Dhirubhai Ambani Institute of Information and Communication Technology

Assignment 3

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Developed using: Python(SimpleCV)

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1 Image Enhancement

1.1 Enhancing scene image

In this problem we applied various contrast enhancement methods for improving the contrast of the given image.

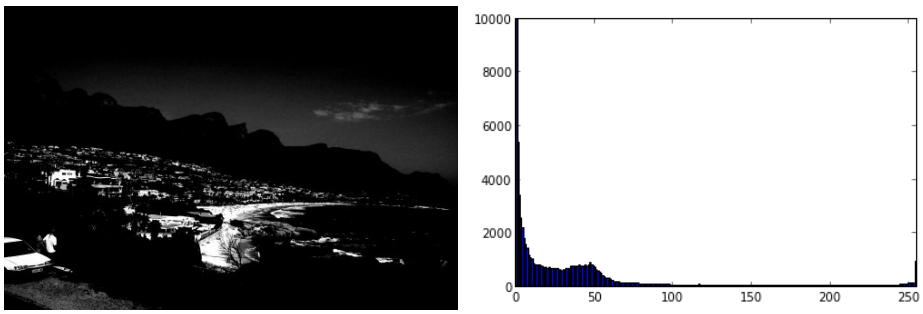

Figure 1.1: Original Image and corresponding histogram

From visually inspecting the image we realize that there is a very stark contrast in the image. We extracted the histogram of the image and from it we observe that there is a large concentration of pixels on the dark side. There is very little concentration in the middle of the histogram. Then near the higher intensities there is again a peak.

We applied various techniques for enhancing the contrast of the image. Details of the same are reported below.

1.1.1 Log transformation

We applied the log transformation as our aim is to spread the darker gray levels in the image over a higher range. We applied a transformation of the form
$s = \frac{255}{log(1+255)} log(1+r)$

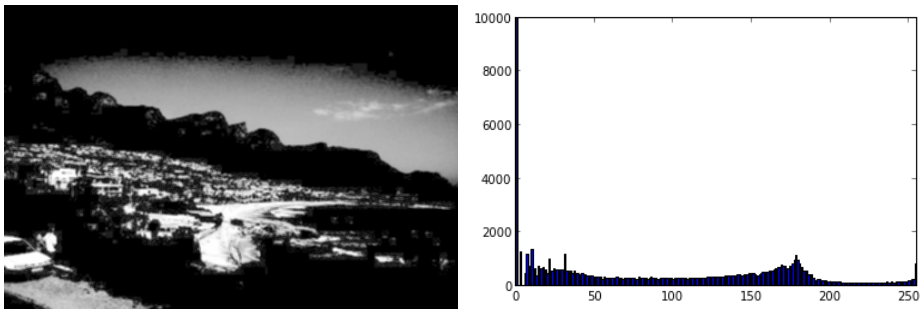

Figure 1.2: Image and corresponding histogram obtained after applying log transformation and a gaussian blur with kernel size = 3

We obtain an image having much better contrast than the original image. We apply the gaussian blur to smoothen the image. It is evident from the histogram that there is a better distribution of the intensities in the transformed image.

1.1.2 Powerlaw transfromation

The results from Log transformation encouraged us to experiment with powerlaw transformations(Gamma transfrorm) as its behaviour is similar to that of log transform when γ is fractional.
$s = 255r^{\gamma}$
We experimented with various vales of γ the results of which are reported. From visually inspecting the images we find that the images obtained with $\gamma \approx 0.37$

1.2 Enhancing Ictext.jpg

In the exercise we had to enhance the image shown in Fig 1.5. We observe from the histogram that there is a uniformity at a global level. Hence global transformations will not have much of an effect. In Fig 1.6 we analyse a section of the image we observe that the local histograms are not equalized.
Hence we apply local histogram equalization on a block size of $8X8$ using the built-in function adapthisteq. The result is shown in Fig 1.7

