CSC 262 Lab: Local Operator

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Overview:

In this lab, we explore local pixel operations including gamma, bias, and gain adjustments. We also aquaint outselves with histogram equalization.

Gamma corrected, Bias altered, and Gain altered images and observations (A.4, A.6, and A.8)

our gamma corrected image has higher brightness than the orginal image while our gain adjusted image has higher contrast with gain value of 2. Our bias altered image has bias value 0.25 and is brighter that the original image.

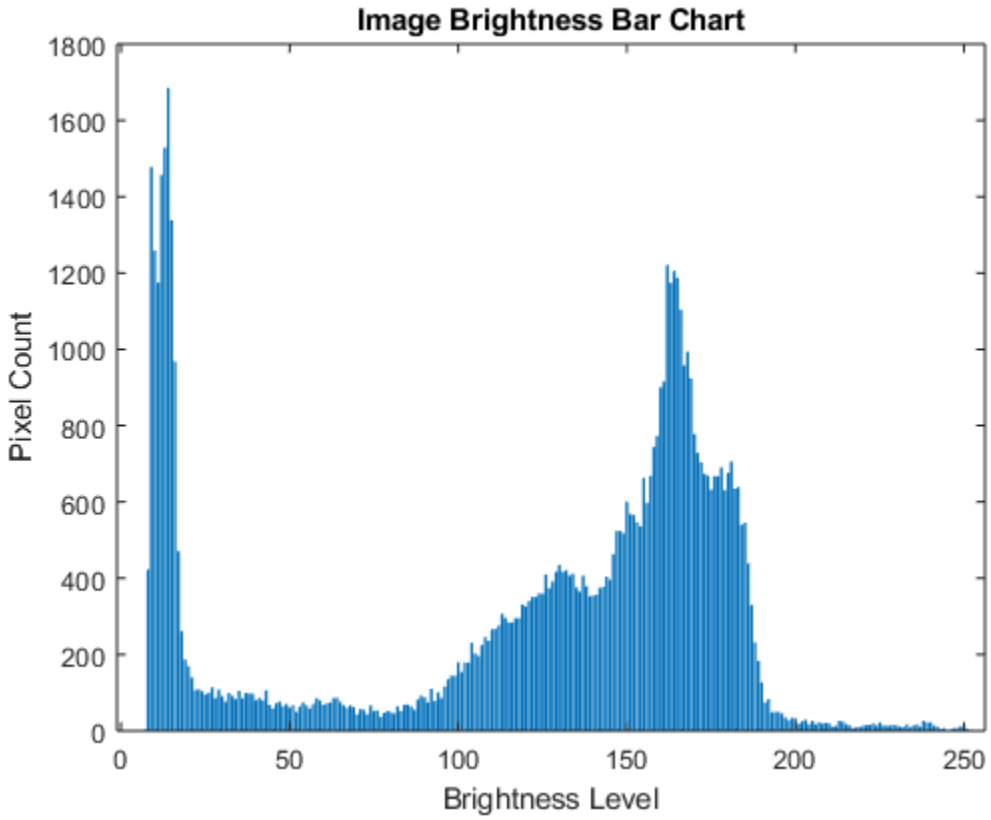
original image

gamma corrected image

bias altered image

gain altered image

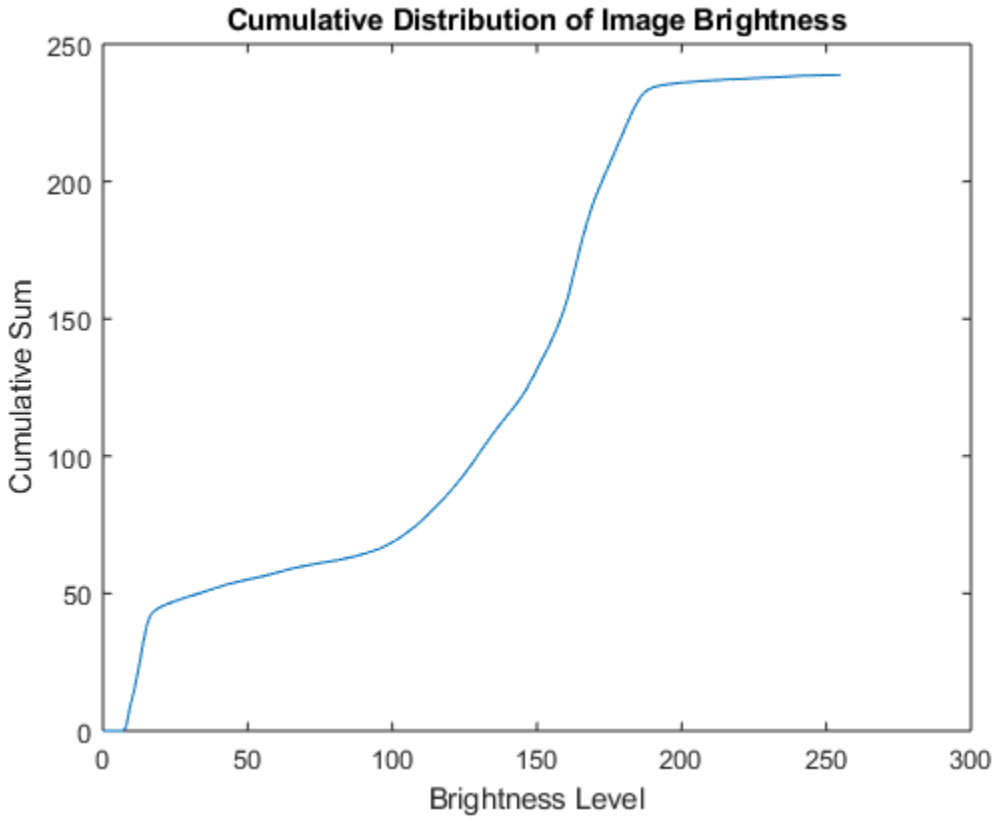
Histogram of our image (B.7)



Observation from the histogram (B.8)

