CS6300 Speech Technology: Assignment 1 Report

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1 Histograms of Vowel Durations

The histograms of the durations of the vowels are displayed below.

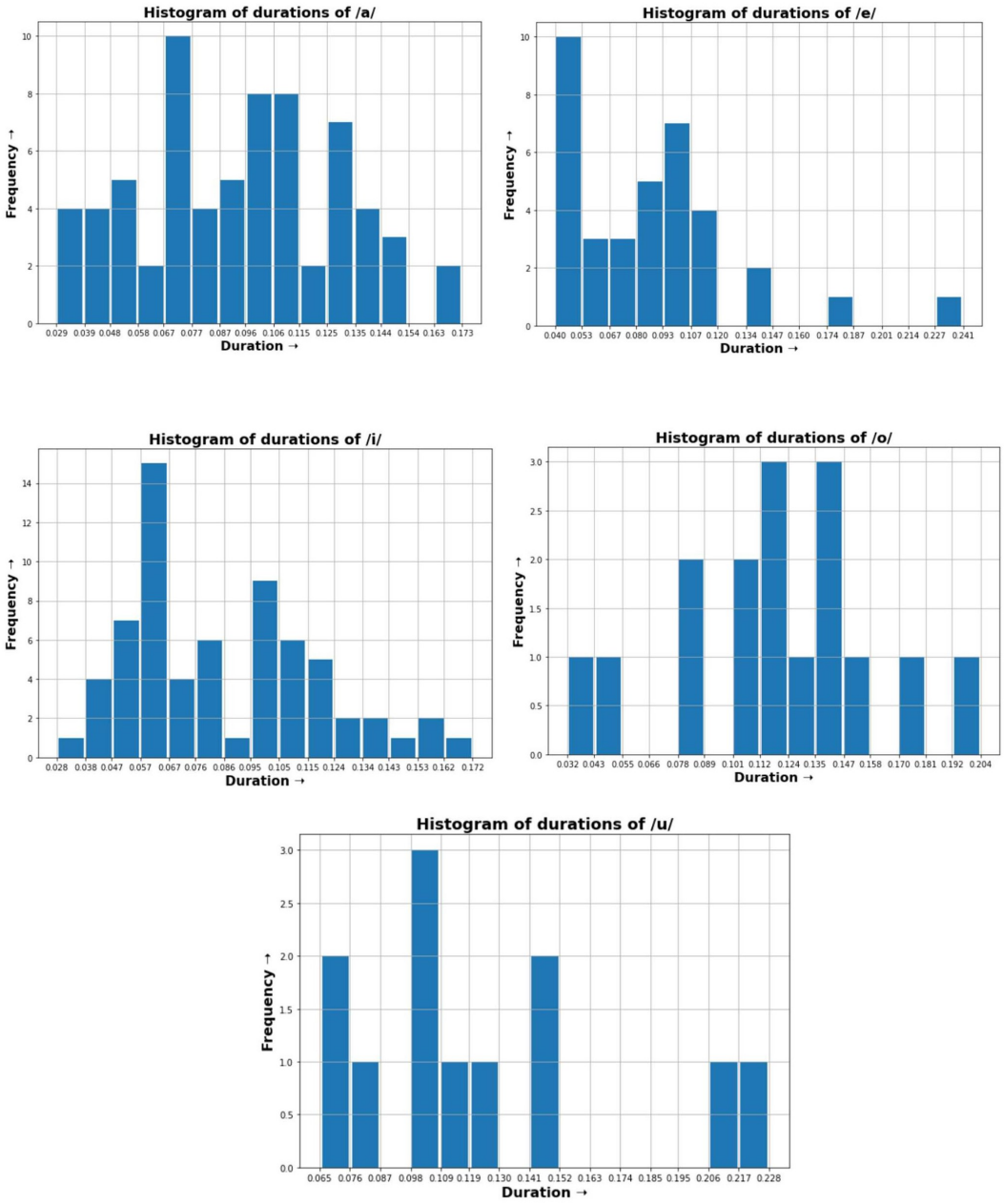

Figure 1: Histogram Plots of Durations of Vowels /a/, /e/, /i/, /o/, /u/

- Most vowels are around the length range of 0.03-0.17 seconds.
- We see that the highest frequencies and overall "sum under histogram" of vowels /o/ and /u/ is smaller. This shows that they are used less frequently than other sounds.
- There are lots of occurrences of the vowel sound /a/. This is because many times, the letters "e", "i", and "u" are also pronounced with the /a/ sound, such as the first "u" in "pursue".
- /e/ tends to have shorter durations in general. Occasionally, a long /e/ vowel shows up. Similarly, the sound /u/ is most often a short sound, but occasionally long. These vowels tend to not be of medium duration.
- /a/ and /i/ are significantly distributed over all regions of duration.

2 Syllable Rate and Histogram of Syllable Durations

The histogram of syllable durations is show below.

