Vaa3d Workshop

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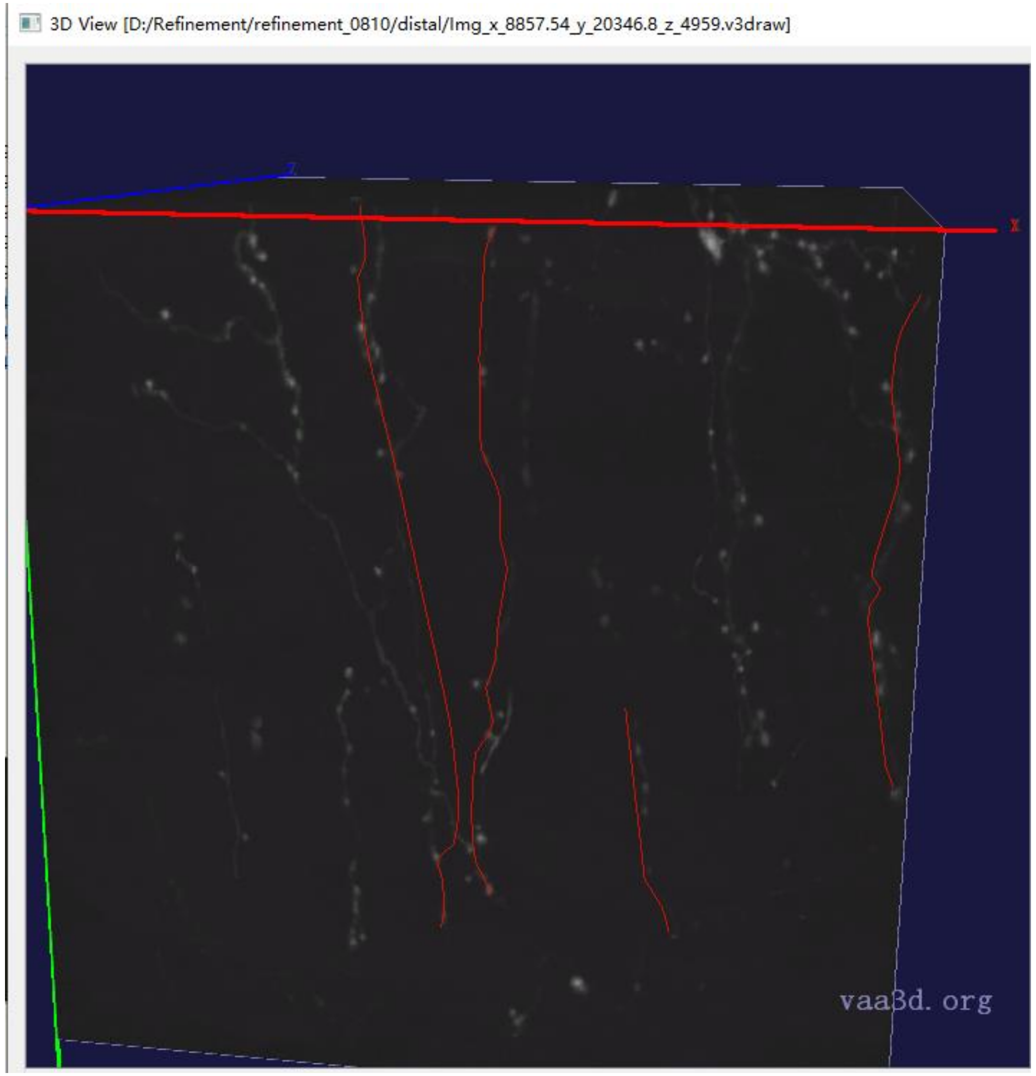
Background

- Swc is not on the signal due to the inconsistent image resolution during the labeling process

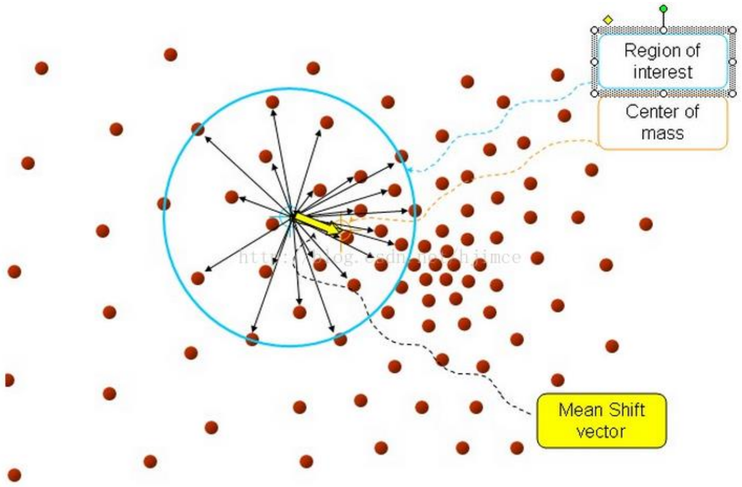
Our problems



Mean-shift

- Move the signal to the centroid of the brightness of the picture

$$m(x_i) = \frac{\sum_{i=1}^{n} x_i g(||\frac{x-x_i}{h}||)^2}{\sum_{i=1}^{n} g(||\frac{x-x_i}{h}||)^2} - x$$



