

Physiological measures as indicators of mental state relevant in driving

Physiological measures potentially provide us with continuous information about a driver's mental state. This is especially interesting in the light of automated driving where the continuous communication between human and machine through using gas pedal, braking and steering is disappearing. Automated actions (such as braking by an Adaptive Cruise Control (ACC) system to reach a slower speed) are performed in the same way, regardless of driver state. Psychophysiology may help us to preserve the link between driver and vehicle. In a real driving experiment, we had a car decelerate either strongly or softly in response to activating the ACC, which was either according to expectation or not. While no effects were found of whether a type of braking was expected or not, we did find effects on ERPs, heart rate and blink duration of whether the expected type of braking was strong or soft. Patterns were consistent with a higher state of arousal or attention for strong compared to soft expected braking. For ERPs, we demonstrated a 63% single trial classification accuracy distinguishing strong from soft expected braking. We conclude that for ACC behavior that is relevant for the driver, the physiological variables may be used as a source of information about mental state elicited by the ACC. Using other examples from our lab, I will further elaborate on challenges and opportunities in the field of mental state monitoring in real life.

Prof.dr. Jan B.F. van Erp
Human Media Interaction
Computer Science, University of Twente