CV2015Spring—Lab report of segmentation evaluation #3

Due: Thursday, April 12 8:00 AM

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1. Assignment

For this assignment, I will implement segmentation through grab cut and meanshift. Then, I will evaluate each method by adjusting parameters in segmentation.

2. Grab Cut (60 points)

The whole framework of the implementation for evaluation of grab cut is shown in Figure 1.

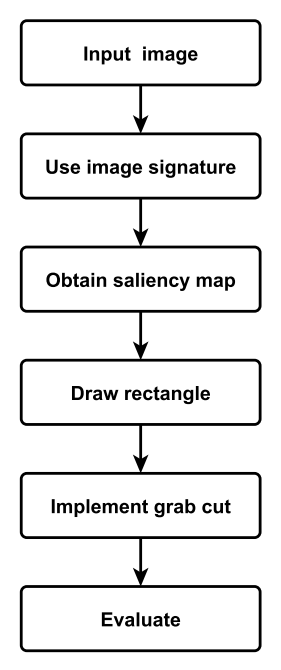

Figure 1: Framework of the implementation for evaluation of grab cut.

2.1 Step 1: Input image

I download and use PASCAL dataset. The dataset contains input images and groundtruth. I use all images (850 images totally) from the dataset for segmentation, and evaluate grab cut by adjusting different parameters.

2.2 Step 2: Use image signature

Input The input color image ($m \times n \times 3$ matrix).

Output The saliency map ($m \times n$ matrix).

Implementation The saliency map is obtained by image signature and the matlab code can be downloaded from website[1], where the files of SIG_single, signatureSal and default_signature_param are used.

2.3 Step 3: Draw the rectangle

Input The input saliency map image ($m \times n$ matrix).

Output A rectangle that is used to initialize the grab cut.

- The rectangle is used to locate the most probable position of object and initialize mask in grab cut.
- I use thresholding to transform saliency map to binary image and draw a rectangle according to the binary image.

2.4 Step 4: Implement grab cut

Input The input image ($m \times n \times 3$ matrix) from step 1, and the rectangle that I computed from step 3.

Output The image after segmentation ($m \times n \times 3$ matrix).

- I use grab cut with the rectangle to initialize and iterate k times for segmentation.

[1] http://www.eecs.berkeley.edu/Research/Projects/CS/vision/shape/action/

- The C++ code for drawing rectangle and implementing grab cut are downloaded from the website[2].

2.5 Step 5: Evaluate segmentation result

Input Segmentation result ($m \times n \times 3$ matrix) and groundtruth ($m \times n$ matrix) from dataset.

Output A figure that indicates evaluation results (The horizontal axis represents the parameter, the vertical axis represents the evaluation results).

Implement I adjust threshold and times of iteration to obtain different segmentation results. Then I draw a bar graph to evaluate grab cut.

- I draw PRF (Precision Recall F-measure) bar graph to evaluate.

2.6 Notes

- I choose two parameters to adjust:
  - threshold in step 3.
  - times of iteration in step 5.

3. Mean shift (40 points)

The whole framework of the implementation for evaluation of mean shift is shown in Figure 4.

3.1 Step 1: Input image

I download and use BSDS500 dataset.The dataset contains input images and groundtruth. I use 200 images from the dataset for segmentation.

3.2 Step 2: Segment via mean shift

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

Input The color image ($m \times n \times 3$ *matrix*).

[2] http://vision.ouc.edu.cn/~zhenghaiyong/courses/cv/2015spring/assignments/GrabcutCode.zip

