

## LAB 5 - Modelling Noise & 2D Filters - Chapter 7- MATLAB for Image Processing

Lab Report Due: - March 9, 2006

In this Lab. we do experiments in Chapter 7, pages 7-1 to 7-12. Note that you will be needing programs from IPO1.

1. We first look at all the 6 ways of modeling noise. Which provides additive noise and which one provides multiplicative noise?

We will focus only on the additive white gaussian noise (*awgn*) in this part. Let us examine the nature of *awgn*. We can start with an image of all zeros so that we can get to the noise part. Use *imnoise* to add wgn with zero mean and variance of, say, 1. Examining this, can you figure out how you can show that the wgn process has zero mean and variance 1?

As a related issue, let us generate *awgn* noise directly, using the function *wgn*. Use  $w=wgn(100,1,1)$  to generate a 100 x 1 matrix  $w$  of wgn with a power of 1 db ( as in watts when applied to a 1 ohm resistor).

1. Use *hist* to show that  $w$  is gaussian.
2. Find the mean of  $w$ .
3. Look at  $xcorr(w)$  to show that it is uncorrelated.
4. Look at  $xcov(w)$  to show that it is uncorrelated.
5. Obtain a zero mean realization (generated from using *xcorr*),  $W = w - mean(w)$ .
6. Do  $W' * W$  to find total power. Divide by 100 to find average power.
7. Do  $W' * W$  to find total power. Divide by 99 to find average power.
8. Now find  $variance(w)$ . Does it agree with 7?
9. Is this 0 db?

Note that you could have the done the same analysis for *awgn*(100,100,1).

2. Use the averaging filter under Averaging Filter, as shown. Note the loss of resolution.
3. Use the median filter under Median Filter, as shown. Note that it is typically used to remove outliers.
4. Do the Wiener adaptive filter example under Adaptive Filter. Note how this adaptive smoothing does a better job preserving edges.
5. Under Filter Demonstration, use *nrfiltdemo* to get familiar with this GUI for filtering.

### REPORT

1. Comment on 1.
2. Comment on 2.
3. Comment on 3.

4. Comment on 4.
5. Comment on 5.

Reference: Image Restoration Techniques, Chapter 7 from MATLAB for Image Processing.  
Programs from IPO1.

*Class notes:mirchand/ee276*