

Department of Electrical and Computer Engineering
Digital Speech Processing
Problem Set No. 2

Problem 1

Transcribe into ARPAbet symbols each of the following (note: if there is more than one pronunciation of the word, give ARPAbet pronunciations for the multiple pronunciations):

- (a) monosyllabic words: why, what, how
- (b) bi-syllabic words: family (pronounced as a 2-syllable word), welcome
- (c) tri-syllabic word: family (pronounced as a 3-syllable word)
- (d) sentence: My name is Fred.

Problem 2

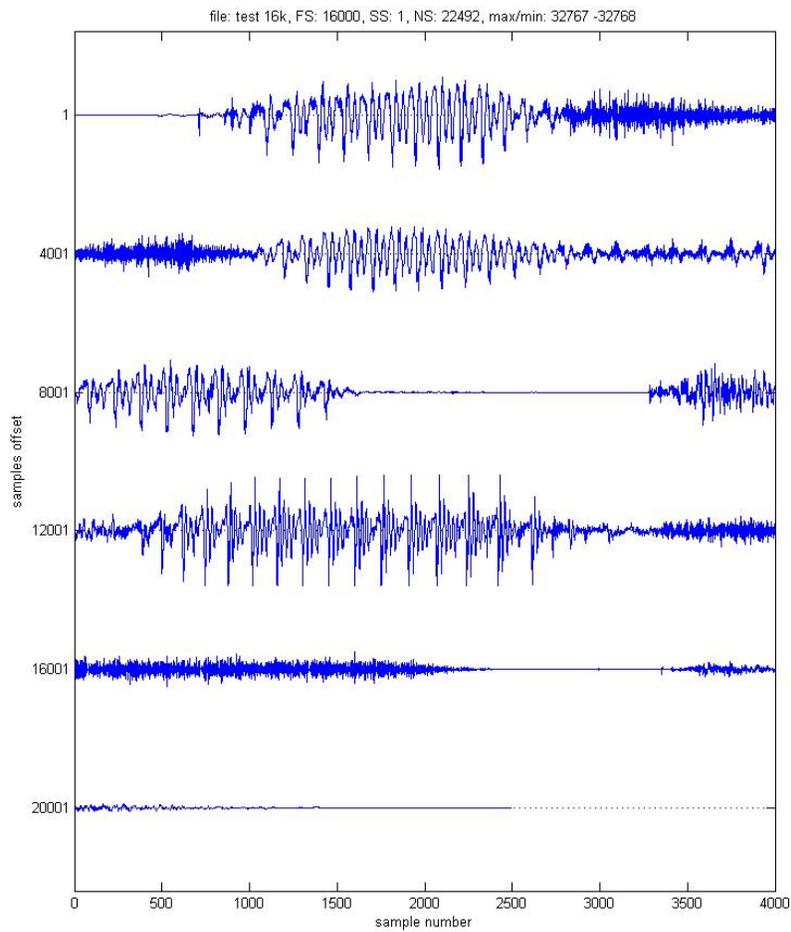
- (a) Write out the phonetic transcription for the following words:

/she/, /eats/, /some/, /meat/

- (b) What effect occurs when these four words are spoken in sequence in a sentence? What implication does this have for speech segmentation of a sentence into words?

Problem 3

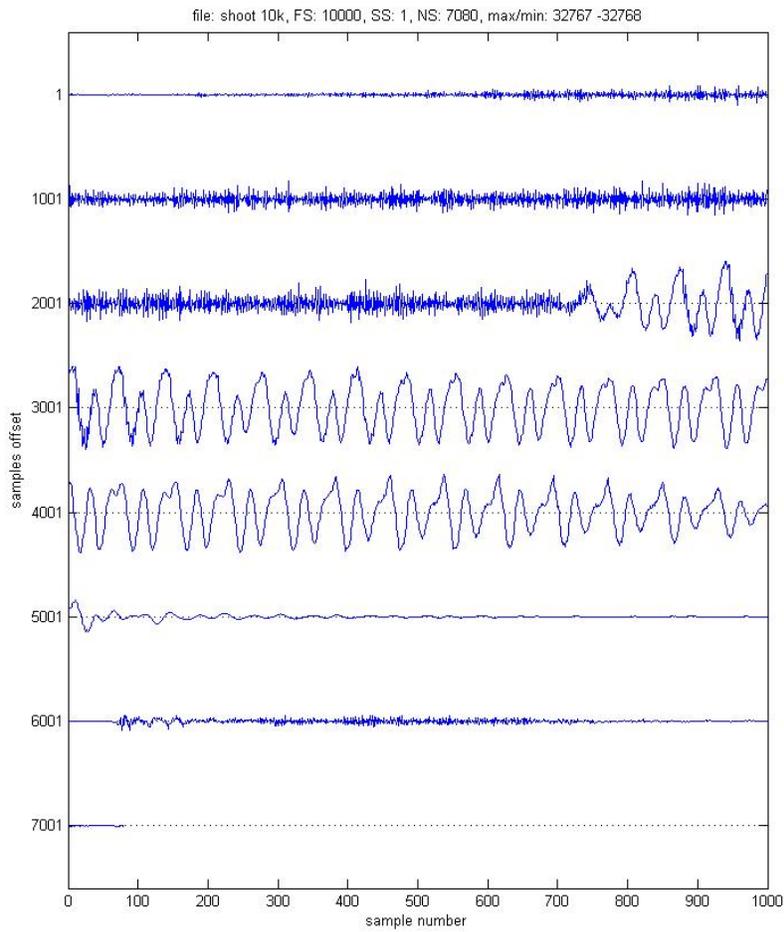
The following waveform is for the utterance /This is a test/ and the waveform samples are at a sampling rate of $F_S = 16000$. Segment the waveform into regions of "Voiced Speech (V)" and "Non-Voiced Speech (N)".



