Jiasen Zheng

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Education

Northwestern University — Evanston, IL
Master of Science in Robotics (3.95/4.00) — *Sep. 2021 – Dec. 2022*

Union College — Schenectady, NY
Bachelor of Science in Mechanical Engineering (Departmental Honors) — *Sep. 2015 – June 2019*

Related Experience

Software Engineer Intern | Mach9 Robotics | *Pittsburgh, PA* — June 2022 – Sep. 2022

Automated a targetless (RGB and Thermal) camera-lidar calibration pipeline

- Wrote python scripts to streamline processes, including image/ point clouds selection, data processing, parameter tuning, and result writing to reduce user intervention, which saved 90% of operational time
- Created an interactive parameter tuning tool in C++ using ROS dynamic reconfiguration for edge extractions and initial extrinsic, resulting in faster converging and more accurate results in the calibration
- Integrated the calibration package to adopt thermal camera-lidar calibrations

Created and validated the simultaneous localization and mapping (SLAM) and GPS stack for high-defination 3D map

- Brought up a GPS module with dual antennas and multi-sensor fusion capabilities, connected to a private Real Time Kinematics (RTK) station
- Aligned GPS trajectories collected from different devices and computed their absolute/ relative pose errors for GPS accuracy evaluation using python
- For SLAM evaluation, developed an efficient landmark detector in C++ for manholes in 3D space using PCL region growing segmentation and RANSAC, which has a detection accuracy higher than 85%
- Made a user-friendly interface in C++ for picking features in the point cloud space for a more general landmark accuracy comparison

Supported the company's image annotation framework by enabling pre-labeling, which increased the labeling efficiency

- Selected images that would most benefit the CNN model base on the results from model inference automatically using heuristic approaches and python
- Created an inference server using REST API and hosted it on AWS Sagemaker

Wrote background subtraction algorithm in C++ using a statistical approach for lidar point

- removed ego-vehicle points and reflections, which improves the SLAM map quality

Projects

Point Cloud Object Detection and Pose Estimation | *C++, ROS, Pytorch (ongoing)* — Spring/Fall 2022

- Built a multiple lidar camera perception platform with pixel-level accurate calibrations between sensors with hardware time synchronizations
- Merged point clouds from multiple lidars and projected RGB pixels to generate a photo-realistic 3D colored model
- Implemented an image collection/annotation pipeline using CVAT with fully-automated model inference to improve labeling efficiency and trained an instance segmentation CNN model using Detectron2 (Pytorch)
- Projected the image labels to point cloud space and estimated the object pose using point cloud registration

Extended Kalman Filter SLAM on Turtlebot3 | *C++, Docker, ROS* — Winter 2021

- Developed a feature-based EKF SLAM package from scratch using C++ and Robot Operating System (ROS) in both simulation and real robot
- Wrote a control library for differential drive robot and implemented a landmark detection algorithm using supervised learning with data association

Stereo Visual Odometry on KITTI Dataset | *Python, OpenCV* — Fall 2021

- Created visual odometry with a stereo camera setup on the KITTI dataset using Python
- Calculated disparity maps and performed feature extractions using SIFT in OpenCV
- Applied RANSAC solver to determine the 3D rigid body transform between each frame
- Estimated the position and orientation of the vehicle within a reasonable drift (lower than 50m at loop closure)

Technical Skills

Languages: C++, Python, C, Bash, Matlab **CAD**: SolidWorks, AutoCAD
Developer Tools: Git, Docker, AWS, ROS/ROS2, Pytorch (Detectron2), Tensorflow (Keras), OpenCV, PCL
Sensors: Lidar, RGB/Thermal Camera, IMU, GPS (RTK) **Calibrations**: Lidar-Lidar, Lidar-Camera