The Center for Control, Dynamical Systems, and Computation
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Presents

Dynamics of Nano-Particle Manipulation

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Abstract:
Nonlinear dynamics is substantial in nano and micro technology and physics. However, the nonlinearity has not been positively accepted in the investigation of new science and technology. Recently, the manipulation of single atoms and molecules has been experimentally achieved on surfaces with use of scanning tunneling microscope (STM) and atomic force microscopy (AFM) in vertical and lateral processes. The lateral processes can carry atoms and molecules parallel to the surface and the vertical process can capture an adatom by vibratory excitation of the target-substrate bond. Recently, we proposed a new mechanism of the vertical manipulation of atoms without quantum mechanics. It is shown that, in the manipulation, the resonance has the key role in vibratory dissociation of atoms. We are going to discuss the dynamics with consideration to the interaction between the AFM tips and surface. Moreover, we will discuss the possibility of applications of resonance for manipulation of micro and nano particles bonding to material surface by Van Der Waals force towards actuations. We will show an idea to actuate the probes along the surface to achieve the selective manipulations.

About the Speaker:
Takashi Hikihara was born in Kyoto, Japan, in 1958. He received the Bachelor of Engineering degree from Kyoto Institute of Technology, Kyoto, Japan, in 1982, and the Master of Engineering, and Ph.D. degrees from Kyoto University, Kyoto, Japan, in 1984, and 1990, respectively. From 1987 to 1997, he was with the faculty of the Department of Electrical Engineering, Kansai University, and Osaka, Japan. From 1993 to 1994, he was a Visiting Researcher at Cornell University. In 1997, he joined the Department of Electrical Engineering, Kyoto University, where he is currently a Professor. He is a member of IEEE, APS, SIAM, the Institute of Electronics, Information and Communication Engineers (IEICE) of Japan, and the Institute of Electrical Engineers of Japan (IEEJ). He is a secretary of Editorial Board of new nonlinear journal NOLTA, IEICE, and an associate editor of European Journal of Control. His research interests include nonlinear science and its application. He is also interested in system control and nanotechnology. Recently, he is involved in the project related to the unification of power and information networks in Japan.