CE671A:Introduction to remote sensing
Lab5: Contranst enhancement and gray slicing in MATLAB

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1 Objective

- To study different techniques for contrast enhancement of the image
- To do Gray level slicing

2 Results and discussion

2.1 Color composite

Three different bands ofResourcesat-II LIS-III imagery corresponding to 2(green),3(blue) and 4(NIR) were given,Colour composite is made by assigning these these bands to the colors other than its true color. Colour composite is made by giving 4th band to red, 2nd band to blue and 3rd band to green color. Color composite is displayed as:

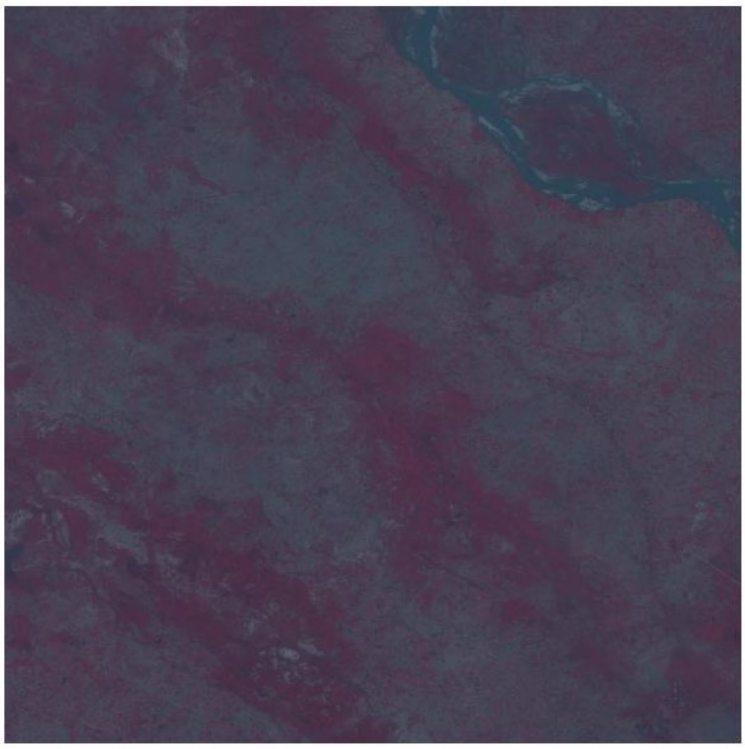


Figure 1: Color composite Image

2.2 Contrast enhancement

2.2.1 Histogram Equalization

Histogram equalization process can be done by using **histeq** command.
DN values of the original images varies mostly between 0 and 1,while after performing histogram equalization output DN values are now distributed evenly between 0 and 1.

- Mean, Standard deviation and variance of each of three band

	Mean	Std deviation	variance
Band2	0.3231	0.0207	0.00042
Band3	0.2482	0.0313	0.00097
Band4	0.2805	0.0259	0.00067

(a) For Original Image

	Mean	Std deviation	variance
Band2	0.5011	0.2922	0.0854
Band3	0.5010	0.2931	0.0859
Band4	0.5005	0.2926	0.0856

(b) After applying histogram equalization

Table 1

Images are displayed after histogram equalization as:

