

Vorbesprechung Hauptseminar Sommersemester 2009

Real-time Visual Tracking Techniques

Betreuer:

Giorgio Panin, PhD; Dipl.-Ing. Claus Lenz; Thorsten Röder, M.Sc.

Model-Based visual Tracking

From Wikipedia:

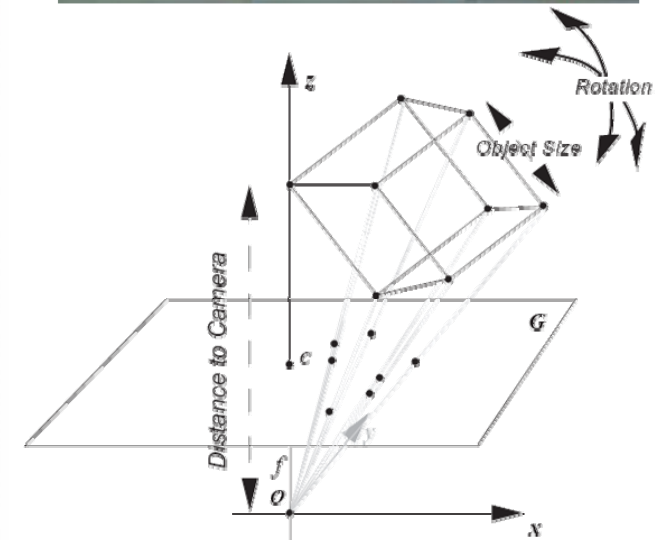
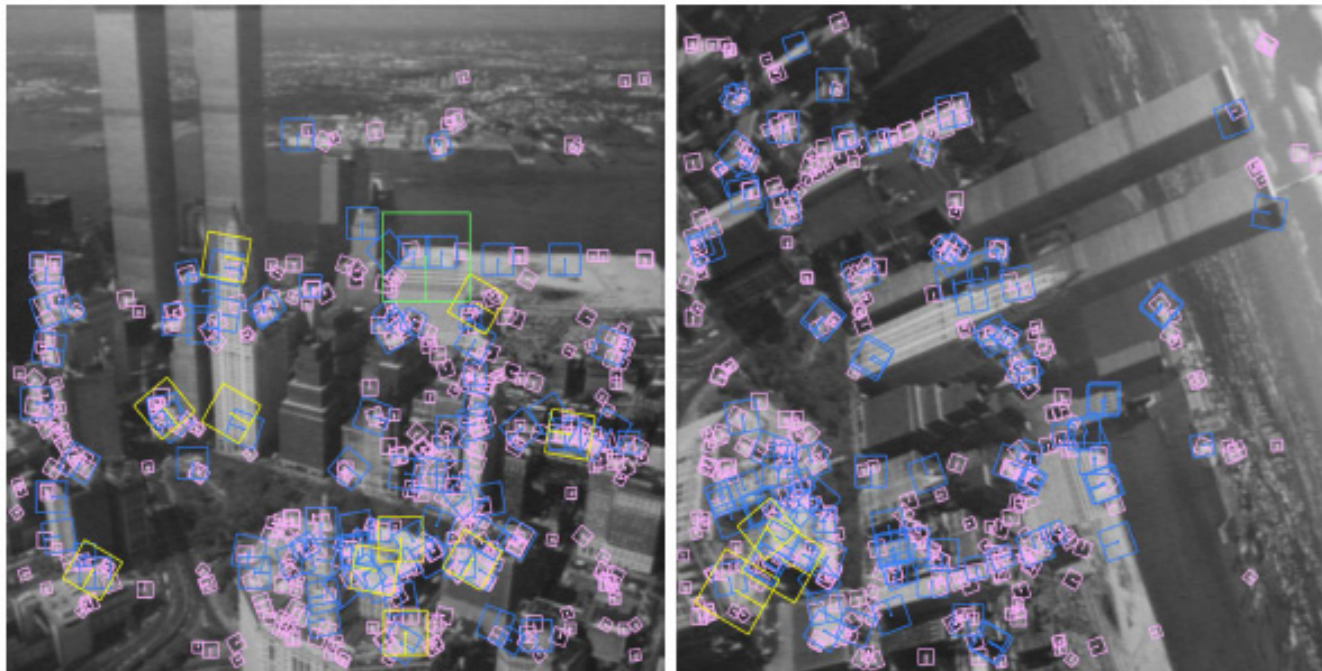
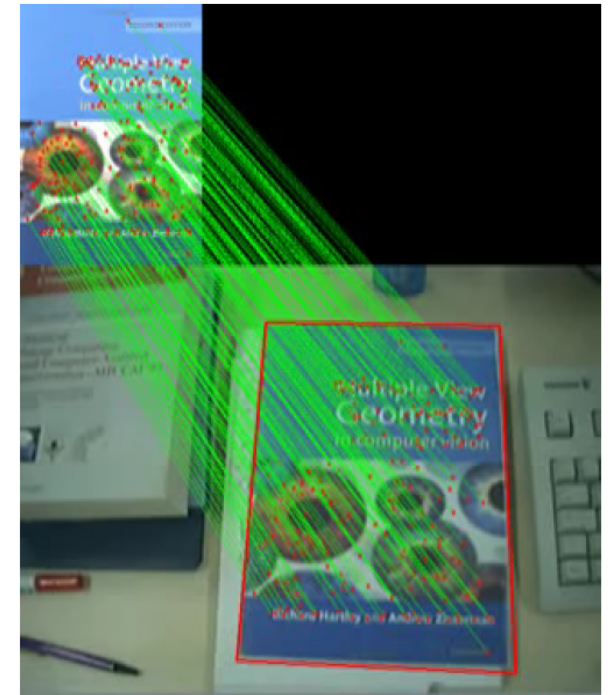
Visual tracking consists in analyzing a *video sequence* in order to *localize* a *moving object* in real-time, by using *natural features*.



