MECHANICAL ENGINEERING STUDENT SEMINAR

Thursday, August 4 2022 at 13:00
Online: https://technion.zoom.us/j/91048697141

Toward reconfigurable microfluidics: non-uniform electroosmotic flow and photoactuated high-voltage control

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The field of microfluidics has enabled a wide range of discoveries and technologies in biological and chemical sciences. However, despite three decades of research, the vision of lab-on-a-chip, a microscale device capable of replacing standard chemical and biological laboratories, remains elusive. A major gap toward achieving this goal is the lack of reconfigurability and programmability of the flow field in existing microfluidic platforms. These platforms are largely still "protocols-on-chip" performing a single predetermined protocol and it is rarely possible to perform unplanned follow-up experiments.

In this talk, I will show a novel concept for microscale flow patterning allowing programable electroosmotic flow patterns using an array of gate electrodes embedded in the floor of a microfluidic device. Each electrode acts as a virtual conveyor belt with tunable flow velocity and direction controlled by its applied voltage. I will present how by combining several gate electrodes, we can obtain a range of dynamic flow patterns that can be reconfigured in real-time. In particular, one unique field achievable with our method but that cannot be created with standard flow mechanisms (e.g. pressure) is bidirectional flow composed of adjacent streams going in opposite directions. I will discuss how such flows can be leveraged as a new mechanism for diffusion-based separation of molecules and particles. Finally, to be able to create tailored microscale flows for a wide range of applications, one must have individual control over a large array of gate electrodes. For that, I will present a new high-voltage control using photoconductive switches for controlling an array of individually addressable gate electrodes.

Note: the seminar will be given in English

Seminars Coordinator: Assoc. Prof. Matthew Suss.