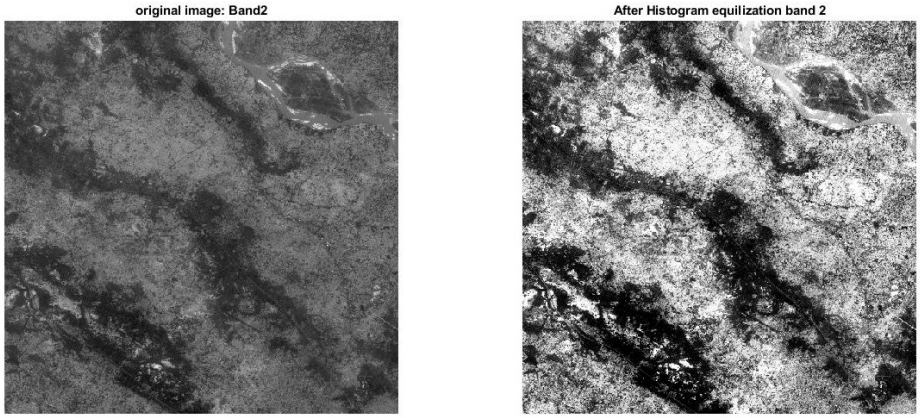
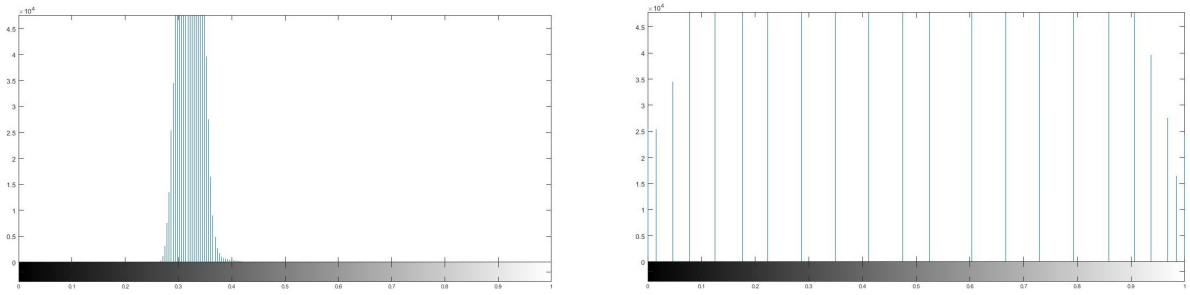


Figure 2: Histogram equalization(Band2)



(a) Histogram: Band 2

(b) Histogram after applying histeq: Band 2

Figure 3

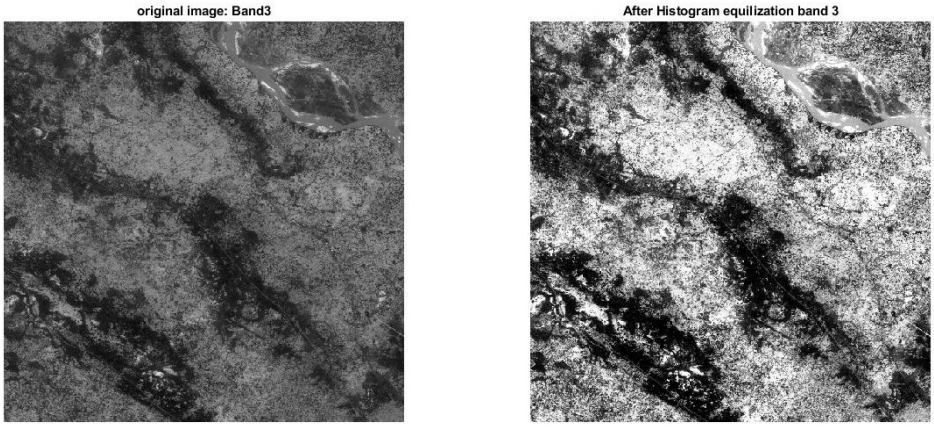
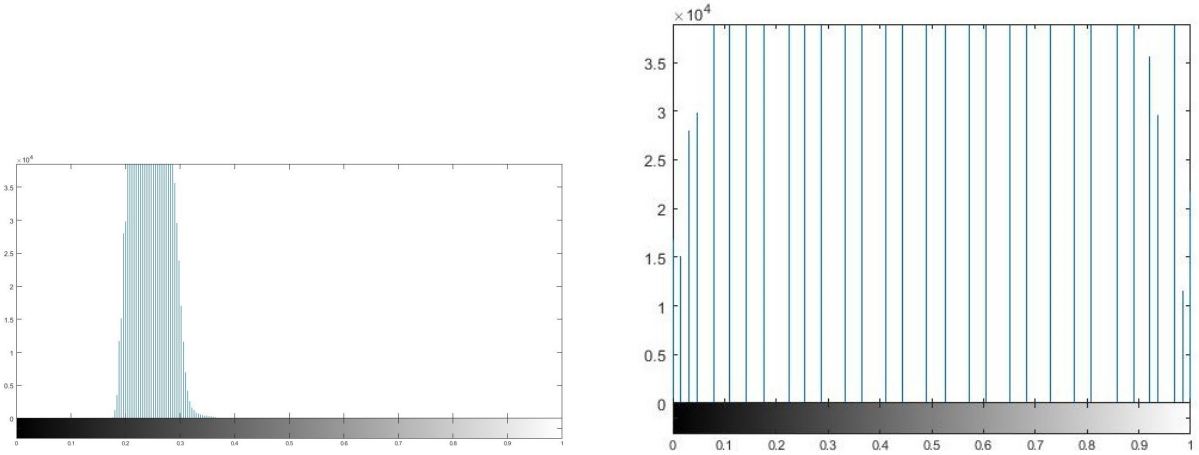


