Prosodic Matching and Turn Competition in Multi-Party Conversations

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Overlapping talk example
Outline

BACKGROUND

MATERIAL & METHOD

RESULTS

DISCUSSION & CONCLUSIONS
Background
Overlapping talk occurs frequently in conversation

Systematically analysed (French & Local, 1983; Kurtič et al., 2013)

- Classification into competitive and non-competitive overlap
  - CA (Conversation Analysis)
    - Sequencing
    - Treatment by participants
- Prosodic constructions of competitiveness
  - impressionistic
  - Automatic
    - Feature extraction
    - Classification
Prosody in Conversation

<table>
<thead>
<tr>
<th>Individual Prosody</th>
<th>Coordinated Prosody Across Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>• single speaker, single turn: e.g. specific pitch</td>
<td>convergence (Kousidis et al. 2008)</td>
</tr>
<tr>
<td>→ specific actions</td>
<td>entrainment (Levitan et al., 2011)</td>
</tr>
<tr>
<td>• within speaker coordination: e.g. increase in pitch</td>
<td>repetition / shadowing (Tannen, 1987)</td>
</tr>
<tr>
<td>→ specific actions</td>
<td>mirroring, synchronization (Lee et al. 2010)</td>
</tr>
<tr>
<td></td>
<td>matching / non-matching (Szczepek-Reed, 2006)</td>
</tr>
</tbody>
</table>

- **Pitch contour matching co-occurs with interactional alignment** *(Gorisch et al. 2012)*
  - Current speaker continues if the second speaker matches the pitch contour
    - e.g. with a response token (“uh huh”)
Research Questions

RQ1: How is competitiveness in overlaps organised prosodically?
- Replication attempt of Kurtić et al. (2013)
  - Expect similar results

RQ2: Is there a link between competitiveness in overlap and interactional alignment?
- We know: interactional alignment is performed with matching
  - competitive overlaps → non-matching prosody
  - non-competitive overlaps → matching prosody
Material & Method
Corpus

- **Recordings** (Kurtić et al., 2012)
  - 2 hours
  - multi-party (four friends)
  - face-to-face
  - conversations
  - British English

- **Segmented manually into Turn Constructional Units (TCUs)** (Sacks et al. 1974)

- **Detected automatically overlap instances**
  - start and end time of TCUs

- **Selection**
  - Only two-speaker overlaps
  - 3092 instances
Definition of turn competition:

- An instance of overlapping speech is competitive if either party, overlappee or overlapper, or both demonstrates the aim to prevent the other party from either keeping or taking over the current turn.

Annotators’ decision:

- Level of competitiveness (1-to-5 scale)
  - 1 = totally non-competitive
  - 5 = totally competitive

Two annotators

- Same experience in conversation analysis
- Annotators agreed in 2012 out of 3044 instances (66.1%) on either “1” or “5”.

Method

- **Automatic classification**
  - **Data**
    - Instances where both annotators agreed
    - 52 extracted and annotated features
  - **Decision Trees using the Weka toolkit**
    - Machine learning technique
    - Inspection of trees can give indications on how the features are used for classification decisions
    - Performance evaluated using Cohen’s Kappa (Japkowicz & Shah, 2011)
Features

- Manually annotated feature
  - Position: Where in the TCU does the overlap start? (following Kurtić, 2011)
    - 6 positions: simultaneous start, terminal, blind spot, mid-turn, recognitional, progressional

- Extracted features
  - Extraction at 3 Locations
    - (1) overlappEr in overlap
    - (2) overlappEe in overlap
    - (3) overlappEe before overlap
  - Duration
  - Periodicity/Aperiodicity
    - average aperiodicity
    - NaN-ratio (between valid and missing F0 values)
  - Fo features
    - 6 pitch features: slope, minimum, maximum, standard deviation, span, height
  - Speaker
    - overlappEe
    - overlappEr

<table>
<thead>
<tr>
<th>Ee:</th>
<th>before -- before --</th>
<th>in overlap</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Er:</th>
<th>in overlap</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td></td>
</tr>
</tbody>
</table>
“coordinated” features

