SAI SHARAN THIRUNAGARI

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SUMMARY

A Robotics Engineer with a strong foundation in both hardware and software aspects of robotic systems. Proficient in developing advanced algorithms for motion planning, perception, and control, with a focus on real-time performance and adaptability to complex environments. Skilled in rapid prototyping, sensor integration, and software development using C++, Python, and ROS.

SKILLS

- **Programming:** C++, Python, MATLAB | **Mathematics:** Linear Algebra, Probabilistic Robotics, Optimization Techniques.
- **Robotics:** ROS, Motion Planning, SLAM, Kalman Filtering, Control Systems | **Hardware:** Sensors, Raspberry Pi, Jetson
- **Perception and Machine Learning** OpenCV, PyTorch, TensorFlow, Point Cloud Library, Sensor Fusion, Object Detection
- **Software Development:** Git version control, Software Architecture Design, Algorithm Design and Optimization.

EXPERIENCE

Safety and Efficient Autonomous Systems Lab (Link for details) **Buffalo, NY**
Robotics Engineer **Jun 2024 - Present**

- Implemented and optimized sampling-based motion planning algorithms (PRM, RRT*) for the Kinova Gen3 robotic arm using C++ and ROS, achieving a 25% reduction in path computation time while maintaining path optimality.
- Developed a custom inverse kinematics solver using the Levenberg-Marquardt algorithm, improving end-effector positioning accuracy by 18% compared to the default solver.
- Integrated a Vicon motion capture system with the robot control pipeline, implementing a multi-threaded architecture in C++ to handle real-time TCP/UDP communication with <5ms latency for high-frequency state updates.
- Designed and implemented an Extended Kalman Filter in C++ for sensor fusion, combining IMU and vision data to achieve sub-centimeter accuracy in end-effector positioning.

ONY Biotech - Human in Loops Systems Lab (Link for details) **Buffalo, NY**
Robotics Research Engineer **Aug 2023 - May 2024**

- Engineered a custom end-effector for fluid extraction, integrating ATI Nano25 6-axis force/torque sensors and designing closed-loop force control algorithms in C++, achieving consistent 0.1N force precision.
- Implemented an impedance control scheme for the Powerball Schunk arm using C++, incorporating real-time force feedback to enable adaptive tissue manipulation with a safety threshold of 30N.
- Developed a real-time control system using C++ and the SOEM (Simple Open EtherCAT Master) library, achieving a control loop frequency of 1kHz for precise servo motor control of the Powerball Schunk.
- Created a custom inverse dynamics solver using the Recursive Newton-Euler algorithm, optimizing the arm's motion for minimal jerk and improving overall movement smoothness by 40%.

Artificial Intelligence Institute (Link for details) **Buffalo, NY**
Graduate Student Researcher **April 2023 - Aug 2023**

- Implemented an SSD ResNet-based object detection model for Boston Dynamics Spot robot, fine-tuning on a custom dataset of 3,000 annotated images and achieving 90% mAP50 on the test set.
- Integrated Spot's onboard 3D depth cameras for precise object localization, developing a point cloud processing pipeline that achieved sub-centimeter accuracy in estimating object positions relative to the robot.
- Designed and implemented a Kalman filter-based tracking system in C++, enabling Spot to maintain consistent object tracking with 95% accuracy even in scenarios with partial occlusions.

PROJECTS

Advanced Robotic Manipulation & Collision Avoidance: C++, Python, ROS, Gazebo | (Link for details)

- Implemented a tightly-coupled visual-inertial odometry system using Extended Kalman Filtering, fusing data from stereo cameras and an IMU to achieve sub-centimeter localization accuracy in GPS-denied environments, while simultaneously building a dense 3D point cloud map with loop closure for global consistency.

Stereo Visual Odometry for Autonomous Navigation: Python, OpenCV, ROS | (Link for details)

- Engineered a stereo camera framework for 3D pose estimation using custom OpenCV algorithms and ROS integration, improving trajectory accuracy by 25% over wheel odometry in diverse environments.

Terrain-Adaptive Snake Robot: C++, CATIA V6, Nvidia Jetson Nano, PyBullet | (Link for details)

- Designed and 3D-printed a snake robot using CATIA V6, programmed C++ control systems on Jetson Nano with Central Pattern Generators, and optimized via PyBullet simulations, achieving 40% improved locomotion efficiency.

EDUCATION

Master of Science - Robotics **Buffalo, NY**
University at Buffalo, The State University of New York - GPA: 3.62
Relevant Courses: Robotic control systems, Robotics Kinematics and Dynamics, Machine Learning, Computer Vision, Human Robot Interaction

Bachelor of Technology in Mechanical Engineering **Delhi NCR, India**
Shiv Nadar University
Relevant Courses: Kinematics and Dynamics of Machines, Advanced Manufacturing, CAD and CAM, Machine Design