

Lab 8: Variational Methods



Primary Goal: Learn how to perform Total Variation (TV) inpainting.

Secondary Goal: Learn how to restore an image that is highly damaged by salt & pepper noise.

Download the Lab 8 dataset from our course website. This dataset is a Matlab save file that can be loaded into your workspace with the command:

```
load lab8;
```

This should load two grayscale images A and B. View both images.

These images have been corrupted by a large amount of salt & pepper noise. Recall that salt & pepper noise selects random pixels and resets the values to the maximum intensity (white=255) or the minimum intensity (black=0). This noise is too severe to remove by standard denoising algorithms such as median filter or TV denoising.

We can attempt to restore the images using TV inpainting. Let's assume that all pixels that take on the value 0 or 255 are damaged. (This may include pixels that originally had the value 0 or 255, but that's OK.) Create a binary inpainting mask that locates these pixels. Then restore the images using your TV inpainting algorithm from Activity 8. I suggest letting the algorithm run for a long time, such as stopping time $T = 300$ with a time step $\Delta t = 0.5$, and the fidelity weight $\lambda = 0.2$.

Display the original image A and its restored version in an appropriate figure. Do the same thing for image B. Also, place your TV inpainting Matlab code in a figure.

What to Include in Your Report

1. *[5 points]* Write a paragraph explaining how you restored the image. In particular, describe how you set up the inpainting mask. Reference your figures in the text.
2. *[5 points]* Create a figure showing image A and its restored version. Include a caption.
3. *[5 points]* Create a figure showing image B and its restored version. Include a caption.
4. *[5 points]* Paste your Matlab code for TV inpainting into a figure. Include comments in your code that describe the process. Include a caption.