Image analysis in Matlab

Vision, Robotics and Control

Umberto Castellani

Histogram

histogram(X)

Computes and plot a histogram. After you create a Histogram object, you can modify aspects of the histogram by changing its property values. This is particularly useful for quickly modifying the properties of the bins or changing the display.

Image histogram

[counts,binLocations] = imhist(I)

Computes and plot a histogram of image data.

Contrast enhancement

J = imadjust(I)

Adjust image intensity values or color map. By default, imadjust saturates the bottom 1% and the top 1% of all pixel values. This operation increases the contrast of the output image J.

Image binarization

- BW = imbinarize(I)

creates a binary image from 2-D or 3-D grayscale image I by replacing all values above a globally determined threshold with 1s and setting all other values to 0s. By default, Imbinarize uses Otsu's method, which chooses the threshold value to minimize the intraclass variance of the thresholded black and white pixels.

Structuring Element (SE)

SE = strel(nhood)

A strel object represents a flat morphological structuring element, which is an essential part of morphological dilation and erosion operations.

A flat structuring element is a binary valued neighborhood, either 2-D or multidimensional, in which the true pixels are included in the morphological computation, and the false pixels are not. The center pixel of the structuring element, called the origin, identifies the pixel in the image being processed. Use the strel function (described below) to create a flat structuring element. You can use flat structuring elements with both binary and grayscale images. The following figure illustrates a flat structuring element.

Opening

J = imopen(I,SE)

performs morphological opening on the grayscale or binary image I, returning the opened image, J. SE is a single structuring element object returned by the strel or offsetstrel functions. The morphological open operation is an erosion followed by a dilation, using the same structuring element for both operations.

Convex Hull

k = convhull(P)

Computes the smallest convex shape enclosing a given shape.

Filtering of small regions

BW2 = bwareaopen(BW,P)

removes all connected components (objects) that have fewer than P pixels from the binary image BW, producing another binary image, BW2. This operation is known as an *area opening*.

Find connected components

CC = bwconncomp(BW)

Find connected components in binary image.

Field	Description
`Connectivity`	Connectivity of the connected components (objects)
`ImageSize`	Size of `BW`
`NumObjects`	Number of connected components (objects) in `BW`
`PixelIdxList`	1-by-`NumObjects` cell array where the *k*-th element in the cell array is a vector containing the linear indices of the pixels in the *k*-th object.

Labelling components

L = labelmatrix(CC)

Create label matrix from bwconncomp structure.

(see also RGB = label2rgb(L) to color the labels).

Image contour

imcontour(I)

draws a contour plot of the grayscale image I, choosing the number of levels and the values of levels automatically

Region properties

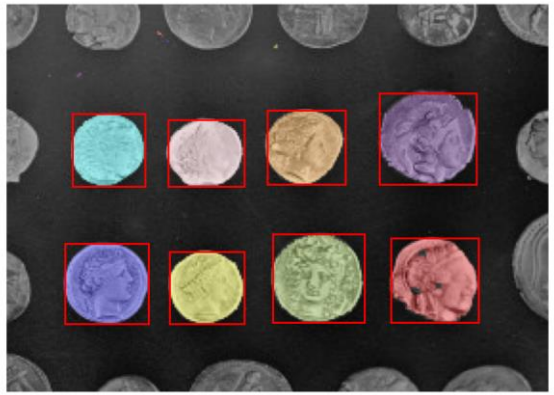
stats = regionprops(BW,properties)

returns measurements for the set of properties for each 8-connected component (object) in the binary image, BW

NOTE: this is one of the most important fuction, evaluate all the properties!

Python version

- There are analog funtions in Python: e.g. scikit-image



scikit-image
image processing in python

https://scikit-image.org/

https://scikit-image.org/docs/dev/auto_examples/segmentation/plot_label.html#sphx-glr-auto-examples-segmentation-plot-label-py