

varsadxandIndex of MOOS Variables paramsbidxbndIndex of Configuration Parameters: All MOOS Apps behaviorscdxcndIndex of Behavior Parameters macrosmdxcndIndex of Behavior Macros

## Publications PavLab

### 2023 (4 items)

1. Shailesh Nirgudkar, Michael DeFilippo, Michael Sacarny, Michael Benjamin, and Paul Robinette. Massmind: Massachusetts maritime infrared dataset. *The International Journal of Robotics Research*, 42(1-2):21–32, 2023.
2. .
3. Nikolai Gershfeld, Tyler Paine, and Michael Benjamin. Adaptive and collaborative bathymetric channel-finding approach for multiple autonomous marine vehicles. *The IEEE Robotics and Automation Letters*, 8(7):4028–4035, 2023.
4. Tyler Paine and Michael Benjamin. An ensemble of online estimation methods for one degree-of-freedom models of unmanned surface vehicles; applied theory and preliminary field results with eight vehicles. In *To Appear, International Conference on Intelligent Robots and Systems (IROS)*, October 2023.

### 2022 (4 items)

5. Nikolai Gershfeld. Adaptive collaborative channel finding approaches for autonomous marine vehicles. Master’s thesis, Massachusetts Institute of Technology, May 2022.
6. Nicholas Craig Evans. A practical search with voronoi distributed autonomous marine swarms. Master’s thesis, Massachusetts Institute of Technology, September 2022.
7. Supun Randeni, Toby Schneider, EeShan Bhatt, Oscar A Viquez, and Henrik Schmidt. A high-resolution AUV navigation framework with integrated communication and tracking for under-ice deployments. *Journal of Field Robotics*, 2022.
8. Supun Randeni, Emily M Mellin, Michael Sacarny, Skyler Cheung, Michael Benjamin, and Michael Triantafyllou. Bioinspired morphing fins to provide optimal maneuverability, stability, and response to turbulence in rigid hull auvs. *Bioinspiration & Biomimetics*, 17(3), April 2022.

### 2021 (6 items)

9. Michael Benjamin, Tyler Paine, and Supun Randeni. Autonomy algorithms for stable dynamic linear convoying of autonomous marine vehicles. In *OCEANS 2021 MTS/IEEE*, October 2021.
10. Michael DeFilippo, Michael Sacarny, and Paul Robinette. Robowhaler: A robotic vessel for marine autonomy and dataset collection. In *OCEANS 2021 MTS/IEEE*, October 2021.
11. Conlan Cesar, Benjamin Whetton, Michael DeFilippo, Michael Benjamin, Michael Sacarny, Scott Reed, and Andrea Munafo. Coordinating multiple autonomies to improve mission performance. In *OCEANS 2021 MTS/IEEE*, October 2021.
12. Blake Cole and Michael Benjamin. Ais-based collision avoidance in moos-ivp using a geodetic unscented kalman filter. In *OCEANS 2021: San Diego - Porto*, October 2021.
13. Toby Schneider, Supun Randeni, and Henrik Schmidt. Fast, Cheap and Good: Development of a high performance communications and navigation system for High Latitude AUV deployments using a Virtual Ocean. In *Antarctic and Southern Ocean Forum 2021*, October 2021.
14. Supun Randeni, Emily Mellin, Michael Sacarny, Skyler Cheung, Michael Benjamin, and Michael Triantafyllou. Bioinspired dorsal fins to provide optimal maneuverability, stability, and response to turbulence in rigid hull auvs. Submitted and Under Review, 2021.

