

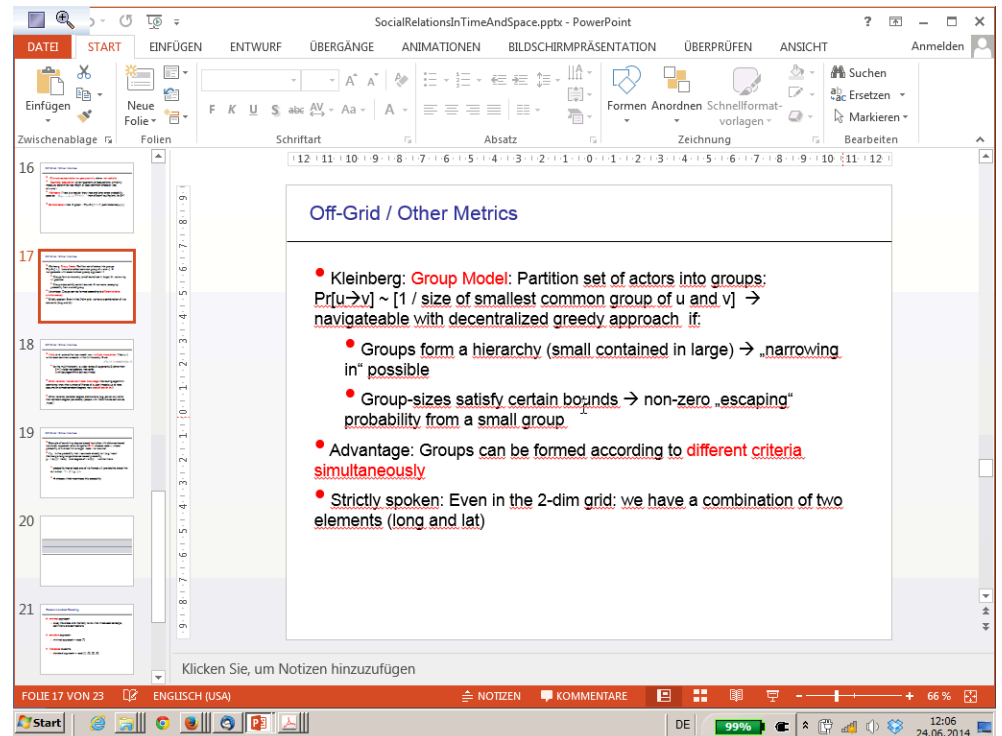
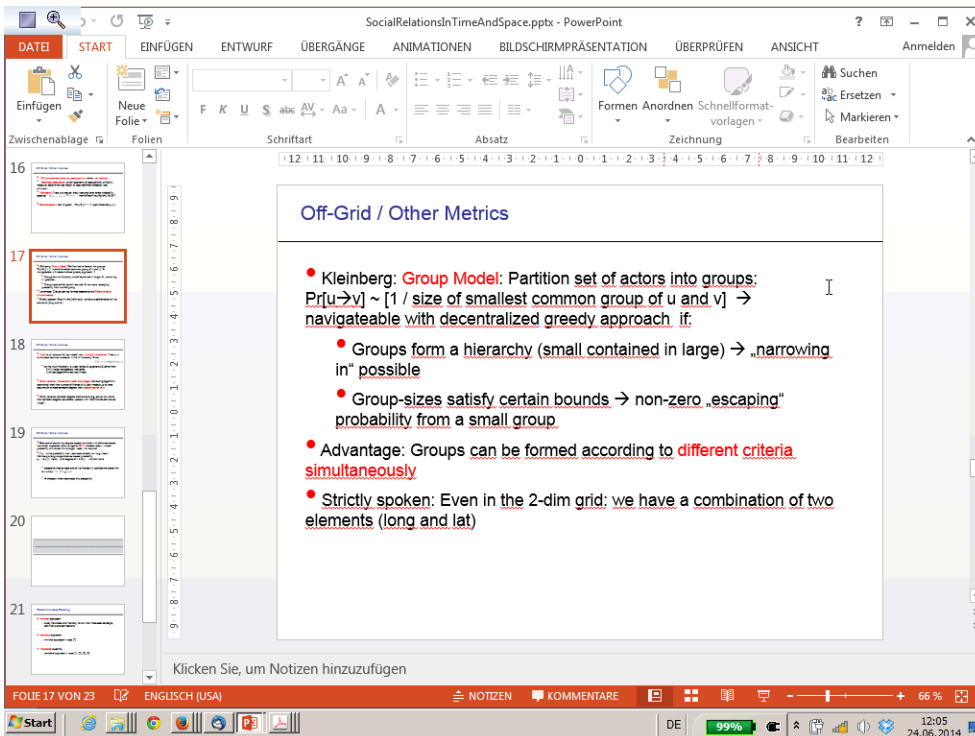
