Lab 7

Sift & Harris Corners

Part 1: SIFT

1. Using SIFT and showing keys:
   a. Apply sift function on example.
   b. What does the result of the function means?
   c. Apply showkeys function on the result from sift
   d. What does the result image displayed means?
2. Object Recognition using SIFT:
   a. Try match function between ('box_in_scene.png', 'box.png')
3. Explain matching process main steps and how can I use other feature extractor.

Part 2: Harris Corner Detection

a. Read the image 'circuit.tif'
b. Compute x and y Derivatives of image

$$I_x = G_\sigma^x * I, \qquad I_y = G_\sigma^y * I$$

c. Compute the products of derivatives at every pixel

$$I_{x^2} = I_x . I_x, \qquad I_{xy} = I_x . I_y, \qquad I_{y^2} = I_y . I_y$$

d. Compute the sum of the products of derivatives at each pixel using Gaussian filter

$$S_{x^2} = G_\sigma * I_{x^2}, \qquad S_{xy} = G_\sigma * I_{xy}, \qquad S_{y^2} = G_\sigma * I_{y^2}$$

e. Compute the response of the detector at each pixel

$$R = (S_{x^2} . S_{y^2} - S_{xy} . S_{xy}) / (S_{x^2} + S_{y^2})$$

f. Apply Threshold on R to get corners (R > T is a corner).
g. Get local maximum of R (after applying the threshold) to remove redundant points (only leave points that is larger than all surrounding points).
h. According the TODOs.

Hints:

$$Sobel\ Operator: G_x = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix} \quad G_y = \begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix}$$

References:

https://docs.opencv.org/3.0-beta/doc/py_tutorials/py_feature2d/py_matcher/py_matcher.html


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