20. Paul Robinette, Michael Sacarny, Michael DeFilippo, Michael Novitzky, and Michael R. Benjamin. Sensor evaluation for autonomous surface vehicles in inland waterways. In *OCEANS 2019 MTS/IEEE*, June 2019.
21. Paul Robinette, Michael Sacarny, Michael Novitzky, Michael R. Benjamin, and Michael DeFilippo. Robot vessels versus centuries of maritime tradition: How should robots react to authorities and emergencies on the water? In *Proceedings of the Workshop The Dark Side of Human-Robot Interaction: Ethical Considerations and Community Guidelines for the Field of HRI ACM/IEEE International Conference on Human-Robot Interaction*, Daegu, South Korea, March 2019. ACM/IEEE.
22. Michael Novitzky, Paul Robinette, Michael R. Benjamin, Caileigh Fitzgerald, and Henrik Schmidt. Aquaticus: Publicly available datasets from a marine human-robot teaming testbed. In *Companion of the 2019 ACM/IEEE International Conference on Human-Robot Interaction*, Daegu, South Korea, March 2019. ACM.
23. Michael Novitzky, Caileigh Fitzgerald, Paul Robinette, Michael R. Benjamin, and Henrik Schmidt. Updated: Virtual reality for immersive simulated experiments of human-robot interactions in the marine environment. In *Proceedings of the Workshop Virtual, Augmented, and Mixed Reality for Human-Robot Interaction ACM/IEEE International Conference on Human-Robot Interaction*, Daegu, South Korea, March 2019. ACM/IEEE.
24. Michael Novitzky, Paul Robinette, Caileigh Fitzgerald, Hugh R. R. Dougherty, Michael Benjamin, and Henrik Schmidt. Issues and mitigation strategies for deploying human-robot experiments on the water for competitive games in an academic environment. In *Proceedings of the Workshop Dangerous HRI: Testing Real-World Robots has Real-World Consequences ACM/IEEE International Conference on Human-Robot Interaction*, Daegu, South Korea, 2019. ACM/IEEE.
25. Paul Robinette, Michael Sacarny, Michael DeFilippo, Michael Novitzky, and Michael R. Benjamin. Marine perception datasets: a work in progress. In *Proceedings of the Workshop Dataset Generation and Benchmarking of SLAM Algorithms for Robotics and VR/AR at the 2019 IEEE International Conference on Robotics and Automation*, Montreal, Canada, May 2019. IEEE.
26. Paul Robinette, Michael Novitzky, Michael R. Benjamin, Caileigh Fitzgerald, and Henrik Schmidt. Exploring human-robot trust during teaming in a real-world testbed. In *(Companion of the 2019 ACM/IEEE International Conference on Human-Robot Interaction)*. ACM, March 2019.
27. Michael DeFilippo, Paul Robinette, Michael Sacarny, , and Michael R. Benjamin. The remote explorer iv: An autonomous vessel for oceanographic research. In *OCEANS 2019 MTS/IEEE*, Marseille, France, June 2019. IEEE.
28. Kyle Woerner, Michael R. Benjamin, , Michael Novitzky, and John J. Leonard. Quantifying protocol evaluation for autonomous collision avoidance. *Autonomous Robots*, 43(4):967–991, April 2019.

**2018 (9 items)**

29. Supun Randeni, Nicholas R. Rypkema, Erin M. Fischell, Alexander L. Forrest, Michael R. Benjamin, and Henrik Schmidt. Implementation of a hydrodynamic model-based navigation system for a low-cost auv fleet. In *IEEE OES Autonomous Underwater Vehicle Symposium*,

- 2018.
30. Kyle L. Woerner and Michael R. Benjamin. Real-time automated evaluation of colregs-constrained interactions between autonomous surface vessels and human operated vessels in collaborative human-machine partnering missions. In *OCEANS 2018 MTS/IEEE Kobe Japan*, May 2018.
  31. Paul Robinette, Michael Novitzky, and Michael R. Benjamin. Longitudinal interactions between human and robot teammates in a marine environment. In *In Workshop on Longitudinal Human-Robot Teaming at HRI 2018*, Chicago, IL, March 2018.
  32. Michael Novitzky, Michael R. Benjamin, Paul Robinette, Hugh R Dougherty, Caileigh Fitzgerald, and Henrik Schmidt. Virtual reality for immersive simulated experiments of human-robot interactions in the marine environment. In *Workshop on Virtual, Augmented and Mixed Reality for Human-Robot Interaction at HRI 2018*, Chicago, IL, March 2018.
  33. Michael Novitzky, Paul Robinette, Michael R. Benjamin, Danielle K. Gleason, Caileigh Fitzgerald, and Henrik Schmidt. Preliminary interactions of human-robot trust, cognitive load, and robot intelligence levels in a competitive game. In *Companion of the 2018 ACM/IEEE International Conference on Human-Robot Interaction*, pages 203–204. ACM, 2018.
  34. Adam Michael Campbell. Enabling tactical autonomy for unmanned surface vehicles in defensive swarm engagements. Master’s thesis, Massachusetts Institute of Technology, Cambridge MA, June 2018.
  35. Michael Novitzky, Paul Robinette, Michael R. Benjamin, Danielle K. Gleason, Caileigh Fitzgerald, and Henrik Schmidt. Late breaking report: Preliminary interactions of human-robot trust, cognitive load, and robot intelligence levels in a competitive game. In *Proceedings of the Thirteenth Annual ACM/IEEE International Conference on Human-Robot Interaction*. ACM, 2018.
  36. Michael R. Benjamin. Capturing velocity function plateaus for efficient marine vehicle collision avoidance calculations. In *OCEANS 2018 MTS/IEEE Kobe Japan*, May 2018.
  37. Arjun Gupta, Michael Novitzky, and Michael R. Benjamin. Learning autonomous marine behaviors in moos-ivp. In *OCEANS 2018 MTS/IEEE Charleston South Carolina*, October 2018.

