YANYU ZHANG

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EDUCATION

University of California, Riverside Sep. 2021 - Present
Ph.D. in Electrical Engineering, Mentor: Wei Ren, GPA: 4.0/4.0
Research Interests: Visual-Inertial Navigation, SLAM, State Estimation

Boston University Sep. 2019 - May 2021
M.S. in Electrical and Computer Engineering, GPA: 3.7/4.0

University of Detroit Mercy + Beijing University of Chemistry Technology Sep. 2015 - Jun. 2019
B.S. in Robotics, GPA: 3.5/4.0

EXPERIENCE

Research Assistant Sep. 2021 – Present
Cooperative Vehicle Networks Laboratory (COVEN), Mentor: Wei Ren
- Visual-Inertial Odometry, SLAM, State estimation

Estimation and Sensor Futon for Autonomous Vehicles Internship Jan. 2023 – Apr. 2023
Mitsubishi Electric Research Laboratories (MERL), Mentor: Karl Berntorp
- Sensor Fusion, SLAM, State estimation

Research Assistant Jan. 2020 - May 2021
Boston University Robotics Laboratory, Mentor: John Baillieul
- Motion planning, SLAM

RESEARCH PROJECTS

NeRF-VIO: Visual-Inertial Odometry with Initialization Leveraging Neural Radiance Fields
- Propose a novel pose estimation model to initialize the first IMU state of VINS from a prior map.
- Define a novel loss function as the geodesic errors on *SE(3)* and prove the left-invariant property.
- Propose a dual-update pipeline based on MSCKF, both captured and rendered images are used to update.

CooperSLAM: Infrastructure-less Cooperative SLAM for Interactive Multi-user AR
- Propose a novel feature-based map alignment to minimize data transmission size between users.
- Propose a progressive map refinement that continuously refines the map with new area explorations.
- Decouple features with robots' state and execute a distributed pose graph optimization using GTSAM.

Cooperative Lane Mapping using Fixed-Lag Smoothing
- Propose a novel road-map model using Bezier curve and an adaptive mappoints combination algorithm.
- Propose a loosely-coupled fixed-lag smoothing algorithm for kinematic and dynamic single track models.
- Extend single-vehicle smoothing to a fully distributed road-map monitoring system.

PL-CVIO: Point-Line Cooperative Visual-Inertial Odometry
- Leverage common points-line features to improve accuracy, especially in low-textured environments.
- Leverage neighbor's observations to bound long-term drifts of VIO.
- IMU-to-camera intrinsic/extrinsic online calibrations, closest point line representation.

Visual Navigation Using Sparse Optical Flow and Time-to-Transit
- Theory of robust Eulerian and Lagrangian optical flow.
- Analyse the geometric and perceived time-to-transit values under different feature densities.

SKILLS

- Languages: C++, Python, MATLAB
- Frameworks/Technologies: Git, OpenCV, ROS, G2O, Ceres Solver, GTSAM, OpenVINS

PUBLICATIONS

[1] **Y. Zhang**, J. Xu, and W. Ren, "PLK-Calib: Single-shot and Target-less LiDAR-Camera Extrinsic Calibration using Pluker Lines", 2025 IEEE International Conference on Robotics and Automation (ICRA 2025). [Submitted]

[2] **Y. Zhang**, D. Wang, J. Xu, M. Liu, P. Zhu, and W. Ren, "NeRF-VIO: Map-based Visual-Inertial Odometry with Initialization Leveraging Neural Radiance Fields", 2025 American Control Conference (ACC 2025). [Submitted]

[3] **Y. Zhang**, H. Zhou, Y. Tsai, W. Ren, J. Chen, S. Krishnamurthy, and H. Qiu, "CooperSLAM: Infrastructure-less Cooperative SLAM for Interactive Multi-agent Augmented Reality", The 22nd USENIX Symposium on Networked Systems Design and Implementation (NSDI 2025). [Submitted]

[4] **Y. Zhang**, M. Greiff, W. Ren, and K. Berntorp, "Distributed Road-Map Monitoring Using Onboard Sensors", 2024 American Control Conference (ACC 2024).

[5] J. Xu, P. Zhu, **Y. Zhang**, and W. Ren, "Cooperative 3-D Target State Estimation and Active Tracking", 2023 IEEE Conference on Decision and Control (CDC 2023).

[6] **Y. Zhang**, P. Zhu, and W. Ren, "PL-CVIO: Point-Line Cooperative Visual-Inertial Odometry", 2023 IEEE Conference on Control Technology and Applications (CCTA 2023).

[7] C. Boretti, P. Bich, **Y. Zhang** and J. Baillieul, "Visual Navigation Using Sparse Optical Flow and Time-to-Transit", 2022 IEEE International Conference on Robotics and Automation (ICRA 2022).

[8] **Y. Zhang**, J Song, and S Li, " 3D Object Detection and Tracking Using Monocular Camera in CARLA", 2021 IEEE International Conference on Electro Information Technology (EIT 2021).

[9] **Y. Zhang** and O. Alshaykh, "5G Utility Pole Planner Using Google Street View and Mask R-CNN", 2020 IEEE International Conference on Electro Information Technology (EIT 2020).

[10] **Y. Zhang**, X. Wang, X. Wu, W. Zhang, M. Jiang and M. Al-Khassaweneh, "Intelligent Hotel ROS-based Service Robot", 2019 IEEE International Conference on Electro Information Technology (EIT 2019).