

SOURAV PATRA

RESEARCH INTERESTS

- Robust Control
 - H-infinity control
 - Control of negative-imaginary systems
 - Generalized distance measure for uncertain systems
 - Control of dynamical systems with actuator saturation constraint and hysteresis nonlinearity
 - Robust control using Linear matrix inequality approach
- Nonlinear control
 - Passivity based control
 - Absolute stability theory
- Applications of robust and nonlinear control

EDUCATION

- **Indian Institute of Technology Kharagpur**, India.
PhD in Electrical Engineering, 2009.

Thesis: Linear matrix inequality approach to H-infinity Loop shaping control problems
- **Indian Institute of Engineering Science and Technology, Shibpur**, Howrah, India
Masters in Control Systems, Electrical Engineering, 2003.

Thesis: Robust speed controller design for sensorless Switched Reluctance Motor drives.
- **Jadavpur University**, Kolkata, India
BE (Hons.) in Electrical Engineering, 2000.

Final Year Project: Robust controller design using H-infinity synthesis

APPOINTMENTS

PRESENT:

Assistant Professor (August 2011 to till date) in the Department of Electrical Engineering, Indian Institute of Technology Kharagpur, India.

PAST:

Research Associate (January 2009 to July 2011) in Control Systems Centre, Department of Electrical and Electronic Engineering, University of Manchester, Manchester, UK.

Reader (September 2007 to December 2008) in the Department of Avionics, Indian Institute of Space Science and Technology, Trivandrum, India.

Trainee Engineer (August 2000 to February 2001) in Calcutta Electric Supply Corporation Ltd., India.

TEACHING ASSIGNMENTS

1. Lectures on Electrical Technology (UG, IIT Kharagpur)
2. Lectures on Robust Control Theory (PG, IIT Kharagpur)
3. Lectures on Control Theory (PG, IIT Kharagpur)
4. Lectures on Optimal Control (PG, IIT Kharagpur)
5. Lectures on Basics of Electrical and Electronic Engineering (UG, IIST)
6. Tutorial on Robust Control (PG, University of Manchester)
7. Electrical Engineering Laboratory (UG, IIT Kharagpur and IIST, Trivandrum)
8. Tutorial on Engineering Analysis (UG, University of Manchester)
9. Tutorial on State Space Control (PG, University of Manchester)

PUBLICATIONS

Journal

- J1. A. K. Naskar, S. Patra and S. Sen, New control allocation algorithms in fixed point framework for over actuated systems with actuator saturation, International Journal of Control (In Press).
- J2. A. Dey, S. Patra and S. Sen, Absolute stability analysis for Negative-imaginary systems, Automatica, 67(5), 107-113, 2016.

- J3. A. K. Naskar, S. Patra and S. Sen, A control theoretic approach for solving underdetermined problems and its application to control allocation, *ASME Journal of Dynamic Systems, Measurement and Control*, 138(4), 2016.
- J4. S. Panja, S. Patra and A. Mukherjee, Tweaking Biochemical Networks: A Design Method, *INAE Letters*, 1, 3-8, 2016.
- J5. A. Naskar, S. Patra and S. Sen Reconfigurable Direct Allocation for Multiple Actuator Failures, *IEEE Transactions on Control Systems Technology*, 23(1), 397-405, 2015.
- J6. S. Konar, D. Chatterjee and S. Patra, A V-Q Sensitivity Based Index for Assessment of Dynamic Voltage Stability of Power Systems, *IET Generation, Transmission and Distribution*, In Press, 2014.
- J7. M. Osinuga, S. Patra and A. Lanzon An iterative algorithm for maximizing robust performance in H-infinity loop-shaping design, *International Journal of Robust and Nonlinear Control*, 23, 919-931, 2013.
- J8. S. Panja, S. Patra, A. Mukherjee, M. Basu, S. Sengupta and P. K. Dutta, A Closed-Loop Control Scheme for Steering Steady States of Glycolysis and Glycogenolysis Pathway, *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, 10 (4), 858-868, 2013.
- J9. S. Panja, S. Patra, A. Mukherjee, M. Basu, S. Sengupta and P. K. Dutta, Robustness of TCA Cycle at Steady-State: An LMI-Based Analysis and Synthesis Framework, *IEEE Transactions on NanoBioscience*, 12 (2), 128-134, 2013.
- J10. S. Panja, S. Patra, A. Mukherjee, M. Basu, S. Sengupta and P. K. Dutta, An optimization-based design framework for steering steady states and improving robustness of Glycolysis-Glycogenolysis Pathway, *IEEE Transactions on Biomedical Engineering*, 60(2), 554-561, 2013.
- J11. S. Patra, S. Sen, G. Ray, Load frequency control of interconnected power systems via low order H-infinity loop shaping controller *International Journal of Power and Energy Systems*, 32, 167-173, 2012.
- J12. Z. Song, A. Lanzon, S. Patra and I. R. Petersen, A negative-imaginary lemma without minimality assumptions and robust state-feedback synthesis for uncertain negative-imaginary systems, *Systems and Control Letters*, 61, 1269-1276, 2012.

