

Robotics and
Embedded Systems



Applied Computer Vision for Robotics

30.10.2013

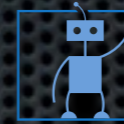
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Features

- ✦ Normally split into a detector and descriptor
- ✦ The detector only finds points of interests
- ✦ The descriptor is extracted around a keypoint to allow comparison and matching
- ✦ Usual feature pipeline:
 - ✦ Detect features
 - ✦ Build descriptor
 - ✦ Use descriptors for matching

Features



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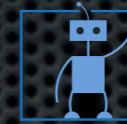
- Exemplary applications
 - Panorama stitching
 - Template tracking
 - Visual Odometry/SLAM

Features

- ✦ Panorama stitching:
 - ✦ Pure rotation of the camera assumed
 - ✦ Correspondences allow homography estimation



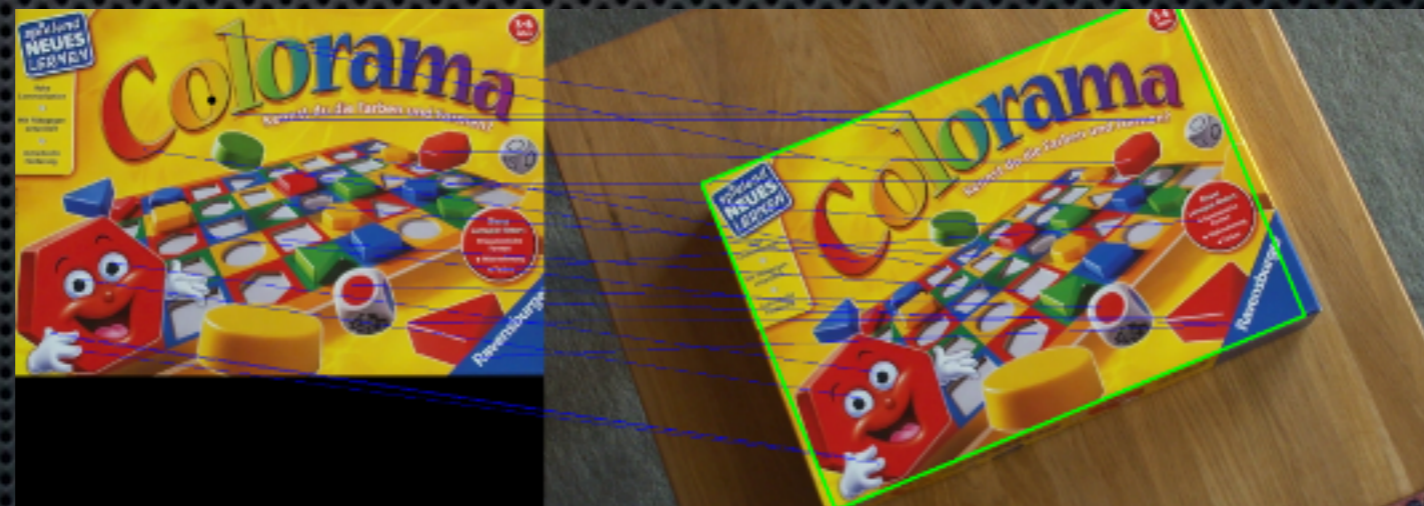
Features



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- Template tracking:
 - Features of a template are matched to features extracted from video stream
 - Use correspondences to estimate homography

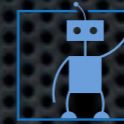


Features

- ✦ Visual Odometry/SLAM
 - ✦ use features to estimate relative movement between frames
 - ✦ build map of 3d features to locate yourself
 - ✦ more details in sheet 3



Sheet 2

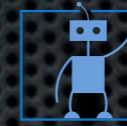


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- Sheet 2 is mainly about descriptors
- Goal: find a way to describe the keypoint in order to compare it with other keypoints

MOPS



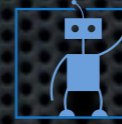
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- ✦ Multi-Scale Oriented Patches
- ✦ Rotate the patch using the found orientation and on multiple scales
- ✦ We just use the smoothed intensities for comparison (original: haar coefficients)
- ✦ To compensate for brightness changes it is a good idea to normalize the patch



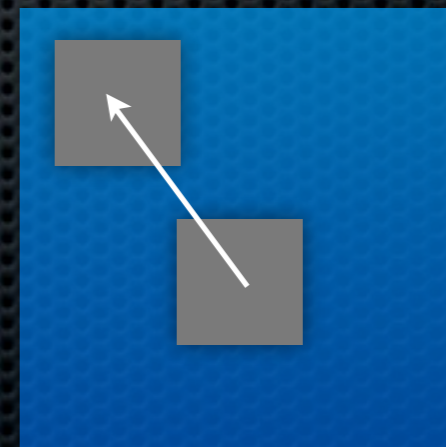
Binary descriptors



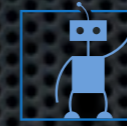
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- ✦ Descriptor only contains the result of brightness comparisons of patch areas
- ✦ Many comparisons get combined and form a binary descriptor
- ✦ Distance measured using Hamming distance
- ✦ Orientation also useful to consider



