

# ABHINAV SINHA




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## WORK EXPERIENCE

Dec 2021- Present	<b>THE UNIVERSITY OF TEXAS AT SAN ANTONIO</b> , SAN ANTONIO, USA <i>Postdoctoral Fellow</i> , Host : Dr. Yongcan Cao
May 2021- Nov 2021	<b>INDIAN INSTITUTE OF TECHNOLOGY BOMBAY</b> , MUMBAI, INDIA <i>Postdoctoral Fellow</i> , Host : Dr. Shashi Ranjan Kumar
Jan 2019- May 2021	<b>INDIAN INSTITUTE OF TECHNOLOGY BOMBAY</b> , MUMBAI, INDIA <i>Teaching Assistant</i> <ul style="list-style-type: none"><li>&gt; AE 305 : Flight Mechanics– II, Spring 2019, 2020, and 2021</li><li>&gt; AE 717 : Aircraft Flight Dynamics, Spring 2019, 2020, and 2021</li><li>&gt; AE 410 : Navigation and Guidance, Fall 2019, 2020, and 2021</li><li>&gt; AE 641 : Introduction to Navigation and Guidance, Fall 2019, 2020, and 2021</li></ul>
Jun 2019- May 2018	<b>CENTRAL SCIENTIFIC INSTRUMENTS ORGANISATION</b> , CHANDIGARH, INDIA <i>Research Student</i>
Sep 2014- Jul 2016	<b>TATA CONSULTANCY SERVICES LIMITED</b> , PUNE, INDIA <i>Assistant System Engineer, Consulting in Manufacturing, Automation and Control Systems</i>
Nov 2015	<b>TATA CONSULTANCY SERVICES LIMITED</b> , TRIVANDRUM, INDIA <i>Visiting faculty at TCS Global Learning Center</i>
Jun 2011- May 2014	<b>KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY</b> , BHUBANESWAR, INDIA <i>Instructor and Coordinator, KIIT Robotics Society</i>

## EDUCATION

 <b>INDIAN INSTITUTE OF TECHNOLOGY BOMBAY</b> Doctor of Philosophy (Ph.D.), Aerospace Engineering <i>Advisor : Dr. Shashi Ranjan Kumar</i>	2018 - 2020
 <b>INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY</b> Master of Technology (M.Tech.), Mechatronics <i>Advisor : Dr. Ritesh Kumar (CSIR-CSIO), Dr. Rishemjit Kaur (CSIR-CSIO)</i>	2016 - 2018
 <b>KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY</b> Bachelor of Technology (B.Tech.), Electronics and Instrumentation	2010 - 2014

## PUBLICATIONS

 REFEREED JOURNALS– PUBLISHED/IN PRESS

- [J17] **Abhinav Sinha**, and S. R. Kumar, “Cooperative target capture using predefined-time consensus over fixed and switching networks”, *Aerospace Science and Technology*, vol. 127, pp. 107686, 2022. [Preprint available at arXiv:2109.01338 ]
- [J16] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Three-agent Time-constrained Cooperative Pursuit-Evasion”, *Journal of Intelligent & Robotic Systems*, vol. 104, no. 28, pp. 1–27, 2022. [Preprint available at arXiv:2106.01895]
- [J15] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Cooperative integrated guidance and control design for simultaneous interception”, *Aerospace Science and Technology*, vol. 120, pp. 107262, 2022.
- [J14] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Impact time constrained integrated guidance and control design”, *Aerospace Science and Technology*, vol. 115, pp. 106824, 2021.
- [J13] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Nonsingular impact time guidance and control using deviated pursuit”, *Aerospace Science and Technology*, vol. 115, pp. 106776, 2021.
- [J12] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Cooperative Salvo Based Active Aircraft Defense Using Impact Time Guidance”, *IEEE Control Systems Letters*, vol. 5, no. 5, pp. 1573–1578, 2021 (also accepted for presentation at 2021 American Control Conference, New Orleans, Louisiana, USA ).
- [J11] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Three-Dimensional Nonlinear Cooperative Salvo Using Event-Triggered Strategy”, *AIAA Journal of Guidance, Control, and Dynamics*, vol. 44, no. 2, pp. 328–342, 2021.
- [J10] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Three-Dimensional Guidance With Terminal Time Constraints for Wide Launch Envelops”, *AIAA Journal of Guidance, Control, and Dynamics*, vol. 44, no. 2, pp. 343–359, 2021.
- [J9] **Abhinav Sinha**, and S. R. Kumar, “Super-Twisting Control Based Cooperative Salvo Guidance Using Leader-Follower Approach”, *IEEE Transactions on Aerospace and Electronic Systems*, vol. 56, no. 5, pp. 3556–3565, 2020.
- [J8] **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*, vol. 93, no. 4, pp. 858–871, 2020.
- [J7] **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*, vol. 50, no. 7, pp. 3254–3263, 2020.
- [J6] **Abhinav Sinha**, R. Kumar, R. Kaur and A. P. Bhondekar, “Consensus-Based Odor Source Localization by Multiagent Systems”, *IEEE Transactions on Cybernetics*, vol. 49, no. 12, pp. 4450–4459, 2019.
- [J5] 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] T. Majumder, R. K. Mishra, **Abhinav Sinha**, S. S. Singh, and P. K. Sahu, “Robust congestion control in cognitive radio network using dynamic event-triggered sliding mode”, *International Journal of Communication Systems*, vol. 33, no. 10, pp. e4206, 2019.
- [J3] **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.
- [J2] 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.
- [J1] **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.

