

MATLAB/Lec8



MATLAB

Stage2

Lec8

Image Processing

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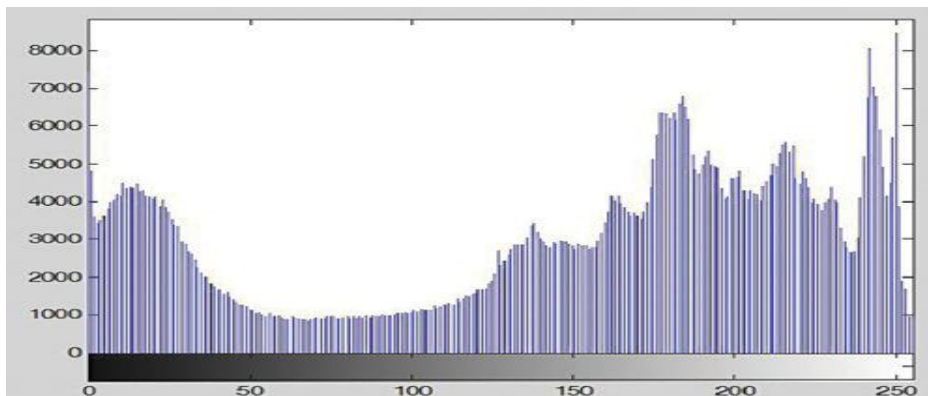
Image enhancement: is the process of adjusting digital images so that the results are more suitable for display or further image analysis, For example, you can remove noise, sharpen, or brighten an image, making it easier to identify key features.

One of the most basic ways to enhance an image is to change its brightness and its contrast.

- By stretching the color distribution
- By equalizing the distribution of colors to use the full range
- By adjusting the scaling of the colors

Histogram of a greyscale image represents the frequency of its grey levels occurrence. It is a graph indicating the number of times each grey level occurs in the image. In a dark image, grey levels (and hence the histogram) are cluttered at the lower end. In a uniformly bright image, grey levels (and hence the histogram) are cluttered at the upper end. In a well contrasted image, grey levels (and hence the histogram) would be well spread out over much of the range.

```
A = imread('Name Image.jpg');  
figure(1), imhist(A);
```





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There are three main operations performed on histogram include:

- histogram stretching.
- histogram shrinking
- histogram sliding.

All these operations are described in the following paragraphs

Histogram Stretching

If the histogram of the image is cluttered at the centre, it can be stretched using `imadjust` function. The following command stretches the histogram

```
F=imrad(name image.type image);
```

```
imadjust (F, [a,b], [c,d]);
```

The values of a, b, c and d must be between 0 and 1.

One way to increase the contrast of an image is to stretch the pixel values (min == 0 and max == 255).

$$J=255 \cdot \frac{I-I_{min}}{I_{max}-I_{min}}$$



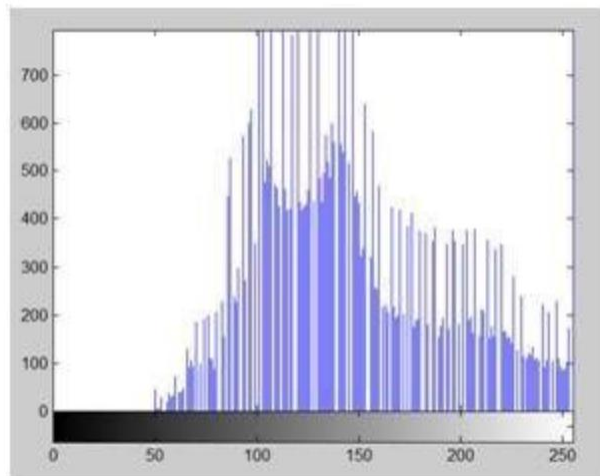
Histogram shrinking

This technique, also known as output cropping, modifies the original histogram such that its dynamic greyscale range is compressed into a narrower greyscale. `imadjust` function can be used for histogram shrinking.

Histogram sliding

The histogram slide techniques can be used to make an image either darker or or

lighter but retain the relationship between gray-level values. In histogram sliding, just simply shift a complete histogram rightwards or leftwards. Due to shifting or sliding of histogram towards right or left, a clear change can be seen in the image.



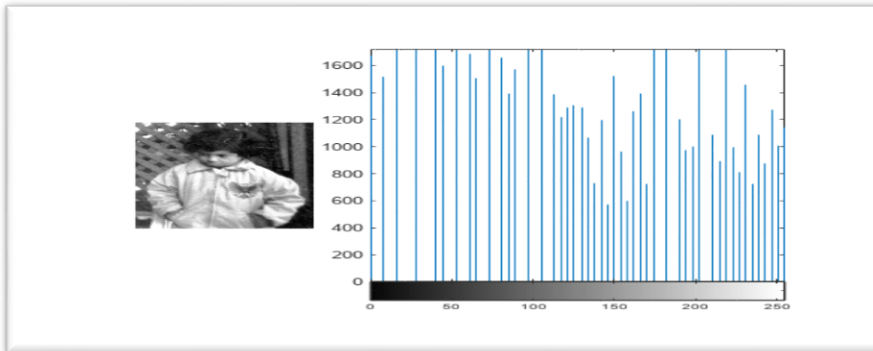


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Histogram Equalization:

The `histeq` function can be used to equally distribute the histogram and enhance the contrast.

```
>> J=histeq(I);
```



Histogram Adjustment:

Intensity adjustment is a technique for mapping an image's intensity values to a new range (`imadjust`).

```
>>I=imread('name image.type');
```

```
>>J=imadjust(I,[0 0.2],[0.5 1]);
```

```
>>imshow(I)
```

```
>>figure, imshow(J)
```



Contrast adjustment:

Contrast adjustment remaps image intensity values to the full display range of the data type. An image with good contrast has sharp differences between black and white.

The functions described apply primarily to grayscale images. However, some of these functions can be applied to color images as well.

Three functions are particularly suitable for contrast enhancement:

imadjust increases the contrast of the image by mapping the values of the input intensity image to new values such that, by default, 1% of the data is saturated at low and high intensities of the input data.

histeq performs histogram equalization. It enhances the contrast of images by transforming the values in an intensity image so that the histogram of the output image approximately matches a specified histogram (uniform distribution by default).



adapthisteq performs contrast-limited adaptive histogram equalization. Unlike `histeq`, it operates on small data regions (tiles) rather than the entire image. Each tile's contrast is enhanced so that the histogram of each output region approximately matches the specified histogram (uniform distribution by default). The contrast enhancement can be limited in order to avoid amplifying the noise which might be present in the image.

Enhance Grayscale Images

Read a grayscale image with poor contrast into the workspace. Enhance the image using the three contrast adjustment techniques with default settings.

```
pout = imread("pout.tif");  
  
pout_imadjust = imadjust(pout);  
  
pout_histeq = histeq(pout);  
  
pout_adapthisteq = adapthisteq(pout);
```