Models of the object are supposed to be available in advance, from which the relevant features can be automatically selected.

Object detection and pose estimation with scale-invariant keypoints

- Describe SIFT keypoints: detection, description and matching
- Describe the POSIT algorithm for 3D pose estimation
- Show application examples of SIFT (auto-panorama, object detection, pose estimation)



Contour tracking with local color statistics - the CCD Algorithm

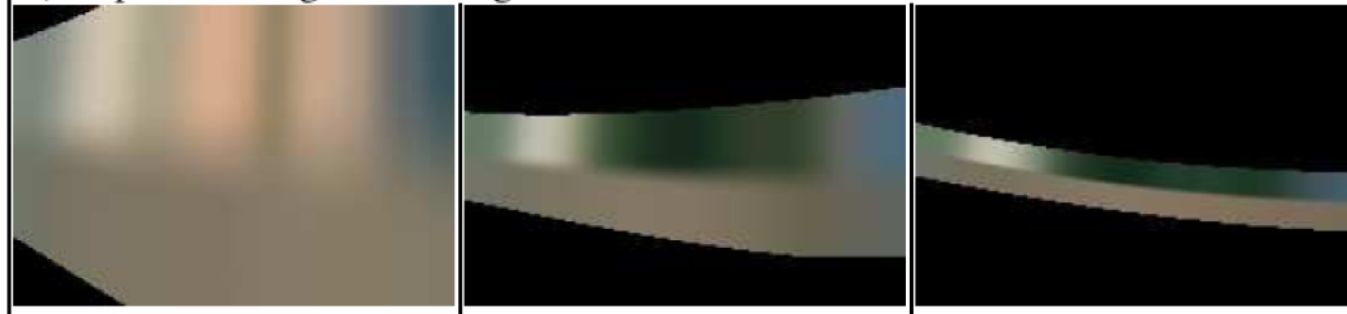
- Talk (briefly) about how to determine visible contours from object model
- What is the CCD algorithm? Define the likelihood function, and the optimization method.
- Show examples of object tracking with CCD



