**Seminar 1: A Robust Control Scheme for 3D Manipulation of a Microparticle with Electromagnetic Coil**

**Abstract**
Electromagnetically actuated microparticles can be widely applied in the field of biomedicine, for its advantages of minimally invasive feature and approachability to complex microenvironments. In this paper, we propose a robust feedback control approach for precise 3D manipulation of a microparticle actuated by a self-constructed electromagnetic coil system. Model uncertainties, environmental disturbances as well as actuator energy loss problem are all considered in the controller design. It is shown that this proposed control scheme can enable the entire system to maintain the input-to-state stability in presence of various perturbations. Experimental results have demonstrated the effectiveness of the proposed control approach. Success of the current study will benefit the precise motion control with high throughput in applications of the targeted material delivery.

**About the Speaker**
Mr. Li is a PhD student in Department of Mechanical and Biomedical Engineering at City University of Hong Kong. He received his B.E degree (2011) and M.S. degree (2014) both in North University of China, in Measurement Technology and Instrument. His current research interests are in fabrication of 3D magnetic porous microrobots for tissue regeneration and drug delivery by 3D laser lithography.
Seminar 2: A High Precision Robot-Aided Single Cell Biopsy System

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Mr. SHAKOOR Adnan  
PhD student  
Department of Mechanical and Biomedical Engineering  
City University of Hong Kong

Abstract  
In this paper we present a precise robot-aided single cell surgery system to perform single cell biopsy for cells of dimensions of 25µm diameter or less. A microfluidic chip is designed to pattern up to one hundred individual cells in an array. A micropipette mounted on 3DOF micro-manipulator and a computer mouse operated high precision XY stage is developed to perform single cell biopsy with high precision and throughput. The system is evaluated experimentally by extracting two organelles from adherent cells patterned in a micro-fluidic chip. The fluorescent labeled nucleus and mitochondria of human dermal fibroblast cells (HFF) are biopsied to demonstrate the capability of the proposed system. The survival rate of the semi-automated biopsy is 73% and 45% for mitochondria and nucleus biopsy, respectively.

About the Speaker  
SHAKOOR Adnan received the Bachelor’s degree of Electrical engineering from University of central Punjab, Pakistan, 2013. He is currently pursuing the PhD degree at City University of Hong Kong. His research interests are in the area of automated single cell surgery.

All are Welcome!

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