

MOBILE HCI'09 WORKSHOP
"Measuring Mobile Emotions: Measuring the
Impossible?"

Possibilities of Psychophysiology for Measuring Emotional Aspects in Mobile Motion Contexts

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„Measuring“ Mobile Emotion

Quantitative approach based on the **processing of psychophysiological signals**:

- Recording of physiological stimulus related processes
- Processing the difference to Pre Stimulus Baseline
- Comparing with results from subjective reports
- Conclusion on affective reactions

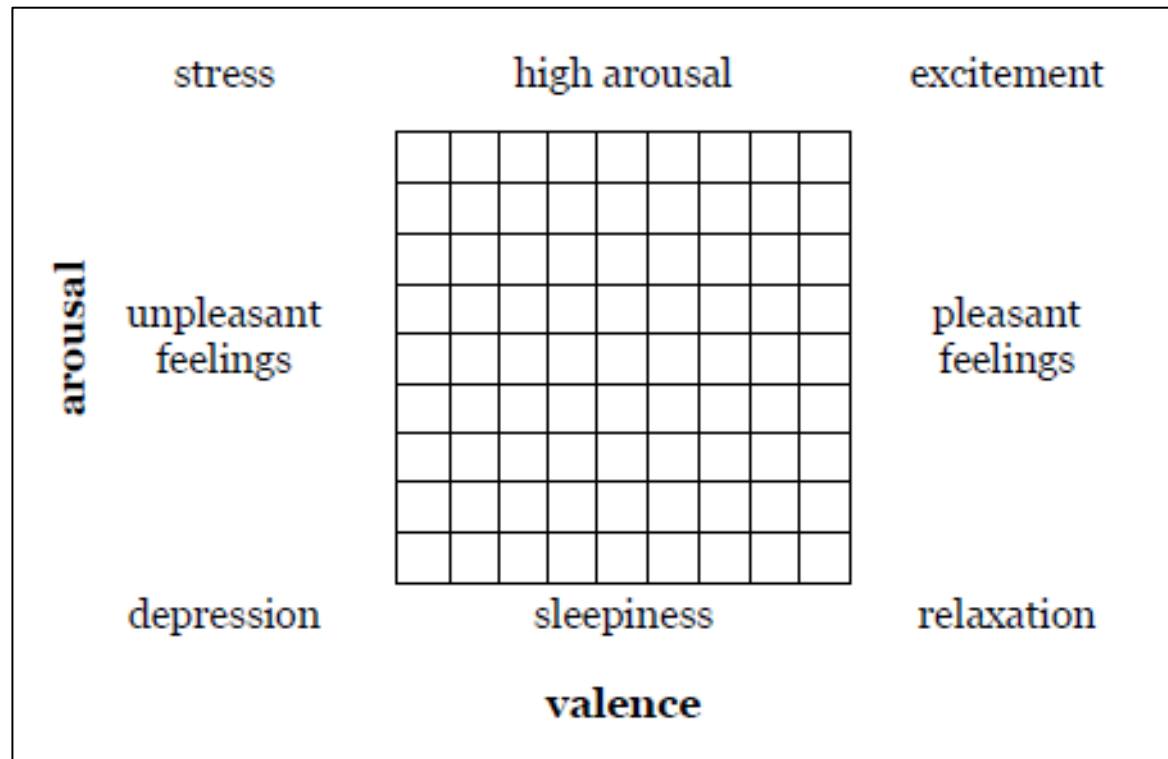


„Measuring“ Mobile Emotion

Concepts of emotion dimensions (Lang)

Valence (positive/ negative emotion)

Arousal (strong/ weak emotion)



Advantages of Psychophysiology in mobile UX

- **„Objective“ Method** to access valence and arousal in mobile contexts
- **Data throughout the evaluation** → summarized analysis
- Accessing **emotional responses to certain events**.
- **Complement/ Correlate with other evaluation methods** such as questionnaires, interviews, EmoFaces, etc.