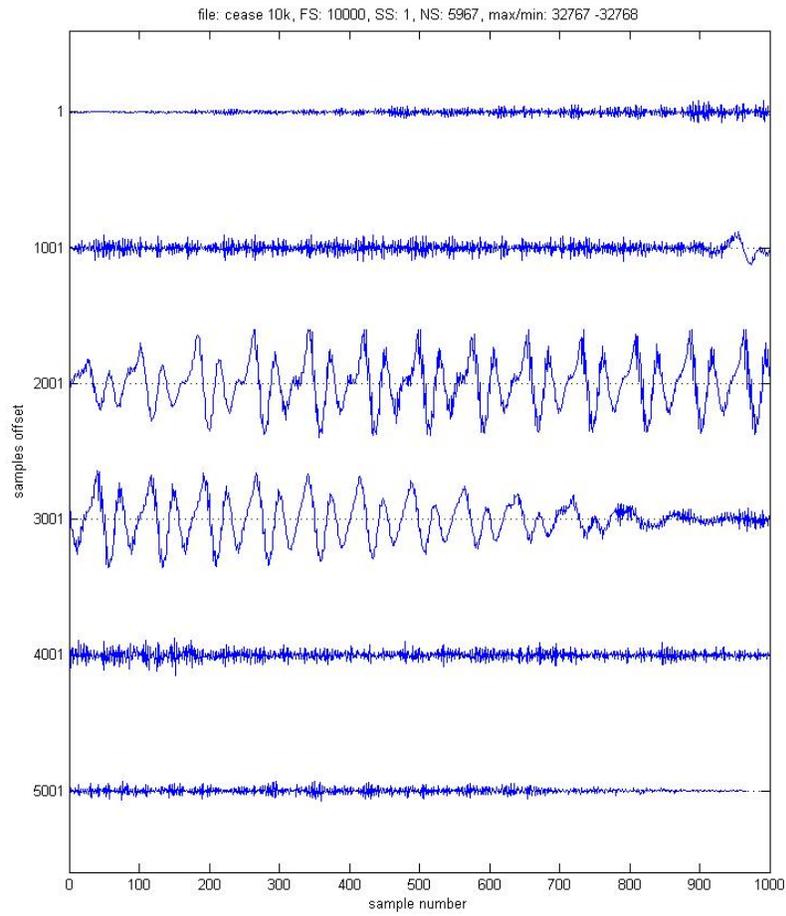
Problem 4

For each of the following waveforms, denote the regions of each of the sounds in the following words:

