Annotation of Emotion and Cooperation in Dialogue Tasks

Federica Cavicchio, Massimo Poesio

CIMEC Università di Trento
Emotion and Cooperation in Dialogue

**Cognitive psychology**
- Elicitation and collection of psychophysiological data
- Recognition of emotive facial expressions

**Computational linguistics**
- Cooperation Annotation in Face to Face Dialogues
- Analysis of the collected data with computational methods

**Neuroscience**
- “Putting emotion into words”: Transmission and decoding of facial expressions of emotions in speech context
Research Question

- **HYPOTHESIS:**
  - negative emotion disrupts cooperation
  - Seeing the other’s face in interaction improves cooperation

- **METHOD:**
  - use of an interactive cooperative task, the Map Task, to elicit cooperative behaviour
  - elicitation of negative emotion (ex. anger) to elicit non-cooperative behaviour

- **EXPERIMENTAL CONDITIONS:**
  - Traditional Map Task
  - Modified (Giver or Follower Confederate) Map Task → elicitation of anger
  - Screen/short barrier condition (eye contact/no eye contact condition)

- **RECORDED DATA:**
  - ECG, HR, GSR
  - Audio and video recording
Stazione degli autobus

Monte Baffoni

Maso Michelini

Chiesa dell’Adagio

Fiume Leno

Monte Poldi

vigneti

vigneti

vigneti

vigneti

Castello di Rovereto

vigneti

Stazione degli autobus

Monte Zaffoni

Maso Michelini

Castello di Rovereto

Chiesa di San Biagio

vigneti

vigneti

vigneti
Rovereto Emotive Corpus
Description

• Task lasts up to 15 mins

• 32 dyadic interactions, 240 mins audio video and psychophysiological recordings

• In the first part of the experiment we record participants baseline.

• Then we record the psychophysiological outputs of task
Rovereto Emotive Corpus
Description

• The confederate at mins 5, 9 and 13 acts a script (negative emotion elicitation in giver)
  - “You driving me in the wrong direction, try to be more accurate!”
  - “It’s still wrong, this can’t be your best, try harder! So, again, from where you stop”
  - “You’re obviously not good enough in giving instruction”

• The timing of emotion elicitation allow a full recovery of the psychophysiological state (Anderson et al., 2005)

• Audiovisual and psychophysiological recordings are simultaneous

• Participants describe the emotion they have felt during the task
Cooperation in Dialogues

- Paul Grice (1975, 1989) describes the cooperative principle: how people interact is described in four maxims (quality, quantity, relevance, manner)

- "Make your contribution such as it is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged."
Cooperation in Dialogues
(Davies 2006 adapted)

• Map task is considered a default cooperative task

• In some Map Task recordings the “emotion factor” starts to be pointed out

• Davies (2006, 2007) applies Gricean maxims in Map Task dialogue corpus computing cooperation
## Computing Cooperation (Davies 2006)

<table>
<thead>
<tr>
<th>Cooperation level</th>
<th>Cooperation type</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td><strong>No response to answer:</strong> breaks the maxims of quality, quantity and manner</td>
</tr>
<tr>
<td>-2</td>
<td><strong>No information add when required:</strong> breaks the maxims of quality, quantity and manner</td>
</tr>
<tr>
<td>-2</td>
<td><strong>No turn giving, no check:</strong> breaks the maxims of quality, quantity and manner</td>
</tr>
<tr>
<td>-1</td>
<td><strong>Inappropriate reply (no giving info):</strong> breaks the maxims of quality and relevance</td>
</tr>
<tr>
<td>0</td>
<td><strong>Giving instruction:</strong> cooperation baseline, task demands</td>
</tr>
<tr>
<td>1</td>
<td><strong>Question answering y/n:</strong> applies the maxims of quality and relevance</td>
</tr>
<tr>
<td>1</td>
<td><strong>Repeating instruction:</strong> applies the maxims of quantity and manner</td>
</tr>
<tr>
<td>2</td>
<td><strong>Question answering y/n + adding info:</strong> applies the maxims of quantity, quality and relevance</td>
</tr>
<tr>
<td>2</td>
<td><strong>Checking the other understands (ci sei? Capito?):</strong> applies the maxims of quantity, quality and manner</td>
</tr>
<tr>
<td>2</td>
<td><strong>Spontaneous info/description adding:</strong> applies the maxims of quantity, quality and manner</td>
</tr>
</tbody>
</table>
Emotion Annotation

• We annotate emotive and non emotive markables to point out what happens to cooperation in normal task and when a negative emotion is induced

• Problem → low kappa in emotion ratings (for a review Callejas and Lopez-Cozar, 2008)

• 4 dimensions are needed to represent similarities and differences in the meaning of emotive words (Fontaine, Scherer 2007)

• Expressions like pitch variations or facial expressions are components building up an emotion (arousal, evaluation, potency, unpredictability)

• Unbiased hit rate (to avoid false alarms and biases in the use of response categories, specific for Non Verbal, Wagner 1994)
PCA Analysis of Emotions

- Human and Computer Emotion Recognition from Faces (Smith et al., 2005; Susskind et al., 2007)

From Smith et al. 2005, Psychological Science

- Face (transmitter) sends expressions signals with a low correlation one another (upper vs lower)
- Human filtering function decorrelates those signals in optimized inputs
- Brain (decoder) responds to the inputs in different brain areas
- Other statistical techniques (nNegative Matrix Factorization, Logistic Regression)
Emotive Facial Expression

Our Coding Scheme

*Mouth signals:*

• **Open lips:** when the mouth is open, o

• **Closed lips:** when the mouth is closed, -

• **Corners up:** e.g. when smiling, ); +) very happy ;

• **Corners down:** e.g. in a sad expression, (, +( very sad

• **Protruded:** when the lips are rounded, O

*Eyebrow signals:*

• **Normal shape:** when eyebrows are relaxed, --

• **One eyebrow up:** 1up

• **Eyebrows up:** up

• **Eyebrows very up:** +up

• **Eyebrows frowned:** fr

• **Eyebrows very frowned:** +fr
Other Conversational and Emotional Indexes

• Conversational turn management

• Feedback (head nodding)

• Gaze contact/ no gaze contact (even in full screen condition!)
Reliability of the Scheme
Kappa Agreement

- 6 annotators divided in two groups (screen vs. no screen conditions) analyzing 60 giver communicative turns

- Fleiss Kappa is computed (the probability of an annotator classifies the markable \( m \) with a particular agreement level \( l \) chosen from a list)

- Cooperation agreement (0.81) and upper/lower facial display (0.78 eyebrow, 0.83 gaze and 0.76 mouth)
Our Coding Scheme Implemented in ANVIL
- Full screen condition: mouth configuration, frowning and cooperation:

- Short barrier condition: mouth configuration, frowning and cooperation:
Future Investigations:
Emotion and Linguistic Context

• Emotion words and conceptual contents help recognition of facial behaviour and emotion recognition (Feldman Barret et al., 2007)

• Investigate emotion recognition in the context of language: how language influences emotion perception and labelling?
Thanks for Your Attention