

Robotics and  
Embedded Systems

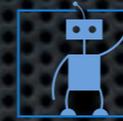


# Final Projects

**Applied Computer Vision for Robotics**

18.12.2013

# Organisation

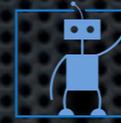


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- ✦ 5 Weeks
- ✦ 08.01.2014: Presentation of Project Roadmap
- ✦ 3 Status meetings (15, 22, 29.01)
- ✦ Final Presentation (05.02.2014)

# Five Shades of Gray



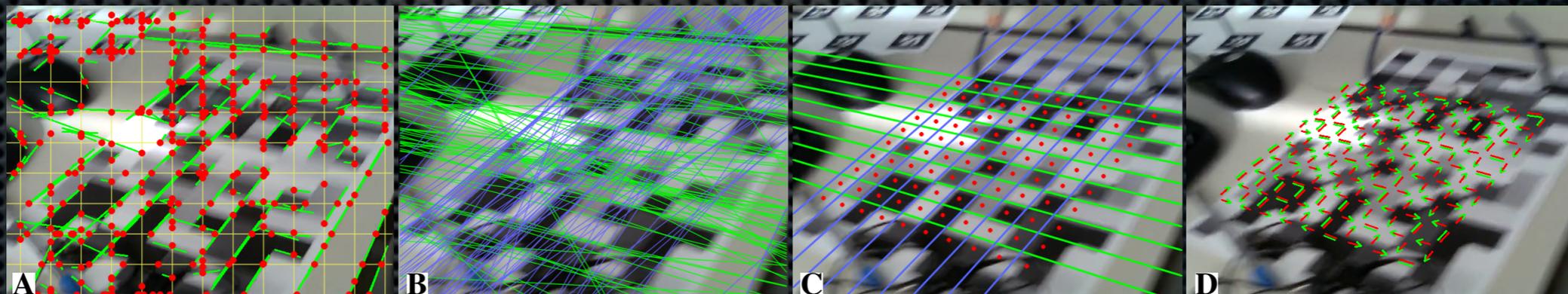
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- ✦ Detect marker in image
- ✦ Useful for camera pose estimation

- ✦ Very recent paper:

<http://www.fit.vutbr.cz/~izacharias/papers/2013-CVPR-UMF.pdf>



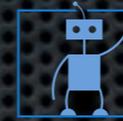
# SLIC Superpixels

- ✦ Simple Linear Iterative Clustering
- ✦ Over segmentation into coherent image regions
- ✦ Applications in labeling, stereo, feature matching



