Due on 10 April 2023

Computer vision - Assignment 6

Use images from this folder.

1. Image noise and de-noising: In this exercise we'll look at various kinds of image noises and compare de-noising methods.

   Download the image 'checkerboard.png'.

   (a) Adding noise: Add the following kinds of noise to the image either by image addition or by using the OpenCV function for
       i. Gaussian noise
       ii. Salt-and-pepper noise
       iii. periodic noise

   (b) De-noising: de-noise the images obtained above. Experiment with various filters such as smoothing Gaussian filter, median filter and the notch filter (for periodic noise) to see what works best. You may try other filters too.

   (c) Apply the ideal, Gaussian and Butterworth notch filters on the images 'notch1.jpg', 'notch2.png' and 'notch3.jpg', and compare the results.

2. Thresholding comparisons: threshold the images 'fingerprint1.jpg', 'fingerprint2.jpg' and 'bookpage.jpg' using the first three methods. Display the histogram for each image and observe how the threshold is working each time. Say which method is giving you the best threshold in each case and why.

   (a) Manual thresholding - manually choose the threshold after observing the histogram.

   (b) Global thresholding

   (c) Otsu's method - measure the effectiveness of thresholding using the ratio of variances.

   (d) Adaptive thresholding: try both mean and Gaussian.

3. Apply the following edge detection techniques to the image 'building.jpg' and compare the results. In each case apply Gaussian smoothing before applying edge detection and thresholding after.Experiment to see which thresholding method works best in the given case.

   (a) Sobel kernel

   (b) LoG (finding zero crossings)

   (c) Canny edge detector

   (d) Hough transform

   Repeat the above steps for the image 'objects.png'. Write down your observations. In particular, note the differences observed in results when the methods are applied to an image with more straight edges in contrast to an image that has more curves. Can you explain these observations?