Recent Improvements in the CUED CTS SU System

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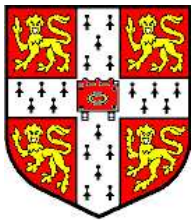

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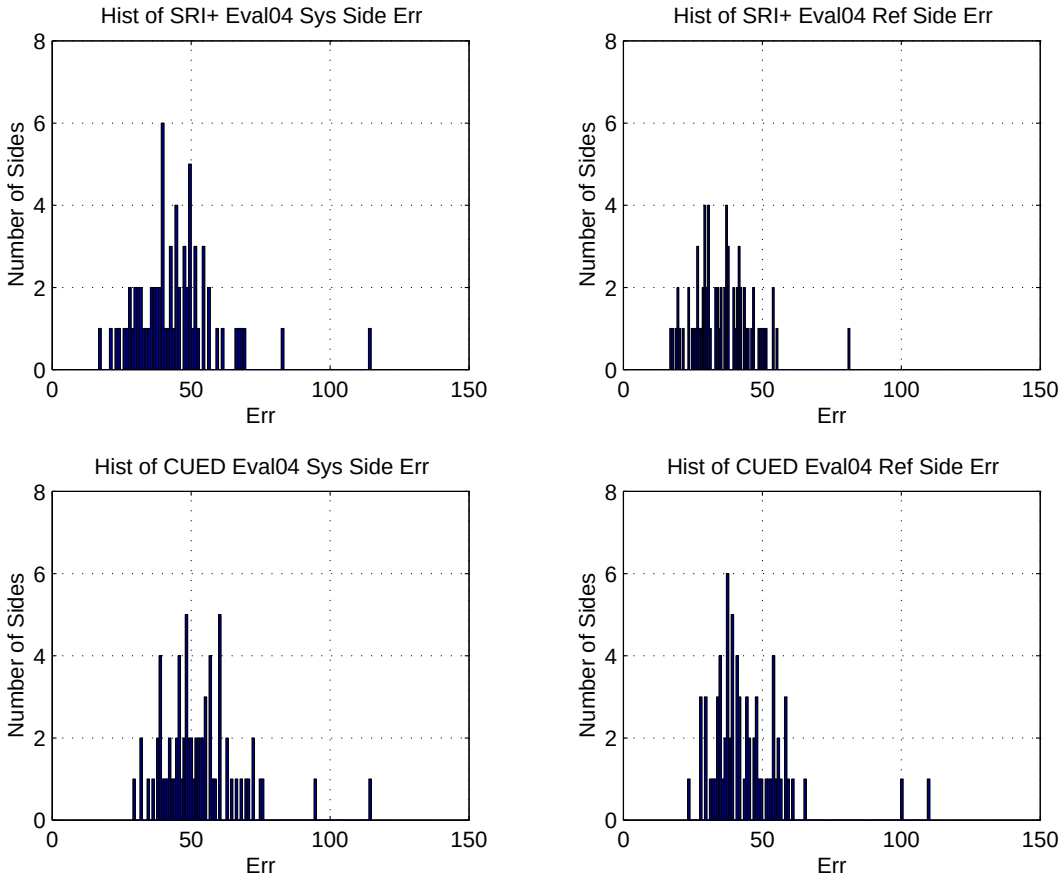
Overview

- Error Analysis
- MDE and NLP
- Prosodic Feature GMMs
- Future Plans

Error Analysis

SRI+ and CUED Side Errors for CTS SUBD Eval04 data:



Error Analysis

c.200 DEL errors analysed by hand:

- **40.7 %: before asyndetic clause boundary**
  Ex: they destroyed all the national monuments (*) he destroyed a large area
- **20.4 %: before co-ordinating conjunction**
  Ex: that's unbiased honesty (*) but then again

c.200 INS errors analysed by hand:

- **26.2 %: before potential BackChannel**
  Ex: just because * yeah well I mean I guess that's unbiased
- **20.4 %: before potential Discourse Marker**
  Ex: on the other hand * well by telling the truth

MDE and NLP

Work in Progress:

Use NLP techniques to detect asyndetic clause boundaries:

- Generate rttm file containing putative SU boundaries
- Parse within each SU; detect possible clause boundaries
- Insert SU boundary if probability of clause boundary greater than threshold

Use RASP (Robust Automatic Statistical Parser) to obtain parse trees.

Prosodic Feature GMMs

Current Cart-style decision tree PFMs require

- training data to be downsampled.
- PFM probs to be divided by priors.

Preferable to model the data without downsampling/dividing by priors...

