

E9 241: DIGITAL IMAGE PROCESSING

ASSIGNMENT 6; DUE NOVEMBER 5/6, 2019

Topics: Matched Filtering, Structure Tensor, Edge Detection

- (1) Implement a matched filter to detect and count how many particles are present in the given *Nanoparticles* image using the template provided.
 - (2) Write a Matlab/Python script to compute the directional derivative of an input grayscale image. The result should be in the form of a video containing 360 frames, one for each degree of the directional derivative, counterclockwise. Remember to perform Gaussian smoothing before computing the derivative. Choose the width of the Gaussian smoother such that the printed circuit board tracks show up as single edges and not as double edges. Report your results on the *PCB* image.
 - (3) Write a Matlab/Python script to implement the structure tensor with a Gaussian smoothing kernel. The output must contain separate panels (with suitable headings, all in uppercase) showing the following maps: (i) Energy; (ii) Orientation; and (iii) Coherence. The orientation map must be displayed in color using the *Color Wheel*. Report your results on the *Fundus* and *Fingerprint* images.
 - (4) Extend the above program to implement the Harris corner detector. Report your results on the *PCB* image. The output must show only the corners (marked by a *) in the input image.
 - (5) Write a Matlab/Python script to implement a *Canny* edge detector. One must be able to select the lower and higher thresholds in the hysteresis thresholding block using sliders. The output must get dynamically updated depending on the values selected. Report your results on the *Lanes* and *DNA* images.
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