SACHIT RAO

IIIT-Bangalore, 26/C, Electronics City, Hosur Road, Bangalore - 560100. +91 80 4140 7777; sachit@iiitb.ac.in

Date of Birth: 5th May 1979

Education

- **Ph.D., Mechanical Engineering**—December 2006
  Ohio State University (OSU), Columbus, USA
- **M.S., Mechanical Engineering**—December 2002
  OSU
- **B.E., Mechanical Engineering**—June 2000
  University of Mysore, Mysore, India

Work Experience

- **International Institute of Information Technology–Bangalore**—Bangalore, India
  Assistant Professor: Dec '15–Present
  - Obstacle Avoidance in Unmanned Systems
  - Use of Tools from Computer Science in Control Systems
- **International Institute for Aerospace Engineering and Management, Jain University**—Bangalore, India
  Assistant Professor: Nov '14–Dec '15
  - Technology and civilian applications of Unmanned Aerial Vehicles
  - State estimation schemes for Structural Health Monitoring
  - Autonomous multi-agent systems in the presence of hardware constraints
  - Advising several Master's students
- **NextFirst Engineering Technologies Private Limited**—Bangalore, India
  Consultant: Sept–Oct '14
  - Development of a Mechatronic Servo Press
  - Support for industrial automation related data acquisition and analysis
- **Systemantics India Pvt Ltd**—Bangalore, India
  Senior Engineer–Research: Dec '08–Jun '09, Jun '11–Sept '14
  - Design, implementation, and testing of motion controllers for a novel 6-DOF indigenous robot
  - Modeling of system dynamics, kinematics, motor selection
  - Support for design of motor drives, gearbox testing, and software implementation (TI DSPs)
- **Department of Aerospace Engineering, IISc**—Bangalore, India
  Centenary Post-Doctoral Research Associate: Jun '09–Jun '11

  - Post-Doc in the Guidance, Control, and Decision Systems Laboratory
  - Sliding mode control based consensus algorithms in a leaderless swarm of dynamic agents
  - Simulation-based implementation of these algorithms for UAVs
  - Impact angle constrained guidance laws for tactical missiles
  - Co-advised a Master's degree student

- **Institute of Automatic Control Engineering, Technische Universitaet Muenchen (TUM)**—Munich, Germany
  Post-Doc: Jun '07–Dec '08
  - Sliding mode control based schemes for estimation of motor speed and flux of induction motors
  - Experimental validation of these schemes for speed control
  - Co-advised a Master's degree student

- **Department of Mechanical Engineering**—OSU
  Graduate Teaching Assistant: Mar '02–Dec '06
  - Laboratory component of an undergraduate Introductory Controls course
  - Grading and tutorials for courses on thermodynamics, numerical methods, and statics

- **Electronics and Energy Conversion Lab, G.E. Global Research**—Bangalore, India
  Summer Intern: Jun–Sept '05
  - Groundwork for non-aerosol based refrigeration systems
  - Simulation of locomotive engine control

Research Work/Thesis

- **Ph.D. Dissertation**—Jan '03–Dec '06
  Sliding Mode Control in Mechanical, Electrical, and Thermal Distributed Processes
  - Position control of a flexible cantilever beam
  - Simulation algorithm for systems defined by partial differential equations
  - Parameter estimation of a 1-D thermal system

- **M.S. Thesis**—Jan '01–Dec '02
  Development of a Unified Simulation Methodology for Electric Networks using Sliding Modes
  - Technique to simulate the dynamics of an LRC circuit where the Kirchoff's current law is a switching surface
  - Pre-cursor to an important part of the Ph.D. dissertation

- **B.E. Final Year Project**—Jul '99–Apr '00
  A 3-D Mechatronic Scanning Device
  - Development of a 3-DOF slider mechanism to scan an object in Cartesian space
  - Motions in Cartesian space are measured as the outputs of potentiometers
  - A simple graphic environment to display the shape of the object being scanned

Publications in Journals

[1] Shashi Ranjan Kumar, **Sachit Rao**, and Debasish Ghose. Sliding-mode guidance and control for all-aspect interceptors with terminal angle constraints. *AIAA Journal of Guidance, Control, and Dynamics*, 35(4):1230–1246, 2012.

[2] Shashi Ranjan Kumar, **Sachit Rao**, and Debasish Ghose. Non-singular terminal sliding mode guidance with impact angle constraints. *AIAA Journal of Guidance, Control, and Dynamics*, 37(4):1114–1130, 2014.

[3] **Sachit Rao**, Martin Buss, and Vadim Utkin. Simultaneous state and parameter estimation in induction motors using first and second order sliding modes. *IEEE Transactions on Industrial Electronics*, 56:3369–3376, September 2009.

