Saliency Optimization from Robust Background Detection

by

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- Introduction
- Background Connectivity
- Background Weighted Contrast
- Saliency Optimization
- Comparison with state of the art methods

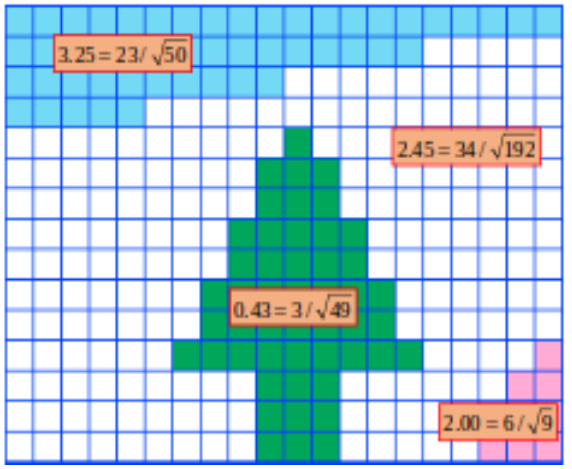
Introduction

- Salient object detection
- Contrast and boundary prior
  - Issues
- Heuristic combination of information

Background Connectivity

- *The ratio of a region's perimeter on the boundary to the region's overall perimeter*

$$BndCon(R) = \frac{\left|\{ p \mid p \in R,\ p \in Bnd \}\right|}{\sqrt{\left|\{ p \mid p \in R \}\right|}}$$



Fuzzy Background Connectivity

- $d_{app}(p,q)$ – Euclidian distance in color space
- $d_{geo}(p,q)$ – shortest path

$$d_{geo}(p,q) = \min_{p_1=p,\, p_2, \ldots, p_n=q} \sum_{i=1}^{n-1} d_{app}(p_i, p_{i+1})$$

- Spanning area

$$Area(p) = \sum_{i=1}^{N} \exp\left(-\frac{d_{geo}^2(p,p_i)}{2\sigma_{clr}^2}\right) = \sum_{i=1}^{N} S(p,p_i)$$

