Multidimensional Arrays (p.289)
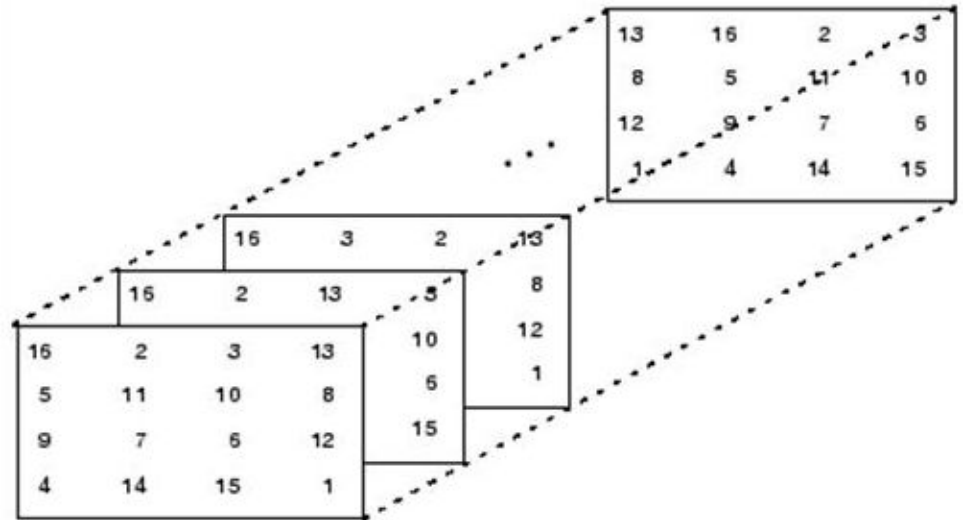
1D array ("vector"): a = [5 4 2 8 6];
a(3) = 2 a(3:end) = [2 8 6]

2D array ("matrix"): b = [5 4 2; 7 3 1; 0 6 8];
b(2,3) = 1 b(2:end,1:2) = [7 3; 0 6]

3D array ("3rd order tensor") – The order of a tensor is the number of indices necessary to refer unambiguously to an individual component.

How to create multidimensional arrays

```
c(:,:,:) = zeros(2,3,3);
c(:,:,1) = [1 2 3; 4 5 6];
c(:,:,2) = ones(2,3);
c(:,:,3) = 2*c(:,:,1);
```

```
c(:,:,:) = zeros(3,3,5);
[nf, nc, nm] = size(c)
for k=1:nm
        c(:,:,k) = k*ones(nf,nc);
end
```

Working with images

```
addpath(C:\Users\LAM\Dropbox\INGE 3016 - Spring
2014\matlabs\clase 15')
% direccion donde esta grabada la imagen


Z = imread('elli.jpg');
% carga la imagen y la guarda en Z
```

The return value Z is an array containing the image data. If the file contains a grayscale image, Z is an M-by-N array. If the file contains a truecolor image, Z is an M-by-N-by-3 array.

True color (RGB) - Image is stored as a three-dimensional (m-by-n-by-3) array of integers in the range [0, 255] (uint8)
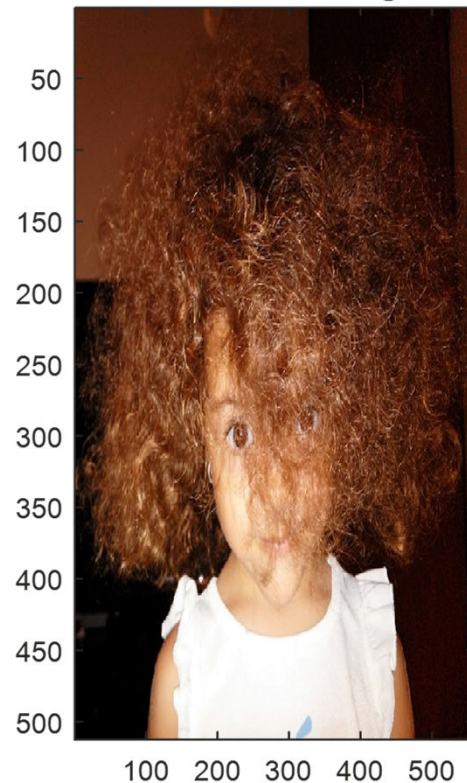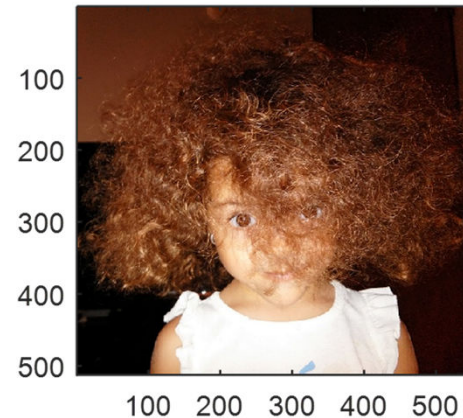
Working with images

