Automation of Micro and Meso-scale Manipulation with Applications to Manufacturing and Biotechnology

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This talk will focus on micro and meso-scale automation technologies developed for manufacturing and biotechnology applications. I will begin with an overview and introduction of the state-of-the-art in micro and meso-scale manipulation and precision robotic systems. Then I will discuss my work on the development of a robotic system for use in micro and meso-scale manipulation and assembly and show experimental results for the canonical peg-in-the-hole problem at the meso-scale. The next part of the talk will focus on tools and automation for biotechnology. Single cell manipulation and characterization studies will be presented as well as the design of a MEMS, compliant mechanism, computer vision based force sensor to sense forces at the micro-Newton level. I will also talk about preliminary work on automating the process of phototransfection on neuron and fibroblast cells along with quantifying morphological changes in the cells.

David J. Cappelleri graduated from Villanova University in 1998 with a Bachelor of Mechanical Engineering degree and from The Pennsylvania State University with a Master of Science in Mechanical Engineering in 2000. He conducted research as a member of the Engineering Design and Optimization Group (EDOG) under Dr. Mary Frecker. The title of his thesis was 'Optimal Design of Piezoelectric Grasping Device for Minimally Invasive Surgery.' Mr. Cappelleri then worked for Radionics, a medical device company outside of Boston, MA, for three years before returning to school to pursue a Ph.D. in the Fall of 2003 at the University of Pennsylvania. At Penn, he works under Dr.Vijay Kumar in the General Robotics, Automation, Sensing and Perception (GRASP) Lab. His research interests include meso and micro-scale manipulation and assembly, mechatronics, robotic system integration, medical robotics, MEMS design and fabrication, and robotics for biotechnology. Mr.Cappelleri will be defending his dissertation on the Automation of Micro and Meso-scale Manipulation with Applications to Manufacturing and Biotechnology this spring.

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