

MATLAB: Image Processing Toolbox

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Overview

- ❑ Image Processing Toolbox is a collection of functions that uses the capabilities of MATLAB to perform Image Processing operations.
- ❑ **How to get in there??**
 - >> help images**

What kind of Operations ?

- ❑ Spatial image transformations
- ❑ Morphological operations
- ❑ Neighborhood and block operations
- ❑ Linear filtering and filter design
- ❑ Image analysis and enhancement
- ❑ Image registration
- ❑ De-blurring
- ❑ Region of interest operations

Curious about these functions ?

- ❑ Most of these functions are m-files
- ❑ These functions can be viewed by typing the following command:
 >> type filename
- ❑ Difference between “help” , “type” and “lookfor”

I/O Operations

- ❑ Information about the downloaded file:
- ❑ Filename, FileModDate, FileSize, Format, Height, width, colortype, BitDepth
- ❑ Syntax:

```
>> Info = imfinfo(filename,[format]);
```
- ❑ Example:

```
Info = imfinfo('a1.jpg');
```

Read/Write

- ❑ **Imread** :Read image data from a graphics file
 - ❑ Syntax: `a = imread(filename, fmt);`
 - ❑ Example: `a = imread('a1.jpg','jpg');`
- ❑ If image is grayscale, [a] is 2-dimensional (m x n)
- ❑ If image is truecolor, [a] is 3-dimensional (m x n x 3)
- ❑ **Imwrite** :Write image data to a graphics file
 - ❑ Syntax: `imwrite(a,filename, fmt);`
 - ❑ Example: `imwrite(a,'a1.jpg','jpg');`

Display

- ❑ **Imshow: Displays an image**
 - ❑ **Syntax: `Imshow(I,N)`; where N is the number of intensity levels, default value of N=256**
 - ❑ **Another syntax: `Imshow(filename)`;**
 - ❑ **HOW IS IT POSSIBLE?**
- ❑ **Image :Display matrix c as an Image**
 - ❑ **Syntax: `Image(c)`**
- ❑ **Imagesc: scales data and displays as an image**
 - ❑ **`Imagesc(c)`**
- ❑ **What is the difference between Image and Imagesc?**
 - ❑ **Data is scaled to use the entire colormap**

Pixel values and statistics

- ❑ Std2: Computes the standard deviation of matrix elements
 - ❑ Syntax: `b=std2(A)`
 - ❑ 'b' is a scalar
- ❑On similar lines : `mean2`
- ❑ hist: Computes histogram of image data
 - ❑ Syntax: `hist(I,N)`
- ❑ Imfeature: Computes feature measurement for image regions
 - ❑ Syntax: `Stats = imfeature(L,'all');`

Image Enhancement

- ❑ **Histeq:**Enhances contrast using histogram equalization.
 - ❑ Helps to spread the intensity values over the full range, thereby improving the contrast of I.
 - ❑ Syntax: histeq(I,N)
- ❑ **Brighten:**Brighten or darken a colormap
 - ❑ Syntax:Brighten(fig, beta)
 - ❑ If $0 < \text{beta} \leq 1$:Brighter
 - ❑ $-1 < \text{beta} < 0$:Darker