figure; image(Z);
%display image object
axis image;
%sets the aspect ratio so that the data units are the same
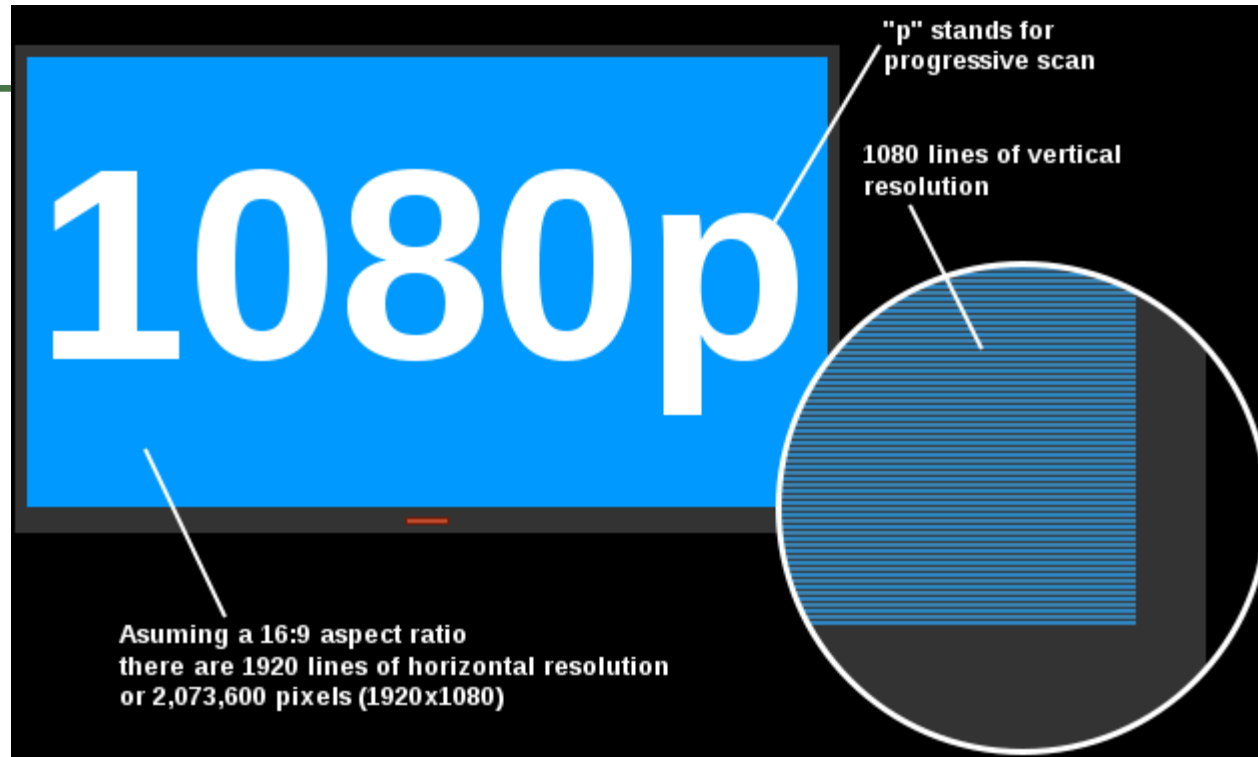in every direction - plot box fits tightly around the data

Full HD? 1080P? 1080i?

