HW2 grading criteria and regrading session

Posted Feb 20, 2019 10:26 PM

Dear all,

HW2 scores have been posted on DEN and grading criteria is attached.

Regrading session for HW2 will be held at the same time and location as regrading session of midterm 1. If you are not available at this time, please send an email to either **Yingpeng Deng (for P1) or Yao Zhu (for P2)** to set up an appointment before **11AM this Friday (Feb.22)**. We won't arrange any appointment if you didn't send us email by this time.

Grading criteria:

Problem1 (by Yingpeng Deng)

(a) **Description**:
Sobel is a type of 1st derivative/gradient filter; neighbor padding instead of zero padding (1pt).
Outputs:
Normalized gx map for vertical edges and gy map for horizontal edges (3 pts).
Intermediate normalized magnitude maps(1 pt).
Intermediate binary edge maps by at least two thresholds (1 pt).
Best binary edge maps (2 pts).
Discussion:
Sobel detector is noise-sensitive, denoising preprocessing can improve (1 pt).
Output edges of Sobel detector are not very precise (1 pt).

(b) **Description**:
Explanation about non-maximum suppression (1 pt).
Explanation about usage of the threshold pair (1 pt).
Outputs:

Edge results(4 pts).
Discussion about isolated effects of both two thresholds (2 pts).
Discussion:
Better than Sobel, thinner edges and better edge connectivity due to NMS and double thresholding (2 pts).

(c) **Description**:
Data-driven approach with training and testing process, or equivalent (1 pt).
Purpose of structured random forest (1 pt). Simplify and cluster labels for lower computational cost.
Relations of node, decision tree and random forest (1 pts).
Explanation about data flow and decision strategy (3 pts).
Approach and Purpose of randomness in random forest (1 pts).
Outputs:
Best results (3 pts).
Discussion about parameter (multiscale, sharpen, nTreeEval and nms) effects (4 pts).
Discussion:
Comparison of Canny detector and SE detector (1 pt).

(d) **Outputs**:
Precisions, Recalls and F measures for Sobel (2 pts x 2), Canny (2 pts x 2) and SE (2 pts x 2) detector on two images.
Discussion:
Comparison of F measures for three detectors (1 pt).
Comparison between F measures of two images and reason (1 pt).
Rationale behind the F measure definition (1 pts).

Problem 2: (by Yao Zhu)

2a: (15 pts)

i. Random threshold correct result(3 pts)

Discussion: (1 pts)

- The strength of this method is that it is very fast. The output image is still acceptable if image detail is not highly required or printing resolution no need to be very high.
- Need to explain that halftoning with random threshold introduces random noise, which is an obvious disadvantage of this method.
- Noise removal post process is not appropriate, as it changes binarized output, will bring grayscales.

ii. Dithering

I2 (3 pts), I8 (3 pts), I32 (3 pts)
Discussion: (2 pts)
- Comparing with random threshold, the output of dithering method is much more stable and detailed.

- There is an overall tendency that larger dithering matrix gives more detailed output, like the comparison between I2 and I8 output. I32 and I8 perform quite similar, demonstrating such tendency converges finally. In practice, in order to balance cost and performance, a dithering matrix with median size is preferred.
- Pros: Easy to manipulate. Better performance than constant and random thresholds, as provides more details.
- Cons: Obvious periodic block patterns.

2b: (15 pts)
FS (4 pts), JJN (4 pts), Stucki (4 pts)
Discussion: (3 pts)
Criteria:
- Performance comparison among the 3 error diffusion methods.
- Pros: More detailed result than dithering method (like the ship in the ocean, and bridge ropes).
- Cons: Inevitable maze-like patterns.
- Suggestion for performance improvement:
e.g. change diffusion matrix to be error dependent, redesign parsing route, etc.
Note: If you find you have deduction of point(s), please check your algorithm first, whether it is serpentine or raster, whether it has correct threshold. The correct result is from serpentine parsing with threshold 127.

2c: (20 pts)
i. Separable (10 pts)
5 for correct result, 5 for discussion
ii. MBVQ (10 pts)
5 for correct result, 5 for answering 1) and 2)
Description: please refer to the paper
Discussion:
- MBVQ can preserve brightness better than separable method.
- Both have maze-like pattern due to the FS error diffusion algorithm.