NIBARKAVI (Niba) NARESH BABU AMUTHA

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EDUCATION

Masters in Robotics, University of Michigan, Ann Arbor | CGPA: 3.64/4.0 Aug 2022 - Apr 2024
Courses: Algorithmic Robotics, Mobile Robotics, Deep Learning for Robot Perception, Machine Learning, Programming for Robotics
Bachelors in Robotics and Automation, PSG College of Technology, Coimbatore | CGPA: 8.61/10.0 Jun 2018 - May 2021

TECHNICAL SKILLS

Languages: Embedded C, C++, Python, MATLAB
Frameworks: Linux, ROS, OpenCV, Docker, Git, SOLIDWORKS, PyTorch, TensorFlow, PyBullet, NumPy, SciPy

PROFESSIONAL EXPERIENCE

Research Intern – Locomotor Control Systems Laboratory (Dr. Robert Gregg) Ann Arbor
Gait-state personalization through Factor Graph optimization in SLAM Aug 2024 – Present
- Formulating factor graph optimization framework to converge exoskeleton parameters to an individual's walking style.

Research Associate – Distributed Aerospace Systems and Control Laboratory (Dr. Dimitra Panagou) Ann Arbor
Automated compound pulley system for accurate VICON motion capture cameras calibration Jun 2024 – Jul 2024
- Reduced camera reprojection error by designing and deploying an automated calibration system with custom-made low-cost stepper motor-driven compound pulleys positioned at the corners of the three-story indoor flight space.
- Developed algorithms for calibration wand motion control and estimated pulley locations via non-linear optimization.

Research Student - University of Michigan Field Robotics Group (Dr. Katie Skinner) [Reports] Ann Arbor
Underwater 3D Reconstruction using Imaging Sonar and Monocular Camera via NeRFs Jun 2023 – Apr 2024
- Developed driver and visualizer for imaging sonar for real-world data acquisition employing ROS in Python and C++.
- Calibrated sonar and camera, deducing their transformation matrix and depth-scaling factor via non-linear optimization.
- Investigated Neural Implicit Representations, designed and conducted underwater experiments for benchmarking state-of-the-art 3D reconstruction models and extended Neusis by formulating a distance function reducing noise.

Shipwreck Localization and Ranking using Side-Scan-Sonar Jan 2023 – May 2023
- Developed an algorithm to compute the GPS coordinates with 30m resolution and 10m accuracy for shipwrecks.
- Formulated a confidence score via pixel-wise segmentation of shipwrecks to rank their sites for archaeological significance and incorporated it into the underwater exploration pipeline of Thunder Baby National Marine Sanctuary.

Robotics R&D Engineer - Hachidori Robotics Bengaluru
Software development for Autonomous Mobile Robots and Mobile Guided Vehicles Jul 2021 – Jun 2022
- Integrated Kalman Filter with IMU, limiting AMR positional drift to 1°, despite Local Positioning System signal dropout.
- Engineered Python and embedded C algorithms for omnidirectional mobility in mecanum-wheeled tele-operated MGV. Enabled variable speed control, joystick-guided linear motion and versatile trajectories for windmill blade cutting.

Intern - Indira Gandhi Centre for Atomic Research (Dr. Joseph Winston) [Publication] Kalpakkam
Real-time subassembly identification for nuclear reactor inspection by fusing IMU and camera Dec 2020 – Jun 2021
- Resolved spatial awareness challenges in reactor core inspections, arising from subassemblies hexagonal structure.
- Devised a spatial coordinates-based numbering system for subassemblies, developed a C++ algorithm to determine the inspection system orientation with 1° accuracy in real-time, and published this work after rigorous prototype testing.

ACADEMIC PROJECTS

Real-time exploration SLAM for a differential-drive robot fusing LIDAR and camera [Report] Nov 2023 – Dec 2023
- Built the robot with PD motor control, odometry with IMU error correction, visual servoing for obstacle avoidance and particle filter SLAM, innovating particle weight update with LIDAR rays using depth-constrained breadth-first search.

Automated block sorting and stacking via vision-guided manipulation [Report] Sep 2023 – Oct 2023
- Implemented and tested camera calibration, forward and inverse kinematics, vision system for block detection with 1mm detection accuracy and 7mm positional accuracy for a 5DoF manipulator and RGBD camera robotic system.

PUBLICATIONS

- Peter S, Sandilya SG, Ashwin S, **Nibarkavi NA**, Emaad G. Volume-DROID: A Real-Time Implementation of Volumetric Mapping with DROID-SLAM. Advances in Artificial Intelligence and Machine Learning. 2023; 3 (3): 73.
- Thirumalaesh A, **Nibarkavi NA**, Winston SJ, Jose J, Rathika PD. Real-time sub-assembly identification through IMU data fusion with vision sensor for an inspection system. International Journal of Nuclear Energy Science and Technology, 16(2), pp.80-96, 2023
- Shalikha R, **Nibarkavi NA**, Puhazhmathi M, Suresh M. Automation of Vehicle Door. International Research Journal of Automotive Technology, 3. 1-5. 10.34256/irjat2011, 2020.