a.) Input image with superimposed curve

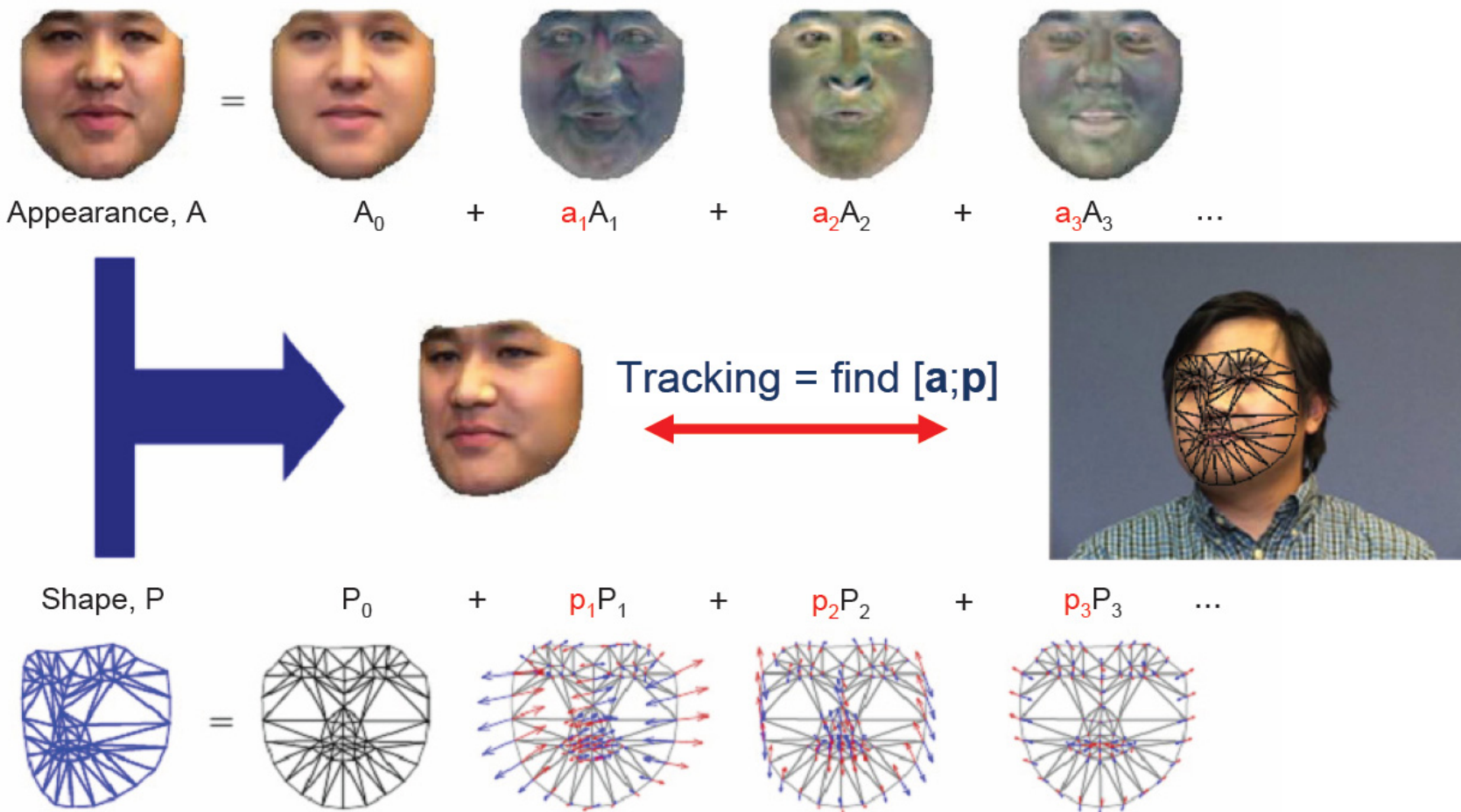


b.) Expected image according to the local statistics



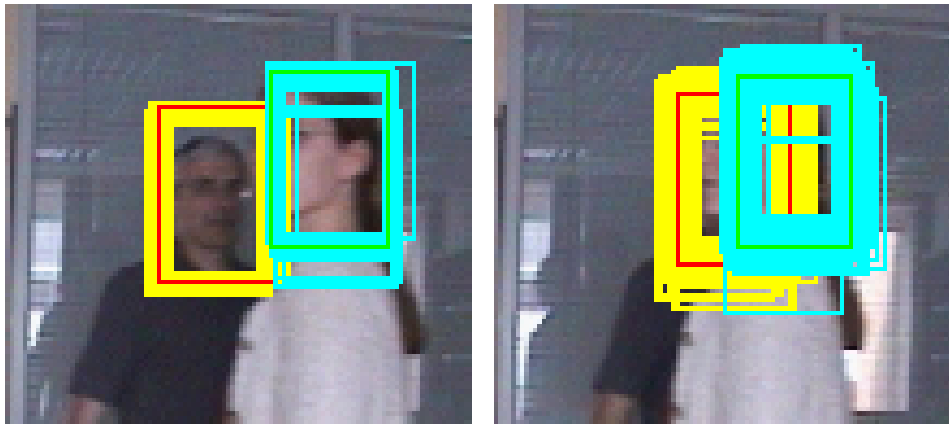
Template-based tracking: Active Appearance Models

- Introduce template-based tracking
- Talk about the AAM approach: how to represent, learn and estimate the shape and appearance model from video sequences

