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Edge Adaptive Seeding for Superpixel Segmentation

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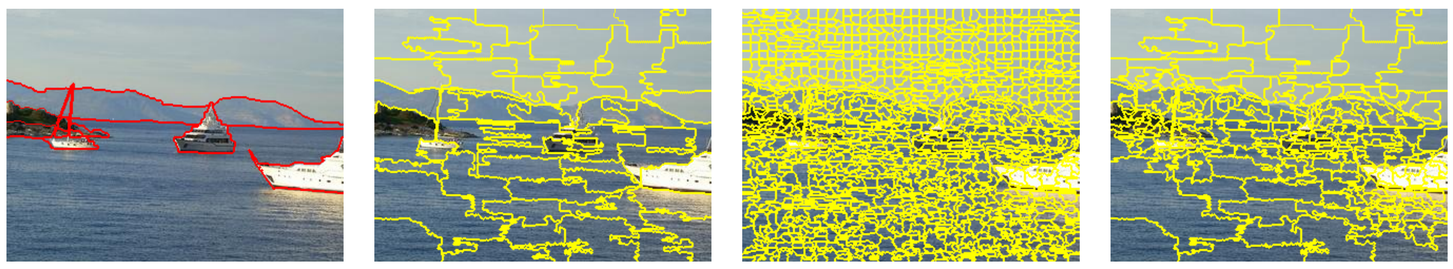
Motivation

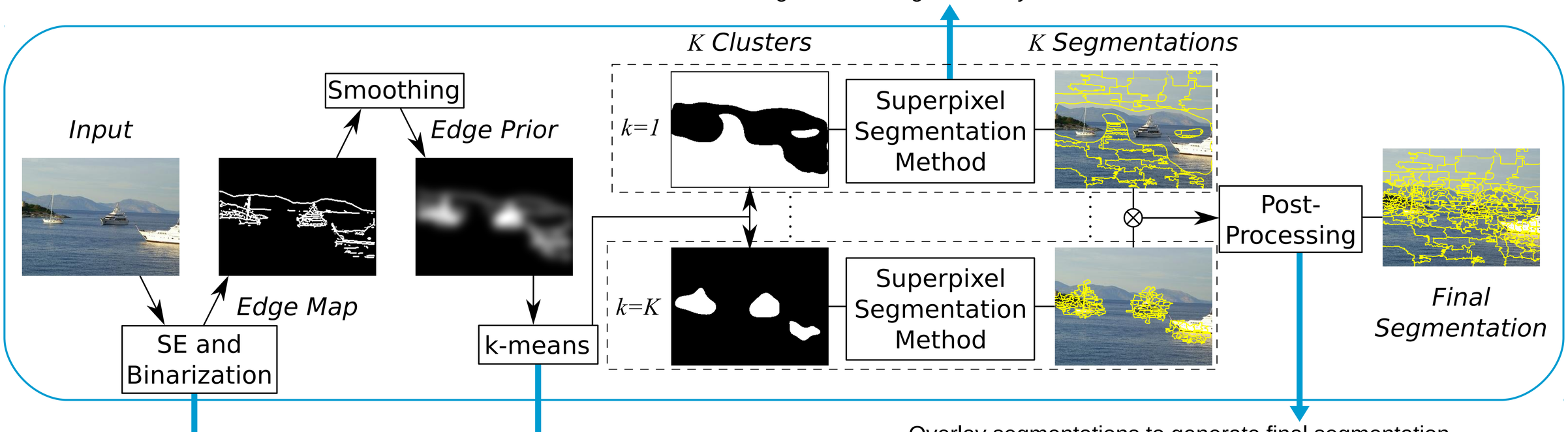
- Superpixels are used to reduce complexity of an image
- However, image content has very different scales
- Thus, one superpixel resolution is not suitable (undersegmentation vs. more complexity)
- Our solution: adapt the seeding of superpixels segmentations based on edge density



Ground truth segmentation | 50 SLIC superpixels (undersegmentation) | 1200 SLIC superpixels (too much complexity) | 250 superpixels with our adaptive approach

System Overview

- K different seeding resolutions in K different clusters
- Seeding resolutions determined based on cluster edge density
- As segmentation algorithm any method can be used



- Edge detected with Structured Edges [2]
- Binarization makes result independent of edge strengths

