Endangered Language Documentation: Bootstrapping a Chatino Speech Corpus, Forced Aligner, ASR

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Agenda

• Work based on the NSF-funded AARDVARC project (http://info.linguistlist.org/aardvarc/) (NSF #1244713)

• Creating the first San Juan Quiahije Eastern Chatino (CTP) Speech Corpus

• Experiment with Forced Alignment

• Why?
The Problems

• The Language Resource Bottleneck
• Large Data Collections in Archives
• The Transcription Bottleneck

From:
Endangered Language Documentation

• Large collections of recordings over the last decades
  • Limited amount of transcribed, translated, or analyzed data

• Ethnologue lists 7,097 living languages (yesterday)
  • 1% of those languages are well-resourced.
  • Biodiversity and language diversity threatened in a similar way.
  • Large number of languages: unwritten, partially qualitatively documented, etc.
  • Growing gap between the low 99% and the 1% highly resourced languages.
Language Resources

• Audio and Video from documentary linguistic work
  • The Archive of the Indigenous Languages of Latin America at UT Austin (AILLA)
  • The Alaska Native Language Archive
  • DOBES, Max Planck Institute
  • SOAS, London
  • many more

• Lack of transcription, effort
  • 50 to 100 x real-time, i.e. one hour of recording requires 50 to 100 hours of work
Possible Approach

• Speech and video technologies (AARDVARC project)
  • Forced Alignment to speed up the production of speech corpora
  • Automatic Speech Recognition (ASR) for the recordings could speed up the transcription task.
    • Low number of speakers and longer spoken sequences = less signal variation.

• Task to estimate effort for:
  • Initial speech corpus for Forced Aligner (approx. 2 to 5 hours).
  • Effective corpus size for ASR.
The Chatino languages spoken in Oaxaca, Mexico
Chatino is a group of three languages
The shown scene was recorded by Lynn Hou.
This is how Chatino sounds

Margarita Balthazar Garcia, Cienequilla.
Typological features of the Chatino Languages

• Highly tonal (Especially Eastern Chatino)
• Strongly head-marking
• Head-initial syntax
• VSO word order
• Alienable vs. inalienable possession
• Complex verbal inflection classes
• Vigesimal numeral system
• No plural marking on nouns
• Excl vs. Incl. pronouns
TONES

Time Normalized F0 of Basic Chatino Tones
## Representation of tone

<table>
<thead>
<tr>
<th>Number</th>
<th>Tonal group</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level tones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ska1+0</td>
<td>skaK</td>
<td>sugar</td>
</tr>
<tr>
<td>kla1</td>
<td>klaE</td>
<td>Weaving loom</td>
</tr>
<tr>
<td>kla2</td>
<td>klaC</td>
<td>water pool</td>
</tr>
<tr>
<td>kla3</td>
<td>klaF</td>
<td>dream</td>
</tr>
<tr>
<td>kla4</td>
<td>klaA</td>
<td>fish, old, star</td>
</tr>
<tr>
<td>descending</td>
<td></td>
<td></td>
</tr>
<tr>
<td>kla24</td>
<td>klaJ</td>
<td>twenty</td>
</tr>
<tr>
<td>tqwa14</td>
<td>tqwaB</td>
<td>cold</td>
</tr>
<tr>
<td>tyuq04</td>
<td>tyuqM</td>
<td>term of endearment</td>
</tr>
<tr>
<td>ascending</td>
<td></td>
<td></td>
</tr>
<tr>
<td>kla42</td>
<td>klaG</td>
<td>you will arrive</td>
</tr>
<tr>
<td>sqen32</td>
<td>sqenI</td>
<td>scorpion</td>
</tr>
<tr>
<td>kla20</td>
<td>klaH</td>
<td>you will sing</td>
</tr>
<tr>
<td>xkwan40</td>
<td>xkwanL</td>
<td>I will throw it</td>
</tr>
</tbody>
</table>
kta^E ‘foráneo (foreign)’
kta^C ‘harina (flour)’
kta^F ‘chepil (chepil Crotalaria longirostrata)’
kta^A ‘tabaco, se bañará (tabacco, s/he will take a shower)’
kta^G ‘lo sebraras, te bañaras (you will take a shower)’
kta^H ‘machucar (to bruise)’
kta^I ‘se sembrará (it will be planted)’
Kta^B ‘ganado (livestock)’
Approach

• Identification of text for reading and recording
• Recording initial speech corpus of 5 hours
• Transcription and time alignment
• Training a Forced Aligner
  • Prosodylab Aligner (PLA, Python module using HTK)
  • ELAN2split (https://bitbucket.org/dcavar/elan2split) corpus creation for PLA
  • Pronunciation dictionary (tokens plus tokenized phonetic transcription)
  • Espeak for Praat: Language model for TXT2Speech
• Extending the speech corpus
Outcome

• **Initial speech corpus:**
  • Approx. 5 hours speech transcribed and time aligned, PoS-tagged and translated
  • Initial annotation in ELAN (time-alignment correction in Praat)

• **Workload (ignoring previous investment in text, transcription schema)**
  • Ford Assembly Line approach: bootstrapping initial corpus, FA-training, …
  • 4 to 6 person weeks
  • Estimate $ 24,000 – 50,000
  • If we would do that for 3,500 languages: < $ 84 mil.
Resources

• GORILLA site (http://gorilla.linguistlist.org/)
  • Audio, ELAN and Praat transcription/annotation files
  • Corpus licenses: CC BY-SA, i.e. free for commercial use (donation-ware and copyright free resources)
  • Code and software: Apache 2.0 licensed, i.e. free for commercial use
  • Every resource comes with a paper to cite
  • LLOD-linked
  • CLARIN-linked
  • …
Resources

• Internships at LINGUIST List and Indiana University:
  • Work on LL resources, but also: corpus creation, speech and language technologies, qualitative and quantitative language related research
  • Corpora created with colleagues, students, native speakers and community members:
    • Chatino, Burmese, Turkic (Baharlu, Khorasan, Iran), Croatian, Russian, Spanish, …
  • Welcoming students from all over the world!
WaC xqweF
qwanJ

Hvala!