Mechanical Engineering **SEMINAR**

Micro Systems for Medical Applications

Professor Gabor Kosa

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Miniaturization of sensors and actuators is a great necessity in the medical field. We are working on micro swimming and force sensing for medical purposes.
Flagellar swimming is one of the swimming methods used by micro-organisms to advance in aquatic environment. The undulating motion of the flagella was successfully imitated to create propulsion for a medical swimming micro robot. Swimming experiments demonstrate forward and backward swimming of a novel magnetically driven swimming tail. In contrary to other magnetically driven micro robots our system can swim in the direction of a constant magnetic field and will use the large static field B_0 of the MRI. In swimming experiments with an upscaled model we were able demonstrate forward and backward swimming. On the other hand we explore numerically and experimentally the swimming properties of the nano-helixes developed by Prof. Bradly Nelson in ETH Zurich.In addition, we develop a miniature force sensor based on piezoelectric sensing principle for haptic sensing and medical applications. The sensor is able to sense three force components and two moment components and its size is Ø5 mm×5 mm. The prototype that was built demonstrated force measurement in three degrees of freedom had a resolution of about 20 mN and a full scale of 4 N.

Dr. Gábor Kósa is a post-doctoral fellow in the laboratory since Feb. 2007. Born in 1972 Szatmar, Transilvania, Romania. He, received his B.Sc. degree cum laude in mechanical engineering from the Technion – Israel Institute of Technology in Haifa in 1995. From 1995 to 1998 he served in the Israel Defense Force (IDF) as a research engineer. In 2001 he received his M.Sc. degree in non-linear dynamics and control from the Technion. He was employed in RAFAEL, the Armament Development Authority, in Haifa from 2000 to 2001 as a research and development engineer of microelectromechanical systems. He received his Ph.D. in the field of medical micro-robots in the Technion in 2007. Currently he is working in the Computer Vision Laboratory in ETH Zurich, Switzerland on novel sensing for haptics and micro swimming and with Surgical Planing Laboratory in Harvard Medical School. His research interests include Modeling, Designing, Fabricating and Testing of Micro Systems, Micro Fluidics and Medical Robotics.

Friday, October 17, 2008
11:00-12:00pm Room 227 Mudd
Lunch served at 12:00pm in ME lobby