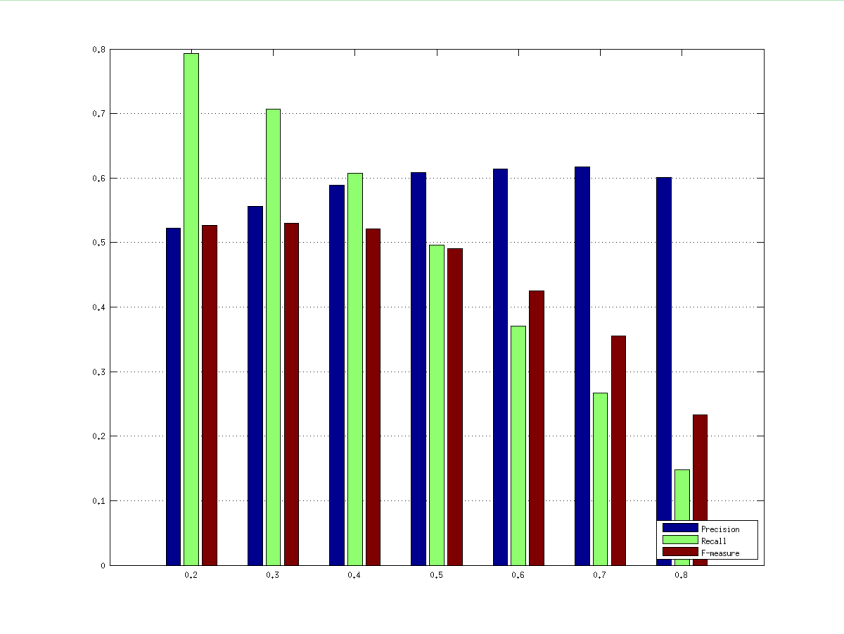

Figure 2: Live chart of PRF by adjusting the threshold value

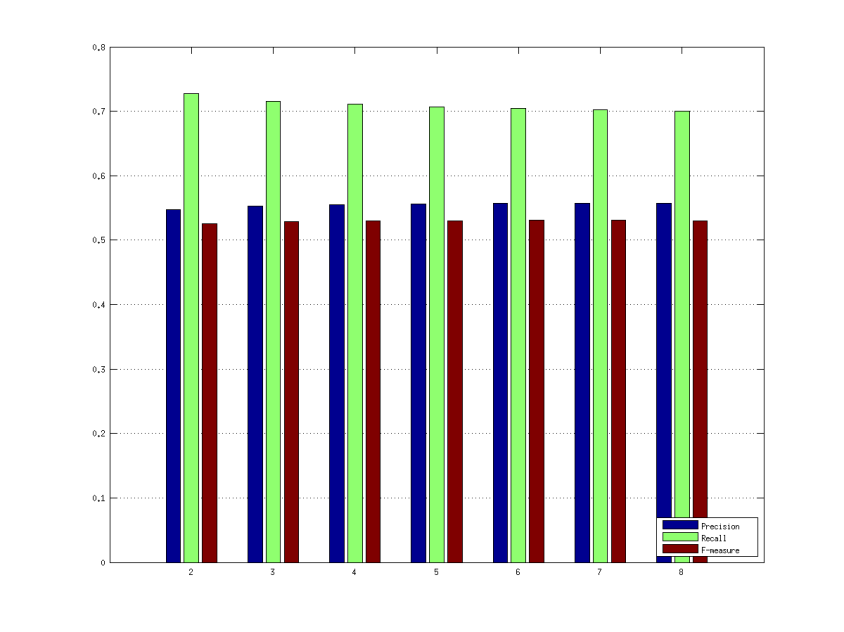

Figure 3: Live chart of PRF by adjusting the iterative times

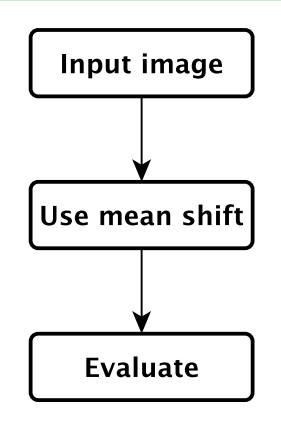

Figure 4: Framework of the implementation for evaluation of mean shift.

Output The segmentation results ($m \times n \times 3$ *matrix*) and label matrixes ($m \times n$ *matrix*) of different parameters.

Implementation I choose and adjust two parameters of mean shift for this implementation, including:

- Spatial radius
- Color radius

3.3 Step 3: Evaluate segmentation result with groundtruth

In this step, I evaluate the different segmentation results from step 2.

Input The label matrixes ($m \times n$ *matrix*) from step 2, the groundtruth matrixes ($m \times n$ *matrix*) from dataset.