Pros and cons:

- Meanshift:

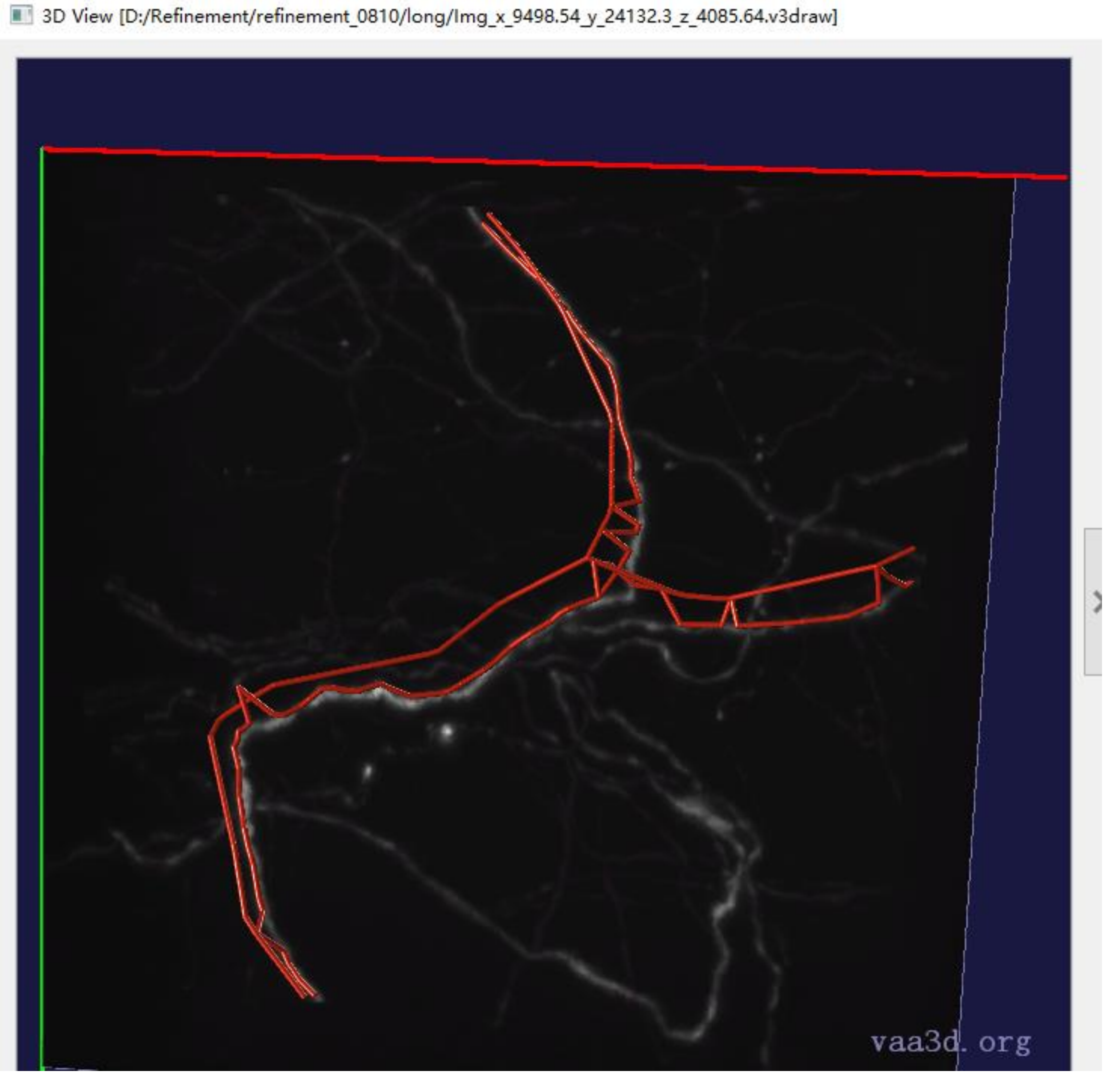
  Advantage: work well on dentrites (bold light signal)

