Affective Computing for Subjective Video Quality Assessment

Project Work: Facial Expression Recognition

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Overview

- Motivation
- Modification
- Related Work
- FER Model
- Challenges
- Future Work

Motivation

Affective Computing
- broad range of applications (applications in multimedia, social networks, aiding autism and more)
- shifts subjective field to objective perspective

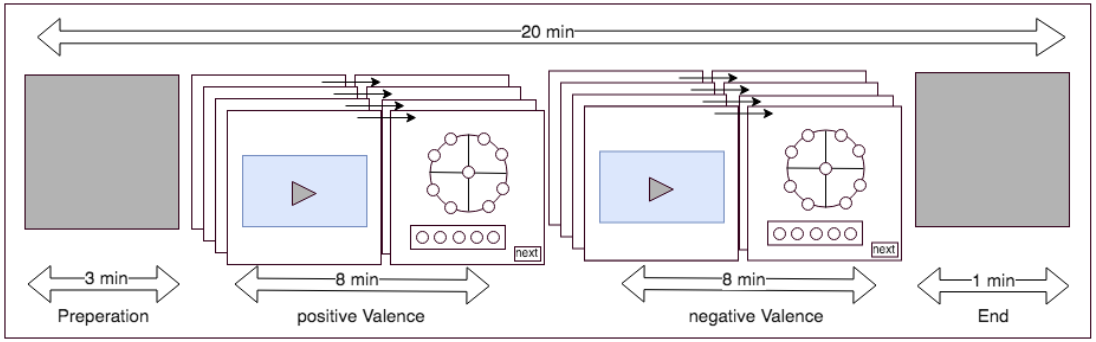
Facial Expression Recognition
- feasible, intuitive model with non-contact sensors
- small gap between observation and stimulation

Modification

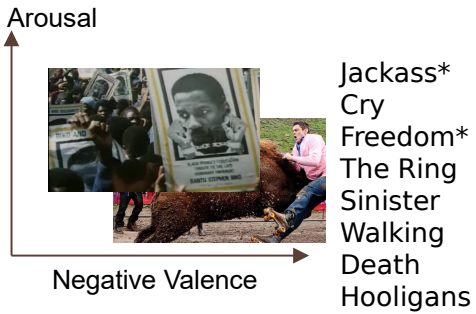
- Video Stimuli with higher arousal (manually labelled)
- Extend valence-arousal model by unipolar valence axis with separated positive and negative scales
- No field of different quality levels

Modification

Modified Video Stimuli Arousal-Valence Model



Tarzan*
Kevin Hart
The Lion King
Whose Line
is it
Anyway??



Jackass*
Cry
Freedom*
The Ring
Sinister
Walking
Death
Hooligans

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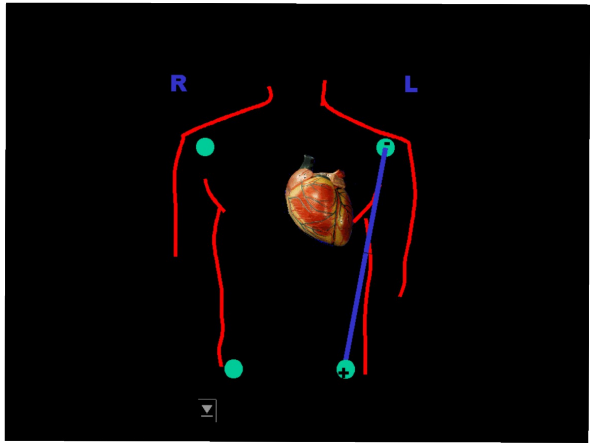
* See Egon L. van den Broeck[1]