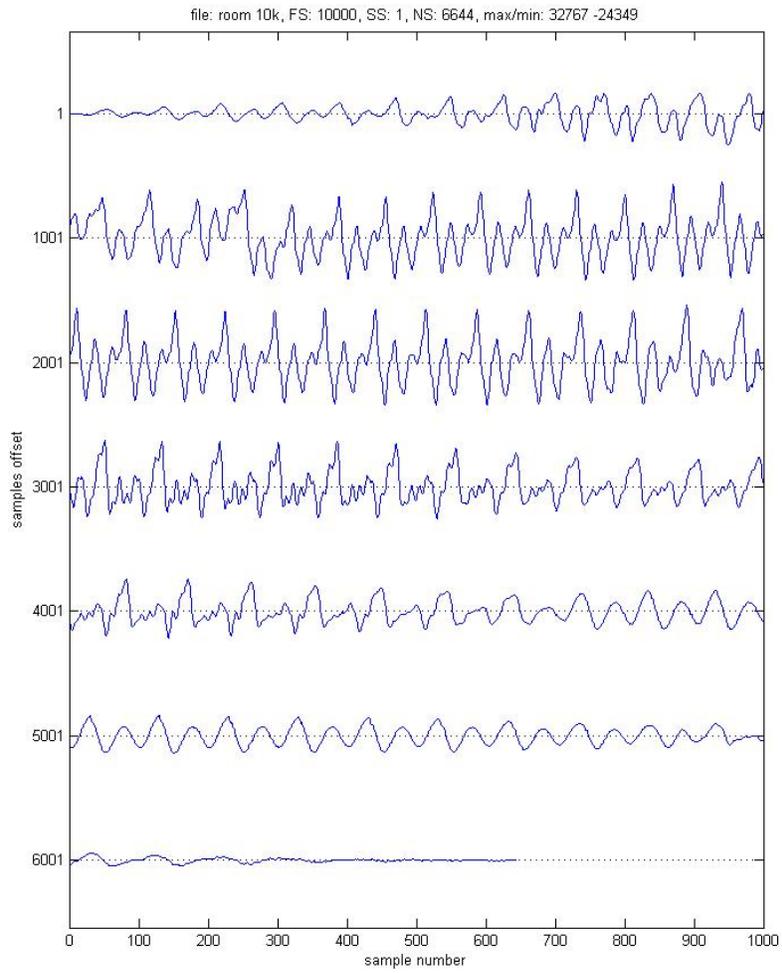
1. /shoot/



2. /cease/



3. /room/



Problem 5

A speech recognition system for voice control of a cassette tape drive uses the vocabulary words:

1. stop
2. start
3. play
4. record
5. rewind
6. pause

Figure 1 shows wideband spectrograms of one version of each of these 6 words. Using your knowledge of acoustic phonetics, determine which wideband spectrogram corresponds to each word.

Problem 6

Write a MATLAB program to read in a speech file and filter it to bandwidths of 5.5 kHz, 4 kHz and 3.2 kHz. (You will have to design appropriate digital filters at the correct sampling rate to do this task). Listen to each of the resulting filtered speech files and describe the effect of lowpass filtering on speech intelligibility and quality. Use the speech signal **test_16k.wav** to test your Matlab program.

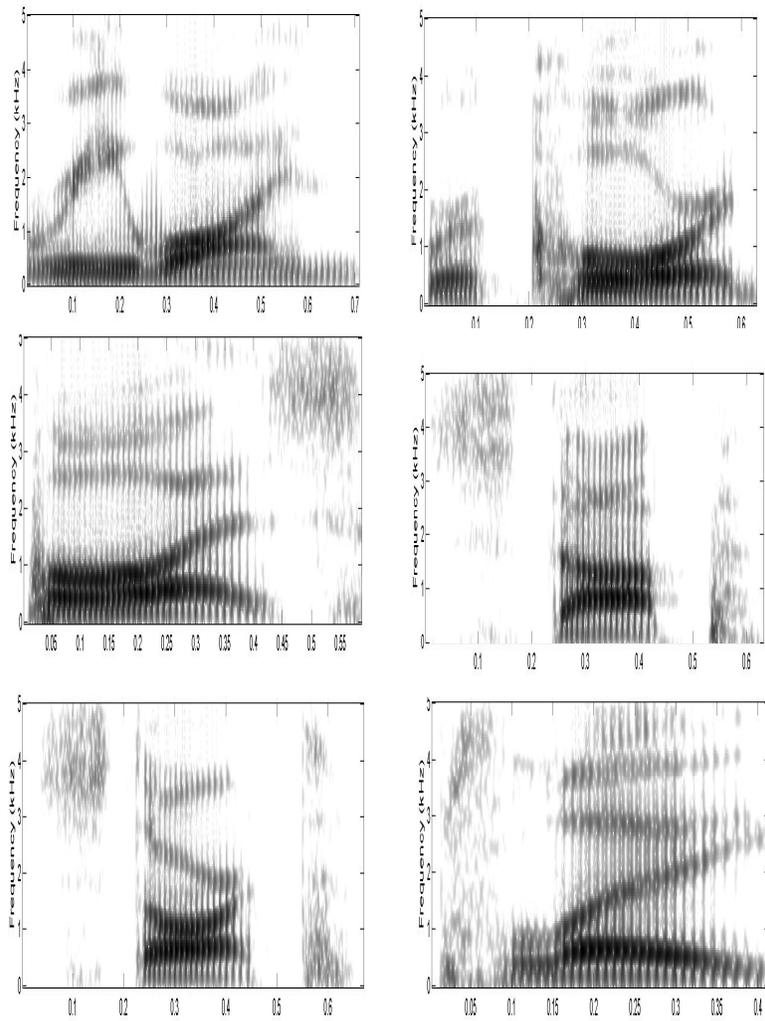


Figure 1: Spectrograms of one version of each of the control words for a voice controlled cassette tape system.