## Table of Contents



# Lab: Image Formation

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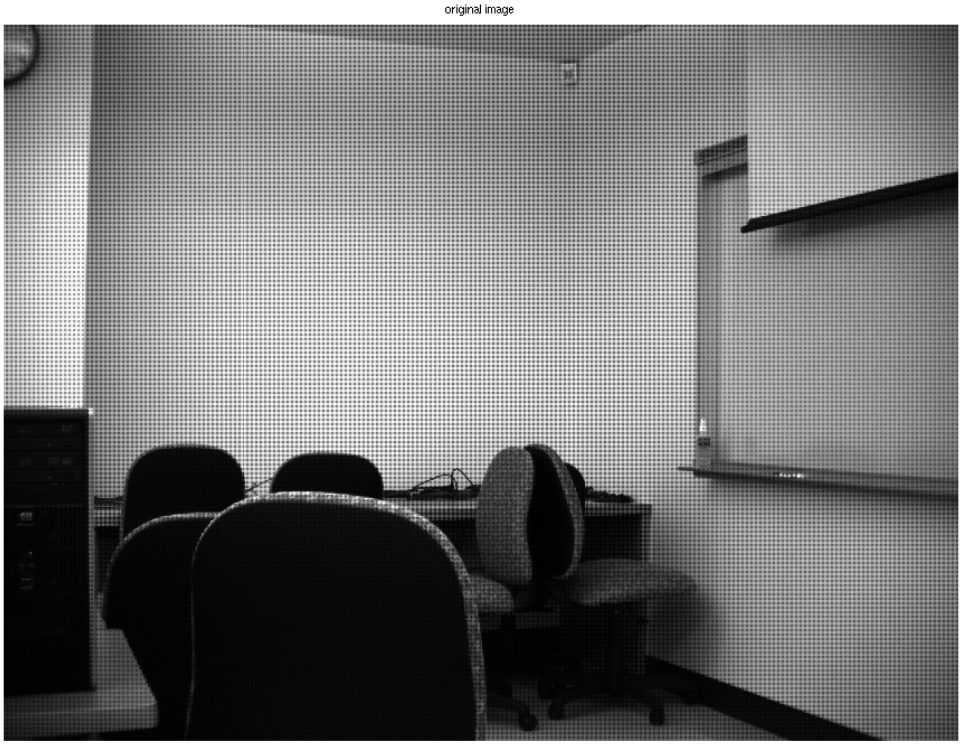
# Introduction

In this lab we beigin processing a set of greyscale images to examine the properties of noise and begin to look at and manipulate plots of this noise.

# A. Loading Images

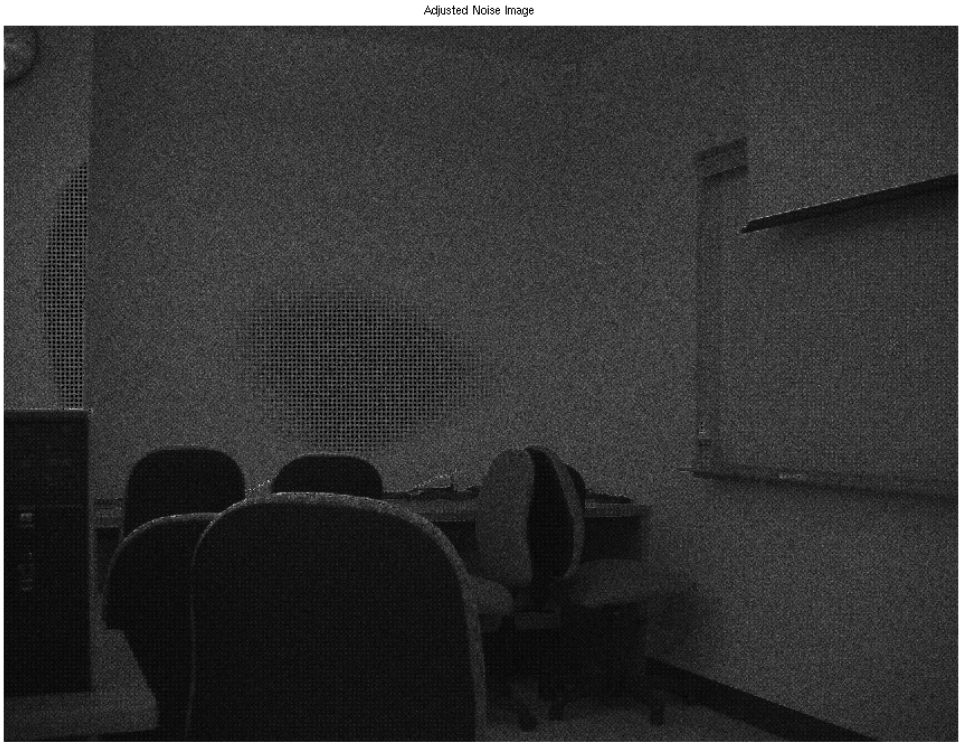
We begin by leading images from a specific directory and read them in matlab using the rawread command. We display one of the original images and then load the rest of the images into an array.



