Shiv Nadar University

Department of Electrical Engineering-(SoE)

EED305: Digital Signal Processing **Lab-3 (Deconvolution)** **Instructor:** Prof. Vijay Kumar Chakka

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Steps to performed for the given x&y (System identification)(or) h&y (Input estimation) using deconvolution:

i. $y = Xh$
ii. Apply X^T on both sides $X^T y = X^T Xh$
iii. Perform $(X^T X)^{-1}$ on both sides for the above resultant $(X^T X)^{-1} X^T y = (X^T X)^{-1} X^T Xh$
iv. Let us consider $\hat{h} = (X^T X)^{-1} X^T y$, Now find the least square error $||\hat{h} - h||^2$.

Case-1:

2. Perform the above process for the example discussed in class by considering input, output signal as one case and impulse response, output signal as another case.

3. Load the input audio signal and divide it into blocks of length 512 and consider the obtained block wise convolution output from Lab-2. Then perform the above steps for each block output

4. Repeat the above process for the given output data of each block *'noiseAddBlockConvOutput .mat'* .
   i. Plot the least square error computed with block index for both 3 and 4

Case-2:

5. Load the impulse response given in Lab-2 and consider the obtained block wise convolution output from Lab-2. Then repeat the above process to obtain the input data approximation.

6. Repeat question number 3 by considering *'noiseAddBlockConvOutput .mat'* output file instead of block wise convolution output.
   i. Plot the least square error of input estimation computed with block index for both 3 and 4