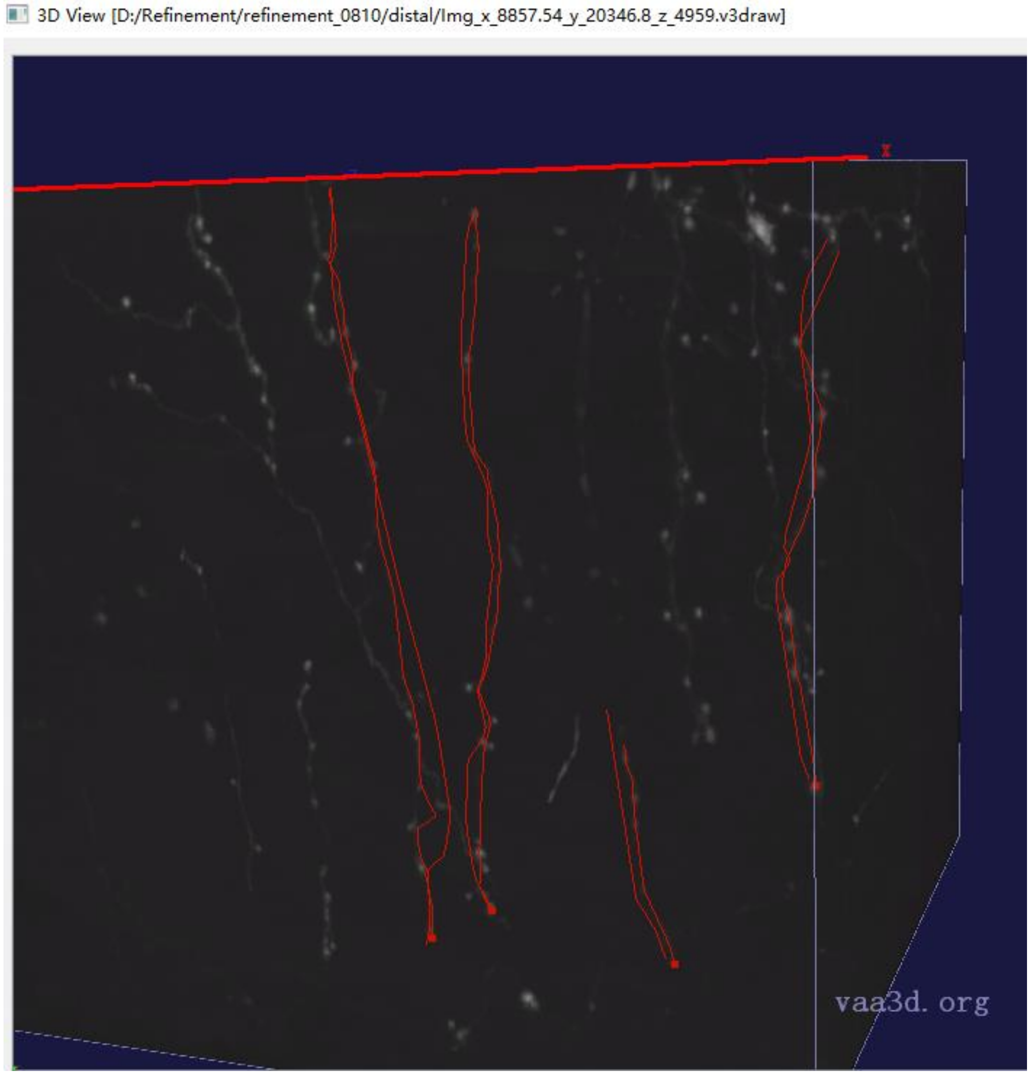
  make the swc close to the centerline

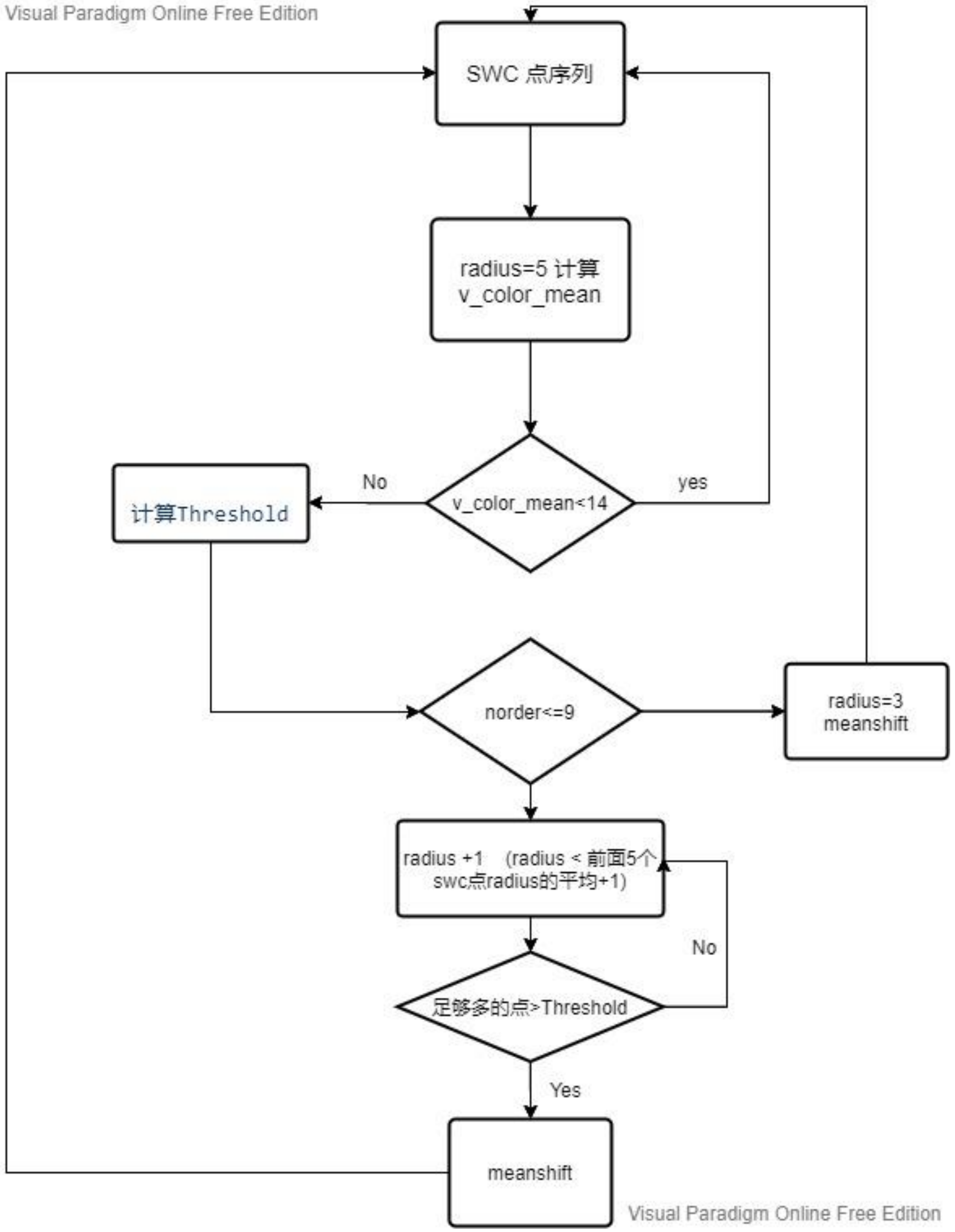
  Disadvantage: rely on threshold and window radius

