

Yuyang Chen

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EDUCATION

University at Buffalo

Ph.D. Computer Science and Engineering, GPA 3.79/4.0

Buffalo, NY

Jun. 2016 – Dec. 2023

University at Buffalo

M.S. Electrical Engineering, GPA 3.24/4.0

Buffalo, NY

Sep. 2014 – May. 2016

SUNY at Stony Brook

B.S. Electrical Engineering, GPA 3.40/4.0

Stony Brook, NY

Sep. 2010 – Sep. 2014

WORK EXPERIENCE

Research Assistant

Drones Lab, Department of Computer Science and Engineering, SUNY at Buffalo

Advised by Dr. Karthik Dantu

Jun. 2016 – Dec. 2023

Motion Compensated LiDAR SLAM | C++, Eigen, Linear Algebra, On-Manifold Optimization, Lie-Algebra, GTSAM

- Developed a C++ framework for existing LiDAR Simultaneous Localization and Mapping (SLAM) algorithms to work with a novel FOV rotating, Motion-Compensated LIDAR. See Publication [1]. VIDEO
- Developed a C++ point-to-point ICP with rotation parameterize with Lie-Algebra.
- Developed a C++ LiDAR/IMU/GPS multi-sensor fusion pipeline with ICP, IMU pre-integration, and Factor Graph
- Interface Intel Aero Drone with novel LiDAR and Vicon motion capture system for Evaluations.
- Developed a ROS Gazebo simulation environment that integrates PX4 drones and a 360 2-D LiDAR that can rotate its FOV.

Long Range 3D Reconstruction and Human Pose Detection | C++, Python, Pytorch, OpenCV, ROS, Bundle Adjustment

- Developed an mixed C++/Python outdoor long range human waking gait motion-capture system on ROS, using four Realsense D455 cameras, two Linux computers and Network-Time-Protocol. See Publication [2]. VIDEO
- Lead and advised a 10 persons group and collaborated with outside teams.
- Developed a C++ 3D reconstruction pipeline, that can auto-calibrate 4xRealsense D455 cameras arrays. The pipeline uses Bundle Adjustment and Perspective-n-Points (for motion capture environment).
- Developed C++ Multiple-Views Triangulation techniques to reconstruct 3D skeleton gait keypoints. Used Camera 3D-to-2D Reprojection to find 2D keypoints on the long range camera.

Targets In Sensor FOV Maximization via On-Manifold Rotation Optimization. | C++, Unreal Engine, CUDA

- Developed an C++ non-linear Lie-Algebra rotational optimization algorithm. The method generates an optimal rotational trajectory. It finds the optimal rotation of a robot in order to keep as many targets or features inside its limited FOV. See Publication[3]. VIDEO
- Validated the algorithm in photorealistic UnrealEngine, Issac Simulator
- Used COLMAP to evaluate Visual Localization Accuracy.

3D Flapping Wing Robot Simulation on a Real Quadrotor | Matlab, Linear Algebra, Simulink

- Developed a flapping wing robot simulation environment in matlab. See Publication[4]. VIDEO
- Integrated existing Simulink robobee controller with the flapping wing robot model.
- Used Vicon Tracker's data stream as external odometry source for various drones including Crazyflie2.0, MiniFly, Intel Aero RTF. Modified Crazyflie and Minifly onboard sensor fusion firmware code to accomodate motion-capture data streams.

