From Biomimetics to Biosyncretics: Robots Based on Integration of Living Systems and Electromechanical Systems

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Abstract

Nature offers boundless inspiration for robotic research. Bionic based Robotics has achieved amazing progress. However, biological systems are immensely sophisticated. Despite significant advances in mimicking biological mechanisms, bionic based robots inherently struggle to fully replicate the intrinsic properties of living systems. Consequently, how to further enhance performance and enable artificial systems to approach, or even surpass, biological counterparts is a major research focus in science and technology.
In this talk, I will introduce the proposed concept of biosyncretic robotics. By utilizing bioactive materials, such as living cells, as core components, and fostering the integration of biological and electromechanical systems at the molecular and cellular scales, we aim to propel robotics beyond bionics towards biosyncretics. This paradigm shift allows us to directly harness the results of billions of years of natural evolution, enhancing various robotic capabilities and driving the advancement of the robotics discipline itself.

About the speaker:

Lianqing Liu is a Professor at Shenyang Institute of Automation, Chinese Academy of Sciences. Currently his research interests include Biosyncretic systems, Micro/Nanorobotics, Intelligent control. He has published over 100 peer reviewed international journal papers and led more than 20 funded research projects as Principal Investigator. He was awarded the Early Career Award by the IEEE Robotics and Automation Society in 2011, Outstanding Young Scientist of Chinese Academy of Sciences in 2014, Rising Star Award of 3M-Nano Society in 2015, Talent Young Scholar Funds of NSFC in 2015, National Program for support of Top-Notch Young Professionals in 2015, Xiongyoulun Outstanding Youth Award in 2018, Distinguished Young Scholar Funds of NSFC in 2019, Xplore Prize in 2024. He is the winner of Best Student/Conference paper Award for ICRA, ROBIO, ICIRA, IEEE-NEMS, IEEE-CYBER, IEEE-NANOMED and IEEE-3M-NANO, and delivered plenary/Keynote talks at ICRA, IROS, IEEE-NANO, IEEE-NANOMED, IEEE-NEMS, ICIUS, MARSS and so on. He is associate editors of Fundamental Research, Cyborg and Bionic Systems, Mechatronics, IET Cyber-Systems and Robotics, Control Theory and Applications. He has been elected as the vice president of IEEE Robotics and Automation Society for the term of 2018-2019, served as a member of long range planning committee of RAS.