NIVYA KUZIVILA PANNICKOTTU

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SKILLS

Linear and nonlinear control design, Flight dynamics and control, Mobile robotics, Trajectory generation and optimization, Path planners, Adaptive control, MATLAB & Simulink, Kalman filter design, Python, C++, ROS2, SLAM, OROCOS, KDL, Git, AutoCAD Electric, Linux, Wiring harness layouts, Gazebo

EDUCATION

JOHNS HOPKINS UNIVERSITY, Baltimore, MD **Aug 2021 - May 2023**
Masters of Science - Robotics
Relevant Coursework: Robot System Programming, Locomotion Dynamics and Control, Applied Optimal Control, Nonlinear Control and Planning in Robotics

POLITECNICO DI MILANO, Milan, Italy **Feb 2021 - Aug 2021**
Exchange Student - Automation and Control Engineering
Relevant Coursework: Advanced Multivariable Control, Perception Localization and Mapping for Mobile Robots

AMRITA VISHWA VIDYAPEETHAM, Bangalore, India **July 2021**
Bachelor of Technology - Electrical and Electronics Engineering

WORK EXPERIENCE

Research Assistant - Dynamical Systems and Control Lab
Johns Hopkins University, Baltimore, MD **Jan 2023 - Present**

- Performed dynamical analysis using Newtonian dynamics on Iver3 3-DOF and 5-DOF Autonomous Underwater Vehicle (AUV) model.
- Designed and tuned adaptive control inputs for a model-based adaptive identification problem that generate feasible states for angle of attack, pitch angle, propeller speed and forward velocity of the AUV.

Member - Locomotion in Mechanical and Biological Systems Lab
Johns Hopkins University, Baltimore, MD **Aug 2022 - Present**

- Developed robust tracking technique to derive kinematic relationship between pectoral fins and ribbon fin in glass knifefish using DeepLabCut, a computer vision, markerless pose estimation software that uses deep neural networks.
- Tracked 35 points on the transparent ribbon fin with 95% accuracy.
- Performed and automated data filtering and PCA analysis on 114 tracked points over 4000 frames.

Electrical Engineering Intern **May 2022 - Aug 2022**
Odys Aviation, Long Beach, CA

- Assessed over-voltage, under-voltage, and over-current discharge safety functions in Texas Instruments' battery management system (BMS) evaluation board for e-VTOL aircraft battery application.
- Ran 100A, 5kW & 200A, 10kW discharge cycles for battery quality verification.
- Created wiring diagrams for onboard electronics using AutoCAD Electrical.

Control System Engineering Intern **Apr 2020 - Aug 2020**
Vtrike Pvt. Ltd., Bangalore, India

- Led a team of 4 interns to design cell balancing schematics.
- Developed MATLAB-Simulink models to estimate the State of Charge (SOC) of Li-ion battery pack.
- Modeled flow charts for protection and monitoring functions in different modes of operation for an electric vehicle.

RESEARCH & PROJECTS

Turtlebot Cooperation
(Final Project, Robot System Programming) **Feb 2023 - Present**

- Performed camera calibration using ROS2 Nav2 packages.
- Used ArUco markers for localization of the Turtlebot.
- Designed simulation for robot teaming operation using ROS2 actions, Gazebo and Rviz.
- Utilized Lidar data for real-time mapping and SLAM.

UR5 Trajectory Controller
(Course Project, Robot System Programming) **Apr 2023 - Present**

- Developed C++ algorithms to move UR5 to desired locations using forward kinematics map, inverse kinematics, KDL library, and Reflexxes library.
- Implemented these codes on UR5 robot using OROCOS real-time toolkit, and by dynamically re-configuring velocity scale, cartesian coordinates and joint coordinates.

Trajectory Generation and Tracking of an Iver3 AUV
(Final Project, Nonlinear Control and Planning in Robotics) **Mar 2022 - May 2022**

- Generated trajectories for precise positioning of a simplified non-linear 5-DOF dynamic model of an Iver3 AUV.
- Used differential flatness property of the model to generate a smooth trajectory which was then fed to a RRT for dynamic motion planning in MATLAB.
- Tracked the trajectory using a virtual input based on feedback linearization control method.

Extended Kalman Filter for Jackal robot state estimation
(Algorithms for Sensor based Robotics) **Oct 2021 - Dec 2021**

- Designed a 3D dynamic state model of the mobile Jackal robot.
- Developed observation models for sensor data from GPS and IMU to get position, orientation and angular velocity.
- Developed an Extended Kalman Filter in C++ to estimate the robot location, implemented through ROS and visualized through Gazebo environment.

Paper Kuzhivila Pannickottu Nivya and K Deepa 2021 IOP Conf. Ser.: Mater. Sci. Eng. 1070 012097, "*Active cell balancing for a 2s Lithium ion battery pack using flyback converter and push-pull converter*"

- Implemented a MATLAB-Simulink model for active cell balancing using pack-to-cell charge transfer technique.
- Compared the performance of flyback converter and push-pull converter for cell balancing application based on State of Charge imbalance and cell voltage imbalance.

EXTRA CURRICULARS

E-bike Retrofitting **Jan 2020 - Feb 2021**
Amrita Vishwa Vidyapeetham, Bangalore, India

- Generated a model of the vehicle dynamics of a conventional bike to determine optimal placement for a 1.5kg, 10 series, 3 parallel Li-ion battery pack.
- Led a multidisciplinary team of 10 undergraduate students to design the battery pack, charger schematic, and battery management system functions.
- Wrote research proposals to raise funds and secure a workspace.

Live-In-Labs **Mar 2019 - Dec 2019**
Amrita Vishwa Vidyapeetham, Bangalore, India

- Volunteered for a multidisciplinary experiential learning program to engineer sustainable solutions for challenges faced in rural India.
- Proposed robot implementation for cleaning plastics and checking water quality of ponds in Kalinagar, West Bengal, India.