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IMAGE PROCESSING - LAB SESSION 2

This lab requires to use Matlab and Python. For Python, install anaconda (https://www.continuum.io/). Once it is installed run anaconda terminal and check that scikit-image library is 0.12.3 or later.

>>python
>> import skimage
>>skimage.__version__

For this lab, you can use the examples from the documentation of scikit-image module which is very complete. For this lab, use a jupyter notebook: Anaconda terminal> jupyter notebook

Most of the questions can be done either in Matlab or Python, but Python has the priority in this lab!

Part I. Space fish

1/ Read and show the "fish_rotated.jpg" image. Display the radon transform of the image, and then the hough transform (radon, canny) and find the rotation needed to get the image into the correct position compared to “fish.jpg”.

2/ Select at least 4 corresponding points in both rotated fish and the normal fish. You can do this manually (in paint-like software) or use cpselect in Matlab. Do the same between the normal fish and the transformed fish. Which transformation would you use for rotated fish? And on transformed fish? Find the transformation matrixes and transform the fish rotated and fish transformed images into a normal view (as in fish image). Display the transformation matrixes and comment them. What happens if you use a SimilarityTransform for fish_transformed (in terms of precision of the transform)?

Part II. Multiresolution fish

1/ Compute a Gaussian pyramid (factor 2 between two resolutions). Compute it first by hand, then using the python scikit function. From this pyramid, compute the corresponding approximation of the Laplacian pyramid.

2/ Compute some Gabor filter responses on the image. What is the parameters meaning?

3/ [In Matlab] Make a discrete wavelet decomposition at several levels (at least 2) and several wavelets (at least db1 and db4). Use the wavedec2 function. Reconstruct the image (waverec2). Reconstruct each level (wrcoef2). Make the sum of the reconstructed levels: what happens?

Part III. Feature fish

1/ Find the corners of the three images (normal fish, rotated fish, transformed fish). Are those points stable? What influence of the parameters?

2/ Compute the Histograms of Gradients (HoG) of the image and explain the results. Vary the parameters.

Part IV. Segmented fish

1/ [In Matlab] Use a kmeans unsupervised classifier (kmeans, reshape) and the Lab color system (makecform and applycform) to get a segmentation of the image into 5 classes. What about the result in RGB color space? Provide the 3 dominant colors. Get documents on internet about the emotions involved by those colors. What do you think about the emotions in this image?