
Image Processing with MATLAB

Lecture 2: Working with Images in MATLAB

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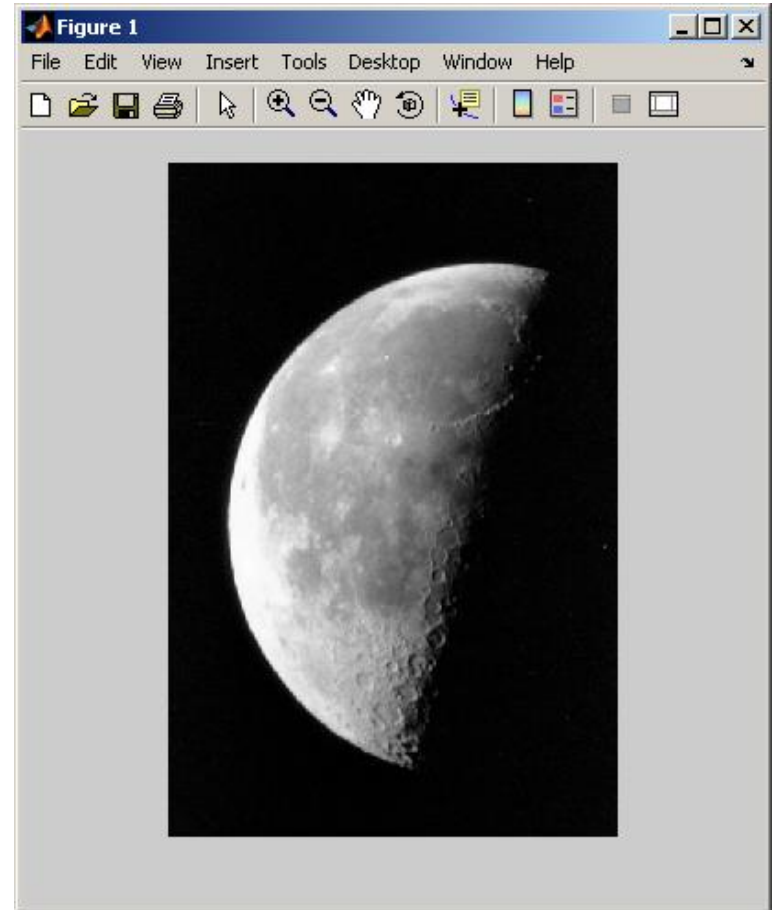
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Lecture Contents:

1. How to use the imshow display function
 2. How to use the Image Tool integrated display and exploration environment
 3. Image Tool pixel information tools, including the Pixel Region tool and the Pixel Information tool
 4. Image Tool's Adjust Contrast tool
 5. Using imshow and imtool to view multiple images
 6. Print images from imshow and the Image Tool
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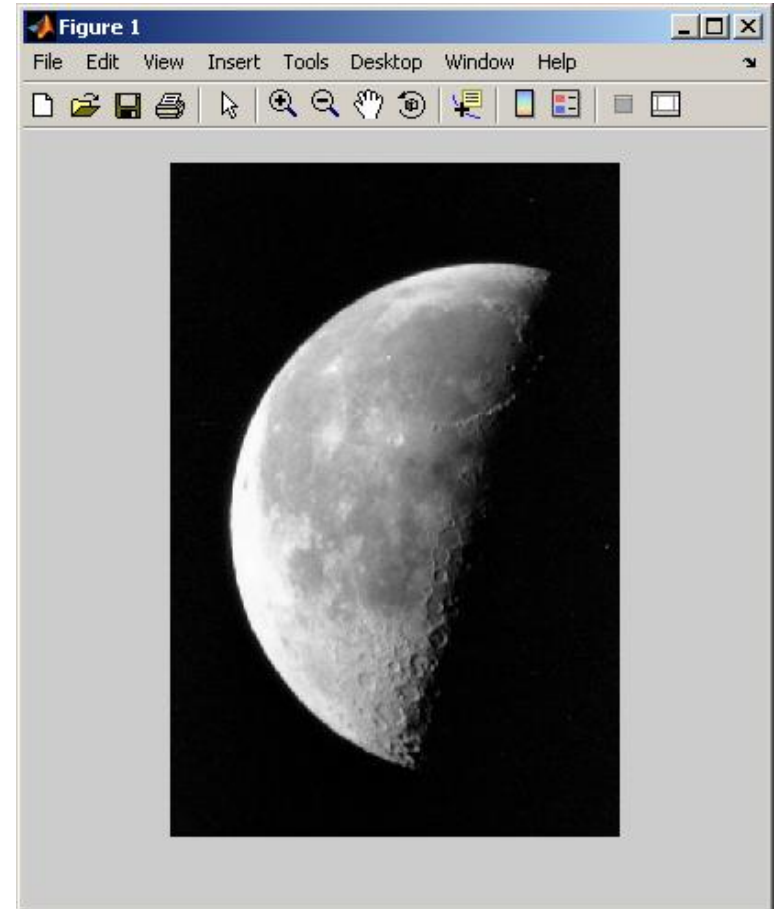
Using imshow to Display Images:

