Facial Displays and their dialogical meanings: Lecture 4

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Recap from Lecture 3 I

- Laughable representation and laughter contents.
- Incongruity effects and sketch of enthymeme resolution therein.
- A decision tree for laughter classification.
- Laughter coding using Praat.

Today's Lecture

- Why do we need to talk about emotion?
- What's a cognitive theory of emotion? Some examples
- Scherer's theory: why chosen
- EMA: an implemented CTE and where it's been used
- CPM in KoS: mood.
- A unified illocutionary force for laughter, but distinct meanings; relating power, arousal, and pleasure change.
- The meaning of emojis.

Laughter and erotetic appraisal I

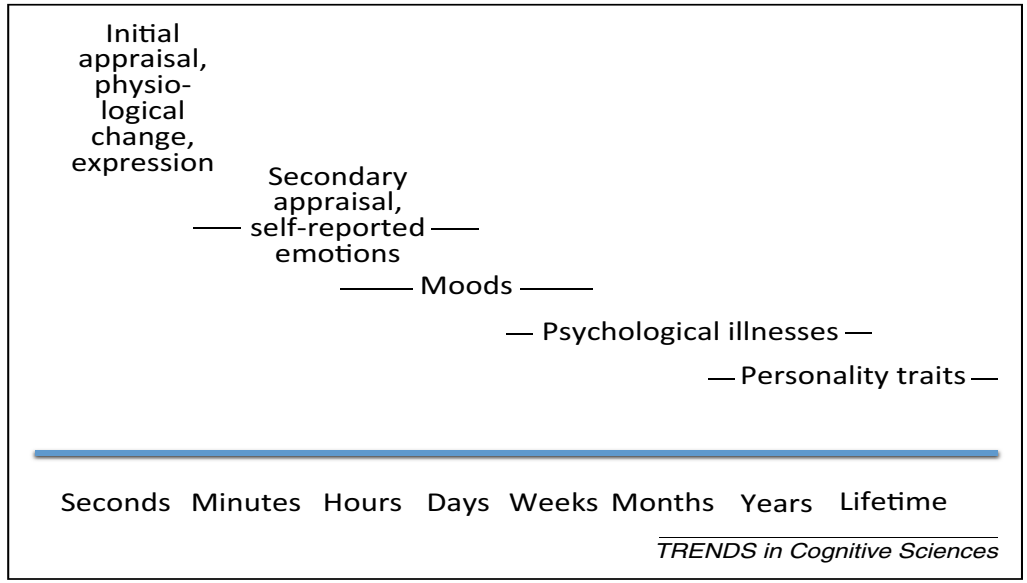
- So far have seen assertion/querying cancellation, scarequoting, disbelief.
- But not all laughter is metadiscursive or metacommunicative.
- Much of it isn't; there are e.g., uses such as *softening* or *benevolence induction* where the laugher is trying to make the addressee 'feel better'.
- And even for the metadiscursive or metacommunicative uses, what we have said so far misses on a fundamental aspect of laughter,
- that it's fun (even healthy Martin & Lefcourt, 2004).

Outline

Cognitive Theories of emotions I

- Contrast with e.g., physiologically oriented theories that view emotion as caused by certain bodily states; cognitive theories view explanatory direction reversed.
- General consensus:
  1. emotions are caused by appraising events in relation to concerns.
  2. an initial automatic appraisal that does not require conscious processing,
  3. then a secondary appraisal that often includes conscious reflection on the meaning of the emotion and that can lead to new intentions.
  4. A third phase of appraisal is social, when emotions are verbally confided to others.

Cognitive Theories of emotions II



Computational models of emotion I

- Appraisal theory is currently an influential force among cognitive perspectives on emotion (Marsella & Gratch, 2009; Oatley & Johnson-Laird, 2014).
- Emotion is argued to arise from patterns of individual judgment concerning the relationship between events and an individual's beliefs, desires and intentions.
- Patterns of appraisal are associated with specific physiological and behavioral reactions. In several versions of appraisal theory, appraisals also trigger cognitive responses, often referred to as coping strategies—e.g., planning, procrastination or resignation—feeding back into a continual cycle of appraisal and re-appraisal

Computational models of emotion II

- Scherer (see e.g., Scherer, 2009) has an influential appraisal theory formulated in the following erotetic way.
- . . . the organism evaluates the event and its consequences on a number of criteria or stimulus evaluation checks:
  1. Does the event have consequences for my needs or goals? Physiological correlates: EEG alpha changes, modulation of the P3a in ERPs; heart rate deceleration, vasomotor contraction, increased skin conductance responses, pupillary dilatation, local muscle tonus changes . . .
  2. Is the event intrinsically pleasant or unpleasant, independently of my current motivational state? Physiological correlates: Pleasant: inhalation, heart rate deceleration, salivation, pupillary dilatation; lids up, open mouth and nostrils, lips part and corners pulled upwards, gaze directed; . . . Unpleasant: Defence response, heart rate acceleration, increase in skin conductance level, decrease in salivation, pupillary constriction; slight muscle tonus increase; brow lowering, lid tightening, eye closing, nose wrinkling, upper lip raising,. . .
  3. Who was responsible and what was the reason?

