Chapter 21
SatNav or SatNag?
A Case Study Analysis of Evolving HCI Issues for In-Car Computing

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ABSTRACT
A wide range of in-car computing systems are either already in existence or under development which aim to improve the safety, efficiency and the comfort/pleasure of the driving experience. Several unique forces act on the design process for this technology which must be understood by HCI researchers. In particular, this is an area in which safety concerns dominate perspectives. In this position paper, I have used a case study system (vehicle navigation) to illustrate the evolution of some key HCI design issues that have arisen in the last twenty years as this in-car technology has matured. Fundamentally, I argue that, whilst HCI research has had an influence on current designs for vehicle navigation systems, this has not always been in a wholly positive direction. Future research must take a holistic viewpoint and consider the full range of impacts that in-car computing systems can have on the driving task.

INTRODUCTION
In-car computing systems provide information of relevance to the driving task (e.g. navigation, traffic and travel) or aim to support/replace the driver in fundamental vehicle control tasks (e.g. collision avoidance, lane keeping). In addition, a range of systems provide information and services related to other salient goals, for instance, to enhance working productivity (e.g. email/Internet access) or for comfort/entertainment purposes.

The single contextual design factor that differentiates this area from any other within mobile HCI work is the safety impact. Paul Green makes...
this point eloquently when he notes that he “knows of no-one who has ever been killed as a consequence of operating a computer at a desk, but the loss of life associated with crashes arising from normal motor vehicle operation is huge” (Green, 2008, p.702). Every year, approximately 1.2 million people die in road traffic collisions (WHO, 2004), and, in the vast majority of cases human error is the primary contributing factor (Dewar and Olson, 2002).

In some respects, safety can be seen as a cloud (or mist) that hangs over the automobile industry and impacts on many design decisions. Figure 1 illustrates a range of tensions which exist within the design process for in-car computing. These have been informed by my experience of working closely with vehicle designers and engineers. They are also influenced by recent work we conducted at Nottingham in which ten industry experts were interviewed regarding their perspectives on HCI and Human Factors research and the development of in-car computing systems (Irune and Burnett, 2008). Whilst several other tensions will inevitably arise (e.g. cost versus functionality), I believe these particular tensions to be specific to in-car computing and HCI issues. Importantly, HCI research must recognise such tensions in their development of methods, tools and interface solutions.

- **Tension 1**: A contextual factor of considerable importance for in-car computing is space. A vehicle has limited ‘real estate’ and drivers/passengers must sit in relatively constrained postures, often for considerable periods of time. Pressures act to increase functionality within the vehicle, yet the space available for controls and displays does not generally change. This factor has had a considerable impact on the nature of user-interfaces developed for vehicles, in particular, the current trend for menu-based interfaces, together with touchscreen or rotary controller input devices.

- **Tension 2**: Designers often seek innovation in their work. However, the automobile industry can be particularly conservative, such that there is often a focus on evolution, rather than revolution, in design. Novel designs are developed, but these

*Figure 1. Typical tensions existing in the design process for in-car computing systems*
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