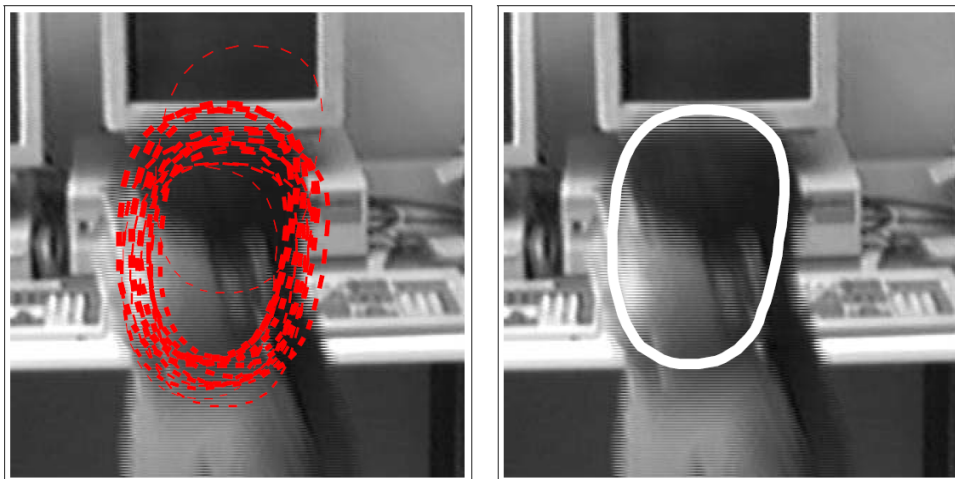


Particle filters for color- and contour-based tracking

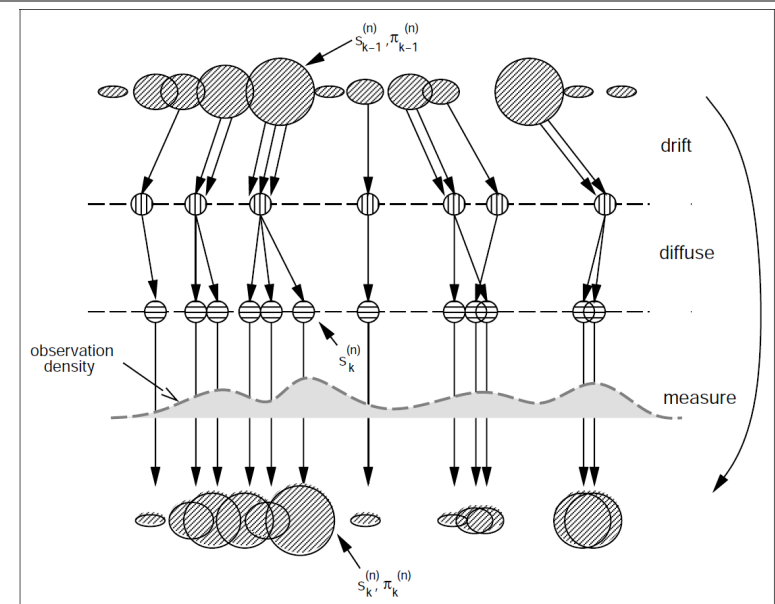
Color-based



Contour-based

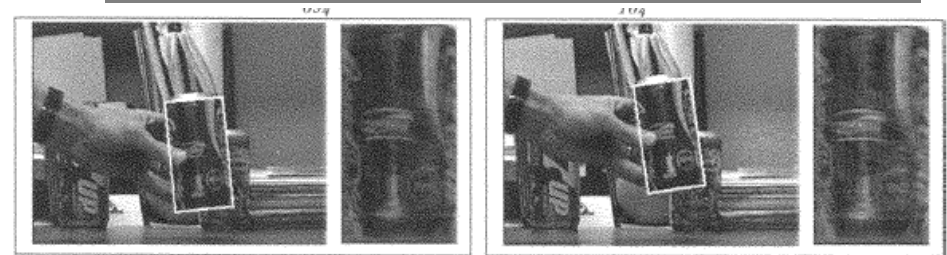
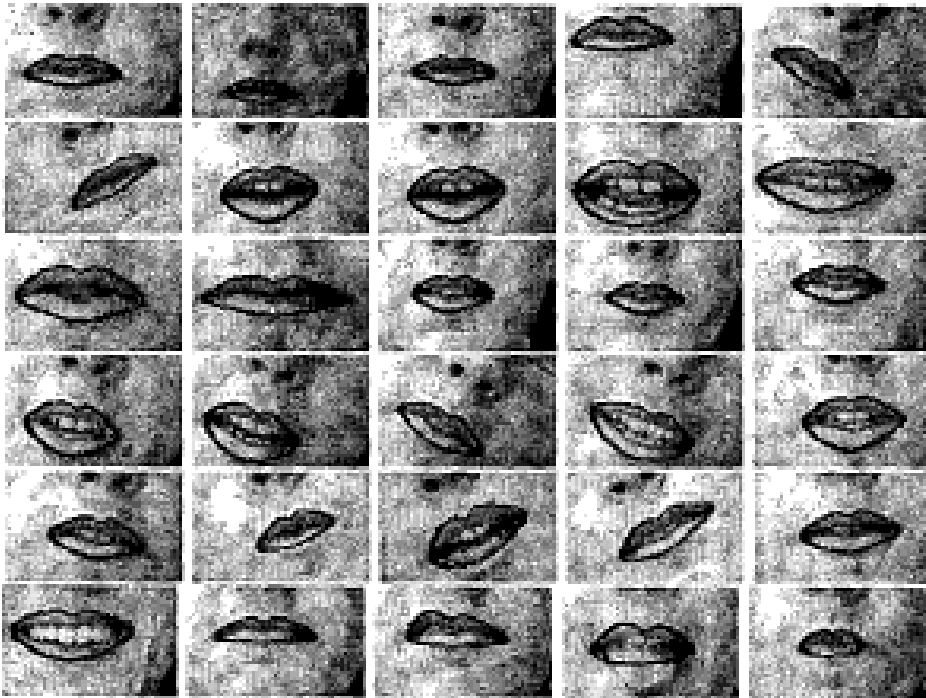


