Rohit Bhikule

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Education

- **University of Pennsylvania** — Philadelphia, PA
  Master of Science in Mechanical Engineering and Applied Mechanics (Robotics); GPA: 3.76 — *Aug. 2021 – May. 2023*
- **University of Pune** — Pune, India
  Bachelor of Technology in Mechanical Engineering; GPA: 3.75 — *Aug. 2016 – Oct. 2020*

Experience

- **Terran Robotics (Bloomington, IN)** | *Robotics Software Engineer* — *June 2023 - Present*
  - Developed a custom GTSAM-based SLAM solution to localize cable-driven parallel robots using AprilTags and encoder data, and implemented a parallel processing pipeline with distributed computing framework python ray in ROS to achieve 10 Hz pose output with 5 mm accuracy.
  - Designed and implemented adaptive algorithm to autonomously perform pick-and-place operations on earthern-clay blobs and hammer them into walls using pointcloud data, utilized a neural network to predict the depthmap based on the hammer hits and optimize hits accordingly, resulted in 30 perecent faster speed.
  - Scripted python deployment scripts for maintaining and managing services across kubernetes cluster for robot operations. Setup CAN communication between motor controllers and server.
  - Scripted pipeline to convert stl CAD files of house walls to 2-dimensional goal depth maps and plan operations.
- **Skymul (Atlanta, GA)** | *Robotics Intern (Vision, Perception)* | *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. Developed algorithm to increase confidence score of rebars in pointclouds obtained by photogrammetry.
- **F1/10th Autonomous Racing (mLAB UPenn, PA)** — *Jan 2023 - May 2023*
  - Acheived **1st** place in the 12th F1Tenth Autonomous Grand Prix at the CPS-IoT 2023 conference by implementing a finite state machine to switch between overtaking, adaptive cruise control and pure pursuit modes on an F1Tenth car.

Projects

- **Computer vision deep learning frameworks** | *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 pipeline from scratch in Pytorch to predict bounding boxes. MAP achieved: 0.43. *Github*
  - **NeRF** : Implemented tiny_nerf pipeline in Pytorch to generate novel views of scene and pointcloud. *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 using SegFormer NN (Transformers-based) on KITTI dataset. Obtained the BEV for the autonomous vehicle. *Video*
- **Local-INN localization fused with IMU using UKF** | *Skills: INN, UKF, IMU* *Paper*
  Improved accuracy of Invertible neural network to output pose from 2D lidar scans by fusing it with IMU using Unscented Kalman Filter to remove false positive pose estimates. Validated results by testing on F1tenth car. *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*
- **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.

Skills

- **Languages**: C/C++, Python, Matlab, Arduino
- **Frameworks**: ROS, ROS2, Kubernetes, Docker, Git, Linux, Pytorch, Numpy, OpenCV, Open3D, redis