"p" stands for progressive scan

1080 lines of vertical resolution

1080p

Asuming a 16:9 aspect ratio there are 1920 lines of horizontal resolution or 2,073,600 pixels (1920x1080)

1080i conveys the images in an interlaced format

4K resolution: In July 2010, YouTube began streaming certain videos at a resolution of up to 4096 x 2304 (in the 16:9 aspect ratio) to 4096 x 3072 (4:3). Registered users at YouTube are allowed to upload videos with a resolution higher than 1080p.
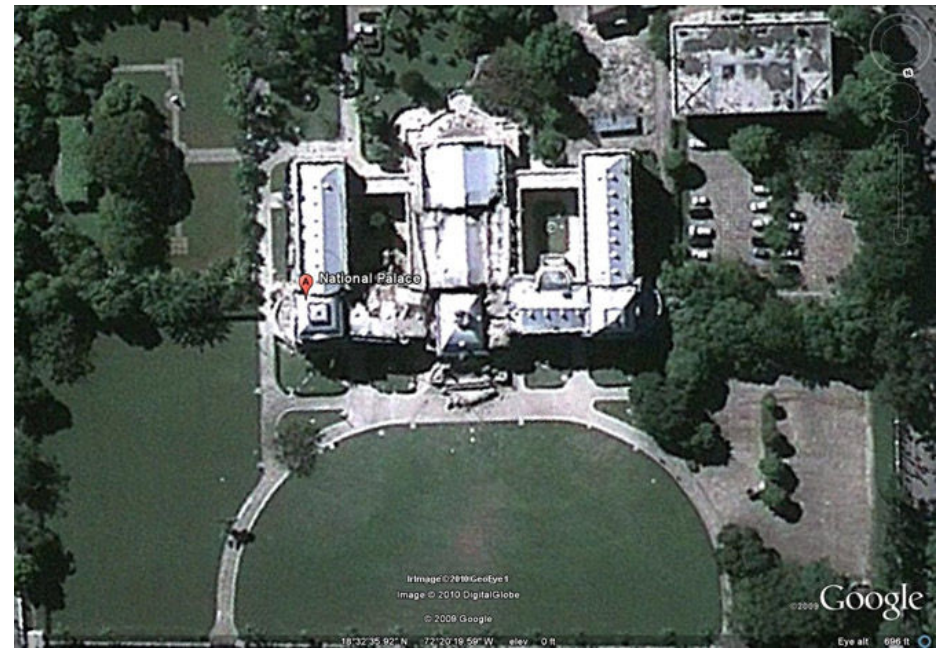
Now that you have a "numerical model" of your image the possibilities are endless. You can write algorithms to analyze your image or to modify your image, e.g.:

- Identification purposes: post-disaster recognition, target detection, face recognition (Facebook).