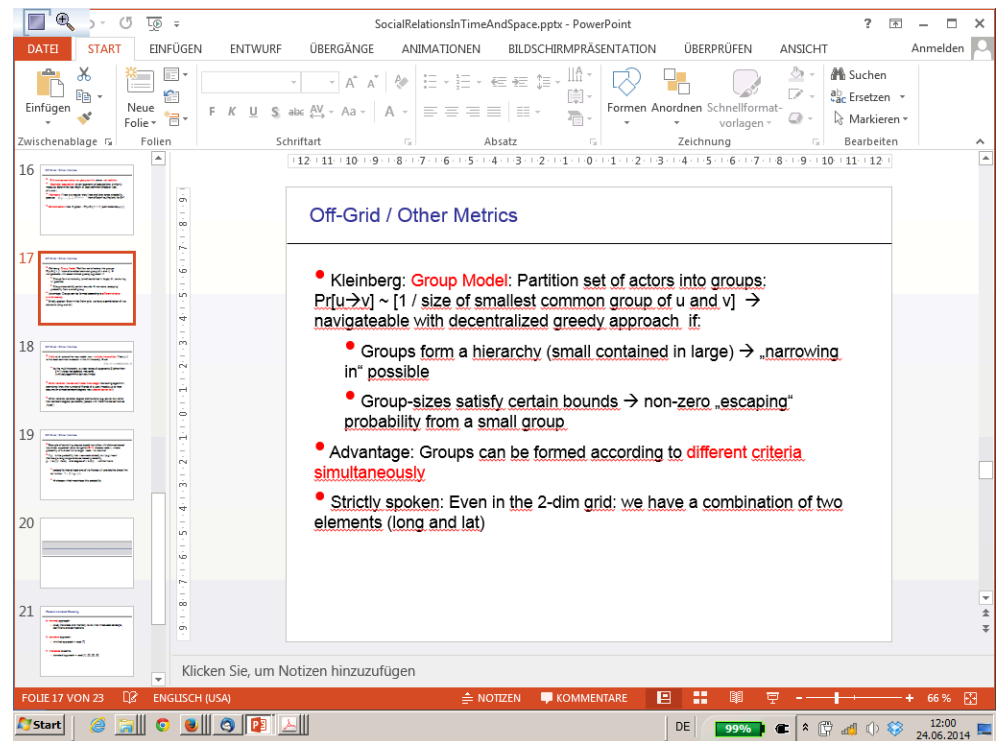
Script generated by TTT