Output Line chart of the evaluation results. (The horizontal axis represents parameters. The vertical axis represents the evaluation results.)

Implementation I use four evaluation methods, including:

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

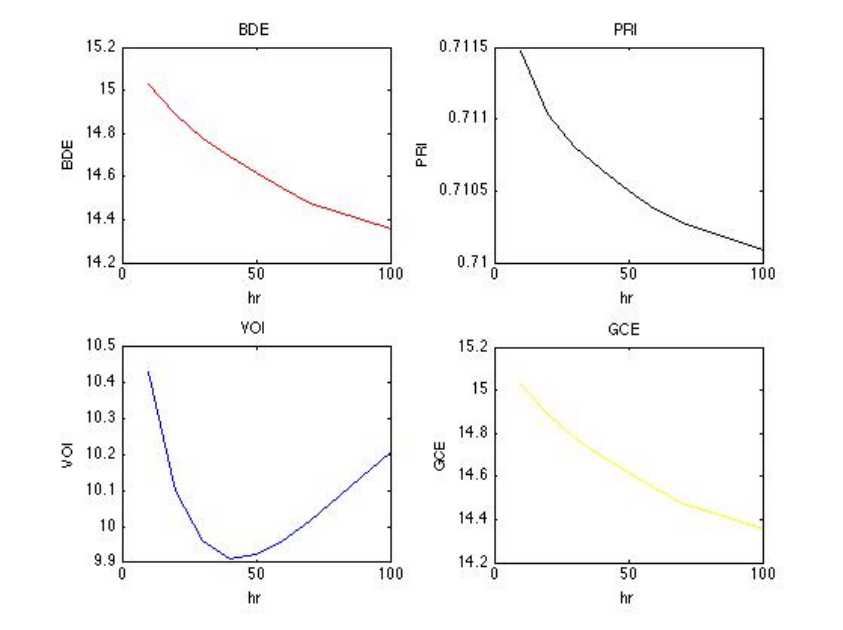

Figure 5: Line chart of BDE PRI VOI GCE by adjusting Spatial radius

Results : Figures show four kinds of evaluation results (BDE PRI VOI GCE) by adjusting two parameter (Spatial radius and color radius).

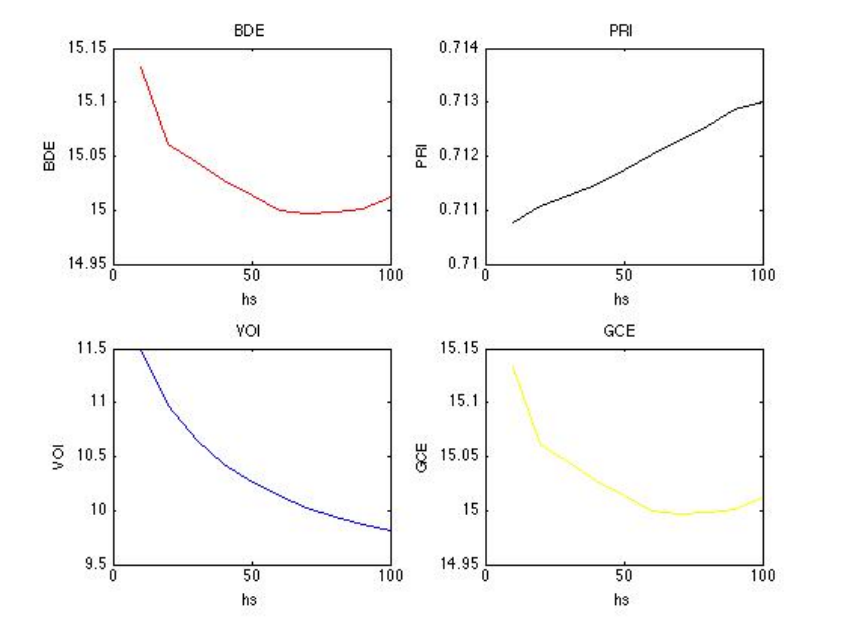

Figure 6: Line chart of BDE PRI VOI GCE by adjusting Color radius