What benefit does Intelligent Speed Adaptation deliver: A close examination of its effect on vehicle speeds

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ABSTRACT
Intelligent Speed Adaptation (ISA) is a driver support system which brings the speed limit information into the vehicle. This paper describes the UK ISA field trials taken place between 2004 and 2006 and presents evidence on how drivers’ choice of speed is altered. The ISA system was observed to have a distinctive effect in transforming the speed distribution from a conventional bell shape to an asymmetric distribution biased towards the high speed end. ISA not only diminished excessive speeding, but also led to a reduction in speed variation, prompting a positive implication to accident reduction. The use of an overrideable ISA system also provided an opportunity to investigate where drivers would choose to have ISA based on observed behaviour instead of opinion. Evidence shows that ISA tends to be overridden on roads where it was perhaps needed most. Behavioural difference among driver groups also suggests that ISA tends to be overridden by those drivers who in safety terms stand to benefit most from using it, as with other safety systems.

1. Introduction
Speeding is a universal road safety problem. It occurs to all types of drivers, and on all categories of roads. Statistical evidence shows that a high proportion of cars travelling over the speed limits, as illustrated in Fig. 1 (Department for Transport, 2009). Speeding has also long been the most common traffic offence dealt with by police action (Ministry of Justice, 2008). Furthermore, a recent one-week operation by police forces across 22 European countries as part of the European Traffic Police Network’s Lifesaver project also discovered that 636,038 drivers were detected breaking the speed limits (European Transport Safety Council, 2009).

In terms of why drivers exceed speed limits, Corbett (2000) argues that speeding is not seen as a crime by most drivers and is widely believed to be socially acceptable. A recent survey by the motor insurance industry seems to support such a view in that three-quarters of UK drivers admitted to regular speeding (CIS, 2008). Drivers’ personality (e.g., sensation seeking) and demographic characteristics (e.g., gender and age) also play a role in intentional speeding (Zuckerman and Neeb, 1980; Webster and Wells, 2000).

Drivers however might unintentionally exceed the speed limits simply due to the inherent difficulty in accurate speed perception. Drivers estimate their own travel speed by a variety of sensory inputs, including visual (Gibson, 1979), auditory (Matthews, 1978), and kinaesthetic (McLane and Wierwille, 1975) cues. Hence, for example, the presence of road environment, noise, and surface quality would all affect drivers’ estimation of their own travel speed. Transitions between high and low speed zones also present a problem in that drivers who have travelled in a high speed zone for a certain duration tend to under-estimate their speed when driving into a lower speed zone (Denton, 1976; Casey and Lund, 1993).

The threat of speeding to road safety lies in its strong relation to accident occurrence and severity. It is a straightforward notion that the faster the vehicle travels, the less time the driver has to respond to incidents (i.e., principles of human performance), and the harder the vehicle collides (i.e., the laws of physics). The link between travel speed and accident occurrence and severity has been well documented (e.g., Nilsson, 1982; Baruya, 1998; Maycock et al., 1998; Quimby et al., 1999; Taylor et al., 2000, 2002; Elvik et al., 2004). The inclusion of contributory factors in UK’s official accident records since 2005 also shows that excessive speed and speeding are a major cause of accident occurrence as well as strongly influencing accident severity, as depicted in Table 1.

2. Intelligent Speed Adaptation
Intelligent Speed Adaptation (ISA) is a driver support system which brings the speed limit information into the vehicle. An ISA system can be configured in various ways depending on the desired level of intervention with the driver’s speed control task: