Selective Search
Region Proposals

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Over-segmentation (Graph-Based Image Segmentation)

Pedro Felzenszwalb's graph-based segmentation
Selective Search Based Hierarchical Pooling

\[ S(a, b) = S_{\text{size}}(a, b) + S_{\text{texture}}(a, b) \]
Intersection Over Union (S_size)

Which has higher S_size?
Hierarchy Pooling Demo

Credit: https://github.com/belltailjp/selective_search_py
Box Proposal (For all levels of pooling)
If we were to give region proposals, the circle would be part of all of them?
What we would expect !!!!

123 proposals
It can’t afford to lose the actual proposals, by doing intelligent things to get rid of noise.

Essential to the task of object recognition
Blur Effects

Why Increasing after this point?

Gaussian Filter
Drop Explanation
Over segmentation Result (k = 10)

Original

Sigma = 32
Increase Explanation
Effect of Cues

• Threshold (k)
• Color Cues
Recall Plot on Pascal VOC (1 class)
Semantic Performance

What do you see?

Difference between Fig 1 and Fig 3 – Former taken to break symmetry.
No Triangles .... No Squares .... Semantically Unsound

Out of 181 region proposal, none could identify the square

Similarly for The other triangle image and the non-symmetric square
Occlusion
Will It Find the Circle ???
Will It Find the Circle ??? Yes

Though Distorted .... But Still Identifies the Circle.
One More Example....
Was Dog Found in the original image? Yes
Was the Dog found in the occluded image? Yes
Rotation
Original Image Proposals
Why? The segment pooling hierarchy is invariant to orientation and translation of segments. The hierarchy itself makes it invariant to Scaling

Rotated Image Proposals
Key Takeaway

• Selective Search Region Proposal is a recall focused metric.
• Selective Search, pools similar texture and similar size segments together, by the advent of the ranking parameter.
• Gaussian Blur can help remove noise or clutter to be identified as region proposal, but too much of it, can alter the original image, and generate zombie proposals that don’t exist on original image.
• Selective Search is semantically unsound – It only responds to intensity and texture.
• It is fairly robust to
  • Occlusion
  • Rotation
  • Translation
  • Scaling
Questions ?
References

• [http://koen.me/research/selectivesearch/](http://koen.me/research/selectivesearch/)
  • Contains the Paper and Matlab Implementation

• Python Implementation - [https://github.com/belltailjp/selective_search_py](https://github.com/belltailjp/selective_search_py)

• Oversegmentation – C++ Code - [http://cs.brown.edu/~pff/segment/](http://cs.brown.edu/~pff/segment/)
Thank You