Shiva Sam Kumar Govindan

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Summary

Robotics Engineer with 3+ years of hands-on experience in autonomous systems, industrial automation, and UAV development. Proficient in ROS2, Python, C++, and MATLAB, with expertise in sensor fusion, motion planning, and AI-driven perception. Demonstrated success in deploying scalable robotic solutions for warehouse automation, aerial surveillance, and disaster response. Skilled in multi-robot coordination, digital twins, and IoT integration, leveraging MoveIt, Gazebo, and AWS RoboMaker to deliver efficient and reliable systems.

Education

M.S, Robotics and Autonomous Systems (Mechanical and Aerospace Engineering) **Aug 2022 - May 2024**
Arizona State University, Tempe, Arizona

B. Tech, Aeronautical Engineering **Aug 2016 – May 2020**
Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, India

Skills

- **Programming Languages:** Python, C++, MATLAB, SQL, LaTeX.
- **Robotics Frameworks:** ROS2, MoveIt, Nav2, OMPL, STOMP, GTSAM, PX4 Autopilot, MAV Link, FreeRTOS, ROSI.
- **Perception & AI:** OpenCV, TensorFlow, PyTorch, Kalibr, Scikit-learn, PCL (Point Cloud Library), LOAM, RTAB-Map.
- **Simulation & Modelling:** Gazebo, CARLA, Ansys, SolidWorks, Blender, AWS RoboMaker, Siemens NX
- **Embedded Systems & IoT:** STM32, Raspberry Pi, NVIDIA Jetson, TMC2209, Socket CAN, Ether CAT, Beckhoff PLCs.

Experience

Rainier Labs, California **Nov 2024 - Present**
Robotics Engineer

- Programmed ABB IRB 2600 robotic arms using ROS-I and MoveIt to automate palletizing tasks for Rainier Labs, reducing cycle time by 25% through Ether CAT integration with Beckhoff PLCs.
- Designed a Kalman filter-based pipeline to fuse LiDAR (Velodyne VLP-16) and Intel RealSense D455 data in ROS2, achieving 97% obstacle detection accuracy for warehouse robots.
- Built a digital twin in NVIDIA Isaac Sim to validate AGV path planning in dynamic environments, reducing real-world testing costs by 40%.
- Optimized OMPL algorithms for 7-DOF manipulators using CHOMP and STOMP in MoveIt, reducing motion jerk by 30% in precision assembly tasks.
- Deployed TensorRT-optimized YOLOv8 on NVIDIA Jetson Orin for real-time defect detection, triggering automated quality control workflows via ROS2 nodes.
- Reduced Hector SLAM drift by 20% in GPS-denied environments using GTSAM factor graphs on Husky UGV platforms.
- Implemented Visual Language Architecture, large language models and convolutional neural networks (CNNs) for natural language-based decision-making, streamlining tasks and reducing execution time by 25% while improving precision.
- Optimized robotic grasping strategies, integrating OMPL and MoveIt for autonomous voice-controlled pick-and-place operations, achieving a 30% improvement in grasp success rates and a 25% reduction in motion execution time.

EPICS Pro, Arizona State University, Tempe, AZ **Jul 2024 – Nov 2024**
Mechatronics Engineer

- Programmed PX4 Autopilot firmware for hexacopter UAVs, integrating MAV Link with ROS2 for swarm coordination in agricultural monitoring missions, achieving 95% mission success in GPS-denied environments.
- Designed STM32-based motor controllers using FreeRTOS and TMC2209 stepper drivers, achieving 0.1° precision in UAV gimbal stabilization for aerial photogrammetry applications.
- Implemented LQR (Linear Quadratic Regulator) controllers in MATLAB/Simulink for UAV trajectory tracking, reducing steady-state error by 18% compared to traditional PID controllers.
- Processed LiDAR point clouds with PCL and Cloud Compare, deploying LOAM (Lidar Odometry and Mapping) on NVIDIA Xavier NX for real-time 3D terrain reconstruction.
- Prototyped lightweight UAV frames using Ulti maker S5 and Carbon Fiber PETG, validated via Ansys Static Structural simulations to ensure structural integrity under 5G loads.
- Developed an autonomous UAV for surveillance, integrating ORB-SLAM and sensor fusion for real-time localization and mapping using ROS2 and Gazebo. Utilized Python, OpenCV for live image processing, enhancing situational awareness.
- Orchestrated AWS RoboMaker simulations for 50+ UAV swarms, leveraging EC2 Spot Instances to reduce cloud compute costs by 35% while scaling mission testing.

Launch Trax Private Limited, Bangalore, India **Feb 2020 - Jul 2022**
Robotics Application Engineer

- Processed LIDAR DEMs (Digital Elevation Models) with GRASS GIS and GDAL, automating flood-risk mapping using Python and Scikit-learn clustering algorithms for disaster response missions.
- Engineered a Dask-parallelized pipeline for SAR (Synthetic Aperture Radar) data processing, reducing latency by 55% in real-time disaster response workflows.
- Deployed Open VINO-optimized YOLOv5 on Intel NUC for real-time aerial object detection, achieving 45 FPS on Hikvision thermal cameras for surveillance missions.
- Developed a CANopen stack with Socket CAN on Raspberry Pi 4, enabling real-time communication between UAV payloads and Pixhawk flight controllers.
- Validated flight controllers with Speedgoat HIL (Hardware-in-Loop) systems, ensuring DO-178C compliance for aviation-grade UAV firmware and reducing certification time by 30%.
- Designed algorithm-based trajectory planners in C++, reducing UAV fuel consumption by 22% for long-range surveillance missions in mountainous terrain.
- Streamlined QGIS workflows with PostgreSQL and GeoServer, dynamically rendering aeronautical charts at 10,000:1 scale for defense and aviation clients.
- Developed and optimized geo-pointing & geo-location algorithms in Python, leveraging OpenCV, GDAL to convert UAV camera feeds from image coordinates to world coordinates via a GUI interface, improving navigational accuracy by 40%.

Certifications

- **Self-Driving Cars Specialization – Toronto University**
- **Introduction to Robotics in Microelectronics Manufacturing – Arizona State University (ASU)**
- **MATLAB Certification – Skill-Lync**
- **Diploma in Mechanical CAD – CAD School**