

Guoquan (Paul) Huang

Research Interests

- Robotics** Sensing, localization, mapping, SLAM, perception, navigation
- Vision** Structure from motion, motion estimation, scene understanding
- Control** State estimation, convex/submodular/sparse optimization
- AI** Deep learning, graphical models, Bayesian nonparametrics
- Applications** AR/VR, autonomous driving, service/warehouse robots

Education

- 2012 – 2014 **Postdoctoral Associate**, *MIT CSAIL (Marine Robotics)*, Cambridge, MA.
Advisor: John J. Leonard
- 2012 **PhD Computer Science**, *University of Minnesota*, Minneapolis, MN.
Advisor: Stergios I. Roumeliotis
Committee: Yousef Saad (chair), Georgios Giannakis, Tryphon Georgiou, Volkan Isler
[Thesis was successfully defended in Sep 2012, while the degree was officially awarded in Feb 2013.]
- 2009 **MS Computer Science**, *University of Minnesota*, Minneapolis, MN.
- 2002 **BS Automation (Electrical Engineering)**, *University of Science and Technology Beijing*, China.

Appointments

- 2020 – now **Associate Professor**, *University of Delaware (UD)*, Newark, DE.
- 2014 – 2020 **Assistant Professor**, *University of Delaware (UD)*, Newark, DE.
Dept. of Mechanical Engineering
Dept. of Computer and Information Sciences (joint)
Dept. of Electrical and Computer Engineering (joint)
Huang's Research Lab: Robot Perception and Navigation Group (RPNG).
GitHub: <https://github.com/rpng>
YouTube: <https://www.youtube.com/c/rpng-ud>
- 2017 – now **Adjunct Associate Professor**, *Zhejiang University (ZJU)*, Hangzhou, China.
Institute of Cyber-Systems and Control (CSC), College of Control Science and Engineering
- 2016 – 2018 **Senior Consultant**, *Huawei 2012 Laboratories*, Toronto, Canada.
- 2014 – 2015 **Technical Consultant**, *DAQRI*, Los Angeles, CA.
- 2012 – 2014 **Postdoctoral Associate**, *MIT, CSAIL, Marine Robotics*, Cambridge, MA.
Advisor: John J. Leonard
- 2005 – 2012 **Research Assistant**, *University of Minnesota (UMN), MARS Lab*, Minneapolis, MN.
Advisor: Stergios I. Roumeliotis
- 2003 – 2005 **Research Assistant**, *Hong Kong Polytechnic University (HKPU), EE Dept*, Hong Kong.
Advisors: Ahmad Rad and Yiu-Kwong Wong

Teaching

- Spring 2020 **UD MEEG 677: Estimation I.**
- Fall 2019 **UD MEEG 311: Vibration and Control.**
- Spring 2019 **UD MEEG 677: Estimation I.**
I developed this course as one of core courses for MS Robotics Program.
- Spring 2019 **UD MEEG 868: Research.**
- Fall 2018 **UD MEEG 621/421: Linear Systems.**
- Fall 2018 **UD MEEG 868: Research.**
- Summer 2018 **ZJU CSC 3204006: Estimation.**
This is a short version of MEEG 677: Estimation I.
- Spring 2018 **UD MEEG 467/678: Introduction to Autonomous Driving.**
I developed this course with partial support from the UD Makerspace Faculty Fellows Program, which becomes a core course of MS Robotics Program.
- Fall 2017 **UD MEEG 311: Vibration and Control.**
- Fall 2017 **UD MEEG 868: Research.**
- Spring 2017 **UD MEEG 877: Estimation II.**
I developed this advanced course particularly for robotics graduates performing research on robot sensing and estimation, which is also part of MS Robotics Program.
- Spring 2017 **UD MEEG 467: Applied Controls, (co-teach).**
- Fall 2016 **UD MEEG 311: Vibration and Control.**
- Spring 2016 **UD MEEG 467: Applied Controls, (co-teach).**
- Spring 2016 **UD MEEG 466: Independent Study.**
- Fall 2015 **UD MEEG 311: Vibration and Control.**
- Fall 2015 **UD MEEG 466: Independent Study.**
- Spring 2015 **UD MEEG 624/467: Control of Dynamical Systems.**
- Spring 2015 **UD MEEG 467: Applied Controls, (co-teach).**
I co-developed this course to promote hands-on learning of control theory.
- Spring 2013 **MIT 2.004: Dynamics and Control II, (co-teach).**
- 2005 – 2009 UMN CS 2031: Introduction to Numerical Computing (TA)
- Fall 2006 UMN CS 4011: Formal Languages and Automata Theory (TA)
- Spring 2004 HKPU EE: Control Laboratory Course (TA)

Student Advisement

PhD Students.

- 2014 – 2019 **Kevin Eckenhoff, ME PhD**, Towards robust visual-inertial navigation.
Helwig Fellowship (2014-2019). Current: Research Scientist at Facebook Oculus.
- 2015 – now **James Maley, ECE PhD (part-time)**, Visual-inertial navigation for guided munitions.
Current: ARL Aerospace Engineer
- 2015 – now **Yulin Yang, ME PhD**, State estimation for robot navigation.
University Doctoral Fellowship (2019-2020)
- 2015 – now **Zheng Huai, ME PhD**, Visual-inertial localization and mapping.
- 2015 – now **Indrajeet Yadav, ME PhD (Co-advised with Tanner)**, Visual-inertial estimation and planning.

- 2016 – now **Xingxing Zuo**, *ZJU CSC PhD (Co-advised with Liu)*, Lidar-inertial-camera fusion.
Chinese Government Scholarship (2019-2021) to Visit ETH CVG (Pollefeys)
- 2017 – now **Patrick Geneva**, *CS PhD*, Semantic mapping and navigation.
NASA DE Space Grant Graduate Fellowship (2019-2020)
- 2017 – now **Woosik Lee**, *ME PhD*, Multi-sensor fusion.
University Summer Doctoral Award (2018)
- 2019 – now **Nate Merrill**, *CS PhD*, Deep learning for visual-inertial perception.
AAUP-UD Student Award (2019)
- 2019 – now **Chuchu Chen**, *ME PhD*, SLAM in dynamic environments.
- 2020 – now **Yuxiang Peng**, *ME PhD*, State estimation and SLAM.

MS Students.

- 2017 – 2019 **Jesse Bloecker**, *ME MS*, Multi-camera visual-inertial odometry.
Current: Research Engineer at ARL Autonomous System Divisions
- 2020 – now **Wenxuan (Owen) Li**, *MS Robotics*, Visual-inertial odometry.

Undergraduate Students.

- 2020 – now **Zachary Zarett**, *ME BS*, Visual-inertial navigation.

Visiting Scholars.

