Assignment#3

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In this assignment, I used c++ 、OpenCV、MATLAB and Shell to complete the assignment.

1. Grab Cut

Firstly, I obtain the saliency maps of all images in PASCAL. Next, I implement segmentation by grab cut. Then, I adjust two parameter (threshole, size of rectangle) to obtain different segmentation results. Finally, I evaluate the different segmentation results of two parameter.

1.1 Input image

In this step, the all images in PASCAL were inputed by batch processing.

1.2 Use image signature

I used the matlab code of "signatureSal" to obtain saliency map of all images. In this process, I adjust threshold to transform saliency map for different binary images. The results of one image's different threshold (Figure 1) are shown in Figure 2. The grab cut results of different binary images are shown in Figure 3.

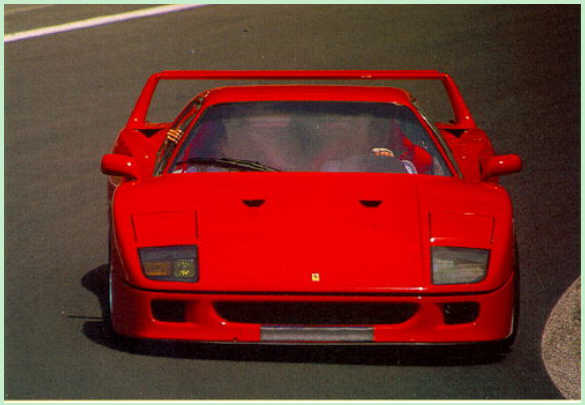
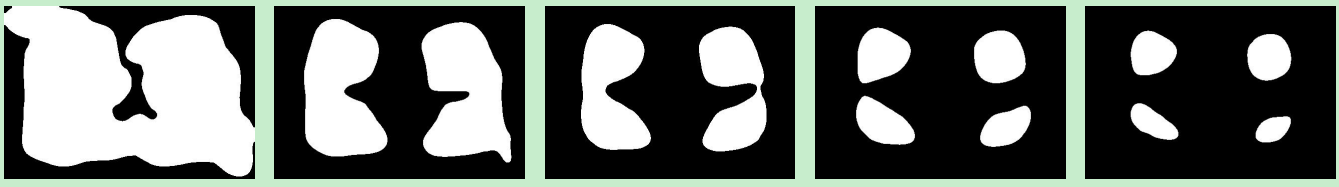
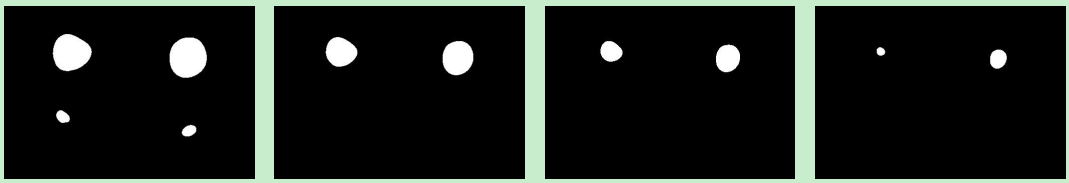


Figure 1: Original images

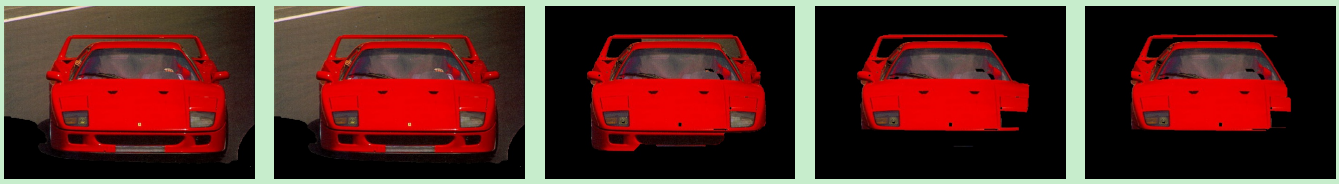


(a) Threshold-0.1 (b) Threshold-0.2 (c) Threshold-0.3 (d) Threshold-0.4 (e) Threshold-0.5



(f) Threshold-0.6 (g) Threshold-0.7 (h) Threshold-0.8 (i) Threshold-0.9

Figure 2: Different binary images



(a) Threshold-0.1 (b) Threshold-0.2 (c) Threshold-0.3 (d) Threshold-0.4 (e) Threshold-0.5

