Shasa Antao

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EDUCATION

CARNEGIE MELLON UNIVERSITY - SCHOOL OF COMPUTER SCIENCE — Pittsburgh, PA
Master of Science in Robotic Systems Development — Aug 2019 - May 2021

Selected Coursework
Computer Vision, Geometric methods in Vision, SLAM, Machine Learning, Visual Learning & Recognition, Computer Graphics

WORK EXPERIENCE

ONWARD ROBOTICS — Pittsburgh, PA
Senior Perception Engineer — Aug 2023 - Present

- Leading the design and implementation of a Simultaneous Localization and Mapping (SLAM) system using LiDAR, camera, & IMU sensors, based on LVI-SAM, deployable on an NVIDIA Orin NX, for an Autonomous Mobile Robot (AMR) in warehouses
- Altering LVI-SAM's visual odometry subsystem by substituting VINS-MONO to better utilize a stereo camera and to improve fusion of camera key frames and IMU pre-integration values
- Conducting technical program management activities such as formulating engineering requirements, establishing a program roadmap, lifecycle analysis, & risk management for the proposed localization system
- Architecting software framework for the flow and fusion of multi sensor data into the localization subsystem of the robot
- Selected sensors through a requirements driven process involving software and hardware prototyping & benchmarking
- Constructed a pipeline to convert a pre-generated KISS-ICP 3D map from an Ouster OS0 into a bird's eye 2D map of a warehouse by fusing bounding boxes and contours of point cloud clusters

THORDRIVE INC — Cincinnati, OH
Senior Perception Engineer — Aug 2021 - Mar 2023

- Designed, deployed & drove requirements engg. for perception algorithms in autonomous driving for airport baggage tugs
- Innovated a Deep Learning based 3D object detection pipeline for LiDAR data for the airfield based on PointPillars with a DLA-34 backbone which resulted in stable bounding boxes and a 72.67 3D mAP score on a custom dataset
- Integrated NDT LiDAR scan match localization with RTK INS using an Extended Kalman Filter to increase position accuracy by 28 % to within 7 cm of ground truth and prevent loss of localization in sparse point areas
- Prototyped Visual Inertial Odometry (VIO) techniques for localization robustness & proposed SLAM architecture based on factor graphs using GTSAM and g2o frameworks to transition from use of pre-maps and LiDAR scan matching
- Led transition to new object detection module (CenterNet) for RGB & thermal cameras resulting in higher mAP score and increased performance by 45 %. Constructed a training pipeline and ONNX-TensorRT inference scripts for the same
- Worked with lower level TensorRT 7 & 8 APIs and modified plugin architecture for transition from CUDA 10 to CUDA 11
- Supervised collaboration with a data annotation company by continually tracking requirements and creating annotation guidelines for object detection and segmentation tasks for RGB & Thermal cameras and LiDAR data

ALERT INNOVATION — North Billerica, MA
Machine Vision Intern — Jun 2020 - Aug 2020

- Developed a "Product Dimensioning" algorithm in Python using point cloud information from a Time-of-Flight camera for an automated warehousing application. Product dimensions are calculated with millimeter precision and a max error of 15%
- Created approach that trims the point cloud to a specific region of interest, uses RANSAC to calculate the base plane equation of the tote, and uses Principal Component Analysis (PCA) to establish the axes of measurement

ROBERT BOSCH — Bangalore, India
Product Development Engineer — Sep 2017 - Jun 2019

PROJECTS

Object Detection with One Shot Learning on 3D Data (Link) — CMU | Feb 2021 - May 2021

- Changed the architecture of VoxelRCNN that takes in point cloud data, to be able to perform one shot learning
- Novel use of non-local feature map generation by performing block matching on query and target 2D feature maps

Depth Estimation-aided Monocular SLAM — CMU | Feb 2021 - May 2021

- Integrated VNL, a depth estimation CNN, with ORB SLAM3 to boost accuracy of monocular SLAM systems
- Increased trajectory tracking accuracy by 23% over traditional RGB SLAM, when tested on TUM- RGBD dataset

Autonomous Driving for Adverse Perceived Terrain (Link) — CMU | Oct 2019 - Dec 2020

- Augmented a $1/5^{th}$ scaled vehicle with a custom built enclosure that can perceive wet road conditions, localize itself, and autonomously plan and navigate extreme traversals in real-time
- Implemented geometry-based puddle detection algorithm using polarization filters on a ZED stereo camera obtaining image features from disparity map and a Gaussian Mixture Model (GMM) classifier
- Setup working compute environment on NVIDIA Jetson Xavier, on-board computer for the autonomous vehicle

SKILLS

Programming: C++ • Python • OpenCV • Open3D • Pytorch • scikit-learn • TensorRT • CUDA • ONNX • ROS
Project Management & Version Control: Jira • Confluence • GitHub • Bitbucket