Computational Vision & Imaging - Lab 4

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In this lab exercise, you will look at image registration using hand-picked selected features and the MATLAB built-in affine transform function. You will need the MATLAB Image Processing Toolbox, which is free for all students.

You are asked to write a short (no more than 2 pages) report of your work, answering specific questions, and showing example images. This work is not assessed (it will not count towards your module mark) but you will get formative feedback.

STEP 1:

- Download the zip file and extract the data files (.tif) for Lab from CANVAS and save them in your working directory
- Register two images representing two different views of a fish embryo:
    - the base image ***fish-vis.tif*** (transmission image, visible light)
    - the floating image ***fish-cfp-#.tif*** that is to be registered to the base image (this is a grey-level version of a fluorescence image with Cyan Fluorescent Protein - CFP).
    - [NB: # corresponds to a number; Use any or as many as you like].

TASK 1:

- Follow the tutorial on Image Registration in the Matlab Image Processing Toolbox (search for "Control point registration" in the Matlab Help).
- Use the Matlab Control Point Selection Tool cpselect() to manually select matching points in the two images from Step 1
- Register the two images using the selected control points
- Display the two images.

Question 1:

- What is the effect of increasing/decreasing the number of chosen control points in registration accuracy?

Question 2:

- How would you evaluate the accuracy of your registration?

Question 3:

- Other than Affine, what are the other options and which one do you think works best?

General Guide:

The whole process involves the following steps:

- Read the base image fish-vis.tif and the floating image fish-cfp-#.tif
- Extract the second 'slice' from the fish-cfp-#.tif image [i.e. (:,:,2)]. From now on use only this grey-scale image as your floating image.
- Use function ***cpselect***() to select and save control points.
- Determine the parameters of transformation using fitgeotrans() [use 'affine' option].
- Transform the input image using imwarp()
    - this will compute your registered image (see hints and tips below).
- Display the registered image alongside the base image.

Hints and Tips:

- Before registration extract a single image plane from you colour image fish-cfp-?? (e.g. (:,:,2)).
- To ensure that the transformed image after registration is the same size as the base image, use the following form of imwarp():

    registered_image = imwarp(floating_image,tform,'FillValues',0,'OutputView',

    imref2d(size(base_image)));

- To get a semi-transparent overlay (for fun), directly after displaying the registered_image, set transparency parameter (alpha) for the base image using the following code:

    alpha=0.6;

    hold on

    h = imshow(base_image, gray(256));

    set(h, 'AlphaData', alpha);