

EE 779 Advanced Topics in Signal Processing
Assignment 3 simulations

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Answer to C4.12

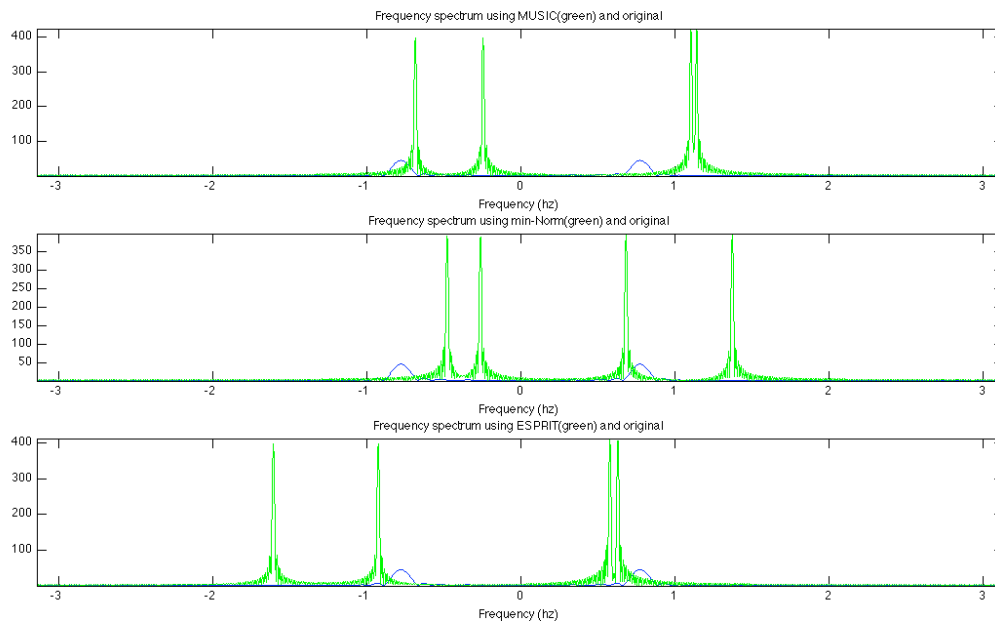
a)

Considering a variance of value '1' for this part.

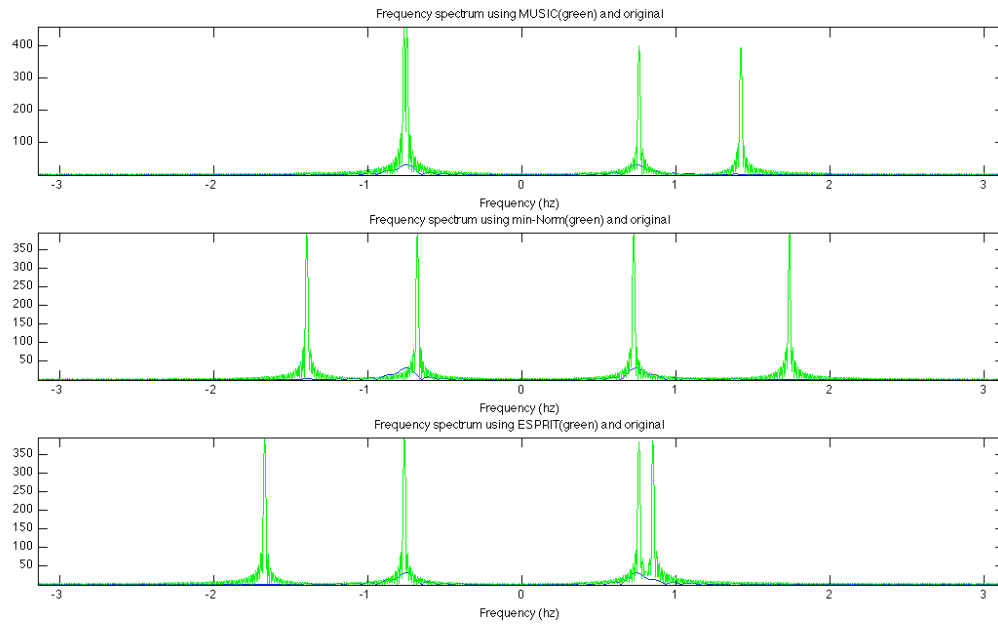
For values of 'm' from 5 to 9 all three methods i.e. MUSIC, min-norm and ESPRIT either have peaks at inaccurate values of frequencies or they are not resolvable (meaning the peaks merge into one). At $m = 10$ we see some change for the min-norm and the ESPRIT case, they start to show peaks at close to original frequencies while being resolvable at the same time. The ESPRIT case is more resolvable at this 'm'. At $m = 12$, the MUSIC method gives close to original peaks that are resolvable.

