Mechanical & Industrial Engineering Colloquium

MICRO 3D PRINTING OF SOFT MATERIALS

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Abstract:

Active materials that can adapt to dynamic environment hold great potential in development of autonomous and multifunctional devices. Although various stimuli-responsive soft materials have been extensively studied for the past decades, unique properties and advantages of these materials have not been fully utilized because of limitations of existing manufacturing methods. In this talk, a novel three-dimensional (3D) microfabrication technique, projection micro-stereolithography (PμSL), will be presented. PμSL is flexible, scalable, and multi-material manufacturing tool, capable of creating structural and functional complexity in 3D micro-architectures. PμSL was used to implement in hydrogel devices design principles inspired by exquisite motions and morphologies of moving plants in nature such as Venus Flytrap. Swelling-induced elastic instability has been studied to enhance actuation speed of soft devices and to create spontaneous structural pattern transformation. In the second part of the talk, ultra-light cellular material with unprecedented specific stiffness will be presented. PμSL and various post-processing techniques were used to build highly ordered meso scale stretching-dominated octet truss materials with micro-scale architecture and nano- scale features, resulting in orders of magnitude greater mechanical efficiency than existing cellular structures and natural materials.

About the Speaker:

Dr. Lee received his B.S. and M.S. from Seoul National University and Ph.D. from the University of Illinois at Urbana-Champaign. He was a Battelle/MIT Postdoc Fellow at MIT before he joined Rutgers University in January 2014. His research interest includes three-dimensional micro fabrication, polymer science, soft materials mechanics, metamaterials, and biomedical engineering.

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