

# How is surrounding traffic complexity related to driver workload?

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## **Abstract**

Driving a car can involve extreme fluctuations in mental workload and some vehicle manufacturers are attempting to develop systems that manage workload. Such systems are needed to manage the attentional processing demands placed on the driver both from outside the vehicle and within the vehicle. As the modern driving task is a driver-vehicle-environment interaction, this research explores the possible methods in quantifying the workload imposed by the dynamic environment. In this study, different methods of assessing the demands placed on drivers by traffic variables, particularly traffic density and lane change effects were examined. The changes in the driving demand resulting from the surrounding traffic were measured using subjective ratings and tactile detection task. The analysis presented here was based on subjective ratings and detection task response times, compared with data obtained from the simulator. The results showed that both main effects of traffic density and lane change were found to be significantly affecting the driving task difficulty, while subjective ratings was found to be the most sensitive measure of driver workload.

## **Introduction**

Today, there is a wide range of assistance systems available in the market, built to support the driver in the car. The increase of interaction of the driver with in-vehicle systems has increased the awareness of the risk of extra driver workload and distraction, simply because the driver has to divide his or her attention between the outer world and the system inside the vehicle. While all researchers would agree that driver workload and distraction are a major safety issue, the question still remains how do we measure workload, particularly during presence of any sudden increases in workload?

Most studies often looked at how adding secondary tasks interferes with driving, with some of these studies also manipulated the complexity of the drive insofar as they compare rural and urban driving (Cantin, Lavalliere, Simoneau, & Teasdale, 2009), low and high density traffic (Cnossen, Meijman, & Rothengatter, 2004, Verwey, 2000), etc. The focus is often on the dual-task manipulation and the effect magnitudes vary. This study used a more naturalistic approach exploiting the fact that driving task is a visual cognitive task and the driving difficulty is affected by environmental factors outside the vehicle, namely the roads and traffic. The goal of