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**BIO-ROBOTIC INNOVATIVE MANIPULATION FOR MICRO AND NANO
WORLD**



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ABSTRACT: Robotic technology can be applied for many areas, such as manufacturing, environment hazard and rescue, inspection and maintenance, traffic control, daily life support, medicine, bio-automation, entertainment and amusement, and many others. There are so many innovative areas in robotics and automation and in particular in micro and nano areas.

In this talk, based on micro technology, the specific application to the Bio-medical area is presented with on-going research projects. The robots need a good hardware system with advanced sensors and actuators based on micro and nanotechnology, intelligent control system and a good human-robot interface for operators to use it easily. There are many medical robots which aim to help patients to have minimum invasive surgery robotic system.

Medical doctor needs training to improve skills better to operate those robots efficiently. Thus the more sophisticated simulator system is required to improve skill by hardware and/or virtual reality technologies. In this talk, the intravascular micro surgery system is shown with the blood vessel simulator.

Then the nano-robotic system is introduced to show the current status of the robotics and automation technologies in the nano world. In particular, nano bio area including the biological cell handling will be presented with application of the robotic manipulation system. These salient features are to observe measure and manipulate cells in the 3 D system, unlike the conventional system.

At the end, the potential applications will be discussed by the future bio robotic manipulation.

About the Honoree: **Toshio Fukuda** received the B.A. degree from Waseda University, Tokyo, Japan, in 1971, and the M.S and Dr. Eng. from the University of Tokyo, Tokyo, Japan, in 1973 and 1977, respectively.

In 1977, he joined the National Mechanical Engineering Laboratory. In 1982, he joined the Science University of Tokyo, Japan, and then joined Nagoya University, Nagoya, Japan, in 1989. Currently, he is Director of Center for Micro-Nano Mechatronics and Professor of Department of Micro-Nano Systems Engineering at Nagoya University, where he is mainly involved in the research fields of intelligent robotic and mechatronic system, cellular robotic system, and micro- and nano-robotic system.

Dr. Fukuda was President of IEEE Robotics and Automation Society (1998-1999), Director of the IEEE Division X, Systems and Control (2001-2002), and Editor-in-Chief of IEEE / ASME Transactions on Mechatronics (2000-2002). He was President of IEEE Nanotechnology Council (2002-2003, 2005) and President of SOFT (Japan Society for Fuzzy Theory and Intelligent Informatics) (2003-2005). He was elected as a member of Science Council of Japan (2008-). He received the IEEE Eugene Mittelmann Award (1997), IEEE Millennium Medal (2000), IEEE Robotics and Automation Pioneer Award (2004), IEEE Robotics and Automation Society Distinguished Service Award (2005), Award from Ministry of Education and Science in Japan (2005). IEEE Nanotechnology Council Distinguished service award (2007). Best Googol Application paper awards from IEEE Trans. Automation Science and Engineering (2007). Best papers awards from RSJ (2004) and SICE (2007), Special Funai Award from JSME (2008), 2009 George Saridis Leadership Award in Robotics and Automation (2009), IEEE Fellow (1995), SICE Fellow (1995), JSME Fellow (2001), RSJ Fellow (2004).