E9 222 Signal Processing in Practice
Assignment 06 Report

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Discipline: Signal Processing

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Image Sharpening

High boost filtering is a popular technique used for image sharpening that uses a combination of a high pass filter and a gain factor. For a given image f (m, n), the sharpened image g (m, n) is obtained as

$$g\,(m, n) = f\,(m, n) + k\,[f\,(m, n) * h\,(m, n)]$$

where **h (m, n) is a high pass filter**, such as the Laplacian filter.

We have to sharpen the given images using high boost filtering.

Saturation of pixel values below 0 or above 255 is also incorporated.

A spatially varying gain k (m, n) is designed such that for weak edges (or small magnitude of the Laplacian filter output), k is larger and for stronger edges (or large magnitude of the Laplacian filter output), k is smaller.

In particular, a curve for k as a function of |f (m, n) ∗ h (m, n)| is designed with the above property.

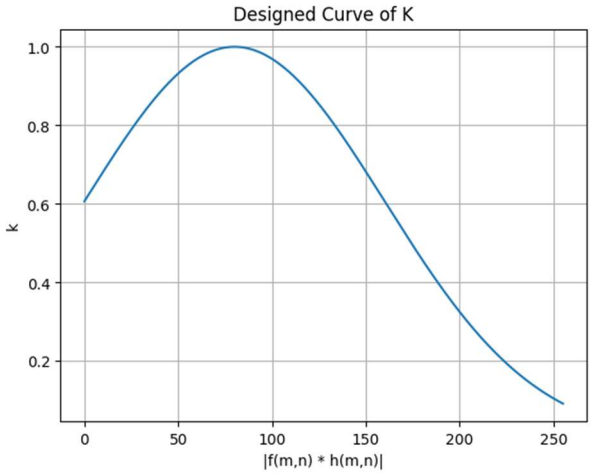
Observations/Results:

The above figures give the results of sharpening the image with varying Gain and Constant Gain respectively.

It can be observed that sharpening with a varying Gain has significantly less noisy/grainy look in the final image.

This can be observed in the case of all three images.

The Designed Curve for K(Gain) is given as:



The Gain is then multiplied by a constant (>1) so that the gain is >1.

Comments/Inferences:

In the sharpened images using constant Gain K, all edges irrespective of their strengths are added to increase the sharpness of the image. So, the final image is noisier/grainier when compared to sharpening with varying Gain. In sharpening with Varying Gain, too weak (generally noise) or too strong edges (Big discontinuities) are given less importance. So, the middle value of the edges which correspond to fine details are only amplified. This results in a better overall sharpening and a clean and crisp image