- 2020 – now **Pengxiang Zhu**, *UC-Riverside*, Cooperative VINS.
- 2017 **Wanlong Li**, *Huawei Noah's Ark Lab*, SLAM.
- 2016 **Dongxuan Li**, *Zhejiang University*, Camera-odometer calibration.
Current: Senior Project Engineer at NetEase

Former Undergraduates and HS Interns.

- 2018 – 2019 **Tianyi Weng**, *ME BS*, LiDAR SLAM.
Current: MS at John Hopkins University
- 2016 – 2019 **Nate Merrill**, *CS BS*, Deep learning for visual SLAM.
Outstanding CIS Senior Award (2019); Current: PhD in my group
- Summer 2018 **Sybil Roosen**, *High-School Intern*, Autonomous driving.
- Summer 2018 **Christa Mumley**, *High-School Intern*, Autonomous driving.
- Summer 2017 **Louise Victoria Cancino**, *ME BS*, Autonomous driving.
- Summer 2017 **Grace Gong**, *High-School Intern*, Autonomous driving.
Current: Undergraduate at Princeton
- 2015 – 2017 **Patrick Geneva**, *ME/CS/Math BS*, Robot perception and navigation.
Current: PhD in my group
- 2016 – 2017 **Jesse Bloecker**, *ME BS*, MAV navigation.
Current: MS in my group
- Winter 2017 **Cory Dodd**, *ME BS*, UGV navigation.
- Winter 2017 **Parth Modi**, *ME BS*, MAV navigation.
- Winter 2017 **Sahil Parikh**, *ME BS*, UGV navigation.
- Winter 2017 **Joseph Koch**, *ME BS*, UGV navigation.
- Summer 2016 **Joel Tylecki**, *ME BS*, MAV navigation.

- 2015 – 2016 **Huayu Fu**, *ECE BS*, SLAM on Turtlebots.
Current: MS at USC
- 2015 – 2016 **Junpeng Zhu**, *ECE/ME MS (4+1)*, SLAM on Turtlebots.
Current: Ladder Education Group
- Summer 2015 **Arnav Prasad**, *High-School Intern*, Visual SLAM.
Current: Undergraduate at UD

Students Mentored at MIT.

- 2014 **Mukul Singh**, *ME undergraduate*, Dense visual localization and mapping.
- 2013 – 2014 **Henry Nassif**, *EECS undergraduate*, Multi-robot cooperative SLAM.
- 2013 – 2014 **Yasir Latif**, *Visiting PhD student from Univ. of Zaragoza*, Loop closure of visual navigation.
- 2013 **Hongchuan Wei**, *Visiting PhD student from Duke*, Decentralized motion planning.
- 2013 **Robert Truax**, *ME MS student*, Cooperative localization and target tracking.

Publications

Google Scholar: <https://scholar.google.com/citations?user=trMUyZIAAAAJ>

Notes: ‡ refers to students advised and † to visiting scholars who perform research at UD.

- [J21] K. Eickenhoff[‡], P. Geneva[‡], and **G. Huang**, “MIMC-VINS: A Versatile and Resilient Multi-IMU Multi-Camera Visual-Inertial Navigation System”, *IEEE Transactions on Robotics (TRO)*, September 2020. [Cond. Accepted]. Preprint: <https://arxiv.org/abs/2006.15699>
- [J20] X. Zuo[‡], W. Ye, Y. Yang[‡], R. Zheng, T. Vidal-Calleja, **G. Huang**, and Y. Liu, “Multi-modal Localization: Stereo over LiDAR Map”, *Journal of Field Robotics (JFR)*, January 2020. doi:[10.1002/rob.21936](https://doi.org/10.1002/rob.21936)
- [J19] X. Zuo[‡], P. Geneva[‡], Y. Yang[‡], W. Ye, Y. Liu, and **G. Huang**, “Visual-Inertial Localization with Prior LiDAR Map Constraints”, *IEEE Robotics and Automation Letters (RA-L)*, 4(4): 3394–3401, 2019. [with IROS 2019 presentation]. doi:[10.1109/LRA.2019.2927123](https://doi.org/10.1109/LRA.2019.2927123)
- [J18] Y. Yang[‡], and **G. Huang**, “Observability Analysis of Aided Inertial Navigation with Heterogeneous Features of Points, Lines and Planes”, *IEEE Transactions on Robotics (TRO)*, 35(6): 1399–1418, December 2019. doi:[10.1109/TRO.2019.2927835](https://doi.org/10.1109/TRO.2019.2927835)
- [J17] K. Eickenhoff[‡], Y. Yang[‡], P. Geneva[‡], and **G. Huang**, “Tightly-Coupled Visual-Inertial Localization and 3D Rigid-Body Target Tracking”, *IEEE Robotics and Automation Letters (RA-L)*, 4(2): 1541–1548, 2019. [with ICRA 2019 presentation]. doi:[10.1109/LRA.2019.2896472](https://doi.org/10.1109/LRA.2019.2896472)
- [J16] Y. Yang[‡], P. Geneva[‡], K. Eickenhoff[‡], and **G. Huang**, “Degenerate Motion Analysis for Aided INS with Online Spatial and Temporal Sensor Calibration”, *IEEE Robotics and Automation Letters (RA-L)*, 4(2): 2070–2077, 2019. [with ICRA 2019 presentation]. doi:[10.1109/LRA.2019.2893803](https://doi.org/10.1109/LRA.2019.2893803)
- [J15] Z. Huai[‡], and **G. Huang**, “Robocentric Visual-Inertial Odometry”, *International Journal of Robotics Research (IJRR)*, July 2019. doi:[10.1177/0278364919853361](https://doi.org/10.1177/0278364919853361)
- [J14] K. Eickenhoff[‡], P. Geneva[‡], and **G. Huang**, “Closed-form Preintegration Methods for Graph-based Visual-Inertial Navigation”, *International Journal of Robotics Research (IJRR)*, 38(5): 563–586, 2019. doi:[10.1177/0278364919835021](https://doi.org/10.1177/0278364919835021)
- [J13] F. Han, H. Wang, **G. Huang**, and H. Zhang, “Sequence-Based Sparse Optimization Methods for Long-Term Loop Closure Detection in Visual SLAM”, *Autonomous Robots (AURO)*, 42(7): 1323–1335, 2018. doi:[10.1007/s10514-018-9736-3](https://doi.org/10.1007/s10514-018-9736-3)
- [J12] **G. Huang**, “Particle Filtering with Analytically Guided Sampling”, *Advanced Robotics (AR)*, 31(17): 932–945, 2017. doi:[10.1080/01691864.2017.1378592](https://doi.org/10.1080/01691864.2017.1378592)