**2017 (14 items)**

38. Mary Beth O’Leary. Unlocking marine mysteries with artificial intelligence. MIT Mechanical Engineering News Media, December 2017.
39. Paul Robinette, Michael Novitzky, and Michael R. Benjamin. Trusting a robot as a user versus as a teammate. In *In Workshop on Morality and Social Trust in Autonomous Robots at RSS 2017*, Cambridge, MA, July 2017.
40. Michael Novitzky, Paul Robinette, Danielle Gleason, and Michael R. Benjamin. A platform for studying human-machine teaming on the water with physiological sensors. In *In Workshop on Human-Centered Robotics: Interaction, Physiological Integration and Autonomy at RSS 2017*, Cambridge, MA, July 2017.
41. Michael Novitzky, Paul Robinette, Danielle K. Gleason, and Michael R. Benjamin. A platform for studying human-machine teaming on the water with physiological sensors. In *Workshop on Human-Centered Robotics: Interaction, Physiological Integration and Autonomy at RSS 2017*, Cambridge, MA, July 2017.

42. Erin M. Fischell and Henrik Schmidt. Supervised machine learning for estimation of target aspect angle from bistatic acoustic scattering. *IEEE Journal of Oceanic Engineering*, PP(99):1–11, 2017.
43. Oscar A. Viquez. Deployment of a passive acoustic detection for reactive collision avoidance in autonomous underwater vehicles. Master’s thesis, Massachusetts Institute of Technology, Cambridge, Massachusetts, 2017.
44. Michael R. Benjamin. Fast-CPA: A layered caching algorithm for rapid closest point of approach calculations in marine collision avoidance. In *OCEANS 2017 MTS/IEEE Anchorage*, Anchorage, AK, September 2017.
45. Kyle L. Woerner, Michael R. Benjamin, and Henrik Schmidt. Collaborative autonomous multi-vessel detection, bounding, and containment for maritime environmental disasters. In *OCEANS 2017 MTS/IEEE Anchorage*, Anchorage, AK, September 2017.
46. Michael R. Benjamin. The interval programming model solution algorithm experimentation tools and results. Technical Report MIT-CSAIL-TR-2017-013, MIT Computer Science and Artificial Intelligence Lab, September 2017.
47. Michael R. Benjamin. Autonomous colregs modes and velocity functions. Technical Report MIT-CSAIL-TR-2017-009, MIT Computer Science and Artificial Intelligence Lab, May 2017.
48. Kyle L. Woerner, Michael Novitzky, Michael R. Benjamin, and John J. Leonard. Legibility and predictability of protocol-constrained motion: Evaluating human-robot ship interactions under COLREGS collision avoidance requirements. In *In Workshop on Mathematical Models, Algorithms, and Human-Robot Interaction at RSS 2017*, Cambridge, MA, July 2017.
49. Joseph W. Leavitt. Intent-aware collision avoidance for autonomous marine vehicles. Master’s thesis, Massachusetts Institute of Technology, June 2017.
50. Paul Robinette, Michael Novitzky, and Michael R. Benjamin. Trusting a robot as a user versus as a teammate. In *Workshop on Morality and Social Trust in Autonomous Robots at RSS 2017*, Cambridge, MA, July 2017.
51. Nicholas R. Rypkema, Erin M. Fischell, and Henrik Schmidt. One-way travel-time inverted ultra-short baseline localization for low-cost autonomous underwater vehicles. In *IEEE International Conference on Robotics and Automation (ICRA)*, Singapore, May 2017.

