KARTIK MADHIRA

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EXPERIENCE

Senior Computer Vision Engineer, Innovasea Systems, Boston *Jan 2021 - Present*

- Designing and implementing underwater perception pipelines for accurate biomass estimation of fish using stereo cameras. The pipeline uses a mix of traditional and deep-learning based computer vision for a balanced trade-off in accuracy and speed.
- Carried out various R&D works for underwater perception - Underwater 3D mapping, fish health analysis, fish 3D reconstruction, etc.
- Headed software evaluation, testing, and final pick of stereo cameras for Innovasea V1 and V2 stereo cameras.
- Created a software ecosystem for continuous feedback and updates from and to the algorithm respectively including active learning for adding dataset. Helped the team in achieving a 17% improvement in estimation accuracy and 45% in saving time for post-camera deployment analysis.

Computer Vision Engineer, Vecna Robotics, Boston *Aug 2020 - Dec 2020*

- Implemented perception pipeline prototype for robustly detecting the pose of warehouse payloads from a forklift robot equipped with a lidar and a camera.
- Implemented a metrics dashboard to track the accuracy of deep-learning models deployed in the pipeline and achieved 17% mAP increase simply by tracking the dashboard.

Research Assistant, RAAS Lab, University of Maryland *Jan 2020 - Aug 2020*

- Implemented end-to-end perception pipeline (Gazebo ROS environment) for UAV based autonomous infrastructure inspection. The sensor module includes a 3D Lidar (VLP-16) and a monocular camera.
- Perception pipeline involves semantic understanding of the environment where the infrastructure is present and catering as the input to the planning pipeline.

Perception Intern, Aeva Inc., Mountain View *May 2019 - Aug 2019*

- Implemented object tracking and detection feedback tracker for the perception pipeline.
- Worked on end to end metrics to set benchmarks for tracker and classifier improvements.

PROJECTS

Visual - SLAM

- Fun re-implementation of the ORB-SLAM paper by Raul et al. for stereo camera.
- PnP and Bundle adjustment custom implementation using Sophus and g2o.
- Mapping and tracking were implemented by simplifying some of the methods in the paper. All are implemented in C++.
- Benchmarked odometry accuracy for the KITTI dataset.

SnapCut/Rotobrush

- Implemented Adobe After Effects segmentation pipeline SnapCut, a robust video object cutout using localized classifiers.

Structure from Motion (SfM)

- 3D reconstruction of floor structure from multiple snaps taken from a flying quadrotor. To simplify the textureless problem, AprilTags were used on the floor.

EDUCATION

Master of Engineering, Robotics *Aug 2018 - May 2020*
University of Maryland : 3.96

Bachelors in Technology, Instrumentation and Control Engineering *Jul 2013 - Aug 2017*
Nirma University : 3.8

SKILLS

Computer Vision: Visual odometry, Object segmentation, Object detection, Visual SLAM, Structure from Motion (SfM), Calibration, NeRF, Dense stereo, Depth estimation, Object Tracking
Lidar & Radar: Point Cloud Processing, Sparse Mapping, Sensor Fusion, Radar based tracking
Softwares/Libraries: OpenCV, PyTorch, TensorFlow , PCL, Keras, Boost, Agile Iterative Process (AIP), Robot Operating System (ROS), NumPy, Eigen, TensorRT, g2o, Sophus
Computer Languages: C++, Python, MATLAB