- What is a Particle Filter?
- When can it be used?
- Explain two applications in detail (e.g. from the given literature)
- Find more examples and review them roughly

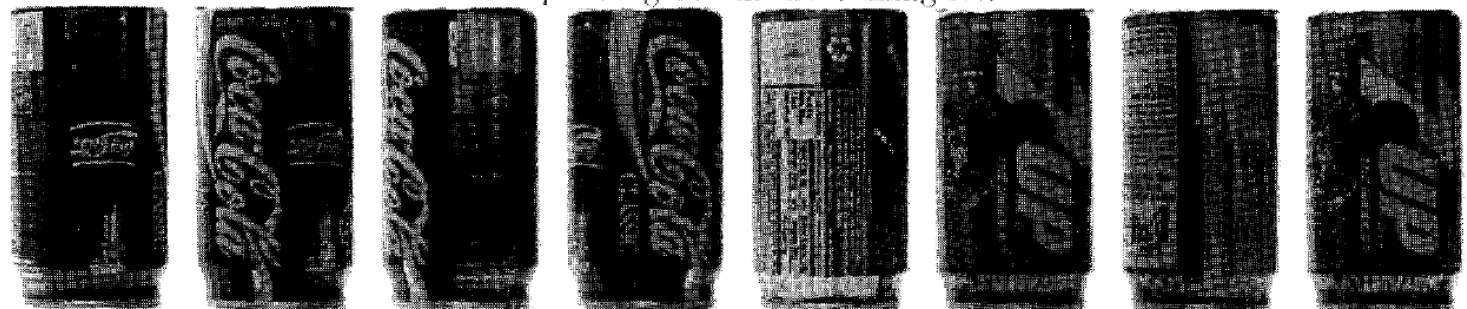


Template-based tracking : the EigenTracking technique

- Explain the term Eigen-Space?
- Explain the EigenTracking method (modeling, tracking)
- Explain two applications in detail (e.g. face, object)
- Find more examples and review them roughly