[4] **Sachit Rao**, Martin Buss, and Vadim Utkin. Design of first and second order sliding mode observers for induction machines using a stator flux based model. *International Journal of Control*, 83(7):1457–1464, 2010.

[5] **Sachit Rao**, Martin Buss, and Vadim Utkin. Sliding modes for the simulation of mechanical and electrical systems defined by differential-algebraic equations. *ASME Journal on Computational and Non-linear Dynamics*, 5(4), October 2010.

[6] **Sachit Rao** and Debasish Ghose. Sliding mode control-based algorithms for consensus in connected swarms. *International Journal of Control*, 84(9):1477–1490, 2011.

[7] **Sachit Rao** and Debasish Ghose. Sliding mode control based autopilots for leaderless consensus of Unmanned Aerial Vehicles. *IEEE Transactions on Control Systems Technology*, 22(5):1964–1972, December 2013.

[8] **Sachit Rao** and Debasish Ghose. Terminal impact angle constrained guidance laws using variable structure systems theory. *IEEE Transactions on Control Systems Technology*, 21(6):2350–2359, November 2013.

Publications in Conferences

[9] Shashi Ranjan Kumar, **Sachit Rao**, and Debasish Ghose. Non-singular terminal sliding mode guidance and control with terminal angle constraints for non-maneuvering targets. In *Proceedings of the 12th International Workshop on Variable Structure Systems*, Mumbai, India, January 2012.

[10] **Sachit Rao**, Heide Brandtstaedter, Martin Buss, and Vadim Utkin. Sliding mode control in mechanical systems with electric actuators. In *8th International Workshop on Variable Structure Systems (VSS 04)*, Villanova, Spain, September 2004.

[11] **Sachit Rao**, Heide Brandtstaedter, Martin Buss, and Vadim Utkin. Generalised block control principle. In *16th International Federation of Automatic Control (IFAC) Congress*, Prague, Czech Republic, July 2005.

[12] **Sachit Rao**, Martin Buss, and Vadim Utkin. An adaptive sliding mode observer for induction machines. In *2008 American Control Conference*, pages 1947–1951, Seattle, Washington, USA, June 2008.

[13] **Sachit Rao** and Debasish Ghose. Consensus amongst swarms of agents with first-order dynamics through sliding modes. In *Towards Reliable and Smart Air-Vehicles, UKIERI Workshop*, NIT Trichy, December 2009.

[14] **Sachit Rao** and Debasish Ghose. Achieving consensus amongst self-propelling agents by enforcing sliding modes. In *VSS 2010–The 11th International Workshop on Variable Structure Systems*, Mexico City, Mexico, June 2010.

[15] **Sachit Rao** and Debasish Ghose. Sliding mode control based terminal impact angle constrained guidance laws using dual sliding surfaces. In *Proceedings of the 12th International Workshop on Variable Structure Systems*, Mumbai, India, January 2012.

[16] **Sachit Rao** and Jagannath Raju. Forward and inverse kinematics of a hybrid series-parallel manipulator. In *Proceedings of the 15th National Conference on Machines and Mechanisms (NaCoMM 2011)*, Chennai, India, December 2011.

[17] **Sachit Rao** and Vadim Utkin. Development of a unified simulation methodology for electric networks using sliding modes. In *International Conference on Industrial Technology (ICIT 03)*, pages 439–444, Maribor, Slovenia, December 2003.

[18] **Sachit Rao** and Vadim Utkin. Sliding mode control of 1-dimensional heat transfer processes. In *9th International Workshop on Variable Structure Systems (VSS 06)*, pages 1–4, Sardinia, Italy, 2006.

[19] **Sachit Rao** and Vadim Utkin. Designing sliding modes for the control of flexible mechanical structures in the presence of spillover. In *Proceedings of the IISc Centenary International Conference and Exhibition on Aerospace Engineering (ICEAE 2009)*, Bangalore, India, May 2009.

[20] **Sachit Rao**, Vadim Utkin, and Martin Buss. Simulation of constrained dynamic multibody systems using sliding mode control theory. In *10th International Workshop on Variable Structure Systems (VSS 08)*, pages 7–12, Antalya, Turkey, 2008 2008.

[21] **Sachit Rao**, Vadim Utkin, and Martin Buss. Sliding mode based stator flux and speed observer for induction machines. In *10th International Workshop on Variable Structure Systems (VSS 08)*, pages 95–99, Antalya, Turkey, June 2008.

[22] **Sachit Rao**, Vadim Utkin, and Martin Buss. State and parameter estimation in induction motors using sliding modes. In *13th Power Electronics and Motion Control Conference (EPE-PEMC 2008)*, pages 2312–2317, September 2008.