# B. Processing Images

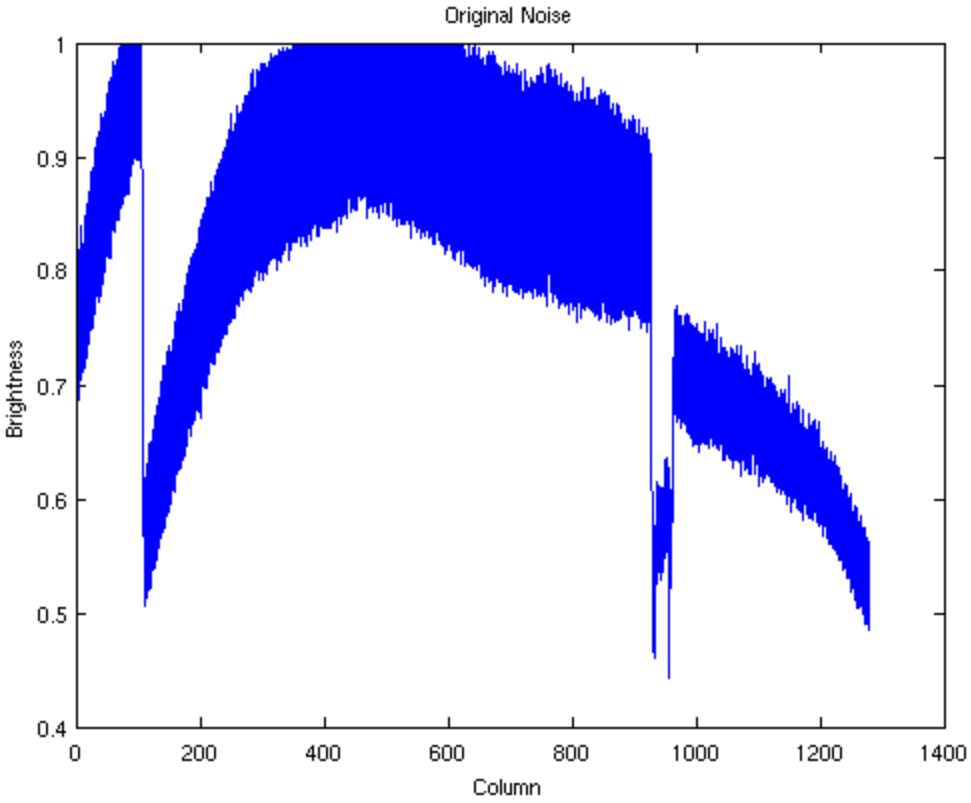
Then we must convert the images to doubles so we can do matrix arithmetic. We want the standard deviation for each pixel among the 10 pictures so that we may analyze the noise. We first find image difference by subtracting the mean image from each original pixel. We square the result using .^ notation and find the varience by summing these values. From the variance we find the standard deviation by taking the square root.