- `moon = imread('moon.tif');`
- `imshow(moon);`
- The `imshow` function displays the image in a MATLAB figure window, as shown in the following figure.



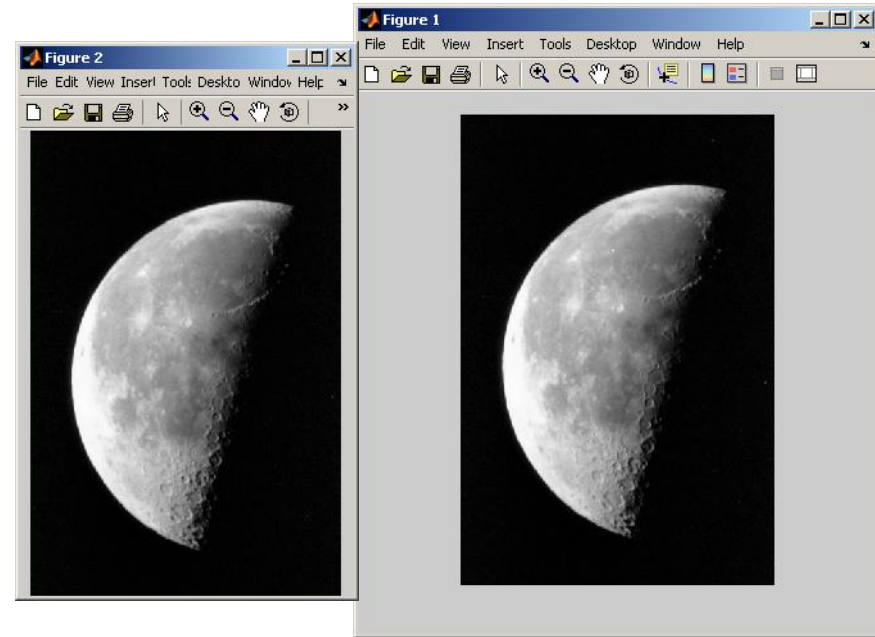
Specifying the Initial Image Magnification:

- For example, to view an image at 150% magnification
- `pout = imread('pout.tif');`
- `imshow(pout, 'InitialMagnification', 150)`



Controlling the Appearance of the Figure:

- For example, to display an image without a border, set the `imshow` `Border` preference to `'tight'`. By default, this preference is set to `'loose'`, which causes the border to be included. This code sets the preference to suppress the border and then displays an image.
- `iptsetpref('ImshowBorder','tight')`
- `imshow('moon.tif')`



Using the Image Tool to Explore Images

- For example, this code reads an image into the MATLAB workspace and then displays it in the Image Tool.
- `moon = imread('moon.tif');`
- `imtool(moon);`

The screenshot displays the MATLAB Image Tool interface for the file 'moon.tif'. It includes several windows:

- Image Tool 1 - moon.tif**: The main image viewer showing a grayscale image of the moon. A blue crosshair cursor is positioned at (215, 451). The display range is [0 255].
- Overview (Image Tool 1)**: A smaller thumbnail of the image with a blue border.
- Pixel Region (Image Tool 1)**: A window showing a grid of pixel values for a selected region. The current pixel info is (175, 271) 150.
- Image Information (Image Tool 1)**: A window displaying image details and metadata.
- Adjust Contrast (Image Tool 1)**: A window for adjusting image contrast, showing a histogram and sliders for minimum and maximum values.

