Project 1 for CAP6412
Due 16:30, 25 September 2003

Implement the method presented in the paper: Vector-Valued Image Regularization with PDE's: A Common Framework for Different Applications

- Input images are in the zip file on the website. Jpeg, ppm, and pgm files are available for all images.
  - gnome_noisy
  - zoomu_gnome_noisy
  - NoisyFace
  - bar_original
  - zoomu_bar_noisy
  - totoro_small
  - resu_lolo_bloc
  - resu_david_original, needs mask: resu_david_mask
  - parrot_original needs mask: parrot_mask
  - japan_original
  - 2Dflow this image may not be good enough
- For more images or for a description of the images and what the output should be like go to http://www-sop.inria.fr/odyssee/research/tschumperle-deriche:02d/appliu/index.html

Deliverables:

- Implement method in paper in C, Octave, or matlab (Octave or matlab will be better, since you do not have to write programs for finding Eigenvalues and Eigenvectors)
- Write a short report describing the method, your implementation, experiments, problems you encountered, and any comments you have.
- Show the applications of this method for color image restoration, improvement of lossy compressed images, color image inpainting, color image magnification, and flow visualization. Show your results for the input images given. You will most likely need to use multiple iterations, thus you should output the images at different iterations.

Solution tips:

1. Compute gradients for each channel (Hessians are actually not needed)
2. For every pixel
   - Compute the eigenvalues and eigenvectors for G_{Color}
   - Compute T as defined in equation 12
   - Compute $\mathbf{G}^{(T,dt)}$ as defined in equation 7 (should be a 3X3 kernel)
   - For each channel
     - Convolve channel value for this pixel with $\mathbf{G}^{(T,dt)}$
     - This will be the output value for this channel
2. Repeat steps 1-2 for multiple iterations using the updated image channels

Bonus:
1. Compare results obtained by treating each color channel as a scalar valued function with the results obtained treating it as vector valued function.
2. Compare results obtained using bi-lateral filtering with the results obtained using this method.
3. Compare results obtained using anistropic diffusion of Perona and Malik with the results obtained using this method.
4. Use each color channel separately and compare the results with vector-valued formulation.