Fig1(a) Original Image

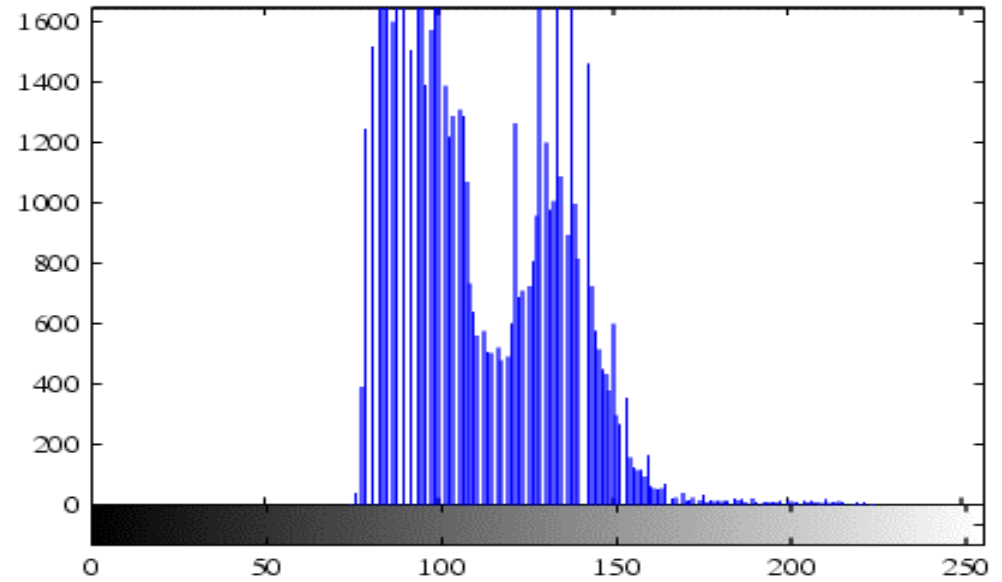


Fig1(b) Corresponding histogram



Fig1(d) New Image

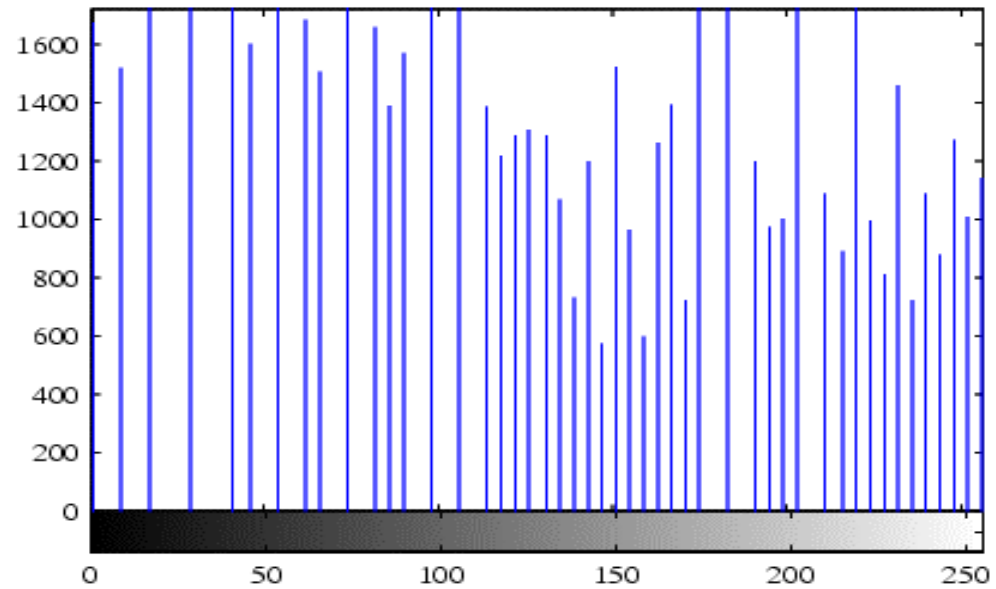


Fig1(c) After Histogram equalization

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Binary Image Processing

- ❑ **Bwarea:** Computes area of objects in a binary image.
 - ❑ **Syntax:** `Bw = bwarea(I)` , returns a scalar.
- ❑Similar lines.... `bwperim`
- ❑ **Bwlabel:** label connected components in a binary image
 - ❑ **Syntax:** `[L,NUM] = bwlabel(bw,N)`
- ❑ **Bwmorph:** Helps perform morphological operations on an image
 - ❑ **Syntax:** `Bw2 = bwmorph(bw1,OPERATION);`

Summary

- ❑ Access the image processing toolbox and see the contents of various m-files
- ❑ I/O Operations:
 - ❑ Read an Image
 - ❑ Write an Image to a file
 - ❑ Obtain image details
- ❑ Display Images
- ❑ Pixel statistics
- ❑ Enhancement of Images
- ❑ Operations on Binary Images
- ❑ Region based operations