MATH865 HW2

April 4, 2008

1.Consider a functional of the form

$$F(u) = \int_\Omega f(x, u(x), \nabla u(x))dx,$$

where f is of class C^1 with resepact to $(u, \nabla u)$. Derive its functional derivative.

2. Play with the demo code on Lagged Diffusivity fixed point method for ROF model. Try to get an image you like, add in two different kind of noise (such as Gaussian, Salt & peper), and then denoise. You should plot the original image u, the image with noise u^{noise}, the denoised image $u^{denoise}$, and noise estimation $|u^{noise} - u^{denoise}|$, and energy function which decrease in time.

3.Write a code which follows ROF paper to do denoising. (In this case, λ is not a constant any more, it is also updated in each time iteration.) Try to add a Gaussian noise with mean 0 and variance σ^2 you picked, and then denoise. You should plot the original image u, the image with noise u^{noise}, the denoised image $u^{denoise}$, and noise estimation $|u^{noise} - u^{denoise}|$, and energy function which decreases in time.