechanistically tunable three-dimensional structures. This talk will present my group's work on exploring the mechanics and design of origami with the aim of enabling functional shape-morphing and adaptation at multiple scales. We first discuss our work on creating reduced-order models to simulate the deployment, mechanics, and multi-physics of different origami geometries. These models allow us to explore and address challenges related to the physical design and fabrication of origami at multiple-scales. At the micro-scale, we use photo-lithography based micro-fabrication to create miniature electro-thermal origami that achieve 3D self-assembly, rapid actuation, programmable shape-morphing, and active control of many degrees-of-freedom. At the meter scale, we introduce a concept for modular uniformly thick origami systems that can adapt into different shapes and can carry remarkably large loads. The fundamental principles of mechanics and design discussed in our talk are relevant to a variety of deployable and adaptable structures include metamaterials, biomedical micro-robotics, deployable satellites, reconfigurable architecture, and more.





Biography:

Evgueni Filipov is an Associate Professor in the Department of Civil and Environmental Engineering and the Department of Mechanical Engineering at the University of Michigan, Ann Arbor. His research interests are focused on the underlying mechanics of origami-inspired deployable and reconfigurable structures. These mechanics are employed to improve stiffness, functionality, and manufacturing of the folded systems. He holds M.S. and Ph.D. degrees in Civil Engineering from the University of Illinois at Urbana-Champaign, and a B.S. from Rensselaer Polytechnic Institute. He has received the Simons Foundation Pivot Fellowship (2023), the ASCE EMI Leonardo da Vinci Award (2023), the NSF CAREER Award (2020), the DARPA Young Faculty Award (2018), the Cozzarelli Prize from the National Academy of Sciences (2015), and the NSF Graduate Research Fellowship. Learn more about his research at his lab's website: http://drsl.engin.umich.edu/

主持人：刘珂 研究员（北京大学工学院先进制造与机器人系）
时　间：2024 年 1 月 5 日（周五）下午 15:00-16:00
地　点：北京大学工学院 1 号楼 212

欢迎广大师生参加交流与研讨！