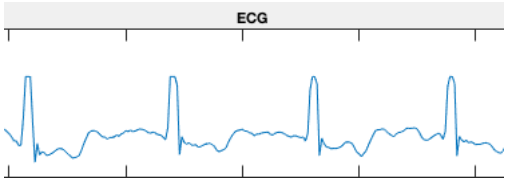
Modification

Bio-Sensors

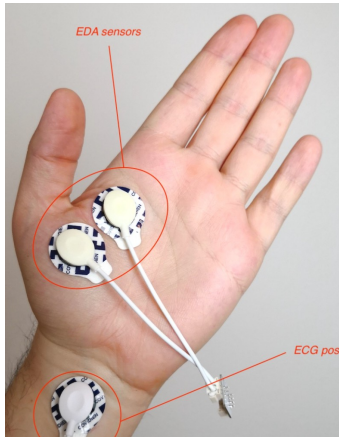
ECG – three channels



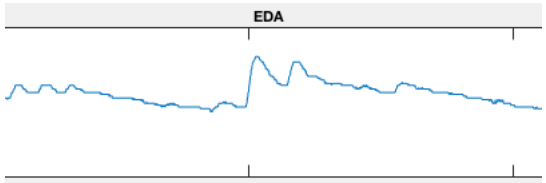
Source: ECG Primer: The Lead of a ECG*



EDA – two channels



Source: Collaboration with Berlin



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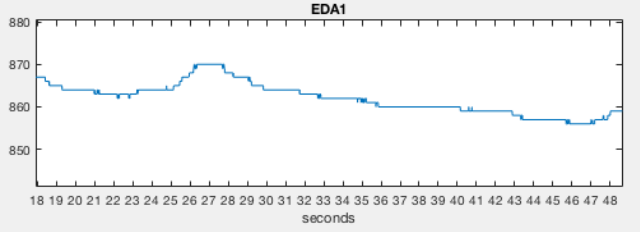
*Source: https://courses.kcumb.edu/physio/ecg%20primer/ecgleads.htm

Modification

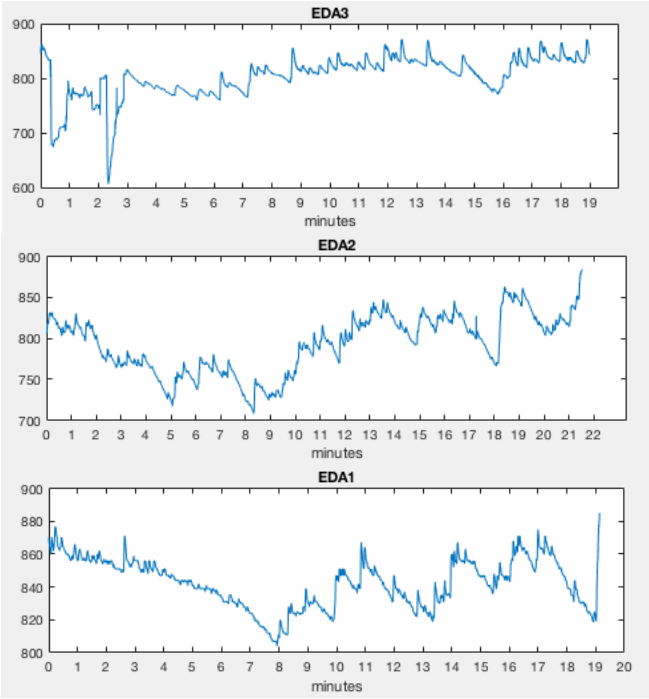
Do they work?

EMG

- good to address mood
- evolution clear viewable
- even in small time frames



Raw Data



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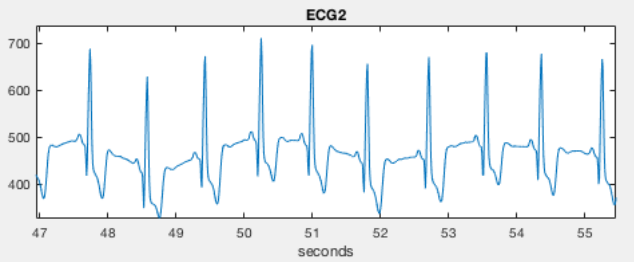
Modification

Do they work?

