Chaitanya Sriram Gaddipati

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Education

Worcester Polytechnic Institute 2022 - 2024
Master of Science - Robotics Engineering *GPA: 4.0/4.0*
- **Coursework :** Robot Control, Deep Learning, Motion Planning, Autonomous Aerial Robotics, Machine Learning

Indian Institute of Technology Hyderabad 2018 - 2022
Bachelor of Technology - Mechanical Engineering (Major) *GPA: 9.29/10.0*

Skills

Programming Languages: Python, C, C++
Software: Linux, ROS2, Gazebo, Blender, NumPy, SciPy, OpenCV, PyTorch, TensorFlow, Git, Docker, MATLAB, Eigen
Hardware: DJI Tello drone, NVIDIA Jetson, Franka Emika Panda Arm

Experience

Void Robotics Aug 2024 – Present
Robotics Software Engineer Intern *Marathon, Florida*
- Developing a localization system using Nav2 with GPS sensor on a custom robot for navigation with ROS2 in C++.
- Incorporating Extended Kalman Filter for sensor fusion of the wheel odometry, IMU data, and GPS data, and simulating the robot in Gazebo.

Comet Lab, WPI May 2023 – Jun 2024
Research Assistant *Worcester, MA*
- Designed and implemented a **Model Predictive Controller** with thermal diffusion **partial differential equation constraints** for optimal tissue surface temperature control in **robotic laser surgery** to minimize tissue damage.
- Conducted experiments on animal tissues to test the controller performance using a Franka Emika Panda robot arm mounted with a laser and a thermal imaging system.

Projects

Optical flow based gap detection for drone flight | Python, PyTorch, OpenCV Dec 2023
- Developed a sensori-motor framework for autonomous navigation through unknown gaps without 3D reconstruction and mapping, leveraging solely a **monocular camera** and onboard IMU sensing.
- Utilized the **RAFT** model which is a composition of CNN and RNN architectures with **PyTorch** for **dense optical flow estimation**, achieving a **99% IoU score** for the unknown-shaped gap detection.
- Performed post-processing with **OpenCV (Python)** for gap contour detection and center identification, integrated **visual servoing** methods to align the drone with gap centers for successful navigation. - **Github**

Sim2Real Learning for Autonomous Drone Racing | Python, PyTorch, OpenCV, sim-to-real Oct 2023
- Engineered a perception stack for DJI Tello EDU drone, enabling precise navigation through diverse drone racing gates.
- Created Blender based Python script to generate a robust synthetic dataset of 14100 image-mask pairs using **domain randomization**.
- Trained YOLOv8 neural network on generated dataset for real-time gate identification and **segmentation** in complex environments with latency of 30ms.
- Extracted corners with OpenCV and used **Perspective-n-Point(PnP)** for 3D pose estimation for navigation. - **Github**

3D RRT* Drone Motion Planning | Python, Numpy, SciPy Sep 2023
- Developed motion planning pipeline for DJI Tello drone using RRT* path planner and generated smooth **minimum snap trajectories** by solving unconstrained quadratic optimization problem with NumPy and SciPy.
- Fine tuned the cascaded velocity and position PID controllers to ensure precise tracking of the optimal 3D trajectories.
- Validated planner through Blender simulation and real drone testing. - **Github**

Quaternion based Attitude Estimation of IMU | Python, NumPy Aug 2023
- Implemented a Complimentary, **Madgwick**, and **Unscented Kalman filters** for attitude estimation of a 6-DoF IMU in Python and benchmarked it against ground truth data from Vicon motion capture system for accuracy. - **Github**

SCARA Robot Simulation | C++, ROS, Gazebo, Docker Dec 2022
- Simulated a SCARA Robot manipulator in Gazebo with ROS and created forward and inverse kinematics nodes in C++.
- Additionally designed custom velocity and position controllers for path tracking. - **Github**

Publications

N. P. Babu M, P. Kumar Duba, **G. C. Sriram** and P. Rajalakshmi, **"Autonomous Bio-Inspired Micro Aerial Vehicle (MAV)"**, 2022 IEEE IAS Global Conference on Emerging Technologies (GlobConET), Arad, Romania, 2022, pp. 661-666, doi: 10.1109/GlobConET53749.2022.9872352.