

(1) WINDOWING: $X_w(t) = w(t) x(t)$

$w(t) = \phi$ OUTSIDE
 $[0, \dots, N-1]$

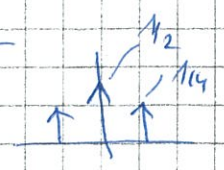
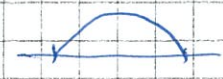
RECTANGULAR: (DIRICHLET)

$w(t) = 1$



HANNING
 (RISED COSINE WINDOW)

$w(t) = \frac{1}{2} \left(1 + \cos \left(\frac{2\pi t}{N} \right) \right)$



$X_H(k) = \frac{2X_{rect}(k) - X_{rect}(k-1) - X_{rect}(k+1)}{4}$

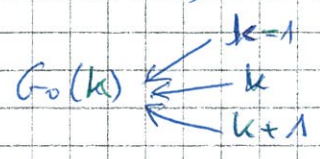
$\sim 2^{\text{nd}}$ DIFFERENCE

T_0 - SMOOTH

DIFFERENTIATING $\Rightarrow \phi$

(Worst ϕ)

NEW ERROR: INTERPOLATION:



ERRORS: e_1 - LEAKAGE

e_2 - INTERPOLATION

RECTANGULAR WINDOW:

$\hat{G}_{rect}(k) = G_0(k) + \frac{T_0(k)}{U_0(k)} = G_0(k) + O(N^{-1/2})$

(STATIONARY RANDOM EXCITATION)

$\begin{cases} e_{1, rect}(k) \\ e_{2, rect}(k) = \phi \end{cases}$

AVERAGED:

$\hat{G}_{n, rect}(k) = G_0(k) + \frac{\frac{1}{n} \sum U_0^{(i)}(k) T_0^{(i)}(k)}{\frac{1}{n} \sum |U_0^{(i)}(k)|^2}$

BIAS: $\frac{E \{ \bar{U}_0^{(i)} T_0^{(i)} \}}{E \{ |U_0^{(i)}|^2 \}} = O(N^{-1}) \leftarrow \text{WEAK CORRELATION } T_0 \leftrightarrow U_0$

VARIANCE: $VAR \{ \hat{G}_{n, rect}(k) \} \sim O(N^{-1} N^{-1})$

WITHOUT NOISE