(f) Threshold-0.6 (g) Threshold-0.7 (h) Threshold-0.8 (i) Threshold-0.9

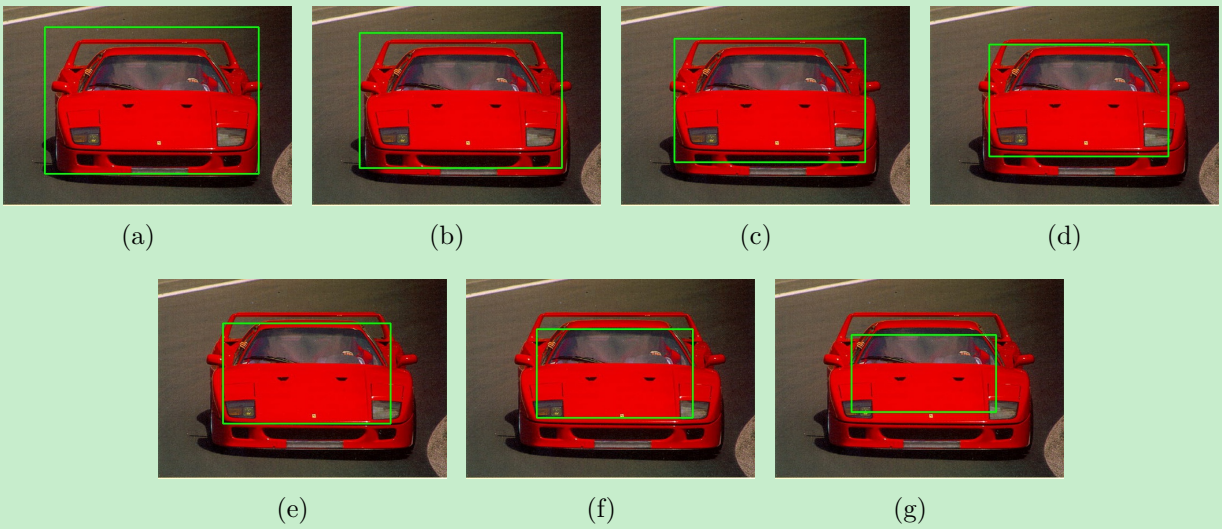
Figure 3: The result of different binary images

1.3 Draw the rectangle

According to the binary image of threshold 0.3, the rectangle is draw to locate the most probable position of object and initialize mask in grab cut. In this process, I also adjust the size of rectangle to obtain different segmentation results. One image's different size of rectangle is shown in Figure 4. The grab cut results of different rectangle size are shown in Figure 5.

1.4 Implement grab cut

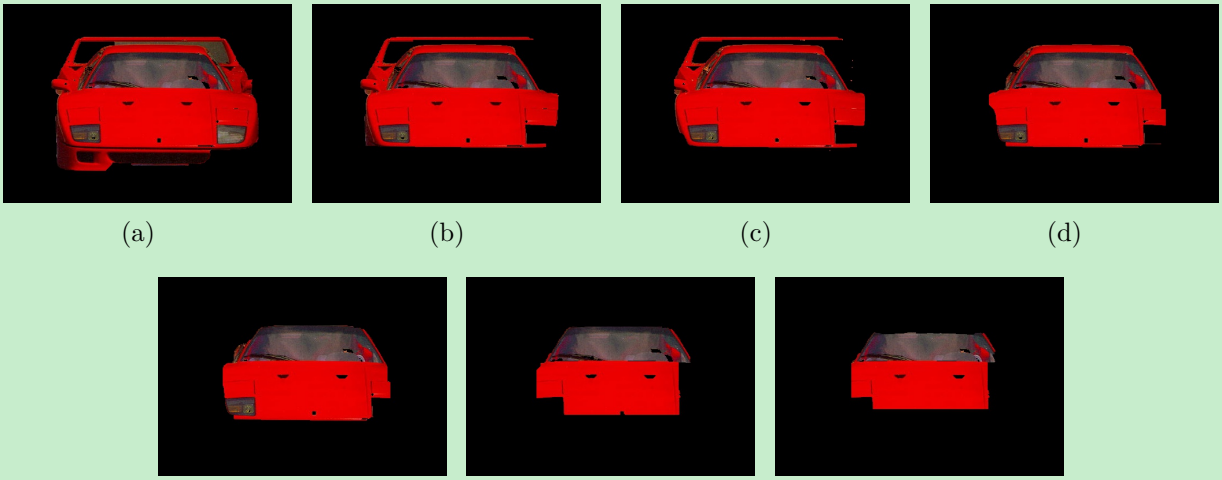
I implement grab cut with different size of rectangle.



(a) (b) (c) (d)

(e) (f) (g)

Figure 4: Different size of rectangle



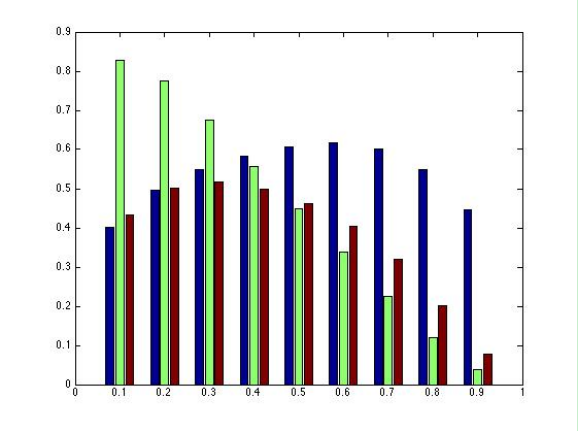
(a) (b) (c) (d)

(e) (f) (g)