- Boundary length

$$Len_{bnd}(p) = \sum_{i=1}^{N} S(p,p_i) * \delta(p_i \in Bnd)$$

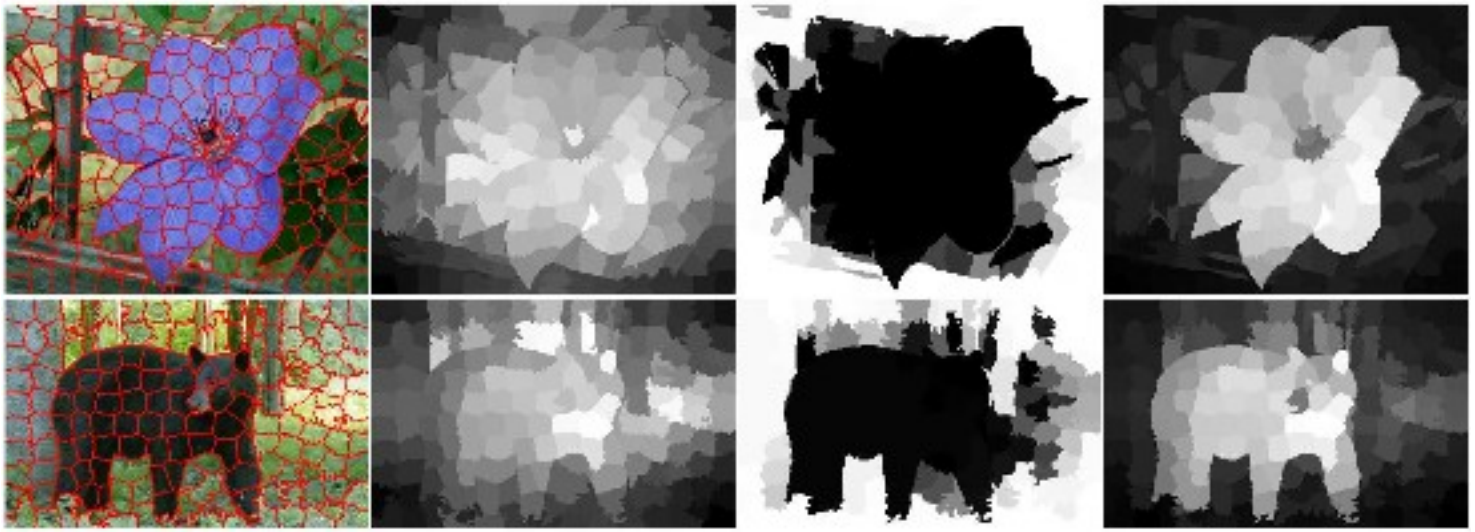
- Boundary patch linking

Background Weighted Contrast

- Extending current contrast measure

$$wCtr(p) = \sum_{i=1}^{N} d_{app}(p, p_i) w_{spa}(p, p_i) w_i^{bg}$$

- Background connectivity as weight w^{bg}

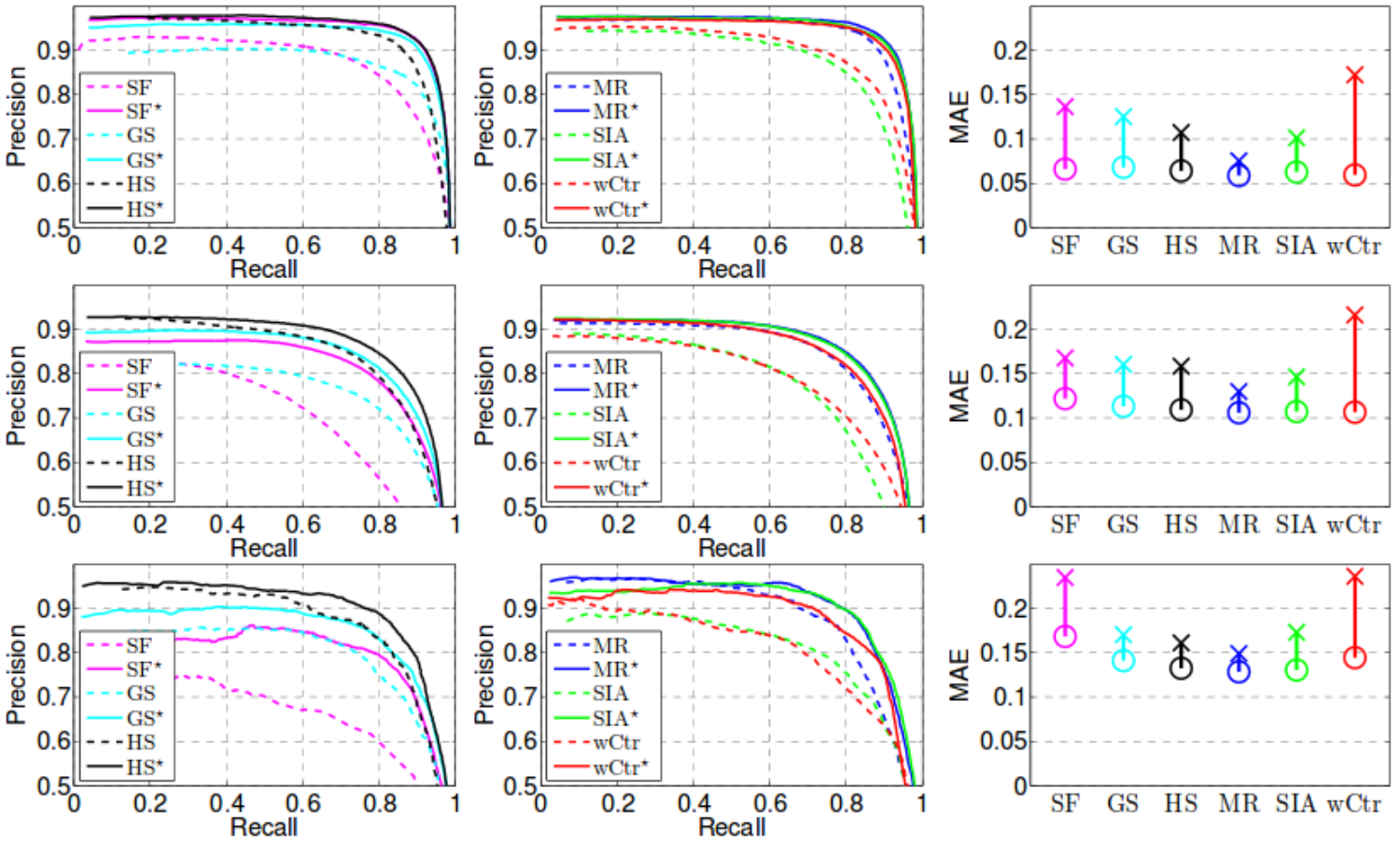


Saliency Optimization

$$\underbrace{\sum_{i=1}^{N} w_i^{bg} s_i^2}_{background} + \underbrace{\sum_{i=1}^{N} w_i^{fg} \left(s_i - 1\right)^2}_{foreground} + \underbrace{\sum_{i=1}^{N} w_{ij} \left(s_i - s_j\right)^2}_{smoothness}$$

