ADIP-2019
ASSIGNMENT-1

Read the colour image "Church.jpg", convert it to gray level image and perform the following operations. Respective marks for your implementations are shown with the tasks assigned here.

(1) For reading and conversion to gray. -- 2+3 =5

(2) On the original gray image: Add random noise (Gaussian noise of standard deviation 5) to it. Then perform denoising by performing wavelet analysis, setting the coefficients below a threshold value (to be provided by the user), and then applying wavelet synthesis on the images. Apply Le Gall 5/3 wavelet filters (separable in 2D) for this purpose. The coefficients of these filters (in 1D) are provided in the Table below.

n	Analysis Filter Bank		Synthesis Filter Bank	
	Low-pass filter	High pass filter	Low-pass filter	High pass filter
0	3/4	1	1	3/4
±1	1/4	-1/2	1/2	1/4
±2	-1/8			-1/8

For applying these filters, you need to convolve row wise and column wise with 1-D filter responses for Low-Low (LL), Low-High (LH), High-Low (HL) and High-High (HH) bands. After applying analysis filters, downsample filtered images by half in both directions. Before applying synthesis filters upsample them by the factor of two in both the directions. Summation of responses from synthesis filter will provide the reconstructed image. For details refer to Fig. 3.1 of the attached document on tutorial of wavelet transforms.

Also apply median filtering and Gaussian filtering (of standard deviation 4) for denoising. Display the original, noisy, and all filtered images. Compute the PSNR of the noisy and filtered images w.r.t. the original image in each case. – Analysis (10), downsampling (5), thresholding (10), upsampling (5), Synthesis (10), Gaussian filtering (5), Median filtering (5), Computing PSNRs (5), Display (5) = 60

(3) On the original gray image: Apply LoG (Laplacian of Gaussian) operator of standard deviation 5, and find edge pixels by computing its zero crossings. Display both LOG image and its zero-crossings. -- 4+4+2=10

(4) On the original colour image: Apply mean shift algorithm for segmenting it in the RGB color space. For reference please consult the attached paper . -- 15

(5) Implement Harris corner detector on the gray image and display the detected corners. - 8+2

Bonus: If all the modules are implemented and the results are shown for each of them. -- 10

You may implement your programs in C++-OpenCV/MATLAB/ Python with necessary user's interfaces and visualization of your results and input.
Please provide a documentation for compiling and running the programs in a README file.
The whole project should be submitted in a single tar or zip file.