Image details (Image Tool 1 - moon.tif)

Attribute	Value
1 Width (columns)	358
2 Height (rows)	537
3 Class	uint8
4 Image type	intensity
5 Minimum intensity	0
6 Maximum intensity	253

Metadata (moon.tif)

	Fieldname	
1	Filename	\bat12\R14\nightly\matlab\c
2	FileModDate	04-Dec-2000 13:57:59
3	FileSize	183950
4	Format	tif
5	FormatVersion	[]
6	Width	358
7	Height	537
8	BitDepth	8

Adjust Contrast (Image Tool 1)

Auto Scale... Reset Image

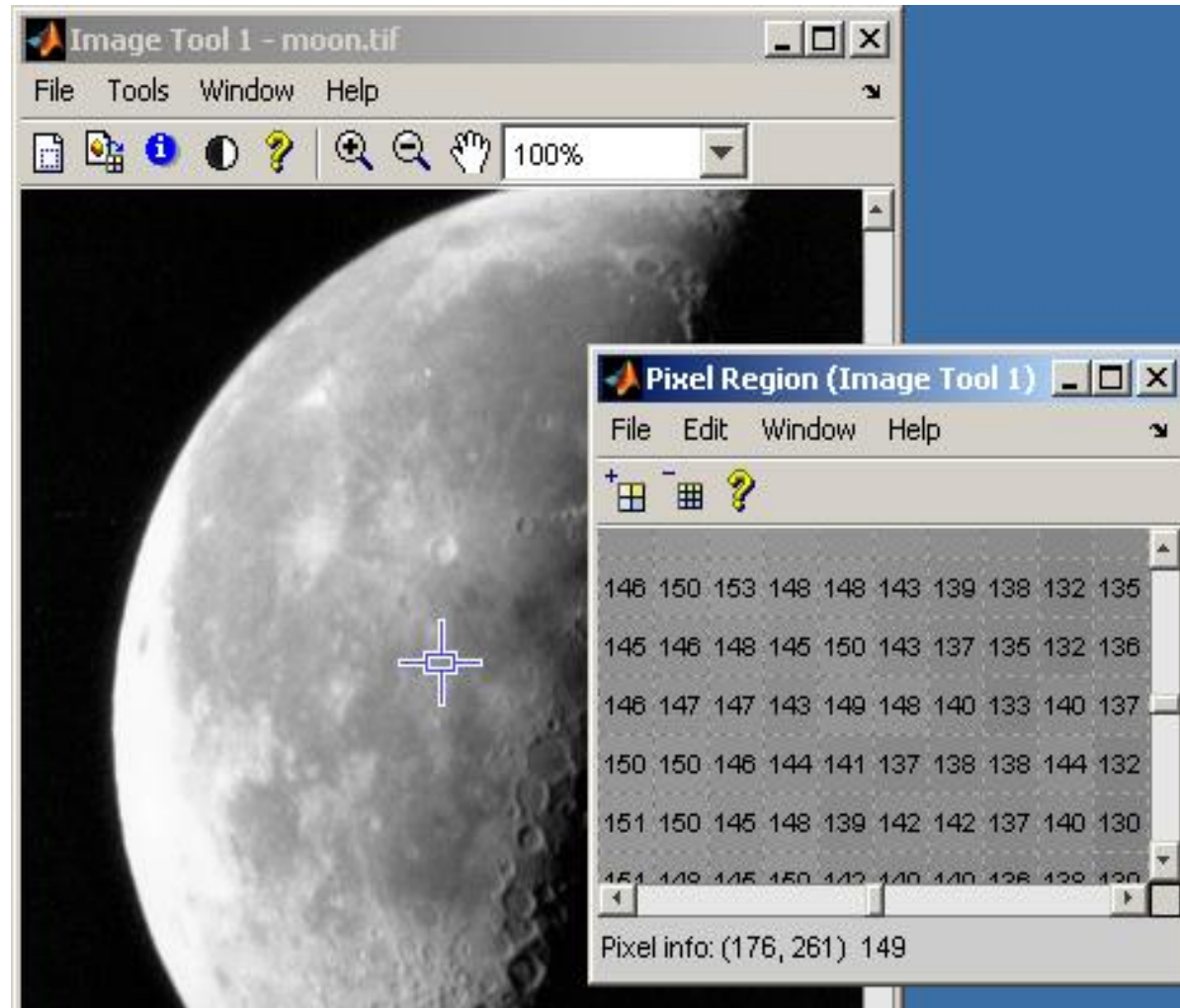