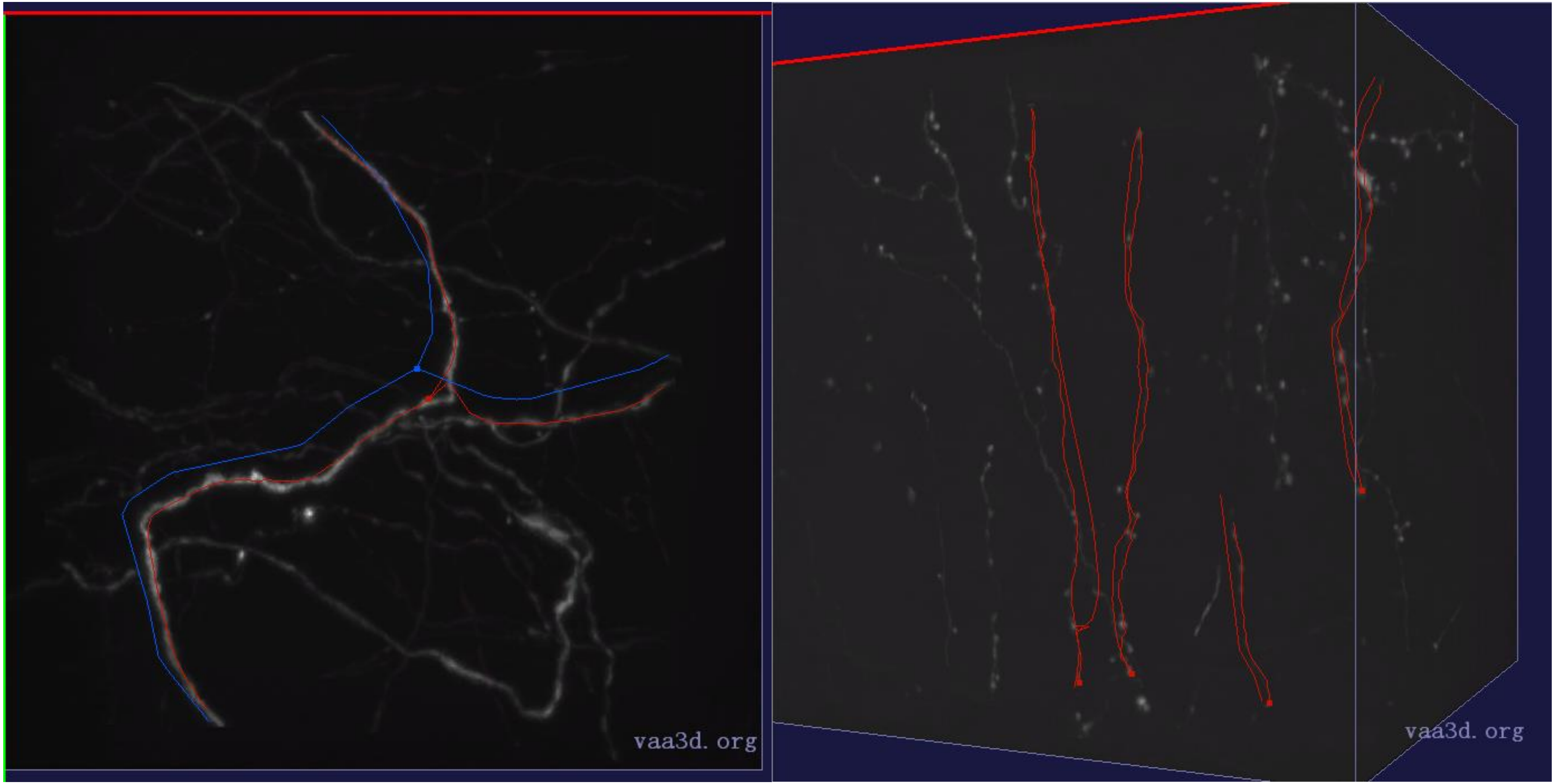
  may easily make mistakes

Remaining problem:






SWC 点序列
radius=5 计算
v_color_mean
v_color_mean<14
yes
No
计算Threshold
norder<=9
radius=3
meanshift
radius +1 (radius < 前面5个swc点radius的平均+1)
No
足够多的点>Threshold
Yes
