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METHODS OF ACOUSTIC ANALYSIS

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Abstract

The main target of this project is to analyze and find out the differences between native (American) and Uzbek speakers of English language in different categories of examples as: front and back vowels; voiced and voiceless stop sounds and also determine consonant noise duration difference in onset and coda positions. I use the program Praat as a tool of project. As you can see in the table below the table, I'll compare my pronunciation to American student's. also I'd like to ask you focus on another point that in tables I used seconds (s) instead of milli second (ms) to get more clear view of differences in examples.

As pronunciation of sounds are different in Uzbek and English languages there might be difficulties in pronouncing some some sounds, I try to find out these problems also.

Analysis

'Vowel length'

Here is the first category of our test. There are front and back vowel examples and the result of my measurement: as you can see from the table below there is no huge difference in pronunciation in native and foreign speakers. Most obvious difference is observed in [u] and [Y] sounds. The timing differences in pronouncing these vowels are above 0.0500 (s)s. Commonly, in pronunciation the bigger differences in timing are observed mainly in back vowels. Of course, there are differences in all of them as I am a foreign speaker of the language.

Main vowel length differences in graph 1.1

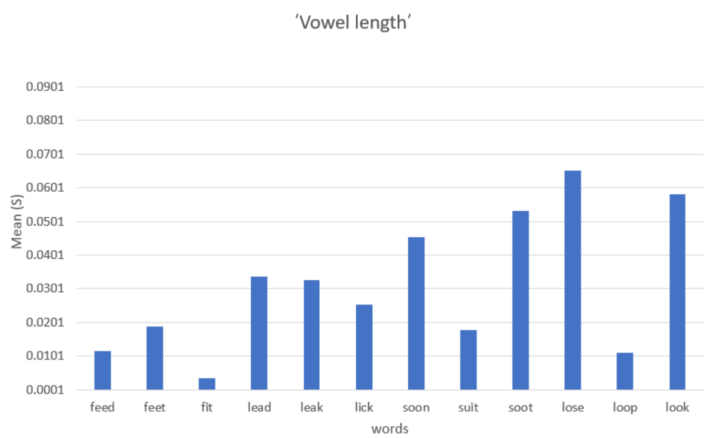

Table 1.1.

Word	Subject	Mean (s)	Mean value difference
feed	American	0.2711	0.0115
	Otakhon	0.2826	
feet	American	0.1402	0.0189
	Otakhon	0.1213	
fit	American	0.1168	0.0036
	Otakhon	0.1132	
lead	American	0.3042	0.0338
	Otakhon	0.2704	
leak	American	0.0915	0.0326
	Otakhon	0.1241	
lick	American	0.1163	0.0253
	Otakhon	0.1416	
soon	American	0.1869	0.0454
	Otakhon	0.1415	
suit	American	0.1201	0.0179
	Otakhon	0.1380	
soot	American	0.1336	0.0533
	Otakhon	0.0803	
lose	American	0.2802	0.0652
	Otakhon	0.2150	
loop	American	0.1229	0.0111
	Otakhon	0.1118	
look	American	0.1054	0.0583
	Otakhon	0.1637	

VOT values: voiced and voiceless stops

In this category of sound measurements, we try to find out differences in voiced and voiceless stop sounds. As you can see from the table here also the biggest difference is observed in [b] sound with 0.0808 (s)s and less one is [g] sound pronounced with almost no difference in timing 0.0077 (S)s