Computational models of emotion III

4. Do I have sufficient power to exert control if possible?
   Physiological correlates: High control/High power: Shift toward ergotropic, trophotropic balance; increase in depth of respiration, slight heart rate decrease, increase in systolic and diastolic blood pressure, changes in regional blood flow, increased flow to head, . . . Low power: Protection/Submission Extreme ergotropic dominance; faster and more irregular respiration, strong increase in heart rate and heart stroke volume, increase in systolic and decrease in diastolic blood pressure, increase in pulse volume amplitude),

More on the CPM model I

- Contrary to basic emotion theories , the CPM does not assume the existence of a limited set of discrete emotions or affect programmes, but considers the possibility of an infinite number of different types of emotion episode.
- The nature of the emotion episode is exclusively determined by the pattern of appraisal results and the specific patterning over time driven by the recursively generated appraisal results.
- *modal emotions*—modal outcomes that occur more frequently due to event contingencies and psychobiological prewiring. Prime candidates for such frequent and important contingencies are major patterns of adaptation in the life of animate organisms that reflect frequently recurring patterns of environmental evaluation and adaptation.

More on the CPM model II

- Explaining individual differences in emotional reactions even in cases in which the eliciting event is objectively the same.
- In a study of 109 airline passengers waiting in vain for their baggage to materialise, (Scherer & Ceschi, 1997) found that there were virtually no two passengers who reported feeling exactly the same 'pure' emotion. Rather, all of them reported various mixtures or blends of several different emotions.
- When systematically questioning these passengers about their appraisals of the event (using questions based on the CPM checks), Scherer & Cesch showed that specific appraisal results and predicted response types clustered closely together in three- dimensional space.
- In analysing the videotaped interaction between the passengers and the airline agents processing their claims, one could also see that certain types of appraisal differentiate the occurrence of true (Duchenne) smiles or false smiles.