Figure 4: Histogram equalization(Band3)



(a) Histogram: Band 3 (b) Histogram after applying histeq: Band 3

Figure 5

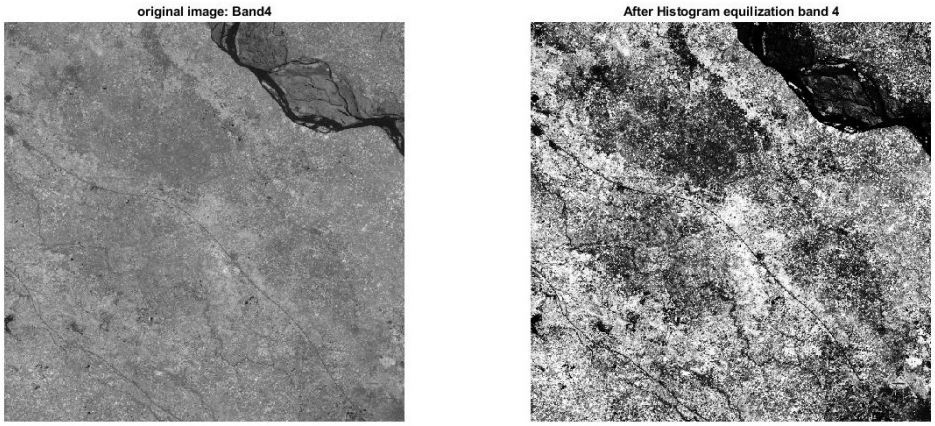
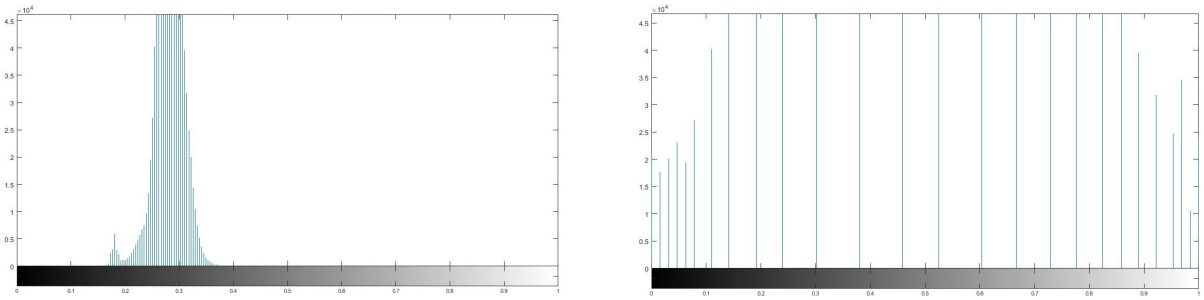


Figure 6: Histogram equalization(Band4)



(a) Histogram: Band 4 (b) Histogram after applying histeq: Band 4

Figure 7

2.2.2 Making Colour composite of histogram equalized bands:

By assigning each histogram equalized band to each band of colour composite a colour composite is created and displayed as follows-