- ✦ <http://ivrg.epfl.ch/research/superpixels>

# Evaluation of various binary descriptors using a systematic approach

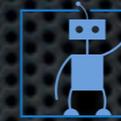


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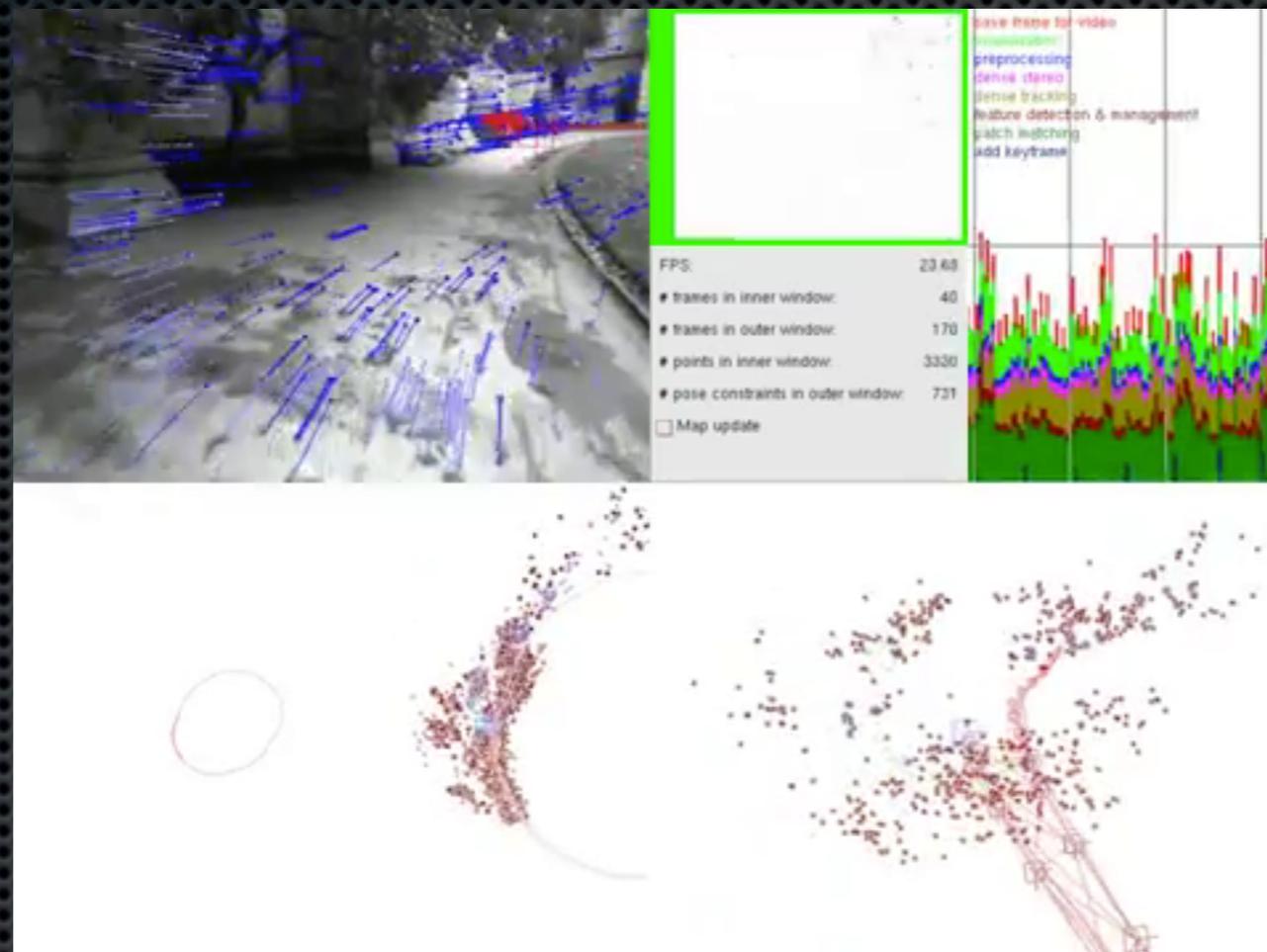


- ✦ Instead of just using the difference of two regions the idea is to “try” the combination of more regions, different sizes, filters etc.
- ✦ Systematic evaluation of many possible combinations using a big dataset
- ✦ Find a better descriptor!