meanshift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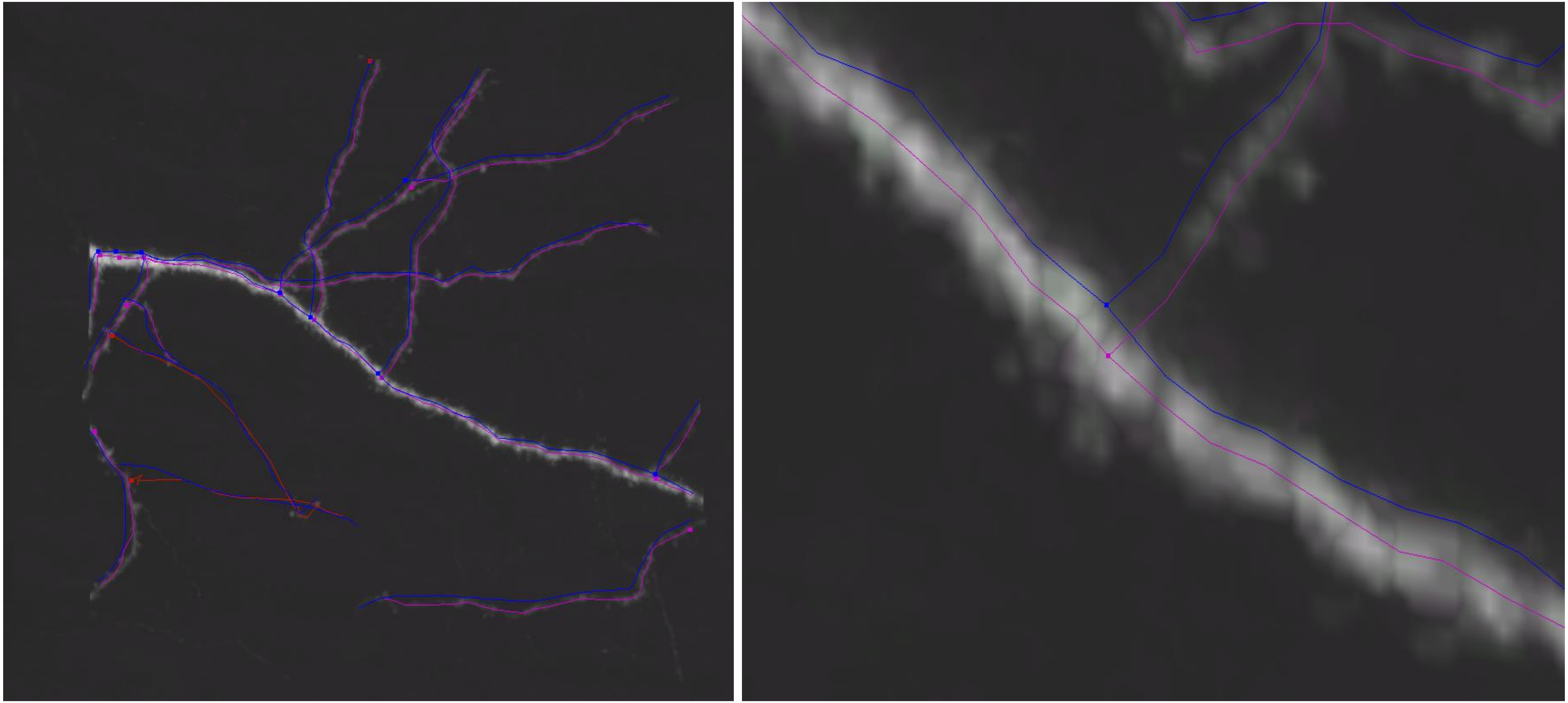


GD(graph-augmented deformable model)

- Step1: initialize a “shortest” path based on Euclidean distance and image intensity between given point A and B.

$$e(v_0, v_1) = \|v_0 - v_1\| \cdot \left(\frac{g_I(v_0) + g_I(v_1)}{2} \right)$$

