SYDE 671 Advanced Image Processing

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Assignment 1 - Questions Part (100 pts)

1 Instructions

- 4 questions (25 pts each).
- The answers to this document is to be submitted as a part of a Jupyter notebook file only.
- Feel free to include images and equations and comment on both your codes and results meticulously.

2 Questions

Q1: Explicitly desribe image convolution: the input, the transformation, and the output. Why is it useful for computer vision?

Q2: What is the difference between convolution and correlation? Construct a scenario which produces a different output between both operations.
Please use scipy.ndimage.convolve and scipy.ndimage.correlate to experiment.

Q3: What is the difference between a high pass and a low pass filter in how they are constructed, and what they do to the image? Please provide example kernels and output images.

Q4: How does computation time vary with filter sizes from 3×3 to 15×15 (for all odd and square filter sizes), and with image sizes from 0.25 Mpix to 8Mpix (choose your own intervals that you deem appropriate - not less than 8 intervals). Measure both using either scipy.ndimage.convolve or scipy.ndimage.correlate to produce a matrix of results. Use skimage.transform module to vary the size of the image. Use an appropriate charting function to plot your matrix of results such as Axed3D.scatter or Axes3D.plot_surface. Does the results match your expectations given the number of multiply and add operations in convolutions? Use the Image: RISDance.jpg included in your assignment to perform these tets.