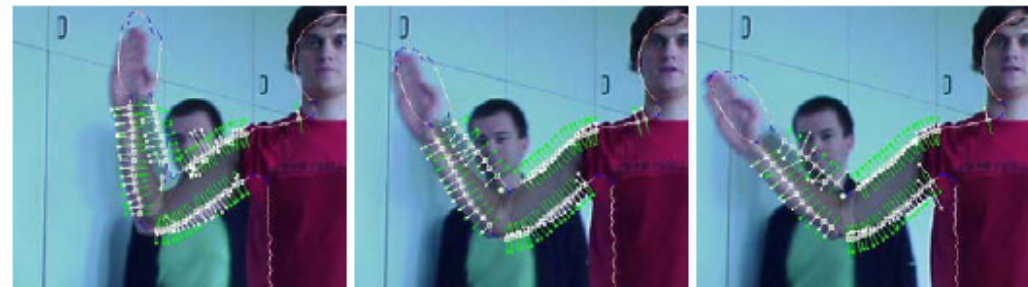
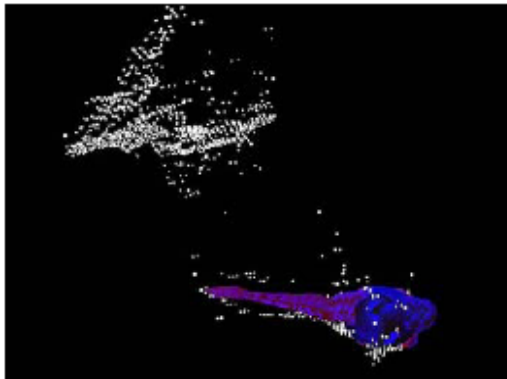
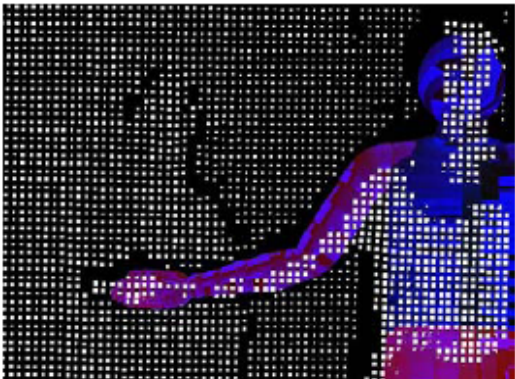
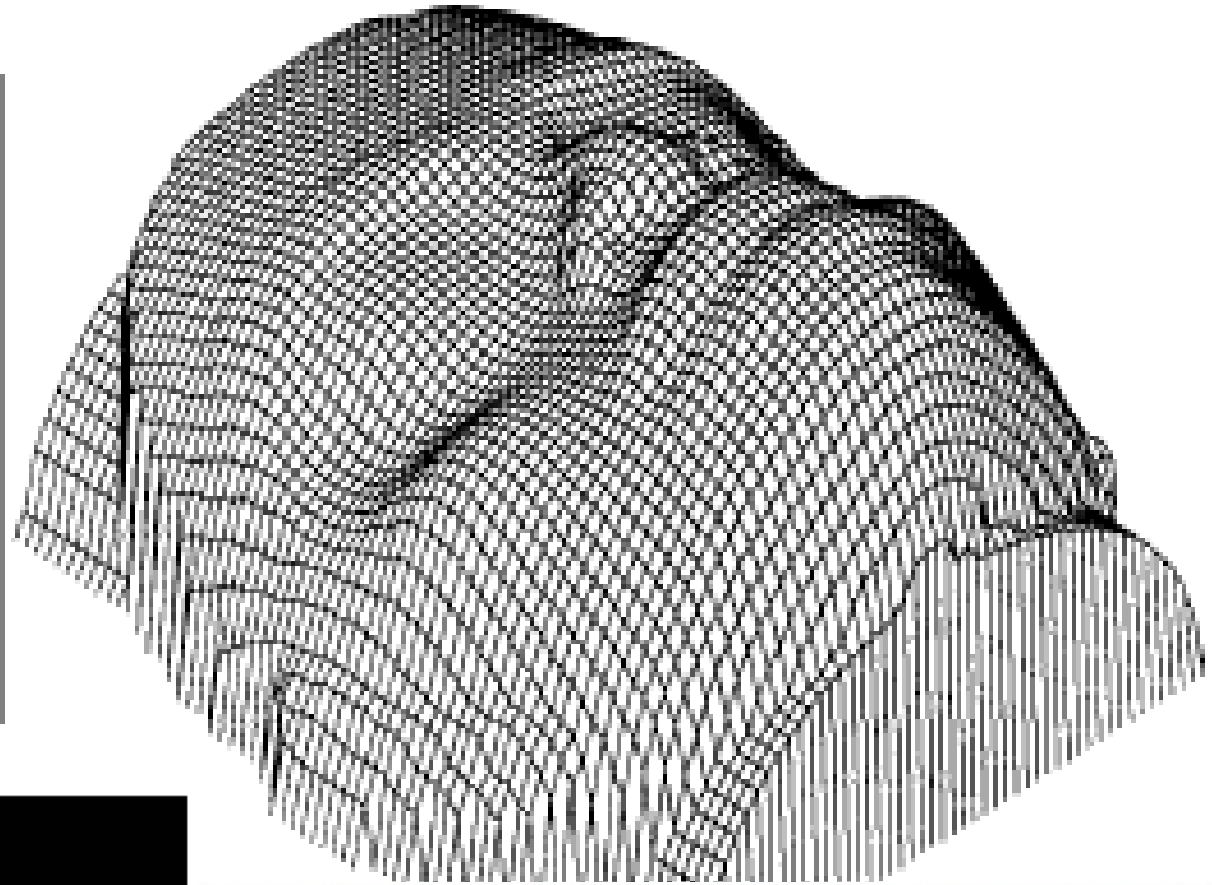


Sample images from the training set:

