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Driving with intelligent speed adaptation: Final results of the Belgian ISA-trial

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Abstract

In October 2002 the first ISA-trial in Belgium was started in Ghent. Thirty-four cars and three buses were equipped with the ''active accelerator pedal''. In this system a resistance in the accelerator is activated when the driver attempts to exceed the speed limit. If necessary, the driver can overrule the system. The main research goals of the trial in Ghent were to evaluate the effects of ISA on speed-change, traffic safety, drivers' attitude, behaviour and drivers' acceptance. To study these effects of the ISA-system both surveys and logged speed data were analyzed. In the surveys drivers noticed that the pedal assisted them well in upholding the speed limits and that the system increased driving comfort. Most important drawbacks were technical issues. Data analysis shows a reduction in the amount of speeding due to the ISA-system. There is however still a large remaining percentage of distance speeding, especially in low speed zones. Differences between drivers are large. For some drivers speeding even increases despite activation of the system. For less frequent speeders average driving speed almost always increases and for more frequent speeders average speed tends to decrease. With the system, less frequent speeders tend to accelerate faster towards the speed limit and drive exactly at the speed limit instead of safely below, which causes average speeds to go up.

Keywords: Intelligent Transport Systems (ITS); Intelligent Speed Adaptation (ISA); Acceptance; Driving behaviour

1. Introduction

Excessive speed can be considered as a contributory factor in road accidents. Not only can it be the cause of accidents, it also defines the level of impact. Finch et al. (1994) declared that reducing speed with 1 km/h can

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lead to 3% less accidents risk. Inappropriate speed is involved in around one-third of the accidents resulting in vehicle occupant fatalities (ETSC, 1995).

In 2000, the European Union (2001) has set the ambitious target to reduce the number of fatal accidents by half before 2010. Many different European countries have therefore taken actions to increase road safety. One of these actions is the further development of intelligent transport systems that potentially have a significant role to play in road safety. Indeed, since Intelligent Speed Adaptation (ISA) is considered as a useful device to reduce inappropriate speed, it may contribute to increase road safety.

ISA is an intelligent in-vehicle transport system, which warns the driver about speeding discourages the driver from speeding or prevents the driver from exceeding the speed limit (Regan et al., 2002). Most ISA-devices are categorized into three types (ETSC, 2005) depending on how intervening (or permissive) they are. An informative or advisory system will only give the driver feedback with a visual or audio signal. A supportive or warning ISA system will intervene when the speed limit is overruled. For example, the pressure on the accelerator pedal will increase when the driver attempts to drive faster than the speed limit. A mandatory or intervening system will totally prevent the driver of exceeding the limit: these systems cannot be overruled by the driver.

Several trials are already held across Europe, with different types of ISA. In the Netherlands, a mandatory system has been used. The United Kingdom, instead, focussed on an advisory system (Carsten and Comte, 1997; Carsten and Fowkes, 2000). In Sweden, a range of different types of systems were tested in different cities (Vägverket, 2002). Special focus in Sweden was on the ''active accelerator pedal'' (Almqvist and Nygård, 1997). The same system is also used in the Belgian trial.

From October 2002 until January 2004, an ISA-trial has been held in the city of Ghent (Belgium). 34 cars and 3 buses were equipped with an ISA-system called the ''active accelerator pedal''. To study the effect of the ISA-system on speed-change, traffic safety, drivers' attitude, behaviour and drivers' acceptance, surveys and analyses of driving data were held. In this paper, the results of this trial will be reported.

2. Background of the Ghent ISA-trial

In this trial, a half-open or supportive ISA-system was used. This system is better known as the 'Active Accelerator Pedal (AAP) or 'Limit Advisor' manufactured by the Swedish company Imita. This system has a force feedback function, which is a mechanical resistance applied to the accelerator pedal as a distinct moveable pressure point.

The test area covered the city of Ghent, within the ring-road R4. All legislated speed limits (30, 50, 70 and 90 km/h) within this area were put on a digital map. Inside the test-area the system could not be switched off. Outside the test-area, the participants could choose to enter a speed limit manually to activate the system.

In total, 37 vehicles participated in the ISA-trial. Twenty vehicles were owned by private test-drivers, 17 vehicles were owned by companies: six cars of the City of Ghent (one of the Social Services), five vehicles of the Ghent University, three buses of the regional public transport company, two vehicles of the Province of East-Flanders and one of Volvocars Ghent.

To recruit private test-drivers, advertisements were published in different media. Possible candidates could respond by letter to receive an application form. Hundred and eight drivers were retained as potential candidates. The drivers were selected from those 108 applicants based on technical feasibility of installation of the system inside the car, gender and age. It was difficult to have equal age and gender groups because a low number of women had respond. Twenty candidates ere selected as test-drivers: 11 male and 9 female drivers. Also, not every selected driver was the only driver of the vehicle. The total number of voluntary drivers was 28, spread over the 20 private cars.

Companies selected their cars themselves, only based on the given criteria of technical feasibility of installation. The gender and age of these test-drivers were not known in advance. By these selected cars it was assumed that there would be more than one driver, for example the bus drivers. The total (restricted) number of test drivers was 62: 42 male and 20 female spread over different ages.