End-to-end Multichannel Speaker-Attributed ASR: 
Speaker Guided Decoder and Input Feature Analysis
Can Cui, Imran Ahamad Sheikh, Mostafa Sadeghi, Emmanuel Vincent

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End-to-end Multichannel Speaker-Attributed ASR: Speaker Guided Decoder and Input Feature Analysis

Can Cui, Imran Sheikh, Mostafa Sadeghi, Emmanuel Vincent

Task
- Transcribe a multichannel multi-speaker meeting

Key challenges
- Complex audio signals containing overlapping speech, noise, and reverberation
- Information sharing between ASR and speaker identification modules
- Design of optimal training losses, regularization, and training schedules of the E2E model

Main contributions
- E2E Multichannel Speaker-Attributed ASR (MC-SA-ASR) system
- Impact of multichannel input features

Proposed methods: MC-SA-ASR
- W1, W2, W3 <sc> W4, W5

Proposed methods: Input features
- Multichannel multi-speaker audio
- Reference speaker embeddings
- Speaker-wise Decoder

Experiments on LibriSpeech: Data preparation
- Data: LibriSpeech train-960, dev-clean, test-clean
- Preparation for multichannel multi-speaker setting on train-dev-test set: Room Impulse Responses simulated by the gpuRIR toolkit; Dynamic mixing for 2 and 3 speakers without duplication

Experiments on LibriSpeech: Results and discussion

<table>
<thead>
<tr>
<th>System</th>
<th>Input</th>
<th>1-spk</th>
<th>2-spk mix</th>
<th>3-spk mix</th>
<th>1,2,3-spk mix</th>
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<th>WER</th>
<th>SER</th>
<th>WER</th>
<th>SER</th>
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Experiments on AMI: Data preparation
- Data: 100 hours of meeting data with 3–5 participants and 8–16 microphones
- Dividing each meeting (approximately 1 hour) into fixed-size chunks while avoiding speaker overlaps or cutting within a word
- The training and development sets consist of 5 s, 10 s, or 15 s chunks only. The test set comprises 5 s, 10 s, and 15 s chunks

Experiments on AMI: Results and discussion

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<th>System</th>
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<th>3-spk mix</th>
<th>4-spk mix</th>
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Conclusions
- WER reduction up to 16% relative on simulated data
- Phase features perform better on chunks with a larger number of channels and/or with a larger number of speakers

Perspectives
- Improve the speaker count accuracy on real data
- Make effective usage of multichannel phase features for a better localization of speakers

References