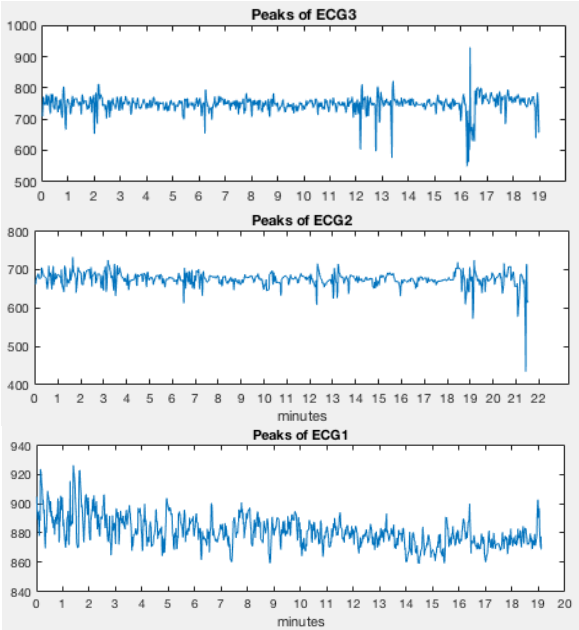
ECG

- now: Analysis of peaks
- peaks more or less constant
- open: Heart-Beat-Rate

  (see group 2)



Raw Data



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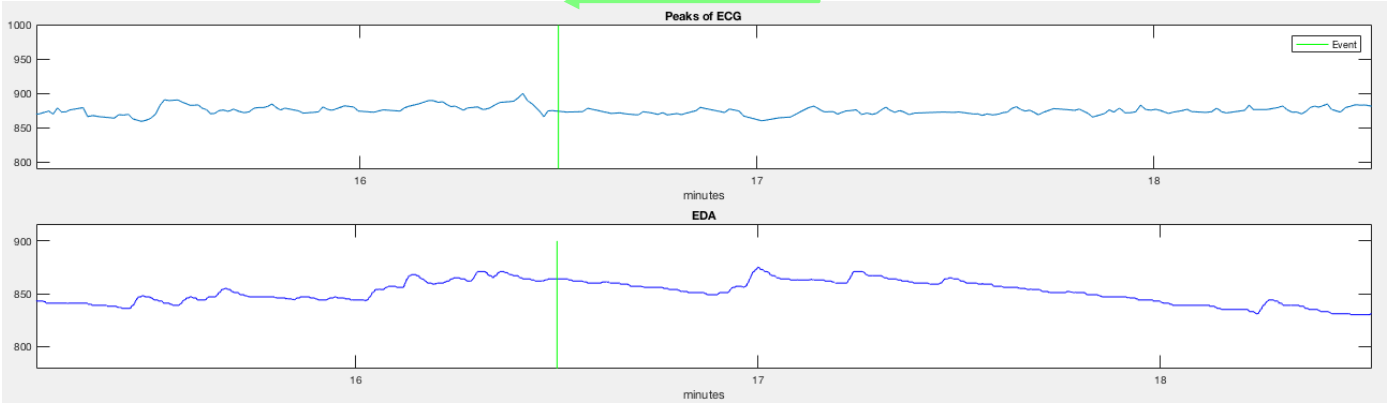
Modification

Does it work?

Stimulus: Disgust (negative)



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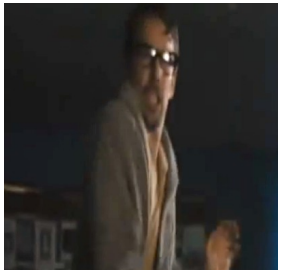
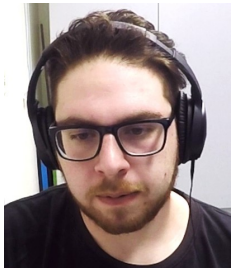
Modification

Does it work?

