Principle-Based Preparation of Authentic Bilingual Text Resources

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TALK ORGANIZATION

1. The context: Speech recognition for military

2. The research questions: Where does the material fit?

3. The problem: Material and task description

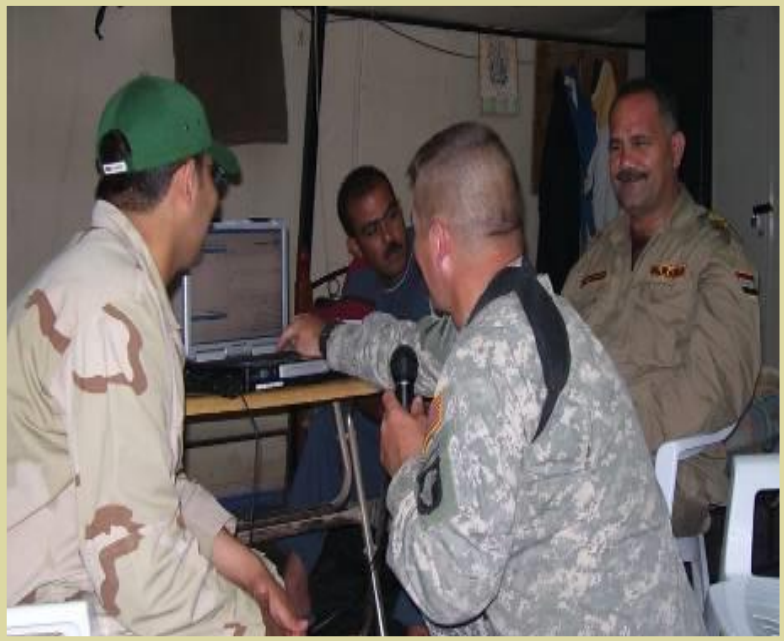
4. The principles: Constraints on organization

5. The examples: What you would do & why

OPERATIONAL ACCENTED SPEECH ADAPTATION INITIATIVE

Vision and Objective

- Automated Speech Recognition (ASR) technology trained on authentically accented data for operations
- High quality ASR for military-relevant languages spoken in operational scenarios
- Algorithms adapting general purpose ASR technology to military operational needs



Problems Being Addressed

- Algorithms to adapt ASR to new types of variation
- Expeditionary Force: local populace & coalition partners
- Army Challenges
  1 Situation Awareness: Adversary intent & capabilities
  2 Security Force Assistance: HQ ASR for effectiveness

Impact

- Understand foreign media and captured document content
- HLT-equipped soldiers: Train & serve with coalition partners
- Focus: Variations of high military, low commercial value

RESEARCH QUESTIONS I

- *Given the modest amounts of* **bilingual in-domain speech data** *available, which approaches to Automatic Speech Recognition (ASR) adaptation have the most impact on language modeling for Army-centric technologies?*

- *Can ASR software components and algorithms be trained to achieve* **better performance** *with African-Accented speakers?*

- *Is it possible to generalize—and to what extent—ASR adaptation algorithms designed to address individual speaker differences, over sets of non-native pronunciations present in communities?*

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RESEARCH QUESTIONS II

ARL

Strategy:

1. *Improve techniques for ASR adaptation on* **bi-modal—speech-text aligned**--*accented data.*
2. *Algorithms for low resource languages, dialects and accented variations.*
3. *Assess for* **general purpose** *tech to process the speech of African accented* **high-resource languages**

Technical Barriers:

1. *Valuable on individual non-native variations, maximum likelihood linear regression (MLLR) & maximum a posteriori (MAP) adaptation likely improve high-resource language ASR on similar variations in accented speakers*, **e.g., French and accented French:** *However experimentation for specific* **Army operations** *is required.*
2. *Morphological analysis improves performance of translation for low resource languages. Methods require extensive training of bilingual humans and are not cost-effective.*
3. *French an official language in 21 of 54 African countries. Phonetic variation in African French clusters around national accents. Assessment of speech recognition accuracy for African-accented speech needed* to support operations.

Approach:

1. *Experiment with language modeling software offering Deep Neural Network technology on compiled* **parallel aligned data sets** *for low resource languages* **of military interest**.
2. *Test a new unsupervised morphological analyzer on Pashto data compiled in* **domains of military interest**.
3. *Use speech data collected in Cameroon and Gabon to test accuracy of a* **French** *speech recognizer with one type of African-accented speech. Adapt the French speech recognizer with a modest amount of Cameroon-accented French and compare accuracy using Word Error Rate.*

PROBLEM

- Lots of raw data in an operational format
- In this case, Power Point slides
  - Could be bilingual web data or digitized books
- Bi-text needed for multiple purposes
  - Speech recognition pronouncing dictionary
  - Machine translation domain adaptation
  - Glossaries and Translation Memory
- First Step: Change the format!
  - Find a suitable editing environment
  - In this case, MS Excel worked fine

A SAMPLE OF THE TEXT EDITING PRINCIPLES:

1. **Each row** represents a single semantic unit, word, phrase or clause and can be simple or complex.

2. **Punctuation:**

a. Periods only after full clauses, with or without grammatical subjects and where appropriate by convention.

b. Commas as appropriate

c. Usually delete colons, except when required on the basis of content.

3. **Capitalization:** As appears in raw text for application-specific pre-processing

…. AND SO ON

A SAMPLE OF THE TEXT EDITING PRINCIPLES:

4. **Insertion:** Without substitution of original material, syntactic support structures for creation of a corpus usable for training machine translation of genres other than the genre of provenance.

5. **Insertion:** Conventionally accepted orthographic forms, without substitution of forms presented in original data.

6. **Insertion:** Without substitution of original material, of semantically accurate and similarly structured translation, when given dynamic equivalent rendering is structurally divergent.

…. AND SO ON

EXAMPLES

EEIFA	EEFI
les éléments essentiels d'information des forces amies	essential elements of friendly information
ce que nous voulons cacher de la menace	what we want to hide from the threat
la SECOP	OPSEC
COA	COA
cause de l'action	cause of action
zone géographique	geographic area
où l'information pour répondre à un EIP peut être receuillie	where information to answer a PIR can be collected
zone géographique où l'information pour répondre à un EIP ou confirmer / refuser un COA de la menace peut être recueillie	geographical area where information to answer a PIR or confirm/deny a threat COA can be collected

QUESTIONS

Questions?

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