the brightness level with the most pixel count is 14 (count 1685). we would observe the most significant detail improvement in the ranges 0-20 and 160-170 as they have the highest pixel density with similar brightness.

Plot of cumulative distribution function (D.2)



Explanation of transfer function (D.3)

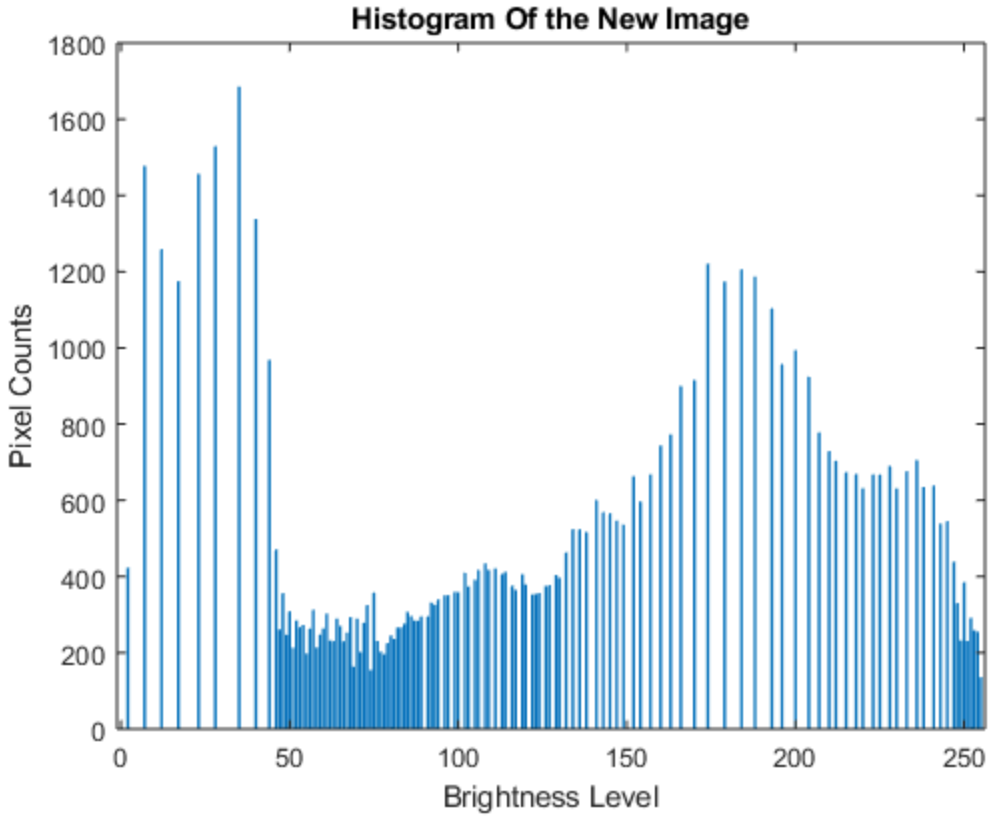
regions with steep slopes are 0 to 20 and 160 to 185. These regions correspond to the parts of the histograms with high pixel count. The diagonal region is from 100 to 160, and the other regions have approximately near horizontal slopes. When we use the CDF as a transfer function, we expect an increase in brightness from 10 to 60, and from 160 to 240. We also expect a decrease in brightness from the remaining ranges. We normalized the distribution of cumsum to maximum value of 255, and plot it against a diagonal line to obtain this result.

