Image Deblurring
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Notes on Chapter 2
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Manipulating Images in MATLAB

Reference: Chapter 2 of Deblurring Images.

We will discuss the following MATLAB commands for processing images:

MATLAB		MATLAB's IPT
colormap	imformats	imshow
double	importdata	rgb2gray
imread	imwrite	mat2gray
imfinfo	load	
image	save	
imagesc		

Image Basics

- Images can be color, grayscale, or binary (0s and 1s).

- Color images can use different color models, such as RGB, HSV and CMY.

- We will mainly use grayscale intensity images, but some examples use RGB (red, green, blue – the primary colors of light) format for color images.

Grayscale intensity images

Recall:

— Grayscale intensity images can be represented as a 2-D array (or matrix), where each entry contains the intensity value of the corresponding pixel.

— Typical grayscales for intensity images have integer values in the range $[0, 255]$ or $[0, 65535]$, where the lower bound, 0, is black, and the upper bound, 255 or 65535, is white.

— MATLAB supports each of these formats and also double precision floating point numbers in the interval $[0, 1]$.

— For ease of algebraic manipulation of the pixel values, we will convert images to floating point before performing arithmetic operations on them.

File formats for images

Currently, the most commonly used formats include:

− GIF (Graphics Interchange Format)
− JPEG (Joint Photographic Experts Group)
− PNG (Portable Network Graphics)
− TIFF (Tagged Image File Format)

MATLAB can be used to read and write files with these and others, too.

The MATLAB command `imformats` provides more information on the supported formats. Note also that MATLAB has its own data format, so images can also be stored using this "MAT-file" format.

Reading, Displaying and Writing Images

See demo.

Summary

- Before performing arithmetic operations on a gray scale intensity image, use the command `double` to convert the pixel values to double precision, floating point numbers.
- If the IPT is available,
  use the command `imshow(I, [])` to display images.
- If the IPT is not available,
  use `imagesc(I)` followed by `axis image`.
- To display grayscale intensity images, follow these commands by the command `colormap(gray)`.
- When using the `imwrite` command to save gray scale intensity images, first use the `mat2gray` function to properly scale the pixel values.

– The `importdata` command can be very useful for reading images stored using less popular or more general, file formats. For example, images stored using the Flexible Image Transport System (FITS), used by astronomers to archive their images, currently cannot be read using the `imread` command, but can be read using the `importdata` command.