Computer Vision: Assignment 2

Submission Date: September 19, 2024

1. Hough-Transform for line detection. Implement a second-derivative edge detector on the image north.jpg and top_view.png (first convert to grayscale) using the Laplacian of Gaussian (LoG) method described on page 724 (G&W book). Plot edges uses zero crossing. Also use a threshold of 4% similar to Fig 10.22 (pg. 728, G&W) to plot a second edge image.

The goal of this step is to outline the lines correctly identify the block structure of top view of IIT Jammu. You will be graded upon the accuracy of structure shown by your lines. You can use built-in functions.

2. Perform Hough-Transform for circle detection on the image X. You can use build in functions.
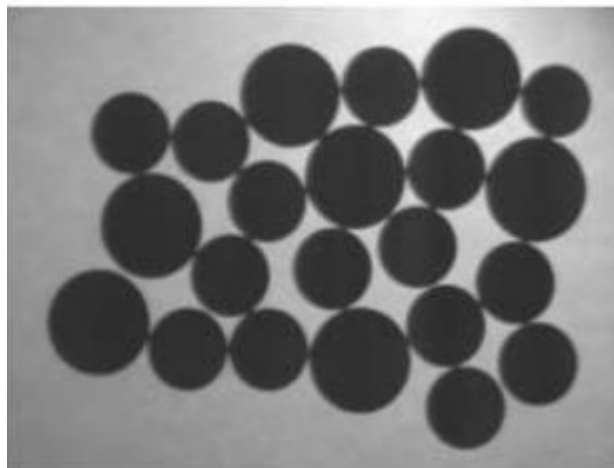
3. Hybrid Images: A hybrid image is a picture that combines the low-spatial frequencies of one picture with the high spatial frequencies of another picture producing an image with an interpretation that changes with viewing distance. The basic idea is that high frequency tends to dominate at a closer distance, but as you move away only the low frequency (smooth) part of the signal can be seen. By blending the high frequency portion of one image with the low-frequency portion of another, you get a hybrid image that leads to different interpretations at different distances. An example of a hybrid image is shown below.

(a)   A Hybrid Image

The image shown above is the hybrid of two images as given below:

The low-pass (blurred) and high-pass versions of these images look like this:

The high frequency image is actually zero-mean with negative values so it is visualized by adding 0.5. In the resulting visualization, bright values are positive and dark values are negative. The above results are shown for color images. Now you have to do the following operations initially for generating hybrid using two grayscale images **(take any image from the internet):**

(a) Generate hybrid images in using spatial filtering techniques. You are required to show the experiments done using simple filters (also vary their parameters like mask size) and results obtained for each of them. Make a note of your observations.

(b) Use Gaussain Filters to perform image smoothing. Note the variations by changing the filter size, and σ for the images.

(c) Study and make use of Gaussain Pyramids and Laplacian Pyramids for mixing the two images.

(d) Implement Laplacian Pyramids with Bilateral filters and use them with Gaussain Pyramids for the same.

(e) Design a way to do the same mixing in frequency domain.

(f) Generate hybrid color images using the best set of filters obtained for spatial and frequency domain using color images.

Note: Original and self-coded programs will be marked higher. Use your own choice of images to make funny or artistic hybrids. The best hybrid and its chosen parameters will be judged!