Psychophysiological Methods used for Study

- **Electromyography (EMG)** - Valence
- **Electrodermal activity (EDA)** - Arousal
- **Respiration** - Arousal



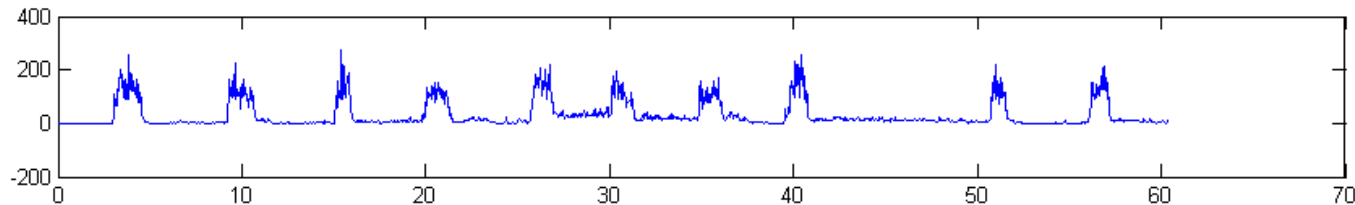
Electromyography (EMG)

- **Recording of muscular activity** (microvolt) by detecting surface voltage during contraction of selected muscles
- used in mobile UX evaluation context to **measure valence**
 - Positive Emotions
 - Negative Emotions
- Signal amplitude (treshold setting) and frequency are used for parameter extraction.

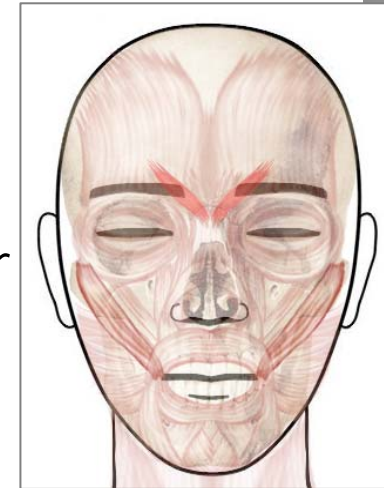
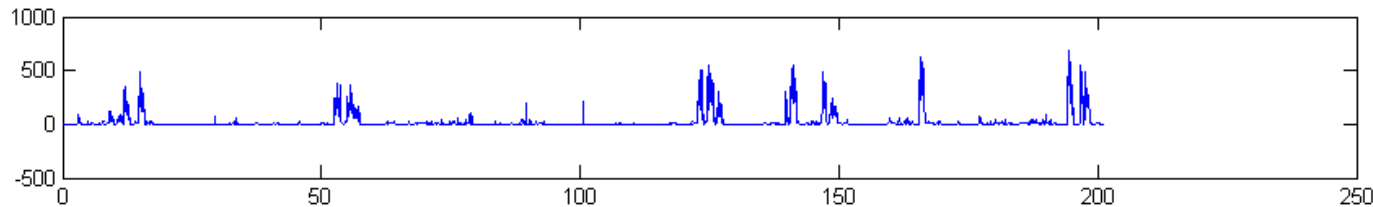


Facial EMG & Pleasure

- *Currogator supercillii* activated while frowning as indicator for **negative** emotion



- *Zygomaticus major* activated while laughing as indicator for **positive** emotion



(verified with Facial Action Coding System (FACS, Ekman & Friesen, 1978))

Electromyography (EMG)

Strength

- Objective
- Reliable
- Valid in mobile contexts, as signals are not inferred by movement

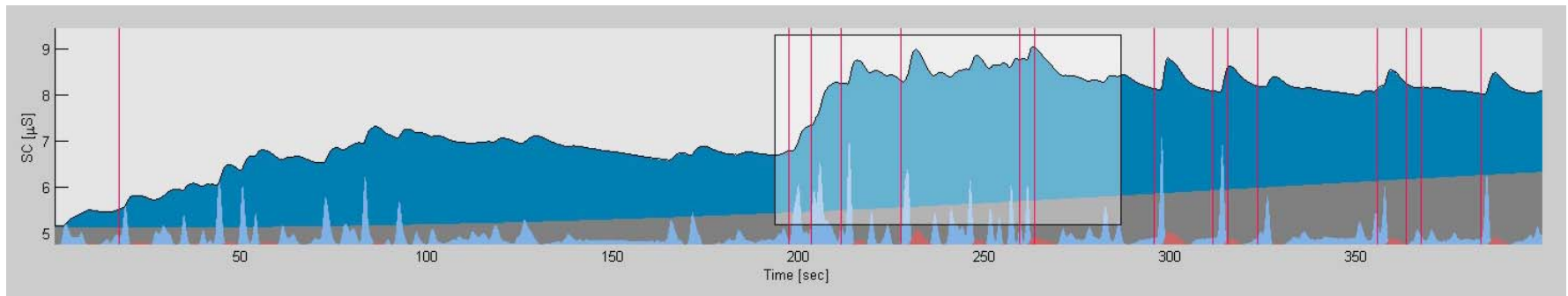
Disadvantages

- No indication which emotion experienced (joy, challenge...)
- Obtrusive, electrode applications in the face
- Ambiguous results on validation



