Fady Algyar

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EDUCATION

New York University (NYU), Tandon School of Engineering, New York, USA.

Master of Science in Robotics   *Sept 2020-May 2023*

- *GPA*: **3.91/4.0**
- *Relevant Courses*: Robot Perception, Machine Learning, Robot Localization and Navigation.

The American University in Cairo (AUC), Cairo, Egypt.

Bachelor of Science in Mechanical Engineering.   *Sept 2012-May 2017*

- *GPA*: 3.71/4.0

ROBOTICS PROFESSIONAL EXPERIENCE

Computer Vision Engineer |The Toro Company: Minnesota, USA.   *Jun 2023-Present*

- Developed and implemented **multi-camera calibration** algorithms utilizing **factor graphs** and **GTSAM** in **C++**, resulting in highly accurate camera **pose estimation** for robust **3D scene reconstruction**.
- Spearheaded the implementation of the **Maximum Expected Reprojection Error** (MERE) in **Python** to assess the impact of Gaussian noise on multivariate fisheye camera parameters, enhancing the precision of fisheye camera calibration.
- Improved code efficiency through Python multithreading, drastically reducing (MERE) computation time.
- Developing a solution for **visual odometry** windowed **bundle adjustment** to enable visual navigation in GPS-denied environments, enhancing autonomous system robustness and reliability.

Visual SLAM Engineer Intern |Nokia Bell Labs: New Jersey, USA.   *Jan 2023-May 2023*

- Lead research efforts in computer vision to generate **3D maps** of drones in challenging environments.
- Design and implement **sensor fusion** algorithms to incorporate prior **visual-inertial odometry (VIO)** poses to improve the robustness and accuracy of **3D map generation**.
- Utilize tools such as **COLMAP** and **ORB SLAM3** to improve the efficiency of the 3D mapping process.

RESEARCH EXPERIENCE

Computer Vision Graduate Researcher | NYU: New York, USA.   *July 2022 –May 2023*

- Lead research and development efforts in lidar **3D point cloud registration**, implementing a novel **multi-level attention transformer** in **Python** and **PyTorch** to extract multi-scale features scans.
- Conduct extensive experimentation and evaluation of the proposed algorithms on real-world datasets, demonstrating a **threefold reduction in translation error** for pairwise point cloud registration.
- Design and implement an **inlier classification network** using **PyTorch** and **Python**, which utilizes the transformer architecture as a global feature extractor and triplet loss function for inlier points detection.

PROJECTS

Vision Based Pose and Velocity Estimation of Quadrotor (MATLAB)   *June 2022*

- Designed and implemented a vision-based system for pose and velocity estimation of a quadrotor.
- Conducted experiments by flying the quadrotor over a planar surface with known **April Tags** distributed on it and capturing images using an onboard camera.
- Extracted **feature points** and formed correspondences between the April Tags in the images, calculated the **planar homography** matrix using the correspondences and camera **intrinsics**.
- Estimated **camera pose** from **homography**, enforcing orthonormality constraints on the rotation matrix.
- Computed **Optical Flow** with **KLT** algorithm to estimate the linear and angular velocity of quadrotor.

Kalman Filter for State Estimation of Micro Aerial Vehicle (MATLAB)   *May 2022*

- Developed and implemented **extended Kalman filter** (EKF) and **unscented Kalman filter** (UKF) for state estimation of a micro-aerial vehicle.
- Formulated a 15-dimensional state vector for the quadrotor and derived the corresponding **Jacobian matrix** for the EKF, and formulated sigma points for the UKF to propagate the state estimate.
- Designed a **sensor fusion** algorithm to incorporate data from multiple sensors, including **IMU**, and **GPS**, for measurement updates in the filters.