- Step2: optimize the objective function

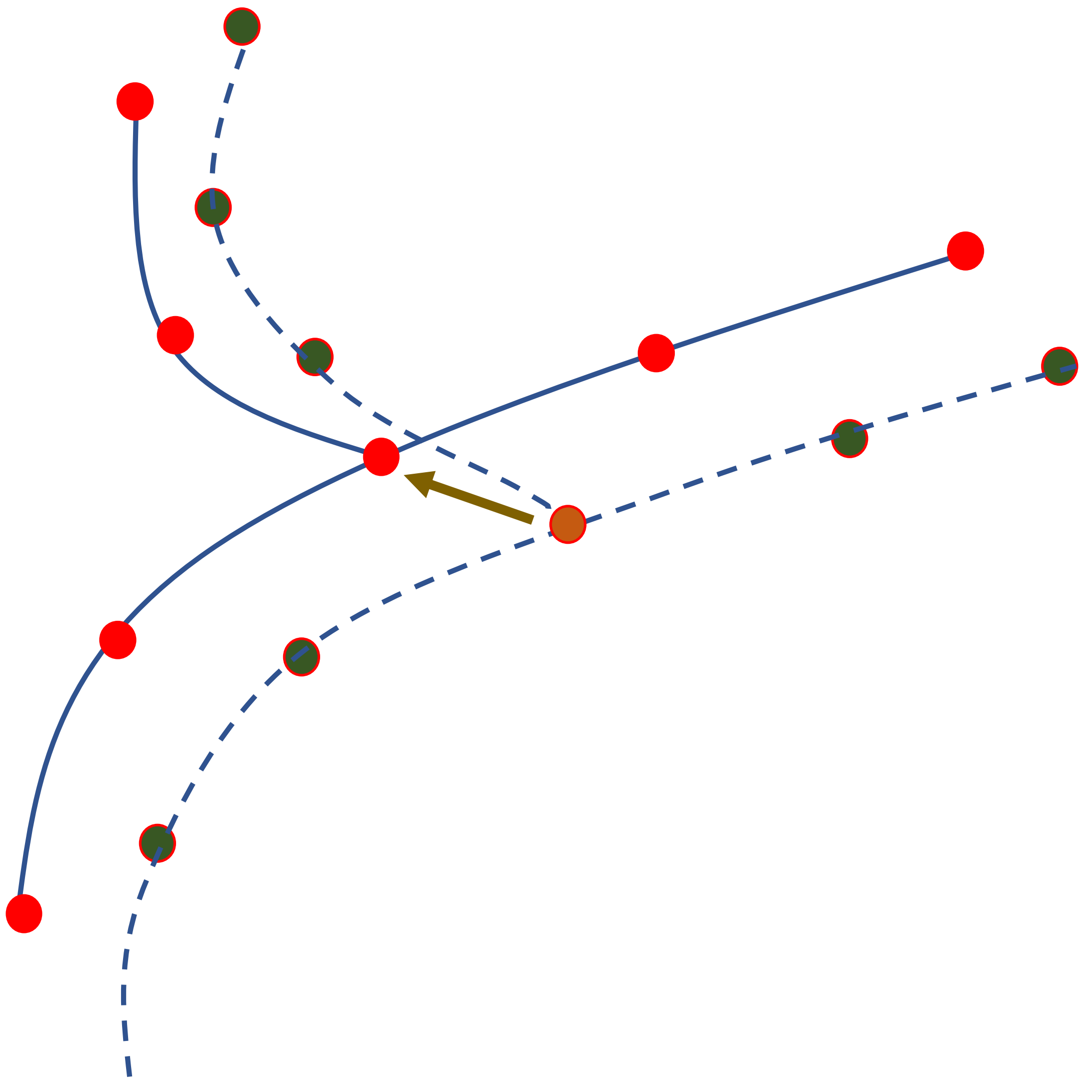
$$L(C) = \int_C g(p, I[\Theta(p, r)]) \|dp\|$$