- [J11] **G. Huang**, “Towards Consistent Filtering for Discrete-Time Partially-Observable Nonlinear Systems”, *Systems & Control Letters (SCL)*, 106: 87–95, 2017. doi:[10.1016/j.sysconle.2017.06.006](https://doi.org/10.1016/j.sysconle.2017.06.006)
- [J10] Y. Latif, **G. Huang**, J. Leonard, and J. Neira, “Sparse Optimization for Robust and Efficient Loop Closing”, *Robotics and Autonomous Systems (RAS)*, 93: 13–26, 2017. doi:[10.1016/j.robot.2017.03.016](https://doi.org/10.1016/j.robot.2017.03.016)
- [J9] X. Z. Zhang, A. B. Rad, **G. Huang**, and Y. K. Wong, “An Optimal Data Association Method Based on the Minimum Weighted Bipartite Perfect Matching”, *Autonomous Robots (AURO)*, 40(1): 77–91, 2016. doi:[10.1007/s10514-015-9439-y](https://doi.org/10.1007/s10514-015-9439-y)
- [J8] **G. Huang**, K. Zhou, N. Trawny, and S. I. Roumeliotis, “A Bank of Maximum A Posteriori (MAP) Estimators for Target Tracking”, *IEEE Transactions on Robotics (TRO)*, 31(1): 85–103, 2015. doi:[10.1109/TRO.2014.2378432](https://doi.org/10.1109/TRO.2014.2378432)
- [J7] **G. Huang**, M. Kaess, and J. Leonard, “Consistent Unscented Incremental Smoothing for Multi-robot Cooperative Target Tracking”, *Robotics and Autonomous Systems (RAS)*, 69: 52–67, 2015. doi:[10.1016/j.robot.2014.08.007](https://doi.org/10.1016/j.robot.2014.08.007)
- [J6] **G. Huang**, A. I. Mourikis, and S. I. Roumeliotis, “A Quadratic-Complexity Observability-Constrained Unscented Kalman Filter for SLAM”, *IEEE Transactions on Robotics (TRO)*, 29(5): 1226–1243, 2013. doi:[10.1109/TRO.2013.2267991](https://doi.org/10.1109/TRO.2013.2267991)
- [J5] **G. Huang**, N. Trawny, A. I. Mourikis, and S. I. Roumeliotis, “Observability-based Consistent EKF Estimators for Multi-robot Cooperative Localization”, *Autonomous Robots (AURO)*, 30(1): 99–122, 2011. doi:[10.1007/s10514-010-9207-y](https://doi.org/10.1007/s10514-010-9207-y)
- [J4] **G. Huang**, A. I. Mourikis, and S. I. Roumeliotis, “Observability-based Rules for Designing Consistent EKF SLAM Estimators”, *International Journal of Robotics Research (IJRR)*, 29(5): 502–528, 2010. doi:[10.1177/0278364909353640](https://doi.org/10.1177/0278364909353640)
- [J3] **G. Huang**, A. B. Rad, Y. K. Wong, and Y. L. Ip, “Heterogeneous Multisensor Fusion for Mapping Dynamic Environments”, *Advanced Robotics (AR)*, 21(5): 661–688, 2007. doi:[10.1163/156855307780108268](https://doi.org/10.1163/156855307780108268)
- [J2] X. Z. Zhang, A. B. Rad, Y. K. Wong, **G. Huang**, Y. L. Ip, and K. M. Chow, “A Comparative Study of Three Mapping Methodologies”, *Journal of Intelligent and Robotic Systems (JIRS)*, 49(4): 385–395, 2007. doi:[10.1007/s10846-007-9143-z](https://doi.org/10.1007/s10846-007-9143-z)
- [J1] **G. Huang**, A. B. Rad, and Y. K. Wong, “A New Solution to Map Building in Dynamic Indoor Environments”, *International Journal of Advanced Robotic Systems (IJARS)*, 3(3): 199–210, 2006. doi:[10.5772/5737](https://doi.org/10.5772/5737)

Book Chapters.

- [B4] K. Eickenhoff[‡], P. Geneva[‡] and **G. Huang**, “High-Accuracy Preintegration for Visual-Inertial Navigation”, In *Algorithmic Foundations of Robotics XII*, Springer Proceedings in Advanced Robotics. K. Goldberg, P. Abbeel, K. Bekris, and L. Miller (Eds.), Springer, 2020. doi:[10.1007/978-3-030-43089-4](https://doi.org/10.1007/978-3-030-43089-4)
- [B3] Y. Yang[‡], and **G. Huang**, “Map-based Localization under Adversary Attacks”, In *Robotics Research*, Springer Proceedings in Advanced Robotics. N.M. Amato, G. Hager, S. Thomas, M. Torres-Torriti (Eds.), Springer, 2020. doi:[10.1007/978-3-030-28619-4_54](https://doi.org/10.1007/978-3-030-28619-4_54)
- [B2] **G. Huang**, K. Eickenhoff[‡], and J. Leonard, “Optimal-State-Constraint EKF for Visual-Inertial Navigation”, In *Robotics Research*, Springer Proceedings in Advanced Robotics. A. Bicchi and W. Burgard (eds.), Springer, 2018. doi:[10.1007/978-3-319-51532-8_8](https://doi.org/10.1007/978-3-319-51532-8_8)
- [B1] **G. Huang**, A. I. Mourikis, and S. I. Roumeliotis, “A First-Estimates Jacobian EKF for Improving SLAM Consistency”, In *Experimental Robotics*, Vol. 54, Ser. Springer Tracts in Advanced Robotics, O., Khatib, V. Kumar, and G. Pappas (eds.), Springer, 2009. doi:[10.1007/978-3-642-00196-3_43](https://doi.org/10.1007/978-3-642-00196-3_43)

Conference Papers.