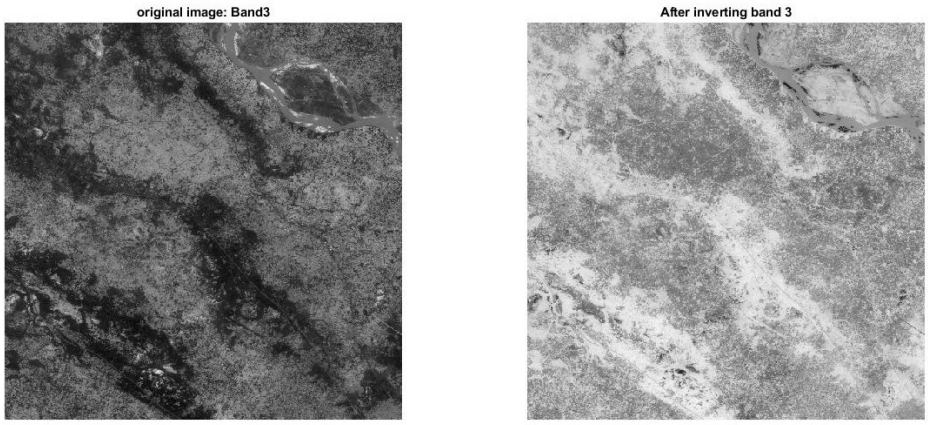


Figure 8: Histogram equilized bands colour composite

2.2.3 Inverse transformation

Inverse transformation is applied to each band by iterating each pixel value of image over for loop and subtracting it from maximum pixel value. In the output image, dark areas become lighter and light areas become darker.
Following eqn is used:

$$L_{inv} : (2^n - 1) - L \tag{1}$$

L is the original image,
n is the number of bits(8)

- Mean, Standard deviation and variance

	Mean	Std deviation	variance
Band2	0.6512	0.1122	0.0126
Band3	0.2922	0.1308	0.0171
Band4	0.4923	0.0971	0.0.0094

(a) After applying histogram equalization

Table 2

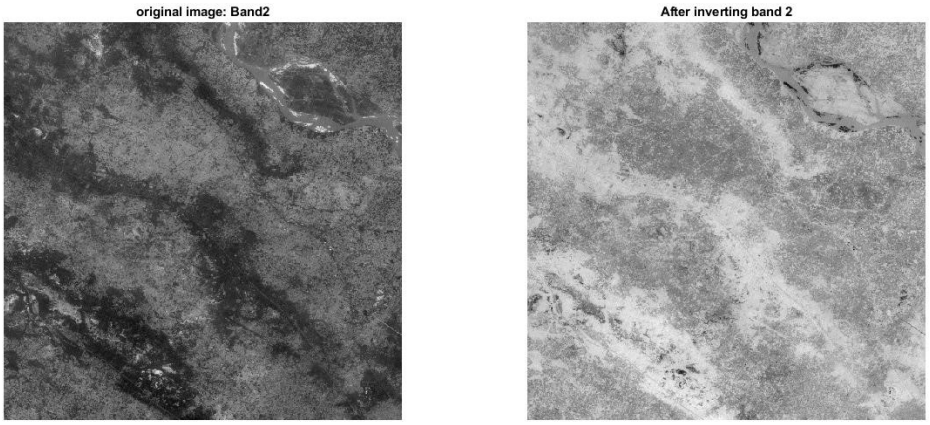
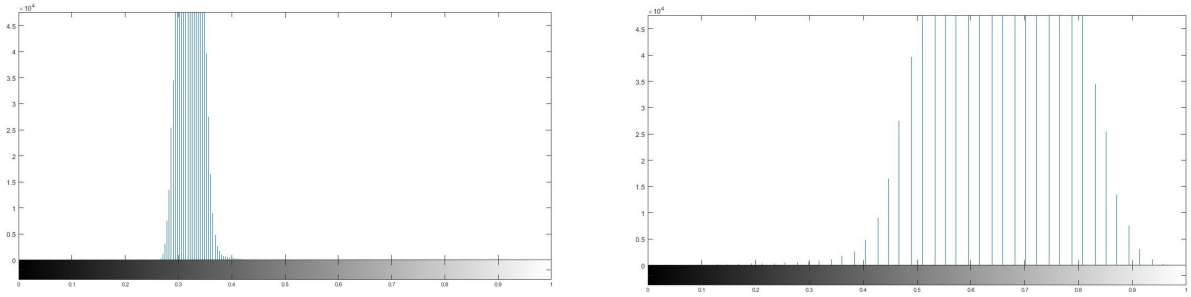


Figure 9: Inverse Transformation(Band2)