Title: groh: profile1 (24.06.2014)

Date: Tue Jun 24 12:00:17 CEST 2014

Duration: 94:53 min

Pages: 44



SocialRelationsInTimeAndSpace.pptx - PowerPoint

DATEI START EINFÜGEN ENTWURF ÜBERGÄNGE ANIMATIONEN BILDSCHIRMPRÄSENTATION ÜBERPRÜFEN ANSICHT Anmelden

Einfügen Neue Folie

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16 Off-Grid / Other Metrics

- **Watts et al.** extend the tree model: now: **multiple hierarchies**: if $lca_i(u,v)$ is the least common ancestor in the i th hierarchy \rightarrow set $d(u,v) := \min_i lca_i(u,v)$
- for the multi-hierarchy: a wider range of exponents β (other than $\beta=1$) yields navigatable networks (with polylogarithmic delivery times)
- Other variants: include semi-local knowledge into routing algorithm: promising: know the number of friends of a user (models up to here assume an almost constant degree; now: exploit power law)
- Other variants: consider degree distributions (e.g. power law) other than constant degree (as before) (people with more friends can act as „hubs“)

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Zwischenablage Folien

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16 Off-Grid / Other Metrics

- Example of combining degree based heuristics with distance based heuristics: expected value navigation EVN: choose node v , whose probability of a direct link to target node t is maximal
- If p_{vt} is the probability that v connects directly to t (e.g. insert Kleinberg's long-range distance based probability $p_{vt} = d(v,t)^{-\alpha}$ here) and degree of v is $\delta(v)$ we then have
 - probability that at least one of v 's friends will provide the direct link to t is then $1 - (1 - p_{vt})^{\delta(v)}$
 - \rightarrow choose v that maximizes this probability

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FOLIE 19 VON 23 ENGLISCH (USA) NOTIZEN KOMMENTARE DE 99% 12:11 24.06.2014

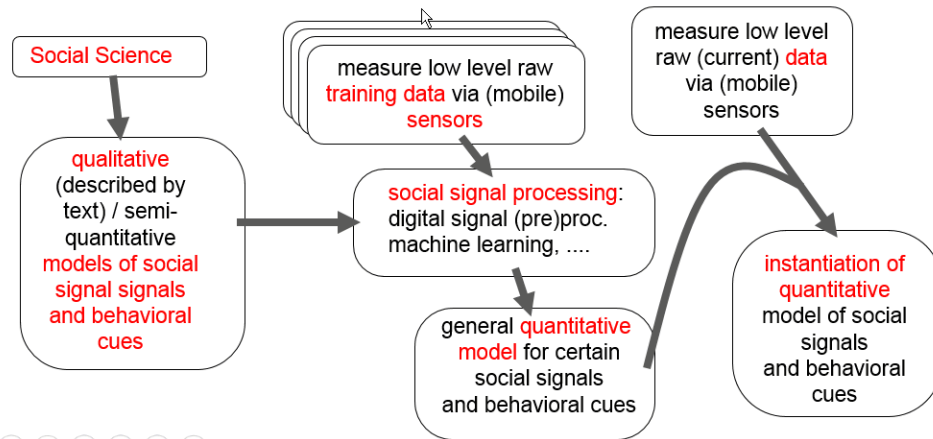
Social Signal Processing

Lecture will mostly follow [1], thus corresponding citations are often omitted to increase readability



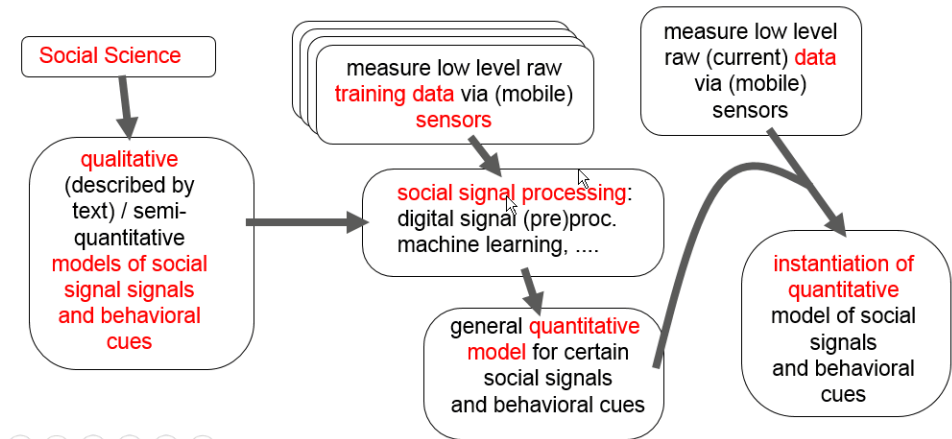
Social Signal Processing

- **Up to now:** most emphasis on **long term social context** (e.g. networks of friendships)
- Now: **short term social context:** social behavior on small spatial and temporal scales: detection + applications



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Social Signal Processing

- **Social intelligence (humans):** Ability to **express and recognize social signals** / social behaviors from other **human individuals** in order to „function“ in a **society** with other **human individuals** in view of (pareto-)optimizing **own** and **other human's utility function** (survival, reproduction) via cooperation (modified from [1])
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Multi-Agent-Systems / Distributed AI
(we will not regard this wide field, see [2], [3])

