A10- Blob Analysis

Introduction

An interesting and commonly encountered problem in image processing is the analysis of **several** regions of interest in one image, for instance, cell counting, measurement of grain properties (granulometry), or printed character recognition. Suppose our task is to measure the area of cells in a blood sample observed under a microscope. One image can have tens or hundreds of cells. It is too tedious to crop out each the individual cell one by one and measure the area. Blob analysis allows us to do such repetitive task in one go.

Our first step is to segment the image. Suppose you binarize the image thru threshold segmentation such that cells will appear white (1's) and the background is black (0's). The blobs are the pixels that form a connected component, thus in this case the binarized cells are the blobs. However if there is an overlap in the graylevel distribution of background and cell, the resulting binarized image may appear grainy and will need to be further cleaned by morphological processing. Different morphological processes can close holes, separate touching blobs, and remove stray pixels (or small blobs which are not ROI's).

After **segmentation**, and **morphological "cleaning"**, the next step is to give each blob a unique identifier. This is called **labelling**. Labelling replaces 1's in the second blob into 2's, the third blobs into 3's, and so on. Once each blob is labelled, we can now loop through each blob to measure its features.

Most scientific software will have a set of functions that can do blob analysis. For Matlab it is bwlabel and regionprops. Check out the Matlab Help documentation for regionprops to see its syntax and examples. For python the functions are in opencv. Google "Blob Detection Using OpenCV (Python, C++)" by Satya Mallick for a tutorial. For Scilab install the Image Processing and Computer Vision Toolbox and checkout ROI Processing.

Procedure

1. Download the image 3468.jpg from UVLE.
2. Use blob analysis to measure the size of each cell (in number of pixels). Give the best estimate of the average cell size. Best estimate is the mean of the size +/- standard deviation of the size.
3. Besides size, mark out the centroid of the cell and enclose each with a bounding box. These features can be derived using blob analysis.
4. Measure other shape features of the cell such as eccentricity, major axis length,or perimeter.