DETECTION OF USABILITY MISTAKES BY MEASURING EMOTIONS WITH EEG AND FACIAL EXPRESSIONS

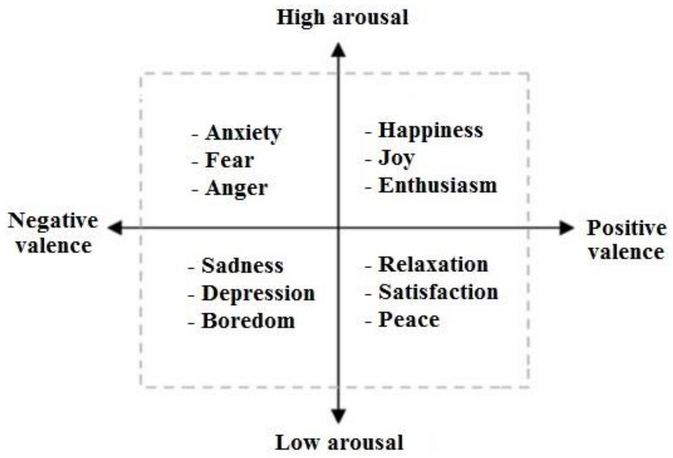
Elena Štefancová, xstefancovae@stuba.sk, Supervisor: Róbert Móro

EMOTIONS

Dimensions of emotions:
- valence – how positive the emotion is,
- arousal – strength of an emotion,
- tension – how tense the person is.

Commonly is used only two dimensional model (valence, arousal).

Our primary concern is detection of changes of emotions caused by a level of usability.



EXPERIMENT

User Experience and Interaction Research Centre at FIIT STU in Bratislava
22 participants, 8 tasks on the same webpage (eshop) for every participant

Test scenario

1. Pupil calibration (by Tomáš Juhaniak)
2. General questionnaire (age, sex, Internet skills...)
3. For every task: Instructions, task, questionnaire

Order of tasks is counterbalanced by *Williams Design*

Tasks

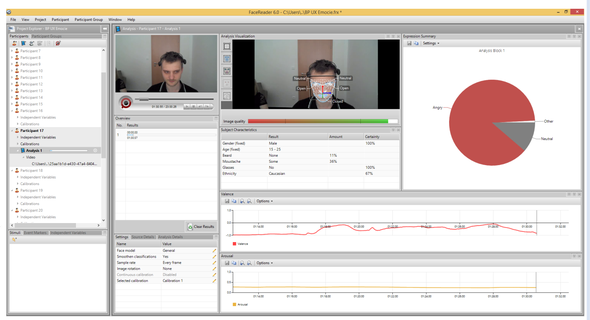
Total amount of tasks was 8.
Four of them contained inserted errors of usability.

Task questionnaire

How intensive emotions did you feel?
How positive emotions did you feel?
What was the strongest emotion you felt?

EMOTION DETECTION

Data obtained in the experiment:
- raw EEG from EMOTIV Epoc device,
- videos of participants from a web camera,
- experiment orchestration using Tobii Studio.



Processing of video

- Facial expressions analysed by Noldus FaceReader

Output: valence and arousal in time

Processing of EEG

- Combination of signal gained by non-invasive surface electrodes

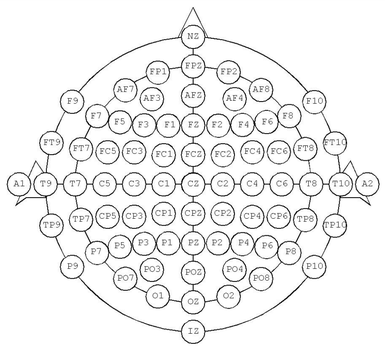
Output: Alpha and Beta waves of a brain

- Application of thse two formulas*

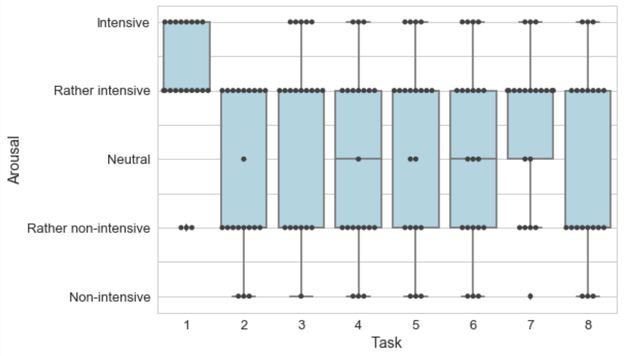
$$Arousal = \frac{\alpha(AF3 + AF4 + F3 + F4)}{\beta(AF3 + AF4 + F3 + F4)}$$

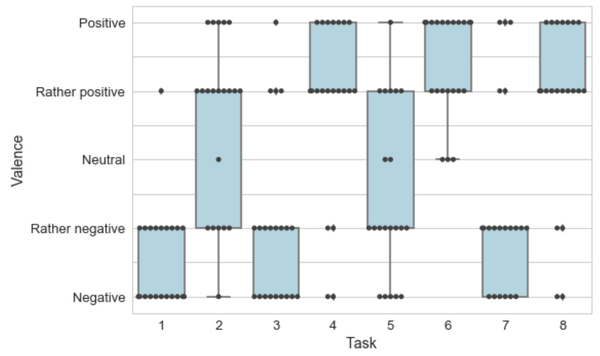
$$Valence = \frac{\alpha(F4)}{\beta(F4)} - \frac{\alpha(F3)}{\beta(F3)}$$

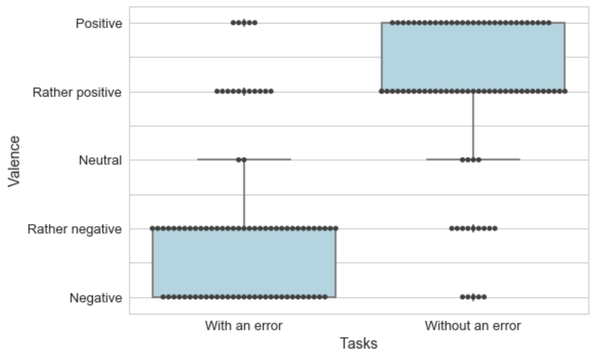
Output: valence and arousal in time

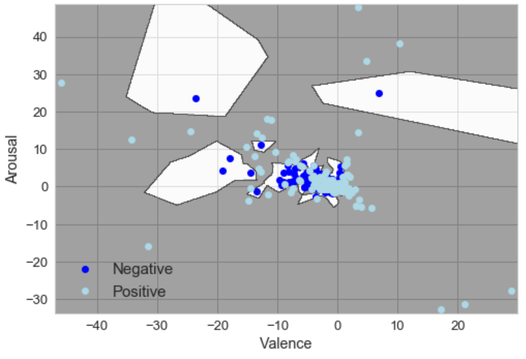


RESULTS









*Hayfa Blaiech, Mohamed Neji, Ali Wali, and Adel M Alimi. Emotion recognition by analysis of EEG signals. In 13th International Conference on Hybrid Intelligent Systems (HIS 2013), pages 312–318. IEEE, dec 2013.