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IIIT Vadodara
Autumn 2018-19
TE3 Computer Vision
Lab-2: Preliminary operations on digital images

Q. 1: Compare imadjust() and imcomplement() for obtaining negative of an image.

Q. 2: Observe the effects of changing Gamma on an image. Show their effects on band of interest using histogram of the input image and corresponding processed image.

Q. 3: Demonstrate following linear filtering operations using imfilter(): (i) low-pass filter, (ii) high-pass filter, and (iii) high-boost filter.

Q. 4: Consider an image. Apply Laplacian of Gaussian (LoG) filtering operation to detect the edges of the image. Experiment with different sizes of masks and windows. Compare their outputs along with corresponding histograms. Use fspecial() and imfilter() commands.

Q. 5: Compare and contrast the functioning of LoG and the high-pass filtering operations for detecting edges from an image.

Q. 6: Consider an image. Add different amounts of salt & pepper noise in it. Now try removing the noise using appropriate filtering in the spatial domain of the image. Display all the outputs.

Q. 7: Repeat the Q.6 for Gaussian noise.

Q. 8: Demonstrate the effects of repeatedly applying low-pass filter operation on an image.

Q. 9: The ability of human visual system to detect an object in a uniform background depends on its size (resolution) and the contrast ratio γ which is defined as

$$\gamma = \frac{\sigma}{\mu}, \tag{1}$$

where, μ is the average luminance of the object and σ is the standard deviation of the luminance of the object plus its surround. Now consider the *inverse contrast ratio*,

$$v(m,n) = \frac{\mu(m,n)}{\sigma(m,n)}, \tag{2}$$

where, $\mu(m,n)$ and $\sigma(m,n)$ are the local mean and local standard deviation, respectively, measured over a window W, within the given image $u(m,n)$. (i) Write the equations for the $\mu(m,n)$ and $\sigma(m,n)$. This transformation generates an image where the weak, i.e., low-contrast, edges are enhanced. A special case of equation (4)

$$v_s(m,n) = \frac{u(m,n)}{\sigma(m,n)} \tag{3}$$

is called *statistical scaling.* (ii) Comment on the output image generated after applying the statistical scaling.