Title: Constraint-Based Control Design for Assured and Long-Duration Autonomy

Abstract: Long-duration autonomy, where robots are to be deployed over long time-scales in unstructured environments, is fundamentally different from its "short-duration" counterpart in that what might go wrong sooner or later will go wrong. What this means is that stronger guarantees are needed in terms of performance. For instance, in the US, a road fatality occurs roughly every 100 million miles, which means that for an autonomous vehicle to live up to its promise of being safer than human-driven vehicles, that is the benchmark against which it must be compared. But a lot of strange and unpredictable things happen on the road during a 100 million mile journey, i.e., rare events are all of a sudden not so rare and the tails of the distributions must be accounted for by the perception and planning algorithms. The resulting notion of "assured autonomy" has implications for the control design, which we approach through the use of barrier functions for encoding tasks and safety constraints. The story will moreover include a detour into ecology as a way of understanding how persistent environmental monitoring can be achieved by studying animals with low-energy life-styles, such as the three-toed sloth.

Biography: Dr. Magnus Egerstedt is the Dean of Engineering in the Samueli School of Engineering and a Professor in the Department of Electrical Engineering and Computer Science at the University of California, Irvine. Prior to joining UCI, Egerstedt was on the faculty at the Georgia Institute of Technology, serving as the School Chair in the School of Electrical and Computer Engineering and the Director of Georgia Tech's Institute for Robotics and Intelligent Machines. He received the M.S. degree in Engineering Physics and the Ph.D. degree in Applied Mathematics from the Royal Institute of Technology, Stockholm, Sweden, the B.A. degree in Philosophy from Stockholm University, and was a Postdoctoral Scholar at Harvard University. Dr. Egerstedt conducts research in the areas of control theory and robotics, with particular focus on control and coordination of multi-robot systems. Magnus Egerstedt is a Fellow of IEEE and the current President of the IEEE Control Systems Society. He is a member of the Royal Swedish Academy of Engineering Science and has received several teaching and research awards, including the Ragazzini Education Award, the O. Hugo Schuck Best Paper Award, the Outstanding Doctoral Advisor Award and the Outstanding Teacher Award from Georgia Tech, and the Alumni of the Year Award from the Royal Institute of Technology.