EECS203A: HOMEWORK #6

Due: May 23, 2019

1. Consider the three filters arithmetic mean filter (AMF), geometric mean filter (GMF), and the contraharmonic mean filter with Q=1 (CMF1).

a) Which of these filters is linear?

b) Which of these filters is highpass?

c) Which of these filters is the best for salt noise reduction?

d) Which of these filters is the best for pepper noise reduction?

e) Which of these filters is the worst for pepper noise reduction?

2. Suppose that $g(x, y)$ is a degraded version of an ideal image $f(x, y)$ with

$$g(x, y) = h(x, y) * f(x, y) + n(x, y)$$

a) What must be known to apply an inverse filter to $g(x, y)$?

b) What image $f'(x, y)$ is the result of applying an inverse filter to $g(x, y)$?

c) What are the most general conditions on $h(x, y)$ and $n(x, y)$ for which $f'(x, y) = f(x, y)$?

3. Suppose that $g(x, y)$ is a degraded version of an ideal image $f(x, y)$ with

$$g(x, y) = h(x, y) * f(x, y)$$

where $h(x, y)$ is an ideal lowpass filter with cutoff frequency D_0.

a) Can we recover $f(x, y)$ from $g(x, y)$ using inverse filtering? Explain your answer.

b) Given an input image $f(x, y)$ that gives a corresponding filtered image $g(x, y)$, describe the set of input images that will give the same filtered image $g(x, y)$.

Computer Problem: Degrade the triangle image by convolution with the spatial degradation function $h(x, y)$ where $h(x, y)$ is a Gaussian lowpass filter with a standard deviation of 7 pixels in the space domain. You can obtain this space domain filter by sampling a continuous 2-D Gaussian. Do not add noise. Use the inverse filtering approach to restore the image. Submit the degraded image and the restored image.