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Graph 2.1

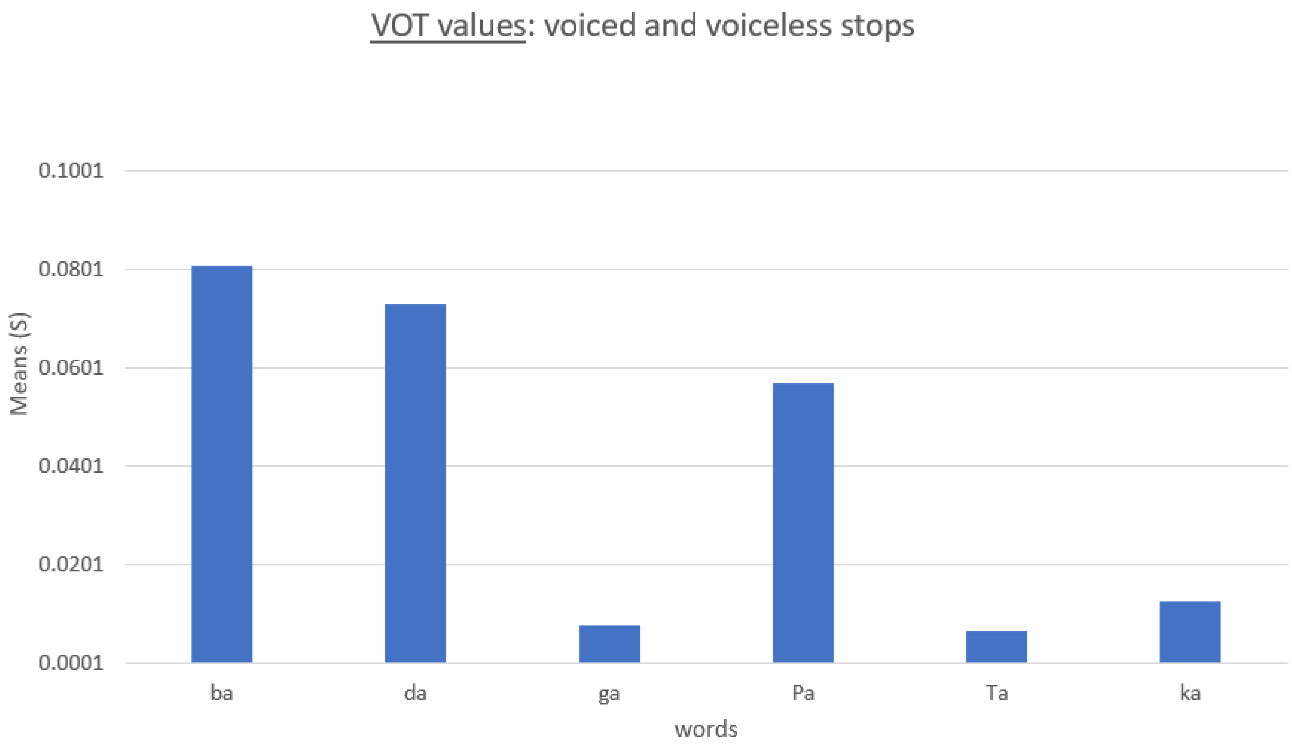

Table 2.1

Word	Subject	Mean (s)	Mean value difference
ba	American	0.1024	0.0808
	Otakhon	0.0216	
da	American	0.0214	0.0728
	Otakhon	0.0942	
ga	American	0.0595	0.0077
	Otakhon	0.0518	
Pa	American	0.0856	0.0567
	Otakhon	0.0289	
Ta	American	0.0836	0.0065
	Otakhon	0.0901	
ka	American	0.0949	0.0126
	Otakhon	0.0823	

Consonant Noise duration: for comparison of similarity and difference of consonants, at the onset and coda positions

Most interesting results I have got from measurements of consonants. Mostly in pronouncing [ð] sound most foreign speakers feel some difficulty because of maybe strangeness of this sound, for some of my friends the most problematic sound for pronouncing is this exact one, but in my measurements the difference between American speaker's and mine is not so tragic. Most surprising result is gained when measuring the [V] sound difference – my pronunciation of this sound is almost 1 ms shorter than American speaker's. more detailed information you can see in the graph 3.1 and table 3.1

