MathWorks®
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MathWorks Special Session and Virtual Booth at ACC 2020

Special Session:

Bridging the Theory-Practice Gap in Robotics on a Massive Scale in Georgia Tech's Robotarium

Date: Thursday, July 2

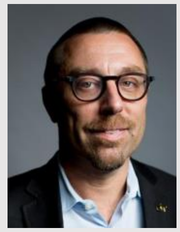
Time: 12pm

In this special session, Dr. Magnus Egerstedt will give a talk on the Robotarium, a remotely accessible swarm robotic lab. You'll also hear from Dr. Craig Buhr on various resources that MathWorks provides for online teaching.

Abstract

The Robotarium is a remotely accessible swarm robotics lab that allows users from all over the world to upload control code, written in MATLAB, and run experiments. Since its official launch in August 2017, over 5000 remote experiments have been conducted by users from all continents (except Antarctica). The impetus behind the Robotarium project is to provide broad, democratized access to a world-class research facility, and users span the gambit from robotics researchers to middle-school students. This talk will discuss the technical challenges associated with the Robotarium as well as a lessons learned in remote-access experimentation.

About the Presenter



Magnus Egerstedt

Dr. Magnus Egerstedt is the Steve W. Chaddick School Chair and Professor in the School of Electrical and Computer Engineering at the Georgia Institute of Technology. Dr. Egerstedt conducts research in the areas of control theory and robotics, with particular focus on control and coordination of multi-robot systems.

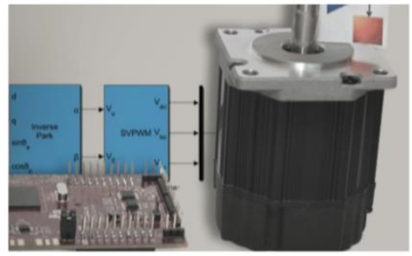
Meet MathWorks Experts:

Dr. Craig Buhr received his Ph.D. degree from the School of Mechanical Engineering at Purdue University in 2003. His research interests include dynamic system modeling and identification, linear systems and control theory. He joined MathWorks as a Senior Developer for the Control System Toolbox in 2003, developing software tools to facilitate the design and analysis of control systems. He is currently the Senior Team Lead of the Control Design group.

MATHWORKS VIRTUAL BOOTH AGENDA

	July 1 (Wed)	July 2 (Thu)	July 3 (Fri)
8:00am – 9:00am	What's new in MATLAB	What's new in MATLAB	What's new in MATLAB
9:00am – 9:30am	Deep Learning and Reinforcement Learning demos, live Q&A	Deep Learning and Reinforcement Learning demos, live Q&A	Power Electronics Modeling and Control demos, live Q&A
9:30am – 10:00am	Live discussion	Live discussion	Live discussion
10:00am – 12:00pm	What's new in MATLAB	What's new in MATLAB	
12:00pm – 1:30pm	Controls demos and online teaching resources, live Q&A	MathWorks special session (Join the virtual session using the link provided on the conference program)	
1:30pm – 3:00pm	What's new in MATLAB	What's new in MATLAB	
3:00pm – 3:30pm	Deep Learning and Reinforcement Learning demos, live Q&A	Controls demos and online teaching resources, live Q&A	
3:30pm – 4:00pm	Live discussion	Live discussion	

Motor Control Blockset



New in 2020a

Motor Control Blockset™ provides reference examples and blocks for developing field-oriented control algorithms for brushless motors. The examples show how to configure a controller model to generate compact and fast C code for any target microcontroller (with Embedded Coder®). You can also use the reference examples to generate algorithmic C code and driver code for specific motor control kits.

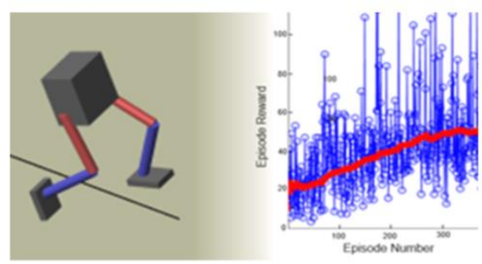
The blockset includes Park and Clarke transforms, sliding mode and flux observers, a space-vector generator, and other components for creating speed and torque controllers. You can automatically tune controller gains based on specified bandwidth and phase margins for current and speed loops (with Simulink Control Design™).

The blockset lets you create an accurate motor model by providing tools for collecting data directly from hardware and calculating motor parameters. You can use the parameterized motor model to test your control algorithm in closed-loop simulations.

Check out the following video for an overview of Motor Control Blockset: ***What is Motor Control Blockset?***

Watch the following video series to learn how you can use Motor Control Blockset to estimate parameters of a PMSM motor, implement a field-oriented control algorithm, generate code from the algorithm, and deploy it on an embedded microcontroller: ***Field-Oriented Control of PMSMs***

Reinforcement Learning Toolbox



2019a

Reinforcement Learning Toolbox™ provides functions and blocks for training policies using reinforcement learning algorithms including DQN, A2C, and DDPG. You can use the trained policies to implement controllers and decision-making algorithms for complex environments such as robots and autonomous systems modeled in MATLAB & Simulink. To improve training performance, you can run simulations in parallel on the cloud, computer clusters, and GPUs.

The toolbox lets you implement policies using deep neural networks, polynomials, or look-up tables. Through the ONNX™ model format, existing policies can be imported from deep learning frameworks such as TensorFlow™ Keras and PyTorch. You can generate optimized C, C++, and CUDA code to deploy policies on microcontrollers and GPUs.

Reinforcement Learning Tech Talks provide an overview of reinforcement learning concepts such as environments, rewards, policies, and learning algorithms.

Deep Reinforcement Learning for Walking Robots video demonstrates an example of controlling humanoid robot locomotion using deep reinforcement learning.