- [C61] P. Geneva[‡], N. Merrill[‡], Y. Yang[‡], C. Chen[‡], W. Lee[‡], and **G. Huang**, “Versatile 3D Multi-Sensor Fusion for Lightweight 2D Localization”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2020.
- [C60] X. Zuo[‡], Y. Yang[‡], P. Geneva[‡], J. Lv, Y. Liu, **G. Huang**, and M. Pollefeys, “LIC-Fusion 2.0: LiDAR-Inertial-Camera Odometry with Sliding-Window Plane-Feature Tracking”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2020.
- [C59] W. Lee[‡], K. Eickenhoff[‡], Y. Yang[‡], P. Geneva[‡], and **G. Huang**, “Visual-Inertial-Wheel Odometry with Online Calibration”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2020.
- [C58] Y. Yang[‡], P. Geneva[‡], X. Zuo[‡], and **G. Huang**, “Online IMU Intrinsic Calibration: Is It Necessary?”, *Robotics: Science and Systems (RSS)*, 2020.
- [C57] I. Yadav[‡], K. Eickenhoff[‡], **G. Huang**, and H. Tanner, “Motion Planning and Visual-Inertial Target Tracking for UAV-based Radiation Detection”, *Mediterranean Conference on Control and Automation (MED)*, 2020.
- [C56] Y. Yang[‡], B. P. W. Babu, C. Chen[‡], **G. Huang**, and L. Ren, “Analytic Combined IMU Integrator for Visual-Inertial Navigation”, *International Conference on Robotics and Automation (ICRA)*, 2020.
- [C55] W. Lee[‡], K. Eickenhoff[‡], P. Geneva[‡], and **G. Huang**, “Intermittent GPS-aided VIO: Online Initialization and Calibration”, *International Conference on Robotics and Automation (ICRA)*, 2020.
- [C54] K. Eickenhoff[‡], P. Geneva[‡], N. Merrill[‡], and **G. Huang**, “Schmidt-EKF-based Visual-Inertial Moving Object Tracking”, *International Conference on Robotics and Automation (ICRA)*, 2020.
- [C53] P. Geneva[‡], K. Eickenhoff[‡], W. Lee[‡], Y. Yang[‡], and **G. Huang**, “OpenVINS: An Open Platform for Visual-Inertial Research”, *International Conference on Robotics and Automation (ICRA)*, 2020.
- [C52] X. Zuo[‡], M. Zhang, Y. Chen, Y. Liu, **G. Huang**, and M. Li, “Visual-Inertial Localization for Skid-steering Robots with Kinematic Constraints”, *International Symposium on Robotics Research (ISRR)*, 2019. <https://arxiv.org/abs/1911.05787>
- [C51] N. Merrill[‡], and **G. Huang**, “CALC2.0: Combining Appearance, Semantic and Geometric Information for Robust and Efficient Visual Loop Closure”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2019. doi:[10.1109/IROS40897.2019.8968159](https://doi.org/10.1109/IROS40897.2019.8968159)
- [C50] X. Zuo[‡], P. Geneva[‡], W. Lee[‡], Y. Liu, and **G. Huang**, “LIC-Fusion: LiDAR-Inertial-Camera Odometry”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2019. doi:[10.1109/IROS40897.2019.8967746](https://doi.org/10.1109/IROS40897.2019.8967746)
- [C49] Y. Yang[‡], P. Geneva[‡], K. Eickenhoff[‡], and **G. Huang**, “Visual-Inertial Navigation with Point and Line Features”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2019. doi:[10.1109/IROS40897.2019.8967905](https://doi.org/10.1109/IROS40897.2019.8967905)
- [C48] P. Geneva[‡], J. Maley[‡], and **G. Huang**, “An Efficient Schmidt-EKF for 3D Visual-Inertial SLAM”, *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2019. pp. 12097–12107. doi:[10.1109/CVPR.2019.01238](https://doi.org/10.1109/CVPR.2019.01238)
- [C47] **G. Huang**, “Visual-Inertial Navigation: A Concise Review”, *International Conference on Robotics and Automation (ICRA)*, 2019. pp. 9572–9582. doi:[10.1109/ICRA.2019.8793604](https://doi.org/10.1109/ICRA.2019.8793604)
- [C46] Y. Yang[‡], P. Geneva[‡], X. Zuo[‡], K. Eickenhoff[‡], Y. Liu, and **G. Huang**, “Tightly-Coupled Aided Inertial Navigation with Point and Plane Features”, *International Conference on Robotics and Automation (ICRA)*, 2019. pp. 6094–6100. doi:[10.1109/ICRA.2019.8794078](https://doi.org/10.1109/ICRA.2019.8794078)

- [C45] K. Eickenhoff[‡], P. Geneva[‡], J. Bloecker[‡], and **G. Huang**, “Multi-Camera Visual-Inertial Navigation with Online Intrinsic and Extrinsic Calibration”, *International Conference on Robotics and Automation (ICRA)*, 2019. pp. 3158–3164. doi:[10.1109/ICRA.2019.8793886](https://doi.org/10.1109/ICRA.2019.8793886)
- [C44] K. Eickenhoff[‡], P. Geneva[‡], and **G. Huang**, “Sensor-Failure-Resilient Multi-IMU Visual-Inertial Navigation”, *International Conference on Robotics and Automation (ICRA)*, 2019. pp. 3542–3548. doi:[10.1109/ICRA.2019.8794295](https://doi.org/10.1109/ICRA.2019.8794295)
- [C43] P. Geneva[‡], K. Eickenhoff[‡], and **G. Huang**, “A Linear-Complexity EKF for Visual-Inertial Navigation with Loop Closures”, *International Conference on Robotics and Automation (ICRA)*, 2019. pp. 3535–3541. doi:[10.1109/ICRA.2019.8793836](https://doi.org/10.1109/ICRA.2019.8793836)
- [C42] Y. Yang[‡], and **G. Huang**, “Aided Inertial Navigation: Unified Feature Representations and Observability Analysis”, *International Conference on Robotics and Automation (ICRA)*, 2019. pp. 3528–3534. doi:[10.1109/ICRA.2019.8793507](https://doi.org/10.1109/ICRA.2019.8793507)
- [C41] J. Maley[‡], and **G. Huang**, “Unit Quaternion-based Parameterization for Point Features in Visual Navigation”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2018. pp. 6880–6886. doi:[10.1109/IROS.2018.8594206](https://doi.org/10.1109/IROS.2018.8594206)
- [C40] P. Geneva[‡], K. Eickenhoff[‡], Y. Yang[‡], and **G. Huang**, “LIPS: LiDAR-Inertial 3D Plane SLAM”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2018. pp. 123–130. doi:[10.1109/IROS.2018.8594463](https://doi.org/10.1109/IROS.2018.8594463)
- [C39] Z. Huai[‡], and **G. Huang**, “Robocentric Visual-Inertial Odometry”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2018. pp. 6319–6326. doi:[10.1109/IROS.2018.8593643](https://doi.org/10.1109/IROS.2018.8593643)
- [C38] N. Merrill[‡], and **G. Huang**, “Lightweight Unsupervised Deep Loop Closure”, *Robotics: Science and Systems (RSS)*, 2018. pp. 1–10. doi:[10.15607/RSS.2018.XIV.032](https://doi.org/10.15607/RSS.2018.XIV.032)
- [C37] P. Geneva[‡], K. Eickenhoff[‡], and **G. Huang**, “Asynchronous Multi-Sensor Fusion for 3D Mapping and Localization”, *International Conference on Robotics and Automation (ICRA)*, 2018. pp. 5994–5999. doi:[10.1109/ICRA.2018.8460204](https://doi.org/10.1109/ICRA.2018.8460204)
- [C36] Y. Yang[‡], and **G. Huang**, “Aided Inertial Navigation with Geometric Features: Observability Analysis”, *International Conference on Robotics and Automation (ICRA)*, 2018. pp. 2334–2340. doi:[10.1109/ICRA.2018.8460670](https://doi.org/10.1109/ICRA.2018.8460670)
- [C35] Y. Yang[‡], and **G. Huang**, “Map-based Localization under Adversary Attacks”, *International Symposium on Robotics Research (ISRR)*, 2017. pp. 1–16. <https://parasol.tamu.edu/isrr/isrr2017/papers/paper057.pdf>
- [C34] Y. Yang[‡], J. Maley[‡], and **G. Huang**, “Null-Space-based Marginalization: Analysis and Algorithm”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2017. pp. 1775–1782. doi:[10.1109/IROS.2017.8206592](https://doi.org/10.1109/IROS.2017.8206592)
- [C33] X. Zuo[‡], J. Xie, Y. Liu, and **G. Huang**, “Robust Visual SLAM with Point and Line Features”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2017. doi:[10.1109/IROS.2017.8205991](https://doi.org/10.1109/IROS.2017.8205991)
- [C32] D. Li[†], K. Eickenhoff[‡], K. Wu, Y. Wang, R. Xiong, and **G. Huang**, “Gyro-Aided Camera-Odometer Online Calibration and Localization”, *American Control Conference (ACC)*, 2017. pp. 3579–3586. doi:[10.23919/ACC.2017.7963501](https://doi.org/10.23919/ACC.2017.7963501)
- [C31] K. Eickenhoff[‡], P. Geneva[‡], and **G. Huang**, “Direct Visual-Inertial Navigation with Analytical Preintegration”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2017. pp. 1429–1435. doi:[10.1109/ICRA.2017.7989171](https://doi.org/10.1109/ICRA.2017.7989171)