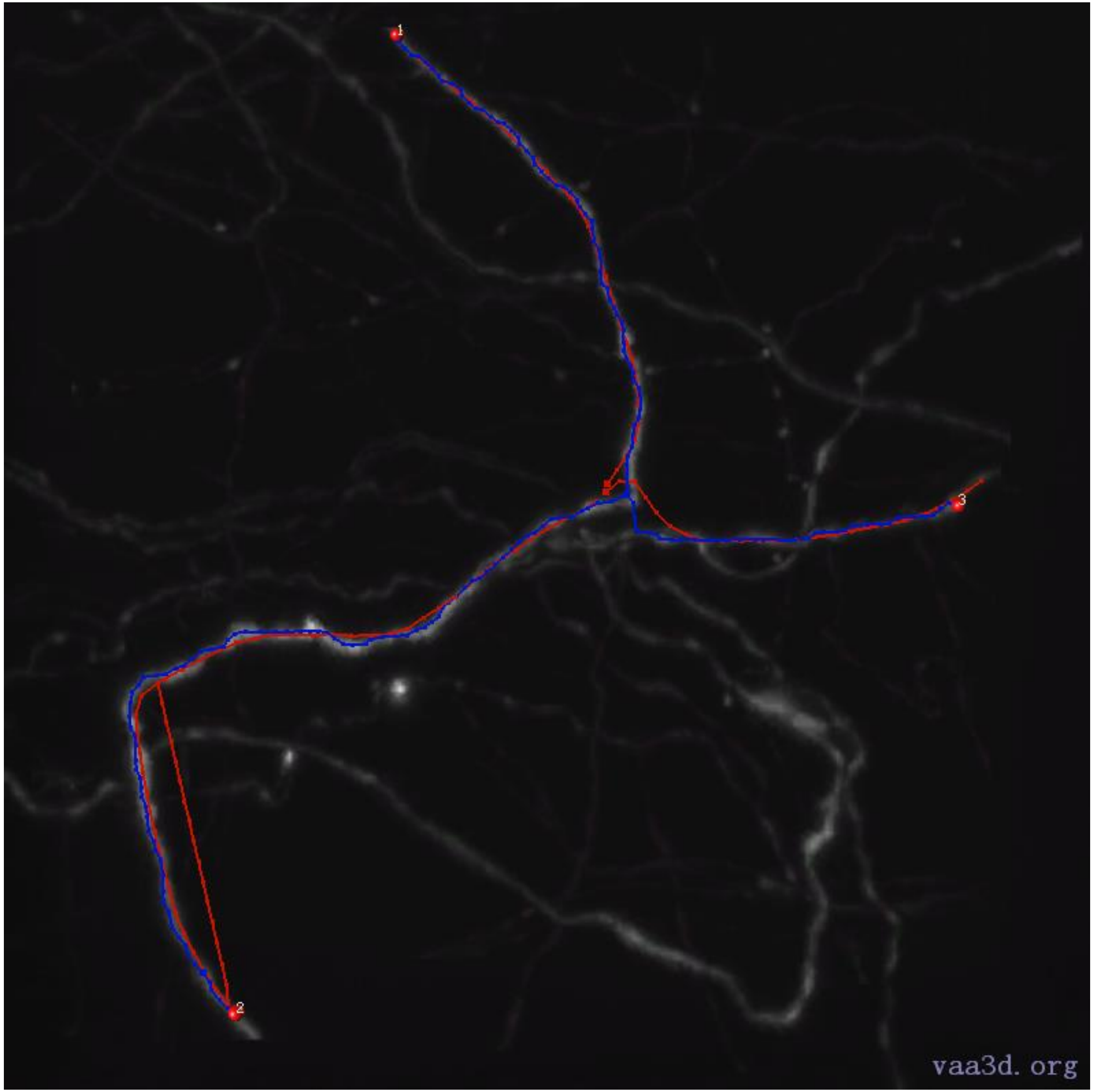
*

Step1: divide neuron into segments

Step2: shift branch point on signal

Step3: run GD twice




1
2
3
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Pros and cons:

- GD:

Advantage: do a much better refinement job

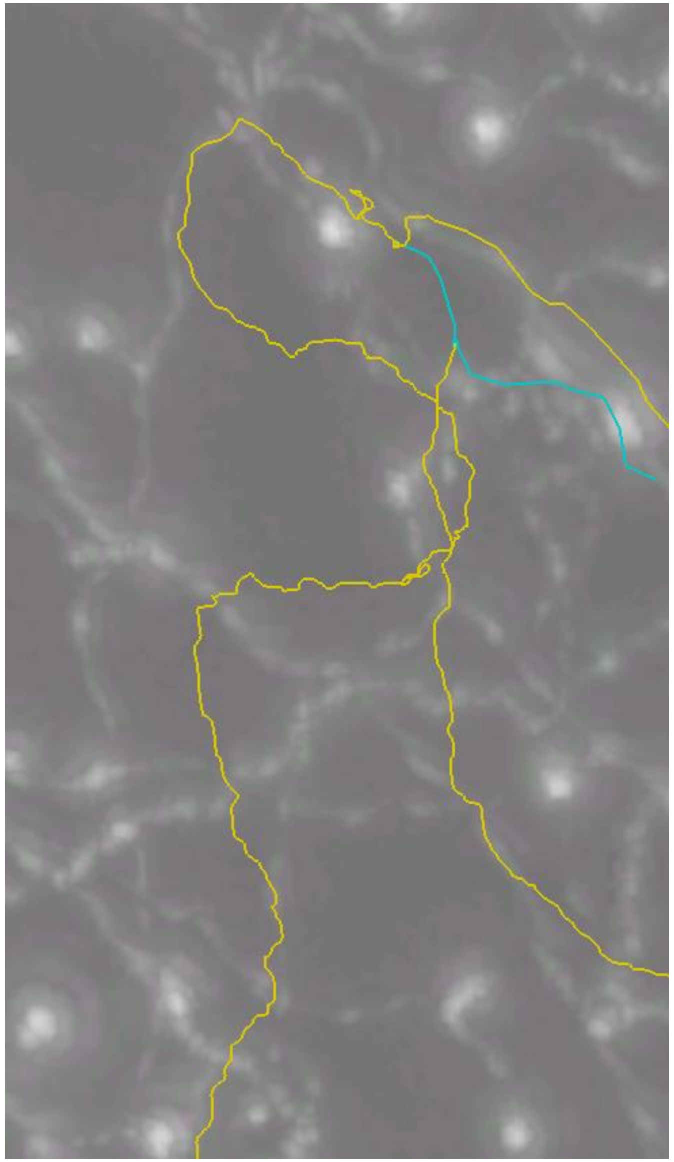
Disadvantage:

