Rohit Bhikule

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Education

- **University of Pennsylvania** — Philadelphia, PA
  Master of Science in Mechanical Engineering and Applied Mechanics (Robotics); GPA: 3.7 — *Aug. 2021 – May. 2023*
- **University of Pune** — Pune, India
  Bachelor of Technology in Mechanical Engineering; GPA: 3.75 — *Aug. 2016 – Oct. 2020*

Skills

- **Languages**: C/C++, Python, Matlab, Arduino
- **Frameworks**: ROS, ROS2, Linux, Git, Docker, Pytorch, Numpy, OpenCV, Matplotlib, sklearn, Open3D, Drake
- **Application Software**: Solidworks, Catia, Creo, HyperWorks, Ansys, Autodesk
- **Leadership experience**: Led a team of 20 members to design and manufacture a go-kart (Gokarting team, Pune University) and competed in national competitions. Achieved 3rd place in ISK-2019, 4th place in IKC-19, 1st place in KDC-19 (also won Best Design prize).

Experience

- **Skymul (Atlanta, GA)** | *Robotics Intern (Vision, Perception)* | *Github, Video* — *May 2022 - Aug 2022*
  - Built a novel algorithm to detect rebar intersections and pose from noisy pointclouds real-time (6 FPS) in a densely multilayered rebar network on quadraped robot. Scripted algorithm to increase confidence score of rebars in pointclouds obtained by photogrammetry.
  - Explored use of factor-graphs to solve odometry drift problem and achieve accuracy within 5 mm using gtsam package
- **mLAB - Autonomous Gokart (GRASP, UPenn)** | *Research Assistant* — *Jan 2023 - Present*
  - **Localization** : Working on sensor fusion of LiDAR, Camera, IMU, GPS to perform localization on the gokart. Exploring use of traffic cones as landmarks to implement graph-SLAM for localization on racetrack.
- **Eaton India Innovation Centre (Pune, India)** | *Associate Engineer* — *Mar 2021 - Aug 2021*
  - Designed Valvetrain system for Diesel HLA (Hydraulic Lash Adjuster) in Off-road vehicles. Assisted testing and design validation of Engine Valvetrain components of commercial and off-road vehicles

Projects

- **Object Detection and Instance Segmentation** | *Skills: Pytorch, OpenCV, CUDA, Feature Pyramid Network (FPN)*
  - **MaskRCNN** : Implemented a FPN based two-staged model to predict instance segmentation masks. *Github*
  - **SOLO** : Implemented FPN based model *(Segmenting objects by location)* to predict segmentation masks. *Github*
  - **YOLO** : Scripted YOLOv1 object detection pipeline from scratch in Pytorch to predict classes and bounding boxes for detecting pedestrians, cars and traffic lights. MAP acheived: 0.43. *Github*
- **Semantic mapping and Pointpainting** | *Skills: Pointcloud, Sensor fusion, Pytorch, SegFormer* *Github*
  Fused LiDAR and Camera data to paint pointcloud as per semantic information from images to classify each point. Obtained the BEV for the autonomous vehicle. *Video*
- **Localization and Estimation** | *Skills: Particle Filter, UKF, EKF, Visual-inertial odometry*
  - **SLAM** : Integrated the orientation and odometry information from IMU and 2D LIDAR scan to build occupancy grip map of environment by updating the log odds while simultaneously performing particle filter based localization. *Github*
  - **3D Orientation tracking** : Implemented a Quaternion based Unscented Kalman filter to track 3D orientation from IMU data and compared it against ground truth data obtained from motion capture system. *Github*
  - **Visual Inertial Odometry** : Implemented controller on quadrotor to follow path obtained by A*. Fused the IMU and stereo pair information to estimate 3D pose of a flying robot using two different algorithms - Error State Kalman Filter(ESKF) and Multistate Constraint Kalman Filter(MSCKF). *Github*
- **Controls and Planning** | *Skills: MPC, LQR, iLQR, Value iteration, Drake solver, Gazebo*
  - **MPC manipulator arm** : Implemented MPC controller on 7 DoF manipulator arm to plan collision-free trajectories in an obstacle cluttered environment. Also, implemented forward kinematics, inverse kinematics to grasp dynamic blocks by detecting Apriltags on their faces. Path-planning using potential fields. *Github*
- **3D Reconstruction from images** | *Skills: Pointcloud, 3D geometric math, SfM (Structure from Motion)* *Github*
  Worked on Projective transformations, PnP and Procrustes algorithms, SfM, Optical flow, two-view/multi-view geometry with stereo cameras to recreate 3D scene.