- [C30] Y. Yang[‡], and **G. Huang**, “Acoustic-Inertial Underwater Navigation”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2017. pp. 4927–4933. doi:[10.1109/ICRA.2017.7989571](https://doi.org/10.1109/ICRA.2017.7989571)
- [C29] K. Eickenhoff[‡], P. Geneva[‡], and **G. Huang**, “High-Accuracy Preintegration for Visual Inertial Navigation”, *International Workshop on the Algorithmic Foundations of Robotics (WAFR)*, 2016. pp. 1–16. http://wafr2016.berkeley.edu/papers/WAFR_2016_paper_95.pdf
- [C28] K. Eickenhoff[‡], L. Paull, and **G. Huang**, “Decoupled, Consistent Node Removal and Edge Sparsification for Graph-based SLAM”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2016. pp. 3275–3282. doi:[10.1109/IROS.2016.7759505](https://doi.org/10.1109/IROS.2016.7759505)
- [C27] L. Paull, **G. Huang**, and J. Leonard, “A Unified Resource-Constrained Framework for Graph SLAM”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2016. pp. 1346–1353. doi:[10.1109/ICRA.2016.7487268](https://doi.org/10.1109/ICRA.2016.7487268)
- [C26] P. Corcoran, P. Mooney, and **G. Huang**, “Unsupervised Trajectory Compression”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2016. pp. 3126–3132. doi:[10.1109/ICRA.2016.7487479](https://doi.org/10.1109/ICRA.2016.7487479)
- [C25] **G. Huang**, K. Eickenhoff[‡], and J. Leonard, “Optimal-State-Constraint EKF for Visual-Inertial Navigation”, *International Symposium on Robotics Research (ISRR)*, 2015. pp. 125–139. doi:[10.1007/978-3-319-51532-8_8](https://doi.org/10.1007/978-3-319-51532-8_8)
- [C24] K. Eickenhoff[‡], and **G. Huang**, “State-Transition and Observability Constrained EKF for Multi-robot Cooperative Localization”, *Chinese Control Conference (CCC)*, 2015. pp. 7404–7410. doi:[10.1109/ChiCC.2015.7260813](https://doi.org/10.1109/ChiCC.2015.7260813)
- [C23] T. Steiner, **G. Huang**, and J. Leonard, “Location Utility-based Map Reduction”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2015. pp. 479–486. doi:[10.1109/ICRA.2015.7139223](https://doi.org/10.1109/ICRA.2015.7139223)
- [C22] L. Paull, **G. Huang**, M. Seto, and J. Leonard, “Communication-Constrained Multi-AUV Cooperative SLAM”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2015. pp. 509–516. doi:[10.1109/ICRA.2015.7139227](https://doi.org/10.1109/ICRA.2015.7139227)
- [C21] H. Wei, W. Lu, P. Zhu, **G. Huang**, J. Leonard, and S. Ferrari, “Visibility-based Motion Planning for Active Target Tracking and Localization”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2014. pp. 76–82. doi:[10.1109/IROS.2014.6942543](https://doi.org/10.1109/IROS.2014.6942543)
- [C20] Y. Latif, **G. Huang**, J. Leonard, and J. Neira, “An Online Sparsity-Cognizant Loop-Closure Algorithm for Visual Navigation”, *Robotics: Science and Systems Conference (RSS)*, 2014. pp. 1–9. doi:[10.15607/RSS.2014.X.036](https://doi.org/10.15607/RSS.2014.X.036)
- [C19] **G. Huang**, M. Kaess, and J. Leonard, “Towards Consistent Visual-Inertial Navigation”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2014. pp. 4926–4933. doi:[10.1109/ICRA.2014.6907581](https://doi.org/10.1109/ICRA.2014.6907581)
- [C18] D. Rosen, **G. Huang**, and J. Leonard, “Inference Over Hybrid Finite-/Infinite-Dimensional Spaces Using Gaussian Processes and Factor Graphs”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2014. pp. 1261–1268. doi:[10.1109/ICRA.2014.6907015](https://doi.org/10.1109/ICRA.2014.6907015)
- [C17] **G. Huang**, R. Truax, M. Kaess, and J. Leonard, “Unscented iSAM: A Consistent Incremental Solution to Cooperative Localization and Target Tracking”, *European Conference on Mobile Robots (ECMR)*, 2013. pp. 248–254. doi:[10.1109/ECMR.2013.6698850](https://doi.org/10.1109/ECMR.2013.6698850)
- [C16] **G. Huang**, M. Kaess, and J. Leonard, “Consistent Sparsification for Graph Optimization”, *European Conference on Mobile Robots (ECMR)*, 2013. pp. 150–157. doi:[10.1109/ECMR.2013.6698835](https://doi.org/10.1109/ECMR.2013.6698835)