(a) Histogram: Band 2

(b) Histogram after applying inverse transformation: Band 2

Figure 10

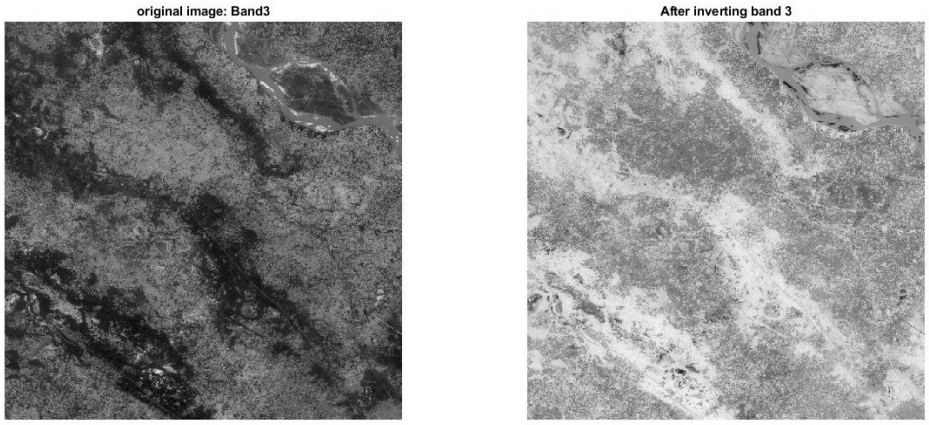
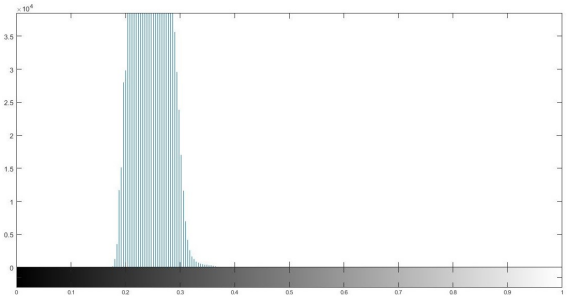
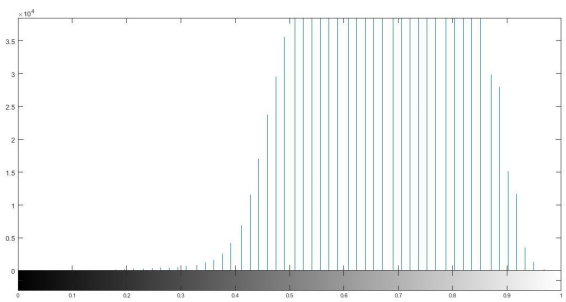


Figure 11: Inverse Transformation(Band3)



(a) Histogram: Band 3



(b) Histogram after applying Inverse Transformation: Band 3

Figure 12

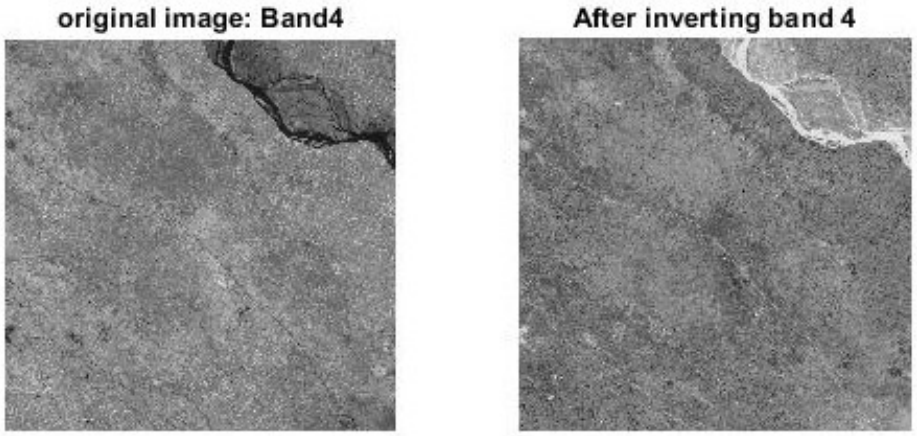
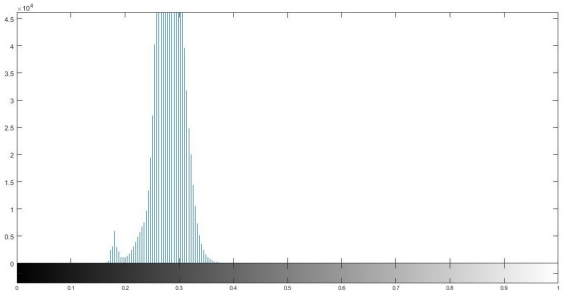
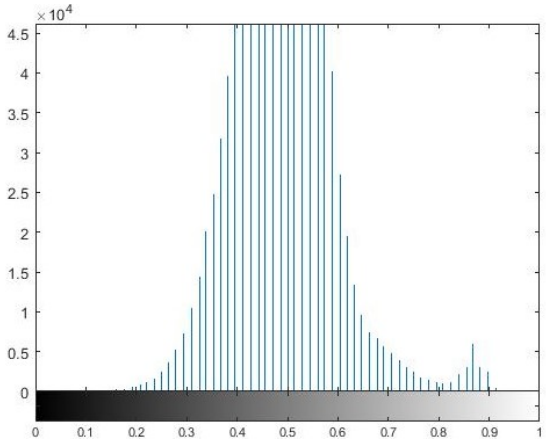


