



## **MMAE SEMINAR**

**Wednesday, April 18, 2007**  
**E-1 BUILDING – CRAWFORD AUDITORIUM**  
**3:30 – 4:30 PM**

### **Nano-robotic Manipulation and Assembly by Atomic Force Microscopy**

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#### **Abstract**

Nanotechnology will allow us to build devices enormously smaller than before and will bring fundamental changes to the disciplines such as engineering, chemistry, medicine, biology, and physics. Although many nano-materials have shown their superiority, they still remain curiosities in many research labs without practical applications due to the lack of effective ways to manipulate them. Therefore, the research in nano-manipulation, nano-assembly, and nano-manufacturing is tremendously important for the advancement of nanotechnology. The main problem of nano-manipulation and nano-assembly using Atomic Force Microscopy (AFM) is the lack of real-time visual feedback during manipulation because the size of nano-materials is beyond the diffraction limit. This problem can be solved by our recently developed augmented reality enhanced nano-robotic system, which possesses real-time visual and haptic feedback. The real-time visual feedback is achieved by combining the physical model prediction and local scan adjustment. Through the augmented reality interface, an operator can control the AFM probe movement and simultaneously feel the interactive forces and observe the real-time changes of the nano environment. The experimental results of utilizing the nano-robotic system for manipulation and assembly of nano particles, nano wires, and DNA molecules will be presented.