- [C15] **G. Huang**, M. Kaess, J. Leonard, and S. I. Roumeliotis, "Analytically-Selected Multi-Hypothesis Incremental MAP Estimation", *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 2013. pp. 6481–6485. doi:[10.1109/ICASSP.2013.6638914](https://doi.org/10.1109/ICASSP.2013.6638914)
- [C14] **G. Huang**, and S. I. Roumeliotis, "On Filter Consistency of Discrete-Time Nonlinear Systems with Partial-State Measurements", *American Control Conference (ACC)*, 2013. pp. 5468–5475. doi:[10.1109/ACC.2013.6580693](https://doi.org/10.1109/ACC.2013.6580693)
- [C13] **G. Huang**, and S. I. Roumeliotis, "Analytically-Guided-Sampling Particle Filter Applied to Range-only Target Tracking", *IEEE International Conference on Robotics and Automation (ICRA)*, 2013. pp. 3168–3175. doi:[10.1109/ICRA.2013.6631018](https://doi.org/10.1109/ICRA.2013.6631018)
- [C12] **G. Huang**, A. I. Mourikis, and S. I. Roumeliotis, "An Observability-Constrained Sliding Window Filter for SLAM", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2011. pp. 65–72. doi:[10.1109/IROS.2011.6095161](https://doi.org/10.1109/IROS.2011.6095161)
- [C11] **G. Huang**, K. X. Zhou, N. Trawny, and S. I. Roumeliotis, "Bearing-only Tracking Using a Bank of MAP Estimators", *IEEE International Conference on Robotics and Automation (ICRA)*, 2011. pp. 4998–5005. doi:[10.1109/ICRA.2011.5980515](https://doi.org/10.1109/ICRA.2011.5980515)
- [C10] **G. Huang**, K. X. Zhou, N. Trawny, and S. I. Roumeliotis, "A Bank of MAP Estimators for Single-Sensor Range-only Target Tracking", *American Control Conference (ACC)*, 2010. pp. 6974–6980. doi:[10.1109/ACC.2010.5531337](https://doi.org/10.1109/ACC.2010.5531337)
- [C9] **G. Huang**, N. Trawny, A. I. Mourikis, and S. I. Roumeliotis, "On the Consistency of Multi-robot Cooperative Localization", *Robotics: Science and Systems Conference (RSS)*, 2009. pp. 1–8. **[Best Paper Finalist]**. doi:[10.15607/RSS.2009.V.009](https://doi.org/10.15607/RSS.2009.V.009)
- [C8] **G. Huang**, A. I. Mourikis, and S. I. Roumeliotis, "On the Complexity and Consistency of UKF-based SLAM", *IEEE International Conference on Robotics and Automation (ICRA)*, 2009. pp. 4401–4408. doi:[10.1109/ROBOT.2009.5152793](https://doi.org/10.1109/ROBOT.2009.5152793)
- [C7] **G. Huang**, A. I. Mourikis, and S. I. Roumeliotis, "A First-Estimates Jacobian EKF for Improving SLAM Consistency", *International Symposium on Experimental Robotics (ISER)*, 2008. pp. 373–382. doi:[10.1007/978-3-642-00196-3_43](https://doi.org/10.1007/978-3-642-00196-3_43)
- [C6] **G. Huang**, A. I. Mourikis, and S. I. Roumeliotis, "Analysis and Improvement of the Consistency of Extended Kalman Filter based SLAM", *IEEE International Conference on Robotics and Automation (ICRA)*, 2008. pp. 473–479. doi:[10.1109/ROBOT.2008.4543252](https://doi.org/10.1109/ROBOT.2008.4543252)
- [C5] **G. Huang**, X. Z. Zhang, A. B. Rad, and Y. K. Wong, "An Optimal Graph Theoretic Approach to Data Association in SLAM", *IFAC World Congress*, 2008. pp. 14669–14674. doi:[10.3182/20080706-5-KR-1001.02484](https://doi.org/10.3182/20080706-5-KR-1001.02484)
- [C4] **G. Huang**, A. B. Rad, and Y. K. Wong, "Online SLAM in Dynamic Environments", *International Conference on Advanced Robotics (ICAR)*, 2005. pp. 262–267. doi:[10.1109/ICAR.2005.1507422](https://doi.org/10.1109/ICAR.2005.1507422)
- [C3] **G. Huang**, A. B. Rad, and Y. K. Wong, "A Hierarchical Hybrid Method for Simultaneous Localization and Mapping", *IFAC World Congress*, 2005. pp. 1–5. <http://folk.ntnu.no/skoge/prost/proceedings/ifac2005/Papers/JsPaper2255.html>
- [C2] **G. Huang**, A. B. Rad, Y. K. Wong, and Y. L. Ip, "SLAM with MTT: Theory and Initial Results", *IEEE Conference on Robotics, Automation and Mechatronics (RAM)*, 2004. pp. 834–839. doi:[10.1109/RAMECH.2004.1438026](https://doi.org/10.1109/RAMECH.2004.1438026)
- [C1] **G. Huang**, A. B. Rad, and Y. K. Wong, "Incorporate Motion Tracking into Map Building in Dynamic Indoor Environments", *International Conference on Computational Intelligence for Modeling Control and Automation (CICMA)*, 2004. pp. 241–251. <http://people.csail.mit.edu/ghuang/paper/hk/cimca04.pdf>

Workshop Papers.

- [W7] P. Geneva[‡], K. Eickenhoff[‡], W. Lee[‡], Y. Yang[‡], and **G. Huang**, “OpenVINS: An Open Platform for Visual-Inertial Research”, *IROS Workshop on Visual-Inertial Navigation: Challenges and Applications*, 2019. <http://udel.edu/~ghuang/iros19-vins-workshop>
- [W6] Y. Yang[‡], and **G. Huang**, “Attack-Resilient Map-based Localization”, *RSS Workshop on Adversarial Robotics*, 2018. http://hcr.mines.edu/2018-rss-workshop/abstracts/RSS18WS_attack-resilient_map-based_localization.pdf
- [W5] K. Eickenhoff[‡], I. Yadav, **G. Huang**, and H. Tanner, “Dynamic Target Interception in Cluttered Environments”, *ICRA RT-DUNE Workshop*, 2018. https://manihsieh.com/wp-content/uploads/2018/06/UD_main.pdf
- [W4] P. Geneva[‡], K. Eickenhoff[‡], and **G. Huang**, “Asynchronous Multi-Sensor Fusion for 3D Mapping and Localization”, *Workshop on Planning, Perception and Navigation for Intelligent Vehicles*, 2017. <http://ppniv17.irccyn.ec-nantes.fr/session4/Geneva/paper.pdf>
- [W3] K. Eickenhoff[‡], P. Geneva[‡], and **G. Huang**, “High-Accuracy Preintegration for Visual Inertial Navigation”, *IROS Late Breaking Results (Poster)*, 2016. https://ras.papercept.net/conferences/conferences/IROS16/program/IROS16_ContentListWeb_3.html
- [W2] K. Eickenhoff[‡], L. Paull, and **G. Huang**, “Decoupled, Consistent Node Removal and Edge Sparsification for Graph-based SLAM”, *RSS Workshop on Geometry and Beyond: Representations, Physics, and Scene Understanding for Robotics*, 2016. <https://rss16-representations.mit.edu/>
- [W1] Y. Latif, **G. Huang**, J. Leonard, and J. Neira, “Applying Sparse ℓ_1 -Optimization to Problems in Robotics”, *ICRA Long-Term Autonomy Workshop*, 2014. <https://sites.google.com/site/icra2014ltaworkshop/>

Dissertations.

