Smart Medical Devices with µSensors and µActuators

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Abstract
The development of chronically reliable and multifunctional implantable medical devices is an enormous challenge in biomedical engineering with significant economic and clinical implications. Soon after implantation, implants often suffer from substantial performance degradation and premature failures due to various abiotic and biotic failure modes. Enabling technologies that improve the lifetime of these implantable devices can have an enormous impact on many debilitating chronic neurodegenerative diseases that are difficult to diagnose and treat. In this presentation, I will discuss our latest efforts to utilize thin-film-based microscale sensors and actuators to fabricate self-clearing implantable medical devices for chronic disease management. As a proof-of-concept, I will share our efforts to create chronically implantable self-clearing catheters, glaucoma drainage devices, and novel peripheral nerve interface.

Bio

Hyowon "Hugh" Lee is an associate professor at the Weldon School of Biomedical Engineering and the Director of Center for Implantable Devices at Purdue University. He received his M.S. and Ph.D. degrees in biomedical engineering from the University of California, Los Angeles, in 2008 and 2011, respectively, under the guidance of Jack Judy. Before joining Purdue, he worked as a senior process engineer for St. Jude Medical's Implantable Electronic Systems Division where he worked on manufacturing challenges associated with implantable electronic devices such as pacemakers, implantable cardioverter defibrillators, deep brain stimulators, and spinal cord stimulators. His current research interest centers around improving the reliability and functionality of implantable sensors and actuators. He is a recipient of the NSF CAREER award and he recently co-founded two medical devices startups. His lab is supported by NIH, NINDS, NIDA, NSF, Indiana CTSI, Samsung, and Eli Lilly.