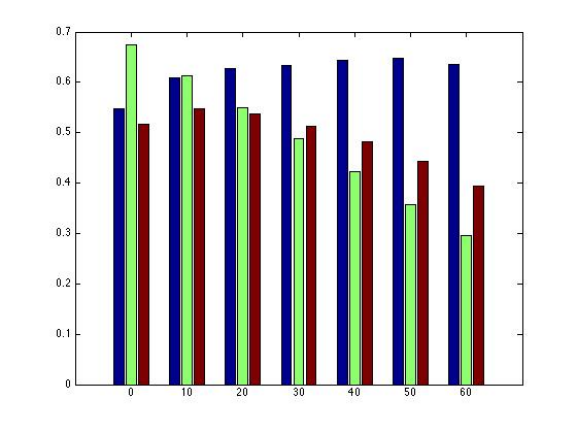
Figure 5: The result of different size of rectangle

1.5 Evaluate segmentation result

I draw PRF (Precision Recall F-measure) bar graph to evaluate segmentation result. The evaluate segmentation results are shown in Figure 6. The precision, recall and F-measure is larger and the segmentation is better. According to Figure 6(a), when the threshold is 0.3 or 0.4, the segmentation result is better. According to Figure 6(b), when the size narrows down 10 , the segmentation result is better.



(a) The evaluation result of different threshold



(b) The evaluation result of different size of rectangle

Figure 6: Bar graph of PRF

2. Mean Shift

In this part, I implement segmentation of 200 images (chosen in BSDS500) through mean shift. And evaluate the different segmentation result.

2.1 Input image

200 images in BSDS500 are inputed by batch processing in my experiment.

2.2 Segment via mean shift

In this step, I adjust two parameters of mean shift to get different segmentation results. The two parameters are:

- Spatial radius
- Color radius

When color radius, the number of iterations and iteration accuracy are fixed value (10, 5, 0.1), I adjust spatial radius from 10 to 100 (the interval is 10). When spatial radius, the number of iterations and iteration accuracy are fixed value (40, 5, 0.1), I adjust color radius from 10 to 100 (the interval is 10). A image's (Figure 7) segmentation results are shown in Figure 8 9 by adjusting spatial radius and color radius.

Figure 7: Original images

(a) spatial radius-10 (b) spatial radius-20 (c) spatial radius-30 (d) spatial radius-40 (e) spatial radius-50

(f) spatial radius-60 (g) spatial radius-70 (h) spatial radius-80 (i) spatial radius-90 (j) spatial radius-100

Figure 8: The result of different spatial radius

(a) color radius10 (b) color radius-20 (c) color radius-30 (d) color radius-40 (e) color radius-50

(f) color radius-60 (g) color radius-70 (h) color radius-80 (i) color radius-90 (j) color radius-100

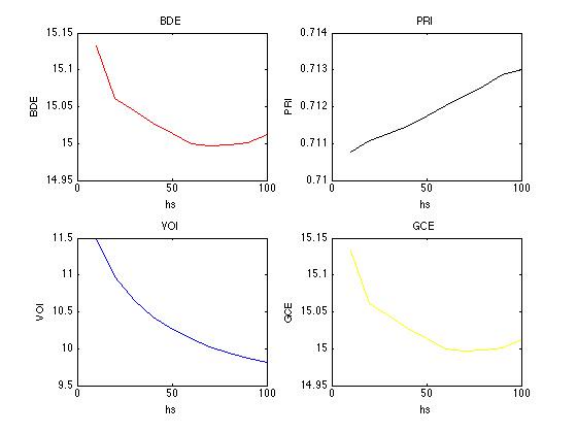
Figure 9: The result of different color radius

2.3 Evaluation segmentation result with groundtruth

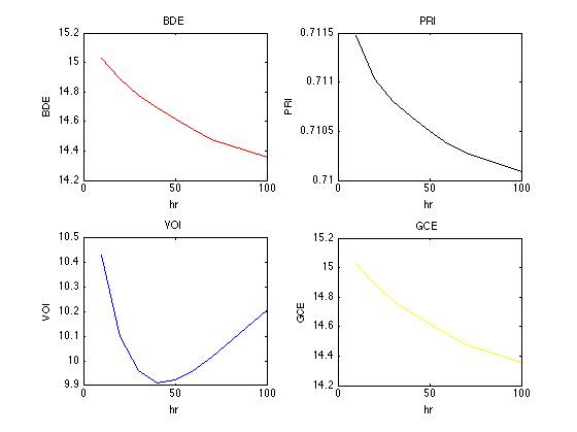
I evaluate the different segmentation results which are obtained by adjusting parameters. The methods applied are:

- Probabilistic Rand Index (PRI)
- Variation of Information (VOI)
- Global Consistency Error (GCE)
- Boundary Displacement Error (BDE)

A segmentation is better if PRI is larger and the other three are smaller, when compared to the ground truths. My evaluation result is shown in Figure 10. According to Figure 10(a), the larger spatial radius is, the better segmentation result is. According to Figure 10(b), the evaluation result may be wrong, and I will continue to check it.



(a) The evaluation result of spatial radius



(b) The evaluation result of color radius

Figure 10: Line chart of BDE PRI VOI GCE