Figure 13: Inverse Transformation(Band4)



(a) Histogram: Band 4



(b) Histogram after applying Inverse Transformation: Band 4

Figure 14

2.2.4 Colour composite after inverse transformation:

By assigning each inverted band to each band of colour composite a colour composite is created and displayed as follows-

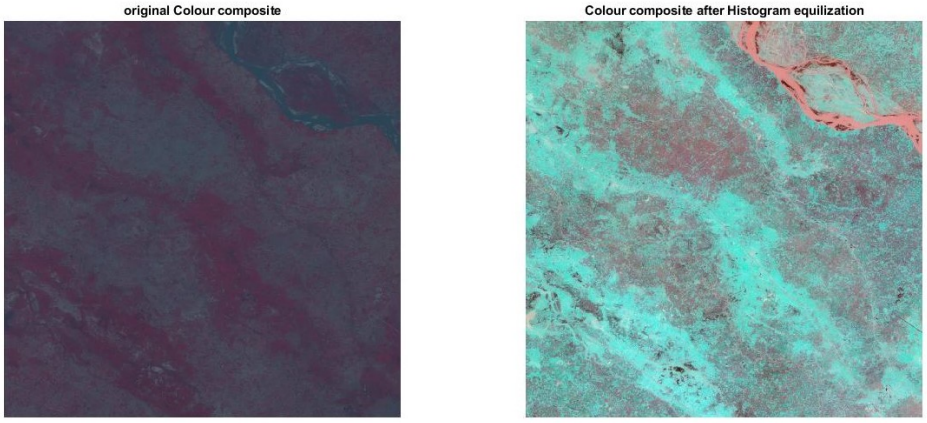


Figure 15: Inverse Transformed bands colour composite

2.2.5 Power Law transformation

Equation used for power law transformation is :

$$L_{power} : C * L^{\gamma} \tag{2}$$

C is a constant, γ :constant Power law transformation is applied on band 2 by changing values of γ and C. results are displayed as below.

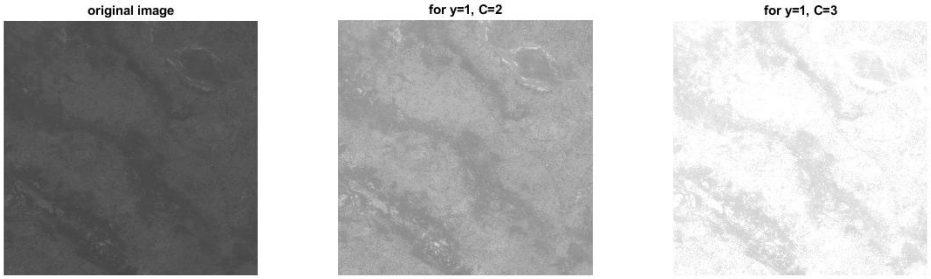


Figure 16: Band 2 for different value of c

It is seen that brightness of image increases as we increase value of C.

3 Conclusion

- Histogram equalization method distributes pixel values of given image evenly over entire range hence apperence of image is significantly enhanced.
- In inverse transform,lighter features appear dark and dark objects appear bright.
- In Power transformation by increasing the value of C we can increase the brightness but resolution will be poor.