

EE 679 Speech Processing
Computing Assignment 1B: Signal analysis with the DFT
Due: 27/9/2020

Note: You can use Python, Octave or Matlab/Scilab. Make a single zipped folder that includes a pdf (with the solution for each question including method, code fragments, plots and discussion). You can also include your code file itself (e.g. .py or .ipynb).

Use your previous synthesized vowel /u/ at two distinct pitches ($F_0 = 120$ Hz, $F_0 = 220$ 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 F_0 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.