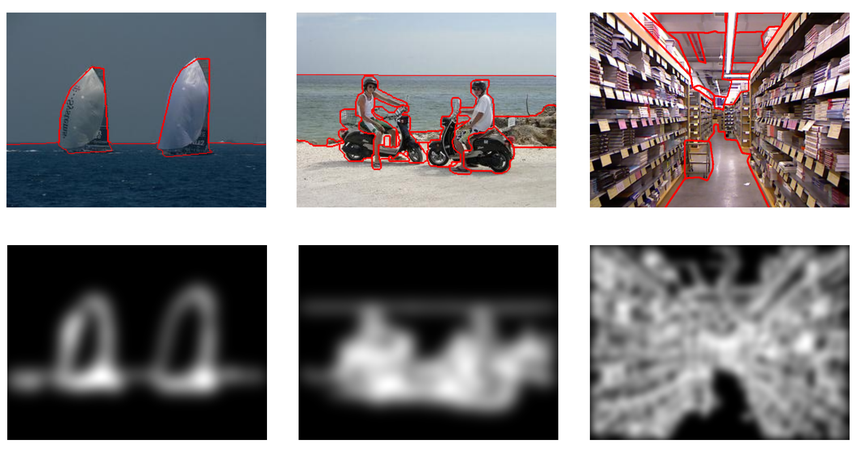
- Clusters pixels with similar edge density
- small/many objects vs. large/few objects

Overlay segmentations to generate final segmentation

Image window and clustering result

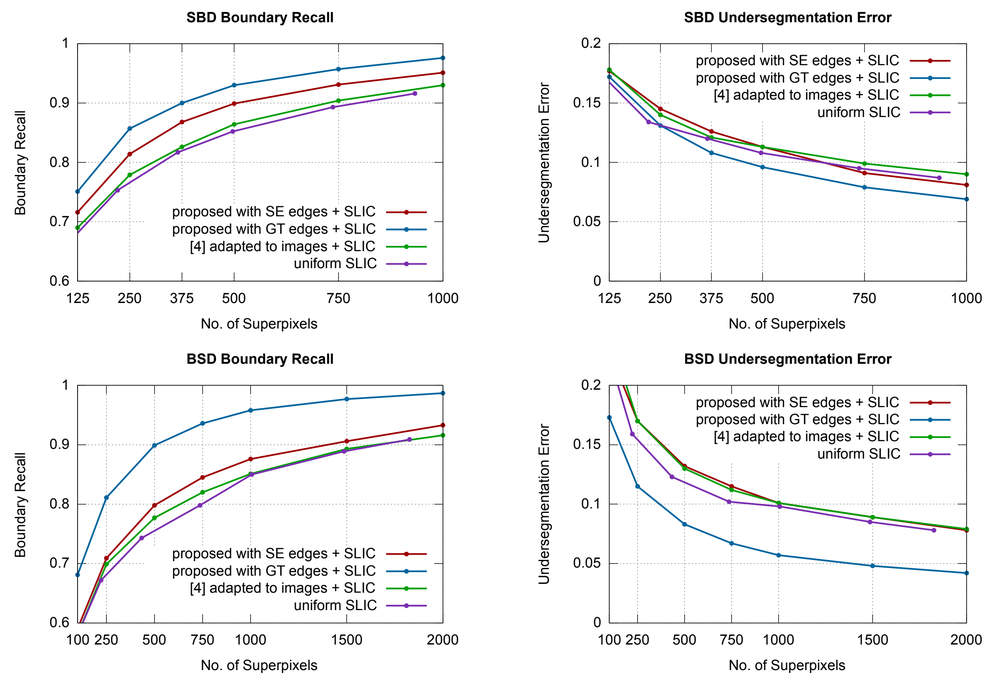
Clipped vs. overlayed segmentations with cluster edges

Results (for more results scan the QR code)



Evaluation based on [3]

- Five datasets used: BSD, SBD, NYUV2, SUNRGBD, Fashionista
- Comparison to [4] and uniform seeding
- Methods chosen for segmentation: SLIC, SEEDS and SMURFS



Paper + Code

References

[1] Achanta, R., Shaji, A., Smith, K., Lucchi, A., Fua, P., Süsstrunk, S.: SLIC superpixels compared to state-of-the-art superpixel methods. IEEE TPAMI 34(11), 2274–2282 (2012)
[2] Dollar, P., Zitnick, C.L.: Fast edge detection using structured forests. IEEE TPAMI 37(8), 1558–1570 (2015)
[3] Stutz, D., Hermans, A., Leibe, B.: Superpixels: An evaluation of the state-of-the-art. CVIU (2017), in press
[4] Gao, G., Lauri, M., Zhang, J., Frintrop, S.: Saliency-guided adaptive seeding for supervoxel segmentation. In: IROS (2017)