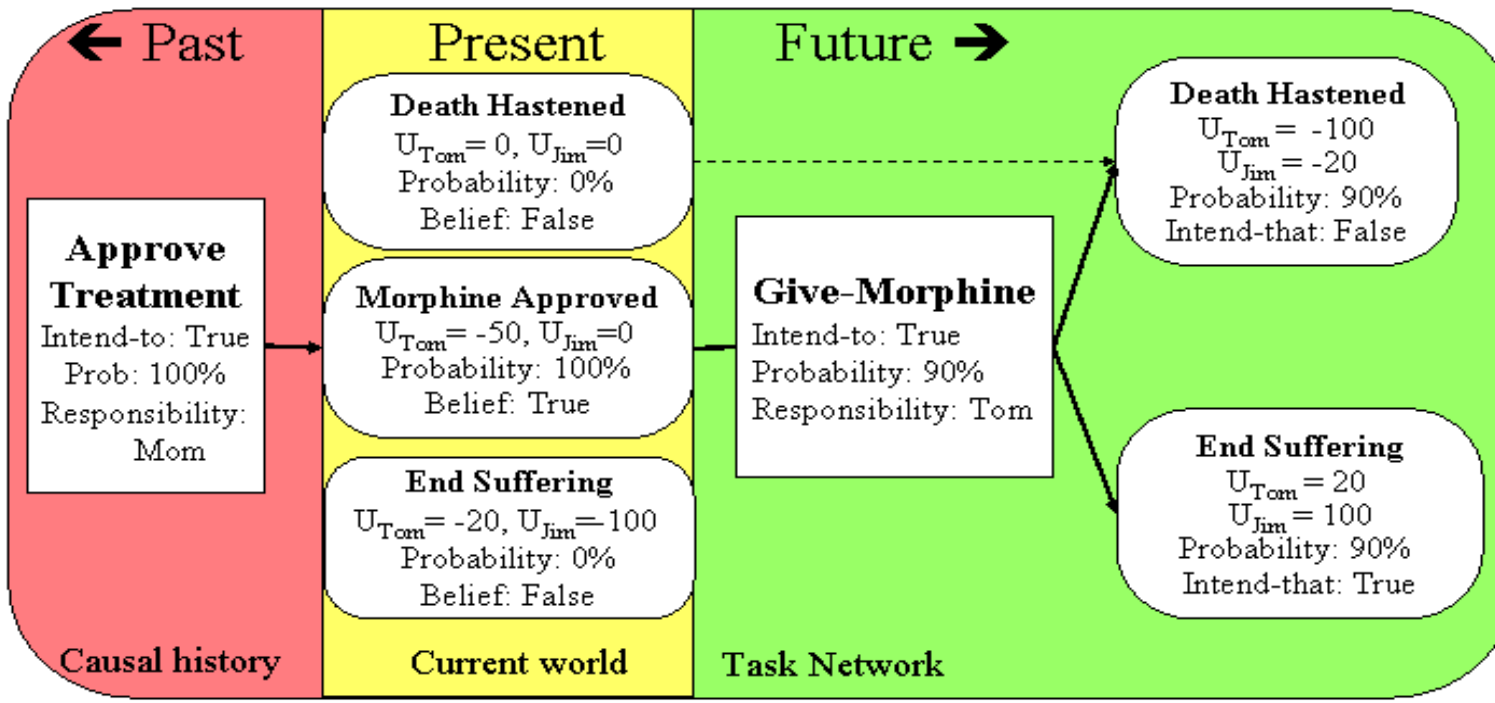
More on the CPM model III

- Appraisal theories predict that emotions are elicited entirely on the basis of an individual's subjective evaluations of the event and his or her role in it rather than its "objective" characteristics given that the latter may be perceived differently and evaluated on the basis of the individual's goals and values as well as on his or her coping potential.
- In consequence, as the baggage-loss example shows, if one knows the results of an individual's event appraisal on the major checks, one can approximately predict what label the person is likely to use to refer to the experience .
- Furthermore, it can be predicted what motor expressions, action tendencies, and physiological changes can be expected to underlie this experience, cf., Scherer on smiling Scherer & Ellgring, 2007

Computational models of emotion: EMA I

- One example: EMA (EMotion and Adaptation) (Gratch & Marsella, 2004; Marsella, Gratch, & Petta, 2010; Traum, Marsella, Gratch, Lee, & Hartholt, 2008)
- Build representations of events, plans and how these affect appraisal variables.
- Use utility and probability to model desirability and likelihood.
- Explicit representations of intentions and beliefs are also critical for properly reasoning about causal attributions.

An example: a sequence of emotion dynamics



Modelling

- The agent's interpretation of its "agent- environment relationship" *the causal interpretation*.
- It provides a uniform, explicit representation of the agent's beliefs, desires, intentions, plans and prob- abilities that allows uniform, fast appraisal processes, regardless of differences in the underlying phenomena being appraised.
- The causal interpretation (corresponding to the agent's working memory) encodes the input, intermediate results and output of reasoning processes that mediate between the agent's goals and its physical and social environment (e.g., perception, planning, explanation, and NLP).

Modelling

- At any point in time, the causal interpretation represents the agent's current view of the agent-environment relationship, which changes with further observation or inference.
- Appraisal treated as a set of feature detectors that map features of the causal interpretation into appraisal variables. For example, an effect that threatens a desired goal is assessed as a potential undesirable event.

Appraisal variables

- Events are characterized in terms of appraisal variables via domain-independent functions that examine the logical structure of the causal interpretation:
  - Perspective: viewpoint that the event judged
  - Desirability: what is the utility (positive or negative) of the event if it comes to pass, from the perspective taken (e.g., does it causally advance or inhibit a state of some utility).
  - The utility of a state may be intrinsic (agent X attributes utility Y to state Z) or derived (state Z is a precondition of a plan that, with some likelihood, will achieve an end with intrinsic utility).
  - Likelihood: how probable is the outcome of the event, derived from the decision-theoretic plan.

Appraisal variables (cont.)

- Causal attribution: who deserves credit/blame. This depends on what agent was responsible for executing the action, but may also involve considerations of in- tention, foreknowledge and coercion.
- Temporal status: is this past, present, or future.
- Controllability: can the outcome be altered by ac- tions under control of the agent whose perspective is taken. This is derived by looking for actions in the causal interpretation that could establish or block some effect, and that are under the control of the agent who's perspective is being judged (i.e, agent X could execute the action).
- Changeability: can the outcome be altered by some other causal agent.

