SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

An Autonomous Institution

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE NAME : 19EC513 – IMAGE PROCESSING AND COMPUTER VISION

III YEAR / V SEMESTER

Unit II- **IMAGE ENHANCEMENT AND RESTORATION**

Topic : Weiner filtering

The inverse filtering approach discussed in the previous section makes no explicit provision for handling noise. In this section, we discuss an approach that incorporates both the degradation function and statistical characteristics Of noise into the restoration process. The method is founded on considering images and noise as random variables, and the objective is to find an estimate of the uncorrupted image f such that the mean square error between them is minimized. This error measure is given by

$$e^2 = E\{(f - \hat{f})^2\}$$

where $E\{\cdot\}$ is the expected value of the argument. It is assumed that the noise and the image are uncorrelated; that one or the other has zero mean; and that the intensity levels in the estimate are a linear function of the levels in the degraded image. Based on these conditions, the minimum of the error function in Eq. (5.8-1) is given in the frequency domain by the expression

$$\hat{F}(u, v) = \left[\frac{H^*(u, v)S_f(u, v)}{S_f(u, v)|H(u, v)|^2 + S_\eta(u, v)}\right]G(u, v)$$

$$= \left[\frac{H^*(u, v)}{|H(u, v)|^2 + S_\eta(u, v)/S_f(u, v)}\right]G(u, v) \qquad (5.8\text{-}2)$$

$$= \left[\frac{1}{H(u, v)}\frac{|H(u, v)|^2}{|H(u, v)|^2 + S_\eta(u, v)/S_f(u, v)}\right]G(u, v)$$

$$\text{SNR} = \frac{\sum\limits_{u=0}^{M-1}\sum\limits_{v=0}^{N-1}|F(u,v)|^2}{\sum\limits_{u=0}^{M-1}\sum\limits_{v=0}^{N-1}|N(u,v)|^2}$$

$$\text{MSE} = \frac{1}{MN}\sum\limits_{x=0}^{M-1}\sum\limits_{y=0}^{N-1}[f(x,y) - \hat{f}(x,y)]^2$$

a b c

FIGURE 5.28 Comparison of inverse and Wiener filtering. (a) Result of full inverse filtering of Fig. 5.25(b). (b) Radially limited inverse filter result. (c) Wiener filter result.

Any Query????

Thank you……