MATLAB Assignment 1 for ECE251A

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Problem on the STFT:

1. Plot the spectrogram for the given speech file “part1.wav” with M = 256 / R = 128 using a Hamming window in your own code. Compare your result with the result from the MATLAB built-in function *spectrogram()*.
2. Repeat (1) with M = 1024 / R = 512 and M = 4096 / R = 2048.
3. Draw the signal recovery diagram for M = 256 / R = 128 using the Hamming window. Plot the weighting function for M = 256 / R = 128.
4. Reconstruct the signal from the spectrogram from (1) and check that exact recovery (possibly with delay) is achieved in terms of Mean Square Error. (Overlap and add is recommended for reconstruction—see reference here.)
5. The signal “part5.wav” is corrupted by additive sinusoids. Use time-frequency processing to attempt to clean up the signal and recover the original speech. (For example, use the spectrogram to identify which time-frequency bins contain the corrupting signal, then zero those time-frequency bins and reconstruct the signal.) Plot the spectrograms of the corrupted signal and recovered signal. For this part, any reasonable approach will receive full credit, regardless of the exact final accuracy of the reconstruction. **However, the student whose reconstructed signal has the lowest MSE compared to the original (clean) signal will receive 30% bonus credit.** If you are entering this competition, you must provide a MATLAB file called “part5.m” with no dependencies on other files, which reads “part5.wav” in the same directory and creates a file “part5_reconstructed.wav” in the same directory. If your script crashes or does not produce “part5_reconstructed.wav”, you are ineligible for the bonus. I will evaluate the MSE of your output “part5_reconstructed.wav” compared to the original file “part5_clean.wav” (which you don’t have access to), and the student with the lowest MSE gets the bonus.