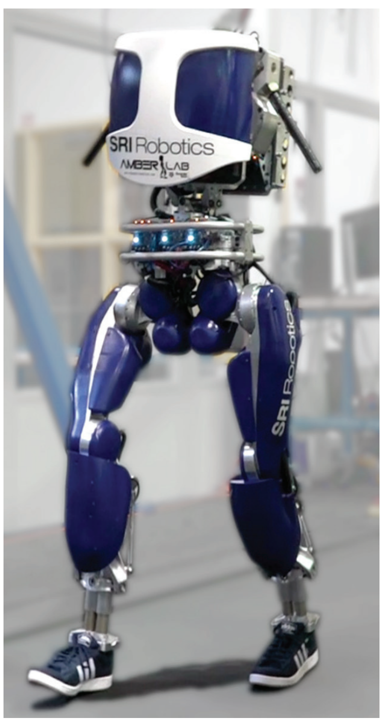
THE WILLIAM E. BOEING DEPARTMENT OF
AERONAUTICS & ASTRONAUTICS

... welcomes ...

AARON AMES

CALIFORNIA INSTITUTE OF TECHNOLOGY

Optimization-Based Control of Dynamic Robotic Systems



Humans have the ability to locomote with deceptive ease, navigating everything from daily environments to uneven and uncertain terrain with efficiency and robustness. With the goal of achieving these capabilities on robotic systems—ranging from legged robots, to robotic assistive devices to wheeled and aerial vehicles—this talk will present a unified formal framework for realizing dynamic behaviors in a provably correct and safety-critical fashion, along with the application of these ideas experimentally on a wide variety of robotic systems.

Beginning at the level of behavior synthesis, a unified control framework will be presented that balances achieving control objectives—represented by control Lyapunov functions (CLFs)—with safety constraints—encoded by control barrier functions (CBFs)—in the context of optimization-based controllers that can be solved efficiently online. The application of these ideas to humanoid robots will first be explored, wherein the means of achieving efficient dynamic locomotion will be presented together with corresponding experimental validation. The translation of these ideas to robotic assistive devices, and specifically powered prostheses, will be described in the context of custom-built hardware. Finally, the extension of these concepts to safety-critical systems—including automotive applications, multi-agent systems, and swarms of quadrotors—will be discussed. Therefore, this talk will explore a formal approach to achieving dynamic behaviors on robotic systems, together with the validation of these concepts experimentally on hardware platforms ranging from quadrotors, to powered prostheses to humanoid robots.

WILLIAM E. BOEING
DEPARTMENT OF AERONAUTICS & ASTRONAUTICS
UNIVERSITY *of* WASHINGTON

Monday, March 27, 2017 @ 4:00pm
Johnson Hall. Rm 102 | UW Seattle

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THE WILLIAM E. BOEING DEPARTMENT OF
AERONAUTICS & ASTRONAUTICS

... Distinguished Guest Speaker ...

AARON AMES

CALIFORNIA INSTITUTE OF TECHNOLOGY

Bren Professor of Mechanical & Civil Engineering
Control & Dynamical Systems

Aaron D. Ames is the Bren Professor of Mechanical and Civil Engineering and Control and Dynamical Systems at the California Institute of Technology. Prior to joining Caltech, he was an Associate Professor in Mechanical Engineering and Electrical & Computer Engineering at the Georgia Institute of Technology. Dr. Ames received a B.S. in Mechanical Engineering and a B.A. in Mathematics from the University of St. Thomas in 2001, and he received a M.A. in Mathematics and a Ph.D. in Electrical Engineering and Computer Sciences from UC Berkeley in 2006. He served as a Postdoctoral Scholar in Control and Dynamical Systems at Caltech from 2006 to 2008, and began is faculty career at Texas A&M University in 2008. At UC Berkeley, he was the recipient of the 2005 Leon O. Chua Award for achievement in nonlinear science and the 2006 Bernard Friedman Memorial Prize in Applied Mathematics. Dr. Ames received the NSF CAREER award in 2010, and is the recipient of the 2015 Donald P. Eckman Award recognizing an outstanding young engineer in the field of automatic control. His research interests span the areas of robotics, nonlinear control and hybrid systems, with a special focus on applications to bipedal robotic walking—both formally and through experimental validation. His lab designs, builds and tests novel bipedal robots, humanoids and prostheses with the goal of achieving human-like bipedal robotic locomotion and translating these capabilities to robotic assistive devices.

The William E. Boeing Chair's Distinguished Seminar Series brings scholars of national and international reputation who have made an impact in the field of aerospace engineering and beyond. This seminar series will cover a diversity of topics of current interest to those in academia, industry and the general public. It is our hope that these monthly seminars will encourage an exchange of ideas and bring aerospace engineering and science to the forefront.

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