Social Signal Processing for useful services



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SSP and Reality Mining

- **Reality Mining:** Field of study / application defined by Alex Pentland (MIT)
 - **Analyzing all available traces of human behavior** (social and also non-social)
 - → derive **models** for this behavior → **scientific knowledge** and **applications** (e.g. prediction)
 - special focus on „**non-virtual**“, „**direct**“, „**physical**“ behaviors recordable via **mobile sensors** (calling patterns, location, acceleration patterns etc.)
 - not excluded but not in main focus: large networks arising from long term social relations, analysis of communication content etc.
- Reality Mining may use SSP techniques



Where and how to use SSP techniques for improving services?

- **Socially smart environments:** examples:
 - **smart home:**
 - adapt env. to **short term individual context:** **individual emotional state** (tune light according to emotion)
 - caveat: not social!!** but: similar / same techniques may be used
 - **availability management:**
 - use **short term social context** detected / characterized via SSP: ++ **social situation** → modify volume of ringtone
 - **e-learning environments:**
 - react to social signals of pupils: ++ slow down, speed up, suggest a break



Social Signals and Behavioral Cues

- **Examples of Social Behavior:** Expressing attitude towards elements of a social setting:
 - Mirroring (if mutual attraction)
 - aggressive turn taking behavior
 - expression disapproval of sth. (e.g. via disapproving looks)
 - expression of sympathy / empathy
- **Examples for Behavioral Cues:**
 - facial expressions
 - body posture / interaction geometry
 - gestures
 - expressives (laughter etc.)
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Social Signals, Social Behavior, Behavioral Cues

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- Humans: perceived Social Behavior of other humans
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- **Non-verbal** social signalling + behavior: conveys / determines **most of social perception** of others (compared to e.g. **verbal content** (only 7%))



Social Signals and Behavioral Cues

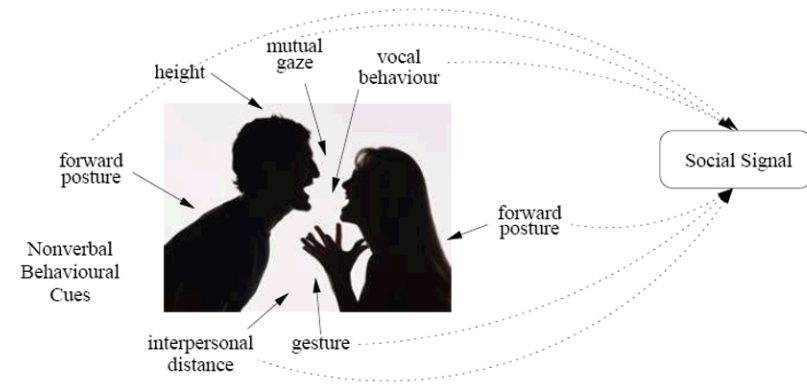


Fig. 1. Behavioural cues and social signals. Multiple behavioural cues (vocal behaviour, posture, mutual gaze, interpersonal distance, etc.) combine to produce a social signal (in this case aggressivity or disagreement) that is evident even if the picture shows only the silhouettes of the individuals involved in the interaction.

[1]



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- **Temporal domain**:
Social Signals + Behavioral Cues :
typically: microseconds to seconds
Social Behavior:
minutes to hours or longer

- **Types of „messages“** conveyed by Behavioral Cues:
 - *affective/attitudinal/cognitive states* (e.g. fear, joy, stress, disagreement, ambivalence and inattention),
 - *emblems* (culture-specific interactive signals like wink or thumbs up),
 - *(manipulators)* (actions used to act on objects in the environment or self-manipulative actions such as lip biting and scratching),
 - *illustrators* (actions accompanying speech such as finger pointing and raised eyebrows), and
 - *regulators* (conversational mediators such as the exchange of a look, palm pointing, head nods and smiles).