# C. Analyzing Noise

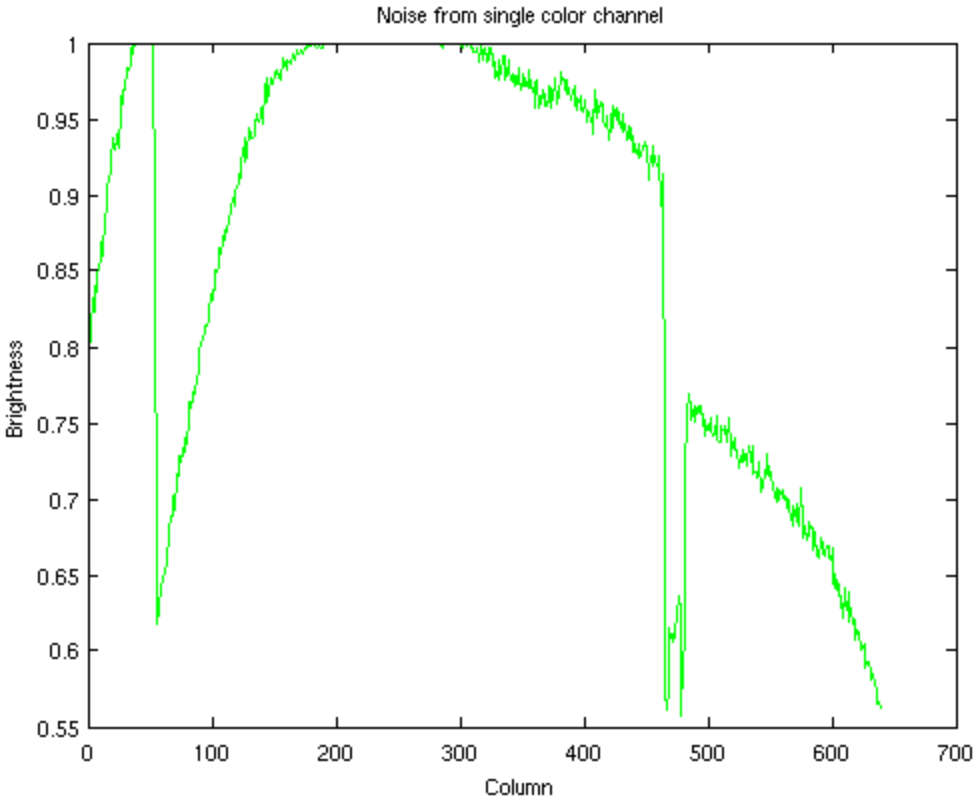



C.2 The parts of the image with the most noise seemed to be two specific points of blank wall that appeared the most bright in the original images. The deviation image does not show the checkerboard pattern observed in the original images, but the areas of most noise have a more apparent pattern than the rest of the deivation image. Perhaps the brighter portions of the image produce most noise becase the 3 different types of photoreceptors do not necessarily read the same brightness value between pictures.

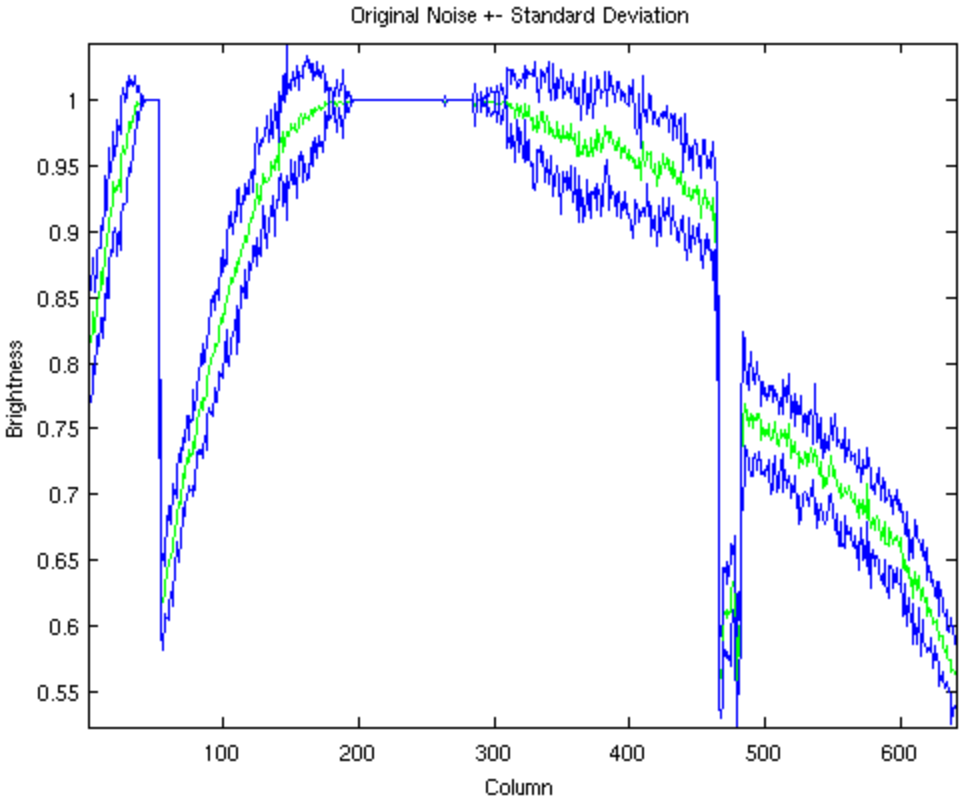
Now we plot one row of above image to get a better visual for the noise.




C.4 We now extract only every other column from a single row to consider only one color channel, which makes a smoother plot.




C.5-6 We want plot the mean plus and minus the standard deviation on the same canvas as the original (shown in green).




C.11 We examined the noise by multiplying Std. Dev. by 2 and then multiplying by 256 to examine the span of grey levels. The noise appears to span on average 6 gray levels in this particular instance.

C.12 We used the mean function to cakculate average noise of image across all pixles. An estimate of the average noise for all pixels is 13.0574.

C.13 Finally, we used 'max' to calculate the worst case of noise in the image. An estimate of the worst case noise is 69.7

# Conclusion

In this lab we explored the baisics of image processing as well as an approach for analyzing the noise of greyscale images, given a set of similar images. We saw how to calculate the standard deviation of a set of images, and we hypothesized that areas of greatest brightness seem to yield the most noise. The noise in our set of images seemed relativily low, on average traversing 13 grey levels, and our maximum noise was around 70.

# Acknowlegements

All image data taken from Jerod Weinman, location : /home/weinman/courses/CSC262/images/raw.

FIN

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