Electrodermal activity (EDA)

- Recording of **spontaneous fluctuations** in skin conductance level (Microsiemens) due to adapting activities of the eccrine sweat glands
- **Skin conductance level (phasic activity)** is correlated to arousal
 - increasing skin conductance response following emotional stimulation
 - Cognitive activity



Grey area indicates skin conductance level (Source: <http://ledalab.de>)

Electrodermal activity (EDA)

- **Strength**
 - proven to be **viable indicator for arousal**
- **Disadvantages**
 - Obstrusive for tasks with both hands
 - Intermitting variables (temperature, humidity, movements)
 - Difficult to differentiate between arousal resulting from motion of participant or emotional experience.

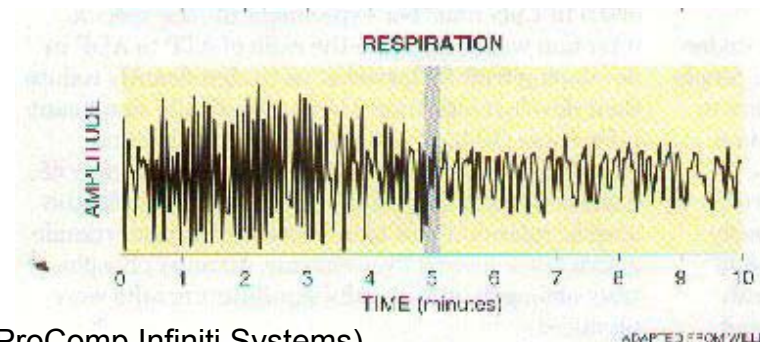


Respiration

- Recording of the respiration rate (RespRate) and deep of breath (RespAmp) with **stretch-sensor** around the chest
- Emotional **arousal increases respiration** rate
- **Rest/ relaxation decreases respiration** rate
- **Higher respiratory** rate and **irregular rhythm** as indicators for **negative emotions** (Stern et al., 2001)



Stretch Sensors (ProComp Infiniti Systems)



Respiration

- **Strength**
 - proven to be **viable indicator for arousal**
- **Disadvantages**
 - Talking alters respiration rate
 - Difficult to differentiate between respiration arousal resulting from motion of participant or emotional experience.



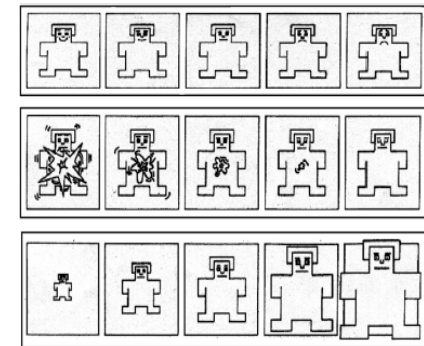
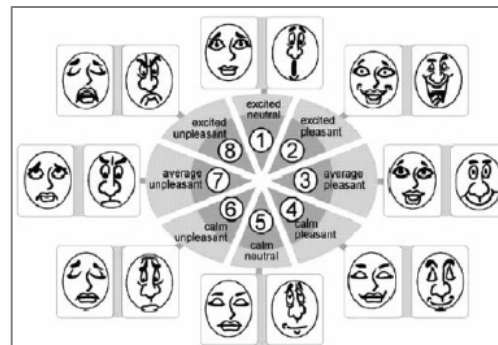
Multimethod approach: self reports

Subjective reports offer additional qualitative information

- **Verbal reports:** interviews, self-reporting, etc.
- **Non-verbal reports:**

EmoFaces showing a certain affective state. Interpretation of the physiognomy as consistent among different cultures (Desmet, 2004)

- Self Assessment Manikin, SAM (Bradley & Lang)
- PRemo
- Emocards



Psychophysiology for mobile context as a great challenge (1)