- J13. Z Song, A Lanzon, S Patra and I R Petersen Robust performance analysis for uncertain negative-imaginary systems, *International Journal of Robust and Nonlinear Control*, 22, 262-281, 2012.
- J14. M Osinuga, S Patra and A Lanzon, State-space solution to weight optimization problem in H-infinity loop shaping control, *Automatica*, 48, 505-513, 2012.
- J15. S. Patra, S. Sen and G. Ray, Local stabilisation of uncertain linear time-invariant plant with bounded control inputs: parametric H-infinity loop-shaping approach *IET Control Theory and Applications*, 6 (11), 1567-157, 2012.
- J16. S. Patra and A. Lanzon A closed-loop data based test for robust performance improvement in iterative identification and control redesigns *Automatica*, 48 (10), 2710-2716, 2012.
- J17. S. Engelken, A. Lanzon, S. Patra and G. Papageorgiou, Robust stability and performance analysis for uncertain linear systems—The distance measure approach, *International Journal of Robust and Nonlinear Control*, 22 (11), 1270-1292, 2012.
- J18. D Y Lana, S Patra and A Lanzon, A parameterization of parahermitian matrix functions and its application to a state-space solution for mu-analysis, *Systems and Control Letters*, 60, 798-806, 2011.
- J19. S Patra, S Sen and G Ray, Design of H-infinity loop shaping controller for LTI system with input saturation: Polytopic gain scheduled approach, *ASME Journal of Dynamic Systems, Measurement and Control*, 133, 2011.
- J20. S. Patra and A. Lanzon, "Stability Analysis of Interconnected Systems with 'Mixed' Negative-Imaginary and Bounded-Real Properties", *IEEE Transactions on Automatic Control*, 56, 1395-1400, 2011.
- J21. S. Patra, S. Sen, G. Ray A Linear Matrix Inequality Approach to Parametric H-infinity Loop Shaping Control, *Journal of the Franklin Institute*, 348, 1832-46, 2011.
- J22. A Lanzon, Z Song, S Patra, I R Petersen, A strongly strict negative-imaginary lemma for non-minimal linear systems *Communications in Information and Systems*, 11(2), 2011.
- J23. S. Engelken, S. Patra, A. Lanzon and I. R. Petersen, "Stability Analysis of Negative-imaginary Systems with Real Parametric Uncertainty: SISO Case", *IET control theory and applications*, Vol. 4, No. 11, 2010, pp. 2631-2638.