Minimum Value: 0 Window Width: 255

Maximum Value: 255 Window Center: 128

Adjust the histogram above, or click and drag the mouse over the image.

Getting Information about the Pixels in an Image

- Pixel Information tool.
- Display Range tool
- Pixel Region tool



Getting Information about an Image

- Pixel Information tool.
- Display Range tool
- Pixel Region tool

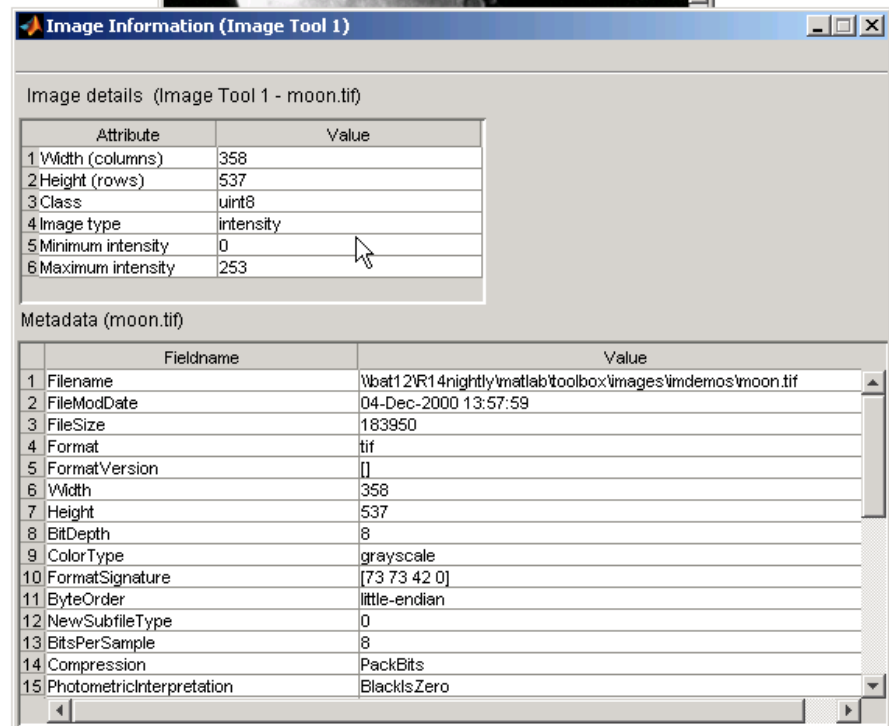
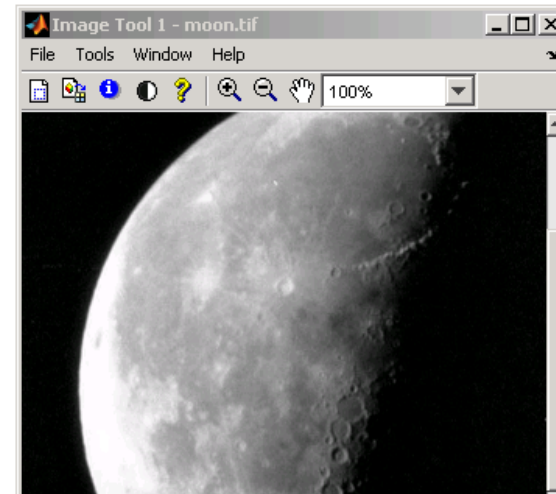


