

# ABHINAV SINHA

<http://home.iitb.ac.in/sinha.abhinav> @ [abhinavsinha@aero.iitb.ac.in](mailto:abhinavsinha@aero.iitb.ac.in)  
[in linkedin.com/in/abhinav24](https://www.linkedin.com/in/abhinav24) [github.com/sinha-abhinav](https://github.com/sinha-abhinav)



## EDUCATION

### INDIAN INSTITUTE OF TECHNOLOGY BOMBAY, MUMBAI, INDIA

2018– PRESENT

Doctor of Philosophy (Ph.D.)

Specialization : Aerospace Engineering (Dynamics and Control)

Thesis : Cooperative Nonlinear Guidance Strategies under Resource Constraints

Cooperative Guidance and Control Multiagent Systems Event-based control Sliding mode control

### INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, HOWRAH, INDIA

2016– 2018

Master of Technology (M.Tech), G.P.A. 9.28/10

Specialization : Mechatronics

Thesis : Event-based cooperative control of multi-agent systems for odor source localization in an unknown environment

Robot Olfaction Cooperative Control Multiagent Systems Event-based control Sliding mode control

### KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY, BHUBANESWAR, INDIA

2010– 2014

Bachelor of Technology (B.Tech), G.P.A. 8.46/10

Specialization : Electronics & Instrumentation

Thesis : Automated PID tuning of line follower robot

Robotics Control Systems Embedded Systems

## EXPERIENCE

Jan 2019–  
Present

### INDIAN INSTITUTE OF TECHNOLOGY BOMBAY, MUMBAI, INDIA

Teaching Assistant

- AE 305 : Flight Mechanics– II, Spring 2019
- AE 717 : Aircraft Flight Dynamics, Spring 2019

Jun 2017–  
May 2018

### CENTRAL SCIENTIFIC INSTRUMENTS ORGANISATION (CSIR–CSIO), CHANDIGARH, INDIA

Research Student

- Designed robust cooperative control protocols for multiagent systems tasked to locate source of an odor in an unknown environment characterized by heavy turbulence.

Sep 2014–  
Jul 2016

### TATA CONSULTANCY SERVICES LIMITED, PUNE, INDIA

Assistant System Engineer, Consulting in Manufacturing, Automation and Control Systems

- Worked on tools like WinCC SCADA, Kepware, Step7, Prosoft, etc. for Control System Integration (CSI); GE IP Proficy Suite, SAP ME, etc. for Manufacturing Execution Systems (MES); and SAP MII for Enterprise Manufacturing Intelligence (EMI).
- Integrated data from factory floor machines with business layers for various productivity applications like reporting, dashboarding, monitoring, etc.
- Configured multi master and sensor data integration directly to cloud.
- Provided plant network security and segmentation for several new manufacturing units.
- Worked towards enhancing efficiency in Manufacturing Operations Management (MOM).

Nov 2015	<b>TATA CONSULTANCY SERVICES LIMITED, TRIVANDRUM, INDIA</b> <i>Visiting faculty at TCS Global Learning Center</i> <ul style="list-style-type: none"> <li>➤ Visited TCS Global Learning Centre at Trivandrum, India to impart hands on training on Manufacturing Operations Management (MOM) and the role of web technologies such as HTML, CSS, JavaScript, etc. in it.</li> <li>➤ Introduced concepts of flow of data from factory floor to managerial layer and cloud; machine logic and business logic; and other aspects of role of engineering and IT in manufacturing.</li> </ul>
Jun 2011– May 2014	<b>KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY, BHUBANESWAR, INDIA</b> <i>Instructor and Coordinator</i> <ul style="list-style-type: none"> <li>➤ Managed students directly by teaching and training them about innovation in technology and science related to robotics and embedded systems. Control systems, automation and signal processing were integral parts of the course. From theory to applications, hobbyist electronics to complex machines, there were several other major areas of engineering which were explored and a forum of discussion over the same was created. Apart from academics, there were other things such as event management, competitions that were regularly organized to promote interest and developments in robotics and embedded systems.</li> </ul>

