

## **The effects of electronic map complexity and orientation on driver response time and error rate for road identification**

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### **Abstract**

An experimental study was conducted to investigate driver abilities of information processing within a short time. The major objective of the study was to test the effects of electronic map complexity and orientation on driver response time and error rate for road identification. The interaction between map complexity and orientation was also tested, along with the effect of individual factors such as age and gender on the response to the information display. The results showed that both road complexity and map orientation had significant effects on response time and the error rates, with the road complexity having a stronger influence on the two measures than that of map orientation. The study suggests that, when designing in-vehicle map display systems for efficient route navigation, care must be taken not to overload the driver with excessive road information. It appears that road complexity would be best limited up to 'level 3' (as defined in this study) for each display as under these circumstances map orientation tends not to significantly affect the driver responses tested. If more complex road situations were to be viewed at a glance, an upright orientation would be more beneficial to compensate the negative effect on driver responses.

### **Introduction**

Driving is a complex task in which there is continuous and rapidly changing information available to the driver. It is estimated that 85%-90% of the information necessary to drive comes through visual inputs (Dewar, 1988). In order to facilitate the design of in-vehicle route navigation systems, two questions need to be answered with priority: What information do drivers need? How should the information be presented? It is still not fully understood at this stage, however, what type of information would best meet an individual driver's needs for efficient route navigation and how much information a driver can take from an information display during driving, given the fact that the driver has only limited time to look at the in-vehicle display such as an electronic map.

There are basically two types of map displays for navigation, namely north-up and track-up map alignments. With a north-up alignment, there is incongruity between