ELECTRICAL & COMPUTER ENGINEERING BIO-SEMINAR Fall 2017 ENGINEERING TEXAS A&M UNIVERSITY

When: **Friday 13:50 – 14:50**

Where: **ETB 1035**

Speaker: **Prof. Hangue Park**

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Department of Electrical & Computer Engineering
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Title: **Integrated neuroprosthesis: help our body with communicating electronics**

Date: **09-22-2017**

Abstract: Communication between our brain and body is so important, to help our brain to fully associate our body with the built-in map. If this communication is disturbed, we encountered a problem in controlling our body, such as a spinal cord injury as an extreme case. A phantom limb pain is another example caused by the mismatch between the built-in brain map and the actual body. To solve this communication problem, the "neuroprosthesis" supplants/supplements both ascending sensory feedback and descending motor commands. The "integration" is another important keyword because the neuroprosthesis should be implemented with strict size and weight limit not to disturb the natural body movements. In this talk, I will discuss the development of the "integrated neuroprosthesis" and its potential to enhance rehabilitation outcomes.

(1) First, I will address why the electrical and computer engineering (ECE) plays an important role in developing the integrated neuroprosthesis. I will discuss how the ECE techniques contribute to the development of the integrated neuroprosthesis.

(2) Second, I will share my experience of the lower-limb neuroprosthesis development, with special focus on the ascending neural pathway for delivering sensory feedback. The sensory feedback from the foot could be replicated by the electrical nerve stimulation, which has been verified by experiment with four cats walking on the split-belt treadmill. I will also introduce the development of cat's hindlimb neuroprosthesis, with on-going experiment with amputee cats. The intriguing co-adaptation between the prosthesis and the body will be also discussed.

(3) Third, I will discuss the unlimited potential of the integrated neuroprosthesis toward the rehabilitation. I will share the current methods of gait rehabilitation and their limits. I will then show how the integrated neuroprosthesis can make another important step in the rehabilitation paradigm, which is not even limited to the gait rehabilitation.

Biography: Hangue Park is currently an assistant professor in Electrical and Computer Engineering at Texas A&M University. He received his Ph.D. in Electrical and Computer Engineering at Georgia Institute of Technology, in 2017. Before joining Georgia Tech, he received both B.S. and M.S. in Electrical and Computer Engineering from Seoul National University, Seoul, Korea, in 2006 and 2008, respectively. He also has 5+ years of industrial experience at Samsung Electronics and Bluebird Soft. His research interests lie in artificial sensory feedback and closed-loop optimization of sensorimotor loop, to solve problems of patterned body movements (e.g. walking) and to enhance rehabilitation outcomes. He is also interested in developing smart bio-mimicking/bio-inspired circuits and systems for his research purpose. He is a recipient of the Trainee Professional Development Award from Society for Neuroscience at 2017, the Outstanding Research Award from the Association of Korean Neuroscientists at 2016, the 2nd Place Award/the Best Showcase Award at the Georgia Tech Business Plan Competition 2012, and the Best Demonstration Award at the IEEE Biomedical Circuits and Systems Conference 2012.