Curriculum Vitae

Thomas M. C. Sears, M.A.Sc., P. Eng.
Ph.D. Candidate

Ingenuity Labs Research Institute
Queen's University

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1 University Education

09/2019–Present: Ph.D. Candidate, Electrical and Computer Engineering, Queen's University

Offroad Robotics and the Ingenuity Labs Research Institute
Research focus: Using Gaussian process regression to enable mapping of dynamic natural phenomena with mobile robots for use in environmental surveys and precision vehicle control.
Supervisor: J. A. Marshall

09/2012–08/2014: M.A.Sc., Aerospace Engineering, University of Toronto

Space Flight Laboratory (SFL), University of Toronto Institute for Aerospace Studies (UTIAS)
Research focus: Design, analysis, and qualification of materials and mechanisms for a spacecraft deorbit drag sail and accompanying miniature inspection camera.
Supervisor: R. E. Zee

09/2007–05/2012: B.Eng., Aerospace Engineering (Co-op), Carleton University

Space System Design Stream
Capstone project: Attitude determination using a Multiplicative Extended Kalman Filter (MEKF) for a pair of Earth-observing satellites.
Supervisor: A. de Ruiter

2 Academic Positions Held

09/2019–Present: Teaching Assistant

Queen's University
W2023 – MREN 203: Mechatronics and Robotics Design II (Lead TA)
W2022 – ELEC 299: Mechatronics Project (Lead TA)
F2019 – APSC 143: Computer Programming for Engineers

09/2021–Present: Course Development

Queen's University

September 2022–February 2023: MREN 203: Mechatronics and Robotics Design II

November 2021–February 2022: ELEC 299: Mechatronics Project

May 2021–March 2022: CIVL 222: Numerical Methods for Civil Engineers

3 Industry Experience

08/2014–08/2019: Engineer

Sinclair Interplanetary (Rocket Lab), Toronto, Ontario, Canada.

05/2010–08/2011: Research Assistant (Co-op)

National Research Council of Canada, Institute for Aerospace Research, Structures and Materials Performance Laboratory, Ottawa, Ontario, Canada.

4 Honours and Awards

2022: Department of Electrical and Computer Engineering Graduate Travel Grant to the 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022) ($500).

2022: Robotics and AI Symposium 2022 Best Robotics Poster Award ($500)

2020–2022: Vanier Canada Graduate Scholarship ($50,000 per year)

2019: Arthur B. McDonald Prize for Academic Excellence ($30,000)

2019–2022: Dean's Graduate Research Award ($20,000 per year)

2014: Frank J. Redd Student Competition Honorable Mention ($2,500)

2014: School of Graduate Studies Conference Grant to 4S Symposium in Mallorca, Spain ($1,200)

2013: Ontario Graduate Scholarship ($15,000)

2012: University of Toronto Fellowship ($8,000)

2012: Senate Medal for Outstanding Academic Achievement

2011: Esterline CMC Electronics Scholarship ($2,500)

2007–2012: Deans' Honour List

2007–2012: Faculty Entrance Scholarship ($4,000 per year)

2007: Governor General's Medal (bronze)

5 Publications

Conference Papers (Accepted)

1. **T. M. C. Sears**, M. R. Cooper, and J. A. Marshall. Mapping waves with an uncrewed surface vessel vis Gaussian process regression (Manuscript No. 3293). Accepted to *2023 IEEE International Conference on Robotics and Automation* (ICRA) on January 16, 2023.

Conference Papers (Fully Refereed)

1. **T. M. C. Sears** and J. A. Marshall. Mapping of spatiotemporal scalar fields by mobile robots using Gaussian process regression. 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Kyoto, Japan, October 2022.

Conference Papers (Abstract Refereed)

1. C. C. Grant, **T. M. C. Sears**, J. Gibson, N. Kerr, and D. Sinclair. Quantity and Quality: Scaling Small Business for Large Constellations. Proceedings of the AIAA/USU Conference on Small Satellites, Logan, Utah, August 2019.

2. D. Sinclair, J. Enright, T. Dzamba, and **T. M. C. Sears**. Custom Optics vs Modified COTS for Small Spacecraft: The Build vs. Rebuild Decision. Proceedings of the AIAA/USU Conference on Small Satellites, Logan, Utah, August 2015.

3. **T. M. C. Sears**, J. Newman, B. Cotten, J. Fine, J. Chung, H. Spencer, K. A. Carroll, and R. E. Zee. Proposed Design of a Microspace Mission for Near-Earth Asteroid Mining Survey and Tracking. Proceedings of the 65th International Astronautical Congress (IAC), Toronto, Canada, September 2014.

4. **T. M. C. Sears** and R. E. Zee. Sail Material, Inspection Imager, and Deployment Analysis for an End-Of-Life Disposal Drag Sail. Proceedings of the AIAA/USU Conference on Small Satellites, Logan, Utah, August 2014.

