

Assignment 2 Image segmentation

Yang Mu, 05/11/2021

263-5902-00L - Computer Vision HS2021

Mean-Shift Algorithm

1. Implementation of mean-shift

When implementing the for-loop-based mean-shift algorithm, in the distance function, I calculated the quadratic norm of the current point and all points in the three-dimensional feature space (Lab) with the torch.norm function. For gaussian function, I calculated the weights by distances between the current point and all points with gaussian kernel formula. In update_point function, I calculated the sum of weights, and got the new position of the current point by multiplying weights divided by sum and Lab values of all points.

In the batch-processing-based mean-shift algorithm, to avoid using for-loop in the distance_batch and update_point_batch function, I used 3D data operation to replace the previous 2D data operation to calculate the distances and update points in batches.

2. The timings of for-loop-based and batch-processing-based mean-shift

In the for-loop-based mean-shift, the consumed time is 36.59s.

```
In[2]: runfile('/Users/muyang/PycharmProjects/me
Elapsed time for mean-shift: 36.58712029457092
```

When batchify the inputs (batch size = 2048), the consumed time is reduced to 26.36s.

```
100%|██████████| 2/2 [00:01<00:00, 1.58it/s]
100%|██████████| 2/2 [00:01<00:00, 1.57it/s]
100%|██████████| 2/2 [00:01<00:00, 1.53it/s]
100%|██████████| 2/2 [00:01<00:00, 1.55it/s]
100%|██████████| 2/2 [00:01<00:00, 1.54it/s]
Elapsed time for mean-shift: 26.358101844787598
```