Harin Kumar Nallaguntla

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Education

Northeastern University — Boston, MA
Master of Science in Robotics; ***GPA: 3.95/4.0*** — *Sep 2022 - April 2024*

Coursework - Legged Robotics, Reinforcement Learning and Sequential Decision Making, Robot Mechanics and Control, Robotics Sensing and Navigation, Mobile Robotics

Sardar Vallabhbhai 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++.
Operating Systems: Ubuntu, Windows, Kali Linux, MacOS.
Technologies: Git, Simscape, ROS/ROS2, Gazebo, Rviz, NumPy, OpenCV, PyTorch, Raspberry Pi, Arduino.
Design and Manufacturing: SolidWorks, CATIA, Ultimaker S3/S5 3D printers, ULTRA R9000 Laser Cutter.

Experience

SiliconSynapse Lab — **Apr 2023 – Present**
Research Assistant | Python, MATLAB, Simscape, C/C++, Git, Ubuntu, PyTorch, Gazebo — *Boston, MA, USA*

- Led the development and maintenance of simulation software for COBRA, an innovative morpho-functional snake robot. Secured funding from NASA to support lunar surface exploration initiatives.
- Optimized firmware code for servo control on COBRA, resulting in 7x increase in data throughput for servo positions and velocities for the purpose of efficient real-time execution of locomotion patterns.
- Developed an accelerated Reinforcement Learning model training pipeline, resulting in 4x increase in model training capacity, thereby substantially expediting prototyping and deployment processes.
- Implemented an innovative RL-based optimization algorithm in Webots simulator, reducing simulation-to-reality gap by over 150%, significantly enhancing accuracy and fidelity of COBRA's locomotion simulations.
- Designed novel RL-guided gait patterns tailored for seamless object manipulation, leveraging COBRA's unique body design to enhance dexterity and precision.
- Pioneered the implementation of energy-efficient trajectory planning using RL for Harpy, a thruster-assisted bipedal robot built in collaboration with CalTech, enhancing performance while prioritizing sustainability.

Lycan Automotive — **May 2021 – Jan 2022**
Software Engineer | Python, C/C++, Git — *Bangalore, India*

- Implemented and fine-tuned single-stage and multi-stage monocular 3D Object Detection algorithms using PyTorch, and Numba, achieving a remarkable mean average precision of 87%.
- Utilized OpenCV and TensorFlow to deploy 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

Energy-Optimized Gait Design for A Bipedal Robot | *Simulink* — **Feb 2023 – Apr 2023**

- Performed comprehensive modeling of kinematics, dynamics, and vector fields for a sophisticated bipedal robot, ensuring thorough understanding of its intricate mechanics and behavior.
- Engineered energy-efficient gait patterns for the bipedal robot through optimization techniques, achieving 70% reduction in power consumption during locomotion.

i-SLAM: Wireless Sensor Fusion and Navigation System for Mobile Platforms | *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 system.
- Innovated an iPhone sensor-based approach integrating LiDAR-based SLAM, visual SLAM, and dead reckoning methods, delivering impressive accuracy rates of 92%, 90%, and 80% respectively.

Optimal Longitudinal Control System Design for Aircraft Navigation |*MATLAB, Simulink* **Sep 2021 – Oct 2021**

- Derived a comprehensive model for longitudinal equations of motion of aircraft and applied an LQR controller to precisely regulate pitch using deflection angle inputs, resulting in exceptional steady-state error of just 0.01%.
- Utilized zero-order hold method to digitalize the LQR controller, ensuring seamless integration with flight control hardware for effective deployment and operation.