The Kinematics of Life

The Evolving Role of Robot Kinematics in Bio-Nanotechnology

A presentation by Professor Kazem Kazerounian

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School of Engineering, Viale Risorgimento 2, Bologna
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The fusion of kinematics, and in particular robot kinematics, a field centered on motion and geometry, with molecular biology has opened new avenues in disease diagnosis and treatment, drug development, nanomachines, nanorobots, nanotechnology, and sustainability.

In particular, proteins are evolution's mechanisms of choice. The study of nano-mechanical systems must encompass an understanding of the geometry and conformation of protein molecules. Proteins are open- or closed-loop kinematic chains of miniature rigid bodies connected by revolute joints. The robotics community is in a unique position to extend the boundaries of knowledge in nano biomechanical systems and bio-nanotechnology.

This presentation explores the critical role of robot kinematics in biotechnology and its future trends. Emphasizing the importance of precise kinematic approaches in understanding protein molecules' behavior for nano machine development, we argue that the robot kinematics community remains ideally positioned to drive groundbreaking progress in bio-nanotechnology and broaden the scope of these approaches in drug design, nanomachines, and development of new architected materials.

About Dr. Kazem Kazerounian

Dr. Kazem Kazerounian is a Professor of Mechanical Engineering, and has served as Dean in the College of Engineering at the University of Connecticut (2012-24). Dr. Kazerounian's research expertise lies in analytical and computational kinematics and dynamics applied in diverse applications, such as protein-based nano mechanical devices, optimization of mechanisms and gear systems, robotics, and human motion analysis, as well as creativity in engineering education and practice. Dr. Kazerounian is active on ASEE's Engineering Deans' Public Policy Committee, has been the Chair of the ASME Design Division Executive Committee, and has led several major national and international conferences and technical committees. He has served on the editorial boards of the ASME Applied Mechanics Review and ASME Journal of Medical Devices and has been associate editor of both the ASME Journal of Mechanical Design and the Journal of Mechanisms and Machine Theory. In addition to being a Fellow of ASME, he is the recipient of many honors and awards. He was inducted into the Connecticut Academy of Science & Engineering (CASE) in 2008 and into the American Institute for Medical and Biological Engineering (AIMBE) College of Fellows in 2016.