Harin Kumar Nallaguntla

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Education

Khoury College of Computer Sciences at Northeastern University — Boston, MA
Master of Science in Robotics; ***GPA: 3.958/4.0*** — *Sep 2022 - April 2024*

Coursework - Master's Thesis, Legged Robotics, Reinforcement Learning and Sequential Decision Making, Robot Mechanics and Control, Robotics Sensing and Navigation

National Institute of Technology — Surat, India
Bachelor of Technology in Mechanical Engineering; ***GPA: 8.49/10.0*** — *Apr 2018 - May 2022*

Coursework - Control Systems Engineering, Computer-Aided Design and Manufacturing, Computer Programming, Theory of Machines, Optimization Techniques

Technical Skills

Programming Languages: MATLAB, Python, C, C++, Rust.
Operating Systems: Ubuntu, Windows, Kali Linux, MacOS.
Technologies: Git, Simscape, ROS/ROS2, Gazebo, Rviz, OpenCV, PyTorch, Raspberry Pi, Arduino, SLAM.
Design and Manufacturing: SolidWorks, CATIA, OnShape, Ultimaker S3/S5 3D printers, ULTRA R9000 Laser Cutter.

Experience

Silicon Synapse Lab — **Mar 2023 – Present**
Research Assistant | Python, C/C++, Git, Ubuntu, PyTorch, ROS/ROS2, MATLAB, Simscape — *Boston, MA, USA*

- Spearheaded the development and maintenance of autonomous software for COBRA, an innovative morpho-functional snake robot designed for traversing uneven terrains, improving locomotion efficiency by over 40% and achieving successful deployment in more than 15 field tests.
- Pioneered the implementation of energy-efficient trajectory planning algorithm for Harpy robot, a collaborative creation with Caltech, enhancing performance by prioritizing stability and optimizing its thruster-assisted bipedal locomotion.
- Developed an accelerated Deep Learning training pipeline, resulting in 4x boost in model training capacity, thereby substantially expediting prototyping and deployment workflows.
- Implemented a dynamic Reinforcement Learning-based optimization algorithm aimed at reducing the simulation-to-reality gap, resulting in a remarkable 90% improvement in the accuracy and fidelity of COBRA's locomotion simulations.
- Designed a novel contact-implicit optimization framework that generates locomotion patterns for seamless object manipulation, utilizing COBRA's unique body design to enhance dexterity and precision, achieving a 95% success rate.

Key Achievements:

- Received NASA's prestigious Artemis Award for developing the COBRA robot, which will support lunar colonization initiatives in the NASA's upcoming Artemis Missions.
- Authored three papers submitted to top conferences, with one accepted for publication at IEEE/ASME AIM 2024 and the others under review at IROS and CDC 2024.
- Secured over $200,000 in funding from NASA for the development of the COBRA robot and additional funding from Caltech to enhance the autonomous capabilities of the Harpy robot.

Lycan Automotive — **Mar 2021 – Feb 2022**
Software Engineer | Python, PyTorch, OpenCV, Tensorflow, Ubuntu, C/C++, Git — *Bangalore, India*

- Implemented and fine-tuned single-stage and multi-stage monocular 3D object detection algorithms, achieving a remarkable mean average precision of 87%.
- Deployed robust lane detection systems capable of accurately identifying and distinguishing between all lanes on the road, achieving impressive accuracy rate of 84%.
- Created a sophisticated collision avoidance algorithm adept at preventing collisions with both vehicles and pedestrians, achieving success rate of 95%.

Projects

i-SLAM: Wireless Sensor Fusion and Navigation System for iPhones | *Python, MATLAB* — **Nov 2022 – Dec 2022**

- Developed a seamless wireless data streaming pipeline to transmit real-time sensor data, including Lidar, Camera, and IMU data, from an iPhone to a computer.
- Created a framework utilizing iPhone sensors for pose graph optimization, enabling simultaneous iPhone's position localization and environment mapping with an impressive 93% accuracy.

Optimal Flight Controller Design and Integration | *MATLAB, Simulink* — **Sep 2021 – Oct 2021**

- Crafted a comprehensive model for the longitudinal equations of aircraft motion and implemented an LQR controller to accurately regulate pitch through deflection angle inputs, achieving an exceptional steady-state error of only 0.01%.
- Applied the zero-order hold method to digitize the LQR controller, ensuring seamless integration with flight control hardware for effective deployment and operation.