東京大学大学院工学系研究科専攻間横断型教育プログラム
「機械システム・イノベーション」

東京大学 THE UNIVERSITY OF TOKYO

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第142回公開セミナー/第51回実践リーダーレクチャー

A Distributed Network of Autonomous Bio-Hybrid Nanorobots for Drug Delivery

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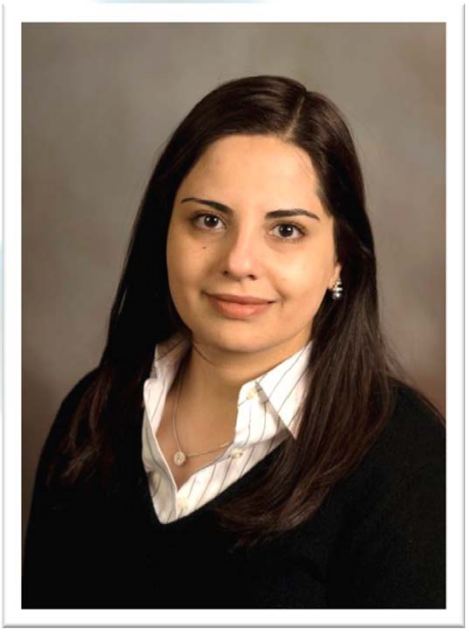
会　場:　東京大学工学部2号館3階31A会議室

要旨

Current drug delivery approaches rely on passive mechanisms to control the transport of drugs as well as semi-passive means to control selectivity in targeting and release rates. In contrast, it is envisioned that nanorobots will be able to easily navigate through the human body and interact with single cells due to their small size. Moreover, nanorobots can be employed in large numbers as inexpensive agents of a distributed robotic system with decentralized control. Therefore, nanorobotics is uniquely poised to have a significant impact on minimally invasive diagnosis and localized treatment of diseases. While the potential impact of these systems is envisioned to be very significant, many challenges remain in developing such nanorobots.
In the MicroN BASE laboratory, we have harnessed bacteria as intelligent "cargo" carriers and have pioneered the first generation of a distributed network of bacteria-powered autonomous nanorobotic agents (BacteriaBots) capable of communicating among themselves and with their immediate environment. Each robotic agent is realized by interfacing live engineered bacteria with an engineered micro/nano-scale robot body. In contrast to fully synthetic microrobotic systems, BacteriaBots have unique attributes, such as the ability to harness chemical energy from the environment for active transport, high selectivity for sensing, and the ability to communicate and collaborate as an intelligent, reconfigurable, and adaptable swarm with decentralized control. This talk will describe our experimental and computational research efforts on actuation, sensing, and control of the first generation BacteriaBots. Our recent findings on applications of BacteriaBots in targeted drug delivery will also be discussed.



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