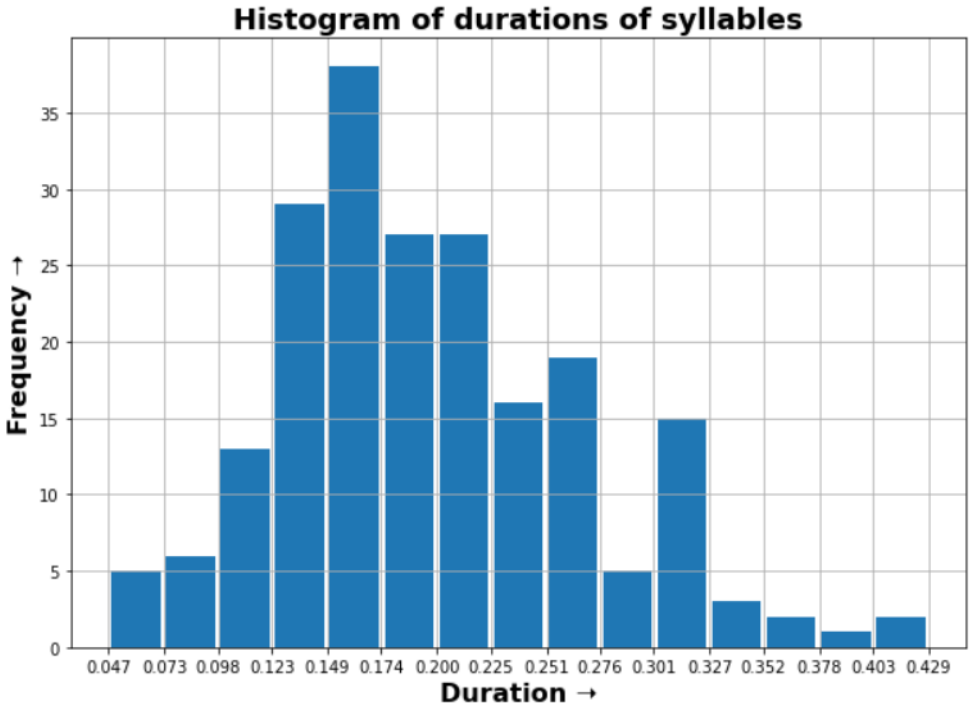

Figure 2: Histogram Plots of Durations of Syllables

- Since we have a large number of syllables in our dataset, the Central Limit Theorem comes into play and the syllable duration histogram tends towards a Gaussian distribution with a mean duration close to 0.2 seconds.

Also, the syllable rate has been calculated as:

$$\text{Syllable rate} = \frac{\text{Total number of syllables uttered in the entire dataset}}{\text{Sum total duration of utterance of syllables}}$$

In our dataset, there are 208 syllables in total across all 20 sentences (2 copies of each of the 10 given sentences). I have taken a sum total of ≈ 41.201 seconds to utter these syllables in my recordings.

Therefore,

$$\begin{aligned}\text{Syllable rate} &= \frac{208}{41.201} \\ &\approx \mathbf{5.048}\ \frac{\text{syllables}}{\text{second}}\end{aligned}$$

3 Mean and Standard Deviation of Syllable Durations

The means and standard deviations for each syllable's duration has been calculated using the sets of durations across 5 datasets (my own + 4 other students). The results are given below.

SYLLABLE	MEAN	STD
ice	0.28	0.0
hav	0.332	0.105
pab	0.352	0.149
briks	0.631	0.208
birth	0.682	0.0
par	0.306	0.063
riy	0.251	0.074
wher	0.447	0.129
irs	0.406	0.0
your	0.354	0.17
se	0.243	0.044
keks	0.449	0.128
hand	0.482	0.117
dark	0.405	0.109
have	0.332	0.118
ry	0.264	0.079
li	0.17	0.062
laik	0.426	0.088
lu	0.19	0.035
no	0.222	0.048
don't	0.603	0.232
mi	0.165	0.04
ten	0.266	0.061
num	0.272	0.073
ask	0.443	0.17
wher	0.447	0.129
lar	0.262	0.055
mu	0.29	0.068
she	0.467	0.109
this	0.459	0.175
ea	0.269	0.068
is	0.363	0.166
flimsy	0.659	0.0
in	0.255	0.097
cup	0.331	0.087
kakes	0.46	0.0
gu	0.172	0.036
all	0.33	0.108
go	0.41	0.154
to	0.203	0.091
was	0.452	0.156
berth	0.398	0.069
ri	0.203	0.041
can	0.312	0.147
crim	0.406	0.109
ers	0.315	0.099
gri	0.268	0.098
be	0.26	0.096
the	0.341	0.185
silverware		0.97 0.0
wa	0.218	0.061
tiy	0.254	0.078
a	0.198	0.091
day	0.256	0.052
sy	0.339	0.068
that	0.451	0.115
ning	0.368	0.109
er	0.213	0.096
aluminum		1.042 0.0
way	0.293	0.109
ais	0.303	0.061
a	0.198	0.091
of	0.298	0.061
ties	0.378	0.104
an	0.321	0.154
the	0.341	0.185
where	0.976	0.0
ao	0.234	0.105
na	0.252	0.086
me	0.34	0.163
siy	0.264	0.059
and	0.324	0.149
tiv	0.399	0.057
ver	0.219	0.03
like	0.233	0.107
ar	0.375	0.155
liy	0.243	0.074
flim	0.298	0.056
ev	0.267	0.093
had	0.36	0.113
car	0.285	0.078
ans	0.299	0.074
bricks	0.606	0.0
wer	0.315	0.103
um	0.188	0.04
suit	0.446	0.099
rag	0.428	0.151
vil	0.383	0.118
sin	0.286	0.055
you	0.366	0.069
wash	0.433	0.11
us	0.495	0.121
she	0.467	0.109
ter	0.261	0.11
si	0.213	0.048
year	0.478	0.107
for	0.343	0.069
ci	0.207	0.035
we	0.251	0.125
often	0.615	0.0
gol	0.455	0.095
berth	0.398	0.069
this	0.459	0.175
sil	0.298	0.04
al	0.278	0.098
oi	0.271	0.07
hai	0.27	0.06
briks	0.631	0.208
dont	0.616	0.116
ly	0.301	0.0

Figure 3: Means and Standard Deviations of Syllable Durations

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