# Key Frame based SLAM

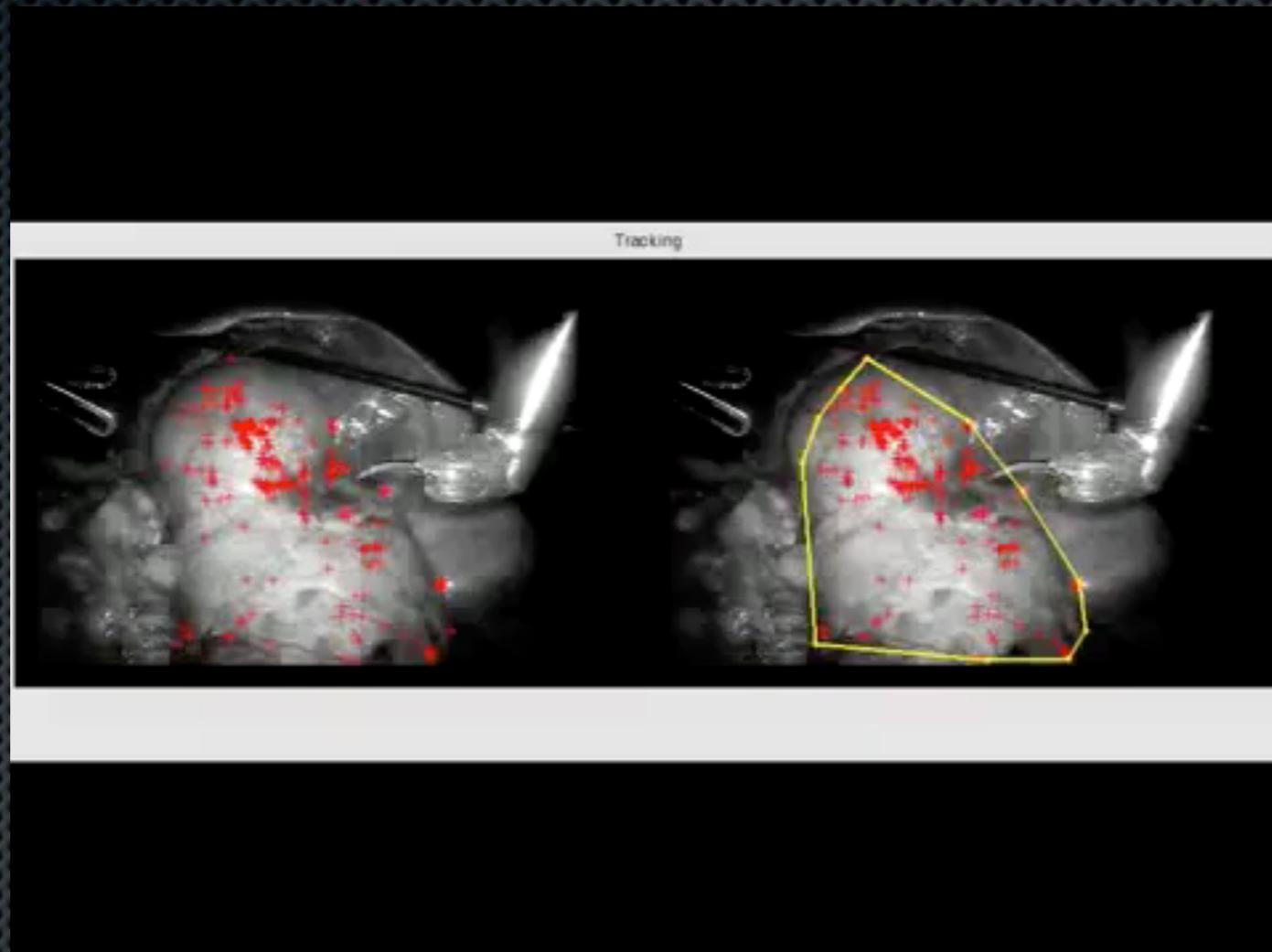


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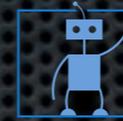
- Key Frame matching strategies for improved performance
- Create a feature map of the environment

# Adaptive Multi-Affine Feature Matching



- Adaptively find regions with similar optical flow between frames.
- Special feature matching strategy using geometric constraints

# Overview



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Topic	Short Description	Assigned Team
Five Shades of Gray	Template Detection & Tracking	
SLIC Superpixels	Simple Linear Iterative Clustering into coherent image regions	
Systematic evaluation of binary descriptors	Feature Descriptor Development	
Key Frame based SLAM	Simultaneous Localization and Mapping using key frames	
Adaptive Multi-Affine Feature Matching	Feature Matching Strategy with geometric constraints	