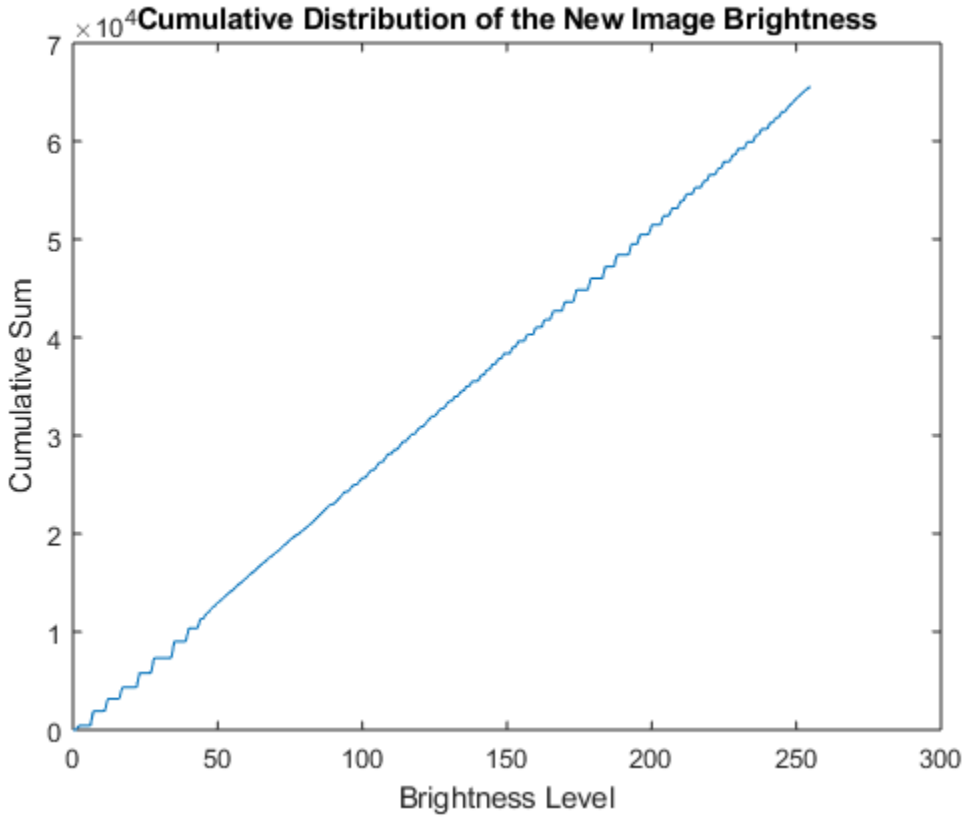
Histogram-equalized image and observations (D.8)

after we histogram-equalized the image, the image intensity is adjusted such that the contrast of the image is significantly higher. We can see details in the man's coat that is invisible in the original image.

Histogram and observations (D.9)

the histogram of the new image is much flatter than that of the old one. While the overall features is unchanged, the distribution is much more even, less clumped into large peaks. The cumulative distribution function also has the interesting feature of being almost diagonal.


Histogram Of the New Image
Pixel Counts
Brightness Level
0
200
400
600
800
1000
1200
1400
1600
1800
0
50
100
150
200
250


×10^4
Cumulative Distribution of the New Image Brightness
Cumulative Sum
Brightness Level
0
1
2
3
4
5
6
7
0
50
100
150
200
250
300

Conclusion

We found that histogram equalization is a method that can be used to enhance an image's contrast. It brings the histogram of the image closer to that of a flat image. We also learn a method to create an image histogram using the functions available in Matlab. Finally, we observed diffrent image alteration techniques and understand their behaviors.

Acknowledgements

We referenced the houghlab.m script by Professor Jerod Weinman

Published with MATLAB® R2018a