Suraj Kiron Nair

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EDUCATION

New York University — New York, NY
MSc in Mechatronics and Robotics, GPA: 3.933 — Sept 2022-May 2024
Related Coursework:Deeplearning, Robot Perception, Robot Localization and Navigation, Optimal Control

Ramaiah Institute of Technology — Bangalore,India
BSc in Mechanical Engineering, GPA: 8.48/10 — Aug 2017-July 2021
Related Coursework: Mechatronics, Control Systems, Machine Learning

TECHNICAL SKILLS

Programming Languages: Proficient - C/C++, Python, MATLAB and Simulink, ROS/ROS2; **Familiar** - Docker, Tensorflow, Pytorch, PX4

WORK EXPERIENCE

Agile Robotics and Perception Lab — New York, NY
Graduate Research Assistant — Jan 2023 – June 2024

- Graduate Teaching Assistant Robot Localization and Navigation Course
- L1 Adaptive Controller for Quadrotors: The L1 Adaptive control architecture enables UAVs to adapt to wind gusts and propeller damage. Developed ROS C++ Packages, and analyzed experimental data from simulation software and the real-world system (ModalAI VOXL2 Platform).
- UAV Software Integration and Testing: Built and tested software on two types of platforms the ModalAI VOXL2 board and Pixracer Pro with Xavier NX. Collected and analyzed data using ROS/ROS2
- Conducted SITL simulations using Gazebo and PX4 Autopilot software:
- Integrated Px4 EKF with Vicon System: Setup the Px4 EKF localization to conduct offboard flights using the Vicon system

Interdisciplinary Center for Energy Research (ICER IISc) — Bangalore, India
Research Associate — Sept 2021-May 2022

- Heat Exchanger Simulations: Created a 2D model of a printed circuit heat exchanger using Python and conducted analysis to determine the heat exchanger footprint.
- SCO2 Power generation Engine Simulations: Performed fluid dynamics simulations for SCo2 Brayton cycle power generation Engine using Ansys and Python.

Formula Student — Bangalore, India
Lead Drive train engineer — Jan 2018 - Jul 2021

- Vehicle Dynamics Simulations: Simulated vehicle dynamics to optimize lap times and determine Electric drive train parameters. Reduced the acceleration time by 40%.
- System Integration: Coordinated tasks between the mechanical and electrical teams. Managed the electronics and hardware integration of the electric vehicle. Ranked 1st in engineering design Formula Green 2020

PROJECTS

Computer Vision and Robot Perception:

- **Pedestrian Detection using MobileSAM:** MobileSAM is a neural network architecture that can perform the segment anything computer vision task in real time.
- **Multi Object Tracking using DeepSort:** Used Deepsort, a YOLO based object tracking method to track vehicles and passengers in traffic.
- **Visual Place Recognition(VPR) and SLAM:** Explored and mapped a maze using a virtual robot. Used VPR and other ML techniques to localize the robot and navigate to the location of the target images. Completed Top 3 in the competition.

Control Projects

- **Motion Planning for a SCARA Robot:** Generated trajectories for obstacle avoidance and simulated an inverse dynamic Controller for a SCARA robot.
- **Implemented Fault Tolerant Control onboard a quadrotors:** Fault Tolerant Control enables quad-rotors experiencing rotor failure to track position trajectories by conceding yaw control.
- **L1 Adaptive control for Micro Aerial Vehicles:** Implemented the L1 adaptive control scheme on a quadrotor.

Localization and Estimation

- **State Estimation using Extended Kalman Filters:** Fused GPS/Vicon positions with IMU measurements using an EKF for drone localization
- **State Estimation using Optical Flow:** Implemented velocity estimation using Optical flow and fused with IMU measurements of a quadrotor using Unscented Kalman Filter (UKF).

PUBLICATIONS

From Propeller Damage Estimation and Adaptation to Fault Tolerant Control:Enhancing Quadrotor Resilience
IEEE Robotics and Automation Letters: Under the guidance of Professor Giuseppe Loianno