

Smart driving advice from a smart driving advisor: how Foot-LITE responds to driver mental workload

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Abstract

'Foot-LITE' is a UK project aimed at developing an in-car smart driving advisor. Running on a smartphone platform, it will gather data from the vehicle's on-board diagnostics and, through a visual and auditory interface, provide feedback on driving in a safer and more environmentally friendly way. One of the key concerns throughout the project has been the design of the interface, to ensure that the desired behaviours (smarter driving) are elicited without introducing negative impacts such as distraction. In an effort to achieve these goals, the visual display has been developed through an ecological interface design process, based on the foundation of cognitive work analysis. However, it was also determined that there should be a dynamic aspect to the interface, in providing appropriate levels of feedback in different driving situations, to manage the driver's mental workload. This paper reports on some of the theoretical underpinnings of the interface, based on hierarchical models of driving and skill acquisition (e.g., the skill-rule-knowledge framework). Moreover, the paper proposes a set of rudimentary rules for a mental workload manager within Foot-LITE to respond to the driving context in a dynamic manner.

Introduction

Modern vehicles contain an increasing amount of instrumentation, as a combined consequence of factors including the motivations of vehicle manufacturers, advances in technology and consumer demand. Over the past decade in particular, such motivations have become more and more focused on the environmental and economic costs of road transport (Young, Birrell, & Stanton, in press). One way in which these costs of driving can be reduced is by adopting an 'eco-driving' style, and many manufacturers are now offering in-vehicle information displays to provide feedback on such behaviours.

However, this added information available to the driver raises significant ergonomic concerns for mental workload, distraction and ultimately driving task performance. Meanwhile, road safety remains a high priority alongside these other concerns (e.g., PACTS, 2007). As an effort at resolving these issues, the UK 'Foot-LITE' project (www.foot-lite.net) was aimed at developing a system to encourage 'smart' – that is safe and environmentally friendly – driving behaviours. A key component of the