## PUBLICATIONS

### REFEREED JOURNALS

- [J1] **Abhinav Sinha** and S. R. Kumar, “Super-Twisting Control based Cooperative Salvo Guidance using Leader-Follower Approach”, *AIAA- Journal of Guidance, Control and Dynamics*, under review, 2019
- [J2] **Abhinav Sinha**, R. Kumar, R. Kaur and R. K. Mishra, “Consensus-Based Odor Source Localization by Multiagent Systems Under Resource Constraints”, *IEEE Transactions on Cybernetics*, in press, 2019
- [J3] R. K. Mishra and **Abhinav Sinha**, “Event-triggered sliding mode based consensus tracking in second order heterogeneous nonlinear multi-agent systems”, *European Journal of Control*, vol. 45, pp. 30–44, 2019
- [J4] **Abhinav Sinha** and R. K. Mishra, “Consensus in first order nonlinear heterogeneous multi-agent systems with event-based sliding mode control”, *International Journal of Control*, in press, 2018
- [J5] **Abhinav Sinha**, R. Kumar, R. Kaur and A. P. Bhondekar, “Consensus based odour source localisation by multiagent systems”, *IEEE Transactions on Cybernetics*, in press, 2018
- [J6] **Abhinav Sinha** and R. K. Mishra, “Control of a nonlinear continuous stirred tank reactor via event triggered sliding modes”, *Chemical Engineering Science*, vol. 187, pp. 52–59, 2018
- [J7] T. Majumder, R. K. Mishra, **Abhinav Sinha**, S. S. Singh and P. K. Sahu, “Congestion Control in Cognitive Radio Networks with Event-triggered Sliding Mode”, *AEU– International Journal of Electronics and Communication*, vol. 90, pp. 155–162, 2018
- [J8] **Abhinav Sinha** and R. K. Mishra, “Nonlinear autonomous altitude control of miniature helicopter UAV based on sliding mode methodology”, *International Journal of Electronics and Communication Technology*, vol. 61, spl.- 1, Jan- Mar 2015

### PEER REVIEWED CONFERENCE PROCEEDINGS

- [C1] **Abhinav Sinha** and S. R. Kumar “Super-Twisting Control based Impact Time Constrained Guidance”, *under review, AIAA Sci-Tech Forum, Orlando, USA, 6<sup>th</sup>-10<sup>th</sup> Jan 2020*
- [C2] **Abhinav Sinha**, D. Mukherjee and S. R. Kumar “Deviated Pursuit based Cooperative Simultaneous Interception against Moving Targets”, *under review, 6<sup>th</sup> Indian Control Conference, Hyderabad, India, 18<sup>th</sup>-20<sup>th</sup> Dec 2019*
- [C3] **Abhinav Sinha**, S. R. Kumar and D. Mukherjee, “Consensus based Nonlinear Guidance for Cooperative Salvo”, *under review, 6<sup>th</sup> Indian Control Conference, Hyderabad, India, 18<sup>th</sup>-20<sup>th</sup> Dec 2019*
- [C4] **Abhinav Sinha**, R. Kumar and R. Kaur, “Resource efficient control strategy for consensus based odour source localisation by multiagent systems”, *accepted, 2018 IEEE Symposium Series on Computational Intelligence, 18<sup>th</sup>-21<sup>st</sup> Nov 2018*
- [C5] **Abhinav Sinha** and R. K. Mishra, “Convergence of multi-agent systems to unknown source of an odor”, *accepted, 2018 IEEE 3<sup>rd</sup> International Conference for Convergence in Technology, 7<sup>th</sup>-8<sup>th</sup> Apr 2018*
- [C6] **Abhinav Sinha** and R. K. Mishra, “Distributed cooperative control of multi agent systems for odor source localization”, *accepted, Third International Conference on Advances in Control and Optimization Of Dynamical Systems (ACODS 2018), 18<sup>th</sup>-22<sup>nd</sup> Feb, 2018*
- [C7] **Abhinav Sinha** and R. K. Mishra, “Temperature regulation in a Continuous Stirred Tank Reactor using event triggered sliding mode control”, *IFAC PapersOnLine*, vol. 51, no. 1, pp. 401–406, 2018

- [C8] T. Majumder, **Abhinav Sinha**, R. K. Mishra, S. S. Singh and P. K. Sahu, “Robust nonlinear congestion controller for time delayed and uncertain cognitive radio based wireless network”, in *Proc., 2015 IEEE Power, Communication and Information Technology Conference (PCITC), Bhubaneswar, India, 15<sup>th</sup>-17<sup>th</sup> Oct, 2015*
- [C9] **Abhinav Sinha** and R. K. Mishra, “Sliding mode controller design for high performance of permanent magnet stepper motor”, in *Proc., 2015 IEEE International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS), Coimbatore, India, 19<sup>th</sup>-20<sup>th</sup> Mar, 2015*
- [C10] **Abhinav Sinha** and R. K. Mishra, “Robust altitude tracking of a miniature helicopter UAV based on sliding mode”, in *Proc., 2015 IEEE International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS), Coimbatore, India, 19<sup>th</sup>-20<sup>th</sup> Mar, 2015*
- [C11] T. Majumder, **Abhinav Sinha**, R. K. Mishra, S. S. Singh and P. K. Sahu, “Robust nonlinear congestion controller for cognitive radio based wireless network”, in *Proc., 2015 IEEE International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS), Coimbatore, India, 19<sup>th</sup>-20<sup>th</sup> Mar, 2015*
- [C12] **Abhinav Sinha**, R. K. Mishra and S. Jaiswal, “Robust and Smooth Nonlinear Control of an Industrial Robot for Automated Pick and Place”, in *Proc., 2015 IEEE International Conference on Computing Communication Control and Automation (ICCUBEA), Pune, India, 26<sup>th</sup>-27<sup>th</sup> Feb, 2015*
- [C13] **Abhinav Sinha**, P. Prasoon, P. K. Bharadwaj and A. C. Ranasinghe, “Nonlinear Autonomous Control of a Two-Wheeled Inverted Pendulum Mobile Robot Based on Sliding Mode”, in *Proc., 2015 IEEE International Conference on Computational Intelligence and Networks (CINE), Bhubaneswar, India, 12<sup>th</sup>-13<sup>th</sup> Jan, 2015*
- [C14] A. C. Ranasinghe, K. Rasnayake, **Abhinav Sinha** and K. K. Rasnayake, “Perturbing effect compensation technique for smart sensors”, in *Proc., 7th IEEE International Conference on Information and Automation for Sustainability (ICIAfS), Colombo, Sri Lanka, 22<sup>nd</sup>-24<sup>th</sup> Dec, 2014*
- [C15] **Abhinav Sinha** and R. K. Mishra, “Smooth sliding mode controller design for robotic arm”, in *Proc., 2013 International Conference on Control, Automation, Robotics and Embedded Systems (CARE), Jabalpur, India, 16<sup>th</sup>-18<sup>th</sup> Dec, 2013*

