EE 679 Speech Processing
Computing Assignment 1B: Signal analysis with the DFT

Due on September 9, 2022 11 pm

Note: This assignment is a continuation of CA 1A. The submission instructions are the same as before. Make neat and properly labeled plots.

Use your previous synthesized vowel /u/ at two distinct pitches (F0 = 120 Hz, F0 = 220 Hz). Keep the bandwidths constant at 100 Hz for all formants.

Vowel F1, F2, F3
/u/ 300, 870, 2240

We would like to use the DFT computed with various window lengths and shapes to estimate the vowel's F0 and formant frequencies and study the obtained accuracies with reference to our 'ground truth' values. For the analysis, use a single waveform segment near the centre of your synthesized vowel.

Plot the magnitude (dB) spectrum with rectangular and Hamming windows of lengths: 5 ms, 10 ms, 20 ms, 40 ms, each with a large zero-padded DFT. (i) Comment on the similarities and differences between the different computed spectra. (ii) Estimate the signal parameters from each of the magnitude spectra and report the error with respect to the ground-truth.