- [D2] **G. Huang**, “Improving the Consistency of Nonlinear Estimators: Analysis, Algorithms, and Applications”, PhD Thesis, Department of Computer Science and Engineering, University of Minnesota - Twin Cities, Sep 2012. <https://conservancy.umn.edu/handle/11299/146717>
- [D1] **G. Huang**, “Dynamic Data Transmission in Industrial Control Systems”, BS Thesis (in Chinese), Department of Automation, School of Information Engineering, University of Science and Technology Beijing, China, Jul 2002.

Open Sources

- OpenVINS **An Open Research Platform for Visual-Inertial Estimation**, *ICRA 2020, IROS-WS 2019*.
https://github.com/rpng/open_vins
- CPI **Closed-form Preintegration for Graph-based VINS**, *WAFR 2016, IJRR 2019*.
<https://github.com/rpng/cpi>
- R-VIO **Robocentric Visual-Inertial Odometry**, *IROS 2018, IJRR 2019*.
<https://github.com/rpng/r-vio>
- CALC **Deep Learning for Loop Closure**, *RSS 2018, IROS 2019*.
<https://github.com/rpng/calc>
<https://github.com/rpng/calc2.0>
- OC-EKF **Observability-Constrained (OC)-EKF for 2D SLAM**, *IJRR 2010*.
<https://github.com/rpng/ocekf-slam>

Invited Talks

- [T44] “Visual-Inertial Navigation”, The 3rd Chinese SLAM Summer School, Aug 2020 [Instructor]
- [T43] “Visual-Inertial State Estimation and Perception for Autonomous Vehicles”, UBTECH North America R&D Center, Jun 2020
- [T42] “Visual-Inertial State Estimation and Perception for Autonomous Vehicles”, UT Austin, Apr 2020
- [T41] “Visual-Inertial State Estimation and Perception for Autonomous Vehicles”, Georgia Tech, Mar 2020
- [T40] “Visual-Inertial State Estimation and Perception for Autonomous Vehicles”, Yale, Mar 2020
- [T39] “Visual-Inertial State Estimation and Perception for Autonomous Vehicles”, Purdue, Feb 2020
- [T38] “Visual-Inertial State Estimation and Perception for Autonomous Vehicles”, UIUC, Feb 2020
- [T37] “Visual-Inertial State Estimation and Perception for Autonomous Vehicles”, Google, Jan 2020
- [T36] “Visual-Inertial State Estimation and Perception”, John Hopkins Univ. (LCSR Seminar), Nov 2019
- [T35] “Visual-Inertial State Estimation”, UBTECH Robotics, Nov 2019
- [T34] “Visual-Inertial State Estimation”, Tsinghua University (Dept. Precision Instrument), Oct 2019
- [T33] “State Estimation and SLAM”, [Chinese SLAM Tech Forum](#), Jul 2019 [Key Speaker]
- [T32] “Visual-Inertial State Estimation”, The 2nd Chinese SLAM Summer School, Jul 2019 [Instructor]
- [T31] “State Estimation and Autonomous Navigation”, Geekplus, Jun 2019
- [T30] “State Estimation and Autonomous Navigation”, Trifo, Apr 2019.
- [T29] “State Estimation and Autonomous Navigation”, Google ARCore, Apr 2019.
- [T28] “State Estimation and Autonomous Navigation”, Bosch Research, Apr 2019.
- [T27] “Towards Autonomous Navigation in the Wild”, Beijing Sineva, Dec 2018.
- [T26] “Towards Autonomous Navigation in the Wild”, Zhejiang University (CS), Jul 2018.
- [T25] “Towards Autonomous Navigation in the Wild”, HK Univ. of Science and Technology (RI), Jun 2018.
- [T24] “Towards Autonomous Navigation in the Wild”, Zhejiang University (CSC), Jun 2018.
- [T23] “Towards Autonomous Navigation in the Wild”, Zhejiang Sci-Tech University, Jun 2018.
- [T22] “Towards Secure, Efficient and Consistent Robot Navigation”, University of Michigan, Mar 2018.
- [T21] “Localization and Mapping for Autonomous Driving”, UD IDEA Network Faculty Social, Oct 2017.
- [T20] “Visual-Inertial Navigation”, NetEase Inc., Aug 2017.
- [T19] “Mapping and Localization in the Wild”, Zhejiang University (CSC), Aug 2017.
- [T18] “Visual-Inertial Perception”, Huawei Canada Research Center, Aug 2016.
- [T17] “Consistent Visual-Inertial Navigation”, Zhejiang University (CSC), Jul 2016.
- [T16] “Towards Consistent Robot Navigation”, Beijing Institute of Technology, Jan 2016.
- [T15] “Towards Consistent Robot Navigation”, Zhejiang University (CSC), Dec 2015.
- [T14] “Towards Consistent Robot Navigation”, University of Delaware (ECE), Dec 2015.
- [T13] “Towards Consistent Robot Navigation”, Army Research Laboratory (APG), Oct 2015.
- [T12] “Towards Consistent Robot Navigation”, University of Texas at Austin, Mar 2014.
- [T11] “Towards Consistent Robot Navigation”, University of Delaware, Mar 2014.
- [T10] “Towards Consistent Robot Navigation”, SUNY - Buffalo, Mar 2014.
- [T9] “Towards Consistent Robot Navigation”, University of Nevada, Mar 2014.
- [T8] “Towards Consistent Robot Navigation”, University of Michigan, Mar 2014.
- [T7] “Towards Consistent Robot Navigation”, Duke University, Feb 2014.
- [T6] “Towards Consistent Robot Navigation”, Google, Mountain View, CA, Dec 2013.

- [T5] “Improving the Consistency of Nonlinear Estimators: Analysis, Algorithms, and Applications”, MIT CSAIL Marine Robotics Group, Nov 2012.
- [T4] “Consistency of Nonlinear Estimation in Robotics: Analysis, Algorithms, and Applications”, University of Macau, Jun 2012.
- [T3] “Consistency of Nonlinear Estimation in Robotics: Analysis, Algorithms, and Applications”, University of Michigan – Shanghai Jiao Tong University Joint Institute (UM-SJTU JI), May 2012.
- [T2] “Consistency of Nonlinear Estimation in Robotics: Analysis, Algorithms, and Applications”, University of Tennessee, Mar 2012.
- [T1] “Observability-Constrained Consistent Estimators for Robot Localization”, Peking University, State Key Lab of Machine Perception, Jun 2011.