- Minimize the cost function
- Extendability - w^{fg}

Comparisons



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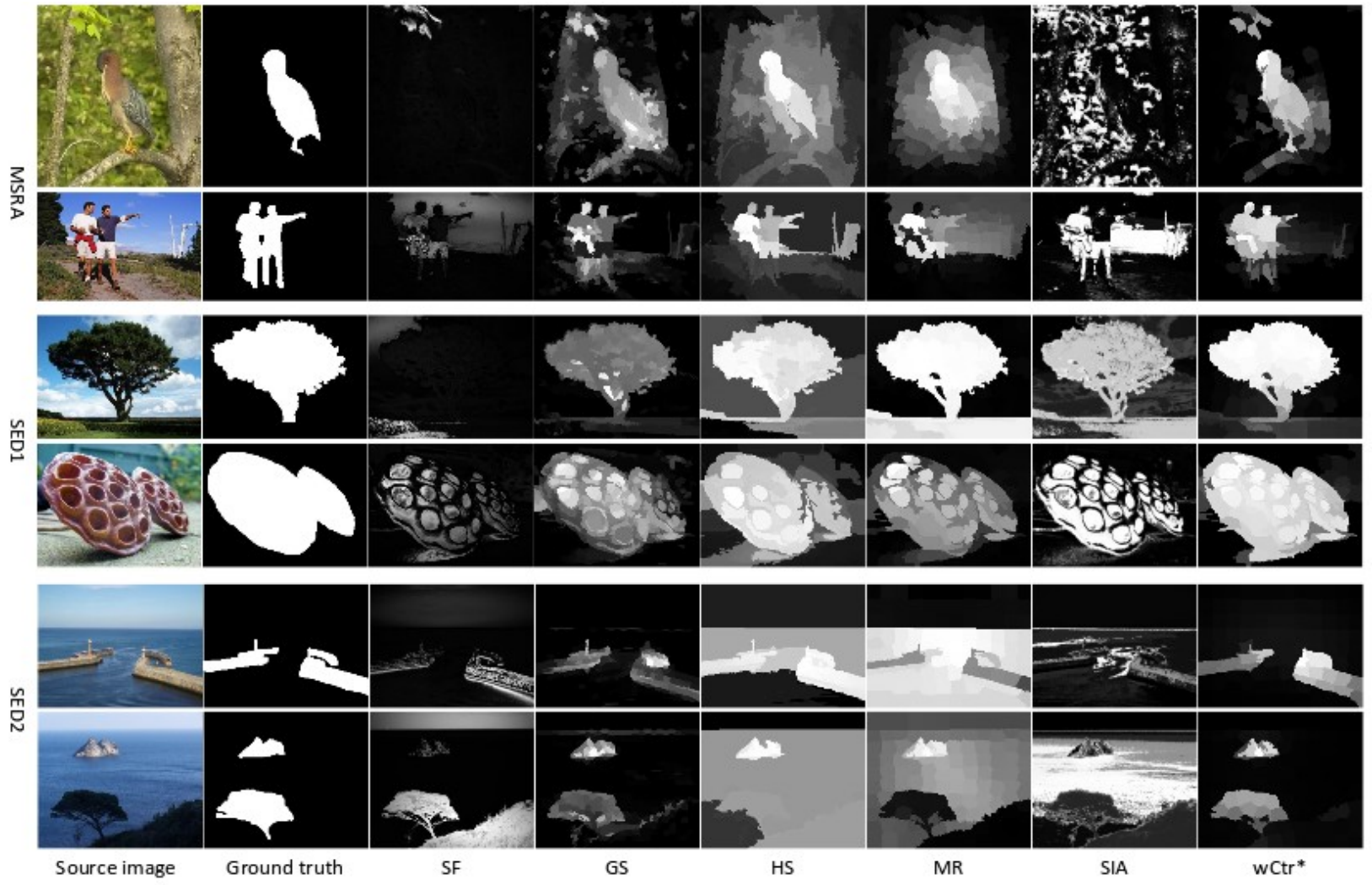

Conclusion

- The work presented in this paper offers a significant improvement on previous used methods.