graph 3.1

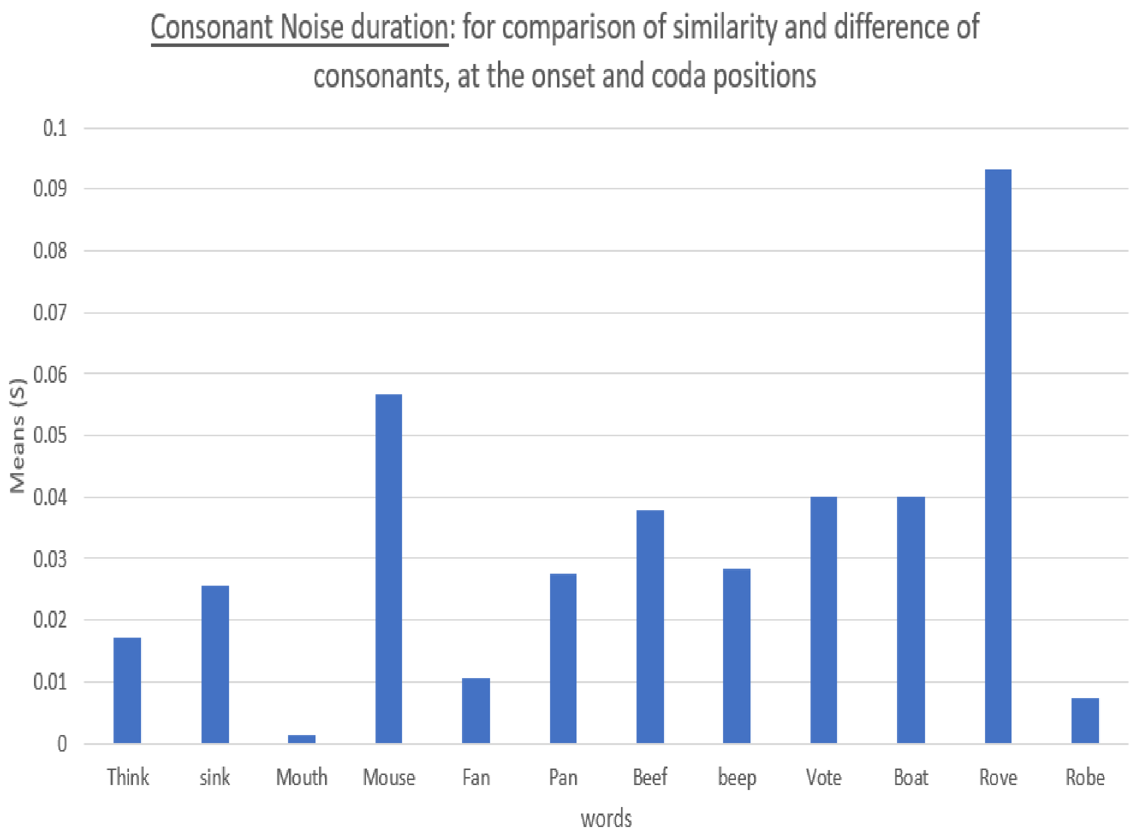

table 3.1

Word	Subject	Mean (s)	Mean value difference
Think	American	0.1646	0.0171
	Otakhon	0.1475	
sink	American	0.1796	0.0257
	Otakhon	0.2053	
Mouth	American	0.1935	0.0015
	Otakhon	0.1950	
Mouse	American	0.2540	0.0567

	Otakhon	0.1973	
Fan	American	0.1316	0.0107
	Otakhon	0.1423	
Pan	American	0.0830	0.0275
	Otakhon	0.0555	
Beef	American	0.2682	0.0378
	Otakhon	0.2304	
beep	American	0.1175	0.0283
	Otakhon	0.1458	
Vote	American	0.0940	0.0400
	Otakhon	0.0540	
Boat	American	0.0803	0.0401
	Otakhon	0.0402	
Rove	American	0.1872	0.0933
	Otakhon	0.0939	
Robe	American	0.0817	0.0075
	Otakhon	0.0892	

Conclusion

Acoustic analysis is critical for understanding sound qualities such as speech, music, environmental noise, and mechanical vibrations. Time-domain analysis, frequency-domain analysis (such as Fourier transforms), spectrograms, and advanced techniques such as cepstral analysis and machine learning-based approaches can all provide useful insights into sound properties. Each method has strengths and uses, whether in languages, engineering, medicine, or audio processing. As technology progresses, new computational and AI-driven techniques improve the accuracy and efficiency of acoustic analysis. Scientists and engineers can extract useful data by selecting the proper approach according on their study or industry objectives, resulting in improvements in communication, noise management, and sound design. Acoustic analytic techniques continue to evolve, ensuring their relevance in an increasingly sound-driven environment.

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