An Amharic Speech Corpus for Large Vocabulary Continuous Speech Recognition

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1. The Amharic Language

Amharic:

- is fficial language of Ethiopia.
- is a Semitic language family.
- has the largest number of speakers after Arabic - 22.5 million.
- has five dialectical variations: Addis Ababa, Gojjam, Gonder, Wollo, and Menz.
- has special features. For example: glottalized plosives ጵ, ጥ, ጽ, ፍ, and ቅ.
- has rich morphology -> many word forms.

Phonetics

Amharic has a set of 38 phones, seven vowels and thirty-one consonants.

Consonants

Manner of Art/n	Voicing	Place of Articulation				
		Lab	Dent	Pal	Vel	Clo
Stops	Voiceless	ፕ[p]	ት[t]	ች[tʃ]	ክ[k]	ኣ[ʔ]
	Voiced	ብ[b]	ድ[d]	ጅ[dʒ]	ግ[g]	
	Glottalized	ጵ[pʼ]	ጥ[tʼ]	ጭ[tʃʼ]	ቅ[q]	
	Rounded				ኵ [k^w], ጕ[g^w], ቍ[q^w]	
Fricatives	Voiceless	ፍ[f]	ስ[s]	ሽ[ʃ]		ሀ[h]
	Voiced		ዝ[z]	ዥ[ʒ]		
	Glottalized		ጽ[sʼ]			
	Rounded					ኍ[h^w]
Nasals	Voiced	ም[m]	ን[n]	ኝ[ɲ]		
Liquids	Voiced		ል[l], ር[r]			
Semi vowels	Voiced	ው[w]			ይ[j]	

Vowels

	front	center	back
high	ኡ[i]	ኣ[ɨ]	ኡ[u]
mid	ኤ[e]	ኧ[ə]	ኦ[o]
low		ኣ[a]	

The writing system

- Amharic writing system is phonetic.
- Amharic orthography is syllabic, because
  - there is, more or less, a one-to-one correspondence between the sounds of CV syllable and the graphemes.
- Amharic orthography consist of 276 symbols, including the redundant ones.
- Amharic has 234 distinct CV syllable sounds.

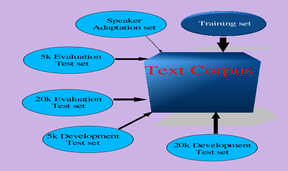
Used graphemes

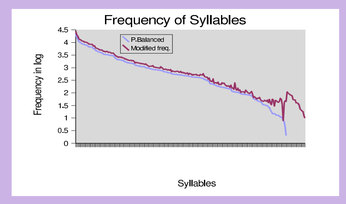
		ə	u	i	A	E	e	o	ua	ui	uA	uE	ue
h	h	ሀ	ሁ	ሂ	ሃ	ሄ	ህ	ሆ	ኈ	ኍ	ኋ	ኌ	ኈ
l	l	ለ	ሉ	ሊ	ላ	ሌ	ል	ሎ			ሏ		
m	m	መ	ሙ	ሚ	ማ	ሜ	ም	ሞ			ሟ		
r	r	ረ	ሩ	ሪ	ራ	ሬ	ር	ሮ			ሯ		
s	s	ሰ	ሱ	ሲ	ሳ	ሴ	ስ	ሶ			ሷ		
S	^s	ሸ	ሹ	ሺ	ሻ	ሼ	ሽ	ሾ			ሿ		
q	q	ቀ	ቁ	ቂ	ቃ	ቄ	ቅ	ቆ	ቈ	ቍ	ቋ	ቌ	ቈ
b	b	በ	ቡ	ቢ	ባ	ቤ	ብ	ቦ			ቧ		
v	v	ቨ	ቩ	ቪ	ቫ	ቬ	ቭ	ቮ					
t	t	ተ	ቱ	ቲ	ታ	ቴ	ት	ቶ			ቷ		
c	^c	ቸ	ቹ	ቺ	ቻ	ቼ	ች	ቾ			ቿ		
n	n	ነ	ኑ	ኒ	ና	ኔ	ን	ኖ			ኗ		
N	^n	ኘ	ኙ	ኚ	ኛ	ኜ	ኝ	ኞ			ኟ		
H	ʼ	አ	ኡ	ኢ	ኣ	ኤ	እ	ኦ					
k	k	ከ	ኩ	ኪ	ካ	ኬ	ክ	ኮ	ኰ	ኵ	ኳ	ኴ	ኰ
K	^k	ኸ											
w	w	ወ	ዉ	ዊ	ዋ	ዌ	ው	ዎ					
z	z	ዘ	ዙ	ዚ	ዛ	ዜ	ዝ	ዞ			ዟ		
Z	^z	ዠ	ዡ	ዢ	ዣ	ዤ	ዥ	ዦ			ዧ		
y	y	የ	ዩ	ዪ	ያ	ዬ	ይ	ዮ					
d	d	ደ	ዱ	ዲ	ዳ	ዴ	ድ	ዶ			ዷ		
D	^d	ጀ	ጁ	ጂ	ጃ	ጄ	ጅ	ጆ					
g	g	ገ	ጉ	ጊ	ጋ	ጌ	ግ	ጎ	ጐ	ጒ	ጓ	ጔ	ጐ
T	t	ጠ	ጡ	ጢ	ጣ	ጤ	ጥ	ጦ			ጧ		
C	^C	ጨ	ጩ	ጪ	ጫ	ጬ	ጭ	ጮ	ጨ		ጯ		
P	p	ጰ	ጱ	ጲ	ጳ	ጴ	ጵ	ጶ					
x	c	ፀ	ፁ	ፂ	ፃ	ፄ	ፅ	ፆ			ፇ		
f	f	ፈ	ፉ	ፊ	ፋ	ፌ	ፍ	ፎ			ፏ		
p	p	ፐ	ፑ	ፒ	ፓ	ፔ	ፕ	ፖ					

2. Preparation of Amharic Speech Corpus

Text Corpus Preparation

- It is a read speech corpus.
- Text was aquired from EthioZena website.
- Preprocessing:
  - Spelling and grammar errors have been corrected;
  - Abbreviations have been expanded;
  - Foreign words have been eliminated;
  - Numbers have been textually transcribed; and
  - Concatenated words have been separated.





Recording of the speech

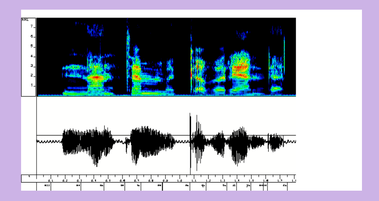
We have done the recording using a laptop and a noise canceling micraphone.

Age Range	Training set		Test sets	
	Male	Female	Male	Female
Speakers of the Addis Ababa dialect				
18-23	18	18	3	3
24-28	12	12	3	3
29-40	5	5	3	3
Older than 40	5	5	1	1
Total	40	40	10	10
Speakers of the other four dialects				
18-23	10	3	4	
24-28	6	1		
Total	16	4	4	
Grand Total	56	44	14	10

- Size of the corpus:
  - 20 hours of training speech
  - 100 speakers
  - 10850 sentences
  - Vocabulary of training speech is 28666
- The training speech covers 233 of the Amharic CV syllables

Segmentation of the speech

Segmentation is done semi-automatically at word- and syllable-level.



3. Availability

- Used for our research of developing automatic speech recognizer for Amharic.
- Part of it is used by students of Addis Ababa University.
- It will be made available through a third party.

4. Acknowledgments

Daniel Yacob who made the archive of EthioZena available to us. He also provided his SERA to Ethiop (namely g2) conversion tool.
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God bless you