Speech Signal Processing

EC5.408

Assignment 1

Aug 8, 2023

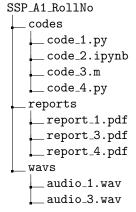
Guidelines

- Do not copy or plagiarise. If you're caught for plagiarism, the penalty will range from **zero** in the assignment to **F** grade in the course.
- Always cite your sources (be it images, papers or existing libraries).
- Mention clearly if any assumptions are being considered.
- Only MATLAB or Python can be used for the coding part.

Submission Format

Make a directory using the naming format SSP_A1_RollNo. The submission might include codes (.py/.m) to answer the coding problems, reports (.pdf) to answer the theory questions or notebooks (.ipynb) to answer both coding and theory questions together. Place the files in their respective folders and zip the main directory using the naming format SSP_A1_RollNo.zip and upload this zip file to Moodle.

This is how the final directory structure might look like



Resources

- For this assignment you might use Audacity or Wavesurfer software (will be mentioned)
- Install Audacity: https://www.audacityteam.org/download/
- Install Wavesurfer: https://sourceforge.net/projects/wavesurfer/

Questions

[Maximum marks: 20]

1.	Explain briefly about the following	[6]
	(a) What is the difference between sampling and quantization ?	[1]
	(b) When converting a speech signal into a sequence of frames, why is the frame shift usually sn than the frame duration?	naller [1]
	(c) Why Hamming or Hann window is preferred over a rectangular window in speech processing	g? [1]
	(d) What are the assumptions to be considered while analyzing a speech signal?	[2]
	(e) How would you make an impulse train with fundamental frequency F from sine waves?	[1]
2.	Explain briefly about the following	[4]
	(a) Co-articulation	[1]
	(b) Epochs	[1]
	(c) Pitch	[1]
	(d) Formants	[1]
3.	"Female pitch is more when compared to male pitch". ${\bf True}$ or ${\bf False}.$ Justify the statement proper explanation.	with [2]
4.	Record a sentence which should be as "My name is <your name="">"</your>	[4]
	(a) Plot the waveform	[1]
	(b) Identify and mark the voiced, unvoiced, silence and plosive regions (plot it over the waveform	n) [1]
	(c) Acoustic-phonetic description of the regions (MOA and POA)	[1]
	(d) Plot the Mel spectrogram and identify the formants	[1]
	Use Audacity or Wavesurfer for this question. You are expected to submit a wav file, along with annotated transcription on top of the waveform.	h the
5.	Write a code to plot the following for a given audio file	[4]
	(a) short-time energy	[2]
	(b) short-time zero-crossing	[2]

Choose appropriate window sizes, window shifts, and window for the analysis. Explain your choice of these parameters.

Appendix

In the Acoustic-phonetic description, the following format is expected:

For the example of kitAb (/k/,/i/,/t/,/A/,/b/)

It is unvoiced unaspirated velar stop followed by front vowel followed by unvoiced unaspirated dental stop followed by middle vowel followed by voiced unaspirated bilabial stop