Awards and Honors

- 2019 **Team Winner for the FPV Drone Racing VIO Competition, IROS 2019.**
- 2019 **Google AR/VR Faculty Research Award, Google.**
- 2018 **Google Daydream Faculty Research Award, Google.**
- 2018 **SATEC Robotics Delegation, Sino-American Technology & Engineering Conference (SATEC).**
 [Invited by ASME as *one of ten* robotics experts from US to visit companies and institutions in Anhui province and attend a meeting with the Minister of Science and Technology in Beijing. The ASME group offered recommendation on Chinese Intelligent Robotics. The event was organized by the China State Administration of Foreign Experts Affairs and Ministry of Science and Technology.]
- 2017 **UD MakerGym Faculty Fellows, University of Delaware.**
- 2016 **NSF CRII Award, NSF Computer and Information Science and Engineering (CISE).**
- 2015 **NASA DE Space Research Seed Award, NASA DE Space Grant Consortium.**
- 2015 **UDRF Research Award, University of Delaware Research Foundation.**
- 2013 **MIT Postdoctoral Association Travel Award, Office of the MIT Vice President for Research.**
- 2012 **Chinese Government Award for Outstanding Self-Financed Students Abroad, China Scholarship Council.**
 [This award is established to encourage research excellence and to recognize the achievement among Chinese students abroad. It is granted across all fields of study and all countries in the world, and was presented to only 495 out of over 440,000 Chinese oversea students all over the world in 2011.]
- 2009 **Best Paper Award Finalist, Robotics: Science and Systems (RSS) Conference.**
- 2006 **Academic Excellence Fellowship, University of Minnesota - Twin Cities.**
- 2002 **Excellent Graduate Scholarship, University of Science and Technology Beijing, China.**

Academic Services

- 2015, 2018 U.S. National Science Foundation (NSF) Panelist
- 2017 Canada Foundation for Innovation Reviewer
- 2016, 2018 Israeli Ministry of Science and Technology Reviewer
- 2014 – 2019 DE Homeland Security Advisory Council Unmanned Aerial Vehicle (UAV) Subcommittee

Main Organizer / Program Chair:

- 2019 [ISMAR 2019 SLAM for AR Competition](#)

[International Symposium on Mixed and Augmented Reality (ISMAR) is the leading international academic conference in the fields of Augmented Reality and Mixed Reality, organized and supported by the IEEE Computer Society and IEEE VGTC.]

2019 [IROS 2019 Workshop on Visual-Inertial Navigation](#)

[International Conference on Intelligent Robots and Systems (IROS) is one of the two flagship robotics conferences.]

Associate Editor:

- 2019 – now IEEE Robotics and Automation Letters
- 2018 – now IET Cyber-Systems and Robotics
- 2017 – now IROS (International Conference on Intelligent Robots and Systems)
- 2015 – 2017 ICRA (International Conference on Robotics and Automation)

Editorial Board:

- 2018 – now Virtual Reality and Intelligent Hardware
- 2016 – now Frontiers in Multi-Robot Systems

Program Committee:

- 2014 – 2020 RSS (Robotics: Science and Systems Conference)
- 2017, 2019 IJCAI (International Joint Conference on Artificial Intelligence)
- 2018 AAAI (AAAI Conference on Artificial Intelligence)
- 2015 RSS Workshop on SLAM

Session Chair:

- 2018 IROS (International Conference on Intelligent Robots and Systems)
- 2013 ECOMR (European Conference on Mobile Robots)
- 2004 RAM (IEEE Conference on Robotics, Automation and Mechatronics)

Reviewers:

- Journal Reviewer TRO (IEEE Transactions on Robotics), IJRR (International Journal of Robotics Research), AURO (Autonomous Robots), JFR (Journal of Field Robotics) RAS (Robotics and Autonomous Systems), JIRS (Journal of Intelligent and Robotic Systems), IJARS (International Journal of Advanced Robotic Systems), TASE (IEEE Transactions on Automation Science and Engineering), TAC (IEEE Transactions on Automatic Control), IEEE-CYB (IEEE Transactions on Cybernetics), IEEE-SJ (IEEE Systems Journal), IJSS (International Journal of Systems Science), CVIU (Computer Vision and Image Understanding), SCL (Systems & Control Letters), JOE (IEEE Journal of Oceanic Engineering)
- Conference Reviewer ICRA (IEEE International Conference on Robotics and Automation), IROS (IEEE/RSJ International Conference on Intelligent Robots and Systems), RSS (Robotics: Science and Systems Conference), ACC (American Control Conference), CDC (IEEE Conference on Decision and Control), MED (Mediterranean Conference on Control and Automation), ICCV (International Conference on Computer Vision), ECCV (European Conference on Computer Vision), CVPR (Computer Vision and Pattern Recognition), AAAI (AAAI Conference on Artificial Intelligence), IJCAI (International Joint Conference on Artificial Intelligence)

University Services

- 2016 – now ME Graduate Admission Committee
- 2015 – now ME Department Undergraduate Curriculum Committee

- 2017 – 2019 ME Faculty Search Committee
- 2014 – 2017 ME Department Publicity Committee
- 2015 – 2016 ME Department Seminar Committee (*chair*)
- PhD Thesis Committee Konstantinos Karydis (UD ME PhD 2015, Advisor: Tanner), Jianxin Sun (UD ME PhD 2016, Advisor: Tanner), Prasanna Kannappan (UD ME PhD 2016, Advisor: Tanner), Yiyi Liao (ZJU CSC PhD 2018, Advisor: Liu), Sushant Veer (UD ME PhD 2018, Advisor: Poulakakis), Qiaosong Wang (UD CS PhD 2019, Advisor: Rasmussen), Adam Stager (UD ME PhD 2020, Advisor: Tanner), John Tsogias (UD ME PhD 2020, Advisor: Tanner), Chunbo Song (UD CS PhD 2020, Advisor: Rasmussen), Bilin Sun (UD CS PhD 2020, Advisor: Rasmussen)
- MS Thesis Committee Saurabh Arora (UD ME MS 2016, Advisor: Tanner), Caili Li (UD ME MS 2017, Advisor: Tanner), Dian Jiao (UD ME MS 2017, Advisor: Tanner), Anthony Rossi (UD ME MS 2018, Advisor: Poulakakis), Benjamin Remer (UD ME MS 2019, Advisor: Malikopoulos), GilHwan Kim (UD ME MS 2020, Advisor: Poulakakis)

Professional Membership

- 2020 – now Sigma Xi (Scientific Research Honor Society)
- 2020 – now ACM
- 2020 – now AAAI
- 2006 – now IEEE
- 2007 – now IEEE Robotics and Automation Society
- 2013 – now IEEE Control Systems Society

References

Available upon request.