have direct verbal translation, people are aware of

adaptors:
involuntary, habitual, honest (e.g. folding arms, crossing away legs)

regulate turn taking and other conversational aspects

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	emotion	personality	status	dominance	persuasion	regulation	rapport (*)	speech analysis	computer vision	biometry
Physical appearance										
height			✓	✓					✓	✓
attractiveness		✓	✓	✓	✓		✓		✓	✓
body shape		✓		✓					✓	✓
Gesture and posture										
hand gestures	✓	✓			✓	✓	✓		✓	✓
posture	✓	✓	✓	✓	✓	✓	✓		✓	✓
walking		✓	✓	✓					✓	✓
Face and eyes behaviour										
facial expressions	✓	✓	✓	✓	✓	✓	✓		✓	✓
gaze behaviour	✓	✓	✓	✓	✓	✓	✓		✓	
focus of attention	✓	✓	✓	✓	✓	✓	✓		✓	
Vocal behaviour										
prosody	✓	✓		✓	✓		✓	✓		
turn taking	✓	✓	✓	✓		✓	✓	✓		
vocal outbursts	✓	✓		✓	✓	✓	✓	✓		
silence	✓	✓				✓	✓			
Space and Environment										
distance	✓	✓	✓		✓		✓		✓	
seating arrangement				✓	✓		✓		✓	

(*) mutual trust vs. distrust

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Physical Appearance

- „Implicit“ „Behavioral“ Cues / Social Signals

- natural characteristics (e.g. body shape)
- artificial characteristics (e.g. make up)

- Especially important for attractiveness → halo effect (“what is beautiful is good”);
- other example of effect mechanism: height, sematotype → power, influence, strength

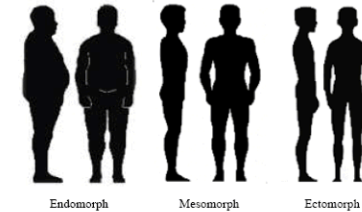


Fig. 2. Somatotypes. The figure shows the three body shapes that tend to elicit the perception of specific personality traits. [1]



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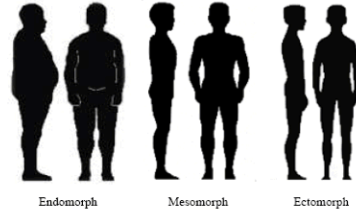


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Gestures and Posture

• **Posture**: very important Behavioral cues: considered as among the **most reliable** cues about **actual social attitude** towards (elements of) a social setting

• (partly overlapping) **Classification** axes for **postures in interactive social settings**:

- Inclusive vs exclusive postures
- relative body orientation
- congruent vs incongruent (→ mirroring)



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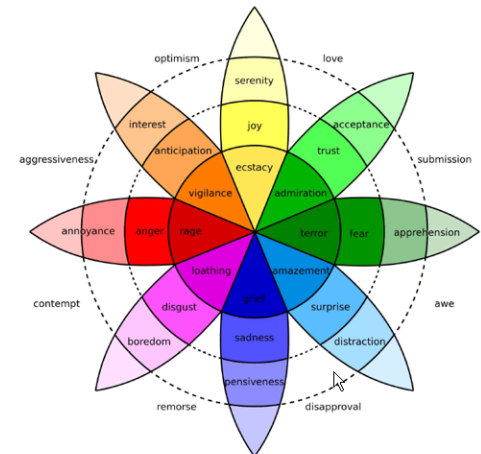
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Emotion Encoding Systems

• System to describe (basic) **message**: **6 basis emotions (Ekman)**: fear, sadness, happiness, anger, disgust, surprise

• **Plutchik's Wheel of Emotion**:



Plutchik's Wheel of Emotion. Source: [Plutchik, 2012; in (1)] slide-set: Social Games

