

## **HFES-Europe Chapter Annual Meeting 2014**

### **Authors:**

Robert Kaul, Firas Lethaus, Uwe Drewitz, Meike Jipp

### **Affiliation:**

German Aerospace Center (DLR)

### **Title:**

Drivers' cognitive retrieval of traffic participants at intersections during automated driving: The empirical impact on Intersection-Assistance systems development

### **Abstract:**

A correct spatial representation of traffic participants surrounding the driver is an essential part of drivers' mental models. Adequate situation models are required at complex intersections to support adequate driver responses. When approaching an intersection, attentional resources are needed for the correct construction of spatial representations. These resources play a major role in encoding and retrieval of correct traffic configurations from working memory. During left- and right-turns with crossing traffic, cognitive load can be high, binding attentional resources. Bound attentional resources may impair the retrieval of spatial representations, resulting in incompletely updated situation models. An experiment was conducted in order to investigate the cognitive processes involved in the retrieval of spatial intersection information and the subsequent update of drivers' mental representations. In an automated-driving scenario the participants were approaching urban intersections, while solving demanding secondary tasks. After reaching the intersection, participants had to retrieve their spatial representation and recall the traffic participants surrounding their car. The results show that the quality of retrieval is a function of the distance-to-stop-line, the drivers' angle of view, and cognitive load. The results of the experiment and a first concept of an Intersection-Assistance system, supporting the driver at complex intersections, are presented.