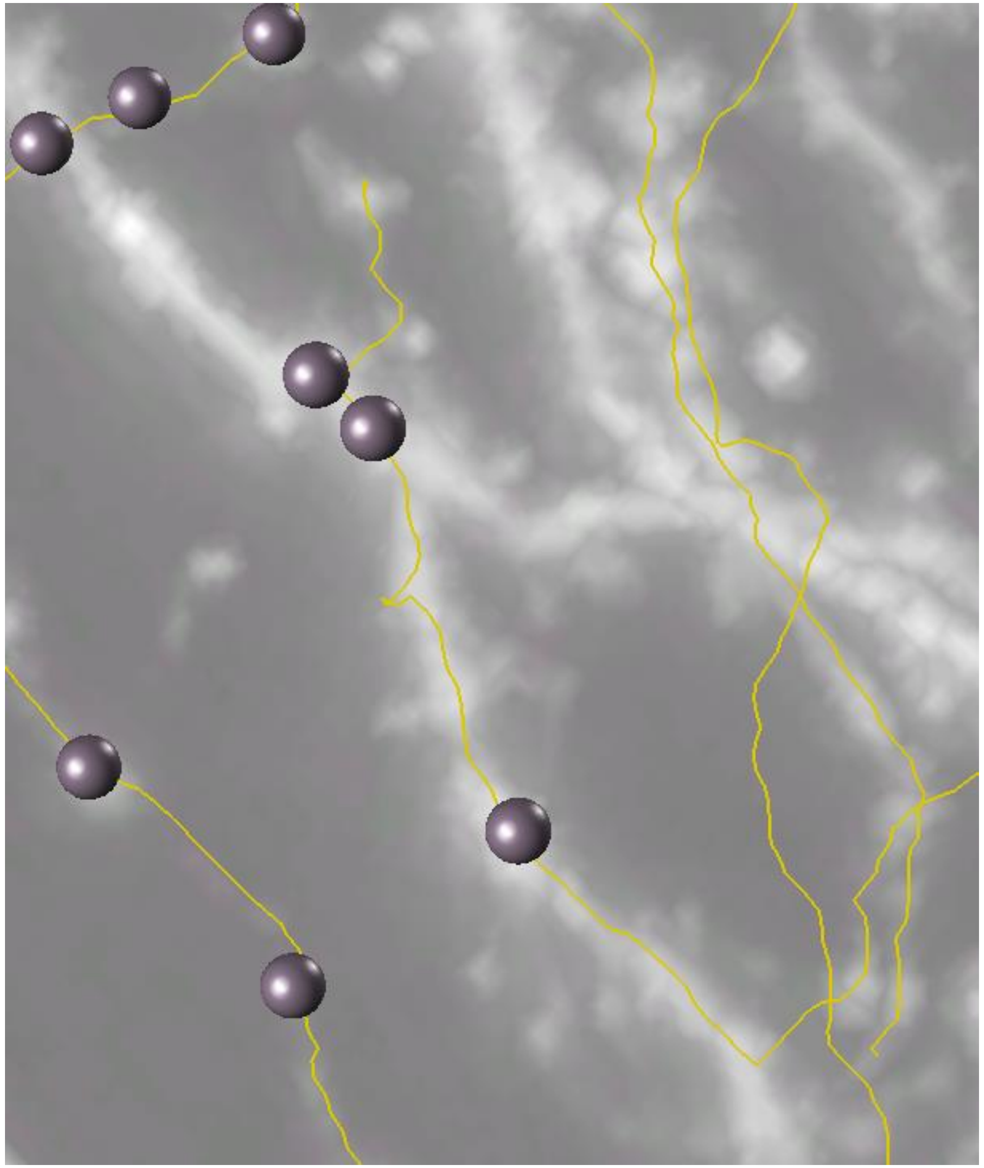
lean on given points and might be disturbed by other signals

bad on dentrites (bold light signal)

There is no guarantee that swc is on the centerline

Swc may become rugged





Current plan

- Step1: Divide swc into segments according to branch points
- Step2: Run GD on each segment
- Step3: Smooth and shift swc to centerline (meanshift)

To do：

- There needs to be a quantitative method to evaluate the effect of refinement.
- Ensure that the swc is in the center of the signal
- Further refinement