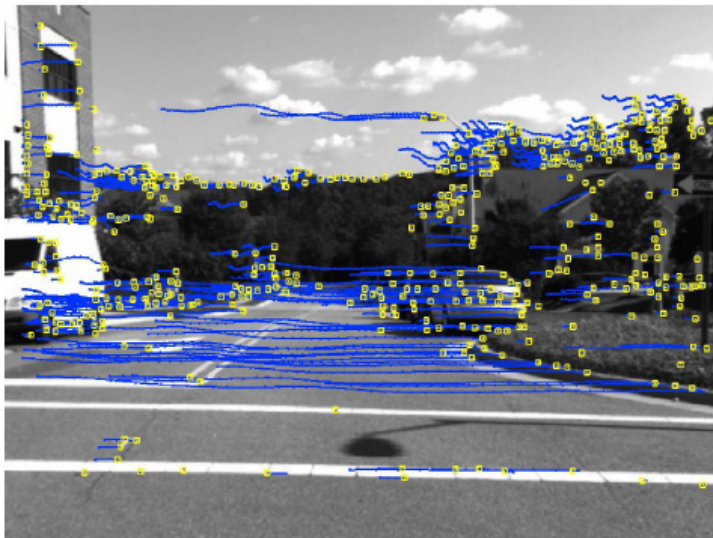


3D tracking techniques using depth information

- Review techniques to gain 3D information (HW / SW)
- Describe the method (ICP algorithm)
- Review other literature in the field
- Find application areas(face, person tracking)

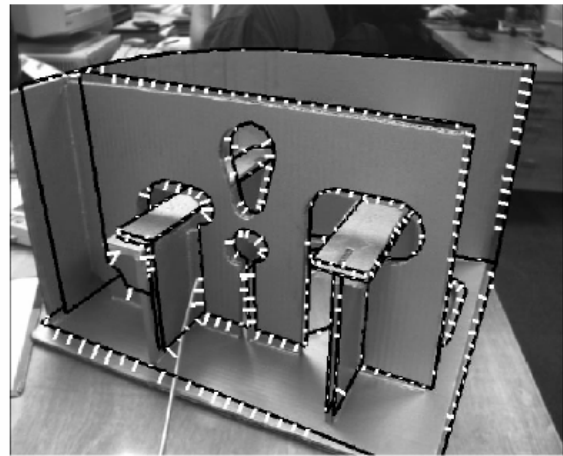
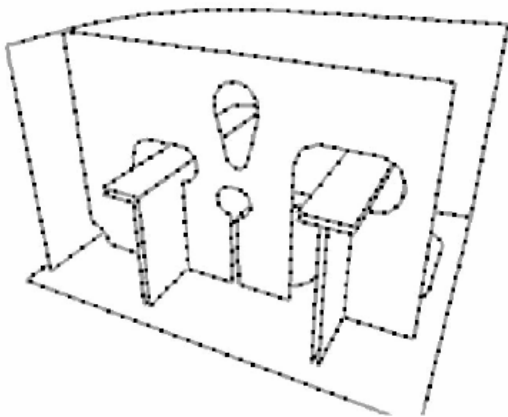
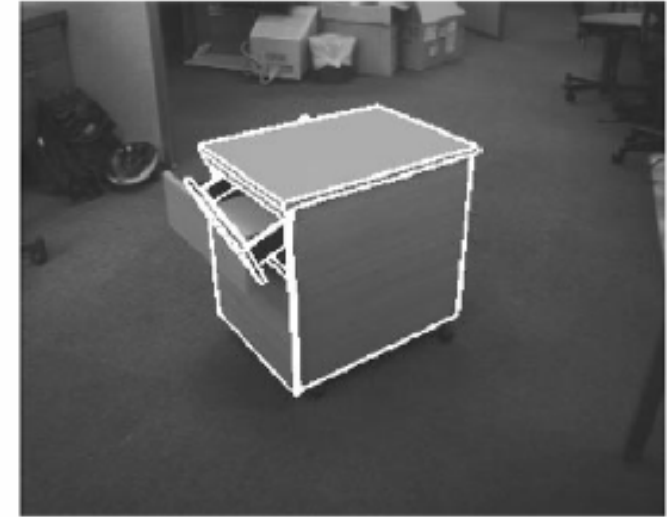


