Lab 6: The Heat Equation

Primary Goal: Learn how to code and apply anisotropic diffusion to a color image.
Secondary Goal: Practice typing equations in a report.

Your goal is to apply anisotropic diffusion to a color image. Preferably the color image will be a selfie, so that you can turn yourself into a cartoon.

Adapt the function you wrote in Activity 6 for anisotropic diffusion. You can process a color image by applying your code to each of the 3 RGB channels and storing it in the corresponding channel of a new image. Demonstrate that your code works by choosing two different values of the edge-stopping parameter a. Choose two values that show clear differences in the resulting images and also from the original image. Paste your code and your images into appropriate figures.

In your text, briefly describe how anisotropic diffusion works and how you extended it to color images. To make sure you get practice typing equations in a report, be sure to include the Anisotropic Heat Equation PDE and the edge-stopping function $K(x, y)$ that your are using. Use Equation Editor or some other equation-writing software (e.g., LaTeX) to prepare your equations. Do not simply type in normal text. For example, you would write the magnitude of the gradient as

$$\|\nabla u\| = \sqrt{u_x^2 + u_y^2}$$

and *not* the absolutely horrendous-looking

||grad(u)||=sqrt(u_x^2+u_y^2).

What to Include in Your Report

1. *[10 points]* Write a short paragraph describing anisotropic diffusion for color images. Your text should reference your figures. Your text must contain neatly typed equations for the PDE you are evolving and the edge-stopping function.
2. *[5 points]* Prepare a figure that shows your Matlab code for anisotropic diffusion. Include a caption on your figure.
3. *[5 points]* Prepare a figure that shows the original image and the 2 diffused images for different values of the parameter a. Include a caption on your figure.