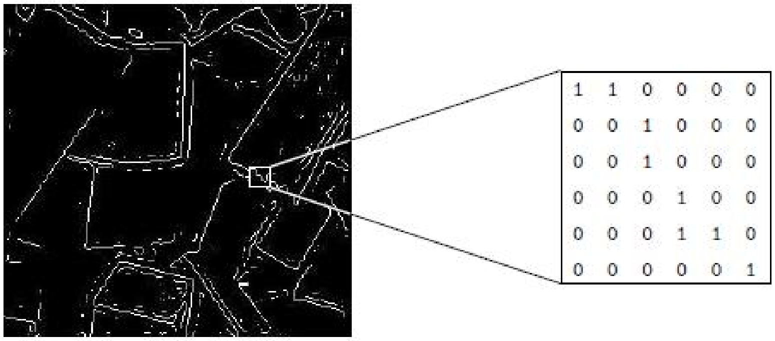
Image Processing with MATLAB

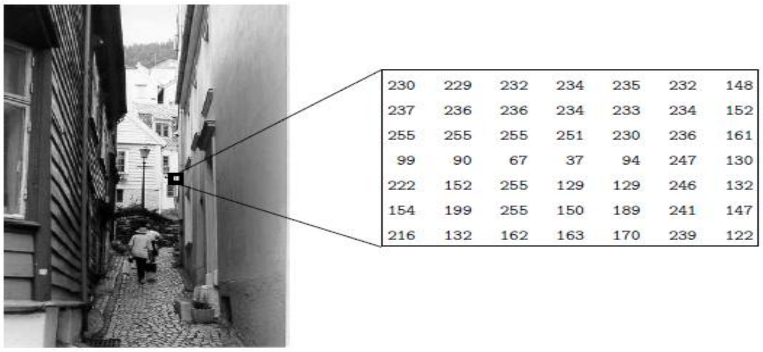
Types of digital images

Binary: Each pixel is just black or white. Since there are only two possible values for each pixel, only need one bit per pixel.



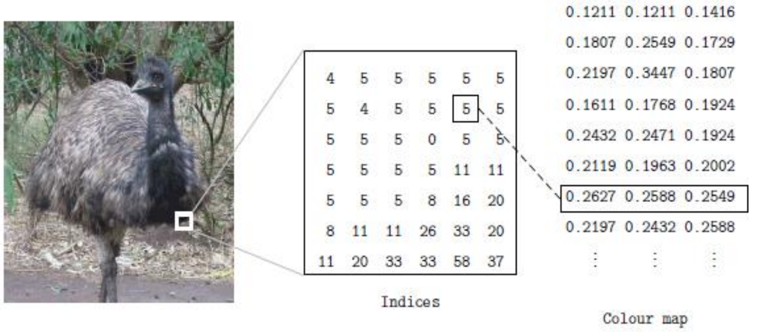
1	1	0	0	0	0
0	0	1	0	0	0
0	0	1	0	0	0
0	0	0	1	0	0
0	0	0	1	1	0
0	0	0	0	0	1

Greyscale: Each pixel is a shade of grey, normally from 0 (black) to 255 (white). This range means that each pixel can be represented by eight bits, or exactly one byte.



230	229	232	234	235	232	148
237	236	236	234	233	234	152
255	255	255	251	230	236	161
99	90	67	37	94	247	130
222	152	255	129	129	246	132
154	199	255	150	189	241	147
216	132	162	163	170	239	122

Indexed: Using two matrices, matrix data and color matrix (color map).



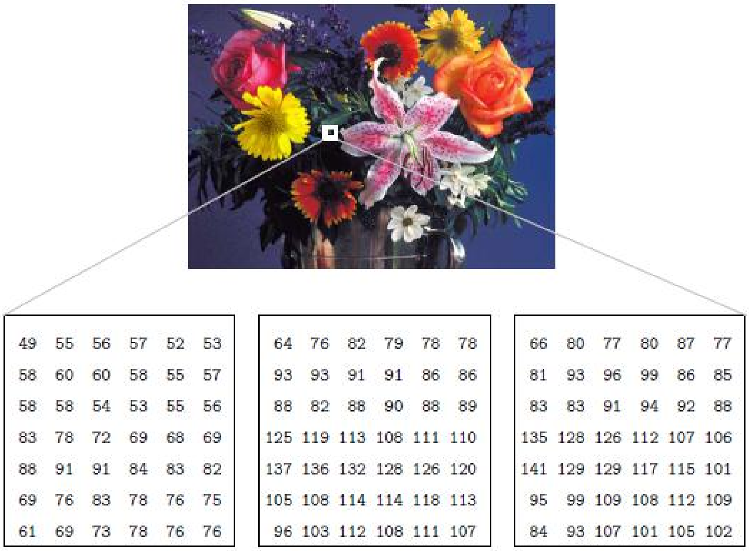
4	5	5	5	5	5
5	4	5	5	5	5
5	5	5	0	5	5
5	5	5	5	11	11
5	5	5	8	16	20
8	11	11	26	33	20
11	20	33	33	58	37