**2016 (5 items)**

52. Arthur Anderson, Erin Fischell, Thom Howe, Tom Miller, Arturo Parrales-Salinas, Nick Rypkema, David Barrett, Michael Benjamin, Alex Brennen, Michael DeFillipo, John J. Leonard, Liam Paull, Henrik Schmidt, Nick Wang, and Alon Yaari. *An Overview of MIT-Olin’s Approach in the AUVSI RobotX Competition*, pages 61–80. Springer International Publishing, 2016.
53. Erin M. Fischell and Henrik Schmidt. Auv behaviors for collection of bistatic and multistatic acoustic scattering data from seabed targets. In *2016 IEEE International Conference on Robotics and Automation (ICRA)*, pages 2645–2650, May 2016.
54. Henrik Schmidt, Michael R. Benjamin, Stephanie M. Petillo, and Raymond Lum. Nested autonomy for distributed ocean sensing. In Nikolas I. Xiros Manhar R. Dhanak, editor, *Springer Handbook of Ocean Engineering*, pages 459–480. Springer, 2016.
55. Michael Novitzky, Hugh Dougherty, and Michael Benjamin. *A Human-Robot Speech Interface for an Autonomous Marine Teammate*, pages 513–520. Springer International Publishing,

- 2016.
56. Kyle L. Woerner. *Multi-Contact Protocol-Constrained Collision Avoidance for Autonomous Marine Vehicles*. PhD thesis, Massachusetts Institute of Technology, June 2016.
- 2015 (5 items)**
57. Kyle L. Woerner and Michael R. Benjamin. Autonomous collision avoidance tradespace analysis for high-speed vessels. In *13th International Conference on Fast Sea Transportation. Society of Naval Architects and Marine Engineers*, 2015.
58. Jacob Gerlach. Autonomous data collection techniques for approximating marine vehicle kinematics. Master’s thesis, Massachusetts Institute of Technology, Cambridge, Massachusetts, 2015.
59. Nicholas Rahardiyana Rypkema. Distributed autonomy and formation control of a drifting swarm of autonomous underwater vehicles. Master’s thesis, Massachusetts Institute of Technology and Woods Hole Oceanographic Institution Joint Program, Cambridge, Massachusetts, September 2015.
60. Erin Marie Fischell. *Characterization of underwater target geometry from autonomous underwater vehicle sampling of bistatic acoustic scattered fields*. PhD thesis, Massachusetts Institute of Technology, Cambridge, Massachusetts, 2015.
61. Erin M. Fischell and Henrik Schmidt. Classification of underwater targets from autonomous underwater vehicle sampled bistatic acoustic scattered fields. *The Journal of the Acoustical Society of America*, 138(6):3773–3784, 2015.
- 2014 (2 items)**
62. Kyle Woerner and Michael Benjamin. Safety and efficiency analysis of autonomous collision avoidance using multi-objective optimization with interval programming. *Naval Engineers Journal*, 126(4):163–168, 2014.
63. Kyle Woerner. Colregs-compliant autonomous collision avoidance using multi-objective optimization with interval programming. Master’s thesis, Massachusetts Institute of Technology, Cambridge MA, June 2014.
- 2012 (1 item)**
64. Michael R. Benjamin, Henrik Schmidt, Paul M. Newman, and John J. Leonard. *Unmanned Marine Vehicle Autonomy with MOOS-IvP*, chapter 2, pages 1–100. Springer, 2012.
- 2010 (1 item)**
65. Michael R. Benjamin, Henrik Schmidt, Paul M. Newman, and John J. Leonard. Nested autonomy for unmanned marine vehicles with moos-ivp. *Journal of Field Robotics*, 27(6):834–875, November/December 2010.