Assignment 2 - report

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Abstract

This Assignment was aimed at understanding the Selective search algorithm [UVDSGS13], utilization of OpenCV [Bra00] framework and analysis of object detection using the Selective search algorithm. The Report contains results and analysis of the selective search algorithm on 3 images provided.

1   Introduction

Selective Search is a region proposal algorithm used in object detection. The algorithm is based on performing hierarchical clustering of similar regions with a high recall. The algorithm uses variety of complementary image partitioning to better deal with image conditions. The selective search algorithm provides a small set of data-driven, class-independent high quality regions.

The Selective search algorithm is designed to;

- Capture all scales with in an image.

- Diversify the strategy to group regions.

- To compute a set of proposals in a fast and efficient way.

2   Results and analysis

Table 2 presents the recall values for the two strategies namely colour and all, for the three images provided.

$$Recall = \frac{TruePositive}{(TruePositive + FalsePositive)} \tag{1}$$

Strategy	Image 1	Image 2	Image 3
Colour	0.57	0.40	1.00
All	0.57	0.60	1.00

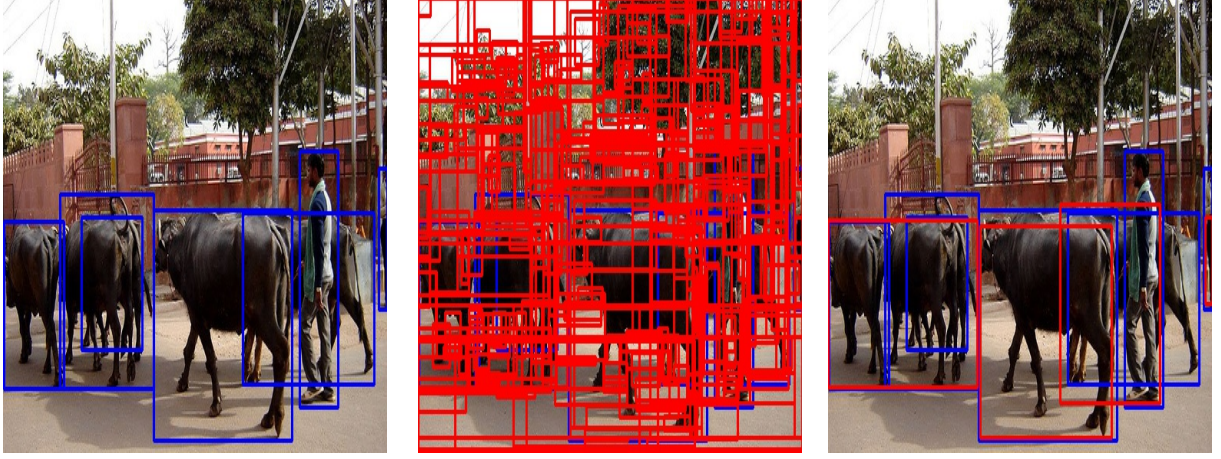Table 1: Recall values for various Selective search strategies for the three images

Table 2: colour strategy analysis for image 1

2.1   Image 1

Table 2 shows the ground truth (image with blue box) , proposal (image with red box) and the ground truth with the intersection over union (threshold $>= 0.5$) boxes, for the colour strategy. We can see that the image has a lot of overlapping objects, the ground truth as 7 objects, algorithm with colour strategy only gets 4. Table 3 represents image one with all strategies. Using the all strategies like colour, size, fill and texture the performance remains the same as there is a lot of overlap and we find no improvements. From table 2 for image 1 the recall value remains the same at 0.57.

2.2   Image 2

Table 4 provides the analysis of the image 2 for the color strategy. Although there are 5 ground truth regions, due to the image conditions, just using colour strategy for selective search algorithm fails to detect most of the regions. From table 5, we can see that by adding other strategies like colour, texture, size and fill the detection becomes better and can identify other regions. This shows that, while having one strategy can give us results, there is improvement in the detection when there are other strategies added to the selective search algorithm.

Recall values from table 2 for image 2 clearly shows that the recall for this image improves from 0.4 to 0.6 with the addition of the other strategies.

