Stereo Visual Odometry

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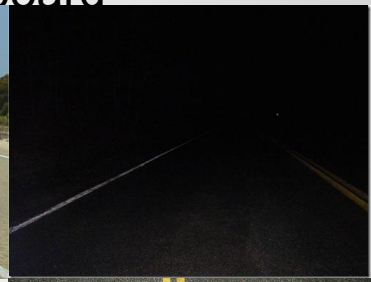
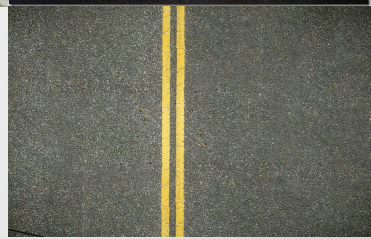
Visual Odometry

VO is the process of incrementally estimating the pose of the vehicle by examining the changes that motion induces on the images of its onboard cameras





Assumptions

1. Sufficient illumination in the environment
2. Dominance of static scene over the moving objects
3. Enough texture to allow apparent motion to be extracted
4. Sufficient scene overlap between successive frames

Why VO?

- Contrary to wheel odometry VO is unaffected by wheel slip
- More accurate trajectory estimates vs. wheel odometry (relative error of .1%-2%)
- VO can be used as a complement to
  - Wheel odometry
  - GPS
  - IMU
  - Laser odometry

Stereo image sequence

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Feature Extraction (Harris)

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Feature Matching (Circular Match)

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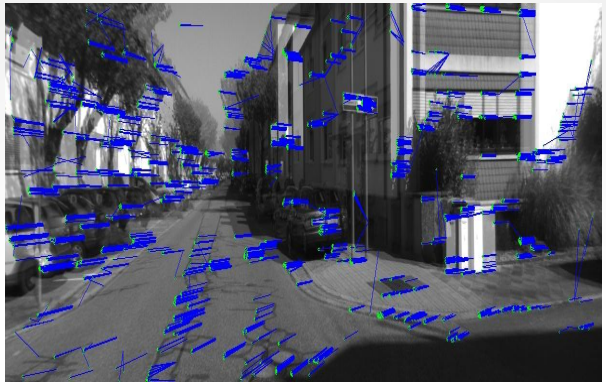
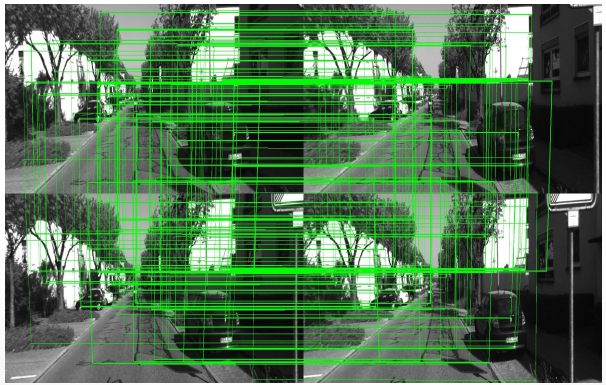
Motion Estimation (3d-to-3d, 3d-to-2d)



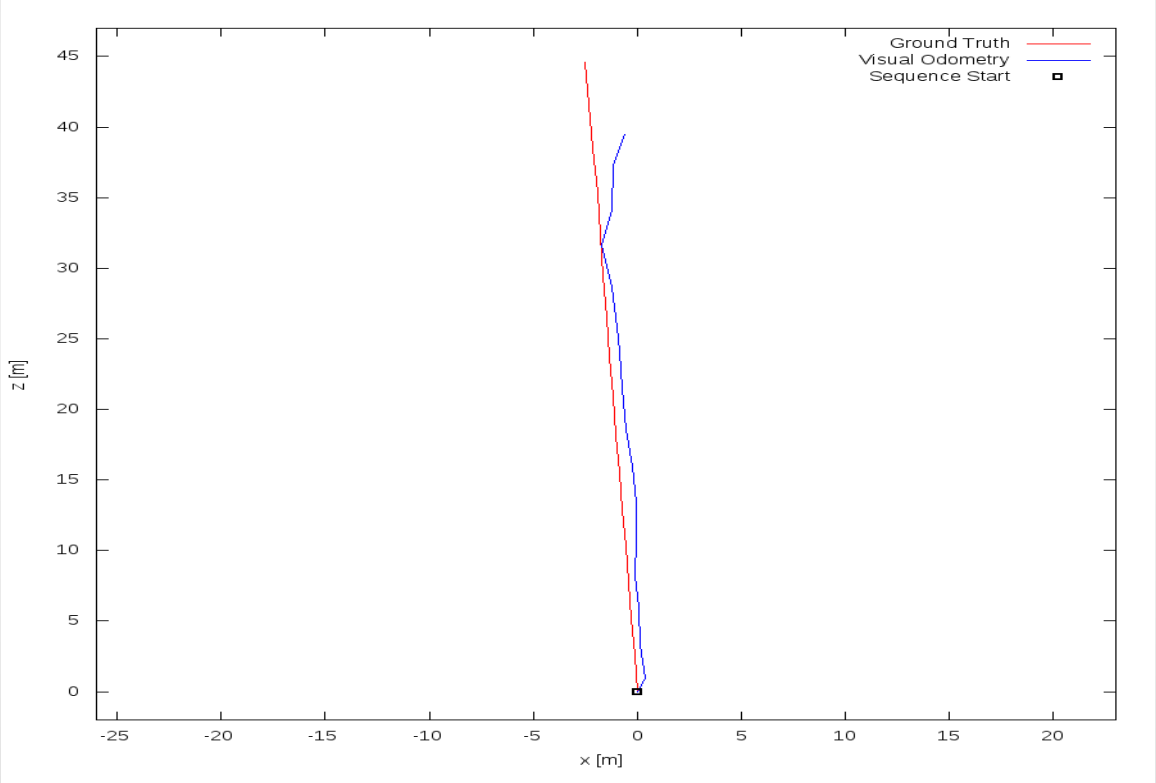


Algorithm Flow Chart

Status and challenges

- Most major building blocks are implemented
- WIP to get to state of the art results
- Some additional features need to implemented
- Outliers
- Feature localization
- Better motion estimation (NLLS)

Path example



Q&A

Thanks