Image details (Image Tool 1 - moon.tif)

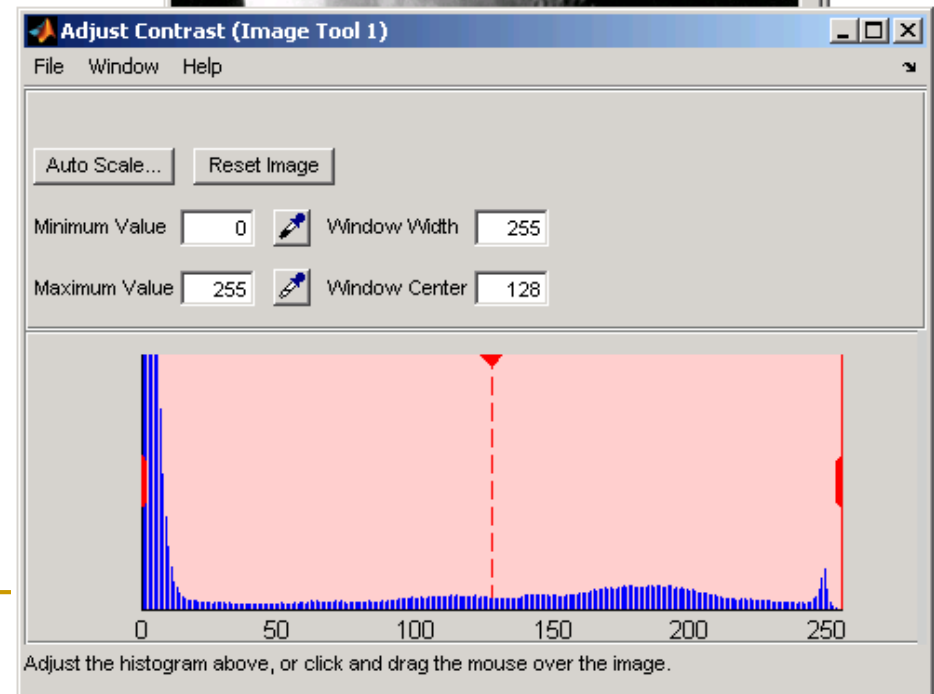
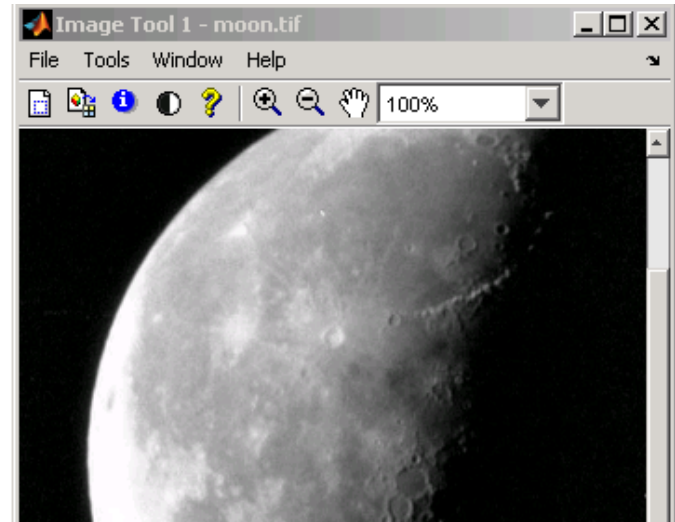
Attribute	Value
1 Width (columns)	358
2 Height (rows)	537
3 Class	uint8
4 Image type	intensity
5 Minimum intensity	0
6 Maximum intensity	253

Metadata (moon.tif)

