

# Challenges of subliminal information displays in the car-context

Andreas Riener

Johannes Kepler University Linz, Institute for Pervasive Computing  
Altenberger Strasse 69, 4040 Linz, Austria  
E-Mail: riener@pervasive.jku.at, Tel. +43(0)732-2468-1432

## ABSTRACT

To cope with the rising volume of information in vehicular interfaces, explicit and attentive interaction is more and more replaced by implicit means of information exchange. This trend, supported by context- and activity-aware assistance systems, is still ongoing, requiring further solutions for reducing a driver's cognitive load or level of attention. Subliminal interaction techniques are considered a promising approach to deliver information or warning signals to the driver without causing any supplementary workload.

This poster aims at discussing the potential of subliminal (or subconscious) perception to improve the information flow for vehicle-to-driver interaction, and to specify research questions around this topic.

## Keywords

Subliminal perception, HCI, Vehicle-driver feedback, Cognitive load, Subconscious driver stimulation

## 1. MOTIVATION AND APPROACH

Due to the limited cognitive resources of a driver and an ever increasing level of attention required for vehicle operation, available solutions (e. g. multimodal, implicit operation) hit their limits, demanding for new ways and means of preventing information overload. (Cognitive) overload occurs when task difficulty exceeds resources available by the driver – in this case driving performance and also safety starts to decline. It has to be pointed out that it would be almost impossible to determine the exact point where cognitive overload is detected (Figure 1, red dashed area). One possible reason is that the driver tends to alter his/her task management e. g. by delaying, excluding or omitting certain elements. An example of the first mentioned point is, that drivers decrease their speed when engaged in side activities [4, p. 338].

Information and warning signals delivered subliminally or subconsciously to the driver (here, both terms are used interchangeably as they are, for the purpose of this work, similar enough, both referring to the effect of *perception beneath the level of perception*) is a very encouraging approach and will be discussed in-depth in this poster. Subliminal information processing raises the question of “*How good is the mind at extracting meaning from stimuli of which one is not consciously aware?*” [2]; nevertheless, it is generally accepted that such stimuli from outside are weak and presented at low intensity [1].

Copyright held by author(s).

AutomotiveUI'10, November 11-12, 2010, Pittsburgh, Pennsylvania.  
Adjunct Proceedings

With this poster we would like to invite other researchers to take part in in-depth discussion of this timely, relevant, and important field of research with the aim to finally improve driving performance, comfort and increase road safety. In particular, we are interested in subliminal stimuli delivered (i) visually via head-up displays or (ii) tactile with actuators embedded into controls of the vehicle, both not perceivable to the conscious psyche but sensible/interpretable to the subconscious mind. Evidenced assertions about the

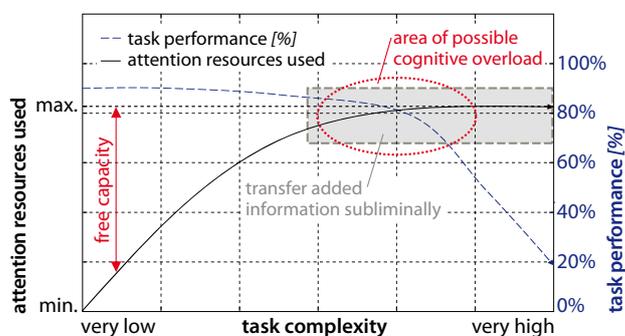


Figure 1: Relationship between cognitive resources and task performance [3, p. 57]. The red dashed oval indicates an area with possible appearance of cognitive overload (task performance starts to decrease).

applicability of information delivered below the threshold of perception will be of great value since it will open completely new ways to improve driving safety and convenience, and to reduce traffic accidents and deaths. This focus and the aimed results do not occur without reason, as it is one of the biggest challenges and objectives in the car domain, defined, for instance, in the sustainable mobility 2030 (WBCSD) directive. The proposed utilization of subconsciously delivered information would cover these issues, as driving would be much safer when the driver is less demanded.

## 2. REFERENCES

- [1] J. A. Bargh and E. Morsella. The unconscious mind. *Perspectives on Psychological Science*, 6(1):73–79, 2008.
- [2] A. G. Greenwald, E. S. Schuh, and M. R. Klinger. Activation by marginally perceptible (“subliminal”) stimuli: Dissociation of unconscious from conscious cognition. *Journal of Experimental Psychology: General*, 124:22–42, 1995.
- [3] C. J. Patten. *Cognitive Workload and the Driver: Understanding the Effects of Cognitive Workload on Driving from an Human Information Processing Perspective*. PhD thesis, Dept. of Psychology, Stockholm University, Sweden, 2007.
- [4] K. Young, J. D. Lee, and M. A. Regan, editors. *Driver Distraction: Theory, Effects, and Mitigation*. CRC Press, October 15, 2008. ISBN: 978-0849374265.