Social inclusion in eParticipation and eGovernment solutions: A systematic laboratory-experimental approach using objective psychophysiological measures

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According to the WHO, about 1 billion people worldwide are disabled. There is no doubt that low access barriers and high usability of eGovernment solutions are essential for the social inclusion of these people. Accordingly there is a long research track concerning usability investigations for disabled persons. However, almost all studies have conducted subjective measurement methods such as observations and questionnaires. In this poster I sketch an approach using electroencephalogram (EEG), electrodermal-activity (EDA) and eye-tracking data representing objective psychophysiological measures in order to study the user–eGovernment solution interactions (fig. 1).

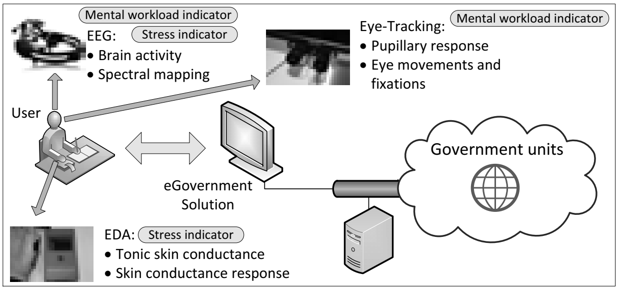

Figure 1: Laboratory setting to analyze the user–eGovernment solution interaction

Following the fundamental investigations of Kahneman and colleagues [KB66, BW78], the amount of a user's mental workload clearly corresponds to pupillary dilation. In addition, eye movements also indicate a user's mental workload level: Since long eye fixations (>500 msec) indicate a deeper cognitive processing, mental workload is clearly positively correlated with the frequency of long fixations but negatively correlated with the saccade speed, e.g. [Ray98]. I successfully replicated the studies of Kahneman and colleagues [KB66, BW78, Ray98], but with modern eye-tracking technology using the binocular double Eyegaze Edge™ System eye-tracker (fig. 1).

To analyze the brain activity EEG signals are captured using the 14 point Emotiv neuroheadset system. Based on spectral analyses (fourier transformation) I derived both mental workload as well as stress indicators from the EEG spectrum, e.g. [RC85].

In order to capture objective stress indicators [Bou12], I use the MentalBioScreen K3 device, which traces participants' EDA value every second. Therefore, two sensors (ECG electrodes) are applied to the non-dominant hand of the participant and in this way I can successfully capture typical stress-related events (figure 2).

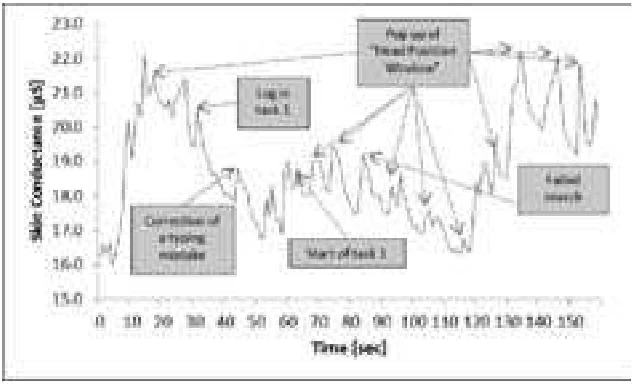

Figure 2: Skin conductance response as stress indicator

In all pretests we could successfully replicate task-evoked mental workload and stress reactions indicated by the objective psychophysiological measures from EEG, EDA and eye-tracking data [Bue13, EMB12]. Based on these pretests, in the future I aim to conduct a large study within the laboratory experiment as sketched in figure 1 to analyze the user–eGovernment solution interaction of disabled people.

References

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