Coping

- Coping determines how one responds to the appraised significance of events.
- Coping strategies are proposed to maintain desirable or overturn undesirable in-focus emotion instances.
- Coping strategies essentially work in the reverse direction of appraisal, identifying the precursors of emotion in the causal interpretation that should be maintained or altered (e.g., beliefs, desires, intentions and expectations).

Coping: some strategies

- Planning: form an intention to perform some act (the planner uses intentions to drive its plan generation)
- Seek instrumental support: ask someone that is in control of an outcome for help
- Procrastination: wait for an external event to change the current circumstances
- Positive reinterpretation: increase utility of positive side-effect of an act with a negative outcome

Outline

Adding Emotion to the DGB I

- Mood : List / weighted sum of appraisals
- Mood represents the publicly accessible emotional aspect of an agent that arises by publicly visible actions (such as NVSS), which can but need not diverge from the private emotional state.
- Emotional analogue to MOVES
- It can be our take on an interaction/piece in case we have difficulties with the *content* (cf., music).

Adding Emotion to the DGB II

- Sharing is easy to model; it is *difference* that raises problems, but is revealing.
- Some options:
  - attempted sharing [shared joy, grief,. . .]
  - refusal to share
  - ambivalence
- To model:
  - Appraisal values
  - Mood as complex entity built from appraisal values.

Emotional interaction in the DGB I

- Treat each appraisal, following Scherer, as n-field type, each field corresponding to answer to a stimulus evaluation check:

(1)
$$\begin{bmatrix} \text{pleasant} : \langle \text{Ptype}, \text{Integer} \rangle \\ \text{responsible} : \text{RecType} \\ \text{power} : \langle \text{Ptype}, \text{Integer} \rangle \end{bmatrix}$$

- New DGBType:

(2)
$$\text{DGBType} \mapsto \begin{bmatrix} \text{spkr: Ind} \\ \text{addr: Ind} \\ \text{utt-time} : \text{Time} \\ \text{c-utt} : \text{addressing(spkr,addr,utt-time)} \\ \text{Facts} : \text{Set(Prop)} \\ \text{Pending} : \text{list(LocProp)} \\ \text{Moves} : \text{list(LocProp)} \\ \text{QUD} : \text{poset(Question)} \\ \text{Mood} : \text{Appraisal} \end{bmatrix}$$

Emotional interaction in the DGB II

- Update Mood componentially

(3) $$\text{Mood} := \text{Mood} + \text{appr0} = \left[\begin{array}{l} \text{pleasant} = \left\langle \text{Mood.pleasant.} \ \wedge + \text{appr0.pleasant} \right\rangle \\ \text{responsible} = \text{Mood.responsible} \wedge \text{appr0.responsible} \\ \text{power} = \left\langle \text{Mood.power} \wedge + \ \text{appr0.power} \right\rangle \end{array}\right]$$

Emotional interaction in the DGB I

- Examples:

(4) a.
$$\begin{bmatrix} \text{pleasant} = \langle \text{pleasant}, 4 \rangle \\ \text{responsible} = \text{responsible(b)} \\ \text{power} = \langle \text{power}, 3 \rangle \end{bmatrix}^{+}$$
$$\begin{bmatrix} \text{pleasant} = \langle \text{pleasant}, 12 \rangle \\ \text{responsible} = \text{responsible(b)} \\ \text{power} = \langle \text{power}, 1 \rangle \end{bmatrix} =$$
$$\begin{bmatrix} \text{pleasant} = \langle \text{pleasant}, 8 \rangle \\ \text{responsible} = \text{responsible(b)} \\ \text{power} = \langle \text{power}, 2 \rangle \end{bmatrix}$$

Emotional interaction in the DGB II

b. $$\begin{bmatrix} \text{pleasant} = \langle \text{pleasant}, 12 \rangle \\ \text{responsible} = \text{responsible(b)} \\ \text{power} = \langle \text{power}, 3 \rangle \end{bmatrix} +$$
$$\begin{bmatrix} \text{pleasant} = \langle \neg\ \text{pleasant}, 4 \rangle \\ \text{responsible} = \text{responsible(b)} \\ \text{power} = \langle \text{power}, 1 \rangle \end{bmatrix} =$$
$$\begin{bmatrix} \text{pleasant} = \langle \text{pleasant}, 12 \rangle \wedge \langle \neg\ \text{pleasant}, 4 \rangle \\ \text{responsible} = \text{responsible(b)} \\ \text{power} = \langle \text{power}, 2 \rangle \end{bmatrix}$$

