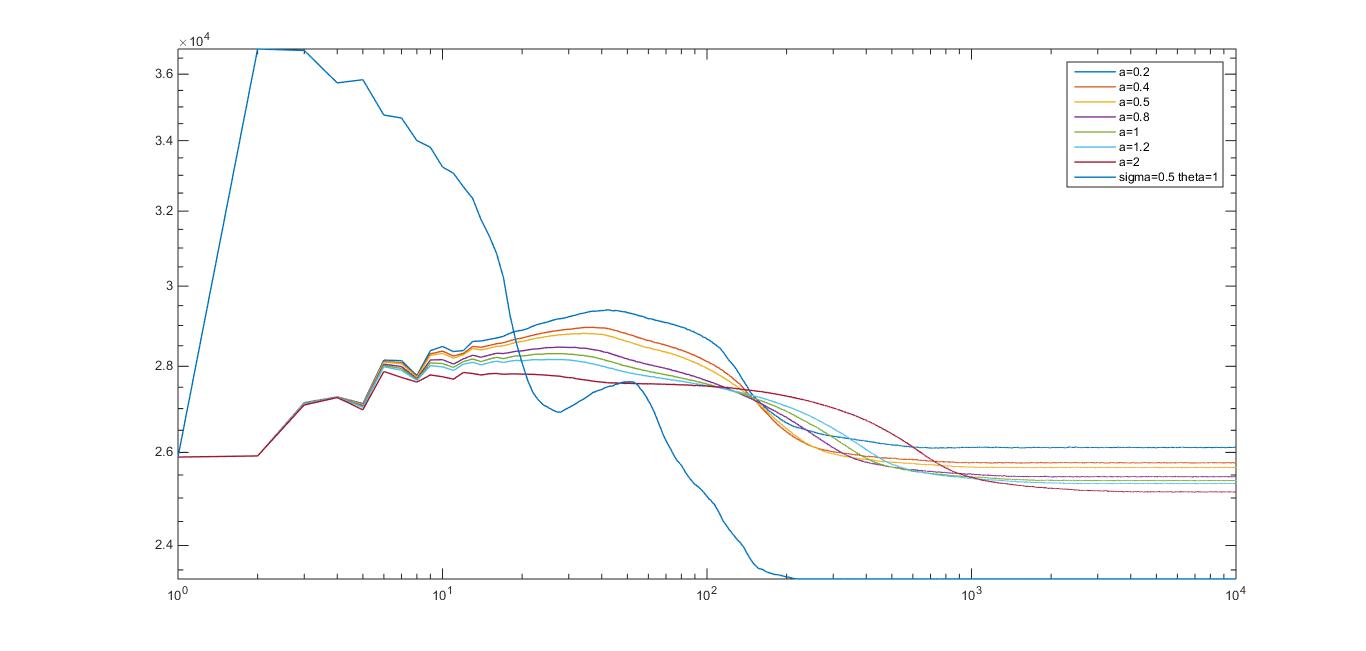
In this summer I did two groups of comparison: PDE acceleration and Chambolle-Pock primal-dual on level set segmentation with TV regularization and Beltrami regularization. The level set scheme I used here is called fuzzy region competition, in which the surface is constrain within [0,1] and the contour is 0.5 level set.

For TV regularization, the potential energy function is:

The difference from Chan-Vese is that there is no Heaviside function here, *u* is the level set. Check the paper [Mory-Ardon2007] for detail. The primal-dual algorithm is from [Chambolle-Pock2011], the algorithm is shown below.

The problem here is I don’t know how to choose sigma and tau to have the best performance. From paper [Chambolle-Pock2011], it says τσL2<1, here ,so . So the multiply of sigma and tau is a fixed value, but I don’t know what the value is for each instance. I played with those parameters and done lots of experiments. I got the best result with tau = 1, sigma =0.5.

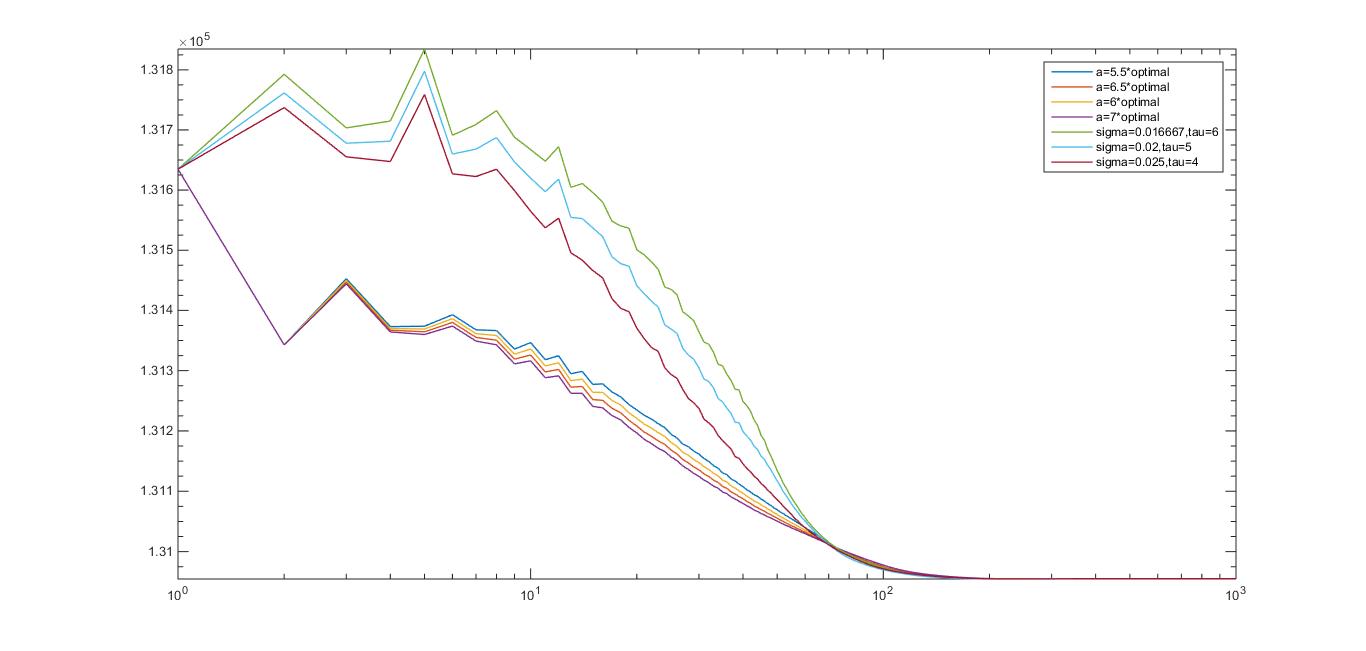
For acceleration, the quantization level Q I use here is 1/255, the acceleration method is forward difference. And Dr.Yezzi told me that there is no optimal damping coefficient for TV, so I tried various of damping coefficients. The energy loglog plot is shown below. Line 1 to line 7 are acceleration, line 8 is primal-dual. All the experiments are done on noisy image. 

For the final segmentation result, please check the folder.

For Beltrami regularization, potential energy is

The primal-dual Beltrami version algorithm is from [Zosso-Bustin 2014], the algorithm is shown below

In the experiment, beta is 2. For the acceleration, the optimal damping coefficient is .But in the experiment the best result occurs when damping coefficient is 6 times of the optimal damping coefficient. The energy loglog plot is shown below. Line 1 to line 4 are acceleration and line 5 to line 7 are primal-dual.



For the visual segmentation results, please check the folder.