

CS 663: Assignment 5

Question 5

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Notes

All the necessary images are present in the corresponding question's *images* folder.

The RMSE values can also be found in the auto generated report in report directory.

Observations

- a) Denoised using all patches - RMSE Value = 0.112036
- b) Denoised using best 200 patches - RMSE Value = 0.091780
- c) Denoised using Bilateral filter - RMSE Value = 0.147315

Bilateral filter doesn't perform as well on the given image. The differences between the two approaches are quite stark.

PCA based approach finds the eigenvectors of the patches, projects them onto their eigenspace and then explicitly denoises the coefficients. It uses the Weiner filter based approach for denoising the coefficients, and the image is reconstructed by assembling these denoised patches.

Bilateral filtering removes noise by smoothing the image. For smoothing a pixel P, it takes a weighted average of pixels in the image, giving more weight to pixels close by in space and also those which have intensity close to that of P. If the noise is large, then intensity at P is off by a large amount compared to ground truth. Applying bilateral filtering gives high weight to pixels with intensity close to this amount and low weight to the ones with intensity far away. This doesn't counter effect of actual noise present. Increasing the variance of spatial part for large noise might lead to blurring of edges.

- d) Filtering Poisson Noise -
RMSE for normal exposure image = 0.037535
RMSE for low exposure image = 0.110380

The normal exposure image has become much better after denoising. But it's the low exposure image which has improved tremendously from the PCA based Denoising.

Images

- In the next page you can find the images for all the parts above