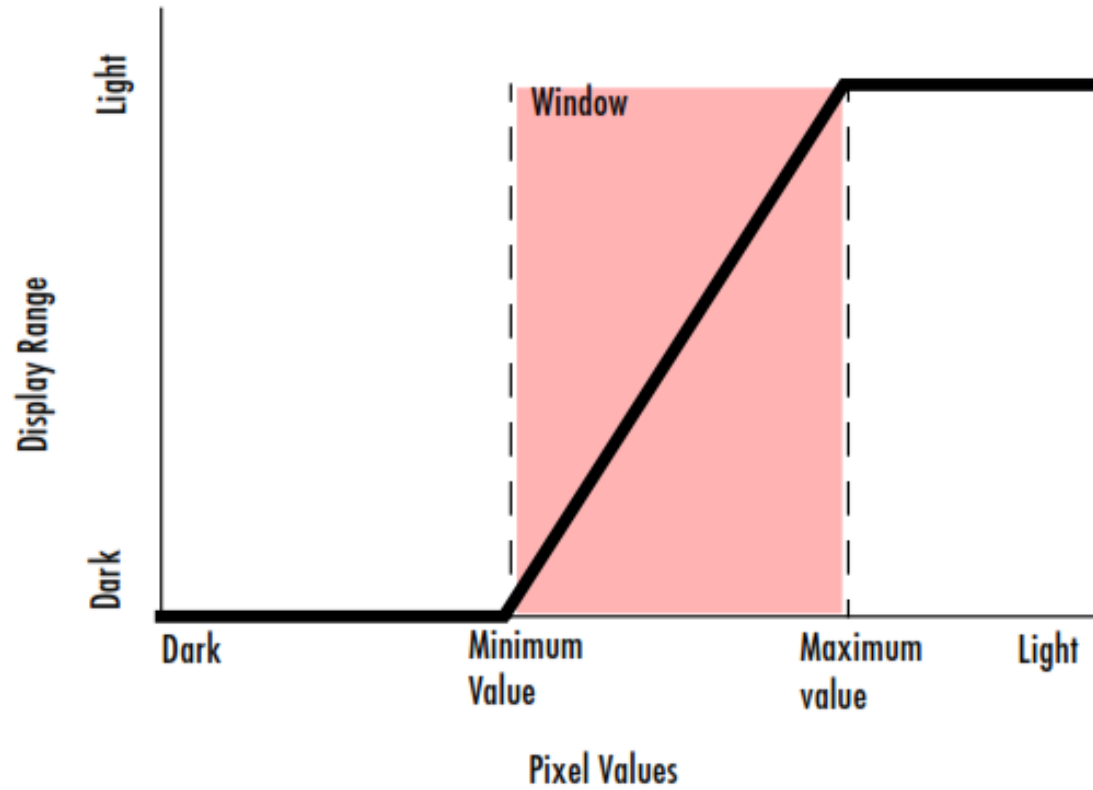
Fieldname	Value
1 Filename	\\bat12\R14\nightly\matlab\toolbox\images\imdemos\moon.tif
2 FileModDate	04-Dec-2000 13:57:59
3 FileSize	183950
4 Format	tif
5 FormatVersion	[]
6 Width	358
7 Height	537
8 BitDepth	8
9 ColorType	grayscale
10 FormatSignature	[73 73 42 0]
11 ByteOrder	little-endian
12 NewSubfileType	0
13 BitsPerSample	8
14 Compression	PackBits
15 PhotometricInterpretation	BlackIsZero