Robotics Research Intern

SONY AI, advised by Dr. Michael Spranger

Summer 2019

Minato, Tokyo

- Applied state-of-the-art SLAM algorithms including applications of Bayesian Recursive State Estimation algorithms such as Particle Filter/Kalman Filter to the problem of indoor visual localization and mapping and path planning with obstacle avoidance

Student Co-op: Embedded System Software Engineering

MAHLE/Formerly Delphi Thermal

2015 – 2016

Lockport, NY

- Worked in a team to develop critical projects, which were well received by the customers
- Developed Embedded software for STM32 chips using C. Developed an over-shoot algorithm for a motor to improve its ramp rate. Integrated CAN/I2C protocol on an embedded Linux platform

SELECTED PUBLICATIONS

- [1]**Chen, Yuyang**, Ding kang Wang, Lenworth Thomas, Karthik Dantu, and Sanjeev J. Koppal. "Design of an Adaptive Lightweight LiDAR to Decouple Robot-Camera Geometry." Transaction on Robotics, Conditionally Accepted on Oct 31st, 2023. arXiv:2302.14334 (2023).
- [2]**Chen, Yuyang**, Praveen Raj Masilamani, Srirangaraj Setlur, Karthik Dantu. "DIOR: Dataset for Indoor-Outdoor Reidentification - Long Range 3D/2D Skeleton Gait Collection Pipeline, Semi-Automated Gait Keypoint Labeling and Baseline Evaluation Methods" Under Review, WACV(2024)
- [3]**Chen, Yuyang**, Chen Wang, Sanjeev J. Koppal, Karthik Dantu, "Maximizing Feature Visibility Through Online On-Manifold Fisher Information Optimization For Variable Field-of-View Cameras", Under Review, ICRA(2024)
- [4]**Chen, Yuyang**, Sawyer B. Fuller, and Karthik Dantu. "Quadrobee: Simulating flapping wing aerial vehicle dynamics on a quadrotor." 2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE, 2017.
- Li, Zhengxiong, Baicheng Chen, Xingyu Chen, Chenhan Xu, **Yuyang Chen**, Feng Lin, Changzhi Li, Karthik Dantu, Kui Ren, and Wenyao Xu. "Reliable digital forensics in the air: Exploring an rf-based drone identification system." Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies 6, no. 2 (2022): 1-25.
- Xia, Stephen, Minghui Zhao, Charuvahan Adhivarahan, Kaiyuan Hou, **Yuyang Chen**, Jingping Nie, Eugene Wu, Karthik Dantu, and Xiaofan Jiang. "Anemioi: A Low-cost Sensorless Indoor Drone System for Automatic Mapping of 3D Airflow Fields." In Proceedings of the 29th Annual International Conference on Mobile Computing and Networking, pp. 1-16. 2023.

SKILLS

Programming Languages: C/C++, Python, CUDA, Assembly, Bash, Shell, Javascript, Verilog, VHDL

Software/Libraries: Eigen, Ceres, OpenCV, ROS, Gazebo, PCL, TensorFlow, GTSAM, Pytorch, CUDA, Docker, Git, TCP/IP, OpenMP, MPI, Matlab, LATEX, UnrealEngine, Vinsmono, COLMAP, open-mmlab/mmdetection3d

Platform: Linux, Windows

3D Computer Vision: BEVFormer, BEV Transformer, Neural Radiance Fields (NeRF), Bundle-Adjusting Neural Radiance Fields (BARF), Bundle Adjustment, Structure-from-Motion, Multiple-Views Triangulation, Camera Models, Camera Reprojection, Camera Extrinsic/Intrinsic Parameters Estimations, Photogrammetry, Multi-view Camera Geometry, geometric and photometric camera calibration, camera calibration, 3D reconstruction

SLAM: Visual SLAM, Visual Inertial Odometry, LiDAR SLAM, Tightly Integrated LiDAR Inertial SLAM, Multimodal Sensor Fusion, Bayesian Estimation, Maximum Likelihood Estimation(MLE), Maximum a Posteriori Estimation(MAP), Nonlinear Optimization, Kalman Filter, Particle Filter

Sensors: IMU, RGB Camera, RGBD Camera, Vicon, Motion Capture Systems, LiDAR, Intel Realsense Cameras

Robots: Intel Aero RTF, Crazyflie 2.0, Minifly

CAREER INTEREST

My career interest is in designing robust, context adaptive 3D Computer Vision, Perceptual and Robotics Planning algorithms, with a fusion of traditional multiple-views geometry and learning based methods.