

Distinguished Lecture Series



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Embry-Riddle Aeronautical University, Daytona Beach, Florida

VARIABLE STRUCTURE CONTROL AND OBSERVERS ALGORITHMS AND THEIR APPLICATIONS

Fri., April 13

11 a.m. to 12 p.m.

777 Glades Road, EE 303

FAU Boca Raton Campus

Videoconferenced to the Dania Beach, SeaTech Site, ST 259

Abstract

Colloquium will address advanced topics in nonlinear control and observers with focus on sliding mode in variable structure systems. This phenomenon requires special mathematical description and in general leads to models in the form of differential inclusions. As it is known feedback algorithms based on sliding modes have outstanding robustness properties with respect to external disturbances and parameters variations. Designing sliding mode control requires solving two distinctive sub-problems (A) finding sliding manifold in the system multidimensional (or infinite-dimensional) state space such that constraining the system state to this manifold eventually leads to achieving ultimate control goal, and (B) finding control that makes the sliding manifold a stable integral manifold with finite time attraction. Several nontraditional approaches for solving both problems will be presented for dynamical systems described by nonlinear differential equations including partial differential equations. Then several applications of sliding mode control and observers will be demonstrated for autonomous vehicle, position and attitude control in aerospace systems, fluid flow and other problems.

Biography

Dr. Sergey V. Drakunov is Associate Dean of Research and Full Professor of Engineering Physics at Embry-Riddle Aeronautical University Daytona Beach, Florida (2007-currently). His previous career includes the following positions: Associate Professor at Tulane University (New Orleans, LA), Visiting Professor at MIT (Cambridge, MA), Research Scientist at the Ohio-State University (Columbus, OH), Research Scientist at USSR Academy of Sciences (Moscow, Russian Federation). He holds M.S. degree in Applied Mathematics (Moscow Institute of Electronics and Mathematics) and Ph.D. in Control Theory and Systems Analysis from the Institute of Control Sciences of USSR Academy of Sciences.

Dr. Drakunov research interests are in mathematical theory of nonlinear control and signal processing algorithms known as observers. Together with his former Ph.D. advisor Prof. Utkin he was originator of variable structure – sliding mode observers and several new methods for designing sliding mode feedback. His further work includes developing this techniques for nonholonomic systems, distributed parameter systems, nonlinear observers and estimators, nonlinear optimal filtering.

He also worked a lot on applications of nonlinear control especially for autonomous systems such as autonomous spacecraft, ground vehicles (Ford Motor Co, and DARPA Grand Challenge), robots, UAS, human-in-the-loop systems.

Dr. Drakunov was PI for several NASA, NSF, DoD, DTRA and NIST grants. He is the founder of Engineering Physics Propulsion Lab (EPPL) at ERAU that works closely with NASA KSC Lab.

Currently Dr. Drakunov has more than 150 peer reviewed publications with 6900+ citations, his H-index is 34.