5. **T. M. C. Sears**, B. Cotten, and R. E. Zee. Performance Analysis of Thin Film Materials in a Drag Sail Deorbiting Device. Proceedings of the Small Satellite Systems and Services Symposium (4S), Majorca, Spain, May 2014.

6. B. Cotten, **T. M. C. Sears**, and R. E. Zee. The CanX-7 Nanosatellite Deorbit Mission: Demonstrating Sustainable Use of Low-Earth Orbit. Proceedings of the Small Satellite Systems and Services Symposium (4S), Majorca, Spain, May 2014.

7. G. Bonin, J. Hiemstra, **T. M. C. Sears**, and R. E. Zee. The CanX-7 Drag Sail Demonstration Mission: Enabling Environmental Stewardship for Nano- and Microsatellites. Proceedings of the AIAA/USU Conference on Small Satellites, Logan, Utah, August 2013.

Technical Reports

1. **T. M. C. Sears**, F. Sorensen, and D. Backman. Uncertainty Determination and Evaluation of a 2-D Digital Image Correlation System. National Research Council (NRC) Canada, Institute for Aerospace Research (IAR), Structures and Materials Performance Laboratory (SMPL), Ottawa, 2012.

Academic Theses

1. *Sail, Deployment, and Imaging Technology for a Nanosatellite Deorbit System Demonstration on CanX-7.* M.A.Sc. Thesis, Institute for Aerospace Studies, University of Toronto, Toronto, ON, September 2014 (supervisor: R. E. Zee).

2. *Satellite Attitude Determination with a Multiplicative Extended Kalman Filter.* B.Eng. Thesis, Department of Mechanical and Aerospace Engineering, Carleton University, Ottawa, ON, May 2012 (supervisor: A. de Ruiter).

6 Selected Scholarly Talks

Conference Presentations

1. Mapping of spatiotemporal scalar fields by mobile robots using Gaussian process regression. 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Kyoto, Japan, October 2022.
2. Robots are here to help: Deploying mobile robots to observe and protect water. Graduate Summer Symposium: Science and the Sustainable Development Goals (SDGs), Kingston, Ontario, Canada, August 2022.
3. Proposed design of a microspace mission for near-Earth asteroid mining survey and tracking. 65th International Astronautical Congress (IAC), Toronto, Canada, September 2014.
4. Sail material, inspection imager, and deployment analysis for an end-of-life deorbiting device. AIAA/USU Conference on Small Satellites, Logan, Utah, USA, August 2014.

Poster Presentations

1. Making Waves: Spatiotemporal Mapping with Mobile Robots. [*Best Robotics Poster Award*. Robotics and AI Symposium 2022, Ingenuity Labs, Queen's University, Kingston, ON. October 13, 2022.
2. Making Waves: Spatiotemporal Mapping with Mobile Robots. Queen's Engineering Research Networking Day, Queen's University, Kingston, ON. October 12, 2022.
3. Performance Analysis of Thin Film Materials in a Drag Sail Deorbiting Device. Small Satellite Systems and Services Symposium (4S), Majorca, Spain, May 2014.

Guest Lectures

1. "Introduction to SLAM" and "Multi-Vehicle EKF-SLAM" for ELEC 845: Autonomous Vehicle Control and Navigation at Queen's University, Kingston, Ontario, Fall 2020.
2. "Lead Compensator Design" and "Lag Compensator Design" for ELEC 433: Linear Control Systems at Queen's University, Kingston, Ontario, Fall 2019.

Seminars

1. "Sail, Deployment, and Imaging Technology for a Nanosatellite Deorbit System Demonstration on CanX-7" for students, faculty, and public at the Institute for Aerospace Studies, University of Toronto, ON, October 2014.

7 Volunteer Activities

Professional Service

December, 2022: Reviewer for Discrete Event Dynamic Systems (DEDS) Journal.

April, 2022: Reviewer for IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

December, 2021: Reviewer for International Conference on Robotics and Automation (ICRA).

July, 2020: Reviewer for IEEE IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI).

Community Service

2020–Present: Advisory Board Member for the Engineer in Residence (EIR) program, Engineers of Tomorrow.

2018–Present: Engineer in Residence (EIR), Engineers of Tomorrow.

University Service

2021–Present: Ingenuity Labs General Committee, Queen's University.

2021: Robotics and AI Symposium 2021 Organising Committee, Ingenuity Labs, Queen's University.

2021: Web Redevelopment Committee, Faculty of Engineering and Applied Science, Queen's University.

2019–Present: Technical Mentor for Queen's Space Engineering Team (QSET) Satellite Project, Queen's University.

8 Professional Affiliations

2019–Present: Student Member of the Institute for Electrical and Electronics Engineers (IEEE)

2019–Present: Student Member of the Robotics & Automation Society (RAS)

2019–Present: Member of the NSERC Canadian Robotics Network (NCRN)

2017–Present: Professional Engineer (Ontario, Canada)