Emotional interaction in the DGB III

- What is an ambivalent mood? When one field has contradictory meets.
- Gives rise to erotetic mood (frowning, head tilting, or posing spoken question)

Emotional interaction I

- Lexical entry for a 'social' laugh bears a mood presupposition that the pleasantness field is positive and low:

$$\begin{bmatrix}
\text{phon} : \texttt{laughterphontype} \\
\text{dgb-params} : \begin{bmatrix}
\text{spkr} : \text{Ind} \\
\text{addr} : \text{Ind} \\
\text{t} : \text{TIME} \\
\text{c1} : \text{addressing(spkr,addr,t)} \\
\text{Mood.pleasant} = \langle \text{pleasant,i} \rangle \\
\text{c2} : i \geq \theta \\
\text{p} = \begin{bmatrix} \text{sit} = \text{I} \\ \text{sit-type} = \text{L} \end{bmatrix} : \text{prop} \\
\text{c2} : \text{ActiveSit(I)} \\
\text{MaxEud} = \text{e} : \text{(Rec)RecType}
\end{bmatrix} \\
\text{content} = \begin{bmatrix}
\text{l-cont} = \begin{bmatrix}
\text{sit} = \text{s} \\
\text{sit-type} = \begin{bmatrix} \text{c4: Pleasant(spkr,p,e)} \end{bmatrix} : \text{Prop} \\
\text{l-arousal} = \text{lphontype.power} : \text{RealNum}
\end{bmatrix} : \text{RecType}
\end{bmatrix}
\end{bmatrix}$$

Emotional interaction II

- Lexical entry for an incongruity laugh bears a mood presupposition that the pleasantness field is positive and high:

$$\begin{bmatrix}
\text{phon} : \texttt{laughterphontype} \\
\text{dgb-params} : \begin{bmatrix}
\text{spkr} : \text{Ind} \\
\text{addr} : \text{Ind} \\
\text{t} : \text{TIME} \\
\text{c1} : \text{addressing(spkr,addr,t)} \\
\text{Mood.pleasant} = \langle \text{pleasant,i} \rangle \\
\text{c2} : i \geq \theta \\
\text{p} = \begin{bmatrix} \text{sit} = \text{I} \\ \text{sit-type} = \text{L} \end{bmatrix} : \text{prop} \\
\text{c2} : \text{ActiveSit(I)} \\
\text{MaxEud} = \text{e} : \text{(Rec)RecType}
\end{bmatrix} \\
\text{content} = \begin{bmatrix}
\text{l-cont} = \begin{bmatrix}
\text{sit} = \text{s} \\
\text{sit-type} = \begin{bmatrix} \text{c4: Incongr(p,e,}\tau\text{)} \end{bmatrix} : \text{Prop} \\
\text{l-arousal} = \text{lphontype.power} : \text{RealNum}
\end{bmatrix} : \text{RecType}
\end{bmatrix}
\end{bmatrix}$$

Emotional interaction III

- given a laughter content, the pleasantness value of the mood value of the dialogue gameboard is incremented in a degree dependent on the arousal:

$$\left[\begin{array}{l}\text{preconditions:}\left[\begin{array}{l}\text{LatestMove} = \left[\begin{array}{l}\text{l-cont : Assert(spkr,Incongr(p,e,}\tau\text{))} \\ \vee\ \text{Assert(spkr, Pleasant(p,spkr))} \\ \text{l-arousal: lphontype.power}\end{array}\right]\text{: LocProp}\end{array}\right] \\ \text{effect:}\left[\begin{array}{l}\text{DGB.Mood.pleasant.x} = \\ \text{preconds.DGB.Mood.pleasant.x} + \theta(\text{preconds.l-arousal})\end{array}\right]\end{array}\right]$$

- Such mood updates will be the basis for our scaling up to other NVSS tomorrow (smiling, sighing, frowning, eye-rolling).

Emotional interaction: some examples I

- Social laugh interaction: pleasure at each other
- A laughs at B; content: Pleasant(A,CoPresence(A,B)) reflecting A's Mood.pleasant = <Pleasant,i>, *i* positive and low.
- Can give rise to similar Mood with B and laugh at A with content Pleasant(B,CoPresence(A,B))
- This relies on resolving the laughable as e = CoPresence(A,B) (nothing necessary about that, by analogy with anaphoric v. deictic pronoun resolution—e could be some distinct event due to which A/B is laughing.

Emotional interaction: some examples II

- Humorous remark at a funeral.
- leads to ambivalence, but can lead to reaction with low arousal laughter.

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