

Mirroring Facial Expressions, Emotions and Empathy

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Mirror system and empathy


Mirror neurons are activated when individuals a) perform a motor act b) observe the act performed by others (di Pellegrino et al.1992, Rizzolatti 2005).

Mirror system:

- enables understanding the goal of and intention behind an observed motor act (Rizzolatti and Fabbri-Destro 2008).
- is behind the development of social skills (Dapretto et al.2006) and ability to feel/show empathy (Gallese et al. 2004) and



Data-based approach

- 12 human-human first encounters, multimodally annotated (1 hour)
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- 13 encounters: mentally impaired subjects, researcher, care giver and Nao-robot recorded by 2 students of UCPH with municipality of Copenhagen analysis of behaviour between humans (6 hours)

Mirroring facial expressions and the emotion they convey

- Frequently mirrored facial expressions: smiles, laughter, raised eyebrows, scowl.
- Co-occurring smiles are related to most emotions in the data, inter alia *Amusement*, *Friendliness*, *Support*, *Uncertainty* and *Hesitancy*.
- Amusement (laughter and smiles) and Surprise (raised eyebrows, opened eyes, mouth) are conveyed both by mirrored/mirroring facial expression.

Mirroring facial expressions and the emotion they convey (2)

- Significant co-occurrence of *complementary* emotions (in terms of Pleasure, Arousal, Dominance dimensions), e.g.:
 - Hesitancy (PAD ---)/Support (PAD +++)
 - Uncertainty (PAD +-)/Friendliness (PAD+ -+)
 - Helplessness (PAD ---)/Helpfulness (PAD +++)
- The complementary co-occurring emotions in both dataset are related to empathy.

Prediction experiments on 12 human-human first encounters data

- Predicting occurrence of facial expressions in one participant from the facial expressions of the other participant
- Predicting type of co-occurring facial expression.

Significant improvement with respect to baseline in both cases (majority classifier) – improvement adding presence of speech.

But, this is only a factor, **many other aspects must be taken into account.**

Concluding

- Data indicate that mirroring theory can account for the occurrences of many facial expressions which convey emotions related to empathy in human-human first encounters.
- Classifiers can be trained to predict occurrence and type of facial expression of one participant based on information of facial expression by the interlocutor. Adding information about co-occurring speech improves prediction.
- Ongoing and future work:
 - investigating mirroring head movements
 - adding speech analysis, PoS, speech acts.