Indices

0.1211	0.1211	0.1416
0.1807	0.2549	0.1729
0.2197	0.3447	0.1807
0.1611	0.1768	0.1924
0.2432	0.2471	0.1924
0.2119	0.1963	0.2002
0.2627	0.2588	0.2549
0.2197	0.2432	0.2588
⋮	⋮	⋮

Colour map

Color: Color images can be represented by using three 2D matrices of the same size, one for every color channel: red (R), green (G), and blue (B) each matrix element contains an 8-bit value, refers to the amount of red, green, or blue at that point in a [0, 255] scale.



49	55	56	57	52	53
58	60	60	58	55	57
58	58	54	53	55	56
83	78	72	69	68	69
88	91	91	84	83	82
69	76	83	78	76	75
61	69	73	78	76	76

Red

64	76	82	79	78	78
93	93	91	91	86	86
88	82	88	90	88	89
125	119	113	108	111	110
137	136	132	128	126	120
105	108	114	114	118	113
96	103	112	108	111	107

Green

66	80	77	80	87	77
81	93	96	99	86	85
83	83	91	94	92	88
135	128	126	112	107	106
141	129	129	117	115	101
95	99	109	108	112	109
84	93	107	101	105	102

Blue

Digital Image File Formats

- PPM (Portable Pix Map)
- TIFF (Tagged Image File Format)
- GIF (Graphics Interchange Format)
- JPEG (Joint Photo graphic Experts Group) format
- BMP (Windows Bitmap)
- PNG (Portable Network Graphics)
- XWD (X Window Dump)

Reading image

```
A = imread(filename.fmt)
```

reads a grayscale or true color image named filename into A. If the file contains a grayscale intensity image, A is a two-dimensional array. If the file contains a true color (RGB) image, A is a three-dimensional (m-by-n-by-3) array.

Displaying image

```
imshow(f)
```

Ex:

```
f=imread('tire.tif');
 imshow(f)
```

Displaying Multiple Images

1. Display each image in the form of (separate figure).

Ex:

```
f=imread('tire.tif');
figure,imshow(f)
I=imread('cameraman.tif');
figure,imshow(I)
```

2. Display multiple images in the same figure using imshow associated with subplot.

Ex:

```
f=imread('tire.tif');
I=imread('cameraman.tif');
subplot(1,2,1), imshow(f)

subplot(1,2,2), imshow(I)
```

Conversion between image types

Name	Value	Description
gray2ind	[X,map]=gray2ind(I,n)	Convert image from grayscale to indexed
ind2gray	I = ind2gray(X,map)	Convert image from indexed to grayscale
ind2rgb	RGB= ind2rgb(X,map)	Convert image from indexed to color
rgb2ind	[X,map]=rgb2ind(RGB,n)	Convert image from color to indexed
rgb2gray	I = rgb2gray(RGB)	Convert image from color to grayscale
im2bw	BW = im2bw(I,level)	Convert image (rgb, gray, indexed) to binary, level between 0, 1.

Conversion between Data types

Data Type	Range	Description
int8	-128_127	8-bit integer
unit8	0_255	8-bit unsigned integer
int16	-32768_32767	16-bit integer
unit16	0_65535	16-bit unsigned integer
double	Machine specific	Double precision real number

Information about image

A great deal of information can be obtained with the imfinfo or whos function.

Ex:

```
imfinfo('football.jpg')
```

Ex:

```
a=imread('football.jpg');
 whos a
```

Definitions:

Rotation:

```
B = imrotate(A,angle,method)
```

A is image.

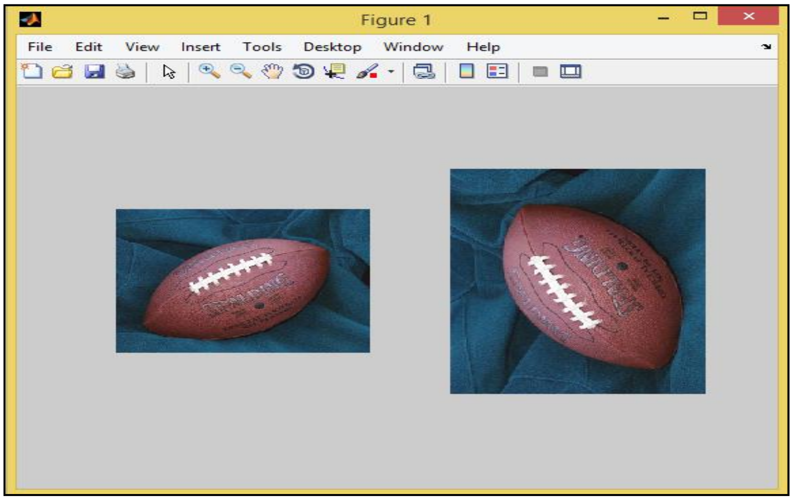
Angle is the angle (in degrees) you want to rotate your image in the counter Clock wise direction.

