

Education

Worcester Polytechnic Institute

Master of Science in Robotics Engineering | GPA 4/4

Worcester, MA

Aug 2022 - Present

Visvesvaraya National Institute of Technology

Bachelor of Technology in Electronics and Communication Engineering | GPA 8.45/10

Nagpur, India

Jul 2018 - May 2022

Skills

- **Languages:** Python, C, C++
- **Software:** OpenCV, Pytorch, Tensorflow, ROS/ROS2, Gazebo, Matlab, VREP, Linux, Git,Ubuntu.

Experience

Nokia Bell labs

Maths and Algorithm Intern

NJ,USA

Jun 2023 - Present

- Working of 3D reconstruction from images using deep learning.

ICS, Technische Universität Hamburg (TUHH),[Reference letter]

Robotics Summer Intern

Hamburg, Germany

May 2021 - Aug 2021

- Designed and generated biped walking gait trajectory using 3D Linear Inverted Pendulum Model (LIPM).
- Developed field endline detection and horizon detection method using traditional (computer vision) methods, also implemented a CNN based object detection algorithm.

Projects

- **Semantic Segmentation using Attention.[Github]:** Implemented and attention embedded U2Net based model for semantic segmentation.
- **Semantic Mapping for an Autonomous vehicle :** Training a U-Net neural network model for semantic labels to obtain a final semantic mapping.
- **Structure from Motion and NeRF [Github] :** Reconstructing a 3D scene and simultaneously obtain the camera poses of a monocular camera w.r.t. the given scene using traditional approach (Triangulation, PnP, Bundle Adjustment) and deep learning approach (NeRF).
- **AutoCalib [Github]:** Implemented Zhang's paper for camera calibration.
- **Panorama stitching [Github]:** Implemented panorama stitching algorithm using traditional homographic estimation and deep learning approach (HomographyNet).
- **FaceSwap [Github]:** Implemented Delaunay Triangulation and Thin Plate Spline (TPS) model for face warping, on the facial fiducial points.
- **Multi-agent Motion Planning for Non-Holonomic Mobile Robots via Heuristic Optimization.[Github]:** Designed a novel Multi Agent Path Finding algorithm using motion primitives for non-holonomic mobile robots with a new and improved heuristic approach.
- **Motion Planning[Github]:** Implemented algorithms like BFS, DFS, Dijkstras, Probabilistic road map, RRT, RRT*, A*, D* and informed RRT.
- **Robust Trajectory Tracking for UAV:** Implemented a Sliding Mode Controller for quadrotor in Crazyflie 2.0 platform for following a square trajectory.
- **Trajectory Generation, Feedback Linearization Control, Robust Control for the RRBot:** Generated a trajectory for the given initial and final positions and velocities using cubic polynomial and designed a Feedback Linearization and Robust controller to follow the desired trajectory.
- **SCARA Robot [Github]:** Designed and developed SACRA robot, which included implementing forward and inverse kinematics algorithm nodes in ROS2. Also implemented PID and velocity controllers for the robot's end effector.
- **Edge detection [Github]:** Implemented a simplified version of Probability based edge detection.
- **Reinforcement Learning [Github]:** Trained an agent using different versions of DQN and PPO to play Atari games.
- **Reconfigurable Quadrupedal Bipedal Snake Robot [video link][Nasa JPL Beacon Library]:** Developed snake robots that reconfigures itself into a quadrupedal and bipedal configuration. Designed transformation gaits using key-frame interpolation based approach. Used sinusoidal trajectory curve for generating serpentine locomotion and used ZMP and kinematic model to generate quadruped pedal walking gaits.
- **Controls and trajectory generation for walking gaits of Nimbro using 3D LIPM.[Link]:** Developed COM and swing leg trajectories using the 3D LIPM for biped walking, designed a PID controller for humanoid stabilization, and modeled a kicking algorithm using ZMP and kinematic modeling.
- **Edge detection, object detection and tracking for Nimbro [Link]:** Implemented Canny edge detection and horizon detection algorithm using traditional computer vision techniques (HSV masking and Hough line transform). Implemented YOLOV4 for object detection on the horizon detected video.

Publications

- H. Zade, **A. Varude**, K. Pandya, A. Kamat, S. Chiddarwar and R. Thakker, "ReQuBiS - Reconfigurable Quadrupedal-Bipedal Snake Robots," 2021 IEEE 17th International Conference on Automation Science and Engineering (CASE), 2021, pp. 2241-2246, doi: 10.1109/CASE49439.2021.9551526.
- International Conference on Advances in Mechanical Engineering, ICAME. Rishabh Runwal, Shivraj Dhonde, Jatin Pardhi, Suraj Kumar, **Aadesh Varude** (2021) Hand Gesture Control of Computer
- Dakhale, B. J., **Varude, A.**, Deshmukh, G., Bhurane, A. A., Kothari, A. G. (2022). Evolution of Hardware Trojans: Structure, Taxonomy, Countermeasures and Challenges. Telematique, 6369-6393.

Course Work

- **Robotics:** Computer Vision (RBE 549), Reinforcement Learning (CS 549), Robot Controls (RBE 502), Deep Learning (CS 541), Controls of Mobile robots (Coursera) Controls Boot Camp (Steve Bruton.)
- **Mathematics:** Probability, Differential Calculus, Linear Algebra, Matrix Theory, Vector Calculus, Statistics and Optimization.