Suraj Kiron Nair

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Education

- **New York University** — New York, NY
  Master of Science Mechatronics and Robotics; GPA: 3.926 — *Sept. 2022 – May. 2024*
  Related Coursework: *Deeplearning, Robot Perception, Robot Localization and Navigation*

- **Ramaiah Institute of Technology** — Bengaluru, India
  Bachelor of Engineering in Mechanical Engineering; GPA: 8.48/10.0 — *Aug. 2017 – Jul. 2021*
  Related Coursework: *Control Systems, Python, Computer Science*

Experience

- **Graduate Teaching Assistant** — New York, NY
  Robot Localization and Navigation — *Jan 2024 - Present*

- **Agile Robotics and Perception Lab (ARPL)** — New York, NY
  Graduate Student Researcher — *Jan 2023 - Present*
  - **L1 Adaptive Controller for Quadrotors**: The L1 Adaptive control architecture enables UAVs to adapt to uncertainties like wind, propeller damage and poor gain tuning. Developed ROS Packages, and analyzed experimental data from simulation software and the real-world system (ModalAI VOXL2 Platform).
  - **UAV Hardware Integration and Testing**: Built and tested software on two platforms the ModalAI VOXL2 board and Pixracer Pro with Xavier NX. Collected and analyzed data using ROS.

- **Interdisciplinary Center for Energy Research** — Bengaluru, India
  Research Assistant(Indian Institute of Science) — *Sept 2021 to 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.

- **Formula Student** — Bengaluru , India
  Lead Drivetrain Engineer — *Jan 2018 - Jul 2021*
  - **Vehicle Dynamics Simulations**: Simulated vehicle dynamics to optimize lap times and determine Electric drivetrain 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

- **Pedestrian Detection using MobileSAM**: MobileSAM is a neural network architecture that can perform the segment anything computer vision task in real time. Modified the model architecture to detect people using a Linear Probing method.
- **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.
- **Dynamic Control of a SCARA Robot**: Generated trajectories and simulated Controller for a SCARA robot.
- **State Estimation using Optical Flow**: Determined the pose and velocities of a quadrotor flying over April Tags.
- **Sensor Fusion**: Implemented state estimation of a quadrotor using Extended Kalman Filter(EKF) and Unscented Kalman Filter (UKF).

Publications

- **From Propeller Damage Estimation and Adaptation to Fault Tolerant Control: Enhancing Quadrotor Resilience**: Simulated the L1 adaptive controller and implemented damage estimation based switching mechanism to activate Fault tolerant control. Thus extending flight time in the case of propeller damage.

Programming Skills

- **Languages**: C/C++, Python, ROS/ROS2, MATLAB and Simulink, Pytorch, Tensorflow