



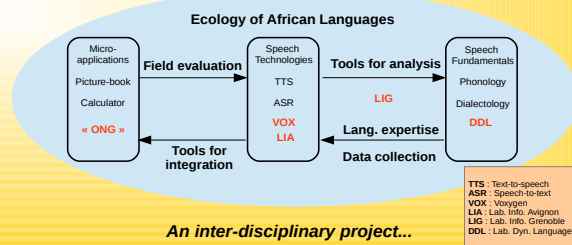
Speech Technologies for African Languages: Example of a Multilingual Calculator for Education

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The ALFFA Project

African Languages in the Field: speech Fundamentals and Automation

- African Languages and Information Technologies
- Address under-resourced languages with immediate or short-term potential (economical, strategic)
- Data collection methodology
- ASR and TTS technologies
- Micro-application prototypes for mobile phones
- Inter-disciplinary project



An inter-disciplinary project...

TTS : Text-to-speech
ASR : Speech-to-text
VOX : Voxygen
LIA : Lab. Info. Avignon
LIG : Lab. Info. Grenoble
DDL : Lab. Dyn. Language

Multilingual Calculator Prototype

- 3 modes for Education

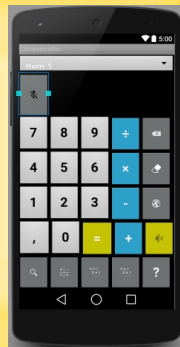
- a simple voice-enabled calculator
- a multiplication table mode
- a quizz mode

- Target Languages for TTS

- Hausa, Wolof, Accented French

- Target Languages for ASR

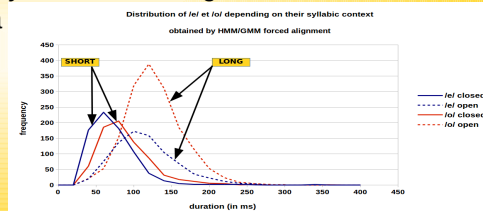
- Hausa, Swahili, Wolof (soon), French, English



Machine-assisted language analysis

- Automatic tools for Laboratory Phonology

- Large scale analysis of vowel length contrast (short/long) in Hausa



Project highlights

- Our Swahili ASR system now included in the **KALDI trunk**
- Multilingual calculator presented at the **Francophonie's summit 2014** in Dakar (Senegal)
- LIG involved in French-German **BULB project** (Breaking the Unwritten Language Barrier)
- **Fulfulde – English – French dictionaries** were computerised and made available on the Web
- DDL co-organized the **Sénélangues 2015 spring school** on west African languages description

Technologies developed

ASR

- Systems available

→ Amharic, Hausa and Swahili ASR systems built with *Kaldi speech recognition toolkit*

→ All online https://github.com/besacier/ALFFA_PUBLIC

→ Performance :

Task	WER (%)
Swahili broadcast news	20.7
Hausa read speech	10.0
Amharic read speech	8.7

- System under construction

→ Wolof

TTS

- Prototypes available

→ Hausa and Wolof TTS

- Systems under construction

→ Fulfulde, Zarma and Serere

- Iterative development process

→ **Step 1:** develop a TTS module able to read any numerical information (time, volume, price, date, ...)

→ **Step 2:** extend to the ability to fill any slot with a single word (merchandise name, company name, place name, ...) in pre-defined sentences.

→ **Step 3:** aim at full language coverage taking into account word functions and contexts, to provide fluid speech with adequate prosody.