- Comparison across participants
  - Measure in three contexts
    - InIn
    - InErBef
    - InEeBef

- absolute differences, e.g.: \( |\text{slope}_{Ee} - \text{slope}_{Er}| \)
- pitch contour similarity: “simScore” (Gorisch et al. 2012)
Results
**RQ1: classification of competitiveness**

<table>
<thead>
<tr>
<th>Feature set</th>
<th># features in set</th>
<th>Cohen’s kappa</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>3</td>
<td>0.50</td>
<td>Duration and Position features add more than F0 when used alone</td>
</tr>
<tr>
<td>F0</td>
<td>45</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>Positional</td>
<td>1</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>Speaker</td>
<td>2</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Duration + F0</td>
<td>48</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td>Duration + Positional</td>
<td>4</td>
<td>0.56*</td>
<td>Duration and Position features add more than F0 when used alone</td>
</tr>
<tr>
<td>F0 + Positional</td>
<td>46</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>Duration + Speaker</td>
<td>5</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>F0 + Speaker</td>
<td>47</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>Positional + Speaker</td>
<td>3</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td><strong>All</strong></td>
<td><strong>52</strong></td>
<td><strong>0.57</strong></td>
<td>best classifier: moderate agreement with human annotators</td>
</tr>
</tbody>
</table>

* indicates: not significantly different from the best classifier (All)
Decision Tree – all features

16 support Kurtic et al. (2013): position and duration: more decisive than \( F_0 \)

non-competitive positions

coordinated \( F_0 \) features

individual \( F_0 \) feature

contradicts Kurtic et al. (2013)

(RQ2) Coordinated features more decisive than individual features

(RQ2) Pitch contour matching and non-matching is not used as interactional resource for competition.
It's they're not doing it anywhere else i* where else again are they

Amy said they never do it in there again

No it's gonna be in DQ isn't it

I don't know how they're gonna do it it's really strange concept

It's they're not doing it

I don't know
## Similarities and differences to Kurtić et al. (2013)

### Similarities

<table>
<thead>
<tr>
<th></th>
<th>overlap placement &gt; prosodic features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>longer overlap -&gt; more competitive</td>
</tr>
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</table>

### Differences

<table>
<thead>
<tr>
<th>Kurtić et al. (2013)</th>
<th>current study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition can be initiated at any point</td>
<td>Competition is classified mainly at mid-turn position</td>
</tr>
<tr>
<td>individual Fo and intensity features: more decisive than coordinated features</td>
<td>coordinated features: more decisive in Fo than individual Fo features (intensity not measured)</td>
</tr>
</tbody>
</table>
Discussion & Conclusions
Discussion

- RQ1 (prosodic organisation of competitiveness?)
  - Long overlap duration
    - if people continue speaking in overlap => competitive
  - supports findings by Kurtić et al. (2013)
Conclusions – is there some ‘ecosystem’?

• If there is an ecosystem,
  o lexicon of constructions linked to interactional meaning
  o often claimed in the literature (e.g. rising intonation “means” a question)
  o but: many counterexamples when we consider real interaction

• It may be there is no ecosystem, no lexicon.
Potential explanation for differences in results

<table>
<thead>
<tr>
<th>Kurtic et al. 2013</th>
<th>current study</th>
</tr>
</thead>
<tbody>
<tr>
<td>excluded: choral productions, collaborative completions,</td>
<td></td>
</tr>
<tr>
<td>continuers/response tokens</td>
<td>all instances of overlap</td>
</tr>
<tr>
<td>134 features</td>
<td>52 features</td>
</tr>
<tr>
<td>ICSI meeting corpus</td>
<td>4 friends having a conversation</td>
</tr>
</tbody>
</table>
Overlapping talk example

it's they're not doing it anywhere else i* where else again are they

Amy said they never do it in there again

no it’s gonna be in DQ isn’t it

well c* I can just get them before and they can owe me

wha* are they selling normal tickets as well

I don’t know

I don’t know how they’re gonna do it’s really strange concept

oh