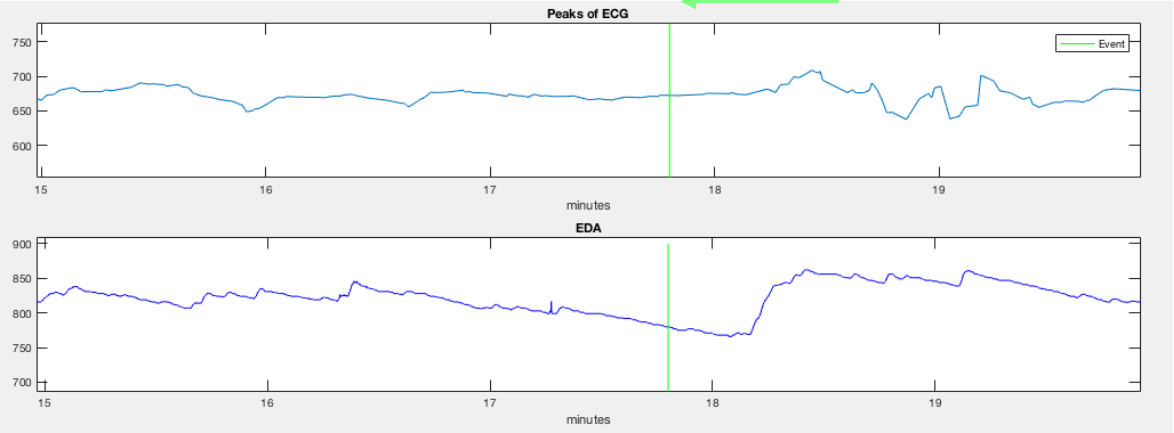
Stimulus: Surprised (negative)



Stimuli



FER



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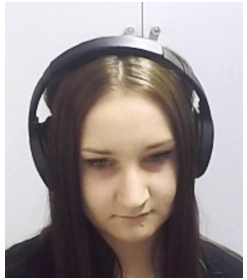
Modification

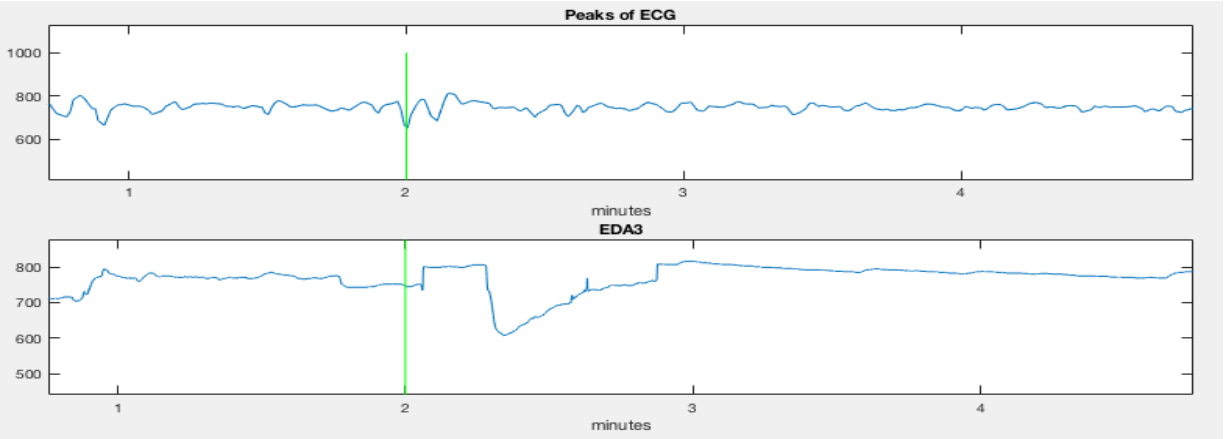
Does it work?