Adjusting the Contrast and Brightness of an Image

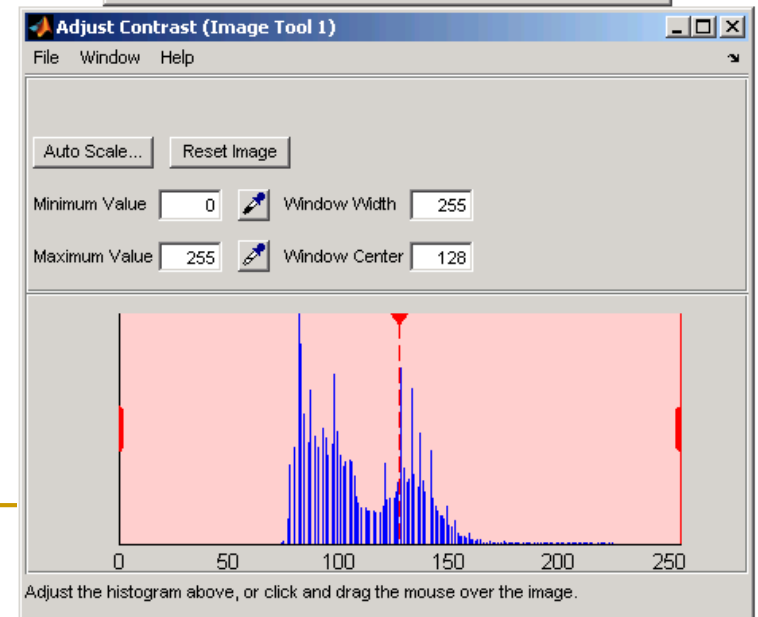
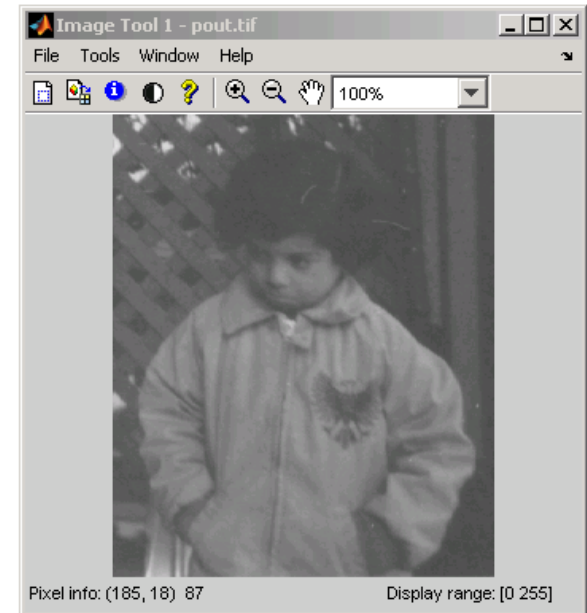
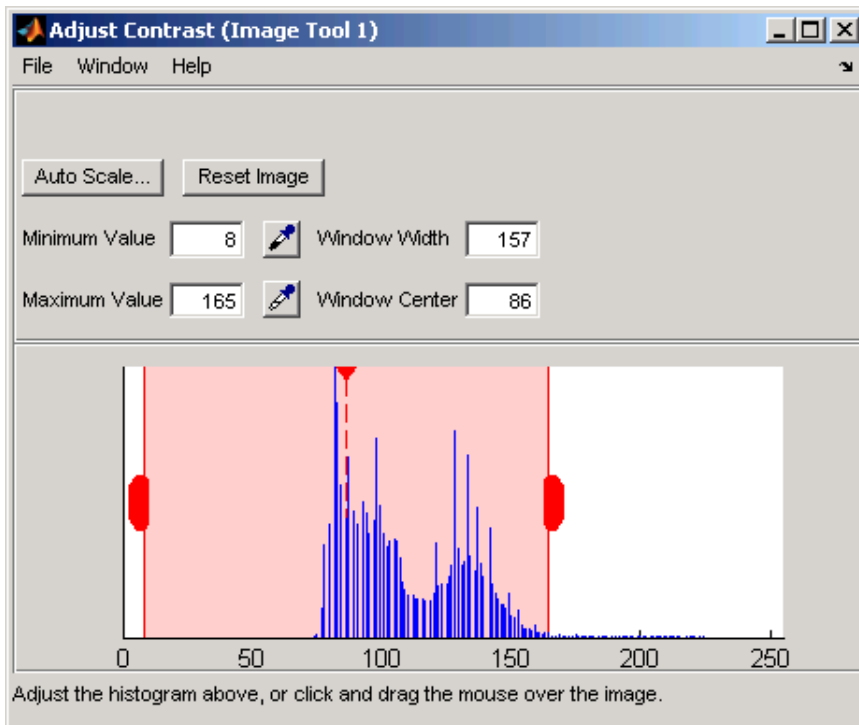
- Adjust Contrast tool with Window Resized