- J24. S. Patra, S. Sen and G. Ray, "Robust Control of Uncertain LTI Plant with Input Saturation Constraint: H-infinity Loop Shaping Approach", *International Journal of Systems Science*, Vol. 41, No. 11, November 2010, pp. 1337-1351.
- J25. M. Osinuga, S. Patra and A. Lanzon, "Smooth Weight Optimization in H-infinity Loop Shaping Control", *Systems and Control Letters*, Vol. 59, 2010, pp. 663-670.
- J26. Z. Song, A. Lanzon, S. Patra, I. R. Petersen, "Towards controller synthesis for Negative-imaginary systems", *IEEE Transaction on Automatic Control*, Vol. 55, No. 6, July, 2010, pp. 1506-1511.
- J27. S. Patra, S. Sen and G. Ray, "Pre-compensator selection for H-infinity loop shaping control", *International Journal of Control, Automation and Systems*, Vol. 8, No. 1, February 2010, pp. 45-51.
- J28. S. Patra, S. Sen and G. Ray, "Design of static H-infinity loop shaping controller in four-block framework using LMI approach", *Automatica*, Vol. 44, No. 8, August 2008, pp. 2214-2220.
- J29. S. Patra, S. Sen and G. Ray, "Design of robust load frequency controller: H-infinity loop shaping approach" *International Journal of Electric Power Components and Systems*, Vol. 35, No. 7, July, 2007, pp. 769-783.

Conference

- C1. S. Mukherjee, S. Patra and S. Sen, "Analysis of linear systems with input saturation and model uncertainty: an LMI approach", IEEE International Conference on Industrial Technology, IIT Bombay, India, 2006.
- C2. S. Mukherjee, S. Patra and S. Sen, "Semi-global stabilization of linear systems with input saturation through state-feedback via circle criterion: an LMI approach", Prastuti, IT BHU, India, 2006.
- C3. A. Sengupta, M. Sengupta and S. Patra, "Design, simulation and comparison of a P-I and an H-infinity optimal controller for a switched reluctance motor based variable speed drive", National System Conference, IIT Kharagpur, India, 2003.
- C4. S. Patra, S. Sen and G. Ray, "Robust load frequency controller design using loop shaping approach", National System Conference, IIT Kharagpur, India 2003.
- C5. A. Sengupta, A. Saha, S. Patra and M. Sengupta, "Design and performance of an Extended Luenberger observer for indirect position estimation in a switched reluctance motor", National Power System Conference, IIT, Kharagpur, India, 2002.

C6. Z. Song, A. Lanzon, S. Patra, I. R. Petersen, 'Robust performance analysis for negative-imaginary systems', Mediterranean control conference, Morocco, 2010.

C7. M. Osinuga, S. Patra, A. Lanzon, 'Incorporating smoothness in weight optimization for H-infinity loopshaping design method', Mediterranean control conference, Morocco, 2010.

C8. S. Engelken, A. Lanzon, S. Patra, G. Papegeorgiou, "Distance measure for inverse multiplicative uncertainty structure", IEEE Conference on Decision and Control, 2010, Atlanta, USA.

C9. A. Lanzon and S. Patra, "Robust performance improvement test for stabilizing controllers using closed-loop data", Proceeding of IFAC World Congress, Milan, 2011.

C10. M. Osinuga, S. Patra and A. Lanzon, "Weight optimization for maximizing robust performance in H-infinity loop-shaping design", Proceeding of IFAC World Congress, Milan, 2011.

C11. A. Naskar, S. Patra and S. Sen, A Reconfigurable Direct Control Allocation Method, European Control Conference, Zurich, Switzerland, 2013.

C12. A. Dey, S. Patra and S. Sen, Robust Closed Loop Position Control of Shape Memory Alloy Wire Actuators: Design and Experimental Validation, Indian Control Conference, Madras, India, 2015.

C13. A. Naskar, S. Patra and S. Sen, Disturbance attenuation problem for overactuated systems with actuator saturation: A control allocation based approach, Mediterranean control conference, Spain, 2015.

C14. P. Bhowmick and S. Patra, On input-output strictly negative-imaginary systems, Indian Control Conference, Hyderabad, India, 2016.

INVITED LECTURE:

1. Robust Control, TEQIP, NIT Durgapur, 2013.

TECHNICAL PROGRAM COMMITTEE MEMBER:

1. IEEE International Conference on Industrial and Information Systems (ICIIS), Gwalior, India, 2014.
2. National Systems Conference (NSC), Delhi, India, 2015.

REVIEWER:

1. Automatica
2. IEEE Transactions on Automatic Control
3. International Journal of Control
4. International Journal of Robust and Nonlinear Control
5. Systems and Control Letters
6. IEEE Transactions on Mechatronics
7. Aerospace Science and Technology
8. Shock and Vibration