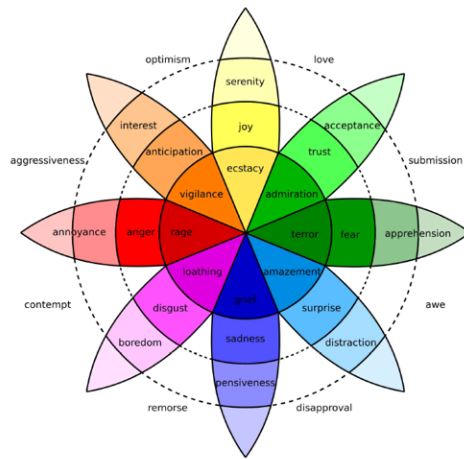




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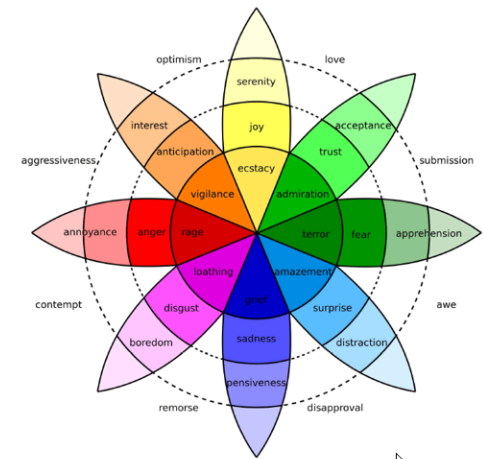
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slide-set: Social Games



Face and Eye Behavior

- **Example studies**: FACS patterns → social signals / individual states: recognition of
 - **basic emotions**
 - **cognitive states** like interest and puzzlement
 - **psychological states** like suicidal depression or pain
 - **social behavior aspects** like rapport (mutual trust vs. distrust),
 - **personality traits** like extraversion and temperament
 - **social signals** : e.g. status, trustworthiness, emblems (wink, thumbs up, etc.), regulators (conversational mediators like nod and gaze exchange) illustrators (accompanying speech (e.g. raised eyebrows))



Vocal Behavior

- **Voice quality** (Prosody): (e.g. pitch, tempo, energy): examples:
 - anger, fear → energy peaks
 - pitch → perception of dominance or extroversion
 - pitch accents, changes in energy: structure or emphasize sth.
- **Linguistic vocalizations** (Segregates): "non-words": e.g. "ah", "äh", "umh", etc.: examples:
 - prolonged "äääähm" → embarrassment / feeling uncomfortable in social situation
 - → backchanneling (attention, agreement, wonder etc.)
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Vocal Behavior

- **Silence patterns**:
 - **hesitation silence**: (e.g. ← explaining difficult concepts)
 - **psycholinguistic silence**: ← (language) en-/de-coding difficulties
 - **interactive silence**: expressing respect, doubt, ignoring persons, attract attention to other forms of communication (e.g. gazes)
- **Turn-Taking**:
 - **regulation of conversations**:
 - maintaining, yielding, denying or requesting the turn
 - ← gaze, voice quality changes, linguistic vocalizations (as backchannelling) at transition relevant points
 - **coordination of speaker transitions**:
 - aspects: awkward silence, overlapping speech (normal ~ 5-10%)



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Space and Environment

Interpersonal distances (Hall):

Proxemics:

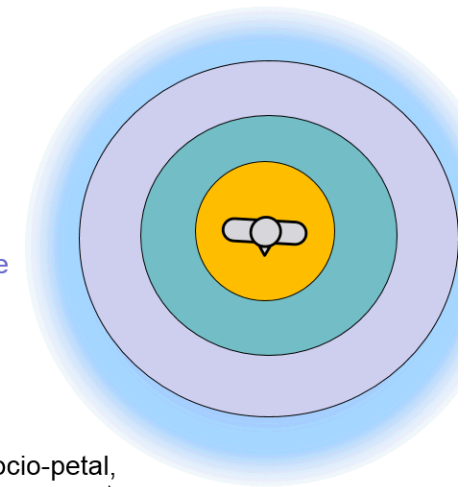
- [0, 0.5] m : intimate zone
- [0.5, 1.2] m: casual-personal zone
- [1.0, 2.0] m: socio-consultative zone
- [2.0, ∞] m: public zone

- Other influences
social context:

architectural environment (socio-petal, socio-fugal forces (Watson) (see [4])), density, gender, etc.

individual context:

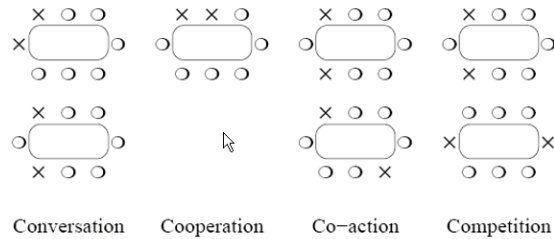
culture, age, self-esteem, disabilities,





