Histogram Equalization

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1 Histogram Equalization

Histogram Equalization is a method that increases the global contrast of images, this technique is useful when an image has a low contrast.

In a grayscale image, the pixel range i varies from 1 to 255 ($0 \leq i \leq 255$).

Let X a grayscale image and let n_i be the number of ocurrences of gray level i. The probability of ocurrence of the pixel i in the image is:

$$p(i) = \frac{n_i}{N} \tag{1}$$

In the equation (1), N will be the total number of pixels in X.

The cumulative distribution function corresponding to $p(i)$ is:

$$cdf(i) = \sum_{j=0}^{i} p(i) \tag{2}$$

A new function will be defined in order to assign a new value to the pixel i of X:

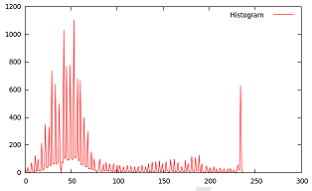
$$T(i) = 255 * (cdf(i)) \tag{3}$$

and applying the function (3), a new equalized image X' will be obtained.

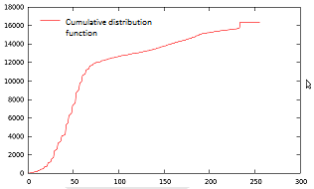
2 Results

2.1 Image “Ball”

(a) Original image “Ball”.



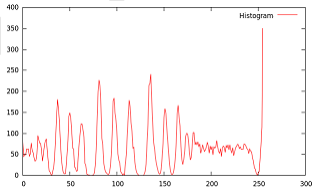
(b) Histogram.



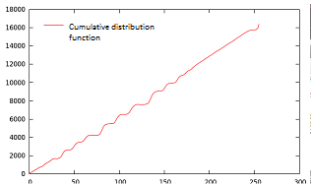
(c) Cumulative distribution function.

Figure 1: Histogram and cumulative distribution function of original image “Ball”

(a) Equalized image “Ball”.



(b) Histogram.

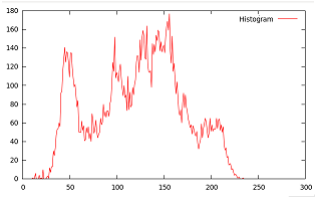


(c) Cumulative distribution function.

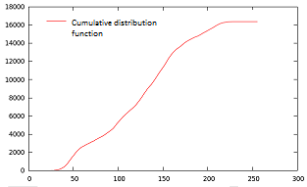
Figure 2: Histogram and cumulative distribution function of equalized image “Ball”

2.2 Image “Lena”

(a) Original image “Lena”.



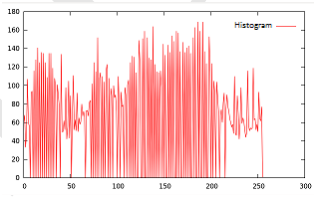
(b) Histogram.



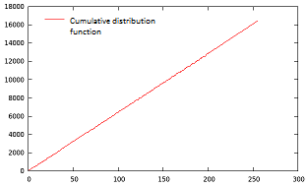
(c) Cumulative distribution function.

Figure 3: Histogram and cumulative distribution function of original image “Lena”

(a) Equalized image “Lena”.



(b) Histogram.



(c) Cumulative distribution function.

Figure 4: Histogram and cumulative distribution function of equalized image “Lena”