Hierarchical Histogram Threshold Segmentation

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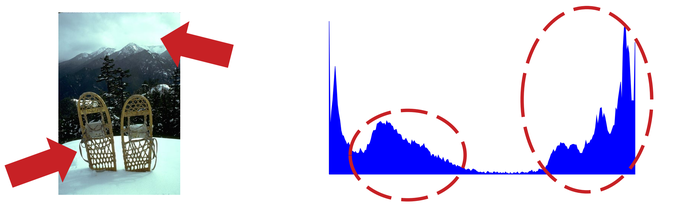
Motivation

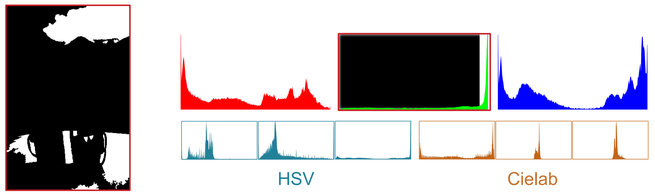
- Get superpixels with extraordinary boundary adherence (BR, MDE)
- Reduce input parameter dependencies (initialization, termination)

Key Idea

- Assumption: Color histogram clusters correspond to object classes



- Usage: Separate object classes by color intensity thresholding at histogram cluster boundaries across multiple color channels



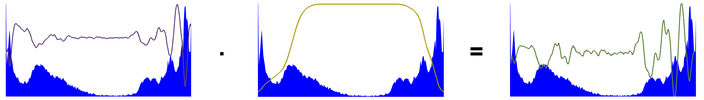
- Progression: Hierarchically split color-inhomogeneous segments into more homogeneous ones (until color information exhaustion)

Challenges

- Where to threshold? → 1D Laplace filter & equal partition weights
- What segments to prioritize? → segment size & color variance
- When to stop? → color information exhaustion / superpixel count
- How to handle tiny segments? → min size & spatial connectivity

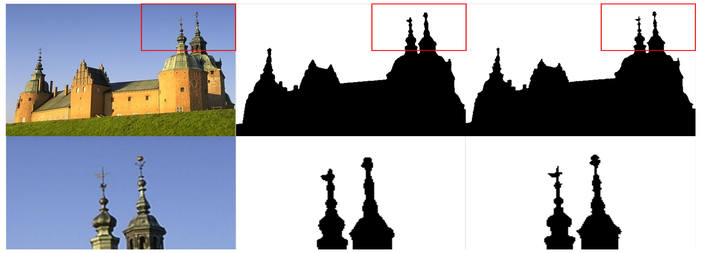
Thresholding

- A threshold should equally split an image at object class boundaries
- 1D Laplace kernel to find limits of object classes in a color histogram
- Cauchy distribution of accumulated histogram for a balanced partition



Application

- Refine semantic masks (e.g., Segment Anything Model – SAM)



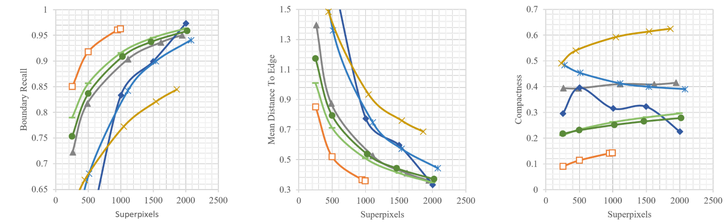
Federal Ministry of Education and Research

Funding

Contact

Project page

Experiments



Superpixels	Method	UE	BR	ASA	EV	CO	BP
250	SH	0.0970	0.8080	**0.9510**			
	HHTS	**0.0668**	**0.8502**	0.9332			
600	SCAC	0.0680	0.8260	**0.9660**	0.8750	**0.4420**	
	HHTS	**0.0373**	**0.9326**	0.9627	**0.8989**	0.1215	
1000	VSSS	0.0324	0.9188	0.9676	**0.9123**	**0.1953**	
	HHTS	**0.0307**	**0.9626**	**0.9693**	0.9100	0.1411	
1200	APENet		0.9204	**0.9758**			**0.1878**
1000*	HHTS		**0.9626**	0.9693			0.0744
1300	LDFUNet		0.9300	**0.9734**			**0.0996**
1000*	HHTS		**0.9626**	0.9693			0.0744
2000	CRTREES	0.0716	0.9624		**0.9482**		
1000*	HHTS	**0.0307**	**0.9626**		0.9100