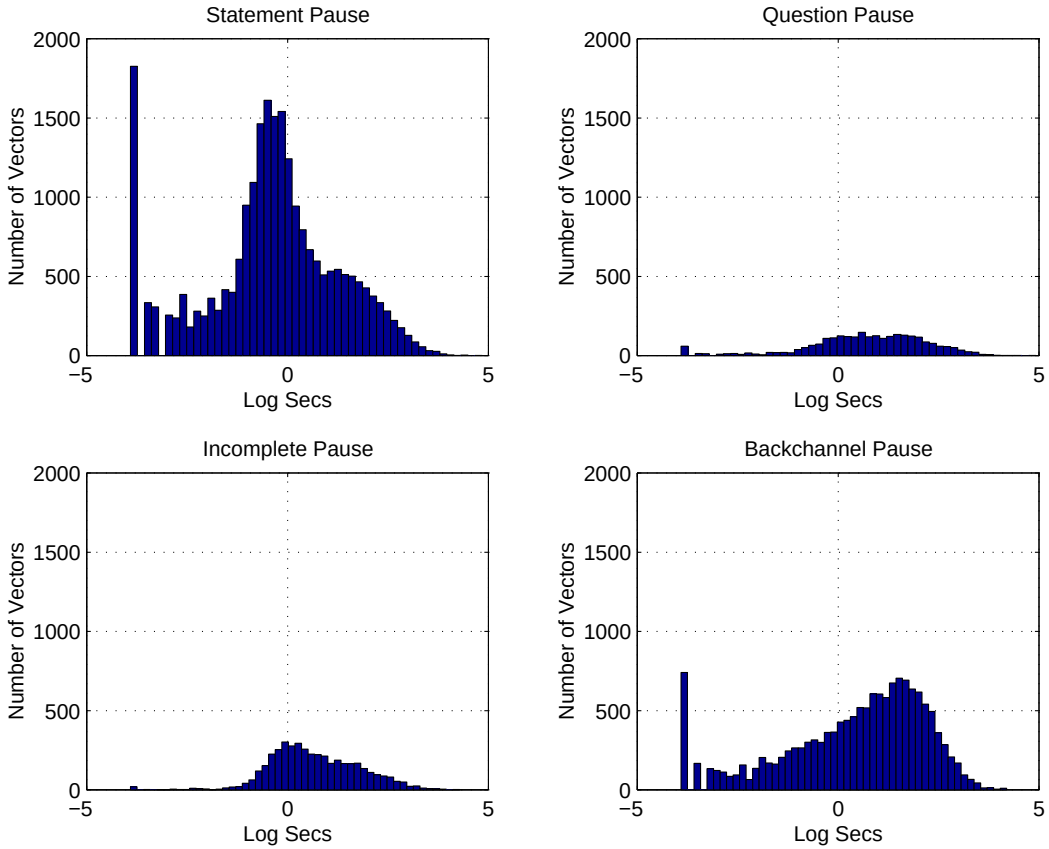
Alternative: GMM-based PFMs:

- Use prosodic features that are modelled well using GMMs.
- Obtain prosodic feature vectors for each SU subtype in training data.
- Construct GMM for each SU subtype.
- Train GMMs using standard tools, increasing mixtures.
- Obtain prob from each SU subtype GMM for each feature vector in test data.
- Place GMM probs on arcs of lattice and decode as usual.

Initially, only pause modelled using GMMs...

Prosodic Feature GMMs

Distrubution of pause feas in RT-04 training data (pause > 0) for SU subtypes:



Prosodic Feature GMMs

GMMs were constructed that modelled pause:

- 50-50 downsampled CTS RT-04 training data
- 4 iterations of parameter re-estimation (MLE training)
- 4/8/16 Gaussian mixture components per state

Initial GMM results for dev03f test set:

SYSTEM	DEL	INS	SUBS	%Err
PFM (pause)	41.8	41.1	32.4	115.3
GMM (pause) 4mix	39.4	54.3	26.3	120.1
GMM (pause) 8mix	39.9	50.6	27.8	118.4
GMM (pause) 16mix	39.7	52.4	28.2	120.3
SULM	37.3	17.1	9.1	63.4
SULM + PFM (pause)	35.2	12.3	10.5	58.0
SULM + GMM (pause) 4mix	36.4	11.5	11.8	59.7
SULM + GMM (pause) 8mix	36.0	10.3	11.2	**57.5**
SULM + GMM (pause) 16mix	36.2	10.1	11.3	57.6

The 8mix GMM outperforms the PFM by 0.5% abs.

Future Plans

Current plans for Structural MDE research include the following:

- Continue exploring a GMM-based alternative to CART-style PFMs
- Use discriminative training for GMMs
- Use NLP techniques to reduce DEL errors involving asyndetic clause boundaries
- Use a larger set of prosodic features in PFMs