2.3   Image 3

Image 3 has a clear colour distinction among the objects to be detected and the background as a result, the colour strategy alone performs very well in detecting the regions as shown in table 6. Using all the other strategies also provides similar results as shown in table 7. The recall for both
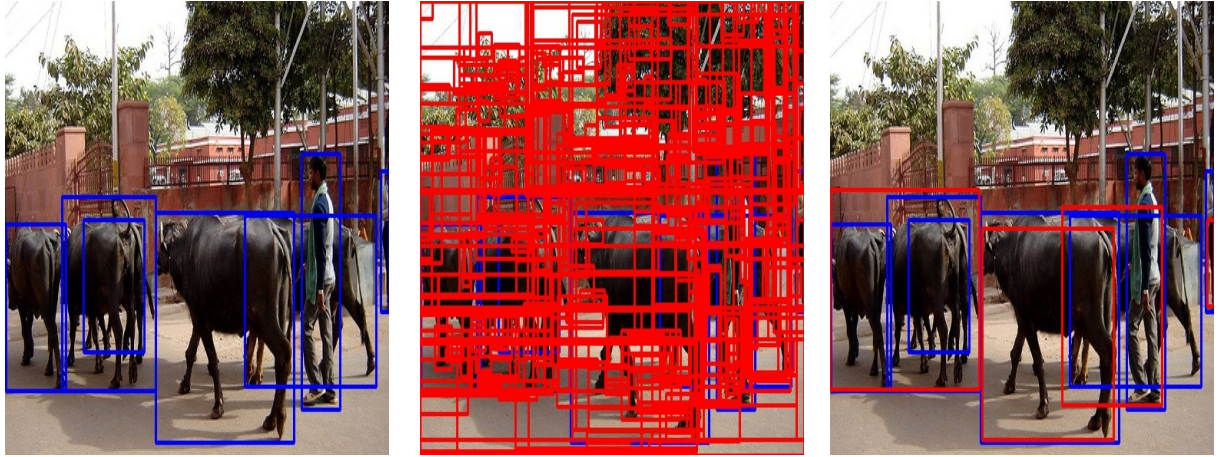
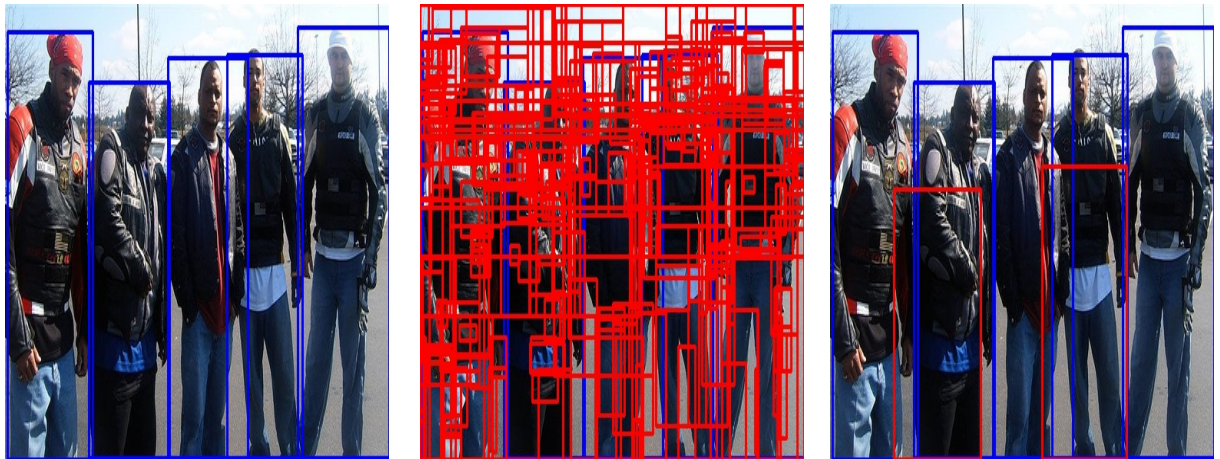Table 3: all strategy analysis for image 1

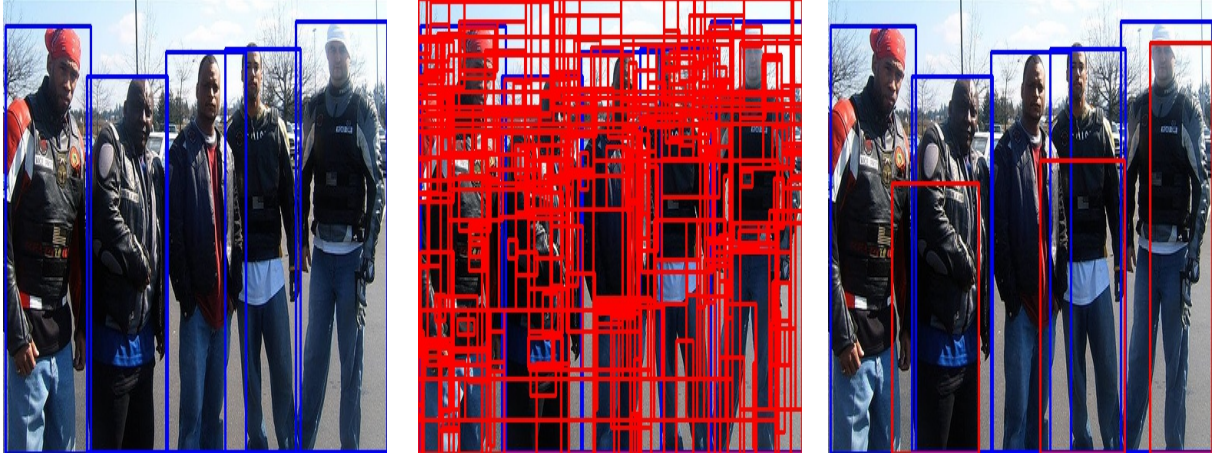
Table 4: colour strategy analysis for image 2

