Final Projects

Applied Computer Vision for Robotics

12.6.2014
Organisation

- 4 Weeks
- 17.06.2014: Presentation of Project Roadmap
- 2 Status meetings
- 08.07.2014 Final Presentation
Key Frame based SLAM

- Key Frame matching strategies for improved performance
- Create a feature map of the environment
- Kinect/Stereo/Mono
- Motionmodel, Filtering, 3D-3D, 3D-2D, Global Optimization
Object detection and pose estimation using Features and PnP

- Extract features from known object and their 3D position (e.g. box and 2D offset)
- Detect features and use 3D-2D correspondences with RANSAC to estimate object pose

Binary Descriptors

- Try more complex binary features
- Experiment with different schemes and perform an in detail evaluation

$$I_2 - I_1 > 0$$

$$w_1 \cdot I_1 + w_2 \cdot I_2 > \tau$$

$$\sum_{i} w_i \cdot I_i > \tau$$
Locally Sensitive Hashing

- Instead of performing a quadratic search to perform feature matching we can also apply hashing.
- Evaluate and/or try Locally Sensitive hashing for different scenarios.
- Try different hashing strategies for binary descriptors.
Freespace, Ground-plane estimation and IPM

- Use stereo setup to estimate freespace
- Estimate ground plane
- Perform inverse perspective mapping of the ground plane

SGM (+Plane Sweep)

- Well known and good dense stereo algorithm
- CVPR2014 paper with several extensions and nice ideas (feature matching initialization, planes, local tiles)

Ferns for traffic sign detection

- Keypoint recognition with learning phase - train special descriptors for certain templates
- Use learned descriptor for e.g. traffic sign detection, template detection

## Overview

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