- "Photoshoping"
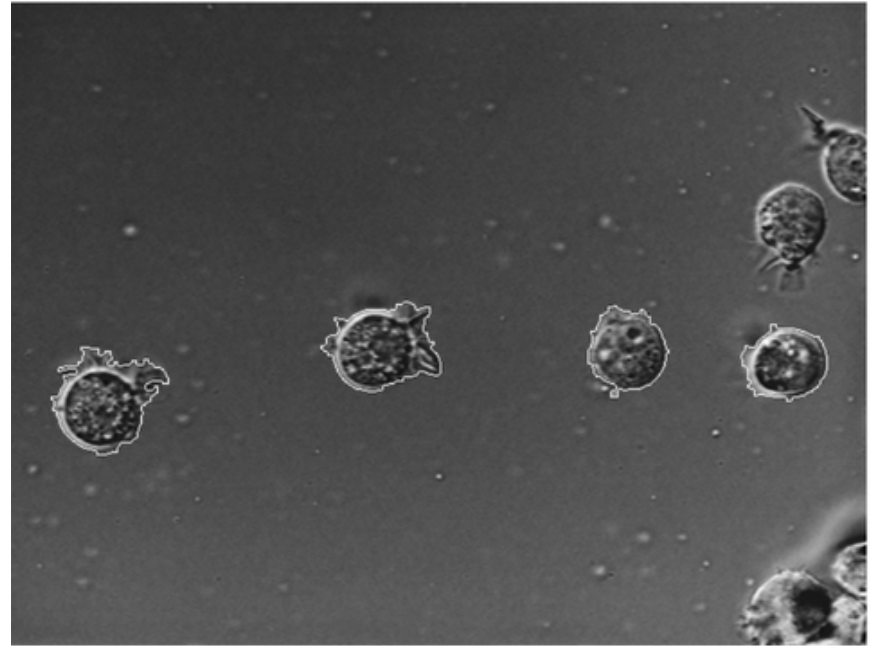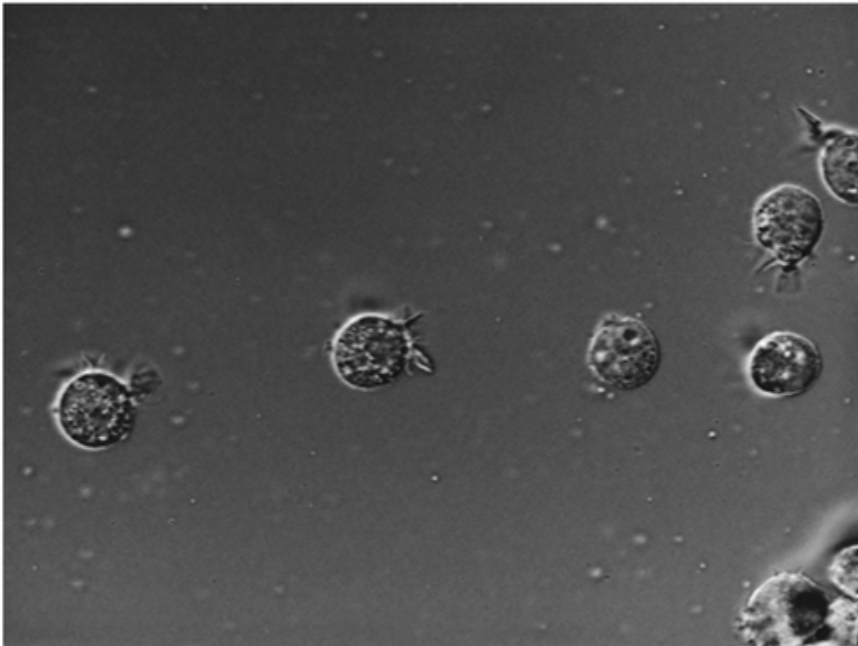
"photoshoping" with Matlab
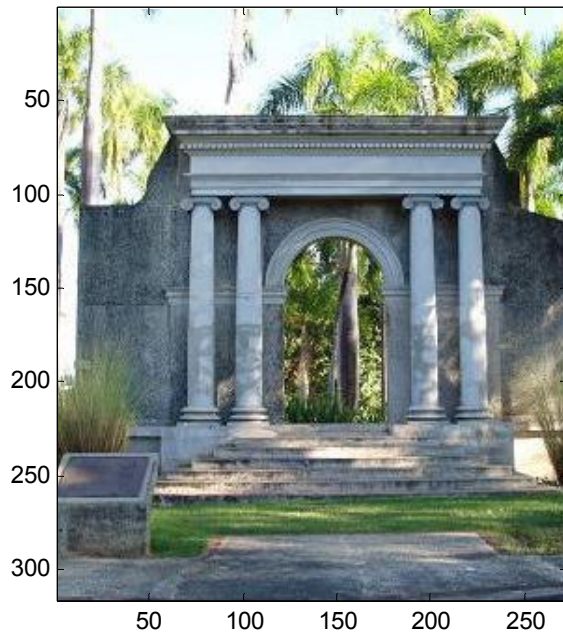
Haiti National Palace before and after the earthquake