

# Mutli-Scale Robotics

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## Abstract:

This lecture is an overview of the Multi-scale robotics, based on the Cellular Robotics System, which is the basic concept of the emergence of intelligence in the multi-scale way from Cell Level to the Organizational Level, proposed more than 30 years ago. It consists of many elements how the system can be structured from the individual to the group/society levels in analogy with the biological system. The key is self-evolution and self-organization of the system. It covers with the wide range of challenging topics:

1. Individual robot level, Brachiation Robots, and Multi-locomotion robots
2. Medical robotics and simulator
3. Cooperation and competition of the multiple robotics system
4. Distributed autonomous robotic system
5. Micro and nano robotics system
6. Bio analysis and bio-synthesis: bio-robotics system
7. Cyborg and bionic system
8. Other systems

Additional focus will be on bio cell manipulation and cell assembly and further cyborg and bionic system, which will be applied for the future hybrid system to improve the quality of life of human.

## Short bio: Toshio Fukuda, 2020 IEEE President & CEO

Toshio Fukuda is a professor of mechatronics engineering at Meijo University in Nagoya, Japan. He is also a professor at the Beijing Institute of Technology and professor emeritus at Nagoya University. His research focuses on intelligent robotic systems and micro-nano robotics. He has published more than 2,000 articles in scientific journals, conference proceedings, and reports.

An IEEE Fellow, Toshio was director of IEEE Region 10 in 2013 and 2014 and IEEE Division X director/delegate in 2001 and 2002, and 2017 and 2018. He was president of the IEEE Robotics and Automation Society in 1988 and 1989 and general chair of the IEEE International Symposium on Micro-Nano Mechatronics from 1990 to 2012. He has served on several IEEE boards and committees. He graduated from Waseda University, Tokyo, Japan and received the Master of Engineering degree and the Doctor of Engineering degree both from the University of Tokyo. He joined the National Mechanical Engineering Laboratory in Japan in 1977, the Science University of Tokyo in 1981, and then joined Department of Mechanical Engineering, Nagoya University, Japan in 1989.