 **REFEREED JOURNALS– UNDER REVIEW/PREPARATION**

- [j4] **Abhinav Sinha**, and Y. Cao, “A Nonlinear Guidance Law for Target Enclosing with Arbitrary Smooth Shapes”, under review.
- [j3] P. Ranjan, **Abhinav Sinha**, Y. Cao, D. Tran, D. Casbeer, and I. Weintraub, “Energy-efficient Ring Formation Control with Constrained Inputs”, under review.
- [j2] H. Bishwash, **Abhinav Sinha**, and S. R. Kumar, “Deviated Pursuit based Predefined-time Convergent Impact Time Guidance with Obstacle Avoidance”, under preparation.
- [j1] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Consensus-based Simultaneous Interception of Moving Targets using Deviated Pursuit”, under preparation.

#### BOOK CHAPTERS

- [BC2] **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*, Taylor and Francis, 2016.
- [BC1] 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*, Taylor and Francis, 2016.

#### PEER REVIEWED CONFERENCE PROCEEDINGS

- [C22] S. K. Singh, **Abhinav Sinha**, and S. R. Kumar, “Nonlinear Control Design for an Unmanned Aerial Vehicle for Path Following”, *IFAC PapersOnLine*, vol. 55, no. 1, pp. 592–597, 2022.
- [C21] Iftisam, **Abhinav Sinha**, and S. R. Kumar, “Three-dimensional Nonlinear Impact Time Guidance Accounting for Autopilot Lag”, *IFAC PapersOnLine*, vol. 55, no. 1, pp. 26–31, 2022.
- [C20] **Abhinav Sinha**, R. V. Nanavati, and S. R. Kumar, “Impact Angle Constrained Integrated Guidance and Control for a Dual-controlled Interceptor”, in *Proc., 7<sup>th</sup> Indian Control Conference (ICC)*, Mumbai, India, 20<sup>th</sup>-22<sup>nd</sup> Dec 2021.
- [C19] **Abhinav Sinha**, and S. R. Kumar, “Cooperative Target Capture using Predefined-time Consensus”, in *Proc., 7<sup>th</sup> Indian Control Conference (ICC)*, Mumbai, India, 20<sup>th</sup>-22<sup>nd</sup> Dec 2021.
- [C18] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Cooperative Salvo Based Active Aircraft Defense using Impact Time Guidance”, in *Proc., American Control Conference (ACC)*, New Orleans, USA, 25<sup>th</sup>-28<sup>th</sup> May 2021.
- [C17] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Integrated Guidance and Control For Dual Control Interceptors Under Impact Time Constraint”, in *Proc., Guidance, Navigation, and Control Conference (AIAA SciTech Forum)*, Virtual Event, 11<sup>th</sup>-15<sup>th</sup> and 19<sup>th</sup>-21<sup>st</sup> Jan 2021.
- [C16] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Three-Dimensional Nonlinear Interception Time Guidance for Stationary Targets”, in *Proc., American Control Conference (ACC)*, Denver, USA, 1<sup>st</sup>-3<sup>rd</sup> Jul 2020.
- [C15] **Abhinav Sinha**, D. Mukherjee, and S. R. Kumar, “Deviated Pursuit based Cooperative Simultaneous Interception against Moving Targets”, in *Proc., American Control Conference (ACC)*, Denver, USA, 1<sup>st</sup>-3<sup>rd</sup> Jul 2020.
- [C14] H. Bishwash, **Abhinav Sinha**, and S. R. Kumar, “Deviated Pursuit Based Nonlinear Impact-Time Guidance with Finite-Time Convergence”, *IFAC PapersOnLine*, vol. 53, no. 1, pp. 93–98, 2020, **Awarded Best Paper**.
- [C13] **Abhinav Sinha**, and S. R. Kumar, “Super-Twisting Control Based Impact Time Constrained Guidance”, in *Proc., Guidance, Navigation, and Control Conference (AIAA SciTech Forum)*, Orlando, USA, 6<sup>th</sup>-10<sup>th</sup> Jan 2020.
- [C12] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, “Consensus Based Nonlinear Guidance for Cooperative Salvo”, in *Proc., 6<sup>th</sup> Indian Control Conference (ICC)*, Hyderabad, India, 18<sup>th</sup>-20<sup>th</sup> Dec 2019.

