

The Department of Mechanical Engineering/College of Engineering and Applied Sciences

Stony Brook University

Mechanical Engineering Seminar

Faculty Candidate



Pablo Valdivia y Alvarado PhD

**Research Scientist in the Center of Environmental Sensing and Modeling
at the Singapore-MIT Alliance for Research and Technology**

**Lecture Title: Multi-functional Field Robotic Devices:
Vehicles and Sensors**

Friday, April 25, 2014 at 2PM, Room 173 Light Engineering Building

Abstract

Industrial, environmental, and humanitarian applications require technologies that can perform in harsh and unstructured environments. Robustness, efficiency, maneuverability, and an acute awareness of the environment are essential for survival and success. In order to truly make an impact, future robotic devices will need to exhibit all these properties. Soft robots and bio-inspiration show promise as platforms to usher much of these developments. In this talk I will present a simple design framework for the synthesis of robust bio-inspired soft mechanisms as well as novel robotic platforms that exploit this idea. Specifically, I will present the design of vehicles and sensors for underwater environments. Vehicles use flexible flapping foils, based on batoid fins, which allow finer control of unsteady propulsive forces, a key feature for maneuverability. Sensors, based on pinniped whiskers, use underwater tactile information to infer the nature of disturbances coming from the far field while measuring the hydrodynamics in the near field. I will explain how the physical insights obtained during the design process uncovered and enabled novel performance and how we are using these new approaches to address engineering problems. Much like biological creatures, where efficiency dictates that several functions are served by a single structure, these robotic devices can exhibit a wide range of physical properties all elegantly fused in a single heterogeneous structure. This emerging field provides a fertile ground for the development of new design methodologies, modeling and control approaches, manufacturing processes, experimental techniques, and an opportunity to develop paradigm-changing multi-functional devices.

Biography

Pablo Valdivia y Alvarado obtained his B.S., M.S., and Ph.D. degrees in Mechanical Engineering at the Massachusetts Institute of Technology. Dr. Valdivia y Alvarado is a Research Scientist in the Center of Environmental Sensing and Modeling at the Singapore-MIT Alliance for Research and Technology. His research lies at the intersection of Robotics, Design, and Modeling. Dr. Valdivia y Alvarado was recognized with a TR35 young innovator award for South East Asia, Australia and New Zealand in 2012 for his work on soft robots for harsh environments. His doctoral work on the design of bio-inspired soft-robots received a considerable amount of publicity worldwide with articles appearing in CNN, the Discovery Channel, National Geographic, and Wired Magazine among others. His work is also featured in the permanent exhibition, "A Journey Through Creativity", at the ARTSCIENCE Museum in Singapore.

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