Understanding Contrast Adjustment

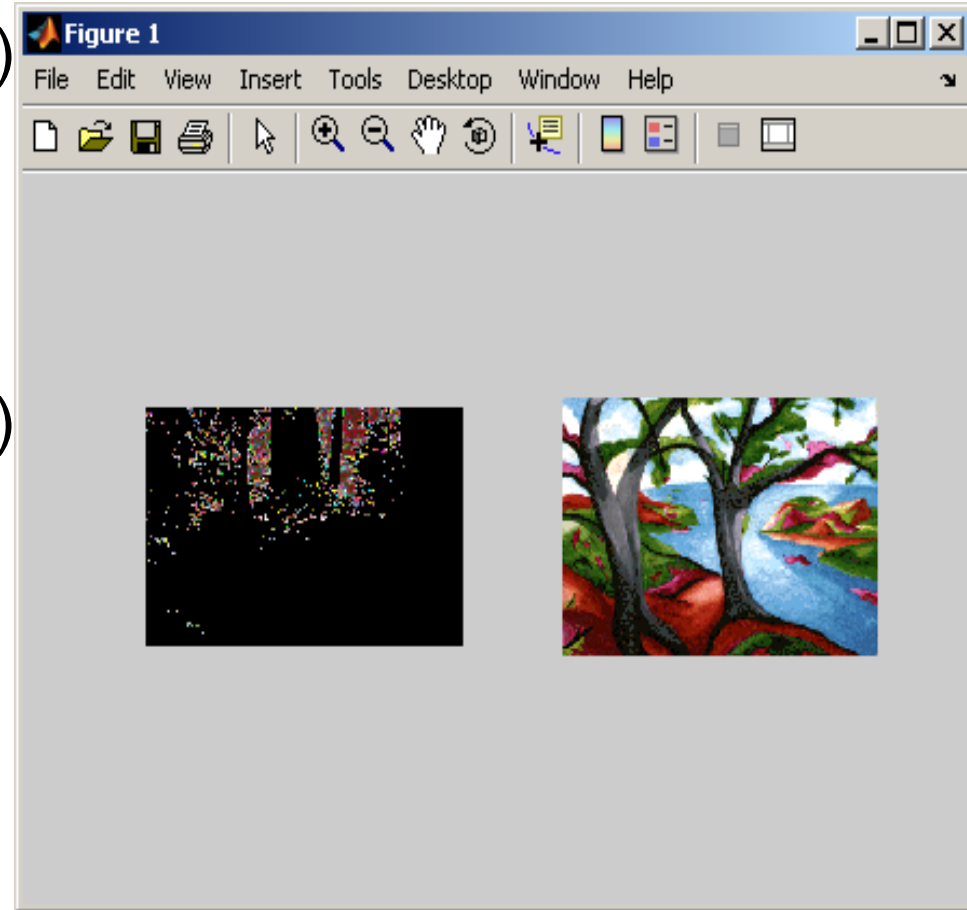


Adjusting Contrast and Brightness



Viewing Multiple Images

- `imtool(multiframe_array(:,:,:),1)`
- `imshow(I(:,:,:),1)`
- `figure, imshow(I(:,:,:),2)`
- `figure, imshow(I(:,:,:),3)`
- `imtool(multiframe_array(:,:,:),1)`
- `subplot(m,n,p)`
- `[X1,map1]=imread('forest.tif');`
- `[X2,map2]=imread('trees.tif');`
- `subplot(1,2,1),`
`imshow(X1,map1)`
- `subplot(1,2,2),`
`imshow(X2,map2)`



Printing Images

- If you want to print an image, use `imshow` to display the image in a MATLAB figure window. If you are using the Image Tool, you must use the **Print to Figure** option on the **Image Tool File** menu. When you choose this option, the Image Tool opens a separate figure window and displays the image in it. You can access the standard MATLAB printing capabilities in this figure window. You can also use the **Print to Figure** option to print the image displayed in the Overview tool and the Pixel Region tool.
 - Once the image is displayed in a figure window, you can use either the MATLAB print command or the **Print** option from the **File** menu of the figure window to print the image. When you print from the figure window, the output includes non image elements such as labels, titles, and other annotations.
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Supplementary files:

- MATLAB Tutorial:

http://www.mathworks.com/products/matlab/matlab_tutorial.html

- MATLAB documentation:

<http://www.mathworks.com/access/helpdesk/help/techdoc/matlab.shtml>

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