- [C11] **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*, Bengaluru, India, 18<sup>th</sup>-21<sup>st</sup> Nov 2018.
- [C10] **Abhinav Sinha**, and R. K. Mishra, "Convergence of multi-agent systems to unknown source of an odor", in *Proc., 2018 IEEE 3<sup>rd</sup> International Conference for Convergence in Technology*, Pune, India, 7<sup>th</sup>-8<sup>th</sup> Apr 2018.
- [C9] **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.
- [C7] **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.
- [C6] **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.
- [C5] 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.
- [C4] **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, **Awarded Best Paper**.
- [C3] **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.
- [C2] 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.
- [C1] **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.

#### OTHERS

- [A2] **Abhinav Sinha**, S. R. Kumar, and D. Mukherjee, "Integrated Guidance and Control Design For Time-Constrained Interception", *IEEE TechRxiv*, 2020.
- [A1] **Abhinav Sinha**, R. Kaur, R. Kumar, and A. P. Bhondekar, "Cooperative control of multi-agent systems to locate source of an odor", *arXiv:1711.03819, arXiv e-prints*, 2017.

## PROFESSIONAL SERVICES

### REVIEWER OF REFEREED JOURNALS

- IEEE Transactions on Automatic Control
- Automatica
- International Journal of Control
- IEEE Transactions on Control Systems Technology

- International Journal of Robust and Nonlinear Control
- IEEE Transactions on System, Man and Cybernetics : Systems
- IEEE Transactions on Cybernetics
- Journal of The Franklin Institute
- European Journal of Control
- IET Control Theory and Applications
- AIAA Journal of Guidance, Control, and Dynamics
- IEEE Control Systems Letters
- IEEE Transactions on Fuzzy Systems
- IEEE Transactions on Aerospace and Electronic Systems
- Journal of Intelligent & Robotic Systems
- IEEE Transactions on Neural Networks and Learning Systems
- Asian Journal of Control
- Information Sciences
- IEEE Transactions on Industrial Electronics
- IEEE Transactions on Industrial Informatics
- ISA Transactions
- Journal of Process Control
- IEEE Access
- IEEE Systems Journal
- IEEE Sensors Letters
- Nonlinear Dynamics
- Advances in Space Research
- IET Generation, Transmission and Distribution
- Chemical Engineering Science
- Asia Pacific Journal of Chemical Engineering
- Journal of Computational Science
- Neurocomputing
- Swarm Intelligence
- IET Power Electronics
- Journal of Aerospace Engineering
- IEEE Journal of Emerging and Selected Topics in Industrial Electronics
- Plos One

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

- Americal Control Conference (ACC)
- Control and Decision Conference (CDC)
- Indian Control Conference (ICC)
- European Control Conference (ECC)
- AIAA SciTech Forum
- IFAC World Congress
- International Workshop on Variable Structure Systems and Sliding Mode Control (VSS)
- International Conference on Control, Decision and Information Technologies (CoDIT)
- International Conference on Control and Automation (ICCA)
- Mediterranean Conference on Control and Automation (MED)
- IFAC Advances in Control and Optimization of Dynamical Systems (ACODS)



#### PROFESSIONAL MEMBERSHIPS

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- > IITB Alumni Association
- > International Federation of Automatic Control (IFAC)
- > American Institute of Aeronautics and Astronautics (AIAA)
- > Asian Control Association

## AWARDS, ACHIEVEMENTS AND HONORABLE MENTIONS

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|---|---------------------|
| > <b>ACC STUDENT TRAVEL GRANT</b><br><i>American Automatic Control Council, USA</i>                                 | MAY 2021            |
| > <b>ACC STUDENT TRAVEL GRANT</b><br><i>American Automatic Control Council, USA</i>                                 | JUN 2020            |
| > <b>ICC STUDENT SUPPORT</b><br><i>Indian Control Conference and IEEE-CSS</i>                                       | DEC 2019            |
| > <b>MHRD POSTGRADUATE GATE FELLOWSHIP</b><br><i>Ministry of Human Resource Development, India</i>                  | JUL 2016 - APR 2021 |
| > <b>CHAMPIONS OF INITIAL LEARNING PROGRAMME (ILP)</b><br><i>TATA Consultancy Services Limited</i>                  | DEC 2015            |
| > <b>ON THE SPOT AWARD</b><br><i>TATA Consultancy Services Limited</i>  | JUL 2015            |
| > <b>OUTSTANDING CONTRIBUTION AWARD</b><br><i>KIIT Robotics Society, Kalinga Institute of Industrial Technology</i> | AUG 2013            |

## REFERENCES

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Furnished upon request.