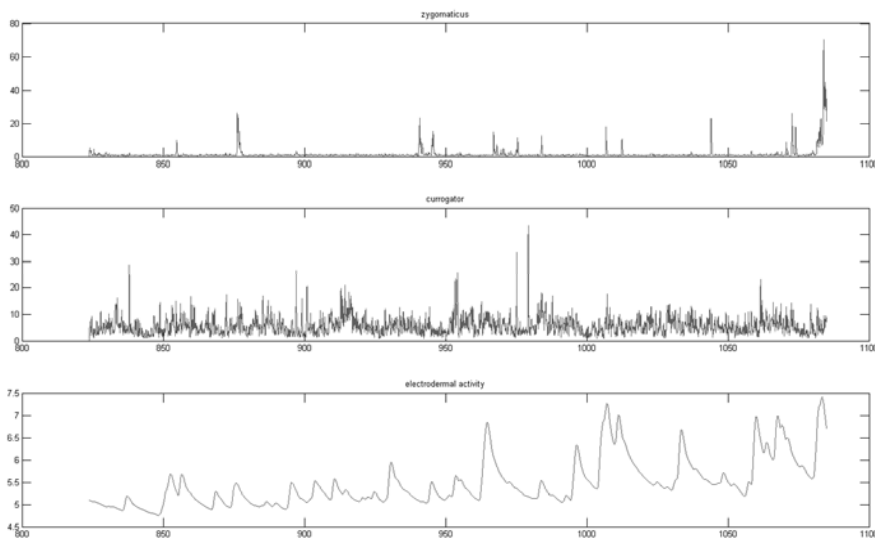
- **Movement** of participants can **alter the signal** correctness
- **Temperature, humidity and time of the day** can **vary** signals greatly and change respectively for a mobile context
- **Setting up with electrodes** of the participant can be **perceived as weird in public** spaces and therefore alter the results.



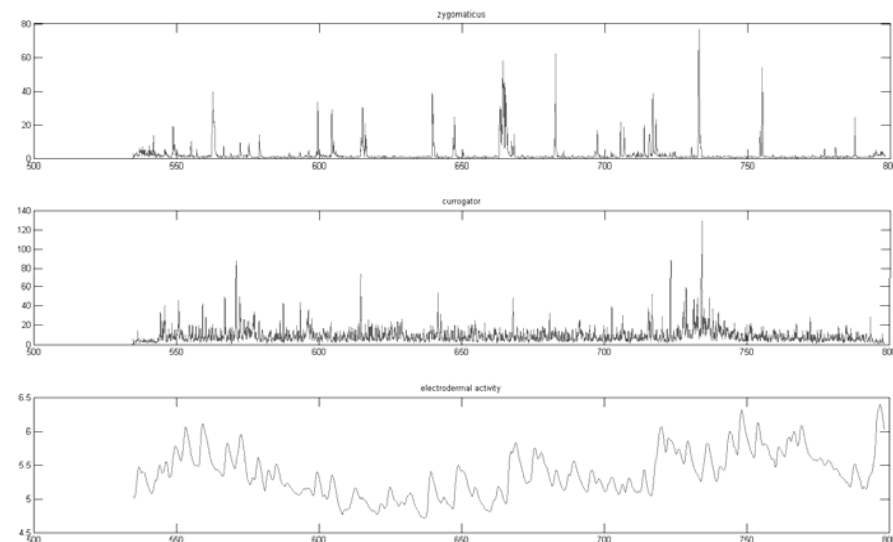
Psychophysiology for mobile context as a great challenge (2)

- Great challenge to differ between resulting signals coming from movement or from heightened arousal:

Zygomaticus, Currogator and Electrodermal Activity with participant sitting.



Zygomaticus, Currogator and Electrodermal Activity with participant moving



Summary (1)

- Need for **valid psychophysiological methods** for determining arousal of **participants that are in motion**.
- **Correlate** subjective reports with objective data
- Psychophysiological data allows **recording during interaction** and **real time processing** is technically possible.



Summary (2)

- **Clarifying applicabilities** in mobile emotion measurement
- **Synchronizing metrics** for easy data processing/ interpretation
- **Reducing obtrusiveness** (wearables, smart shirt)



Sensatex smart shirt

Thank you!



Laboratory Artifacts...



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