Stimulus: Sad (positive)

Stimuli



FER



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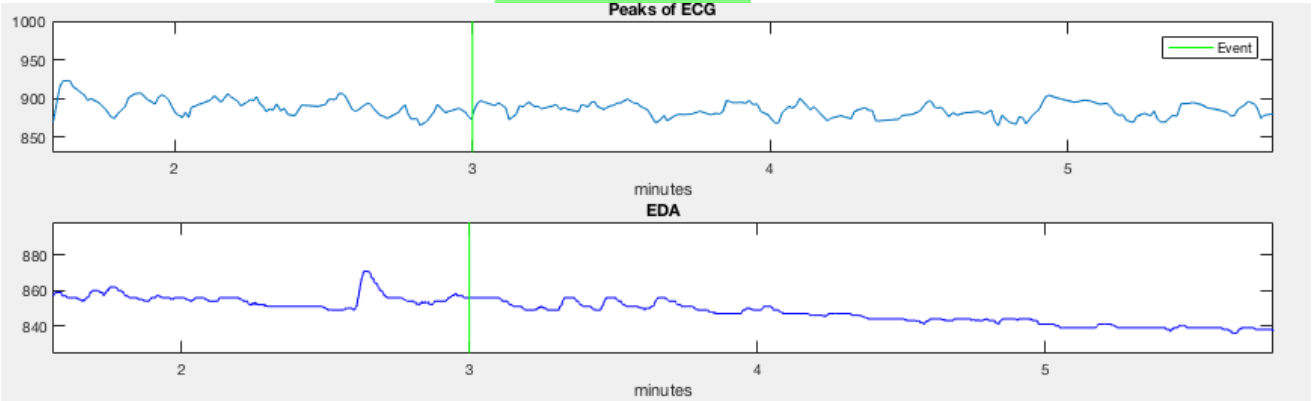
Modification

Does they work?

Stimulus: Happy (positive)

Stimuli

FER



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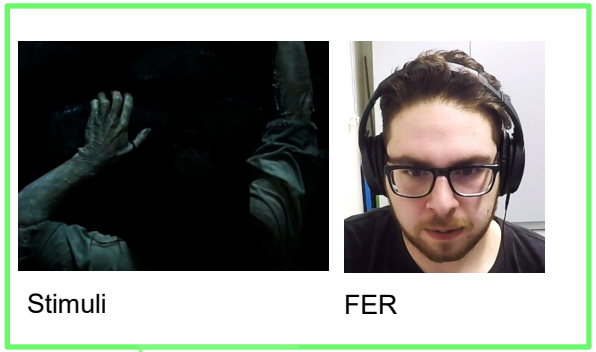
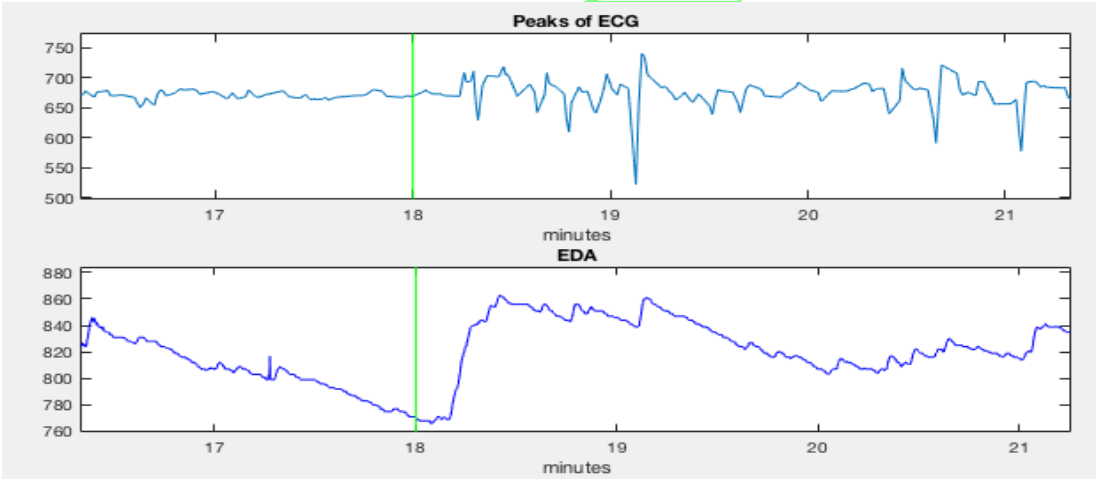
Modification

Does it work?