Fast keypoint tracking: the Shi-Tomasi approach



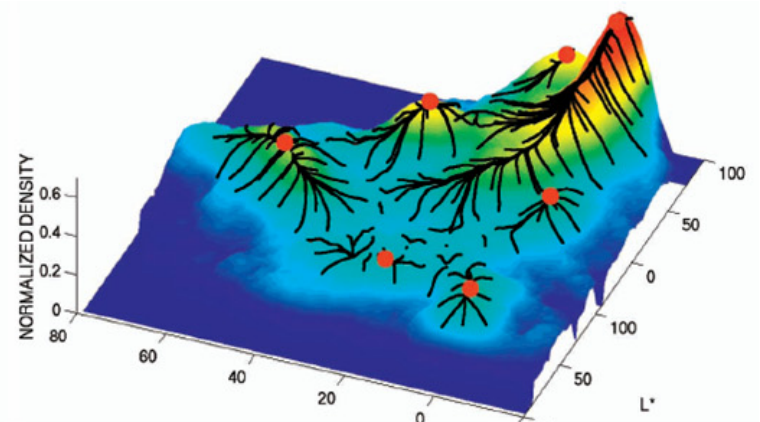
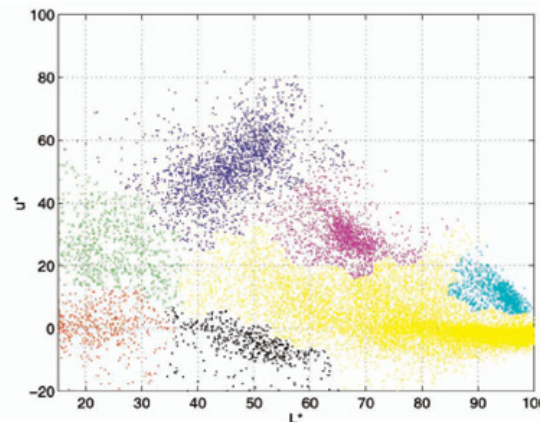
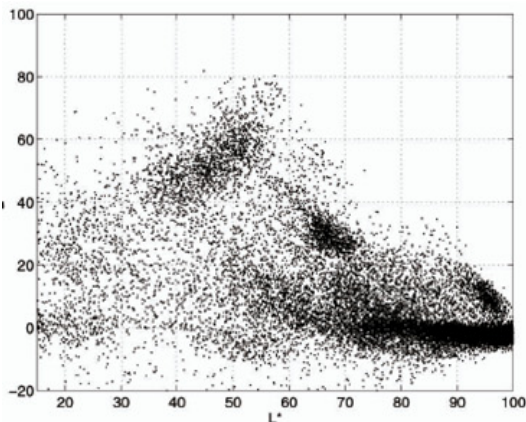
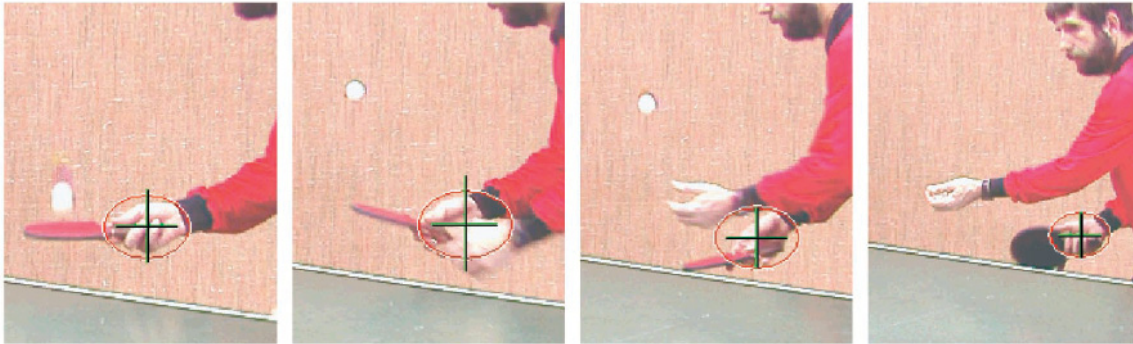
- Introduce keypoint tracking
- Explain the Shi-Tomasi approach
- How are they used for tracking?
- Talk briefly about GPU-accelerated implementations
- Give application examples

Contour tracking based on intensity edges



- What are visible contours?
- How can they be estimated?
- How can we use them for object tracking?
- Explain strengths and weaknesses
- Introduce 1-2 application scenarios

The Mean-shift algorithm for color segmentation and object tracking



- Explain the mean-shift algorithm
- Show examples of color segmentation and object tracking
- Explain strengths and weaknesses

Seminar – organization

- Schriftliche Ausarbeitung: 10-15 Seiten
- Vortrag: 30 Minuten + 10 min. Diskussion
- Sprache: Englisch/Deutsch
- Anwesenheit bei den Vorträgen
- 3 Wochen vor dem Vortrag: Gliederung für die Ausarbeitung
- 2 Wochen vor: Abgabe Ausarbeitung
- 1 Woche vor: Abgabe Folien