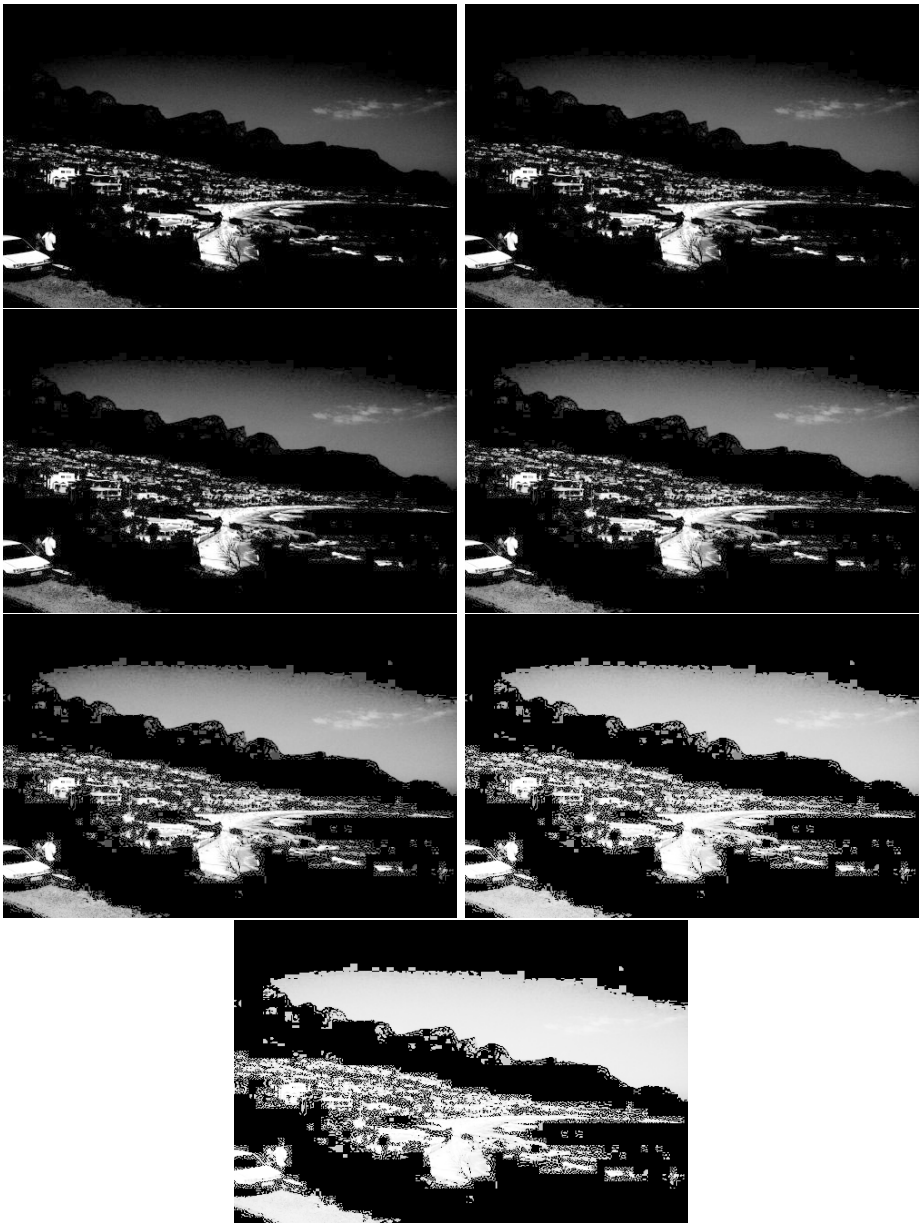

Figure 1.3: Images obtained by applying powerlaw transformation with values of $\gamma = \{0.67, 0.57, 0.47, 0.37, 0.20, 0.10, 0.04\}$

2 Exact histogram equalization

In this section we implemented exact histogram equalization. For the scene.jpg image we obtained an exact histogram as shown in Fig 2.1

Figure 1.4: Images obtained by applying powerlaw transformation with value of $\gamma = 0.37$ gave us the best results

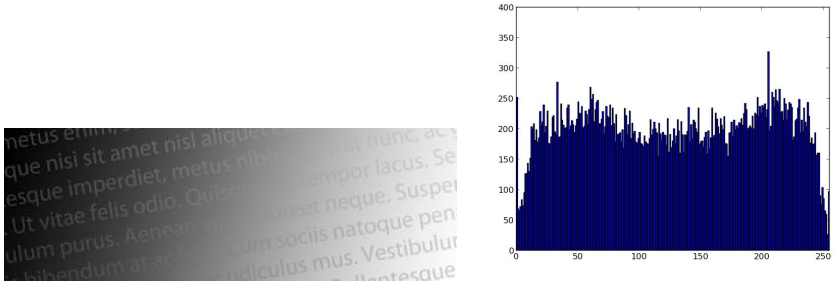

Figure 1.5: Image and its histogram

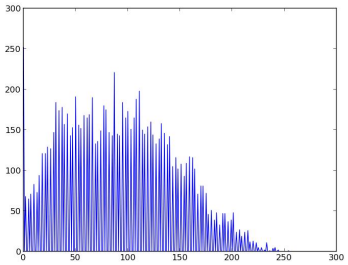

Figure 1.6: Plot Histogram of $100X100$ section of the image

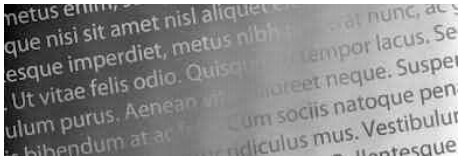

Figure 1.7: Enhanced image after applying local histogram equalization

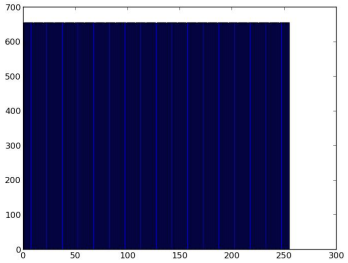

Figure 2.1: Histogram obtained after applying myexacthist() to scene.jpg