IMAGE PROCESSING (RRY025)

Studio Exercises

Image Restoration II: Wiener filter

EX. 1

- Simulate a blurred image that you might get from camera motion. Create a point spread function, `PSF`, corresponding to the linear motion across 15 pixels (`LEN = 15`), at an angle of 27 degrees (`THETA = 27`). To simulate the blur, convolve the filter with the image using `imfilter`.

- To see the importance of knowing the true `PSF` in deblurring, perform three restorations.

- For the first restoration, `wnr1`, using the true `PSF`.

- For the second restoration, `wnr2`, use an estimated `PSF` that simulates motion twice as long as the blur length (`LEN`).

- For the third restoration, `wnr3`, use an estimated `PSF` that simulates an angle of the motion twice as steep as the blur angle (`THETA`).

EX. 2

- Simulate additive noise by using normally distributed random numbers and add it to the blurred image created in EX. 1.

- Restore the blurred and noisy image using an inverse filter, assuming zero noise, and compare this to the first result achieved in EX. 1, `wnr1`. Notice that the noise present in the original data is amplified significantly.

- To control the noise amplification, provide the noise-to-signal power ratio, `NSR`.

- Vary the `NSR` value and see how the restoration is affected.

- To improve the restoration of the noisy and blurred image, supply the full autocorrelation function ACF for the noise, `NCORR`, and the signal, `ICORR`.

EX. 3

- Try now to restore the noisy blurred image by using the autocorrelation function of another (non-nosy, non-blurred) image. Surprised?