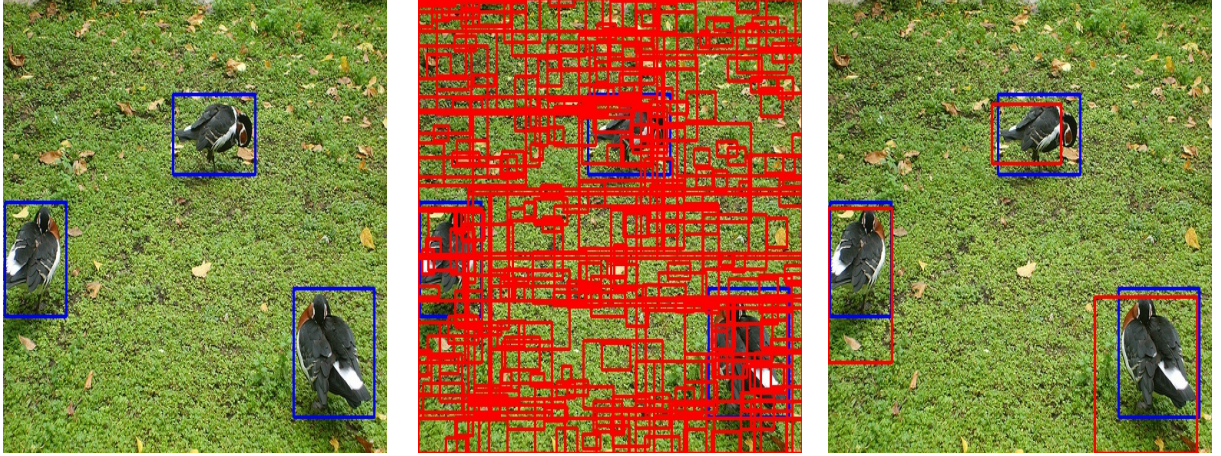Table 5: all strategy analysis for image 2

Table 6: colour strategy analysis for image 3

the strategies for image 3 remains the same as shown in table 2.

3 Conclusion

Analyzing the given images we find that, if the objects are well separated in one of the measures (like colour, texture, size or fill) single strategy works well and we can improve over this by adding all other strategies (as seen in image 3). When there is little overlap with varied lighting conditions in the image (as seen in image 2), adding other strategies improves the performance over the single strategy. When there is complete overlap of objects in the image (as seen in the image 1), both the single strategy and combined strategies performs poorly.
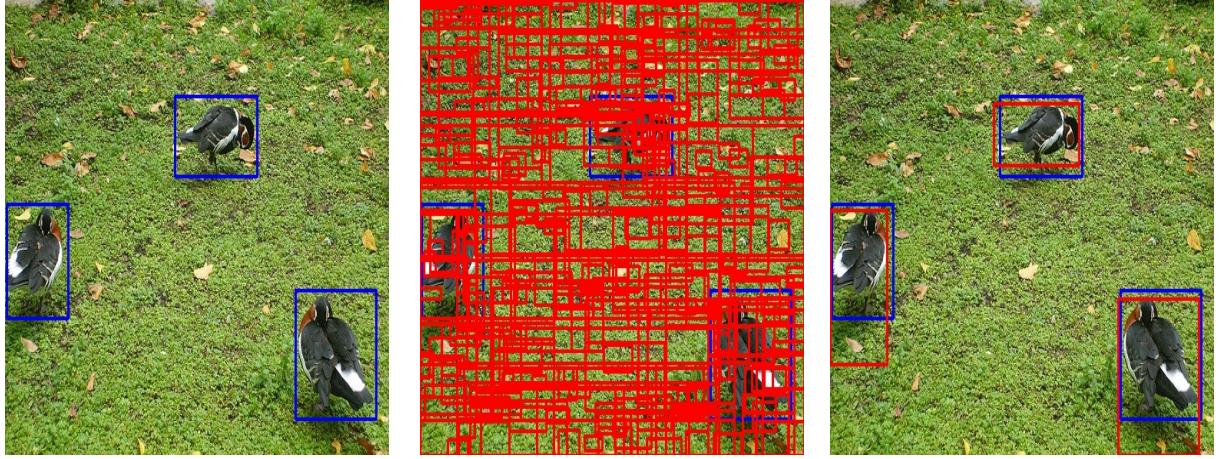
Table 7: all strategy analysis for image 3

References

[Bra00]   G. Bradski. The OpenCV Library. *Dr. Dobb's Journal of Software Tools*, 2000.

[UVDSGS13] Jasper RR Uijlings, Koen EA Van De Sande, Theo Gevers, and Arnold WM Smeulders. Selective search for object recognition. *International journal of computer vision*, 104(2):154–171, 2013.