Space and Environment

- Seating arrangements \leftrightarrow personality (dominance etc.), social status



Social Signal Processing Chain

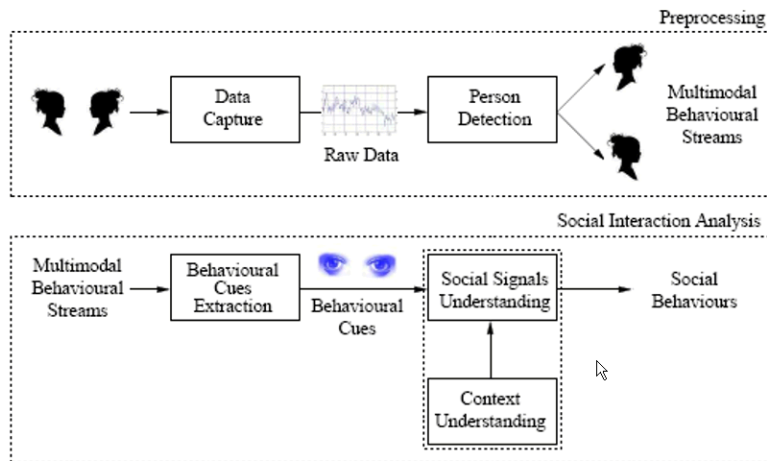


Fig. 6. Machine analysis of social signals and behaviours: a general scheme. The process includes two main stages: The *preprocessing*, takes as input the recordings of social interaction and gives as output the multimodal behavioural streams associated with each person. The *social interaction analysis* maps the multimodal behavioural streams into social signals and social behaviours. [1]



Social Signal Processing Chain

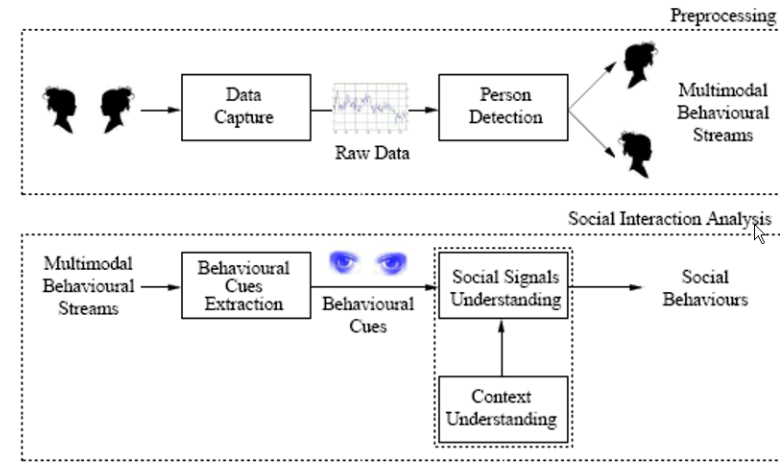


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Data Capture

- **Infrastructure sensors:** (single or multiple) fixed cameras and / or microphones, Kinect devices,
- **Mobile sensors:** e.g. in mobile phones: GPS, accelerometer, gyroscopes, eye tracker glasses, pulse-meters, EEG devices, etc.
- **Issues:**
 - Privacy + scientific ethics („principle of informed consent“)
 - passiveness / unobtrusiveness of sensors





“**Speaker Diarization / Segmentation**“: given multi-party audio data (possibly with background noise):

→ **who talks when?**

- **Typically 3 steps:**

- segmentation into speech / non-speech
- detection of speaker transitions
- clustering of speaker segments (+ classification of speaker)

- **Segmentation into speech / non-speech:**

- **Generate features:**

- ++ digital signal (pre-) processing
(involving e.g. sub-division signal into overlapping samples of typically several ms, Fourier-transform etc.)
- ++ MEL filters → MEL cepstrum coefficients
- ++ Further Fourier- and other transformations
- ++ additional features: zero-crossing rates, energy statistics etc.