(Large size plots are included in this folder)

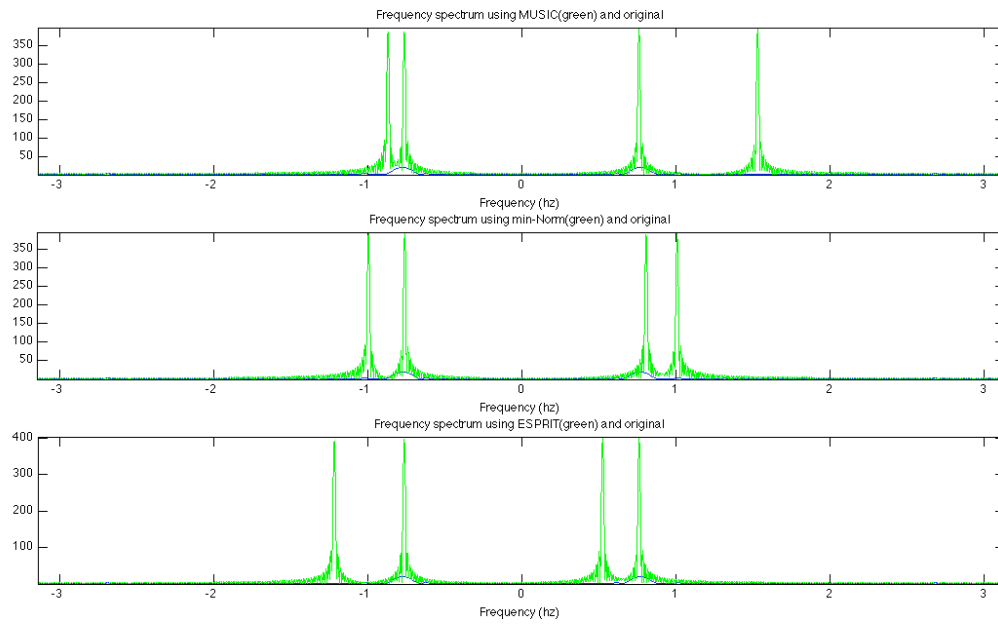
The plot for $m = 5$



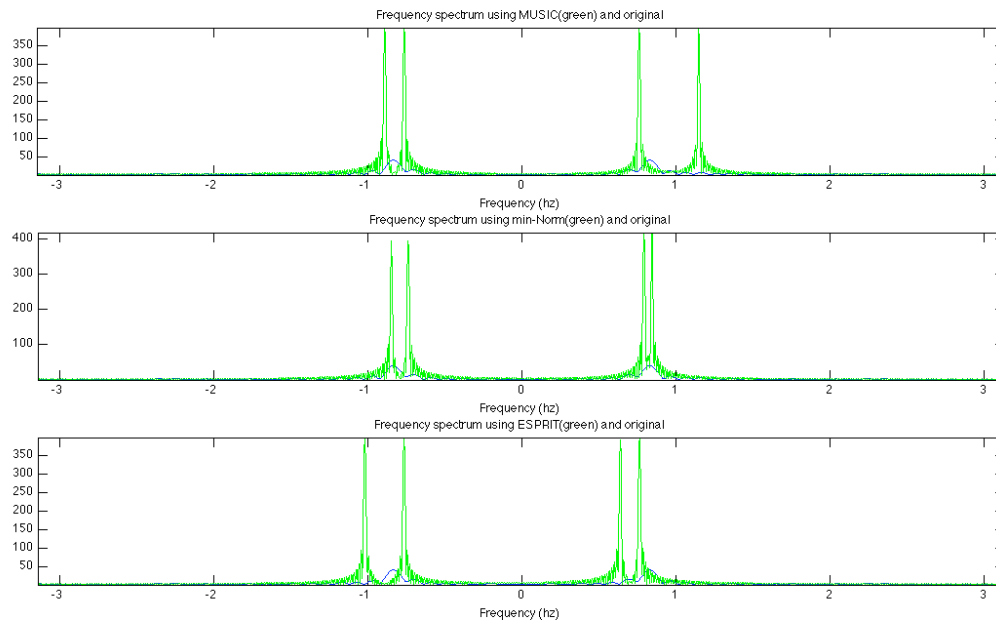
The plot for $m = 7$



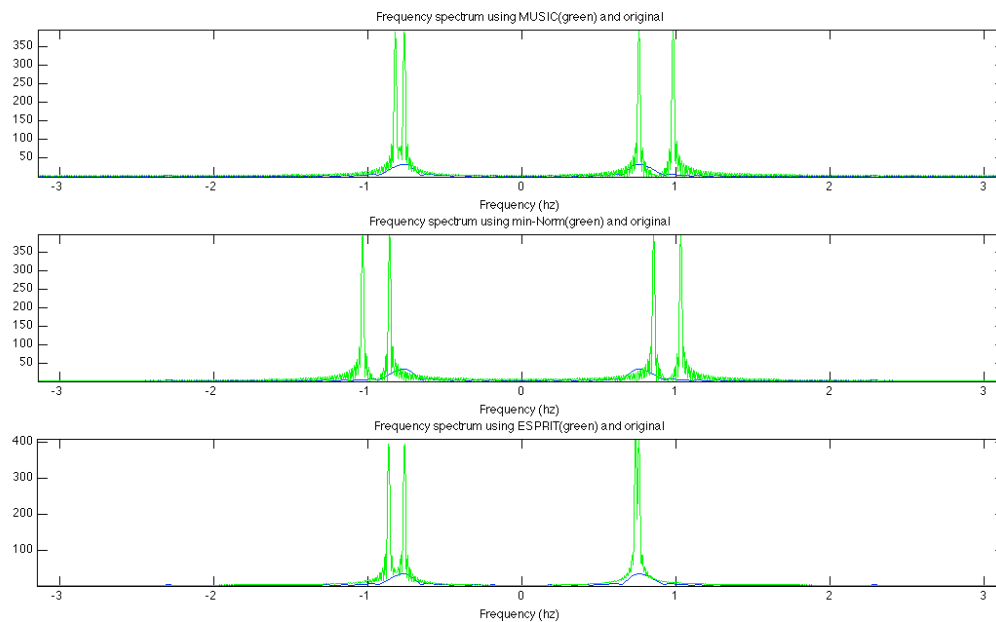
The plot for m=9



The plot for m=10



The plot for $m=12$



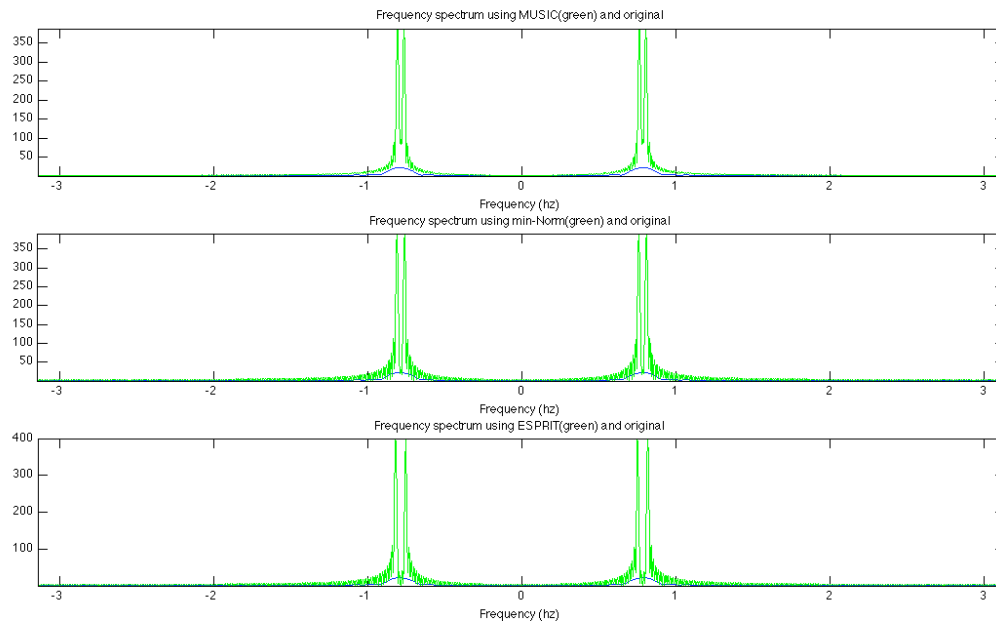
b)