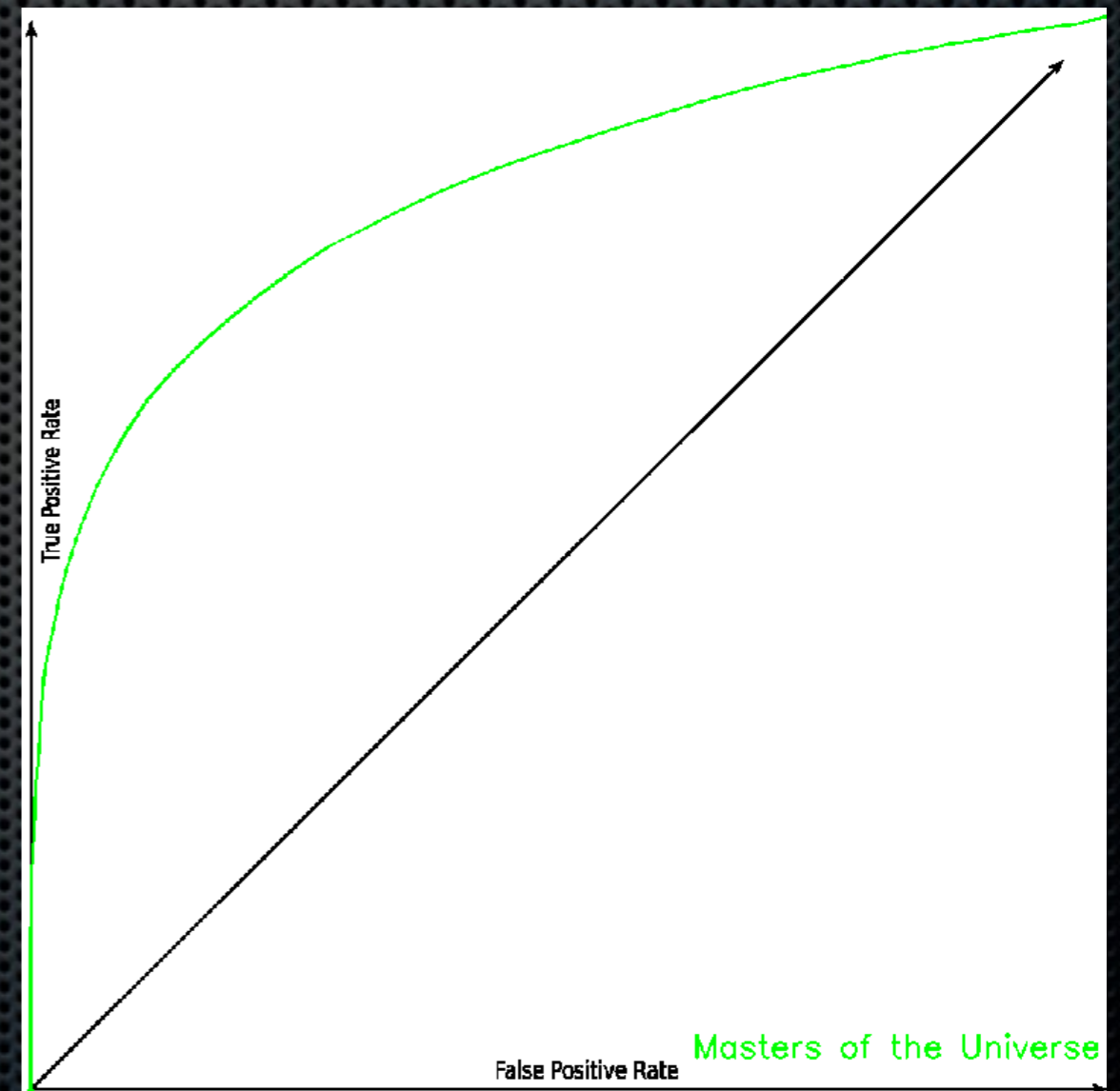
ROC Curve



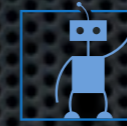
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- ✦ is a graphical plot which illustrates the performance of a binary classifier system
- ✦ plot of the true positive rate against the false positive rate for increasing descriptor distance thresholds



ROC Challenge



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- ✦ Competition between the teams
- ✦ Experiment to find best performing descriptor