Stimulus: fear (positive)





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Modification

Does it work?

Sometimes!

- High reactions in bio-data can mirror FER i.e sad
- No significant reactions in bio-data but good visual results i.e disgust
- No reactions in bio-sensor whether visually (very often) i.e anger

May Bio-sensor and FER approach benefit from each other???
[later]

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*Source: https://courses.kcumb.edu/physio/ecg%20primer/ecgleads.htm

Related Work

Comparison

Effects of positive and negative affect on electromyographic activity over zygomaticus major and corrugator supercilii [4]

- Affective processes are organized in a more bipolar fashion and have reciprocal effects on facial EMG measures , taken over

Affective Signal Processing: Unraveling the mystery of emotions [1]

- Same Valence-Arousal framework
- Similar assessment, same sensors

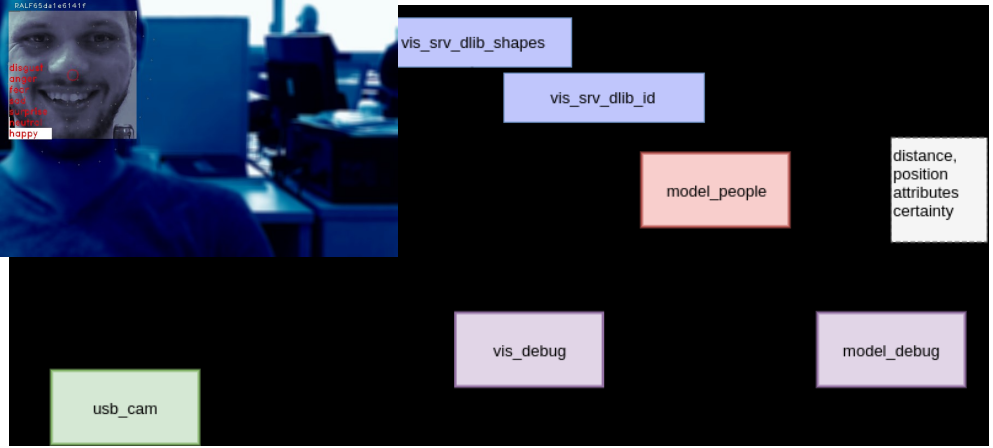
Result: ECG suitable and EDA good to address mood, similar results

Challenges and Perspectives for Affective Analysis in Multimedia [3]

- Capturing of the true emotions
- Trade-off in data collection (clarity, validity)
- Aesthetics are closely related to natural responses, mostly

FER Model

ROS people model



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- **FER Model**
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Models

- Max Accuracy 60%
- Noisy data: Kaggle FER2013
- Tried many models (maybe too many)
- 7 emotions

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Challenges

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Future Work

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Future Work

Outlook

- Need of a clear definition for affective terminology for each aim[3]
- Crowdsourcing and wearables for data collection[3]
- String influence of machine learning methods

References:

[1] Affective Signal Processing: Unraveling the mystery of emotions, Ph.D.-thesis, Wenen, Oostenrijk, Egon L. van den Broeck, 2011

[2] ROS people model, Github project by elggem https://github.com/elggem/ros_peoplemodel

[3] Guest Editorial: Challenges and Perspectives for Affective Analysis in Multimedia, Mohammad Soleymani, Yi-Hsuan Yang, Member, Go Irie, Member and Alan Hanjalic, IEEE TRANSACTIONS ON AFFECTIVE COMPUTING, VOL. 6, NO. 3, july-september 2015

References:

[4] Effects of positive and negative affect on electromyographic activity over zygomaticus major and corrugator supercilii, J. T. Larsen, C. J. Norris, and J. T. Cacioppo., Psychophysiology, 40:776–785, 2003.