This is for the infinite SNR case or the case when variance is 'zero'.

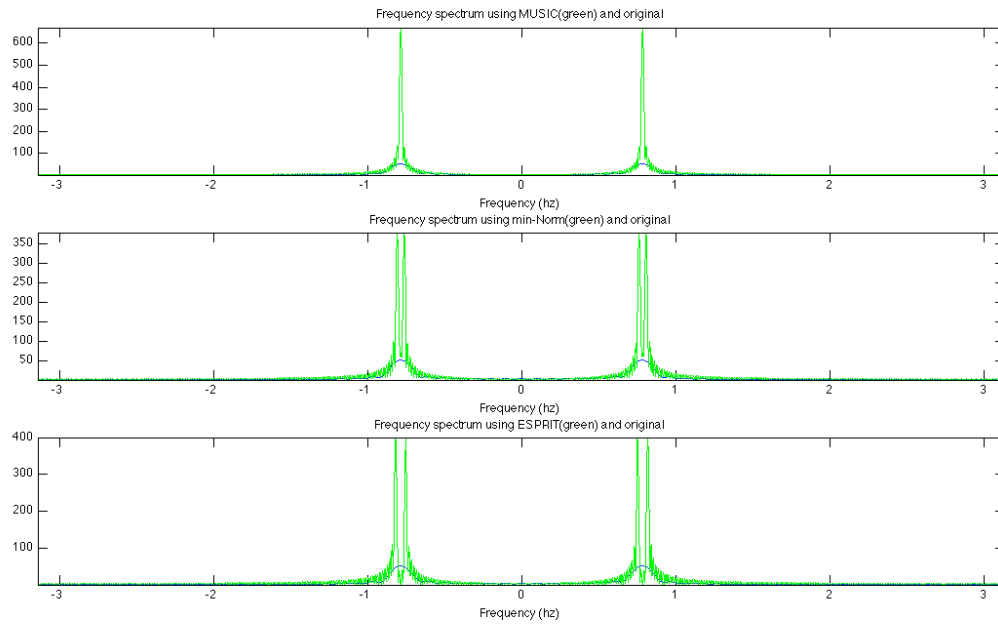
At $m=5$ almost all the three methods give resolvable peaks. The MUSIC case is most weakly resolvable at this value of 'm'. At $m=8$ the MUSIC case is no longer resolvable. At $m=12$ even the min-norm peaks come very close but they still remain resolvable.

This happens because the MUSIC method is statistically less reliable than the min-norm and the ESPRIT method. As m increases and gets closer to 'N' - the number of input data samples, the errors become more pronounced. Relatively low power components get neglected.

Plot for $m = 5$



Plot for $m = 8$



Plot for $m = 12$

