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| **Noms:** |  |
|  |
| **Lloc treball:** |  |
| **Grup:** |  |

1. Fixing the values of A1=1, A2=1, F1=0.125 and **F2=0.148**, repeat the MATLAB code above and represent the DFT of 512 samples of the two windowed tones **xr[n]** and **xh[n]** (using a rectangular window and a hamming window respectively). Try to distinguish the two tones in the DFT representation. Can you easily distinguish the two tones F1 and F2 using both windows? From this result, which window has better ***resolution*** in frequency?
2. Now, using the values F1=0.125, F2=0.25, A1=1 and A2=0.1 represent again the DFT of the two tones using the rectangular and the Hamming window and try to distinguish the two tones F1 and F2. Observing the resulting figures, which window has the better sensitivity?

1. Explain the differences between Fig. 3.7 and 3.4 and justify why there are 'spectral lines' in the DFT of y[n]. Relate the distance between the spectral lines in Fig. 3.7 with some feature of the signal e[n] (note that the DFT of y[n] in Fig. 3.7 has N=1024 samples). Explain which the effect of the window is.

1. Select a period of the vowel segment (an approximate version of the impulse response of the vocal tract for the vowel ‘a’) and estimate the fundamental frequency of the vocal chords.
2. Explain the spectral lines that appear in Fig. 3.10 and relate them to the fundamental frequency (pitch) of the vowel (similarly to question 3).
3. Identify the two most important formants and calculate their analogue frequencies. Do they have the expected values for a vowel ‘a’, as explained in the vowel triangle of Figure 2.5?
4. Load any of the WAV files ‘unknown\_x.wav’ and, following a similar procedure as in the last two questions, relate the formants observed in the DFT plot to the vowels diagram of Figure 2.5 and try to guess which vowel is. *Note: do not forget to readjust manually the selected interval (variable 'interval').*