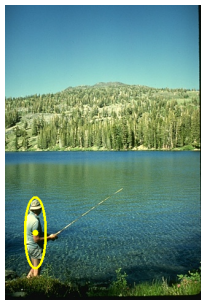


Segmentation with Moment Constraints

Gruppenseminar 17.8.12

Maria Klodt

Image Segmentation with Moment Constraints



User input



Color only
Segmentation



with Moment
Constraints

2D Central Moments



0. order
'area'



2. order
'covariance'



3. order
'skewness'



4. order
'kurtosis'

...

2D Central Moments

$$\text{Area: } \mathcal{C}_0 = \left\{ u \in \mathcal{B} \mid c_1 \leq \int_{\Omega} u \, dx \leq c_2 \right\}$$

$$\text{Centroid: } \mathcal{C}_1 = \left\{ u \in \mathcal{B} \mid \mu_1 \leq \frac{\int_{\Omega} x u \, dx}{\int_{\Omega} u \, dx} \leq \mu_2 \right\}$$

$$\text{Covariance: } \mathcal{C}_2 = \left\{ u \in \mathcal{B} \mid A_1 \leq \frac{\int_{\Omega} (x - \mu)(x - \mu)^{\top} u \, dx}{\int_{\Omega} u \, dx} \leq A_2 \right\}$$

Higher Order Moment Constraints

- The concept can be generalized to moments of arbitrary order.



no constr.



0th order



up to 1st



up to 2nd



up to 3rd



up to 6th

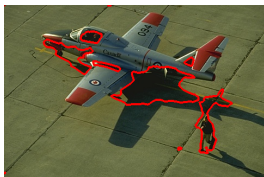
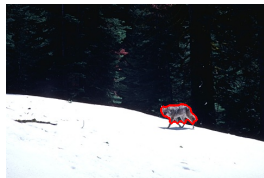


up to 12th



Input
Shape

Segmentation Results

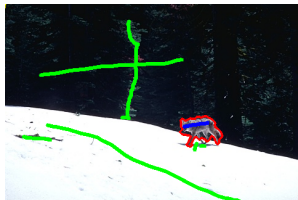
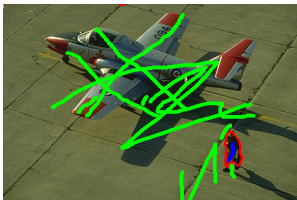
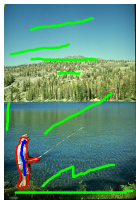
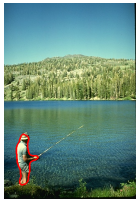


User input

Color only
Segmentation

with Moment
Constraints

Comparison to Scribble Segmentation



First row: Segmentation with Moment Constraints

Second row: Segmentation with User Scribbles

Moment Constraints for Tracking

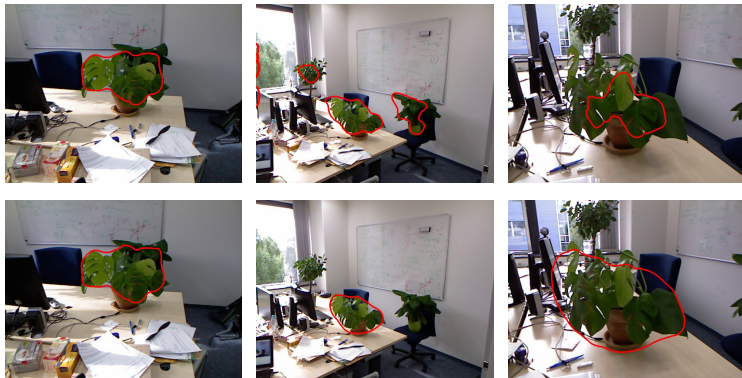


First row: Tracking with Moment Constraints

Second row: Histogram based Tracking

3D Area Constraints for Tracking

- Use depth information from Kinect as additional information.
- Compute area in 3D space instead of the image plane.



First row: Area tracking in 2D

Second row: Area tracking in 3D