Method is a string that can have one of these values:

Value	Description
'nearest'	Nearest-neighbor interpolation
'bilinear'	Bilinear interpolation
'bicubic'	Bicubic interpolation

Ex:

```
clc
clear all
a=imread('football.jpg');
o=imrotate(a,90,'nearest')
subplot(1,2,1), imshow(a)
subplot(1,2,2), imshow(o)
```



Scaling:

```
B = imresize (A,scale,method)
```

A is your image.

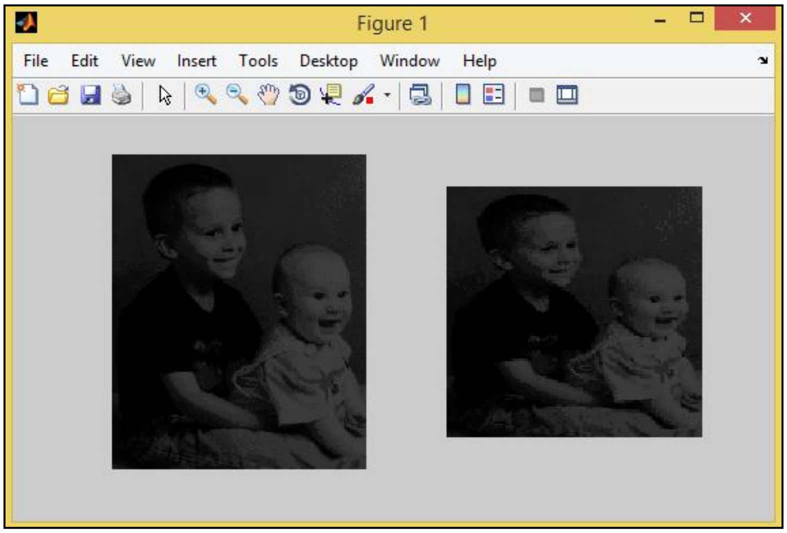
Scale is the size of A

Method is a string that can have one of these values:

Method Name	Description
'nearest'	Nearest-neighbor interpolation; the output pixel is assigned the value of the pixel that the point falls within. No other pixels are considered.
'bilinear'	Bilinear interpolation; the output pixel value is a weighted average of pixels in the nearest 2-by-2 neighborhood
'bicubic'	Bicubic interpolation (the default); the output pixel value is a weighted average of pixels in the nearest 4-by-4 neighborhood

Ex:

```
clc
clear all
t=imread('kids.tif');
i=imresize(t,[128 128], 'nearest');
subplot(1,2,1), imshow(t)
subplot(1,2,2), imshow(i)
```



Example to display (Red,Green,Blue) for color image

```
clc
clear all
RGB=imread('football.jpg');
R=RGB(:,:,1);
G=RGB(:,:,2);
B=RGB(:,:,3);
subplot(2,2,1),imshow(RGB)
subplot(2,2,2),imshow(R)
subplot(2,2,3),imshow(G)
subplot(2,2,4),imshow(B)
```

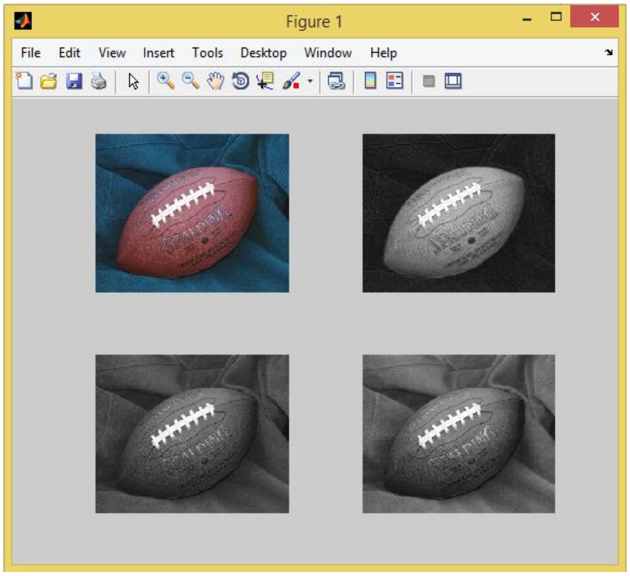


Figure 1
File Edit View Insert Tools Desktop Window Help