#### BOOK CHAPTERS

- [BC1] **Abhinav Sinha** and R. K. Mishra, “Smooth sliding mode control of a nonlinear CSTR using an inverse hyperbolic function-based law, *Foundations and Frontiers in Computer, Communication and Electrical Engineering : Proceedings of 3rd International Conference C2E2, Mankundu, West Bengal, India, 15<sup>th</sup>-16<sup>th</sup> Jan, 2016*
- [BC2] T. Majumder, **Abhinav Sinha**, R. K. Mishra, S. S. Singh and P. K. Sahu, “Congestion control in Cognitive Radio Networks using fractional order rate reaching law based sliding modes, *Foundations and Frontiers in Computer, Communication and Electrical Engineering : Proceedings of 3rd International Conference C2E2, Mankundu, West Bengal, India, 15<sup>th</sup>-16<sup>th</sup> Jan, 2016*

#### ARTICLES OF ARCHIVAL QUALITY

- [A1] **Abhinav Sinha**, R. Kaur, R. Kumar and A. P. Bhondekar, “Cooperative control of multi-agent systems to locate source of an odor”, *ArXiv e-prints*, Nov 2017

### POSITIONS OF RESPONSIBILITY

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#### REVIEWER OF REFEREED JOURNALS

- > IEEE Transactions on Automatic Control
- > IEEE Transactions on System, Man and Cybernetics : Systems
- > Journal of The Franklin Institute (Elsevier)
- > European Journal of Control (Elsevier)
- > IEEE Transactions on Fuzzy Systems
- > Information Sciences (Elsevier)
- > IEEE Access
- > IEEE Sensors Letters
- > Nonlinear Dynamics (Springer)
- > Advances in Space Research (Elsevier)
- > IET Generation, Transmission and Distribution
- > Asia Pacific Journal of Chemical Engineering (Wiley)
- > IEEE Transactions on Neural Networks and Learning Systems

#### REVIEWER OF PEER REVIEWED CONFERENCES (SELECTED)

- > Indian Control Conference
- > American Control Conference

- > Control and Decision Conference (CDC)
- > International Conference on Control, Decision and Information Technologies (CoDIT)
- > International Conference on Control and Automation (ICCA)
- > Mediterranean Conference on Control and Automation (MED)
- > International Conference on Advances in Computing, Communications and Informatics (ICACCI)



## PROFESSIONAL MEMBERSHIPS

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- > Institute of Electrical and Electronics Engineers (IEEE)
- > International Federation of Automatic Control (IFAC)
- > Asian Control Association



## AWARDS, ACHIEVEMENTS AND HONORABLE MENTIONS

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- > **MHRD POSTGRADUATE GATE FELLOWSHIP**

*Ministry of Human Resource Development, India*

Awarded for qualifying Graduate Aptitude Test in Engineering (GATE) with 96 percentile, a computer based standardized test conducted jointly by Indian Institute of Science and Indian Institutes of Technology on behalf of the National Co-ordination Board- GATE, Department of Higher Education, Ministry of Human Resource Development, Government of India for post graduate education in engineering and graduate employments in various Public Sector Undertakings under Government of India.

JUL 2016– PRESENT
- > **CHAMPIONS OF INITIAL LEARNING PROGRAM (ILP)**

*TATA Consultancy Services Limited*

Associated with the position of visiting faculty at TCS, and awarded for contribution towards Engineering and Industrial Services (EIS)- Talent Development in Manufacturing Operations Management domain.

DEC 2015
- > **ON THE SPOT AWARD**

*TATA Consultancy Services Limited*

Awarded for the research work done in the field of Control Systems and allied areas, and for serving as research reviewer for many technical peer reviewed conferences in India and abroad.

JUL 2015
- > **BEST PAPER AWARD**

*IEEE Computer Society/IEEE Pune Section*

Awarded Best Paper of the session track in Robotics at IEEE International Conference on Computing, Communication, Control and Automation, Pune, India.

FEB 2015
- > **OUTSTANDING CONTRIBUTION AWARD**

*KIIT Robotics Society, Kalinga Institute of Industrial Technology*

Awarded for technical contribution towards the robotics society.

AUG 2013