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CSE 5525

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Formant Synthesis Tutorial Goals and Overview

Chapters:

2: Regular Expressions and Automata
7: Phonetics
8: Speech Synthesis

The goals for this tutorial are:

- Learn how to use the AudioLazy toolbox to do simple synthesis of vowels.
- Examine the impact of including various numbers of formants in your synthesis
- Learn how to emulate different speakers by shifting the frequency of vowels.
- Synthesize the entire vowel quadrilateral.

How you planned to achieve this:

Students will walk through implementing a simple speech synthesizer with AudioLazy. We start by simply implementing the synthesizer with one vowel and then build them up to doing the entire vowel quadrilateral. This illustrates the basic steps in getting a vowel synthesizer off the ground. In the process of building up the synthesizer, they experiment with using just 1 formant (which yields vowels that are difficult to distinguish) and 3 formants (which sounds very similar to the 2 formant version). What this illustrates to students is that only 2 formants are necessary for adequate speech synthesis. Students also learn how to modify frequency of the formants which allows them to simulate different speakers.

Resources used:

PyAudio (cross-platform audio input/output stream library)
https://pypi.org/project/PyAudio/
The open-source AudioLazy toolbox github link we used for inspiration:
https://github.com/danilobellini/audiolazy/blob/master/examples/formants.py
Image of the vowel quadrilateral for reference:
http://www.imagequiz.co.uk/quizzes/95279020
Formant statistics for American English vowels
https://www.peterlang.com/view/9783034326179/Chapter02.xhtml