Signal Restoration with the Parametric Wiener Filter

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Section 16.2.4

$Np := 20 \qquad u := 0, \frac{0.5}{Np} .. 0.5$

The Gaussian: $G(\mu,\sigma,x) \equiv \text{if}\left[\left|x-\mu\right| < 3\cdot\sigma, e^{-\left[\frac{(x-\mu)^2}{(2\cdot\sigma\cdot\sigma)}\right]}, 0\right]$

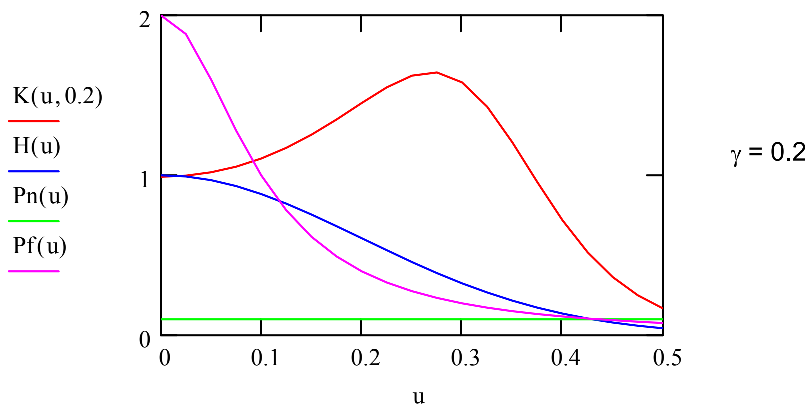
The signal, f(x), has been smoothed by H(u) and corrupted by additive white noise of power N.

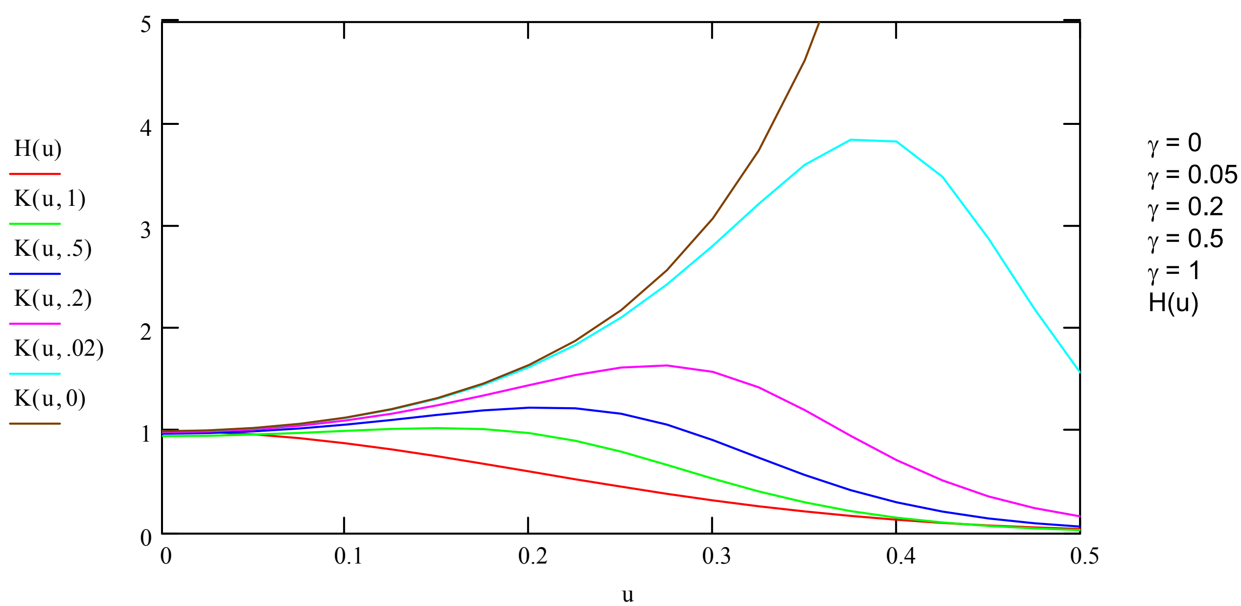
$\mu \equiv 0 \qquad \sigma \equiv 0.2 \qquad N \equiv 0.1 \qquad k \equiv 100$

The smoothing MTF: $H(u) := G(\mu,\sigma,u)$

The power spectra: $Pf(u) := \frac{2}{1+k\cdot u^2} \qquad Pn(u) := N$

The transfer function: $K(u,\gamma) := \frac{H(u)}{(H(u))^2 + \gamma\cdot\left(\frac{Pn(u)}{Pf(u)}\right)}$





Parametric Wiener Filter Transfer Function

Note that $\gamma = 0$ is straight deconvolution, $\gamma = 1$ is Wiener deconvolution, and $0 < \gamma < 1$ is everything in between.
In this case the signal dominates the noise over almost the entire spectrum, but the blurring is rather severe.
$\gamma = 0.02$ gives a pretty good looking restoration MTF. Wiener deconvolution is usually too mild.