Implementation of Probabilistic Fusion of Sparse 3D LIDAR and Dense Stereo
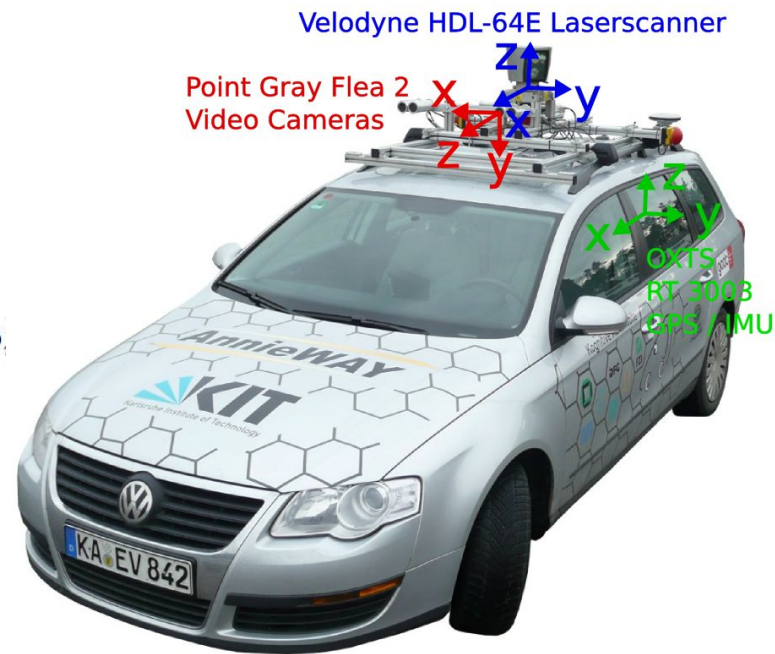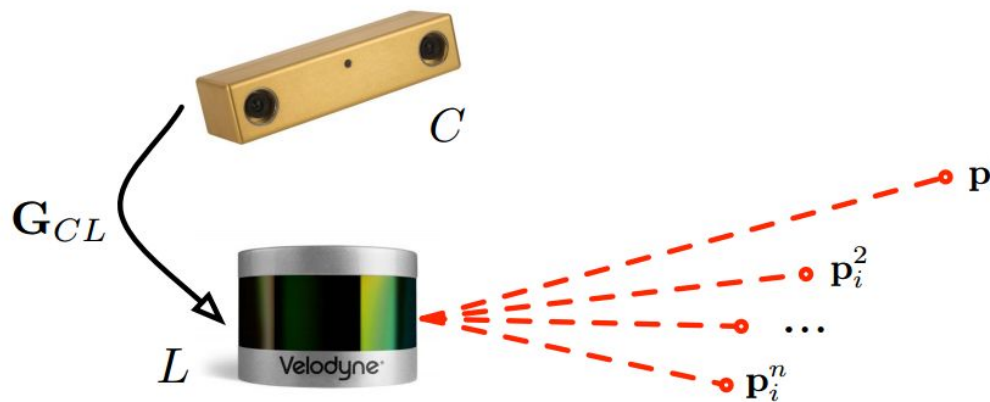
Nicholas and Patrick Geneva

Background

The KITTI Vision Benchmark Suite

Problem

- 3D LIDAR Sensor
  - 300K points per second

- Stereo Camera Pair
  - 500K points per second

- Real-time constraints
  - Process faster then sensor collection speed
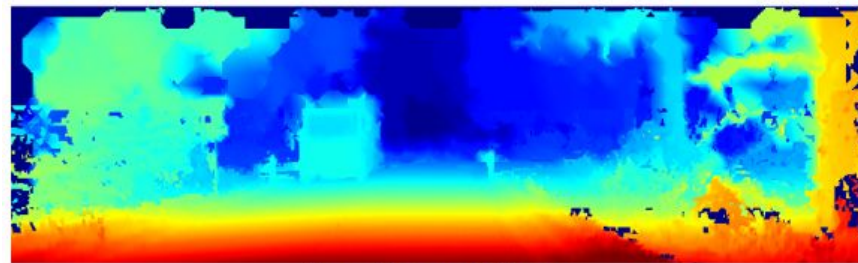 - Large data challenge

Plan of Action

- Following work of Maddern et al.

- Combine sparse and dense sensors

- Reduce the overall computation time for computing a depth map


Input Image

Combined Prior

W. Maddern and P. Newman. "Real-time probabilistic fusion of sparse 3d lidar and dense stereo." In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Daejeon, South Korea, October 2016

Plan of Action

- Limit problem to semester timeframe

- Implement the calculation of just a sparse stereo depth map

- Need a GPU for real-time calculations

- Implementation of fast triangulation of the two stereo images

Stereo pair
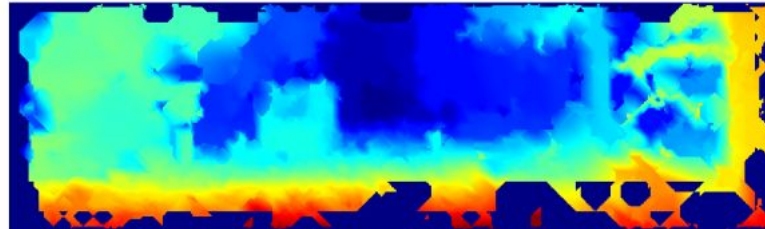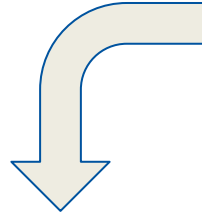
Depth Map

Planned Results

- Calculate sparse depth maps of stereo and LIDAR if time permits

- Compare computational time to Maddern et al.

- Release source code to public

KITTI DATASET COMPUTATION TIME

Method	AMD R9 M370X 50W	AMD R9 295x2 450W
Stereo	84.91ms	19.81ms
Stereo+Pyr	86.975ms	21.39ms
Lidar	33.63ms	8.69ms
Lidar+Pyr	34.97ms	9.83ms
Combined	96.44ms	23.01ms
Combined+Pyr	98.05ms	24.35ms